

Book Reviews

The Deserts: Status Reports on Research and Development

Deserts of the World. An Appraisal of Research into Their Physical and Biological Environments. WILLIAM G. MCGINNIES, BRAM J. GOLDMAN, and PATRICIA PAYLORE, Eds. University of Arizona Press, Tucson, 1969. xxviii + 788 pp., illus. \$15.

Arid Lands in Perspective. Including AAAS Papers on Water Importations into Arid Lands. WILLIAM G. MCGINNIES and BRAM J. GOLDMAN, Eds. AAAS, Washington, D.C., and University of Arizona Press, Tucson, 1969 (order from University of Arizona Press). x + 422 pp., illus. \$18.

Deserts have always attracted the interest of scientists because they offer a unique opportunity to study on a large scale and under natural conditions the influence of one dominant factor, lack of water, on landforms, soil, and plant and animal life. Today, with the dwindling resources of nature and the steeply increasing number of people needing food, the necessity of making the deserts more productive becomes more and more urgent. Since any planning of a more rational use of the deserts has to be based on scientific knowledge, the book *Deserts of the World* is most important. Its aims are to review all the pertinent information available and to evaluate it, along with the methods used to obtain the information, so as to point out gaps in our knowledge, to stress the main problems, and to suggest needed research. The book fulfills these aims admirably. Most reviews of this kind have the same fault: each author treats the field he reviews as he sees fit. The resulting lack of coordination leads on the one hand to duplication and on the other hand to the leaving out of important fields. The editors of *Deserts of the World* have avoided this basic mistake by good planning and exemplary organizing. All the chapters have the same basic structure, which makes them comparable and facilitates the finding of information.

The deserts dealt with in all chapters are: Kalahari-Namib, Sahara, Somali-Chalbi, Arabian desert, Iranian desert,

Thar, Turkestan desert, Takla-Makan, Gobi, Australian deserts, Monte-Patagonian desert, Atacama-Peruvian desert, and North American deserts. The aspects dealt with are: weather and climate, geomorphology and hydrology, surface materials, vegetation, fauna, desert coastal zones, and ground-water hydrology. It was very wise of the editors to have a special chapter on desert coastal zones, because these areas are quite different from the noncoastal parts of the deserts to which they belong and offer special advantages as far as practical land use is concerned.

Each chapter deals with the general background, state of knowledge of each desert area, and recommendation for future research. Each chapter has an annotated bibliography (86 pages in the chapter on geomorphology and hydrology!). As far as I could check some of these bibliographies, they are nearly complete and are of the greatest value for everybody who looks for information about certain deserts. This is very important in these days of the "information explosion" that makes it difficult even for the specialist to orient himself in this paper ocean of publications. I hope that the editors will continue to keep these bibliographies up to date. The bibliographies as well as the book as a whole suffer from one shortcoming: the deserts of the U.S.S.R. and China are dealt with inadequately. The reasons are obviously the obstacles to obtaining the needed information and the difficulties of translation. Some innovations of the book are most recommendable and of great practical value. The chapter on vegetation, for instance, has an annotated list of depositories (herbaria, libraries), a species summary (where found, common habitat, life and growth form, noxious qualities if any, uses, and authors), and a list of authorities for the various desert regions.

Most of the recommendations made in the various chapters are pertinent and should stimulate (so I hope!) peo-

ple to further research. I cite as an example some of the recommendations made in the chapter on geomorphology and hydrology: (i) establishment of basic data stations for gathering additional information on climate, geology, geomorphology, hydrology, and pedology (this recommendation seems to me of special importance in connection with Unesco's planned project MAB on "man and the biosphere"); (ii) the search for *quantitative* descriptive techniques for treatment of specific landforms; and (iii) development of a *quantitative* scale of rock weathering in terms of specific mineral composition and petrological structure and texture. I cite another example concerning gaps of knowledge, taken from the chapter "Surface materials": (i) there has been little progress in understanding the process of aggregation; (ii) we have little knowledge of organic matter in arid zone soils; (iii) the terms used in soil nomenclature are ambiguous (this is a horrid difficulty for specialists in other fields who are forced to deal with soils); and (iv) the cooperation between soil scientists and soil engineers is not satisfactory.

Nobody dealing with deserts, whatever his specialty, can afford not to read this book and not to have it on his bookshelf. It is an invaluable source of information which he will need continuously. I would hope that other fields of knowledge would be as fortunate as the deserts of the world in finding editors willing to take upon themselves the organizational and intellectual burden of preparing with the same strict guidelines and depth of penetration similar "appraisals."

"The desert does not yield to the timid, the vacillating, or the ignorant. . . . Affluent carelessness or biological ignorance can humble the best of intentions." These sentences by D. H. K. Lee are the leitmotiv of *Arid Lands in Perspective*, which consists of 9 papers of an informational character, 20 dealing with the practical potential of arid lands and the problems involved in their development, and two bibliographies.

The informational papers cover some aspects of arid lands which are either insufficiently known to arid-zone investigators or are usually not seen in the right perspective. The playas as possible storage areas and the importance of playa research for the history of climates (J. T. Neal), the arctic and antarctic cold deserts (R. E. Cameron) and their astonishing simi-

larity to hot deserts (in desert pavement, desert varnish, salt lakes, type of soil underlying desert pavement) are points at hand.

Two general problems of arid lands—the lack of sufficient taxonomic work and of taxonomists and the lack of field work on domestic animals in arid environments—are *inter alia* touched upon in a paper on arid lands in Australia (C. S. Christian and R. A. Perry). The same paper contains an allusion to statistical work in progress at the Commonwealth Scientific and Industrial Research Organisation which will make it possible to overcome skewness and kurtosis of rainfall distribution data in arid lands, where rain data are always few. Considering the importance of this matter, all arid-zone investigators will wait impatiently for detailed information.

There are very few cases where it was possible to follow changes of desert vegetation for more than a few years. The original territorial survey of 1858 described vegetation of certain localities in New Mexico accurately enough to permit comparison with today's condition. The single factor of grazing has changed a grassland climax (apparently steppelike in nature) on its ecological borderline into a desert climax. This is in general true for semi-arid areas but not for truly arid ones. It seems, therefore, that the generalization in another paper (R. L. Raikes) that "desert formation is the result of man's improvidence" is greatly exaggerated.

The question of climatic changes in historic times as a cause of desertification is raised in a number of papers. It seems to be generally agreed that in at least the last 5000 to 6000 years there have been no climatic changes in the areas concerned.

Since the botanists, hydrologists, and other specialists trying to develop arid lands easily forget that psychological and sociological factors are at least as important as the facts of nature, it is important that many papers stress just this point. The paper of M. K. Lee dealing with the human response to arid lands, with its pungent formulations ("Physical suitability . . . is not enough. For tasks that demand drive or perseverance the 'gleam in the eye' is still necessary"), is a good example.

The two bibliographies merit special mention, one (P. Paylore) because it is a bibliography of bibliographies and the other (A. Warren) because of its exemplary organization. Paylore's

list contains 370 well-annotated entries and is not restricted to bibliographies of arid lands *sensu stricti* but includes also bibliographies (Zikeev on dew, for example) which list only *some* titles concerning arid lands. The other bibliography is divided into three parts: on sand dunes, on sand movement by wind, and on aeolian soils. It is not simply an alphabetic list but under each heading groups papers according to time of publication (before 1920, 1920–1939, and so on).

The main problems which all schemes of arid-land development encounter are clearly and very frankly summarized in a paper by Batisse. It is especially gratifying that in addition to the technical difficulties we all know, such as waste of water exactly where it is most needed and the danger of salination, Batisse also stresses the no less important problems of a social, psychological, or political nature—for example, the tendency to prefer grandiose projects, because of their publicity value, to small, more practical but less spectacular ones; individual, uncontrolled initiative in the use of the scarce resources; and the trend to record only successful projects because of "financial, social and political implications."

Many of the other 19 papers dealing with potentials and problems of arid-land development demonstrate in specific cases how valid the statements of Batisse are and add to his list: Range development, which is much neglected and a relatively easy and cheap way to make arid lands more productive and to stop deterioration and desertification, is hampered in developing countries—which need it most—by "a jungle of administrative procedure, which is enough to defeat all but the most patient and stouthearted" (R. A. Peterson). Another obstacle is the lack of courage on the part of governments to take risks and face the always present possibility of failure. This is certainly true not only for range development and improvement. Why is it "that not all well designed dams and irrigation facilities promote economic development"? The answer is that "waterspace" (a new term meaning the unity of land, water, and social institutions) is not taken into account as water resources are developed (C. L. Smith and H. J. Padfield). Still another troubling problem is that of "communication" (W. G. McGinnies), by which in this case is meant the lack of a commonly agreed upon, unified terminology. The scien-

tific community should be able to define such terms as "arid," "semiarid," "desert," and "steppe" in such a way that they would mean the same to everybody and not different things to different people. And last but not least, a question that concerns not only arid lands, "Shall we still approach the problem of providing water with the philosophy that water is a free good which should be supplied to all who ask for it in the quantity they request without question or reservation?" (C. C. Warnick).

Most of the papers deal partly or wholly with the developmental potentialities of arid lands. Desert sea coasts are discussed as recreational areas, centers of mining and sea industries (P. Meigs), and centers of "controlled environment communities" (C. N. Hodges). I would like to add that "sea industries" should include controlled ocean farming of fish and of oysters, the latter both for consumption and for pearl growing, for which certain desert sea coasts are ideally suitable. It seems that the "controlled environment communities" combining desalination of sea water, production of electricity, and food production in closed artificial ecosystems with controlled environmental conditions and recycling of water, nutrients, and carbon dioxide are a most promising proposition, which can be improved upon, simplified, and adapted to many different conditions.

The 12 papers from the AAAS symposium on the importation of water into arid lands are most instructive for positive as well as negative reasons. They deal mainly with the grandiose schemes to transfer water from distant sources into the arid North American Southwest and northern Mexico. The most ambitious project ever is NAWAPA (the North American Water and Power Alliance), involving 33 U.S. states, Canada, and Mexico. Are these schemes feasible, and if so under what conditions? What are the safeguards? Are there alternatives?

The difficulties involved in these schemes are enormous and have to be clearly recognized if they are to be carried out successfully. There is first of all the price tag: The NAWAPA project, for example, is estimated to cost about \$100 billion. Are such sums available? The question is most appropriate, since, in the opinion of one author (C. W. Howe), the direct user will be able to pay only part of the expenses.

Most authors point out rightly that

such schemes need large-scale planning. But will the planners be able to take into account all the consequences and foresee the far-reaching ecological and social changes involved? G. W. Thomas and T. W. Box state that "we cannot point to a single example of good advance planning involving the entire scientific community." Furthermore, large-scale transfer of water may in time cause a profound change in the soil-water relationship, resulting in a considerable increase of water salinity at the terminus of the line. The existing Colorado River scheme is cited as an example.

Some papers (S. Resnick's especially) deal with such alternatives to large-scale water transfer as desalination of sea water, water harvesting, a dual or possibly even triple supply system ("water hierarchy," D. A. Okun), reuse of waste water, and increasing irrigation efficiency. There are more alternatives than those mentioned. Much wasting of water could be avoided (Israel is a good example) by installing new types of faucets, by educating people to be water-conscious, and by irrigating at night and not at noon of a burning hot day, for example. But in contrast to the gigantic water-transfer schemes which entice most people so much because they seem to be *the* magic solution of all water problems, these alternatives—though in my opinion most effective—are unspectacular and need the "courage of the small deed," and that is not very popular. Two possibilities need special comment. The conventional treatment of waste water for reuse as drinking water is inadequate because water so treated may and often does contain dangerous viruses (D. A. Okun); more research is needed to solve that problem. Increasing the efficiency of irrigation and water use is in my opinion one of the most urgent needs. This could save considerable amounts of water. For instance, in Israel at least 30 percent of irrigation water is wasted. To use on Texas ranges 200,000 kilograms of water for the production of 1 kilogram of beef (G. W. Thomas and T. W. Box) seems also to be an avoidable waste.

Taken as a whole, *Arid Lands in Perspective* is, like *Deserts of the World*, indispensable for everybody who has to deal with arid lands and their development. One feels that most of the authors have lived the problems they deal with and do not talk merely ex cathedra. Their judgment is sound

and based on vast knowledge of the areas concerned. I hope that the editors will continue to publish similar volumes—as they promise to do—of an equally high standard. There is very little to criticize. The paper on quantitative analysis of desert topography is possibly out of place in such a volume since it is too specialized. The paper on the new system of soil classification contains either too little or too much because it throws a whole new nomenclature of orders, suborders, and great groups (Vertisols, Alfisols, Ustults, Ustorthents, and the like) at the reader without giving sufficient explanation for most of us who are still thinking in the old terms of soil classification. It would also be most advisable in a scientific book to use the decimal system and to do away with miles, yards, inches, acre feet, and Fahrenheit.

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Deciding about Water

Strategies of American Water Management. GILBERT F. WHITE. University of Michigan Press, Ann Arbor, 1969. xvi + 160 pp., illus. \$5.95.

"The theme of this volume," Gilbert White says in his preface, "is that by examining how people make their choices in managing water from place to place and time to time we can deepen our understanding of the process of water management, and thereby aid in finding more suitable ends and means of manipulating the natural water system."

The model of decision making that he offers is new. It is not that of engineering-economics relative to the optimization of the use of resources, or of political science examining the political processes of decision, or of sociology studying "community organization and process relating to the formation and support of agencies making decisions about water management." Instead, social institutions are taken to be the instruments of water resource management. They are seen as affecting the freedom and incentives of their managers and also as affecting managerial perception with respect to (i) range of choice, (ii) water resources, (iii) technology, (iv) economic efficiency, and (v) spatial linkages (such as ecological effects). All five factors are seen as

"being profoundly influenced by the culture of the area and as manipulated by the organization and character of social guides."

Within this framework White identifies and assesses six strategies of water resource management: (i) single-purpose construction by private managers, as in farm water supply; (ii) single-purpose public construction by public managers, as in navigation; (iii) multiple-purpose construction by public managers; (iv) single-purpose action by public agencies using multiple means, as in flood loss reduction; (v) single-purpose action using multiple means where research is included as a conscious management tool, as in weather modification; and (vi) merging of multiple purposes and multiple means, greatly enlarging the span of possible actions.

Who makes what choices? What is their effect upon the public welfare? What is their effect upon the natural environment? These questions are asked of each of the six strategies. Fully adequate answers are not presented. The inadequacy is partly due, as the author notes, to the imperfection of economic and ecological analytical methods for determining effects. It is also due, he notes, to the fact that few attempts have been made to apply the available methods to the appraisal of completed works, so that he is forced to be "largely speculative" and to draw from "scraps of evidence." Nevertheless, his comprehensive examination (which he presented originally as the William W. Cook Lectures on American Institutions at the University of Michigan) provides us with a very valuable book.

Few others, if any, are so well equipped as Gilbert White to undertake this appraisal. A geographer, he has served since the 1930's on national planning and advisory boards and committees and has been closely enough associated with water and related land resource matters to know what has been going on, yet in a position to maintain perspective and to avoid commitments to particular programs. Drawing upon knowledge derived from these official involvements, as well as his wide-ranging intellectual inquiries as professor of geography at the University of Chicago, White discusses many specific matters of significance thoughtfully, sensitively, and with historical insight. Some readers will be disappointed that he avoids conventional judgments, pro or con, with respect to, say, Western irrigation and navigation developments. Others will agree that