Book Reviews

Getting Down to Cases

Congress and the Environment. RICHARD A. COOLEY and GEOFFREY WANDESFORDE-SMITH, Eds. University of Washington Press, Seattle, 1970. xx + 284 pp., illus. $8.95.

The bulk of this book is a series of case histories of congressional action on various environmental and conservation issues and proposals, ranging from the preservation of the Indiana dunes to international control of the ocean floor to control of junked automobiles. The papers grew out of a seminar on environmental policy at the University of Washington, and most of them were prepared as assignments by graduate students in geography. There is little depth in most of them, the presentations being of the superficial kind that can be gleaned from printed congressional hearings or debate; little use has been made of background information that might have been made available by congressmen, committee staffs, or conservation lobbyists. But the collection of studies is nevertheless valuable, for environmental issues are very inadequately reported elsewhere, even in the great national newspapers like the New York *Times* and the Washington *Post*, to say nothing of the papers that do not attempt to cover Congress fully.

The book raises many questions about Congress's handling of environmental issues but offers few answers. There is considerable rhetoric, typified by the comment on the jacket that "the specific question here is whether or not the American political system—and particularly Congress—can cope with the economic, esthetic, and moral problems raised by the steady deterioration of the human environment." The question is a good one, but it is obscured by an editorial tendency to make judgments on the basis of a self-determined morality. (For instance, one of the editors has to admit to embarrassment over Senator Henry Jackson's being "right" on many conservation issues while being "wrong" on many defense issues.) The editors raise their questions as if they were the first to discover defects in the organization and operation of the Congress, and they offer few practical solutions for improving its procedures. Obviously a reorganization of the committees dealing with environmental problems would be beneficial, but the very diversity of the subjects dealt with in this book indicates how wide is the conception of environmental issues and how difficult, therefore, the problem of coordinating their consideration in Congress or the executive departments. What could be left out of the environmental tent? An immediate point in illustrating the problem might be the supersonic transport plane. Most environmentalists with the degree of commitment shown in this book would regard the SST as an environmental issue, but the majority of the Congress and possibly the general public would probably take another view.

In downgrading the capacity of the Congress to act, the editors overlook the fact that much of the current awareness of environmental problems has been developed by leaders using convenient congressional pulpits to dramatize the issues. They also overlook the fact that the long tradition of establishing conservation issues in moral terms, going back to the controversies of the Theodore Roosevelt era, gives the environmentalists a national base from which to operate that is often lost to their opponents. The capacity to develop national public attention to an issue, backed by aggressive, intelligent lobbying, can shape congressional attitudes better adapted to environmental needs. The congressional system needs much improvement, but the environment is going to be a continuing loser if the most dedicated environmentalists spin their wheels fulminating against the system, when there are specific issues and attitudes that can be made to yield to a better-informed public opinion. Attempting to make a moral issue of every question will have no more success than it had during the Roosevelt-Pinchot era, when it was succeeded within a few years by a complacency that accepted Teapot Dome.

The drawback of assuming an omnipotence about environmental issues is illustrated in the way this book skirts around the conflicts between recreationists and preservationists. The conflicts between these two major elements of the environmentalist movement are going to be sharply escalated during the remainder of this century, as a population increasing in both size and affluence comes to grips with the problem of how to achieve enough open space so that people can utilize it instead of merely watching environmental programs on television.

As discouraging as the Congress can be about many vital issues, a better response can be achieved if there is really an aroused and better informed public opinion.

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Into the Ecology Breach

An Introduction to Mathematical Ecology. E. C. PIELOU. Wiley-Interscience, New York, 1969. x + 294 pp., illus. $14.95.

Ecologists at the present time appear to be divided into two groups. On the one hand there are those who believe that ecological phenomena can be abstracted and modeled in such a way that mathematics can be brought to bear in their analysis. "Mathematics" here is taken to include numerical analysis through electronic computation. On the other hand, there are those who believe that the complexity of the phenomena is so great that no mathematical model can be successful and those who ignore all biological research which contains any mathematics. As a result of this polarization the latter group has ceased to be able to evaluate the relevance or importance of the work of the former. With this valuable and timely book, Pielou has attempted to provide a basis for the resumption of communication between the two groups. It is probably the first text on mathematical ecology directed to the biologist with minimal mathematical background who wishes to learn what model analysis can

accomplish and what some of the open problems are.

The book is conveniently divided into four quite self-contained parts in such a way that it is not necessary to proceed in the order they are presented in. However, most readers will prefer to attempt part 1, on population dynamics, first, since this is one of the oldest and best-known parts of the subject. Although it is brief, the treatment given should provide the conceptual base for the understanding of much of the recent literature centered around the competition equations.

Parts 2 and 3 are devoted to the spatial patterns in one- and multi-species populations respectively, subjects to which Pielou herself has made significant contributions. Both discrete and continuous populations are treated, and the consequences of various sampling procedures, such as quadrat sampling and distance sampling, are investigated. In all cases assumptions are clearly stated and the limitations of the resulting formulas adequately explained.

Whereas parts 2 and 3 seem to focus on plant ecology, the final part of the book is of wider interest. It contains a good discussion of the mathematics behind species-abundance relations, currently one of the hottest topics in statistical ecology.

One of the characteristics of some recent work in mathematical ecology has been its lack of rigor. Precision has often been sacrificed for generality and realism. The danger in this procedure, of course, is that the conclusions of the subsequent "analysis," which are often qualitative conclusions, are then suspect. With this book, Pielou has attempted, on the whole successfully, to introduce the student to the more rigorous approach.

At times there are anomalies in the degree of sophistication expected of the reader. For example, in the chapter "Patterns resulting from diffusion" the author includes the passage to the Fokker Planck equation from the random walk. But she has chosen to omit the simple and elegant probability-generating function approach to the birth and death processes of chapter 1 in favor of a more messy induction approach. Again, in chapter 5 when the competition equations are dealt with the local stability criterion for ordinary differential equations should have been invoked so that the reader could easily move to more general cases.

A major criticism of the book as a text is that, with few exceptions, the relevant biological situations and data pertaining to the various models are omitted. One may therefore predict that the reader, if a biologist, will find his interest flagging as he proceeds through the calculations without seeing how they tie in with observation. On the other hand, sufficient references are given so that the enthusiastic and diligent reader can correct this deficiency for himself.

Pielou has been successful in conveying to the reader the rationale behind the various statistical definitions and in showing where they are and are not satisfactory. Areas where further research is needed are discussed, and often the direction this research might most fruitfully take is outlined. Mathematical ecology has become a fashionable discipline. This volume should enable graduate students and researchers in ecology to evaluate the work in an area which to some has seemed mysterious and which others have taken on faith.

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Archeology in Eastern Africa

Kalambo Falls Prehistoric Site. Vol. 1, The Geology, Palaeoecology and Detailed Stratigraphy of the Excavations. J. D. CLARK. With contributions by G. H. Cole, E. G. Haldemann, M. R. Kleindienst, and E. M. van Zinderen Bakker. Cambridge University Press, New York, 1969. xvi + 256 pp., illus., + maps and plates. $14.50.

J. Desmond Clark tells us that Kalambo Falls is one of the most interesting sites he has examined. The importance of this "unforgettable" site is evident when one turns to any discussion of African prehistory. The book is an example of an interdisciplinary study in prehistory, an environmental and ecological study, a specialty in which Clark is justly recognized as a leader. The present volume is the backdrop to two forthcoming volumes which will give the archeology and the general significance of this site in African prehistory.

The particularly interesting feature of the site, and the one for which it is most famous, is its well-preserved wood. This wood, dated to a remarkably early age, was painstakingly extracted by means of the simplest kinds of tools, namely hands, water, and fine hair brushes. The wood was found in place with the actual living floors and the archeological remains. To my knowledge, such an occurrence had not been observed before this in Africa, and has been found only very rarely in Europe. This unique preservation is due in the main to the peculiarly favorable conditions of the water-saturated soil. These same conditions unfortunately destroyed all but the most recent bone remains.

The prehistoric cultures represented cut across the known chronology of this part of eastern Africa. We have first, at the top, the Iron Age, followed by the Microlithic, then the Magosian, the Lupemban, followed by the Sangoan, and, at the bottom, the Acheulian. At the base of the Lupemban is a questionable culture horizon which is called "(?) Lupemban." Actually, the very lowest of the remains of the occupations were not reached, because the deposits are below river level, beyond the reach of the excavators at present. By means of several large concrete casings joined together, the excavators were, however, able to probe down into the deposits of the Acheulian age to about 9 feet below the water level.

We have been well prepared for the appearance of this book from the first discovery of the site by Clark in 1953 and his ensuing reports. This book settles some old questions, but raises some new ones in turn. One of the old questions was why this site, occupied from the early Stone Ages, over 60,000 years ago, to the Iron Ages, was selected by its occupants. Eduard G. Haldemann, one of the two field geologists involved in the work, appears to have the answers. The solution is based upon the topography and other local special features of the river and of the site. Judging by the present environment, there is no clear reason why this particular locale would be chosen in preference to other spots on the now sluggish Kalambo River. Haldemann suggests that it must have been a convenient place to cross the river. This makes good sense. It could have been a "staging" area for a crossing, or a point at which people waited for the best time to cross. Haldemann also advances another consideration, of broader significance. The Kalambo River would have become a very important source of fresh water during the times when the level of Lake Tanganyika (at present situated about 3 miles from the falls) was lowered, as it is believed to have been, and the lake water became more saline because of the drier climate. The Kalambo