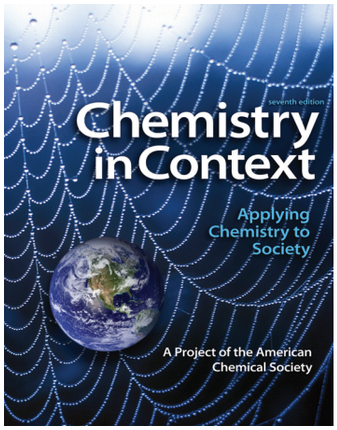
Preface

Dear Readers,

When first published in 1993, *Chemistry in Context* was "the book that broke the mold." Unlike the books of its time, it did not teach chemistry in isolation from people and the real-world issues they were facing. Similarly, it did not introduce a fact or concept for the sake of "covering it" as part of the curriculum. Rather, *Chemistry in Context* carefully matched each chemical principle to a real-world issue such as air quality, energy, or water use. Each was introduced on a need-to-know basis; that is, at the point in the book at which there was a demonstrated need for the principle. Most importantly, the book presented chemistry in the *context* of significant social, political, economic, and ethical issues.

Context! The word derives from the Latin word meaning "to weave." The spider web motif on the *Chemistry in Context* cover exemplifies the complex connections that can be woven between chemistry and society. In the absence of the real-world issues, there could be no *Chemistry in Context*. Similarly, without teachers and students who were willing (and brave enough) to engage in these issues, there could be no *Chemistry in Context*. Together we weave chemistry into the issues that we face in our lives.



Context! Today we also know that teaching in context is a high-impact practice backed by the research on how people learn. *Chemistry in Context* uses real-world contexts that engage students on multiple levels: their individual health and well-being, the health of their local communities, and the health of wider ecosystems that sustain life on this planet.

As we planned this edition, the writing team members questioned how a tradition of "breaking the mold" might best be continued today. The team raised the question not only for the sake of keeping with tradition (and for the fun of breaking molds), but also for a compelling reason: the needs of our readers. We wanted to continue to find ways of communicating chemistry that served our students, given the challenging issues they face today, the complex needs of the societies in which they live, and the changing landscapes on which they will work in the future.

Teaching (and Learning) in Context

The organization of *Chemistry in Context* has remained the same in every edition. The first six chapters form a core through which basic chemical principles are introduced. These chapters provide a coherent strand of topics that focus on a single theme—the environment. They develop a foundation of chemical concepts that can be expanded in subsequent chapters. Chapters 7 and 8 consider alternative (non-fossil fuel) energy sources—nuclear power, batteries, fuel cells, and the hydrogen economy. The remaining chapters are carbon-based, focusing on polymers, drugs, food production, and genetic engineering. They provide students with the opportunity to explore interests, as time permits, beyond the core topics.

Sustainability—New Content

Global sustainability is not just a challenge; rather, it is the defining challenge of our century. The seventh edition of *Chemistry in Context* is designed to help students better meet this challenge. With its new Chapter 0, **"Chemistry for a Sustainable Future,"** our intent was to establish sustainability as a core, normative part of the chemistry curriculum and part of the foundational learning.

Sustainability adds a new degree of complexity to *Chemistry in Context*. In part, the complexity arises because sustainability can be conceptualized in two ways: as a topic worth studying *and* as a problem worth solving. As a topic, sustainability provides a new

body of content for students to master. For example, the *tragedy of the commons*, the *Triple Bottom Line*, and the concept of *cradle-to-cradle* are part of this new body of content and are introduced in Chapter 0. As a problem worth solving, sustainability generates new questions for students to ask—ones that help them to imagine and achieve a sustainable future. For example, students will find questions about the risks and benefits of both acting and of *not* acting on behalf of future generations. To incorporate sustainability, then, requires more than a casual rethinking of the curriculum.

How do you teach and learn about something as complicated as sustainability? In responding to this question, the author team realized that it was necessary both to update the material and to recast it in a new light. Here are some examples of the changes that the team made:

WATER FOR LIFE
2005–2015

Chapter 3, The Chemistry of Global Climate Change, was updated in the light of new developments in climate change science. It now clearly outlines the consequences of climate change, introducing the sustainability concept of external costs.
Chapter 5, Water for Life, now connects to the "Water for Life" decade themes of the United Nations: the scarcity of fresh water, sustainable management of water resources, and water contamination.
Chapter 8, Energy from Electron Transfer, was recast to better show the match between our energy needs and the available technologies. The sustainability concept of cradle-to-cradle, introduced earlier in Chapter 0, is connected to battery design.
Chapter 11, Nutrition, Food for Thought, points out that what you eat affects both your health *and* the health of the planet.

In addition, here is a listing of the sustainability concepts and the chapters in which they can be found:

Tragedy of the commons:	Chapters 0, 1, 2, 5, and 6
Triple Bottom Line:	Chapters 0, 1, 4, 5, 6, and 7
Cradle-to-cradle:	Chapters 0, 7, and, 8
External costs:	Chapters 0, 3, and, 8
Environmental footprints:	Chapters 0, 1, 4, 5, 11, and 12

Green chemistry, a means to sustainability, continues to be an important theme in *Chemistry in Context*. As in previous editions, examples of green chemistry are highlighted in each chapter. In this new edition, look for even more examples. This expanded coverage offers the reader an even better sense of the need for and the importance of greening our chemical processes. For easier access, the principles of green chemistry are now listed on the inside front cover of the text.

Updates to Existing Content

People sometimes ask us "Why do you release new editions so often?" We also hear the question "Would it work to keep using the older edition with our students?" Indeed, we are on a fast publishing cycle, turning out a new version every three years. We do this because *Chemistry in Context*, with its current real-world focus, risks being out-of-date the very day it is published. Given this, we strongly urge instructors to switch to the new edition immediately, given how sensitive the real-world content is to the passing of time.

With each new addition, the author team reworks practically every chapter, updating its content and focus to reflect new scientific developments, changes in policies, energy trends, and current world events. These updates are nontrivial to implement. They involve writing new content as well as producing new graphs and data tables. The issues that we select to "hook" the reader at the start of the chapter also are recast from edition to edition.

For example, in this new edition, the "Water Chapter," Chapter 5, underwent a significant revision. This chapter has been on our list for a makeover for many years, and each successive author team has puzzled over how best to refocus it. Changes in earlier editions had switched the chapter hook to the issue of bottled water vs. tap water; but even with this change, we knew there was more work to be done. In the seventh edition, we finally reworked Chapter 5 from start to finish. The chapter now

follows the United Nations theme of "*Water for Life*," highlighting that fresh water is indeed limited on our planet and all need access to it. Safe drinking water, water footprints, and water for agriculture and industry are the keys to our health and prosperity. From this point of departure, all of the chemical principles fall nicely into place.

The "Food Chapter," Chapter 11, also underwent a major revision. In past editions, we have employed several different hooks to open the chapter. For example, we talked about different diets, including the high protein one. We also talked about the dizzying array of food recommendations. But for this new edition, we went with a new theme that couples food, personal health, and the health of the planet. This theme better connects to issues of energy consumption, water use, land use, and public health. The questions of sustainability also more naturally arise. In addition, this new theme well sets the stage for Chapter 12 on genetic engineering.

Speaking of Chapter 12, we did a careful technical review of this chapter, reworking its content to better reflect what we know about the genetic code and recent developments in the field. Chapter 8 on batteries and alternative energy sources also received careful attention to its technical content. Chapter 3 was updated to reflect the latest climate change science, including that we changed its title from "The Chemistry of Global Warming" to "The Chemistry of Climate Change." Chapter 6, the "Acid Rain" chapter, now opens with ocean acidification, connecting emissions from combustion to the coral reefs and changes in sea water. And Chapter 1 now has an expanded section on indoor air quality, including a green chemistry section about paints that emit fewer volatile organic compounds while drying.

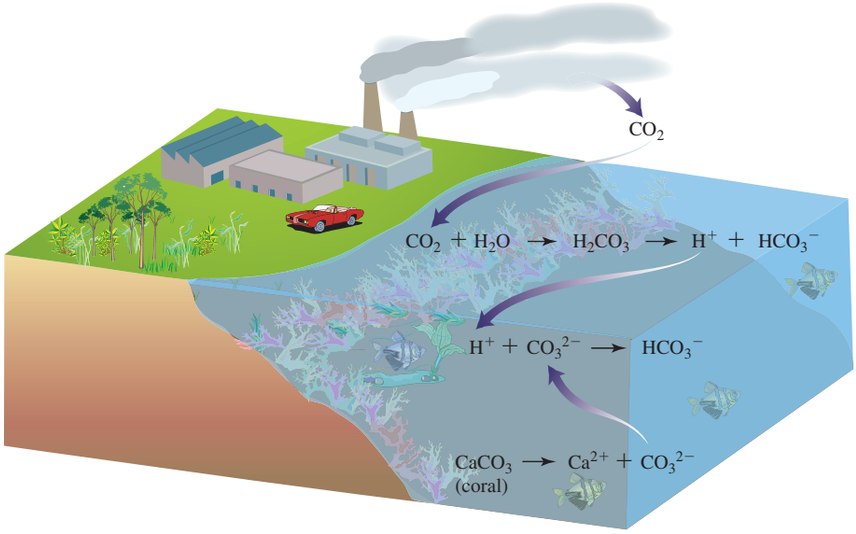


Figure 6.6
Chemistry of CO_2 in the ocean.

Updates to the Laboratory Manual

As we rethought the chapters of *Chemistry in Context* with an eye to sustainability, we recognized that we also needed to rethink the accompanying Laboratory Manual. Both the introductions to the experiments and the post-lab questions were revised in order to emphasize and reinforce the environmental issues and the sustainability concepts

presented in the textbook. The experiments were redesigned to include "greener" procedures, such as a microwave synthesis of aspirin and an investigation of the properties of a biodegradable polymer. Additionally, pre-lab questions were added and expanded data sheets encourage students to form and test hypotheses during each experiment.

The New Edition—A Team Effort

It is always a pleasure to bring a new textbook or new edition to fruition. But the work is not done by just one individual; rather, it is the work of many talented individuals. The seventh edition builds on the tradition of prior author teams led by A. Truman Schwartz, Macalester College, Conrad L. Stanitski, University of Central Arkansas, and Lucy Pryde Eubanks, Clemson University. This edition, we were fortunate to have the leadership and encouragement of Mary Kirchhoff, the Director of the ACS Education Division. We also recognize the able assistance of ACS staff members Marta Gmurczyk, Michael Mury, Jerry Bell, and Corrie Kuniyoshi.

This new edition was prepared by a team of writers: Cathy Middlecamp, Steve Keller, Karen Anderson, Anne Bentley, Michael Cann, and Jamie Ellis. The laboratory manual to accompany it was revised and updated by Jennifer Tripp. Each of us brought different expertise to the project. In common, though we brought our goodwill, hopes, dreams, and seemingly boundless enthusiasm to bring real-world chemistry into the classroom.

The McGraw-Hill team was superb in all aspects of this project. Marty Lange (Vice President, Editor-in-Chief), Ryan Blankenship (Publisher), Todd Turner (Sponsoring Editor), and Jodi Rhomberg (Developmental Editor) led this outstanding team. Tami Hodge served as the Executive Marketing Manger. The Lead Project Manager was Sheila Frank, who coordinated the production team of Carrie Burger (Lead Photo Research Coordinator), Jerry Marshall (Photo Research), Tara McDermott (Designer), Kara Kudronowicz (Senior Buyer), and Mary Jane Lampe (Project Coordinator). The Digital Product Manager was Daryl Bruflodt, and Sandra Schnee served as Senior Media Project Managers. The team also benefited from the careful editing of Linda Davoli.

The author team truly benefitted from the expertise of a wider community. We extend our thanks to the following individuals for the technical expertise they provided to us in preparing the manuscript:

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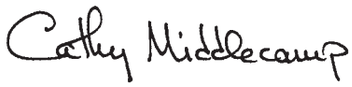
Wishing Our Readers Well

We are very excited by the features of this new edition that continue to "break the mold" in bringing chemistry to you, our reader. We selected engaging and timely topics that we hope will serve you not only today, but also in the years to come. At the same time, we strove to be honest to the science behind these topics.

We wish you well as you read, explore the issues, argue with each other (and with the authors) and, most importantly, as you use what you learn to bring your dreams to reality.

Sincerely, and with all good wishes from the author team,



Cathy Middlecamp
Senior Author and Editor-in-Chief
October 2010