Preface

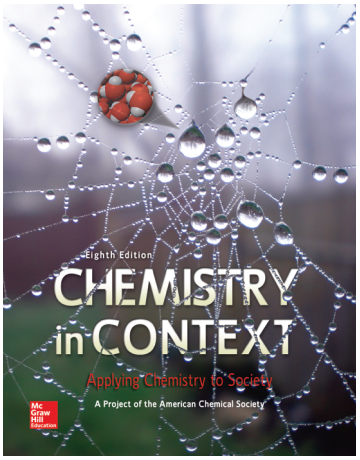
Dear Readers,

The word *context* appears in the title of this book. And context has multiple meanings.

Context! Did you know that the word derives from the Latin word meaning "to weave"? The spiderweb image on the cover conveys the connections that this book weaves between chemistry and society. In the absence of societal 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*. Chemistry is woven into the fabric of practically every issue that our society faces today.

Context! Do you enjoy good stories about the world in which you live? If so, look inside this book for stories that intrigue, challenge, and possibly even motivate you to act in new or different ways. In almost all contexts—local, regional, and global—parts of these stories are still unfolding. The ways in which you and others make choices today will determine the nature of the stories told in the future.

Context! Are you aware that using a real-world context to engage people is a high-impact practice backed by the research on how people learn? *Chemistry in Context* offers real-world contexts through which to engage learners on multiple levels: personal, societal, and global. Given the rapidly changing nature of these contexts, *Chemistry in Context* also offers teachers the opportunity to become learners right along with their students.



Sustainability—The Ultimate Context

Global sustainability is not just a challenge. Rather, it is *the* defining challenge of our century. Accordingly, the eighth edition of *Chemistry in Context* is designed to help students meet this challenge. The opening chapter, "Chemistry for a Sustainable Future," sets the stage for the 12 chapters that follow. By placing sustainability first, sustainability is established as a core, normative part of the chemistry curriculum.

Sustainability adds a new degree of complexity to *Chemistry in Context*. This complexity arises in part 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 all are part of this new body of content. 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 acting (or not acting) to reduce emissions of greenhouse gases.

Incorporating sustainability requires more than a casual rethinking of the curriculum. Which approach do the authors take? Unlike most general chemistry texts, this one is context rich. Thus, the writers already had the necessary vehicle through which to convey the concepts of sustainability—rich real-world scenarios about energy, food, and water. However, the connections to sustainability were not always readily apparent. In essence, the dots needed to be connected for the reader. Here are some examples of how this was done:

Chapter 1, "The Air We Breathe," now more strongly reminds the reader that the air is a resource held in common. We all must breathe it, and nobody owns it. Air pollution is thus a perfect means by which to introduce the concept of the tragedy of the commons.

Chapter 2, "Protecting the Ozone Layer," now more clearly points out that the older replacements for chlorofluorocarbons (CFCs), although not harmful to the ozone layer, are potent greenhouse gases. The chapter ends with a decisive call to action: "We all,

The tragedy of the commons is the situation in which a resource is common to all and used by many, but has no one in particular responsible for it. As a result, the resource may be destroyed by overuse to the detriment of all that use it.

breathing on this planet today and having the potential, must guarantee its future, rapidly and decisively. We have no right to delay; we have no luxury of losing time."

Chapter 3, "The Chemistry of Global Climate Change," now presents more data on the chemistry of global climate change, and challenges students to evaluate the changes occurring on Earth from greenhouse gases and the consequences of these changes.

Chapter 5, "Water for Life," now better connects the scarcity of fresh water, sustainable management of water resources, and water contamination. These themes are echoed in discussing food production in Chapter 11.

Chapter 7, "The Fires of Nuclear Fission," while introducing students to the nuclear crisis that occurred in Japan, also challenges students to evaluate nuclear power as a sustainable resource.

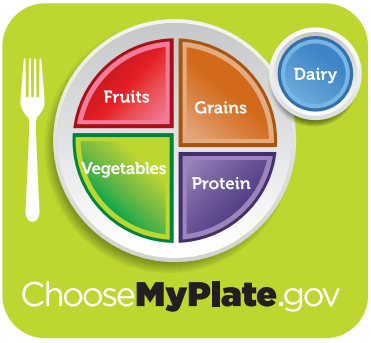
Chapter 8, "Energy from Electron Transfer," was recast to better show the match between our energy needs and the available technologies. The sustainability concept of cradle-to-cradle, introduced in Chapter 0, is connected to battery design.

Chapter 11, "Nutrition: Food for Thought," still describes how what you eat affects your health. Now, however, it more strongly connects what you eat to the health of the planet and has students track food production and consumption.

ACS Green Chemistry Institute

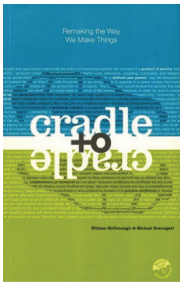
Green chemistry, a means to sustainability, continues to be an important theme in *Chemistry in Context*. As in previous editions, examples of green chemistry are highlighted in each chapter. In this new edition, look for more examples. This expanded coverage offers the reader an even better sense of the need for and the importance of greening our chemical processes. For easier access, key ideas in green chemistry are 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?" Indeed, we are on a fast publishing cycle, turning out a new version every three years. We do this because the content in *Chemistry in Context* is time sensitive.

With each new edition, the author team reworks the content of practically every chapter, updating it to reflect new scientific developments, changes in policies, energy trends, and current world events. These updates are nontrivial to implement. Some involve writing new content; others involve producing new graphs and data tables. For example, since the publication of the 7th edition, the tragedy in Fukushima, Japan, has influenced nuclear power industries and policies. The atmospheric concentration of CO_2 increased to over 400 ppm. A final example is the release of new dietary guidelines from the USDA.



In addition, the issues that we select to "hook" the reader at the start of the chapter are recast from edition to edition. Chapter 9, "The World of Polymers and Plastics," is one example. The new version now opens with a quote from the book coauthored by a chemist who greatly influenced our thinking in revising this chapter: "Nature doesn't have a design problem. People do." (William McDonough and Michael Braungart, *Cradle-to-Cradle*, 2002)

The story of polymers unfolds using a spiderweb as an example, noting that orb spiders may build new webs each day. So how does an orb spider manage to spin so much silk and still survive? Most simply, it recycles. Orb spiders have the ability to ingest old spider silk and recover the raw materials from which they are constructed. The theme of recycling is then carried throughout the chapter.

Teaching and Learning in Context

This new edition of *Chemistry in Context* continues with the organizational scheme used in previous editions, one that has stood the test of time. The first six chapters, all with real-world themes such as air, water, and energy, provide a foundation of chemistry concepts on which to build in subsequent chapters. For example, early chapters introduce elements, compounds, and the periodic table. In later chapters, we build upon these

chemistry concepts to consider other contexts and chemistry content. Chapters 7 and 8 consider additional energy sources—nuclear power, batteries, fuel cells, and hydrogen. Chapters 9–12 are all 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.

The New Edition—A Team Effort

Once again, we have the pleasure of offering our readers a new edition of *Chemistry in Context*. But the work is not done by just one individual; rather, it is the work of many talented individuals. The eighth edition builds on the legacy of prior author teams led by A. Truman Schwartz, Conrad L. Stanitski, and Lucy Pryde Eubanks, all now retired from long and successful careers of teaching chemistry.

This new edition was prepared by a team of writers: Cathy Middlecamp, Michael Mury, Karen Anderson, Anne Bentley, Michael Cann, Jamie Ellis, and Katie Purvis-Roberts. The laboratory manual to accompany it was revised by Jennifer Tripp and Lallie McKenzie and reviewed by Teresa Larson. Each person brought different expertise to the project. In common, though, each brought goodwill, hopes, dreams, and seemingly boundless enthusiasm to bring real-world chemistry into the classroom and into the lives of our readers.

At the American Chemical Society, leadership was provided by Mary Kirchhoff, Director of the Education Division. She supported the writing team, cheering on its efforts to "connect the dots" between chemistry and sustainability, even to the point of writing parts of Chapter 0. Furthermore, she and Terri Taylor, Assistant Director for K–12 Science at the American Chemical Society, made it possible for Michael Mury to expand his role in the project, taking the reins as a production manager. His abilities to bring together all of the parties involved—the author team, the publisher, and the American Chemical Society—were unparalleled.

The McGraw-Hill team was superb in all aspects of this project, with special thanks to Jodi Rhomberg for shepherding the project to the finish line. Marty Lange (Vice President and General Manager), Thomas Timp (Managing Director), David Spurgeon, PhD (Brand Manager), Rose Koos (Director of Development), Shirley Hino, PhD (Director of Digital Content Development), and Jodi Rhomberg (Developmental Editor) led this outstanding team. Heather Wagner served as the Executive Marketing Manager. Sandra Schnee (Content Project Manager) coordinated the production team of Carrie Burger (Content Licensing Specialist), Tara McDermott (Designer), and Nichole Birkenholz (Buyer). The team also benefited from the careful editing of Carol Kromminga and proofreading by Kim Koetz and Patti Evers.

The author team truly benefited from the expertise of a wider community. We would like to thank the following individuals who wrote and/or reviewed learning-goal-oriented content for **LearnSmart.**

Peter de Lijser, *California State University—Fullerton*
David G. Jones, *University of North Carolina at Chapel Hill*
Adam I. Keller, *Columbus State Community College*

We also extend our thanks to David McNelis, *University of North Carolina,* for the technical expertise he provided in preparing the manuscript.

Input from instructors teaching this course is invaluable to the development of each new edition. Our thanks and gratitude go out to the following instructors who participated in *Chemistry in Context* workshops:

Sana Ahmed	*Boca Raton Community High School*
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Carmen Gauthier	*Florida Southern College*
Myung Han	*Columbus State Community College*
Al Hazari	*University of Tennessee*
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Devin Latimer	*University of Winnipeg*
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Mark Morris	*University of Tampa*
Jung Oh	*Kansas State University at Salina*
Tatyana Pinayayev	*Miami University*
Kresimir Rupnik	*Lousiana State University*
Indrani Sindhuvalli	*Florida State College at Jacksonville*
Jose Vites	*Eastern Michigan University*

Wishing Our Readers Well

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.

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 have selected engaging and timely topics that we hope will serve you not only today but also in the years to come.

We wish you well as you read, explore the issues, respectfully argue with each other (and with the authors), and, most important, 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
June 2013

Digital Resources

McGraw-Hill offers various tools and technology products to support *Chemistry in Context,* 8th edition.

McGraw-Hill's ConnectPlus™

McGraw-Hill's Connect Plus (www.mcgrawhillconnect.com/Chemistry) is a web-based assignment and assessment platform that gives students the means to better connect with their coursework, with their instructors, and with the important concepts that they will need to know for success now and in the future. The following resources are available in Connect:

- Autograded assessments
- LearnSmart, an adaptive diagnostic tool
- Powerful reporting against learning outcomes and level of difficulty
- McGraw-Hill Tegrity Campus, which digitally records and distributes your lectures with a click of a button
- The full textbook as an integrated, dynamic eBook that you can also assign
- Instructor resources, such as Instructor's Manual
- PowerPoints and Test Banks
- Image Bank, which includes all images available for presentation tools.

With ConnectPlus, instructors can deliver assignments, quizzes, and tests online. Instructors can edit existing questions and author entirely new problems; track individual student performance—by question and assignment or in relation to the class overall—with detailed grade reports; integrate grade reports easily with Learning Management Systems (LMS), such as WebCT and Blackboard; and much more.

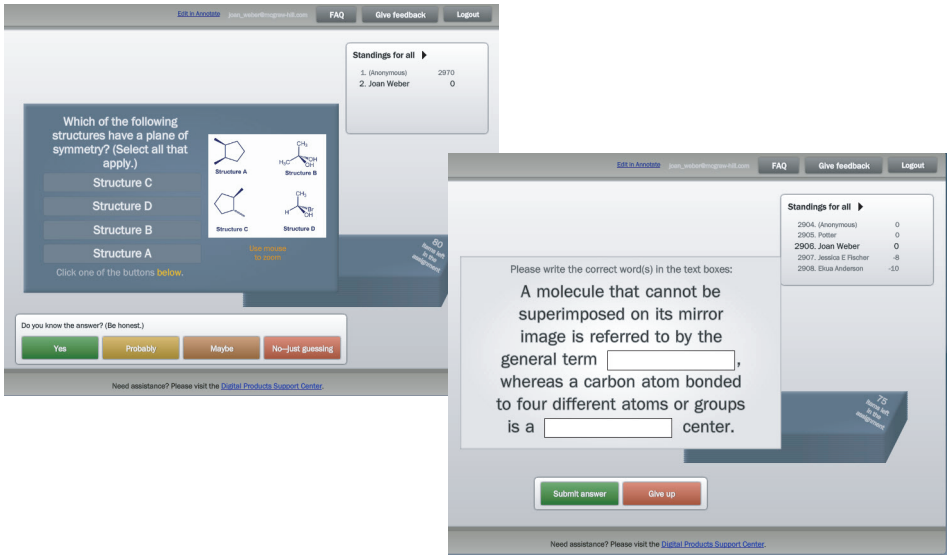
By choosing Connect, instructors are providing their students with a powerful tool for improving academic performance and truly mastering course material. Connect allows students to practice important skills at their own pace and on their own schedule. Importantly, students' assessment results and instructors' feedback are all saved online, so students can continually review their progress and plot their course to success.

McGraw-Hill LearnSmart™

McGraw-Hill LearnSmart™ is available as a stand-alone product as well as an integrated feature of McGraw-Hill Connect® Chemistry. It is an adaptive learning system designed to help students learn faster, study more efficiently, and retain more knowledge for greater success. LearnSmart assesses a student's knowledge of course content through a series of adaptive questions. It pinpoints concepts the student does not understand and maps out a personalized study plan for success. This innovative study tool also has features that allow instructors to see exactly what students have accomplished and a built-in assessment tool for graded assignments. Visit the following site for a demonstration: www.mhlearnsmart.com.

McGraw-Hill SmartBook™

Powered by the intelligent and adaptive LearnSmart engine, SmartBook is the first and only continuously adaptive reading experience available today. Distinguishing what students know from what they don't, and honing in on concepts they are most likely to forget, SmartBook personalizes content for each student. Reading is no longer a passive and linear experience but an engaging and dynamic one, where students are more likely to master and retain important concepts, coming to class better prepared.



SmartBook includes powerful reports that identify specific topics and learning objectives students need to study. These valuable reports also provide instructors insight into how students are progressing through textbook content and are useful for identifying class trends, focusing precious class time, providing personalized feedback to students, and tailoring assessment.

How does SmartBook work?

Each SmartBook contains four components: Preview, Read, Practice, and Recharge. Starting with an initial preview of each chapter and key learning objectives, students read the material and are guided to topics over which they need the most practice based on their responses to a continuously adapting diagnostic. Read and Practice continue until SmartBook directs students to recharge important material they are most likely to forget to ensure concept mastery and retention.

Customizable Textbooks: Create™

Create what you've only imagined. Introducing McGraw-Hill Create—a new, self-service website that allows you to create custom course materials—print and eBooks—by drawing upon McGraw-Hill's comprehensive, cross-disciplinary content. Add your own content quickly and easily. Tap into other rights-secured third party sources as well. Then, arrange the content in a way that makes the most sense for your course. Even personalize your book with your course name and information. Choose the best format for your course: color print, black and white print, or eBook. The eBook is now viewable on an iPad! And when you are finished customizing, you will receive a free PDF review copy in just minutes! Visit McGraw-Hill Create at www.mcgrawhillcreate.com today and begin building your perfect book.

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