

Biophysical Chemistry, Second Edition. By Dagmar Klostermeier and Markus G. Rudolph. CRC Press, Boca Raton, 2025, pp. 944. ISBN 9781032060835. Price GBP 57.39 (hardback)

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The authors indicate in the preface that the main target readers of this book are undergraduate students and scientists with a background in life sciences. This is definitely the least that can be said about this impressive compilation of knowledge presented in a very attractive way, with ‘boxes’ throughout the book giving some explanation of the concepts or remarks on unexpected applications, enlightened by numerous illustrations, schemes and molecular modeling that should inspire numerous teachers.

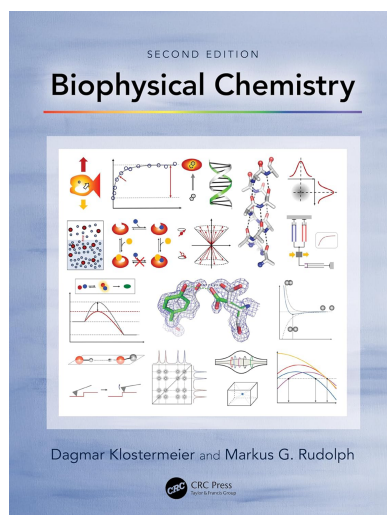
This book is organized into four parts; the first two cover fundamentals in chemistry and physics (thermodynamics and kinetics) and, even though the authors provide some focus on biological and biochemical examples, they contain information that could be useful not only to those who learn and work in the biochemistry field.

With regard to thermodynamics, the authors deliberately use the simplest formalism possible, starting from the most basic definitions (what is a system) to entropy, and without defining any reference state. The standard state is only introduced when heterogenous systems and chemical potential are introduced. This choice of simplifying the writing as much as possible will certainly make most thermodynamics purists squeal, but it allows a focus on the concepts instead of losing the reader in too many superscripts and subscripts. Beyond the scope of thermodynamics usually taught at the bachelor degree level, this part is completed by chapters dedicated to the very interesting statistical thermodynamics and to the thermodynamics of transport processes and one, too short, to electrochemistry.

Regarding the part dedicated to kinetics, this book is really original: most books, especially those covering a large scientific domain, usually limit this part to the simplest rate laws and their integration. This book details many cases and concepts such as irreversible, parallel and consecutive reactions, one- or two-step binding reactions, inhibition, catalysis (enzymatic), the Michaelis–Menten formalism and steady-state approximation concepts. All of the physicochemical techniques and methods are reported in Part IV of the book, but a chapter is dedicated to the method of solving differential equations arising from the rate law with the help of matrix algebra, and three examples of systems for which this mathematical approach may be used are given. In the chapter entitled *Single-Molecule Kinetics*, the link made between the behavior of a molecule and the observed resulting behavior of a large ensemble of molecules is very interesting. The link that is made with statistical thermodynamics and the concept of ergodicity is remarkable.

The part entitled *Molecular Structure and Interactions*, in contrast to that dedicated to thermodynamics, does not start at the zero level. Although some reminders of isomerism concepts are given, it is clearly expected that the reader has some basic knowledge in this domain. As indicated by the title, the structural description and isomerism are systematically intricately with the resulting effect from the energy point of view. For the non-biochemist that I am, this is not the easiest part to describe. Most the biochemical world seems to be described (nucleic acids, enzymes, proteins, DNA, biological membranes . . .). This chapter is not limited to static structural aspects since items such as the stability and kinetics of folding of proteins or, to give only one example, an interesting focus on the solubilization of membrane proteins by surfactant micelles are addressed. This part ends with a chapter dedicated to macromolecular modeling.

The fourth part (400 pages) is an exhaustive review/overview of the physicochemical methods employed for the investigation of matter; as one can imagine, the contribution of



each technique to reactivity and description in biochemistry is systematically investigated. In the first of these ten chapters, entitled *Optical Spectroscopy*, one may read about absorption, linear and circular dichroism, infrared spectroscopy and fluorescence (with some focus on fluorescence quenching, anisotropy, time-resolved fluorescence and FRET!). In other words, this chapter, like the nine following ones, approaches more than could be covered in a complete book. Nevertheless, the goal to outline each technique and its interest in the biochemical field is attained. The following chapters are dedicated to *Magnetic Resonance* (NMR and EPR), *Solution Scattering* (including small-angle neutron scattering; Raman spectroscopy is interestingly described in this part, clearly underlining the difference in principle between quasi or elastic light scattering and inelastic light scattering), *Crystallography*, *Fluorescence Imaging and Microscopy*, *Electron Microscopy*, *Scanning Probe Microscopy and Force Measurements* and *Transient Kinetic Methods* (I personally could complain that the stopped-flow part is too short, but I am certain that in each chapter and subchapter specialists will regret that their favorite technique/method has not been given the place that it deserves), *Molecular Mass, Size and Shape* (this chapter is not based as the others on methods or technique, but on quantity or parameter determination; it thus includes mass spectrometry, analytical centrifugation and surface plasmon resonance) and finally *Calorimetry* (isothermal solution calorimetry and DSC). Even if chromatographic and related techniques (SEC, gel or capillary electrophoresis) could have had a place, for instance in the chapter *Molecular Mass, Size*

and *Shape*, and scanning electrochemical spectroscopy might have had a dedicated paragraph, for instance, in *Scanning Probe Microscopy*, finding an experimental technique or set of methods that is relevant in the biochemical field and is not evoked in this massive 'methods' part is a challenge.

At the end of each chapter some training questions (from four to 15, depending on the chapter) are given. This is not an exercise book, even if it may inspire a teacher; the solutions manual is not included in the book. Bibliographic references are also given at the end of each chapter, often from recent research publications; not all of these references are called out in the text, but one or two lines are given with each reference to indicate the main information or the field to which the reference is relevant. Finally, Chapter 31 is dedicated to the mathematical concepts used in the book, from very basic mathematical operators to an introduction to Fourier transformation. The index is 17 pages long and allows a single item to easily be retrieved.

In the parts including concepts that I have mastered I could not find errors and I found that the descriptions are clear and presented in an attractive manner. This really is a massive and impressive book overviewing a wide field of knowledge, especially when one considers that only two authors contributed. Although I am not a biochemist, it will stay on my desk and I will advise my students, including those who have graduated, to refer to this book as a panorama of concepts, methods and techniques in modern physico-chemistry. Of course I will recommend it to my library, as I recommend the readership of *Acta Crystallographica* to buy it.