

and wildlife—food, protection, indication of environmental health, pleasure. Also included are some thoughts on the moral issue of hunting and a psychologist's list of seven stages of perceiving wildlife (especially helpful as it points out how to communicate with children at their adolescent level of moral reasoning). Other chapters include material on habitat, what animals require for survival, how they adapt physically and behaviorally in order to survive, explanations for the natural rise and fall of animal population, and examples of human influence on all these functions. The final chapters give a "lick and promise" to the subject of selection and care for animals in the classroom (more information would surely be needed before deciding to board many of the critters mentioned) and to careers in the wildlife field.

Each chapter concludes with a listing of the main objective which should be stressed (placement at the beginning would have been more useful). The most helpful feature of the book is the compilation of activities to reinforce each section's concepts. Unfortunately, I found some of the activities objectionable. One in particular, seemingly ripe for a lawsuit, suggests that students "get the janitor's permission to explore the roof of the school building to see if it is a possible home for a barn owl." Lest I sound too negative, there were many excellent activities suggested including the following: listing animal stereotypes and then researching them to see if true; creating a food web of strings by connecting students who each represent a plant or animal; having students try to design a nest from the same materials as birds do (much harder than they think); making plaster casts of animal tracks (complete instructions supplied); competing in a predator-prey game that makes an excellent ecological point. All are keyed to the age level deemed appropriate (K-2, 3-4, and/or 5-6).

The bibliography at the end is very brief; but it does include, for the teacher, general and specific field titles, and, for the children, books by grade level. Also listed are periodicals, some available films (each followed by the distributor's name and address), and a list of national organizations (also with addresses) that might offer helpful reading materials and audiovisuals.

This book is unfinished in many respects; but despite this, and given the "limits of size and cost," it manages to achieve its stated purposes.

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SENSIBLE SLUDGE: A NEW LOOK AT A WASTED NATURAL RESOURCE.

by Jerome Goldstein. 1977. Rodale Press, Inc. (Organic Park, Emmaus, Pennsylvania 18049). 176 p. \$5.95.

This book reviews the history and use of sludge in the United States. The author, who is the editor and writer of several journals, books and articles, presents the case for increasing the use of a material that is now largely wasted. He shows the problems communities face with respect to ever increasing volumes of sludge, and the various alternatives available to them for its disposal.

Of special interest are the successful ongoing experiments to turn sewage into useful compost that is used as fertilizer on farms, parks, stripped mined lands, and neighborhood gardens. The practices of various municipalities of packaging sludge products for commercial distribution are discussed. The book also delves into problems of heavy metal uptake by plants, ground water contamination, the spread of disease organisms, and various legal problems. The author gives numerous examples to back up his contentions that a material that now pollutes our environment could more profitably improve our land and crop yields.

I would recommend this book for high school and college students who have an interest in the quality of life. The book has an extensive (10 page) bibliography, so that they could consult many original references.

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BIOHAZARD

by Michael Rogers. 1977. Alfred A. Knopf, Inc., (201 East 50th Street, New York 10022). 209 p. \$8.95.

Biohazard is a carefully written examination of the major questions, controversies, and events surrounding the recent struggle to control recombinant DNA research.

Michael Rogers accurately reports and artfully distills a voluminous record of discussions and decisions, from the celebrated Asilomar Conference, to the meetings of the NIH Advisory Committee, with the insight of one who clearly understands both the biological import and the political significance of the situations he describes. Ranging from commentary on the catalytic discovery of restriction enzymes, to description of the search for safe vectors, he writes inci-

sively of the technical complexities and the social implications of this awesome new technology.

Especially valuable are the numerous verbatim transcripts and selected excerpts from the meetings he reports. One is able to listen to the words of Paul Berg, Maxine Singer, Sidney Brenner, Stanley Cohen, and an international cast of molecular biologists from the research laboratories where the recombinant drama has developed. And a drama it is, Rogers writes about; one whose last act has not yet been plotted and one whose characters, often uncomfortable, have been pushed toward center stage with the knowledge that they must write their own lines and hope that the drama they participate in can be saved from tragic turns.

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WATER POLLUTION TECHNOLOGY

by John A. Black. 1977. Reston Publishing Company, Inc. (Post Office Box 547 Reston, Virginia 22090). 262 p. \$14.95.

The author states in the preface that, "In this text I have attempted to bring together the total spectrum of information on marine, surface, and ground-water systems; the sources and consequences of pollution and possible solutions; as well as applications and the analytical methods commonly used in water and waste-water monitoring." This is an enormous undertaking for a textbook of this size. In attempting to cover such a large scope of information, this book only touches on the major points of each topic. This can be viewed as very beneficial for the beginning student or the nonspecialist who is interested in acquiring only a general understanding of this field of study. It is obvious by the author's style of writing that he has assumed that the reader has no prior knowledge in this field.

The first part of the book is devoted to a very basic discussion of chemical, physical, and biological principles of water. The book then continues with very brief discussions of freshwater systems including lotic, lentic, ground water, and marine systems such as estuaries and the open ocean. The first half of the book presents the background information that is helpful to understanding the second half which is devoted to pollution technology. The remaining chapters describe the sources and consequences of a variety of organic and inorganic pollutants, water treatment methods, federal acts governing water pollution, and

analytical and collecting methods. The appendices give detailed instructions for carrying out many of the common physical and chemical tests done in water testing.

For the student wanting to explore a particular subject further, there is included at the end of each chapter, except chapter 10, "Legal Aspects of Water Pollution Control," a limited choice of from two to seven "Suggested readings." There are also questions included at the end of each chapter, again with the exception of chapter 10, to test mostly for reading comprehension. Photographs and diagrams are frequently used to help clarify the text material.

This book can be recommended as a good place to begin a study of aquatic environments and pollution.

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GOODBYE TO THE FLUSH TOILET

by Carol Huppert Stoner, ed. 1977. Rodale Press, Inc. (33 East Minor Street, Emmaus, Pennsylvania 18049). 285 p. \$6.95.

Throughout rural and suburban America precious, high quality farmlands and forests are being gobbled up by housing developments, roads and shopping centers. In spite of the billions of dollars spent on sophisticated sewage disposal systems to clean our waterways, they remain polluted. The Environmental Protection Agency last year finally recognized that large sewage systems are often responsible for stimulating the development of such valuable land and expensive sewage plants remain the most significant surface water polluters in many areas. Such wastewater treatment units are enormously expensive, and consume huge amounts of energy in construction, pumping, and operation. About 40% of our precious, pure household water is used to carry a small amount of body wastes (really a valuable resource) into our streams.

Biology and environmental science teachers will be the first to recognize the need to inform themselves, their students and the public of the need to find a better way of "disposing" or using human wastes. Since the Clivus Multrum waterless, composting toilet was developed in Sweden by Rikard Lindstrom, about 40 years ago, the death knell of Thomas Crapper's invention, the flush toilet may have been sounded. This marvelous, fascinating book is the most complete, accurate, and objective account of the status of waterless (especially composting) toilets that I have encountered in

years of reviewing the subject. It describes in detail the history of sewage disposal in the United States, our present mass, and the many alternatives to huge, costly, and wasteful sewage systems. Most important is the complete description of small, self-contained composting units that are easily retrofitted by the average homeowner. Certainly, when Huppert and Ludwig suggest, in their article, "Human Impact on the Inner Gorge of Grand Canyon National Park," (*ABT*, 40(1):15). . . . a safe solution might be developed to put in the toilets that would either chemically or biologically break down the waste material and render it harmless in a relatively short time," that solution probably is to be found in this book.

Those teachers, including myself, who keep a compost box constantly under study as a teaching resource in the classroom will recognize what good, sense the book makes. It may also stimulate ideas for student research aimed toward a better understanding of the ecology of composting. Given the American layperson's misunderstanding of and prejudices against human wastes, the biology teacher must play a pivotal role in changing attitudes. This book in every biology classroom library may go a long way toward making the job easier.

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ECOLOGICAL SANITY

by George Claus and Karen Bolander. 1977. David McKay Company (750 Third Avenue, New York 10017). 592 p. \$16.95.

The authors trace the development of environmentalism, discussing the organizations, some of the activists in the movement, and much of the literature involved. Their scholarly summary of ecological principles is followed by several chapters on environmental contaminants, including detergents, insecticides, drugs, minerals, synthetic fertilizers, manure, and ionizing radiation.

A chapter entitled "The Tocsin Over Toxins" emphasizes differences between hypotheses, theories, principles and laws, and urges the proper application of these terms in scientific literature. In another chapter, parallels are drawn between Lysenkoist biology in Russia and the popular environmentalist movement in the United States. It is noted that when environmentalists "employ tactics of innuendo, intimidation, and falsification, they are no better than were their Soviet colleagues, for they prostitute science by subjecting it to a zealot's cause."

In Part III, "The Pesticide Bugaboo," 270 pages are devoted to a detailed analysis and documentation of alleged adverse effects which have been widely attributed to the use of synthetic pesticides. The authors explain:

We chose the DDT issue as the focus for analysis because it is probably the issue on which the environmentalists have best succeeded in establishing in the mind of the public that *their* opinions represent scientific truth and that any opposition may be written off as mere noise made by 'industry spokesmen' or people with vested interests in 'agribusiness'.

In a chapter on "Vanishing Pesticide Residues" the authors point out several shortcomings in the analytical methods employed for determining the presence and concentration of chlorinated hydrocarbon insecticides. The exquisite sensitivity of the new analytic equipment resulted in widespread but unwarranted concern in the news media when infinitesimal amounts of pesticide residues were allegedly present in the environment. Actually, many naturally occurring chemical compounds were erroneously identified as "insecticide residues," for the gas chromatograph detects those compounds but often cannot distinguish between them and many insecticide residues (such as DDT and DDE). The resultant misinformation has elicited undeserved public and legislative concern, with almost catastrophic results for some aspects of agriculture and public health.

Chapter 18 discusses some politically active environmental agencies and organizations and their anti-pesticide maneuverings. Considerable space is devoted to the Environmental Protection Agency's seven months of DDT Hearings. Statements made there under oath by the "experts" testifying for the EPA/EDF "team" are quoted, including a great many which they quickly retracted under cross-examination. Those significant hearings were scarcely mentioned by the news media, but EPA Administrator William Ruckelshaus' unsupportable and capricious final decision on DDT was publicized as though it reflected scientific data revealed there—even though it clearly did not. Claus and Bolander comment:

In failing to recognize that the Hearings had exposed most of the work indicting DDT as pseudoscience or ignorant bungling, Ruckelshaus has set a very dangerous precedent for the future of American biology.

Mr. Ruckelshaus never attended any part of the Hearings, and he later admitted he had not even read the transcript, yet his decision *reversed* every major conclusion reached by the EPA Hearings Examiner who presided over the seven months of Hearings and then