

gas mileage translated to more miles travelled, Schipper). Finally, Chauncey Starr provides an optimistic but cautious prediction for the next 200 years.

The text examines a broad range of technologies and examines social and philosophical issues. The authors and editors are to be congratulated. The writing is easy to follow, with many tables and figures.

For those who believe the glass is half empty, I strongly urge you to read this text. For those who believe the glass is half full and getting fuller, you should read the text as well. The book does an excellent job of providing balance, a need for change, but is overall optimistic about the future of humans.

*Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1 Canada*

GORDEN A. SURGEONER

Chemical Principles of Environmental Pollution, B. J. Alloway and D.C. Ayres, Chapman and Hall, 1997, 2nd edition, 395 pp.

If "... pollution is the most serious of all environmental problems ... and other major environmental problems are also partly caused by pollution ..." then this is an important book, which is in its second edition 4 years after its first appearance. It is split into 3 parts: basic principles (chapter 1–4), the pollutants (chapters 5–7) and wastes (chapter 8), and it starts with an extensive glossary of acronyms and abbreviations which include such different items as ANOVA (analysis of variance), BATNEEC (best available technology not entailing excessive costs) and Waldsterben (forest death). The text then proceeds with a definition of the basic principles of pollution and a short history of major pollution problems. Influential books such as Rachel Carsons's *Silent Spring* and *Limits to growth* by Meadows *et al.* are not only mentioned but also criticized. However, the enormous influence of those early books is well recognized by Alloway and Ayres who present the last 2 decades as a success story for environmental issues. The authors explain their approach to the problem as pollutant-oriented, in contrast with other books which focus on different media such as air, water and soil. Nonetheless, the pathway from air to water and soil is followed throughout the second chapter and it proves to be a valid classification also in other chapters.

The behaviour of pollutants in the environment, i.e. from the source via transport to the target (organisms, ecosystems but also structures or buildings) is the main topic of the second chapter which touches many arguments from physics of transport and distribution to chemical reactions and the role of bacteria in the breakdown of organic pollutants. It provides a concise yet more or less complete list of pollution sources and transport media, including warfare, industrial accidents (Bhopal, Séveso etc.), a classification of hazardous substances and a "red list" of pollutants in several countries (Tables 2.1 to 2.8). Great emphasis is put on the

transport of pollutants from point and non-point sources in air, water and soil, and the main models, i.e. linear source, area source or box model and indoor models, are presented. Basic principles of air chemistry (photochemistry), redox reactions in aqueous environments and factors responsible for the adsorption of ions and decomposition of organic pollutants in soils are explained concisely.

The third chapter on toxicity and risk assessment of environmental pollutants has only 20 pages, but it is essential for the whole story because it illustrates how pollutants affect humans and animals and which tests are used to assess acute or long-term effects. The authors do not tackle problems of physiology, i.e. the way of action of pollutants, but rather use a straightforward way of classifications and comparisons, thus achieving their promise to be pollutant-oriented. The combined effects of oestrogenic chemicals and male fertility are discussed as well as the probability of being killed by cancer, cigarette smoking and accidents, i.e. the authors present a comparison of overstated and understated risks. They do not point, however, to a major problem in risk assessment, i.e. the increases in, or concern for, specific issues such as sperm counts in human males, which may distort the picture. This chapter includes also valuable lists for background and trigger concentrations of toxic substances in soils, drinking water and air.

The fourth chapter describes in detail the theory, the basis and the analytical procedure of state of the art methods for pollutant analysis. Although the concepts of precision, accuracy and different kind of errors are discussed, I expected to see a paragraph on a basic statistical problem, i.e. how to distinguish between signal and noise. Several pages are dedicated to the sampling procedure, for instance in rivers, lakes and groundwater but think that this point cannot be overemphasized and the authors should give one or more references which describe the specific environments and discuss its peculiarities, especially those pertinent to the quality of sampling and monitoring. It is of crucial importance where and when a lake is sampled and how the water is taken, stored, transported, filtered etc. All treatments will definitely influence analytical results when some fundamental aspects or characteristics of the studied environment are not considered. So the hints given in this chapter can be seen as a general advice for inexperienced readers to be cautious and to seek the help of experts when preparing a sampling or monitoring program. The chapter ends with a helpful comparison of advantages and pitfalls of methods employed for biomonitoring.

Chapter 5 describes inorganic pollutants, from CO₂ to heavy metals, mineral fibres, particles and radionuclides and discusses possible pollution by and energy from thermal and cold fusion. This chapter provides useful tables on toxicity, although Table 5.27 and Table 3.8 are, in essence, identical. Thus some things, such as behaviour or toxicity of inorganic pollutants in air, water and soil, sound a bit repetitious because already mentioned in chapters 2 and 3. However, some redundancy may not be avoidable since pollution is at the centre of interest and it can be seen from different points of views. The chapter on organic pollutants (chapter 6), begins with the production and composition of smoke, and continues

with hydrocarbons from coal and oil sources. It includes a discussion of urban pollution in several parts of the world and the effects of cigarette smoking compared to other sources of organic pollutants, a recurrent issue raised already in chapter 3. Some space is dedicated to solvents, adhesives and aerosol sprays, including production and emission data, and to the history of the use of detergents. Special emphasis is put on the effects of organochlorines and their worldwide distribution, but also dioxin, agent orange, organophosphorus and carbamates are treated in this chapter. The chapter contains also a list of insecticides whose use is banned in the USA since 1955, and ends with a discussion about the properties of odours and methods of odour treatment. Chapter 7 discusses indoor pollution of volatile organic compounds, ozone, NO_x , CO, cigarette smoking (again), asbestos fibres, lead and radon.

The last chapter (#8) is dedicated to wastes and their disposal with many examples from landfills, incineration, composting, sewage treatment, and provides also an interesting discussion of how to treat hazardous wastes. Also the long-term effects of abandoned landfills, tanker accidents and pollution by warfare are discussed in this chapter.

To summarize, this book gives a vivid illustration of almost all actual and historical aspects of pollution, with reference to recent and spectacular events, e.g. the case of Vietnam veterans and agent orange, the Séveso accident and dioxin, but it considers also the pros and cons of modern techniques for treating hazardous wastes. What I missed was a discussion or at least a short mention of multivariate statistics for studying combined effects of pollutants and environmental variables because I consider this a beautiful link between pollution-oriented and ecology-oriented research. A closer collaboration between those two directions in environmental studies is crucial for appropriate sampling and interpretation of results, a point which can hardly be overemphasised. The book is written by experts in the field of the analysis of pollutants who give an integrated view of pollution, pollutants, pathways and transport processes in the air, the water and soils. many practical hints, good examples, clear tables and an updated bibliography at the end of each chapter make this book pleasant to read and a useful tool for students and lecturers in environmental pollution.

*Department of Soil Science
The University of Reading
Whiteknights
P.O. Box 233, Reading RG6 6DW, U.K.*

B. J. ALLOWAY

*Environment Consultant
11a Batford Road
Harpenden, Herts AL5 5AX*

D. C. AYRES