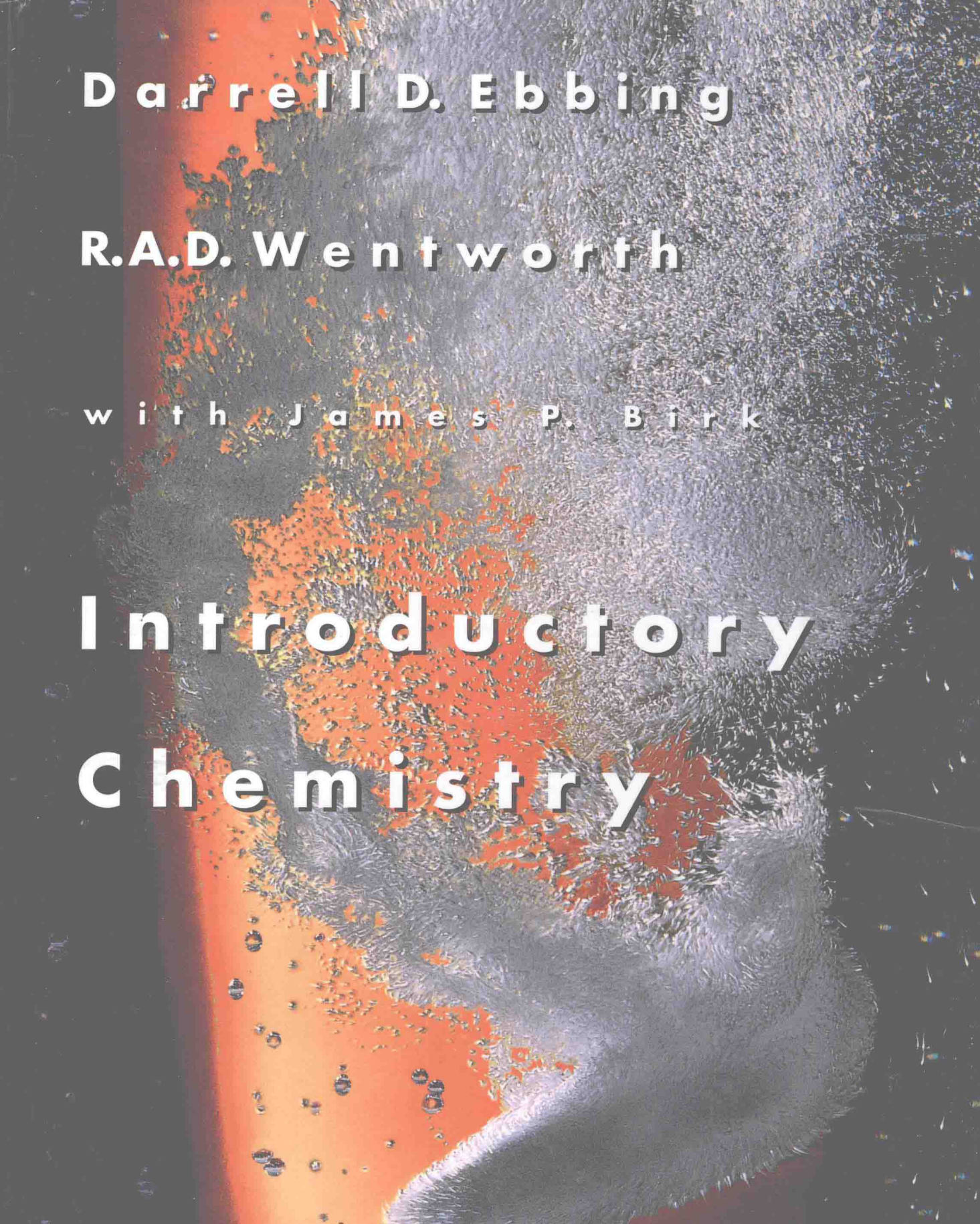

Darrell D. Ebbing

R.A.D. Wentworth

with James P. Birk

Introductory Chemistry

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Darrell D. Ebbing
Wayne State University

R. A. D. Wentworth
Indiana University

with James P. Birk
Arizona State University

Houghton Mifflin Company BOSTON TORONTO

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Warning: This book contains text descriptions of chemical reactions and photographs of experiments that are potentially dangerous and harmful if undertaken without proper supervision, equipment, and safety precautions. DO NOT attempt to perform these experiments relying solely on the information presented in this text.

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Introductory Chemistry

Preface

In writing *Introductory Chemistry,* we have had two types of students in mind. One includes those without previous background in chemistry, who need an understanding of the basic principles to pursue their particular career goals. The second type of student includes those who, while having had a previous chemistry course, require a thorough review of the basic principles as preparation for taking a general chemistry course. While these two types of students make for a diverse group, they do have much in common. They are looking for a course that is not only informative but engaging as well. They want to start at the beginning but do not want to be talked down to. And they want to be shown how chemistry is relevant to their particular interests and careers.

To write a textbook for a course with these expectations is a tall order, but we hope we have succeeded, if not perfectly, at least significantly. And we hope that students find the book both readable and interesting, and that instructors find that the book works with them and not against them. Here then are some features that we think work toward these goals.

WRITING STYLE

Many students approach chemistry with some apprehension. We felt that it was necessary to adopt a friendly but nonpatronizing writing style that will reassure students that we are on their side in their endeavor to understand the basic principles of chemistry. To aid students in their reading, we have consciously erected verbal signposts that remind them where it is they have been and where they are going. And to ease the way and show students that chemistry is indeed a subject that is useful to them, we have worked in as much everyday chemistry as possible. Finally, we have tried to make it clear through organization and illustration that in chemistry, concepts build one on another and each topic introduced has a purpose in developing the subject.

PROBLEM SOLVING

Problem solving is the application of rational argument to arrive at the solution to a problem. It is an important part of the introductory chemistry course, we believe,

because to understand chemical concepts one has to understand the context in which they are used. That requires a certain level of attainment of problem-solving skills. Problem solving involves skills that do not come easily to many people. Developing those skills requires understanding how to approach problems, and it requires practice in solving problems. We have directed much of our effort to helping students gain these problem-solving skills.

When faced with a problem, beginning students are often bewildered and ask, "How do I begin?" To help these students, we added the *Problem Analysis* section to the Examples in the text. This analysis follows each problem statement, and its purpose is to show the student how to think the problem through, using the information given in the problem, and using any relevant principles given in the text. The *Solution* applies this problem analysis to the specific problem statement. As students work through the problem analysis and solution of many problems, we hope they will begin to see that problem solving is not grasping thoughts from thin air by magic, but involves a process that can be learned.

As most instructors will agree, however, learning problem solving involves more than simply reading about how some problems were solved. Students have to solve lots of problems on their own. We have helped by providing similar problems that they can use for practice. We follow each worked-out example with a similar Exercise and then direct the students to similar problems at the ends of the chapters (Try Problems . . .). The chapters also provide many Additional Problems to stretch students' problem-solving skills.

STUDY AIDS

Whereas many students have difficulty knowing where to begin the solution of a problem, others have difficulty in a reading a textbook. They ask: Where are we going? How are the topics related? What are the significant points in what we have just read? No book can do everything for students—some synthesis of the material is a necessary part of the learning process—but we have done our best to make the path as easy as possible for students by designing a system of *study aids* that they can adapt to their own program of study.

Each chapter begins with an *Outline* that shows the structure of the chapter. Note that chapters are divided into Parts, which are divided into Sections and Subsections. We think this outline should help the student see the structure of the chapter and help in answering the questions, Where are we going? and, How are the topics related? Not everything in the outline will be clear at first. Students will find it helpful to return to this *Outline* as they read through the chapter. The *Outline* can also be used in reviewing. For example, a student might look at each section heading in the outline and try to write a short summary from memory of what was covered in that section.

Each section of a chapter begins with learning *Objectives.* These objectives list concepts and problem-solving skills introduced in the section, and so provide an overview of the significant points in the section. Thus, the objectives are particularly appropriate in trying to answer the question, What are the significant points in what we have just read? After reading the section, the student should find the passage in the section corresponding to each objective, perhaps marking it with a highlighter. Also, as in the case of the outline, objectives can be useful in reviewing.

Throughout the text, marginal notes give students additional historical and descriptive information to help engage them in the topic. These notes also provide cross references to other sections of the text, for students' use in reviewing background information.

Chemistry requires students to learn a special vocabulary to express ideas. Every time we introduce a key word, we note that by setting the word in **boldface type,** following it with an explicit definition of the word, given in *italic type,* so that students do not have to guess the exact meaning of key words. These key words and some others are gathered in a *Glossary* at the end of the book. When a student encounters a word in reading that he or she does not know or does not remember, the student can simply look it up in this glossary.

An extensive *Chapter Review* appears at the end of each chapter. *Key Words* lists all of the terms given in boldface type introduced in the chapter. If any important equations were introduced in the chapter, these are listed under *Key Equations.* Following these lists is a *Summary,* a verbal condensation of the important points covered in the chapter. *Problem-Solving Skills* is a summary list of the different problem-solving skills introduced in the chapter. Each skill is keyed to one or more worked-out *Examples* in the text that use that problem-solving skill.

Chapter questions and problems follow these review features. A student should be able to answer most of the questions under *Questions to Test Your Reading* after reading (and perhaps rereading) the chapter. The *Practice Problems* are similar to the problems solved in the Examples, though some Practice Problems provide a variation or extension of the problem-solving skill used in the Examples. *Additional Problems* provide more practice and in many cases more-difficult problems.

DESCRIPTIVE CHEMISTRY

While our aim in this book is to cover the basic principles of chemistry, we strongly believe that students need to see how these principles relate to the world around them. The principles have to appear in the context of "descriptive" chemistry, which is chemistry as we experience it, including the application of chemistry to everyday problems. This descriptive chemistry should be closely related to the students' experience, to bring interest and relevance to the material.

We have used several methods to bring descriptive material into the book. First, we have weaved descriptive chemistry into the discussion of principles, in order to reduce the level of abstraction of the discussion and to help the student see the relevance of the principles. Where possible, we have used a chemical application as a thread for our discussion, both for interest and to help the student see relationships among the principles. Also, we have introduced descriptive chemistry into the examples and problems to give them significance, so they become more than simply problem-solving "drill."

The *Chemical Perspectives* are a special feature of the book. These consist of short essays appearing in boxes at the ends of chapters. Each Chemical Perspective deals with a topic of everyday interest, perhaps an environmental concern or chemistry as applied to medicine, and so forth. The Chemical Perspective uses one or more principles in the chapter to illustrate the usefulness of chemistry.

We want students to enjoy the Chemical Perspectives without fear of being tested on them. Therefore, we have not included any problems dealing with the topics in

Chemical Perspectives. We have also tried to make the style of writing different, so that it approaches the kind found in popular magazines without losing exactness and truth.

ILLUSTRATION PROGRAM

Most of us find that interesting and colorful figures draw our attention to the text material. For those students who are visually oriented, a "picture" of what is being discussed in the text is a necessity. For them, a picture is indeed worth a thousand words. We have gone to great lengths to ensure that the illustration program meets our two-fold goal of appropriateness to the topic and visual interest. The style of many of the figures is, we believe, fresh and modern. For example, zoom-sequence photos are used in some cases to allow the student to compare the macroscopic aspects of a piece of matter to its submicroscopic structure. Pictures of minerals are often inset into a photograph of the country where the mineral is mined. Molecular models are generally computer-generated color images. Atoms in these images have been color-coded so that an atom will have the same color throughout the book. In short, much of the photo and art work is designed, we hope, to make a student look at it a second time, and then learn from it and perhaps even enjoy it.

COMPLETE INSTRUCTIONAL PACKAGE

This text is accompanied by a complete package of instructional materials, designed to help instructors and students alike.

The Instructor's Resource Manual with Test Bank, by R. A. D. Wentworth, James P. Birk, and David Williamson of California Polytechnic State University, is a comprehensive teaching aid that includes chapter descriptions, alternate course sequences, and transparency masters. The manual also contains a 1,000 item multiple-choice test bank.

The Solutions Manual, by George Schenk of Wayne State University, and David Bookin of Mt. San Jacinto College, contains worked-out solutions to all in-chapter exercises and end-of-chapter problems. Complete answers are also provided for the Questions to Test Your Reading.

The Study Guide, by Arnold Loebel, provides discussion of all key concepts and topics with worked-out examples incorporated. Important terms are given for each chapter, and additional practice problems are given for all problem-solving skills. Chapters conclude with a practice exam.

The Lab Manual, by R. A. D. Wentworth and Karen Pressprich, Indiana University, contains 22 experiments class-tested by hundreds of students. At least one experiment is included for each text chapter.

The Instructor's Resource Manual to accompany the Lab Manual, also by Karen Pressprich, includes suggested equipment and material, time requirements, answers to pre-lab and post-lab questions, and sample student data for all experiments.

The Computerized Test Bank is an electronic version of the 1,000-item test bank, available in DOS, Windows, and Macintosh versions.

A set of 76 two- and four-color **transparency acetates** includes selected line art images from the text.

The Houghton Mifflin **Chemistry Videodisc** is available, containing 34 lecture demonstrations by Patricia Samuel, Boston University.

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Hugh Akers, Lamar University
David Bookin, Mt. San Jacinto College
LeRoy P. Breimeier, Vincennes University
Helon L. Chichester, College of Alameda
Phrosene Chimiklis, Victor Valley College
Richard D. Conway, Shoreline Community College
Preston L. Durrill, Radford University
Gordan J. Ewing, New Mexico State University
Sharon M. Fetzer, University of Illinois at Chicago
Beverly D. Foote, Eastern Illinois University
Tom Fredricks, Cypress College
John Goodenow, Lawrence Technical University
John Higashi, Solano Community College
Catherine A. Keenan, Chaffey College
Floyd W. Kelly, Casper College
Robert C. Kelly, Ventura College
Christine S. Kerr, Montgomery College
Joy Kobayashi, Ventura College
Chhiu-Tsu Lin, Northern Illinois University
Arnold Loebel, Merritt College
Miriam Malm, University of New Mexico
Vahe M. Marganian, Bridgewater State College
Barbara O'Brien, Texas A & M University
Richard S. Perkins, University of Southwestern Louisiana
Robert C. Pfaff, St. Joseph's College
George A. Pfeffer, University of Nebraska at Omaha
Richard C. Phillips, Youngstown State University
Ralph Powell, Eastern Michigan University
Richard Reiter, Illinois State University
George H. Schenk, Wayne State University
Alfred C. Schram, West Texas A & M University
Donald L. Showalter, University of Wisconsin-Stevens Point
Donald G. Slavin, Community College of Philadelphia
Alan G. Smith, University of Southern Maine
Tamar Y. Susskind, Oakland Community College
David L. Taylor, Northern Virginia CC
Vernon J. Thielmann, Southwest Missouri State University
Chi Wing Tsao, City College of San Francisco
Walter Weibrecht, University of Massachusetts—Boston
John A. Weyh, Western Washington University
Thomas M. Willard, Florida Southern College
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Finally, we wish to dedicate this book to our wives Jean Ebbing and Anne Fraker, who by their wit and good humor managed to keep us on an even keel through the inevitable windless days and stormy periods of the writing process.

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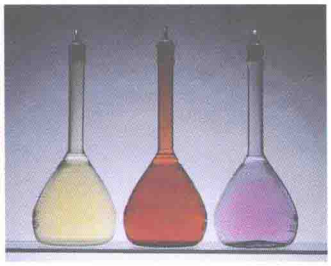

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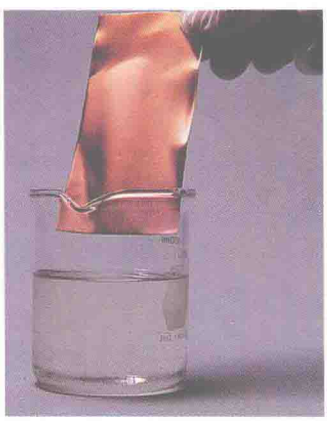

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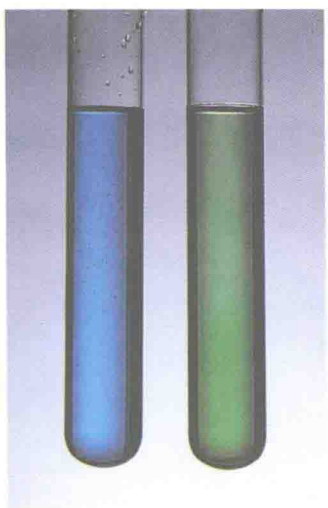

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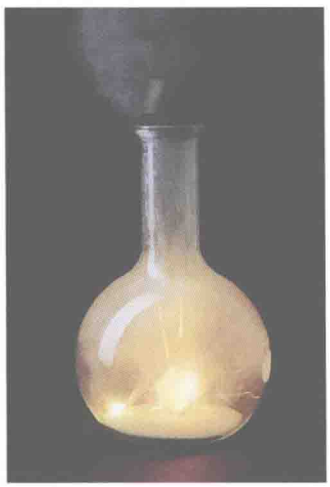

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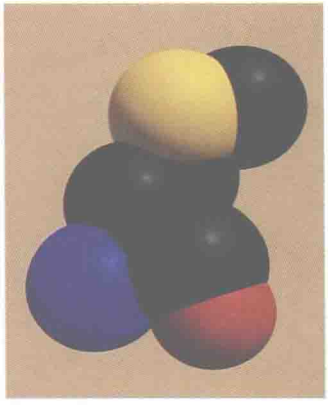

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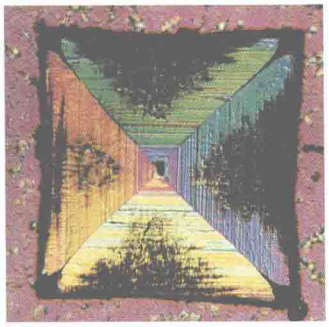

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