- Enzyme catalysis and engineering
- Plant biotechnology and genomics
- Biomass fractionation and hydrolysis
- New and developing industrial bioproducts
- Feedstock supply and logistics
- Microbial catalysis and metabolic engineering
- Bioprocessing and separation R&D
- Bio/thermo-chemical integrated biorefinery
- Life cycle analysis/sustainability
- International biomass/biofuels update

A quick review of the above list of session titles reveals a wide range in coverage of topics in the conference whose impacts were noted by the author of the first paper in the book. Akin, of the USDA Laboratory in Athens, Georgia, writes:

> "Corn-to-ethanol production and use is rapidly expanding. With the phase-out of methyl tertiary butyl ether, which has been used as an oxygenate for more efficient burning of gasoline, ethanol has been added in ever increasing quantities. Further, the desire to use even higher ratios of ethanol as a fuel related to improved national security, trade imbalance, and use of agricultural products has driven up the demand, price, and production. With greater emphasis on fuel ethanol, lignocellulose as substrate for fermentation has been given an increased priority."

The author goes on to discuss the use of this substrate to produce fermentable materials.

Given that a comprehensive review of the 77 papers in this volume was clearly beyond the scope of space available, I have selectively abstracted material that caught my attention:

- A paper entitled "Biodiesel Fuel Production by the Transesterification Reaction of Soybean Oil Using Immobilized Lipase" was presented by scientists from Brazil. The authors describe the enzymatic alcoholysis of soybean oil with methanol and ethanol using a commercial immobilized lipase.
- Another paper from Brazil discussed the "Enzymatic Hydrolysis Optimization to Ethanol Production by Simultaneous Saccharification and Fermentation." The authors noted that: "There is tremendous interest in using agro-industrial wastes such as cellulignin as starting materials for production of fuels and chemicals."
- A third Brazilian paper entitled "Use of Glucose Oxidase in a Membrane Reactor for Gluconic Acid Production" was important because of the high availability of glucose obtained from sucrose and starch which are abundant natural resources. There is a high market demand (over 100,000 tons/year worldwide) for gluconic acid, a product largely used in food as an acidulant, as a chemical for surface cleaning, and in the pharmaceutical industry (gluconate salts).
- Swedish biochemists presented a paper entitled "The Potential in Bioethanol Production from Waste Fiber Sludges in Pulp Mill-Based Biorefineries." I quote from the abstract: "Industrial production of bioethanol from fibers that are unusable for pulp production in pulp mills offers an approach to product diversification and more efficient exploitation of the raw material. In an attempt to utilize fibers flowing to the biological waste treatment, selected fiber sludges from three different pulp mills were collected, chemically analyzed, enzymatically hydrolyzed, and fermented for bioethanol production."
- A contribution from chemical engineers at my own university was entitled "Mitigation of Cellulose Recalcitrants to Enzymatic Hydrolysis by Ionic Liquid Pretreatment." The authors note that the efficient hydrolysis of cellulose-to-glucose is critically important in producing fuels and chemicals from renewable feedstocks.
- The last paper to be reviewed was presented by Converse of Dartmouth College, Hanover, New Hampshire. The paper is entitled "Renewable Energy in the United States: Is There Enough Land?" The author concludes that: "A renewable energy supply scenario, capable of meeting the 2001 US energy demand indicates that there is enough land to support a renewable energy system but that the utilization of biomass will be limited by its land requirement."

The above extremely limited reviews of only a few of the book's papers illustrate the wide coverage of material published. What is unique in this volume was the fact that it is essentially a hard cover production in a single book of four volumes of a periodical.

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Biophysico-Chemical Processes of Heavy Metals and Metalloids in Soil Environments, A. Violante, P.M. Huang, G.M. Gadd (Eds.). John Wiley & Sons Inc., Hoboken, NJ (2008). 678 pp., Price: US$ 135.00, ISBN: 978-0-471-73778-0

"Pollution induced by heavy metals and metalloids in soils is a serious environmental problem because, in comparison with the atmosphere and water, the soil environment has a much lower ability to recover from toxic effects. In soil, trace elements potentially toxic to plants and other living organisms are involved in chemical and biological reactions such as solution and surface complexation, precipitation, sorption–desorption, and oxidation–reduction. These elements interact with a series of clay minerals, humic substances, metal oxides, microorganisms, extracellular enzymes, biopolymers, and other organic and inorganic ligands. Their behavior depends on chemical and physicochemical as well as biological processes and their interactions with microbial activities. These physicochemical–biological interactions would influence the transfer of these elements from the inorganic and organic soil constituents to the soil solution and to plants and contaminate the terrestrial food chain, thus endangering human and animal health. Biogeochemical processes operating in soil environmental that affect the fate, behavior and bioavailability of metals and metalloids are currently an area of active research.

As a recognition of the importance of biophysico-chemical processes of metals and metalloids in soil environments, we initiated the first volume of the IUPAC-Wiley book series "Biophysico-Chemical Processes in Environmental Systems." This volume, which consists of 15 chapters, is organized into three parts: Fundamentals of Biotic and Abiotic Interactions of Trace metals and Metalloids with Soil Components; Transformations and Dynamics of Metals and Metalloids as Influenced by Soil-Root-Microbe Interactions; and Speciation, Mobility, and Bioavailability of Metals and Metalloids and Restoration of Contaminated Soils."

The editors have assembled a series of excellent papers that cover both the theoretical and practical aspects of metal contami-

nants, the problems they pose and potential solutions thereto. This they have done in the following chapters:

Part I: Fundamentals of Biotic and Abiotic Interactions of Metals and Metalloids with Soil Components:

- Impacts of physicochemical–biological interactions on metal and metalloid transformation in soils: an overview
- Transformation and mobilization of metals, metalloids, and radionuclides by microorganisms
- Kinetics and mechanisms of sorption–desorption in soils: a multiscale assessment
- Spectroscopic techniques for studying metal–humic complexes in soil
- Factors affecting the sorption–desorption of trace elements in soil environments
- Modeling adsorption of metals and metalloids by soil components

Part II: Transformations and Dynamics of Metals and Metalloids as Influenced by Soil–Root–Microbe Interactions

- Biogeochemistry of metals and metalloids at the soil–root-interface
- Biogeochemical processes controlling the cycling of arsenic in soils and sediments
- Microbial oxidation and reduction of iron in the root zone and influences on metal mobility
- The complexity of aqueous complexation: the case of aluminum- and iron(III)-citrate

Part III: Speciation, Mobility, and Bioavailability of Metals and Metalloids and Restoration of Contaminated Soils

- Chemical speciation and bioavailability of trace metals
- Fractionation and mobility of trace elements in soils and sediments
- Sources and mobility of metallic radionuclides in soil systems
- Remediation of metal-contaminated soils: an overview
- Phosphate-induced lead immobilization in contaminated soils: mechanisms, assessment, and field applications

Huang, author of the first chapter, concludes it in the following way:

"Fundamental understanding of soil physical, chemical, and biological interfacial interactions at the molecular level is essential to understanding the behavior of metals and metalloids in the pedosphere and to restoring terrestrial ecosystem health on the global scale. Future research on this extremely important and exciting area of science should be stimulated to sustain and enhance ecosystem productivity, services, and integrity and the impact on human health and prosperity."

While the science underlying soil metal problems is of great importance, because of my engineering background, I was more interested in solutions to the problem; that was the topic of Section III. Of the five chapters (listed above) in this section, I have chosen to review the fourth (Remediation of Metal Contaminated Soils: An Overview) by Grafe and Naidu. Written by two Australians, the authors review the bioavailability of metals in soils before they discuss remediation technologies. Remediation is discussed in some detail. Technologies employed it this activity include bioremediation, phytoremediation, electrokinetics, in situ soil flushing, monitored natural attenuation, solidification and stabilization, in situ capping, excavation, soil mixing, incineration and vitrification.

The authors discuss each of the above noted processes briefly but in sufficient detail to understand the techniques and their applications. They note that "... apart from the soil washing process, the other techniques are not yet fully developed and where these have been tried, the duration of the remediation process has been long." This section concludes with a list of the major challenges facing scientists dealing with remediation of metal-contaminated soils:

- "Development of analytical technology for subsurface assessment
- Development of in situ remediation technology that is cheap, effective, and rapid
- Development of an integrated physical, chemical, and biological remediation process
- Remediation of subsurface metal-contaminated soils
- Development of technology for remediation of mixtures (i.e., site contaminated with metals, metalloids, and organics)
- Fundamental process modeling and verification
- Developing genetically engineered microorganisms and genetically modified plants to detoxify metals in contaminated soil
- Enhancement of natural remediation processes"

This book is an important contribution to the literature on soil contamination by metals and its remediation.

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Fundamentals of Industrial Catalytic Processes, C.H. Bartholomew, R.J. Farrauto., 2nd edition, John Wiley & Sons Inc., Hoboken, NJ (2006). 993 pp., 8 1/2 × 11 in. format, Price: US$ 99.95, ISBN: 978-0-471-45713-8

> In this second edition [the authors write] we continue our initial concept, namely, that of a combined textbook that marries the fundamentals of catalysis with practice.

And they have done that well in this book slated for use by students and practicing professionals, both chemists and chemical engineers.

> The book is organized into two parts containing altogether 13 chapters. The first part, Introduction and Fundamentals, contains five chapters dealing with: (1) fundamentals of catalysis; (2) catalyst materials, properties and preparation; (3) catalyst characterization; (4) reactors, reactor design, and activity testing; and (5) catalyst deactivation. The second part, Industrial Practice, includes eight chapters treating: (6) hydrogen production and synthesis processes; (7) hydrogenation and dehydrogenation processes; (8) oxidation processes; (9) petroleum refining and hydrocarbon processing; (10) environmental control of mobile sources; (11) environmental control of stationary sources; (12) homogeneous, enzymatic and polymerization catalysis; and (13) fuel cell catalysis.

The authors begin with a short discussion of the history of catalyst technology. They report that the word 'catalyst' was coined by