

for the spread of diseases and of attack by pest species. Human manipulation of the environment has enabled certain disease organisms to expand their populations and cause more serious damage to crops than hitherto. This in turn has led to massive campaigns to try to eradicate the pest organisms, in some cases by use of wide-spectrum poisons which tended to eradicate useful species as well as the true target organisms, while use of biological control methods have also been developed – not necessarily to eliminate the target organisms completely, but at least to try to bring their populations down to a level where the damage caused is relatively insignificant.

The Authors have reviewed the development of biological control of pest insects from A.D. 900 (in China) until the present day, stressing from the start that before any attempt is made to control it, Man must have adequate knowledge about the ecology of the pest species – and this includes being certain about its taxonomy. In a field as wide and diverse as the one which they cover, the Authors have felt it right to start their book with a glossary covering something like 160 words or terms, in order to ensure full knowledge among their readers of the sense in which the words are used in this book. At first sight it seems strange, for example, to find 'international unit (i.u.)' defined solely in the context of insecticidal activity of *Bacillus thuringiensis* preparations.

The examples given by the Authors cover a wide selection of insect pests and consider the uses of parasitoids (either singly or with several types at one time or else successively), mass-culture methods, the ecological basis of treatment, and the use of non-insect invertebrate predators as well as vertebrate predators. I found that the account of amphibians referred solely to the Giant Toad (*Bufo marinus*) and was disturbed to see that, although the adverse effects in the Philippines are noted, there is no mention of the development of this species into a pest in other areas where it has been introduced. Among birds, the classical example given is the introduction of the Indian Mynah (*Acridotheres tristis*) to Mauritius in 1762 and later to Hawaii, but the possible effects on indigenous bird species are not noted. In mammals, the only example given is the transfer of Canadian Masked Shrews (*Sorex cinereus*) to Newfoundland.

The use of Bacteria, viruses, Rickettsiae, Protozoa, and Fungi, are thoroughly covered and then lead to a major section on 'manipulation of the biological environment for insect pest suppression'. This ranges from use of suitable cropping régimes to the genetic manipulation of host or predator species, insect hormones, and pheromones and 'antifeedants'.

After this wide survey of possibilities comes the final section entitled 'A fusion of ideas'. This includes a thoughtful account of the uses and abuses of agricultural chemicals: one significant comment is that 'The disaster phase occurs when the crop can no longer be grown profitably due to costs of chemical pest suppression.' The next heading is appropriately 'Human education', referring to the need to consider the welfare of the ecosystem, and leading on again to consideration of 'Integrated pest suppression'. This may require the use of a number of different factors, possibly including limited amounts of pesticides at certain critical stages, and it becomes clear that one of the background essentials is that adequate sums of money are spent on background research. The final paragraph produces the hammer blow that 'the one basic problem in the world today is human population

increase', and from this stems the need for suppression of insect pests.

Professor Coppel and Dr Mertins have produced a wide-ranging book which not only covers methods and usages, but leads the intelligent reader to think what the effect on the environment may be and how future treatment of pests should be planned. One begins to wonder if Man is really necessary...

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**Fundamentals of Wind Energy**, by NICHOLAS P. CHEREMISINOFF. Published by Ann Arbor Science Publishers Inc. and distributed by John Wiley & Sons, Baffins Lane, Chichester, West Sussex, U.K.: v + 170 pp., figs and tables, 23.5 × 16.0 × 2.0 cm, £ 6.90, 1978.

This book will satisfy the curiosity of the man-in-the-street who, being aware of the fact that oil, natural gas, and even nuclear fuels, will ultimately run out, wonders if wind energy could help in providing an answer for the future. Indeed 'Fundamentals of Wind Energy' does not address itself to the specialist: it avoids detailed technical discussions and arguments, and leaves aside complex mathematical developments such as are usually found in textbooks for advanced students and scientists. It provides a fairly comprehensive, summarized (the core of the book is only 129 pages long), and clear, overview of the potentials of wind energy utilization.

After an introductory chapter, the book starts with an interesting exposé on the historical uses of wind energy which recalls the fairly important role played by this source of energy, particularly in farmland areas, for grinding cereals, irrigating fields, sawing wood, and even for filling holding tanks at railroad water-stations for steam-operated locomotives. The decline of wind power was abrupt, the major reasons for it being the time-variability of wind, the increased production rates in agriculture which surpassed the windmills' capacity and, most important, the advent of cheap, flexible and simple-to-use electricity.

The next chapter covers modern applications of wind energy. It mainly concentrates on a limited number of direct uses of the shaft power and on its conversion into electricity. Some emphasis is logically given to utilizations in rural areas, particularly for agricultural purposes (where wind energy used to be popular). Several of these applications relate to the protection of the environment and are examined in some detail; some examples are the aeration of sewage waters and the use of the wind's energy for mixing stratified water-bodies as well as for deterring eutrophication. In spite of difficult experiences and economic failures, the large-scale generation of electricity with the help of wind-mills has also received renewed interest, particularly in view of recent progress made in electronics which would ease the synchronization of the power output that could then be fed into a conventional distribution network.

There follow three rather technical (but simple) chapters on wind machines and generators; on technical performances and design characteristics; and on wind site-selection factors. Environmental considerations are examined next—strangely enough, in the same chapter as various energy storage systems. The next briefly reviews

occupational safety problems in case of a blade failure, more or less questionable bird- and insects-kills, aesthetic concerns, noise, and interference with electromagnetic waves (such as radio and TV). There are a few more hypothetical concerns, such as hazards to aviation and navigation (in case of offshore plants) or the triggering of tornadoes, which incidentally might occur only with very large-scale facilities.

The final chapter is devoted to the future potential of wind energy – a future which seems to belong principally to large machines located onshore or offshore. Some authors have estimated that such large-scale wind generators could provide between 5 and 15% of the present electricity requirements in the United States. The book is further supplemented with a glossary of energy-related terms, a table of conversion factors which is lengthy and sometimes childish ('multiply hours by 60 to obtain minutes'), and a short list of references, before ending with an index.

Reading this interesting book, however, leaves us with an uneasy feeling: should the utilization of a renewable source of energy such as wind be visualized only with the help of large-scale and frequently complex technologies corresponding to the present way of living (and consuming) of, say, North America or Europe? Would not the priority use of wind energy be to help the more backward people of the world in their fight against famine and desertification? Indeed *Fundamentals of Wind Energy*—and this is a real lacuna in my view—provides practically no information on the numerous applications of wind energy which, thanks to simple devices that are easy to manufacture with locally available basic materials, would allow the poorest to exploit a readily available and free indigenous energy-resource.

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**Clean Air – The Continuing Challenge**, Edited by E. T. WHITE, P. HETHERINGTON & B. R. THIELE. Proceedings of the International Clean Air Conference, sponsored by The Clean Air Society of Australia and New Zealand, Brisbane, Australia, 15–19 May 1978. Ann Arbor Science Publishers Inc.: Ann Arbor, Michigan: xii + 780 pp., 24 × 16 × 4.6 cm, £ 22.70, 1978.

This thick volume contains 54 papers delivered at an International Clean Air Conference held in Brisbane, Australia, 15–19 May 1978. The papers have summaries and are grouped into 17 sections which makes the large amount of detailed information presented just about manageable. The sections cover a wide range of topics, though a large number of the papers are concerned with detailed technical aspects of pollution control. No paper has a biological title, nor is there a single reference in the index to the effects of air pollution on organisms other than Man. For this reason the volume will be of only minor interest to most biologists.

There are two contributions under the section heading 'Impact Studies', a subject which is becoming fashionable also in Britain. One presents a methodology in use in California for assessing the potential geothermal resources; here hydrogen sulphide is giving rise to concern,

owing to its noxious odour. The other suggests an improved method of assessing one parameter—atmospheric stability—that is used in mathematical models for calculating ground-level concentrations of air pollution discharged from tall stacks.

Clean air on an international scale seems too big a topic for one conference—especially when economics, legislation, and sociology, are all included. This 1.26 kg of loosely-related papers can be recommended only to the most ardent consumers of air pollution literature.

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**Nature Conservation and Agriculture: Appraisals and proposals** by the Nature Conservancy Council, Great Britain Headquarters, 19/20 Belgrave Square, London, England: 40 pp., figs & tables, 30 × 21 × 0.2 cm, paper covers [no price indicated], 1977.

This is the first of a series of appraisals by the British Nature Conservancy Council of the problems of reconciling conservation of wildlife with present-day rural industries, in this instance agriculture with a reasoned assessment of the problem. For while agriculture in Britain loses 12,000 hectares a year to development, this does not impinge to any great extent on valuable wildlife habitats. But the corresponding agricultural 'improvement' of uncropped areas often affects land that is of great importance to wildlife.

The background and the whole question of what particular effects agriculture has on wildlife are considered thoroughly and expertly, with valuable tables, figures, and photographs, to show the degree of loss of wildlife habitats, and maps to show the decline in the distribution of certain plants and one butterfly. The latter is perhaps unfortunately chosen, as its disappearance from a number of chalk grassland sites in the past two decades is directly related to the invasion by scrub and coarser grasses when grazing stops rather than to the effects of such agricultural activity as ploughing.

Having uncovered the problem and explained it, the Nature Conservancy Council considers possible solutions. The initial need is clearly seen as one for greater resources to be made available for conservation. Clearly one cannot dispute the well-argued need for a national land strategy. Likewise, the nation must surely pay farmers to conserve Sites of Special Scientific Interest, if it is held to be in the national interest that they should be actively conserved. The need for a degree of provision for advice to farmers must be conceded, though the way in which this should be made available remains indeterminate. Altogether, a series of fourteen recommendations are put forward, which must provide the necessary strategy for conservation.

It is gratifying to know that the Council has recently received a major increase in funds from the Government, since this is one of the essential items which this report highlights. Let us hope that it is an earnest of official desire to implement the rest of the proposals.

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