时代教育·国外高校优秀教材精选

化学原理

——了解原子和分子的世界

（英文版）

Conceptual Chemistry

Understanding Our World of Atoms and Molecules

（美）约翰 A. 祖霍基（John A. Suchocki）著

机械工业出版社

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出版说明

随着我国加入 WTO，国际间的竞争越来越激烈，而国际间的竞争实际上也就是人才的竞争、教育的竞争。为了加快培养具有国际竞争力的高水平技术人才，加快我国教育改革的步伐，国家教育部近来出台了一系列倡导高校开展双语教学、引进原版教材的政策。以此为契机，机械工业出版社拟于近期推出一系列国外影印版教材，其内容涉及高等学校公共基础课，以及机、电、信息领域的专业基础课和专业课。

引进国外优秀原版教材，在有条件的学校推动开展英语授课或双语教学，自然也引进了先进的教学思想和教学方法，这对提高我国自编教材的水平，加强学生的英语实际应用能力，使我国的高等教育尽快与国际接轨，必将起到积极的推动作用。

为了做好教材的引进工作，机械工业出版社特别成立了由著名专家组成的国外高校优秀教材审定委员会。这些专家对实施双语教学做了深入细致的调查研究，对引进原版教材提出许多建设性意见，并慎重地对每一本将要引进的原版教材一审再审，精选再精选，确认教材本身的质量水平，以及权威性和先进性，以期所引进的原版教材能适应我国学生的外语水平和学习特点。在引进工作中，审定委员会还结合我国高校教学课程体系的设置和要求，对原版教材的教学思想和方法的先进性、科学性严格把关。同时尽量考虑原版教材的系统性和经济性。

这套教材出版后，我们将根据各高校的双语教学计划，举办原版教材的教师培训，及时地将其推荐给各高校选用。希望高校师生在使用教材后及时反馈意见和建议，使我们更好地为教学改革服务。

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序

这是一本新版的普通化学教科书。全书共19章，前12章以化学基本原理为主，通过学科发展的简介和与现实生活的联系，使学生更容易了解和接受化学基本原理和概念。后7章是为了使学生在探索与化学相关的其它课题时获得阅读有关材料的经验。所以后7章是一些相对独立的应用领域，如生活中的化学物质、药物化学、粮食生产的优化、淡水资源、空气资源、材料资源、能源。本书取材生动活泼，插图精美，可读性强。

该书和现有的普通化学教材的最大差别，在于理论的深度和系统性的不同。书中几乎没有关于初等量子力学和化学热力学的内容，这在近年来我所见过的多种国内外普通化学教材中几乎是唯一的。对于该书作者的这种处理，我认为不失为解决普通化学教学出路的一种有价值的尝试。例如，内容繁杂而又极其重要的有机化学，在普通化学教材编写时，由于篇幅和学时的限制，一直是一个很难处理的问题。作者在该书中仅用了36页的篇幅就完成了关于有机粅学基础的介绍。该章共分4节，即：碳氢化合物只包含碳和氢；不饱和碳氢化合物含有多重键；按功能团分类的有机分子；有机分子可以连接成为高聚物。读后颇有耳目一新之感。

各章所设栏目如下：概念自查(附有问题，随之给出解答。有助于学生在学习新概念之前加深对已学概念的理解)；身边的化学(使学生不在化学实验室时，利用家里的器具和物品也能进行化学探究，以提高学生远程学习和课堂学习的积极性)；计算角(不是每章都有，以练习定量计算为主)。各章后均附有关键术语和有关定义，复习问题，身边化学现象的讨论，练习题，问题，讨论题(13～19章)，建议的阅读材料和网址。

该书在文字叙述上，一改原有教材的传统风格，以贴近学生为主，语言生动活泼；内容涉及面较广，比喻生动有趣，可读性强，图文并茂；版面设计和栏目安排都很有特色。

该书作者在化学学科领域不大为人所知，但是他所编写的这本教科书却颇有特色，在体现化学教学新理念方面有比较大的进步，是一本值得向国内普通化学教学界推荐的教科书和参考书。

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清华大学化学系
2002年3月

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Conceptual Chemistry Photo Album

Conceptual Chemistry is personalized with photographs of my family and friends. A photo of my uncle Paul Hewitt, to whom this book is gratefully dedicated, appears on page 643. On Uncle Paul's lap is my son Reece Suchocki (pronounced Su-hock'-ee, with a silent c) who, as a toddler, sums up the book with his optimistic message.

Taking advantage of water's high heat of vaporization is my wife, Tracy, who is seen fearlessly walking over hot coals on page 258. Demonstrating the potential energy of a drawn bow and arrow on page 17 is our oldest son, Ian, who is also seen as a baby with his mom on page 86 letting us know that the closeness between us is in the heart. Our third child, Maitreya Rose, was born just months before the publication of this book. She is proudly showcased both as a fetus and as a baby on page 430 and as one of the models of Figure 13.18, on page 401, highlighting the value of proteins. About to enjoy his favorite beverage—by the liter—is son Reece on page 11. The inverted image of Reece and his mom enjoying the balmy beaches of Hawaii can be seen on page 326 in the discussion on the chemistry of photography. And just in case you were wondering, those are Ian's hands holding the mineral fluorite on page 178, and those are my fingers on page 150 lightly touching the strings of Betsy, my guitar since childhood. Also of our immediate family is Rusty Cat, who you will find on page 616 helping to provide perspective for the propane tank to the side of our home.

A few members of our extended family have also made their way into *Conceptual Chemistry*. My nephew Graham Orr is seen on page 50 enjoying one of the most valuable resources this planet has to offer—fresh water. Exploring the microscopic realm with the uncanny resolution of electron waves is my cousin George Webster, who is seen on page 145 along side his own scanning electron microscope. George's son, Christian, is the cute kid in the Chapter 3 opening photo. Christian is holding a model of the amino acid glycine in front of the multitude of stars from which most all atoms, other than hydrogen, arise. Tracy's brother, Peter Elias, is found on page 582 smelling the camphorous odor of a freshly cut Ping-Pong ball. Look carefully on page 601 and you will see Peter again along with his mom (my mother-in-law), Sharon Hopwood, as they perch upon the branch of a tree made strong by its composite nature. Both Peter and Sharon were key players in the development of the *Conceptual Chemistry Alive!* CD-ROM tutorial.

In addition to family photographs, the photographs of many friends grace this book. Ayano Jeffers-Fabro is the adorable girl hugging the tree on page 10. She is the daughter of Ati and Lisa Jeffers-Fabro, who are dear colleagues of Tracy at the Hawaii Nature Center, which is where Tracy snapped the photo of me in my "To the Student" address (see opposite page). Friend and neighbor Jill Rabinov and her daughter Michaela appear on page 44 demonstrating the chemical nature of biological growth. Looking through the spectroscope on page 138 is our precious Tibetan friend and housemate Rinchen Trashi. A number of close friends of Ian and Reece also appear. Cole Stevens, who is seen on page 232, helps us to be amazed by what happens to the volume of water as it freezes. Cole's sister, Maya Stevens, is seen pondering the organic chemicals within vanilla and chocolate ice cream on page 347. In the Chapter 13 opener on page 384 are Daniel Glassman-Vinci and his twin brother Jacob. I'll leave it to you to decide whether they are two people at the same time or two people at different times—read the opener carefully. Last, but certainly not least, is Reece's best friend, Makani Nelson, who on page 385 provides us with as fine an example of a human body full of cells and biomolecules as there ever was or ever will be. We are born with the desire to learn about our environment and our place in it. Let the sparkle of curiosity in the eyes of the many children portrayed in this textbook serve as a reminder of this important fact.

To the Instructor

Living in a small city, I occasionally run into my former liberal arts chemistry students. I find them stocking shelves in grocery stores, managing hair salons, driving delivery trucks, dispensing tickets at movie theaters, singing in bands, canvassing for politicians. These encounters are pleasant and many even heartwarming, but afterward, I often wonder how these people benefitted from successfully completing my course. They may have enjoyed a number of my class sessions, and could perhaps even recall many of the chemistry demonstrations and hands-on activities we did together. But years later, what positive influences, if any, remain?

As instructors, we share a common desire for our teaching efforts to have a long-lasting positive impact on our students. We focus, therefore, on what we think is most important for the student to learn. For students taking liberal arts chemistry courses, certain learning goals are clear. They should become familiar with and, perhaps, even interested in the basic concepts of chemistry, especially the ones that apply to their daily lives. They should understand, for example, how soap works and why ice floats on water. They should be able to distinguish between stratospheric ozone depletion and global warming, and also know what it takes to ensure a safe drinking water supply. Along the way, they should learn how to think about matter from the perspective of atoms and molecules—we sense the smell of a rose, for example, as molecules from its petals journey through the air and into our noses. Furthermore, by studying chemistry, students should come to understand the methods of scientific inquiry and become better equipped to pass this knowledge along to future generations. In short, these students should become citizens of above-average scientific literacy.

These are noble goals and it is crucial that we do our best to achieve them. Judging from my encounters with former liberal arts students in the midst of their daily lives, however, I have come to conclude that this is not what they cherish most from having taken a course in chemistry. Rather, it is the personal development they experienced through the process.

As all science educators know, chemistry—with its many abstract concepts—is fertile ground for the development of higher-thinking skills. Thus, it seems reasonable for us to share this valuable scientific offering—tempered to an appropriate level—with all students. Liberal arts students, like all students, come to college not just to learn about specific subjects, but for personal growth. This growth should include improvements in their

analytical and verbal-reasoning skills along with a boost in self-confidence from having successfully met well-placed challenges. The value of our teaching, therefore, rests not only on our ability to help students learn chemistry, but also on our ability to help them learn about themselves.

These are the premises upon which *Conceptual Chemistry* was written. You will find the standard discussions of the applications of chemistry, as shown in the table of contents. True to its title, this textbook also builds a conceptual base from which the nonscience student may view nature more perceptively by helping them visualize the behavior of atoms and molecules and showing how this behavior gives rise to our macroscopic environment. Numerical problem-solving skills and memorization are not stressed. Instead, chemistry concepts are developed in a story-telling fashion with the frequent use of analogies and tightly-integrated illustrations and photographs. Follow-up exercises are designed to challenge the students' understanding of concepts and their ability to synthesize and articulate conclusions. Concurrent to helping students learn chemistry, *Conceptual Chemistry* aims to be a tool by which students can learn how to become better thinkers and reach their personal goals of self-discovery.

Organization

The basic concepts of chemistry are developed within the first twelve chapters of *Conceptual Chemistry.* Threaded into the development, real-life applications facilitate the understanding and appreciation of chemistry concepts. In the remaining seven chapters, students have the opportunity to exercise their understanding of earlier material as they explore numerous chemistry-related topics.

You may choose from the standard text (Chapters 1–19); the Alternate Edition, which includes Chapters 1–12 in print (the concept chapters) with Chapters 13–19 (topical chapters) on CD-ROM; and the Electronic Book version which includes all the chapters of the text in e-book format.

Features

Key features of *Conceptual Chemistry* include the following:

- A conversational and clear writing style aimed at engaging student interest.
- In-text **Concept Checks** pose a question and provide answers immediately following. These questions primarily reinforce ideas just presented before the student moves on to new concepts.
- **Hands-On Chemistry** activities allow students to witness chemistry outside a formal laboratory setting. These can be performed using common household ingredients and equipment. Most chapters have two or three Hands-On features, which lend themselves well to distance learning or to in-class activities.
- **Calculation Corners** appear in selected chapters. They are included so students can practice the quantitative-reasoning skills needed to perform chemical calculations. In each Calculation Corner, an example

problem and answer shows students how to perform a specific calculation, then their understanding is tested in a Your-Turn section. None of the calculations involve skills beyond fractions, percentages, or basic algebra.

Extensive end-of-chapter material includes:

- **Key Terms and Matching Definitions** provide a short summary of important terms that appear boldfaced in the text.
- **Review Questions** are a set of simple questions designed to guide the student through the essentials of the chapter. They are grouped by chapter sections to help the student stay focused while reviewing the material.
- **Hands-On Chemistry Insights** are follow-up discussions to the Hands-On Chemistry activities. They are designed to ensure that the student is getting the most out of performing these activities, and also to clear up any misconceptions that may have developed.
- **Exercises** are designed to challenge student understanding of the chapter material and to emphasize critical thinking rather than mere recall. In many cases, they link chemistry concepts to familiar situations. The solutions to all odd-numbered exercises and problems appear in Appendix C. Thus, you can consider assigning even-numbered exercises for group studies, in-class discussions, or exams.
- **Problems** feature concepts that are more clearly understood with numerical values and straightforward calculations. They are based on information presented in the Calculation Corners and therefore appear only within chapters containing this feature.
- **Discussion Topics** appear in the topical chapters (13–19) to prompt students to express their opinions on issues that have no definitive answers. These topics may promote student debate about controversial ideas.
- **Suggested Readings and Web Sites** appear on the last page of every chapter. This feature, however, is particularly important for the topical chapters for which you may be more inclined to assign research papers or poster presentations.

Support Package

The overall *Conceptual Chemistry* instructional package provides complete support materials for both students and faculty.

For the Student

- (**Available Fall 2001**) *Conceptual Chemistry Alive!* is semester-length student tutorial presented by the author through a series of 12 CD-ROMs—one for each of the first 12 chapters. This tutorial features mini-lectures, demonstrations, animations, home chemistry projects, interactive simulations, and explorations of chemistry in the community. Students

browse through Quicktime movies in an interactive environment that follows the *Conceptual Chemistry* table of contents. After viewing a segment, the student answers Concept Checks that encourage them to test their understanding of key material before progressing further. A student's answers to these Concept Checks are recorded in an electronic notebook that can be submitted to an instructor for assessment. More than a study supplement, *Conceptual Chemistry Alive!* is a textbook companion suitable for distance learning programs or for instructors seeking to free up class time for student-centered curricula. For a complimentary demo, please contact chem@awl.com.

- The *Chemistry Place* web site (http://www.chemplace.com/college/suchocki) is a unique study tool that offers practice quizzes and collaborative group activities written specifically to accompany the text.
- *Student Laboratory Manual for Conceptual Chemistry* (ISBN 0-8053-3179-4) co-authored with Donna Gibson, Chabot College, features laboratory activities tightly correlated to the chapter content.

For the Instructor

- The *Instructor's Manual* includes a variety of sample syllabi, lecture ideas and topics not treated in the book, teaching tips, and suggested step-by-step lectures and demonstrations. Answers to Matching Key Terms, Review Questions, Exercises, and Problems are available to instructors in a format suitable for photocopying and posting for students to review.
- The *Chemistry Place* web site (http://www.chemplace.com/college/suchocki) contains areas accessible only by the course instructor. These areas provide course management tools, including an on-line syllabus builder, an on-line grade book, and an on-line quiz generator where instructors can create quizzes from pre-existing questions or add their own.
- A set of 250 four-color acetates of figures and tables from the text is available (ISBN 0-8053-3177-8).
- A CD-ROM contains the book's art library for electronic presentation (ISBN 0-8053-3175-1).
- A test bank comes in both printed format (ISBN 0-8053-3169-7) and computerized format [MAC/WIN] (ISBN 0-8053-3183-2).

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