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Book reviews

Ecotoxicology: A Comprehensive Treatment, M.C. Newman, W.H. Clements. CRC Press/Taylor & Francis Group, Boca Raton, FL (2008). 878 pp., Price: US\$ 139.95, ISBN: 978-0-8493-3357-6

This book, the authors write, “. . . is intended to bridge a widening gap between ecotoxicology textbooks and technical books focused on ecological topics. . . This treatment represents a synthesis needed to provide the student with an understanding beyond that afforded by a general textbook but, unlike that from more specialized books, remains focused on paradigms and fundamental themes.”

“Ecotoxicology is the science of contaminants in the biosphere and their effects on constituents of the biosphere including humans; it is a hierarchical science.” The flyer that accompanied my copy of the book describes it thusly:

“Divided into six sections [divided into 36 chapters], the book builds progressively from the biomolecular level toward a discussion of effects on the global biosphere. It begins with the fundamentals of hierarchical ecotoxicology and ventures for exploring ecotoxicological issues. The second section introduces organismal ecotoxicology and examines effects to biochemicals, cells, organs, organ systems, and whole organisms, and bioaccumulation and bioavailability of contaminants. Population ecotoxicology, section three, places the discussion in the larger context of entire populations by analyzing epidemiology, population dynamics, demographics, genetics, and natural selection.

Section four encompasses issues of community ecotoxicology. This section presents biotic and abiotic factors influencing communities, biomonitoring and community response, and the application of multivariate and multivariate approaches. Section five evaluates the entire ecosystem by describing assessment approaches, identifying patterns, analyzing relationships between species, and reviewing the effects of global atmospheric stressors. A detailed conclusion integrating the concepts discussed and promoting a balanced assessment of the overarching paradigms rounds out the coverage in section six.”

Clearly, a detailed review of this lengthy text is not possible. I will rather briefly summarize one chapter whose topic would be of significant interest to readers of this journal. That is Chapter 26, entitled Community Responses to Global and Atmospheric Stressors. In the introduction to this chapter, the authors write “Effects of atmospheric stressors on communities are likely to be complex, interactive, and difficult to predict.”

The authors limit themselves in this chapter to a discussion of three atmospheric and global pollutants: (1) carbon dioxide and associated global warming, (2) acidic deposition and (3) UV-B radiation caused by atmospheric ozone depletion. The authors write (and I fully agree) that “The cause and consequences of global cli-

matic change and the specific role of carbon dioxide are among the most contentious environmental issues today. However, the connection between the atmosphere and biological processes and the occurrence of a natural greenhouse effect are indisputable factors.”

I was surprised to learn that the hypothesized relationship between global climate change and greenhouse gases is not a new idea because Arrhenius, a Swedish chemist, proposed that increased levels of carbon dioxide in the atmosphere could influence global temperature. The authors discuss the facts and evidence behind the claim that the atmosphere is warming as well as examining carbon cycles and sinks and the mismatch between climate models and ecological studies among other topics.

I have only scratched the surface of this impressive book but suffice it to say, it is well written and to the extent I can evaluate its content is exceedingly well done.

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Kent and Riegel's Handbook of Industrial Chemistry and Biotechnology, J.A. Kent (Ed.), 11th Edition Springer Science, Business Media, LLC, New York, NY (2007). 1861 pp., Price: US\$ 190.00, ISBN: 978-0-387-27842-1

This massive two-volume set has 37 chapters devoted to various areas of the chemical industry—indeed, almost all areas of the chemical industry. Among other topics dealing with specific chemicals, information is provided on process safety, emergency preparedness, statistical modeling, and green engineering. The book is “future looking” with its discussion of the foregoing topics. However, “. . . the heart of the book is contained in twenty-eight chapters covering various areas of the chemical process industry.”

Given the length of the volumes, I can only comment on a fraction of their contents. Let me start by listing the chapter titles:

1. Recent history of the chemical industry
2. Economic aspects of the chemical industry
3. Safety considerations in the chemical process industries
4. Managing an emergency preparedness program
5. Applied statistical methods and the chemical industry

6. Green engineering—integration of green chemistry
7. Industrial catalysis: a practical guide
8. Environmental chemical determinations
9. Nanotechnology: fundamental principles and applications
10. Synthetic organic chemicals
11. Chemistry in the pharmaceutical industry
12. Manufactured textile fibers
13. Dye application, manufacture of dye intermediates and dyes
14. The chemistry of structural adhesives: epoxy, urethane, and acrylic adhesives
15. Synthetic resins and plastics
16. Rubber
17. The agrochemical industry
18. Petroleum and its products
19. Coal technology for power, liquid fuels, and chemicals
20. Natural gas
21. The nuclear industry
22. Synthetic nitrogen products
23. Phosphorus and phosphates
24. Fertilizers and food production
25. Sulfur and sulfuric acid
26. Salt, chlor-alkali, and related heavy chemicals
27. Industrial gases
28. Wood and wood products
29. Pigments, paints, polymer coatings, lacquers, and printing inks
30. Industrial biotechnology: discovery to delivery
31. Industrial enzymes and biocatalysis
32. Industrial production of therapeutic proteins: cell lines, cell culture, and purification
33. Biomass conversion
34. Animal and vegetable fats, oils, and waxes
35. Sugar and other sweeteners
36. Soap, fatty acids, and synthetic detergents
37. Chemical explosives and rocket propellants

As I turn to the review narrative, I note that I have three pages of notes on this book. These two volumes truly deserve that I comment at length. However, space does not permit me to report in detail on the voluminous contents of the two volumes. I will therefore need to omit much material that should be covered.

In the first chapter, Aftalion gives a historical review, beginning in 1973, of the chemical industry including a discussion of the state of the chemical industry in numerous countries—US, Italy, Spain, France, and Morocco. Other topics include safety (several major catastrophic accidents are reviewed briefly), scientific and technological breakthroughs, biotechnology, specialty chemicals, etc. Aftalion notes that regulatory burdens have caused higher costs to the industry.

Englund, of Dow Chemical, reviews the safety concerns and failures of the chemical industry in a very well written and informative chapter. Fire and explosion are discussed in some detail. Case histories of major accidents such as Flixborough's cyclohexane explosion in 1974 and Bhopal's methylisocyanate release in 1985 are discussed. Notable in the reference section in this chapter is a section on Internet resources.

I should note that the majority of the chapters were contributed by authors from chemical companies such as Dow, DuPont, BASF, and Bristol Meyer, just to name a few.

Kent has truly produced an “up-to-date” review of the industry having covered the traditional topics, industry by industry, in later chapters. He also has included chapters on “Green Chemistry”, which is defined as the use of chemistry to reduce pollution at its source. The editor describes this very current topic in the book's preface as follows:

“The handbook contains three new chapters which lie in the area often referred to as ‘Green Chemistry.’ The first and most comprehensive of these is entitled Green Engineering: Integration of Green Chemistry, Pollution Prevention and Risk Based Considerations . . . Another new chapter, Industrial Catalysis: A Practical Guide, is a valuable adjunct to the ‘Green’ chapter since catalysis is an important aid in the practice of green chemistry. The third new chapter in what might be termed the ‘green’ group is Environmental Chemical Determinations.”

Five other chapters caught my attention because of my roots in the biochemical engineering field; chapters 30–34. The first, written by the staff from Genencor International, Danisco Company, begins with a discussion of Pasteur's work, notes Weizman's research to produce acetone for explosives in WWI, touches on Pfizer's 1923 plan to produce citric acid, and progresses in time to production of penicillin. What follows is an excellent survey of the theory underlying the field and the new developments therein.

The last chapter in this series, Biomass Conversion, was supported by the United States Department of Energy, Office of the Biomass Program. To catch the reader's attention, the authors note that “...the energy stored in biomass each year worldwide is seven times greater than humankind's annual energy production.” But how to beneficially use the product is the task at hand. Converting these materials to useful energy most often uses biotechnology (ethanol production being a case in point). However, thermochemical conversion of biomass is an option and this process has been used as a source of heat and light for thousands of years, i.e., by combustion. The authors have done a tremendous amount of work reviewing the literature as evidenced by the 684 cited references.

Limitations in space preclude a more comprehensive review of the material in this text. Suffice it to say that Kent, the book's editor, has done a superb job of assembling a knowledgeable and articulate group of contributors who in the aggregate have done an excellent job of thoroughly covering the topic of “Industrial Chemistry and Biotechnology.” No university or technical library should be without it.

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