

Preface

This short book is primarily intended to be read. If that sounds somewhat redundant, think of the present state of textbooks in science. They have become obese to the point of causing health problems to those students who take the trouble to carry them in their backpacks or read them in bed while drifting into the land of Nod. These massive tomes are often referred to, but rarely read. However, on the positive side, the current crop of textbooks in physical chemistry contain a wealth of information, numerous examples and a thousand or more problems, all carefully assembled. Yet one gets the uneasy feeling, while turning the pages, that the sum of that information does not equal knowledge. If knowledge is structured information, a constant flood of information leads to the question Eliot raised: where is the knowledge lost in the information?

My aims in writing this book are: to draw your attention to the basics, to show the warp and weft of physical chemistry and to be comprehensive and concise in explaining the fundamental ideas. This is an invitation to physical chemistry, but it is not a watered-down version and it does not conceal difficult concepts with a patina of facile analogies.

There are at least two ways of studying a subject. One is to stop at the end of each step, go through several examples and set a number of problems before moving on to the next step. The other is to read several connected chapters together before working through the details. Each method has its merits and its disadvantages. The textbooks already on the shelf are meant for the first mode of study. This book is intended to follow the second. I have, therefore, put examples, exercises and the intermediate steps in the derivations

on a disc for later study. It is my hope that you will read several chapters once or twice, seated comfortably with a pencil in hand, before even looking at the disc's contents. Our understanding of the topic depends on the context. Words that might initially look strange and foreign start making sense as they fit into the ongoing explanation.

For each chapter in the book the disc includes a) examples, exercises and comments on the derivations, b) additional material that is a natural extension of the text and c) historical and philosophical comments. I resisted the temptation to make it encyclopedic simply because so much useful information is already available in various books and postings on the web by authorities and amateurs. What is needed is coordination, and it is my hope that this book will facilitate that.

I believe that this book can be useful on several levels. If you have already taken a course or two in physical chemistry, you will find a refreshingly unique viewpoint in each section of the book. The way that quantum theory, thermodynamics and statistical thermodynamics are introduced differs significantly from the existing literature.

If you are a student about to take a course in physical chemistry intended for chemists, hyphenated chemists or engineers, willingly or unwillingly, you will gain some idea of the forest before counting the trees and twigs. My method of not stopping at every point and giving a lengthy explanation might be puzzling at first, but as you keep reading you will see patterns emerging, and ideas sticking together and making sense. Don't overestimate the difficulty and don't underestimate the patience needed.

If you happen to be an instructor using this book in a course (how delighted I would be!), I believe the text and the disc will provide material on the same level as the current standard textbooks.

However, this book serves best if the students are required to read ahead, then have a group discussion with the instructor or an assistant before diving into the details. Centuries ago Francis Bacon wrote, "Reading maketh a full man, conference a ready man and writing an exact man." I am sure Bacon would white-out "man"

and scribble “person” on the parchment, substitute “discussion” for “conference” and say something about word processing making a legible person, should he be writing today. It is through conference and discussion, however brief, that books of this sort find their best use.

On a more personal note, physical chemistry has always fascinated me. For me it is where the rubber meets the road. Physics and mathematics are both subjects I admire and keep studying, but they are a few inches above the road. Organic, inorganic and analytical chemistry, along with material science, have given us many gifts; they are the real road. I, who do not have the abstract talents of a mathematician, or interest in practical applications, found a comfortable home in physical chemistry. I hope this book conveys some of my fascination with the subject.

If you are broadly interested in science, I urge you to read either this or some other book on physical chemistry. Our knowledge about moon to Mars and beyond, and about mantle and crust, and so forth, comes from spectroscopy, thermodynamics and kinetics. Those are the ideas that have permeated other areas of science through physical chemistry, and the reward of being acquainted with this subject is a deeper understanding of the rest of science.

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