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Book reviews

Fueling Our Future: An Introduction to Sustainable Energy, R.L. Evans. Cambridge University Press, Cambridge, UK (2007). 192 pp., price: US$ 24.99, ISBN: 978-0-521-68448-4, paperback

"One of the most important issues facing humanity today is the prospect of global climate change, brought about primarily by our prolific energy use and heavy dependance on fossil fuels." Coincidentally, this review is being written the day former U.S. Vice President Al Gore received a Nobel Prize for his focus on global warming problems.

And the problem is increasing due to increasing energy use, especially in developing countries. For example, energy use is increasing by 4% per year in China, by 6% per year in India and by 2% per year in the world.

In this book, the author "...takes a systems approach to energy use, so that the complete consequences of choosing a particular energy source or energy conversion system can be seen." Discussed in depth (in a non-mathematical fashion) is the current state of the art of sustainable energy technology including non-conventional fossil fuels and such renewable energy sources as nuclear power (this power source is discussed not because of its sustainable relativity but because it produces no greenhouse gases when employed to produce electricity).

Carbon dioxide concentrations have risen from 270 ppm in pre-industrial time to almost 370 ppm today. At the same time, the earth's temperature has risen approximately 1 °C. Future significant increases are predicted for both carbon dioxide concentration and temperature if carbon dioxide controls are not initiated.

Energy use in all its forms is increasing, The source of most energy production today is fossil fuels which are declining in supply, especially crude oil and natural gas, which along with coal supply 80$ of the world's energy needs; nuclear power supplies 7%.

There is little doubt that large-scale utilization of fossil fuels is putting significant stress on the environment according to the author. Simultaneously, these fuels are being irrevocably consumed and in the process produce air-contaminating byproducts such as particulates, SOX, NOX, CO and CO_2.

In the section of the book entitled "The global energy demand and supply balance," there are the following two chapters: (1) World energy demand and (2) World energy supply. Demand, Evans notes (not surprisingly), is rising. Currently, approximately 25% of all energy is used for transportation and 32% for industrial production (the amount varies by country depending upon the degree of industrialization).

The energy source for the world's consumption is reported to be as follows: oil 35%, coal 24%, combustible renewables and waste 11%, hydro 2%, nuclear 7% and natural gas 21%.

The rest of the book is devoted to the author's main goal which is a focus on new and sustainable energy sources—a topic which I believe is more critical than the concern for global warming. Evans writes, "There is a need, therefore, to develop new or 'non-conventional' sources of fossil fuels to supplement the traditional crude oil supplies."

This source, in the short term, will be oil sands or oil shale and coal-bed methane. Carbon sequestration may well be utilized to control carbon dioxide emissions. But in the future, one should expect contributions by low density sources such as wind, solar, biomass (wood), landfill gas, ocean waves, and geothermal.

Nuclear technology is covered, albeit briefly, in Chapter 8 not because (as noted previously) it is a renewable energy source but because it produces no carbon dioxide and is a high-density energy provider.The final two chapters discuss the transportation challenge. New and exciting energy use reduction efforts are described such as fuel cell and hybrid electric vehicles which will reduce the need for petroleum fuel.

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Industrial Enzymes: Structure, Function and Applications, J. Polaina, A.P. MacCabe (Eds.). Springer, Dordrecht, The Netherlands (2007). 653 pp., Price: US $179.00, ISBN: 978-1-4020-5376-4

"Man's use of enzymes dates back to the earliest times of civilization. Important human activities such as the production of certain types of foods and beverages, and the tanning of hides

and skins to produce leather for garments, serendipitously took advantage of enzyme activities." The enzyme industry now generates 1 billion dollars per year. The scope of this fast-expanding field is covered exceedingly well by this multi-authored text.

In this book, 34 multi-authored contributed chapters discuss the most important types of industrial enzymes, their structure, catalytic properties and applications. This task is accomplished by 80 scientists mainly from Europe.

The book has five major sections (as shown below) with the number of contributions in each section shown in parentheses:

- Carbohydrate active enzymes (9);
- Peptidases (6);
- Lipases (5);
- Nucleic acid enzymes (4);
- Oxidoreductases and other enzymes of diverse function (10).

The editors' goal was "...to provide in a single volume an updated revision of the most important types of industrial enzymes based on consideration of their physicochemical and catalytic properties, three-dimensional structure and range of current and foreseeable applications." In my opinion, they have done that.

Besides being an excellent treatise on the theory, structure and function of enzymes, the various contributors describe practical applications/uses for enzymes such as the production of starch hydrolysates (glucose or maltose serum).

One particularly interesting and very timely chapter written by employees of U.S. National Renewable Energy Center in Golden, Colorado discusses the use of cellulases for the above task. The authors state:

> It is now clear that cutting-edge and efficient biochemical technologies must be used to reduce the cost of cellulase activities delivered to the SSCF bioethanol process. The current estimate for NREL Proven Technologies and Best of Industry Technologies yields cellulase costs to the bioethanol process of $0.32 and $0.18 per gallon of ethanol produced respectively. These costs must be reduced to less than $0.05 per gallon ethanol by 2020 and this requires further increases in specific activity or production efficiency or some combination thereof.

In the next contribution, Miettinen-Oinonen of Finland discusses the use of cellulases in the textile industry for the manufacture and finishing of cellulose-containing material. This use began in the 1980s as denim finishing to create a fashionable stonewashed appearance; the process was known as biostoning.

The book contains numerous other applications. Given space limitations, I will restrict this review to two of them:

- *Application of pectinases*. Industrial applications of pectinases have included fruit juice clarification, wood preservation, wastewater treatment, and coffee and tea fermentation among others.
- *Application of alpha-*L*-rhamnosidases in the chemical industry*. These enzymes are used in the design of low-cost processes for the production of valuable aromatic compounds and flavors.

This review has only touched on a very few of the innumerable uses of enzymes discussed in this book which I feel will prove to be a very valuable reference tool in the field and a beacon for future development.

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Risk Assessment for Chemicals in Drinking Water, R.A. Howd, A.M. Fan (Eds.). Wiley Interscience, John Wiley and Sons, Hoboken, NJ (2008). 387 pp., Price: US$ 99.95, ISBN: 978-0-471-72344-8

This book contains important information on methods to produce our most vital resource—water. It was edited by (and contains several contributions from) members of the California EPA with other contributions coming from the U.S. EPA, Canada, and France. In this volume, the authors examine current risk assessment methods for chemicals in drinking water.

The book has the following 14 chapters:

1. Introduction to drinking water risk assessment.
2. Summary of the development of Federal drinking water regulations and health-based guidelines for chemical contaminants.
3. Interpretation of toxicologic data for drinking water risk assessment.
4. Exposure source and multiroute exposure considerations for risk assessment of drinking water contaminants.
5. Toxicokinetics for drinking water risk assessment.
6. Health risk assessment of chemical mixtures in drinking water.
7. Protection of infants, children, and other sensitive subpopulations.
8. Risk assessment for essential nutrients.
9. Risk assessment for arsenic in drinking water.
10. Risk assessment for chloroform, reconsidered.
11. Risk assessment of a thyroid hormone disruptor: perchlorate.
12. Emerging contaminants in drinking water: a California perspective.
13. U.S. EPA drinking water field office perspectives and needs for risk assessment.