Preface

This book is based on my experience in teaching biophysical chemistry to graduate students in the medicinal chemistry, pharmaceutics, and bioengineering programs at the University of Illinois at Chicago. The course was designed to give these students an adequate background in biophysical chemistry for research in drug discovery and development, and the course has had a strong emphasis on macromolecular solvation and ligand binding. The role of hydration in binding phenomena, along with the effects of salt and pH, is increasingly emphasized in the literature, so these students need a somewhat deeper background in preferential interaction concepts and in linkage thermodynamics than might students in biochemistry, pharmacology, or physiology programs. Of course, the students also need to learn about new techniques for characterizing macromolecular complexes with small molecules, such as surface plasmon resonance and fluorescence polarization, but there are certain underlying concepts in binding theory they need to grasp firmly so that they can interpret the results of assays that use these new methods.

This book tries to give that necessary theoretical background. It is certainly not a complete exposition of macromolecular binding, only an introduction that emphasizes some selected fundamental topics. The analytical methods of assaying macromolecular binding I have mainly left aside, though I do present what I hope will be some useful general advice on designing binding assays and how to interpret them. I also have summarized qualitative features of binding sites on proteins and nucleic acids, an area that is now referred to as "molecular recognition". But my main purposes have been to show how to use the binding polynomial approach in model building and interpretation, and to show how linkage thermodynamics can tie together disparate binding observations. Whenever possible, I have tried to tie the theory to concrete examples drawn from the research literature. I have also included a substantial number of references to the original literature, for those who might wish to pursue further any of the topics presented.

I would like to acknowledge the support given me by the Department of Medicinal Chemistry and Pharmacognosy at the University of Illinois at Chicago, and by my colleagues in that department. And of course, I welcome comments and suggestions from readers for improvement of this book.

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