place among the "immortals," considers the author when evaluating his musical heritage.

Vijvers's book offers to readers a fascinating opportunity to plunge into the epoch of the social rise of Russia in the 1860s and post-reform time. On the one hand, one can become familiar with Borodin, liberal, who had become famous as a progressive social reformer and outstanding pedagogue of female education. On the other hand, one can understand and accept new arguments in evaluation of his actual contributions to the development of chemistry and of new musical forms and musical language.

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Organic Chemistry Principles in Context: A Story Telling Historical Approach, Mark M. Green, New York, Science from Away, 2012, 452 pp, ISBN 978-0-615-70271-1, $25.

In writing this textbook, Mark Green has completely overturned the accepted organization that has dominated organic chemistry textbooks for decades, rejecting the organization by functional group in favor of a contextualized, story-telling approach. Nearly all the basic information contained in traditional textbooks is present, but readers familiar with organic chemistry will need to immerse themselves in the book to find them, since Green has presented each one in a way that highlights a particular real-world chemical context in which it becomes relevant. The goal is to make organic chemistry less dry and more relevant to its everyday applications in polymers and biological systems. Every chapter mentions prominent chemists who were involved in some way with the chemical concepts discussed, and there are numerous portraits, several of which I had not seen before. Each chapter has problems for students, and there is a companion website with solutions to the problems and videos of Green lecturing on the material. In contrast to traditional textbooks, there are substantial amounts of unbroken narrative text and the chapters do not contain an overwhelming number of chemical reactions listed one after the other. This book appears to be self-published, and is clearly a labor of love, created after years of using this material in the classroom. Concepts are extensively cross-referenced by chapter and section.

The material is divided into twelve chapters that use either an industrial or biological example of organic chemistry. The first chapter uses the polymers of glucose—cellulose and starch—to illustrate principles of hybridization, stereochemistry and structure. Chapter two outlines mass spectrometry and IR and NMR spectroscopy. Chapter three uses galactosemia to introduce the conformational isomerism of six-membered rings, and carbocations are introduced in chapter four using the example zeolite catalysis of petroleum to increase octane levels of gasoline. Chapter five continues discussion of carbocations, using the biological synthesis of terpenes and lanosterol. The history of benzene and aromatic chemistry form chapter six, and carbonyl chemistry is treated in chapters seven and eight, using the metabolism of fatty acids and sugars. Acyl substitution and free radical reactions are introduced in the context of forming polyesters, nylon, polypropylene and low density polyethylene. Chapter ten begins with the industrial production of adipic acid and hexanediamine to explore kinetic and thermodynamic control of reactions, nucleophilic substitutions, and biological and non-biological reducing agents. Chapter eleven returns to polymer chemistry and elastomers, specifically the molecular structure of natural rubber and the synthesis of polycarbonates and spandex. The book concludes with a lengthy chapter on organic synthesis with two examples. Green first treats the highlights of R. B. Woodward's 1952 total synthesis of cholesterol, along the way explaining the Diels-Alder and Grignard reactions and more carbonyl chemistry. The second example is E. J. Corey's 1969 total synthesis

of prostaglandin $F_{2\alpha}$ that illustrates the Wittig reaction, hydroboration, and the use of protecting groups. Both examples are classic syntheses, and employ relatively simple chemical transformations that illustrate concepts of stereocontrol, functional group transformations, and synthetic planning.

Green's approach has a lot of potential, but I after examining this book, I came away with mixed feelings about it. I learned a great deal from the examples, and the radically different way of organizing the material certainly provides inspiration for different ways of teaching organic chemistry. Yet there are many disadvantages to the book as it is written. There are many convoluted sentences that are hard to follow. More often than not, those sentences are trying to pack in too much information on key concepts, and much of the presentation could be expanded to clarify the material for readers who have no knowledge of the subject. The text could use a good copy editor.

I admire Green's use of personalities throughout the text, but what is there is anecdotal and triumphalist, emphasizing who was right first, with little indication of contingency, disputes over methodology and ideas, or cultural and institutional influences on chemists' careers. The general assumption throughout the text is that the first publication of theories resembling our own are unproblematic and were immediately accepted by chemists as correct. Surprisingly, while discussing several of the historical examples, most notably Woodward's and Corey's syntheses, Green neglects even to mention a year in which they took place. There is more information about chemists than in a traditional textbook, but what is there is little more than expanded versions of the sideboxes found in other texts that are largely unconnected to the chemistry itself.

There are also some errors in the history. It repeats, for example, the myth that Friedrich Wöhler sounded the "death knell" for vitalism when he made urea in 1828. Archibald Couper was "scooped" by August Kekulé about the tetravalence of carbon and the self-linking of carbon atoms (p 33), because Adolphe Wurtz kept Couper from publishing his paper for a year until 1858, three months after Kekulé's paper, by which time Kekulé had "gained all the credit for the tetravalence of carbon." It's unclear where Green found this story, as it is not in the standard historical literature. Kekulé certainly had not gained sole credit for his theory in 1858, when he had not publicized it, and when most chemists had not yet even accepted it or did not even know about it. Green also claims that Kekulé published his benzene theory in 1865, "sponsored by Wurtz," (p 169) when in 1865, Kekulé had been a professor in Ghent since 1858 and had left Wurtz's laboratory long ago in 1852. Linus Pauling did not win his Nobel Prize for proposing the structure of the alpha helix (p 10), but for his work on the nature of the chemical bond during the 1930s, a fact that is easily checked on the Internet. These fundamental errors are reason enough to suspect others throughout the book. What is perhaps most disappointing for a textbook that aims for historical context, however, is that there is no list of suggested readings or citations for more information about any of the historical information. The strength of Green's approach is therefore not in his use of history, but in his extensive use of specific real-world problems in organic chemistry, from increasing octane levels in gasoline, to understanding why cellulose is different from starch, to how and why chemists plan total syntheses of complex organic molecules.

Putting aside the problems with the presentation of history in the text, is this truly an introductory organic chemistry text, as Green claims? Can it be usefully adopted for a standard sophomore course in organic chemistry? Using this text in isolation would require a very steep learning curve: for example, the very first chemical structures that students encounter in the book are cellulose and starch polymers of glucose, drawn in line-bond formulas in the chair form, with no previous introduction to either structure or the various ways chemists draw structures. Stereoisomerism is introduced before structural isomerism, which seems to be putting the cart before the horse. There is very little on nomenclature, although students would absorb a great deal while working through the text. The chapter on spectroscopy is a good start, but it requires a great deal more explanation and examples of spectra for students to understand it from the text. Adopting this book would likely require instructors to add additional material, use it as a supplement to a more traditional text, or mine it for examples to use in lectures. Although Green has used the book in his own course, my sense is that in its present form, it would not work well at most schools without significant revision and/or expansion.

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