most complete text on water treatment processes that I have seen. This book is a tribute to his lifetime of work in the environmental field.

Water treatment unit processes is designed, according to Hendricks, for several kinds of uses: (1) as a text for a water treatment course, (2) as a reference for practicing engineers, and finally (3) as a reference for persons in operations. In my opinion, this book admirably suits all three intended uses, especially as a textbook. Copious figures, tables, and photographs of equipment enhance the text's use. Regarding this use, Hendricks notes: "As related to the tiered design, the book has more content that would be feasible in a one or two semester course. The design is such, however, that an instructor can assign the pertinent sections and the student may wish to amplify with other sections that may be of interest."

With the same thoroughness as he showed in writing the text, Hendricks has provided a most comprehensive Table of Contents. That section is 40 pages long. In it, he lists 21 chapters (including the numerous subsections for each) which, for the sake of brevity, I will list but not describe: (1) water treatment, (2) water contaminants, (3) models, (4) unit process principles, (5) screening, (6) sedimentation, (7) grit chambers, (8) flotation, (9) coagulation, (10) mixing, (11) flocculation, (12) rapid filtration, (13) slow sand filtration, (14) cake filtration, (15) adsorption, (16) ion exchange, (17) membrane processes, (18) gas transfer, (19) disinfection, (20) oxidation, and (21) precipitation.

To say the least, the topic at hand has been covered thoroughly. For textbook use, Hendricks has provided student problems at the end of each chapter.

The material accompanying the book notes:

> "Professor Hendricks emphasizes the fundamentals, using simple explanations and avoiding models that are too complex mathematically, allowing students to assimilate principles without getting sidelined by excess calculations. Applications of unit processes principles are illustrated by example problems in each chapter. Student problems are provided at the end of each chapter; the solutions manual can be downloaded from the CRC Press website. Excel spreadsheets are integrated into the text as tables designated by a 'CD' prefix. Certain spreadsheets illustrate the idea of 'scenarios' that emphasize the idea that design solutions depend upon assumptions and the interactions between design variables. The spreadsheets can be downloaded from the CRC website."

Each chapter is followed, as I noted earlier, by student problems. The author also has included references and a glossary for each chapter. A four-page section in the Table of contents lists titles of supplemental material that can be downloaded from the CRC website.

I have reviewed very few books that approach this one in comprehensive coverage of a topic. This book is clearly the product of a lifetime of work in the field by the author. As a textbook, *Water treatment unit process*es will be without peer.

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M.N.V. Prasad, K.S. Sajwan, R. Naidu (Eds.), Trace Elements in the Environment: Biogeochemistry, Biotechnology, and Bioremediation, CRC/Taylor & Francis Group, Boca Raton, FL, 2006 (744 pp., Price: US$ 159.95, ISBN 1-56670-685-8).

The concentrations may be small, the role of trace elements in the environment is very large. Some elements are required for growth while others are toxics. The editors note, "Trace element behavior and fate depend upon their chemistry in soil inorganic and organic phases; their bioavailability depends on a variety of factors concerning the ambient environment, soil, and/or sludge.

For this book, the editors have assembled 33 papers that discuss the applications of strategies of the problem of toxic elements in the environment. The editors have acquired an impressive list of papers written by 69 authors from 18 countries.

Key features of the book, according to the flyer that came with it, are described below. The various contributions:

- Emphasize biotechnological aspects from the transgenic plants for environmental cleanup to microbial sensors for monitoring trace elements.
- Provide background information and appropriate examples for the understanding of trace elements in the biogeosphere.
- Discuss the use of biomaterials as efficient and affordable methods for cleaning up heavy-metals contaminated soils.
- Examine the scope and limitation of plant metallothionein genes, genetic engineering for the cleanup of toxic trace elements, and metallomics.
- Cover the advantages and limitation, adaptive physiology, and rhizosphere biotechnology of bioremediation.

The papers are published under five major section headings with the number of papers in each section noted in brackets:

1. Bioavailability (5).
2. Biogeochemistry (5).
3. Biotechnology (9).
4. Bioremediation (11).
5. Risk assessment (3).

The broad coverage is well-illustrated by a review of some of the papers in the Bioremediation Section. For example, papers

are published that discuss phytoremediation using trees, stabilization of metal-contaminated ecosystems by grasses, lead-accumulating plants, cycling of trace elements by aquatic wetland plants, metal tolerant plants, plants that accumulate and/or exclude tract toxic elements, and phytomanagement of radioactively contaminated soil.

Sewage sludge, a material of interest to me (having conducted research in this area in years past) is treated in three papers (two of these discussions of sludge, however, are quite brief). Sludge is the residual left after treating wastewater. It has both beneficial segments (nitrogen and phosphorous) and materials of concern (heavy metals). As an agricultural amendment, sewage sludge has value because it supplies nitrogen, phosphorus, and organic solids. But there is concern for the heavy metals that sludge may contain. This topic is discussed by Antoniadis and his colleagues who conduct research at the Institute of Soil Mapping and Classification, National Agricultural Research Foundation, in Larissa, Greece. The authors note (and my research results agree) that "Soil pH is probably the most widely recognized factor affecting heavy metal availability."

This review probably is too brief for the length of the book, but it is very difficult to comprehensively review 33 uniquely different papers that span the entire body of knowledge on how and why plants interact with metals and other trace elements in the environment. As advertised on the back cover, "The book highlights cutting-edge applications of strategies and technologies of the problems of trace elements in the environment."

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J. Gregory, Particles in Water: Properties and Processes, CRC/Taylor & Francis Group, Boca Raton, FL, 2006 (192 pp., Price: US$ 129.95, ISBN: 1-58716-085-4).

Natural waters contain a wide variety of impurities (both dissolved and suspended) that mainly are contributed by the weathering of rocks and soils. But in inhabited areas, contributions from human activities are important. These impurities are first discharged as dissolved ions or particulates. The latter are normally: (1) inorganics, (2) organics, or (3) organisms (living or dead). These particles scatter light and adsorb materials from solution, and if they are microorganisms or viruses, they may be pathogenic. Obviously, their presence in drinking water is undesirable. Removal processes include sedimentation (including centrifugation), flotation (dispersed or dissolved air), or filtration (deep bed or membrane units).

The author ends his first chapter with the following statement:

> "Many of the topics covered in the following chapters are fundamentally important in particle separation processes. Most of the emphasis will be on fairly dilute suspensions, typical of those encountered in water treatment processes, but the basic principles apply to solid–liquid separation in a wide range of industries, including biotechnology, mineral processing, papermaking, and others."

Chapter 2 deals with particle size and related properties including particle size distributions, particle transport, light scattering and turbidity, and particle size measurement.

Chapter 3 covers surface charge which plays a major role in colloid stability and interaction between particles. The most common reason for particles in an aqueous solution to acquire a charge is that its surface has chemical groups that can ionize in water and leave a residual charge on the surface. Surface charge is important because it plays a major role in colloidal stability.

Colloid interactions and colloid stability is the title of Chapter 4. The interactions discussed here are both attractive and repulsive. They are important because they control particle sizes.

The remaining chapters (5–7) are entitled: Aggregation kinetics, Coagulation and flocculation, and Separation methods. Discussed in the first of these chapters, in addition to the kinetics of particle aggregation, are the forms of aggregates and aggregate strength, all of which are of considerable fundamental and practical importance.

Chapter 6, Coagulation and flocculation, discusses the mode of action of some common additives on coagulation and flocculation. Chapter 7, Separation methods, gives an overview of some important solid–liquid separation processes and the principles on which they are based.

The theory pertinent to the science underlying particle processes is well presented by Gregory. However, the numerous equations are not worked out, i.e., no numerical examples are given. The references, although pertinent to the material discussed, seem limited in number with more of them referring to books in the field than to single research papers. I note this only because it is different; it is not to be construed as a criticism.

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