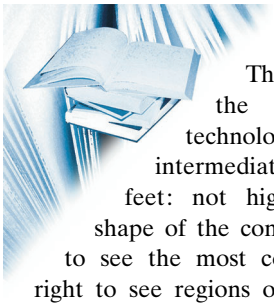


2030

This book is a flyover of the landscape of today's technology, at an interesting, intermediate altitude; say, 5000 feet: not high enough to see the shape of the continents, not low enough to see the most colorful bushes, but just right to see regions of swamp and plain and forest. It touches on an admirably broad range of topics—with major sections on "Needs" (water and food), "Earth" (climate, energy, materials, manufacturing), "Tools" (electronics, communications, cryptography, stability and failure in systems, robotics), "Humans" (medicine and health), and "Communities" (societies, megacities, disasters, financial systems). The breadth of the coverage defines the character of the book: one cannot go very deep if one goes for breadth.

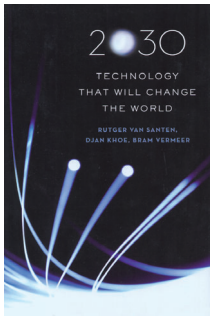
What the book does very well is to sketch the problems (or, if you prefer, "opportunities") in many of these areas, and to do so in a way that gives an idea how numerous, and how interesting, they are. For someone wishing to sense the way in which technology is entangled with many facets of society, this approach is more interesting than one presented by books that focus on just one aspect of technology. The price it pays for its breadth is that it does not cover any aspect in more than a few pages: if *2030* had pictures, it would be a "graphic novel" (as we now call comic books with serious themes). I suspect that this coverage will be about right for its plausible audiences—graduate students who wish to view pictures broader than their theses; science-literate but non-professional adults generally interested in technology, and why anyone cares about it; undergraduates in courses on science and society; high-school students who are in love with the idea of science; even professional scientists and technologists who want to be reminded that there is a world outside of their specialties. It's a fine book for getting a sense for the landscape of technology in 2010.

What the book is not is one that will give any illuminating detail about a particular subject. It does not do calculations, give data (aside from occasional instructive and well-chosen plots), or estimate costs. Certainly, in reading it, one discovers interesting nuggets of fact and speculation, especially in unfamiliar areas, but it is resolutely science journalism at a popular level, rather than a more sophisticated scientific essay: I would position it as roughly *Scientific American* in content (although more straightforward and less breathless in style). It is also a collection of disconnected sections, rather than a coherent story. The prose is very clear, if a little colorless.

In assembling the content of the book, one major approach seems to have been to have an extended interview with one or more authorities, and then to put their opinions in a broader context. This approach tends to emphasize the opinions, and sometimes prejudices, of these authorities, and to give views of the field that range from balanced (Hugo De Man, on electronics) to enthusiastic (Craig Venter, on genomics). I like the style, but it is not a dispassionate and deeply informed analysis.

The book emphasizes an interesting, broad overview of many needs in society that will require technologies, and technologies that are contributing to change in society. What it does not do—and what a 30000-feet view would do—is to make an effort to fit technology into an economic or political/policy/regulatory context. Technology provides options to society, but whether a technology is used often depends more on its cost, and on its politics or societal acceptability, than on its performance. Cost is mentioned in a few sections (for example, as an important factor in the development of nanoelectronics below 40 nm), but, as an example of an missed connection of this type, "healthcare cost reduction" is not mentioned as a political and economic requirement that will probably force enormous changes on healthcare technology—larger, in my view, than genomics. Similarly, the book barely mentions the proliferation of nuclear weapons and its relation to the development of nuclear power, the socialization of the young and Facebook, globalization and cell phones, jobs and robotics, "the cloud" and the democratization of information, and so on. The kind of breadth required to sketch a technical/economic/political context might, plausibly, cause intellectual indigestion (or growth of a tractably short book into an intractably long one); but I would have been interested in hearing what De Man thought about Facebook, or how Venter would have responded to the suggestion that genomics will add unacceptable expense to an already too-expensive healthcare system.

The one type of integration the authors do attempt—although rather casually—is to fit a number of the problems they discuss under the umbrella of "complexity science". This ill-defined term is interpreted in the context of Per Bak-style logarithmic scaling laws, and the case is not very compelling; still, by introducing the concept, the book introduces the reader to the idea that there might be something called complexity science, even if it turns out there isn't, or that it comes in many different flavors. Emphasizing that many of the problems needing solutions are complicated, or complex, or just difficult, tangled, and expensive, does reveal a kind of distinguishing commonality to them: the unsolved problems discussed here are quite different in character from those that led to



2030
Technology That Will Change the World.
By Rutger van Santen, Djan Khoe and Bram Vermeer. Oxford University Press, 2010. 304 pp., hardcover, $ 29.95.—ISBN 978-0195377170

the development of genomics or the discovery of quantum mechanics.

Curiously and perhaps sensibly, the book is also generally not about 2030 it is about 2010. Predicting 20 years into the future requires that authors enjoy being wrong, and there is more than enough interest in extrapolating what already exists, without adding the complexities of inventing hypothetical new technologies. The focus of *2030* is very much the "now" of 2010, and how technologies that already exist might be used; but, of course, unexpected, radical new sciences and technologies will emerge between 2010 and 2030, and they may make all the difference. Twenty years is a long distance along the timeline of technology.

One last good features to this book (of many): a student coming away from reading it should have the feeling that almost no really important problem has been solved, and the future of technology and society is up to him or her. The book does not fall into the trap of trumpeting solutions—it emphasizes problems remaining to be solved. Since there are far more "unsolved problems" than "satisfactory solutions", it should be a very encouraging read for a young scientist or engineer. There is lots remaining for him or her to do!

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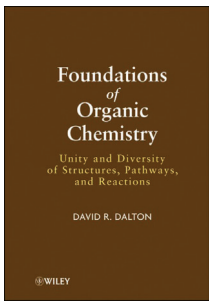

Foundations of Organic Chemistry
Unity and Diversity of Structures, Pathways, and Reactions. By David R. Dalton. John Wiley & Sons, Hoboken 2011. 1440 pp., hardcover, € 129.00.—ISBN 978-0470479087

Foundations of Organic Chemistry

Foundations of Organic Chemistry is a textbook designed for introductory classes in organic chemistry. It is divided into three parts—background, middleground, and foreground—and 14 chapters.

The background chapters provide a well balanced introduction to the principles of analytical, physical, and theoretical chemistry related to the study of organic chemistry; it includes the spectroscopic analysis of organic compounds and the kinetics of reactions, as well as valence bond theory and molecular orbital theory. The presentation continues with an outline of the general principles of the nomenclature of organic compounds, the basics of reaction thermodynamics, isomerism, acid–base chemistry, and solvents in organic chemistry.

In the five middleground chapters the reader is guided through the major classes of organic compounds. The focus of these chapters is on the description of typical reactivity patterns and an in-depth discussion of the reaction mechanisms underlying them. The coverage and depth of presentation in most chapters goes far beyond that of other common textbooks. As well as modern aspects of organic chemistry, such as cross-coupling reactions and metathesis, topics such as photochemistry and the chemistry of phosphorus and silicon compounds are well fitted into the contents.

The foreground part of the book provides the student with a detailed overview, in four chapters, of the chemistry, biochemistry, and bioorganic chemistry of the main classes of natural products. Carbohydrates and their biosynthesis, oligo- and polysaccharides, acetogenins, fatty acids, and terpenes are covered first. Amino acids, peptides, and the most common coenzymes, as well as alkaloid chemistry, are presented and their significance is outlined. Nucleotides and the derived DNA and RNA are treated next. The book finishes with a description of the biosynthesis and functions of the pigments of life—the tetrapyrrolic cofactors, such as heme, chlorophyll, and vitamin B_{12}.

What can the student expect from this textbook? The language of the book is mostly adjusted to the audience for which it is written. The author talks to the reader, and ignites interest by clever comparisons and quotations at the beginnings of the chapters. The text is criss-crossed with problems for recapitulation and improvement of knowledge, and every chapter ends with a set of problems concerned with the topic covered. A very nice feature of the book, which places it next to more advanced textbooks, is that references to the primary literature are provided. The book contains a 42-page index that is very useful for finding specific topics quickly.

The book certainly covers much more material than most of the other common basic organic chemistry textbooks, such as "Vollhardt", "Clayden", or "Bruice", on approximately the same number of pages for a similar price. However, studying with this textbook is somewhat more demanding. The treatment of certain topics is elaborate enough to serve as an introduction to individual courses of physical organic or theoretical chemistry, and may not be suitable for study without professional guidance. The inclusion of additional material succeeds by using a very dense style of presentation, which is unlike the above-mentioned textbooks. This may make it difficult for students who begin their first organic chemistry course with only a little background to distinguish the essentials from more specialized content. Here a clearer visual differentiation would have been valuable.