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BookReview

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Book Reviews

LEAD, POLLUTION AND CONTROL, by R. M. Harrison and D. P. H. Laxen, University of Lancaster, U.K., 168 pages (including 51 figures, 72 tables, and an index of three pages), hardback, format 241 × 162 mm, ISBN 0-412-16360-8, Chapman and Hall Ltd., London EC4P 4EE (1981), £9.50.

Any effective control strategy for lead requires knowledge of the sources of environmental exposure and an understanding of the pathways of this element in the environment. This book aims to provide such information and to explain the methods available for limiting emissions of lead from the most important sources. This includes also routes of human exposure to lead and health effects. The authors are said to be environmental scientists without commitment to either the pro- or anti-lead lobby. Their prime interest is in understanding the nature and control of lead as an environmental pollutant. The book gives therefore the necessary background to environmental scientists, both in universities and in industry, but also to those in related areas, such as public health, geochemistry and ecology. Each chapter contains valuable Anglo-Saxon literature references, but one misses unfortunately important research results of scientific work on the continent, such as studies made at the University of Düsseldorf, at the Nuclear Research Center (KFA) in Jülich, or in the Umweltbundesamt Berlin.

The book is composed of eight chapters:

- Introduction (with interesting statistics)
- Lead in the Atmosphere
- Lead in Water (Subchapter 3.4 deals with speciation, but one misses the newer information, and also the literature about possible chemical and/or microbiological alkylation and dealkylation is not discussed).
- Lead in Soils
- Control of Lead in Air
- Control of Lead Discharges to Water
- Human Exposure to Lead and its Effects (this chapter is worked out quite carefully, and there is a good analysis of the Needleman study. But

one misses the results of scientific research studies, made for instance in Düsseldorf. Nothing is said about how lead passes the blood-brain barrier, which is not yet fully developed in embryos and infants. In a new edition also possibilities of damages of lung alveoles should be discussed, because these may reduce resistance to some sickness of non-lead origin. This mutual effect is also important, because it depends only on the inhaled ratio of the total lead uptake. Another gap in the book is that nothing is said about lead effects to plants and animals. This may also be important in view that one misses the descriptors cancerogenicity, mutagenicity and teratogenicity (embryotoxicity) in the index. According to Evaluation of the Carcinogenic Risk of Chemicals to Humans: Some Metals and Metallic Compounds, WHO/IARC Monograph, Volume 23 (Lyon 1980) one knows that some lead salts are carcinogenic to rats and mice, and they are reported to cross the placenta to induce embryo- and fetomortality. Human epidemiological studies are probably not yet adequate, but should nevertheless be mentioned, especially also the studies of observed chromosomal aberrations.)

- Chemical Analysis of Lead in the Environment (since Dr. R. M. Harrison is a well known analytical chemist with international reputation, this is a very good summary of six pages of analytical methods. One misses however some information how to deal with speciation problems (for instance in sea water), and also blood-lead and blood-ALAD analyses are not discussed, though they are very important and many interlaboratory studies exist (for instance also in the European Communities).

ERNEST MERIAN

MEASUREMENT OF RISKS, ENVIRONMENTAL SCIENCE RESEARCH, Volume 21, by George G. Berg and H. David Maillie, University of Rochester, N.Y., USA, 549 pages (including 46 figures, 74 tables and an index of 4 pages), linen, format 258 × 180 mm, ISBN 0-306-40818-X, Plenum Press, New York (1981), US\$59.50.

Thirty papers presented at the Thirteenth Rochester International Conference on Environmental Toxicology (held 2nd–4th June, 1980 at the University of Rochester, New York) analyse the interference of risk—especially of toxic chemicals and ionizing radiation—and the validity of the experimental evidence of damage. Twenty-five of the papers originated in the U.S.A., the rest in Canada, England, Belgium and the Federal

Republic of Germany. Seventeen papers were elaborated in universities, 2 in industry, and 11 in agencies or independent institutes. Each paper contains literature reviews, and the scientific results of the discussions. Methods of risk assessment are examined as are topics ranging from the statistical inference of risks to such areas as cancer risks, the comparative risks of energy sources, and the hazards of inhaled contaminants and contaminated drinking water. The volume is therefore especially useful for those working in the fields of toxicology, pollution research, and public health.

The contributions are grouped under six headings:

- Statistical Inference of Risks
- Risks of Prenatal Exposures
- Risks of Contaminated Air and Drinking Water
- Comparative Risks of Energy Sources
- Genetic and Cancer Hazards
- Extrapolation to Low Doses.

As standardized and simplified procedures—which may be used by environmental toxicologists to measure and evaluate risks—single factor models, the method of population responses, the method of conservative inferences, and the linear extrapolation (also to zero risk) were developed, and compared. Also the risks of measuring risk are discussed, for instance misinterpreting, overestimation, underestimation, and misuse. Especially, when the damages occur rarely, error-rates may be high. Nevertheless it is important to detect damages of very low levels, also extra cases of cancer in a high population. Therefore a better understanding of the presented statistical theory is necessary. Also sensitive biological dosimeters are interesting tools. According to H. M. Utidjian (Union Carbide Corporation)—who made epidemiologic studies of toxic response—some of the currently permissible occupational exposures to heavy metals come entirely too close to the danger line.

A substantial part of the volume deals with the question “Where do the mutagenic effects of ionizing radiation fit into the pattern of environmental risks?”. The answer is also compared with the evidence that some chemicals cause measurable increases in cancer and reproductive defects. But also the risk of mutation pressure is compared with social risk. One key is also to evaluate cancer as one of many competing causes of death, in order to measure toxic damage in terms of life shortening. Finally, simple-minded interpretations of biased measurements are encouraged. The review of advances in measurement of risks to health by leading specialists may also have a lasting value as a landmark of a change in scientific opinion.

For the ecotoxicologist six papers are—besides others—of special interest:

- Th. W. Clarkson, *et al.*, Rochester, N.Y. “Dose-response Relationships for Adult and Prenatal Exposures to Methylmercury”
- Z. Stein, *et al.*, Columbia University, N.Y. “Epidemiologic Studies of Environmental Exposures in Human Reproduction”
- W. F. Forbes, *et al.*, Waterloo, Ontario, Canada “Health Risks of Lead as Judged from Autopsy Material”
- B. G. Ferries, Jr., *et al.*, Harvard, Boston “Use of Tests of Pulmonary Function to Measure Effect of Air Pollutants”
- J. D. Hackney, *et al.*, Downey, California “Experimental Evaluation of Air Pollutants in Humans as a Basis for Estimating Risk”
- F. Pott, R. Tomingas, *et al.*, Düsseldorf, FRG “Problems and Possibilities of Determining the Carcinogenic Potency of Inhalable Fibrous Dusts and Polyaromatic Aromatic Hydrocarbons”.

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AIR POLLUTION CONTROL EQUIPMENT, by Heinz Brauer, Technische Universität Berlin, and Yalamanchili B. G. Varna, Indian Institute of Technology Madras, 388 pages (including 285 figures, 53 tables, and a subject index of 6 pages), cloth, format 250 × 173 mm, ISBN 3-540-10463-1, Springer-Verlag, Berlin (1981), DM 196.00, US\$93.30.

The book has arisen from a university course on air and pollution control, and is addressed primarily to chemical, environmental and mechanical engineers, engaged in the design and operation of equipment for air pollution control. Research and Development work invested in the last decades in the field have achieved a high degree of performance in equipment applicable to the abatement of harmful emissions into air.

The valuable and well printed volume is divided into 12 chapters:

- Introduction to the Problems of Environmental Protection (including a review on legal actions)
- Integration of Technical Measures Taken for Environmental Protection.
- Survey on Technical Processes and Equipment for Air Pollution Control and Some Fundamentals (especially Removal of Particulate and Gaseous Pollution, Application of High Chimneys)
- Design and Operation of Cyclones
- Design and Operation of Wet Dust Scrubbers
- Design and Operation of Fabric Filters

- Design and Operation of Electrical Precipitators
- Design and Operation of Mist Separators
- Design and Operation of Absorption Equipment
- Design and Operation of Adsorption Equipment
- Design and Operation of Equipment for Biological Waste Gas Treatment
- Design and Operation of Equipment for Chemical Waste Gas Treatment.

Each chapter concludes with a list of symbols and literature references (which are however mainly restricted to German sources). The principles are well explained with good schemes, with many data, and also with the necessary physicochemical background (including many mathematical equations). Emphasis is put on technical engineering, and not too much is said about related fields such as particle size measuring, monitoring, and for instance health effects of particles. One misses also specific indications for instance to asbestos, glass fibre, lead particulates and (polycyclic) hydrocarbons. It may have some advantages to differentiate better between different dust species in a future edition of the usual manual.

PARTICLE SIZE MEASUREMENT (Powder Technology Series, Third Edition), by Terence Allen, University of Bradford, 678 pages (including 235 figures, many tables, equations and formulae, two appendices of equipment and suppliers, and their addresses, an author index of 19 pages, and a subject index of 4 pages), hardbook, format 240 × 169 mm, ISBN 0-412-15410-2, Chapman and Hall, London (1981), £24.50.

The measurement of particle size is an essential part of many scientific investigations in areas such as pollution control, soil mechanics, industrial health, physical chemistry, fuel science, etc. The new edition is both updated and greatly enlarged (since the degree of technology is changing very rapidly), and acts as an invaluable reference source for those dealing with materials in powder form. It covers many techniques which are important especially in powder technology.

To get a better idea what is included in the volume the titles of the twenty chapters may be mentioned:

- Sampling of Powders
- Sampling of Dusty Gases in Gas Streams
- Sampling and Sizing from the Atmosphere
- Particle Size, Shape and Distribution
- Sieving
- Microscopy

- Interaction between Particles and Fluids in a Gravitational Field
- Dispersion of Powders
- Increment Methods of Sedimentation Size Analysis
- Cumulative Methods for Sedimentation Size Analysis
- Fluid Classification
- Centrifugal Methods
- The Electrical Sensing Zone Method of Particle Size Distribution Determination (the Coulter Principle)
- Radiation Scattering Methods of Particle Size Determination
- Permeametry and Gas Diffusion
- Gas Adsorption
- Other Methods for Determining Surface Area
- Determination of Pore Size Distribution by Gas Adsorption
- Mercury Porosimetry
- On-line Particle Size Analysis.

The author tries to help the reader to make the best choice of methods in relation to different tasks. Often a particle cannot just be completely described by one number. In general it is not primarily required to measure the size of the particle. One may be more interested in some property of the particles, that is size dependent. The author discusses also the cost of the appropriate apparatus as well as the ease and the speed with which analysis can be reasonably carried out. The different situations—solid particles, liquid particles, and particles with properties of gases—influence the selection of the most promising method. In the new edition additional emphasis is given to sampling, to mathematical handling of size data, to centrifugal methods, to the Coulter principles, and to determination of surface area and of pore size.

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