knowledgeable and experienced professional architect or engineer for all but the most trivial of projects, it is important for the laboratory owners and responsible technical directors to understand the process to be sure that they have made their needs abundantly clear. When it comes to the matter of acceptance, it is essential that all the technical laboratory directors participate in a detailed examination of every aspect of the construction and furnishings that are about to become their personal work environment and that of their assistants; they leave this final task solely to a third party at their own peril."

Separate chapters discuss:

- project execution and bidding procedures;
- performance and final acceptance criteria;
- energy conservation;
- background on HVAC;
- comfort;
- fans;
- air cleaning;
- laboratory hoods and other exhaust air contaminant-capture facilities and equipment;
- exhaust air ducts and accessories;
- variable-air-volume systems.

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Environmental Biotreatment Technologies for Air, Water, Soil, and Wastes
Catherine N. Mulligan, ABS Consulting/Government Institutes, Rockville, MD, 2002, US$ 149.00, 420 pp., ISBN: 0-86587-890-0

According to the author, "the purpose of this book is to provide a complete state-of-the-art review, description, and evaluation of the technologies available for the biological treatment of air, water, soil, and solid wastes." It examines, "the various available technologies; provides process descriptions and conditions used in various case studies, performance data, scale-up issues, and site characteristics affecting performance; and weighs the advantages and disadvantages of each process and how they compare to traditional processes, such as incineration in terms of time requirements, safety issues, and other factors."

The author notes the unique aspect of the book is that it discusses treatment (albeit only biological) of air, water, soil and wastes in one book. In my opinion, she does this well, although I did take exception to some overly broad statements in passing:

- "biological processes do not product toxic by-product"—true in general, but anaerobic systems operating on chlorinated organics can produce toxic chemicals;
- "the use of microorganisms is relatively new"—not so unless you consider 100 years a short usage period;
- "waste can be degraded completely"—not normally; biological processes leave some small fraction of the organics unoxidized.

These concerns aside, the text in general is well written. The text coverage of biotreatment is best described in the author's own words.

"In the first chapter, the near- and long-term prospects for biological treatment processes are discussed. Aspects include what further process developments (e.g. faster degradation rates, smaller reactors) are required so that biological processes will be competitive with conventional processes and what other considerations must be overcome (e.g. public perception, regulatory aspects).

The second chapter describes the basic principles of the biological degradation of chemicals by bacteria, yeast, and fungus. The types of chemicals that can be degraded or transformed, the pathways of conversion, the potential for genetic improvement, the general conditions used, and the importance of acclimatization are discussed. The general criteria that must be met for biological technologies to be considered as a choice is examined. Some of these include the toxicity of the chemical to be degraded, the availability of the component to the microorganism, favorable growth conditions, and low process cost.

The third chapter describes the biological technologies available for air pollution treatment. The components to be treated are either odorous or volatile organic chemicals. Industrial applications, such as in the printing, flexography, and pharmaceutical industries, are included. This chapter consists of three sections—biofiltration, bioscrubbers, and trickling filters, which are the main technologies. The composition, concentration, and types of chemicals that can be biologically treated are examined. Examples from Germany, The Netherlands, and other countries are included and compared to conventional technologies, such as activated carbon filtration and incineration.

The fourth chapter, which is on water treatment, includes aerobic and anaerobic processes for industrial and municipal applications. Aerobic processes, such as activated sludge, aerated lagoon and trickling filters, and anaerobic ones such as upflow sludge blanket reactor and others are described. Each type of reactor is illustrated with the type and concentration of components treated, the water flow rate treated, and the conditions used. Processes for conversion or adsorption of organics or inorganics, such as metals, nitrogen, or phosphorus compounds are covered.

The next chapter details the processes available for biological soil and groundwater treatment. In situ processes include various methods for the addition of microorganisms, oxygen, nutrients, and water, the anaerobic processes for chlorinated organics, and the use of plants (phytoremediation) for metal accumulation. Ex situ processes where treatment parameters, such as mixing, temperature, and aeration can be more easily controlled are also described. Examples of technologies for treatment of excavated soil and sediments are landfarming, biopiles, and slurry reactors. Parameters, such as the time schedule available, concentration of contaminants, treatment costs, and availability of components to be treated are considered in the choice of technology.

Chapter six contains a description of the biological treatment of solid wastes in terms of what types and concentrations of wastes can be treated in industrial and municipal applications, what factors are important in choosing a process, and which processes are available for treatment or conversion to higher value products. Anaerobic digestion, composting, leaching of mining wastes, and conversion of food wastes to animal feed are some examples. Various processes are described through the use of illustrations and performance data.

Each of the foregoing sections is resplendent with appropriate tables and process diagrams. Each chapter, too, is well, but not exhaustively referenced.

Mulligan discusses the theory behind each process and presents design equations with appropriate design variations given. However, she does not provide worked examples for practice. She does, however, do an excellent job reporting cost data (although, I am not qualified to evaluate their accuracy).

The book ends with two appendices: (1) a glossary of terms and abbreviations and (2) a list of vendors. The 30 pages devoted to the latter area, in my opinion, are a waste of space. Commercial firms too often move or disappear. Better to rely for this information, I believe, on the yearly lists provided by environmental magazines.

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Environmental Law for Engineers and Geoscientists

Robert Lee Aston (Ed.), Lewis Publishers, Boca Raton, FL, 2002, 280 pp., US$ 99.95, ISBN 1-56670-575-4

"Today's engineer needs to know more than how to design a new or remedial project or facility." The foregoing is the phrase on the flyer advertising this book. The book itself begins with the statement: "This work is intended as a textbook of instruction in environmental law for engineers and geoscientists, to be used primarily in the geological, mining, petroleum, civil, and environmental engineering departments, and in the earth sciences curricula of universities." Indeed it will be, but the course using this book will be a different/difficult one for scientists and engineers, given that the foundation of the book is standard fare of lawyers: cases. In my opinion, such a course would be taught best (and probably only) by an attorney.

In reviewing books, I often go to the final chapter to see "how the story ends." My technique in reviewing this book was no exception as I am very interested in the topic of expert witnessing and admissible scientific evidence. My interest is based on my personal experience as an expert witness. What is intriguing, as described in the book, is the dramatically altered rules of the American Federal Court System regarding whether experts are admissible. To this end, Aston states "the expert's testimony/evidence must now meet greater and more intense inspection by the judge as to the scientist's procedure of investigative methods, relevancy, reliability of results, specific knowledge and experience of the question before the bar (the case), and professional peer acceptability of the investigatory methods." The chapter ends with a short section containing advice on how to be a successful expert witness in courts.

Perhaps, I should back up and introduce the author whose background is very impressive, especially his academic accomplishments. Beginning his career with a mining engineering degree in 1950, he subsequently received law degrees (JD, LLM, and is an LLD candidate) and doctoral degrees (Ph.D. and D.E.). His last degree was in 2000. Dr. Aston is active as an attorney, as well as having been a faculty member in mining geology, petroleum geology, and mining engineering.

By way of introduction to the law, Chapters 1 and 2 are, respectively, titled: (1) Introduction to environmental law and (2) Basic law for engineers and geoscientists. The author