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## Molecular Crystals and Liquid Crystals

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### A Review of "Organic Chemistry Principles in Context"

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## Book Review

*Organic Chemistry Principles in Context* by Mark M. Green; Science From Away Publishing, New York, NY, 2012; ISBN 978-0-615-70271-1, xxiv + 452 pp., \$25.00 (paperback).

What does the next generation of introductory organic chemistry textbooks look like? Since the early 1960s, when material on spectroscopic methods was added to the typical presentation of functional groups, this type of text has been in common usage. It is widely anticipated that textbooks will appear that have a significant biological emphasis compared to existing texts. Mark Green has self-published a rather original treatment of the subject, allowing a price much lower than the typical text. The book has a subtitle “A Story Telling Historical Approach,” and this renders it an enjoyable read for an experienced chemist. Is this a hint of what is to come or is it a diversion?

The text has a collection of quotes of two, three, or four sentences in length from an international group of prominent organic chemists. These serve to tell the reader that Green’s approach is well received yet they lack the kind of detail that prospective adopters would like.

Rather than start with a simple molecule such as methane, Green starts with cellulose and starch and discusses their differences. He uses these polymeric materials to teach six-member ring conformation and some stereochemistry. In 1900, topics such as the structure of glucose and the nature of cholesterol were major issues in organic chemistry, yet they are relegated to the back of the traditional text. Green uses the story-telling approach to introduce numerous fundamental principles of organic chemistry including much historical and biographical information. Hence the student gets to learn something of the chemists who built the subject. Green also uses much material from basic polymer chemistry and related monomer synthesis to illustrate basic organic chemical principles.

At 452 pages, this book is about half the length of the typical introductory organic text. What is left out? In many places throughout the book, the reader is referred to the Internet. The details of infrared and nuclear magnetic resonance spectra are to be found on websites. These “sporting methods” for structure determination are presented, but X-ray crystallography, a definitive method for quantitative structure determination, is presented primarily as the tool that found the benzene ring to be planar. Hydrocarbon combustion is discussed in the context of octane number and the role of carbocations in achieving a high octane number in gasoline. The use of combustion for elemental analysis, a major tool of organic chemistry for over a hundred years, is not presented. Electrophilic aromatic substitution is discussed; there is no tabulation of activating and deactivating groups. Diazotization and diazonium salt reactions are not presented. Isotopic labeling is mentioned, but methods for labeling are not discussed. It would be very easy to have a problem where the student is asked to think about reaction of a Grignard reagent with D<sub>2</sub>O. Alkylolithiums and organoaluminums are used, but their preparation and structures are not discussed. With the exception of a brief mention in Chapter 1 and the structures of the nucleic acid bases, DNA and RNA are not discussed. Hyperconjugation is mentioned but not explained. Molecular modeling is not discussed.

What can we project for the learning outcomes for students who use this textbook compared to students schooled with a traditional text? Students learning from this text will be stronger in stereochemistry, carbocation chemistry, and the organic chemistry of biochemical cycles and processes. Due to the discussions of R.B. Woodward's cholesterol synthesis and E.J. Corey's prostaglandin synthesis, they will have a better feeling for the strategy of total synthesis. They will also have a much better appreciation for the historical origins and development of the subject.

What will be the students' response to using this text? Students who are chemistry majors will like this book and its approach. Even with its strong biological emphasis, I don't think the text will be all that well received by premedical students and biology majors.

On the website of the Canadian Science Writers Association, <http://sciencewriters.ca/>, Mark Green wrote about his text and his reasons for self-publication.

In summary, Mark Green deserves applause for producing this text and advocating its use. It is definitely of interest to follow the long-term impact of this text as a novel approach to the teaching of introductory organic chemistry.

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