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BOOK REVIEWS

Sociobiology: The New Synthesis. By Edward O. Wilson. The Belknap Press of Harvard University Press, Cambridge, Mass., 1975, ix + 697 pp., tables, diagrams, illustrations, glossary, bibliography, $20.00 (cloth).

Edward O. Wilson's monumental volume is a most ambitious effort. It opens with a promise to explain philosophy and philosophers, ethics and aesthetics. What we end up with is a world reduced to genes. Segments of the academic world, as well as the public, have registered some shock, even outrage, at the implications of this reductionism. Others have praised the book's comprehensive scope and the apparent utility of its simplifications. Can human ecologists learn something useful from a synthesis of modern population biology and ethology? If there is substantial merit to this new paradigm, it will certainly encourage a fundamental rethinking of the behavioral sciences.

The target of inquiry is the full range of society, from sponges to humans. Society is seen as the product of cooperation beyond that required for sexual reproduction, and is based on some measure of compromise or self-sacrifice (altruism) on the part of individual organisms interacting with others of their species. The very existence of cooperative, self-sacrificing behavior can be considered paradoxical, given the fundamental assumptions of Darwinian evolution which lie at the base of all biological explanation. Biological traits, whether morphological, biochemical, or behavioral, evolve or persist as a result of natural selection. Each organism competes with other species members to transmit its own genes. Those traits which enable the organism to take a greater share of the limited resources on which it depends will be represented in greater proportions of the population during succeeding generations. How, then, could there be natural selection for cooperation and self-sacrifice? Altruistic behavioral traits would be rapidly selected *out* of a population, unless they somehow contributed to the potential of altruistic organisms to transmit their own genetic material. This is the fundamental problem of sociobiology: How do cooperation and self-sacrifice contribute to the fitness of organisms? What are the genetic consequences of social behavior?

Society itself is reduced to potentially measurable attributes which can theoretically be associated with specific selective pressures. These qualities, useful for cross-species comparison, include group sizes, demographic distributions, cohesiveness, amount and pattern of connectedness, permeability, compartmentalization, differentiation of roles, integration of behavior, information flow, and fraction of time devoted to social behavior. The relative expression of each measure of sociality in a society is simply the net outcome of the various behaviors of its individual members; the whole is *not* greater than the sum of its parts.

Much of Wilson's book is devoted to an examination of behavior patterns which evolve in social contexts and which are explicable in terms of natural selection. These include regulation of group size, socialization, communication (in three chapters), aggression, spacing (including territoriality), dominance, roles and castes, sex and childrearing, and interspecific social behavior. Each pattern of behavior is treated as a mechanism which enables organisms to cope with specific problems in the environment. The discussion is encyclopedic in nature. Castes in ants are described together with role differentiation among hyenas. The analysis is largely ahistorical and relies on establishing functional analogues among diverse societies. These chapters are valuable as a comprehensive summary of what is known about social life among species other than humans. Wilson's juxtaposition of different theoretical interpretations of particular social behaviors provides a stimulating opportunity for review and evaluations. His own judgments and insights are offered throughout. Some are tentative, others rather dictatorial, most controversial.

Twelve chapters on social "mechanisms" are sandwiched between an introductory review of the principles of population biology and sociobiology and a synopsis and interpretation of social life among a wide range of different animal species. Given the enormous scope of subjects and disciplines covered, we feel obliged to confine our remarks to those topics which pertain to anthropology and human ecology.

Wilson assumes that a limited number of forces have shaped social evolution. He lists a series of "prime movers" that singly, or in conjuction, select for characteristics of sociality. These include (1) defense against predators and increased competitive ability, (2) increased feeding efficiency, (3) penetration of new adaptive zones, (4) increased reproductive efficiency, (5) improved population stability, and (6) modification of the environment. A striking facet of the presentation is its focus on defense and competition. This reflects an emphasis on predator-prey models in sociobiology and perhaps also in population biology. The concepts of competition and defense (warfare) have also received frequent and sometimes controversial emphasis in anthropological literature on social evolution. The focus on intergroup competition and defense, like the emphasis given to individual competition,

underlies much of the moral or ethical content of the debate on the nature of human evolution. The author suggests, by implication, that our moral concern with "rightness" of individualism, selfishness, and competitiveness is itself a product of evolutionary forces, a device to induce cooperation in the face of countervailing pressures to do otherwise. It is in this sense that philosophy and philosophers are explicable in terms of natural selection.

Wilson's contention that the simple elegance of Darwinian models can no longer be ignored by social scientists is an important contribution. He provides a clear discussion of the group selection debate, explicitly siding with the critics and giving very convincing reasons for his choice. For most, if not all, cases in which group selection is thought to provide the evolutionary mechanism, he suggests that *kin* selection is a better explanation. Central to this argument is the concept of inclusive fitness. If organisms are simply conveyances for genetic material, then their behavior must be evaluated in terms of its contribution to the transmission of genes possessed by themselves and their kin. To the degree that an organism shares genes with another organism, its altruistic behavior toward that organism will be promoted by natural selection if their joint behaviors result in greater transmission of their shared genetic material.

Wilson discusses case after case showing that individual social behavior is directed mainly toward promoting the reproductive potential of the altruist's kin, whether among ants, birds, or humans. The concepts of inclusive fitness and kin selection must be especially appealing for anthropologists, whose concern with kinship as a primary factor in human social life lies at the very roots of their discipline. However, the acceptance of a Darwinian evolutionary model means acceptance of the individual, not the group, as the relevant unit of selection. This idea may seem less palatable to those favoring a holistic perspective.

For a behavior pattern to have an effect on gene frequencies in a population, it must have some genetic component. But the indeterminacy of genetic codes affecting social behavior, especially *learned* behavior, severely limits the utility of the natural selection model for explaining many specific traits. Wilson's way of dealing with this problem is to point out that the *capacity* to learn in general, and the capacity to learn certain things in particular, is genetically acquired. Few anthropologists would argue that human superiority over other primates in the learning of language is not genetically based. Many would even argue that particular aspects of human language are genetically shaped. But when we address ourselves to problems of social variation among humans, we are led to question the immediate utility of sociobiology. For example, some human societies allow or prefer polygamy, others prohibit it. Some allocate certain tasks to males, others do not. Where one pattern is predominant, it can be agrued that there is a genetically determined propensity for that pattern. Yet in the absence of specific

quantitative data it is a mistake to *assume* a significant genetic component or consequence to most cross-culturally variable patterns of human behavior.

Social behaviors which vary *within* a society raise even greater problems. Wilson assumes that there are genetic components to homosexuality, subservience, creativity, and other complex behavior patterns. Behaviors associated with these labels appear in other animals, and are sometimes thought to be genetically programmed. This is difficult to prove. If human individuals of different social classes or castes systematically reproduce at different rates, perhaps they enjoy different fitness? Yet for most human populations internal social variability is not constant through time. Within two or three generations the genetic offspring of one class or caste are likely to be scattered among all the classes or castes. The risk lies in assuming inclusive fitness from *indirect* measures such as fecundity.

It seems to us that the simplification introduced by Wilson and his colleagues may be beneficial when it leads us to investigate the possible genetic consequences of social acts. It is misleading when it results in obscuring the complexities of their nature and causes. The simplification becomes all the more problematic in the context of what Wilson calls the "multiplier effect." In a deceptively brief section of an early chapter he introduces this concept, which later provides the basis for much of the rest of his interpretations. He claims that relatively small behavior patterns with a genetic component become magnified by unspecified means to structure a large part of all social relations within the group. Lack of specificity here underlines the immaturity of the study of social behavior.

We have already discussed some of the implications of sociobiology for anthropologists. What is its utility for ecologists? One major contribution relates to the importance of considering intraspecific behavior (social behavior) as an important element in interspecific relationships (ecological relationships). In his studies of the ecological contexts of the evolution of particular social systems, Wilson has drawn our attention to the ways in which social interaction actually contributes to the shaping of ecosystems. The "carrying capacity" of an ecosystem for a particular species can be increased or decreased by changes in the exchange relationships between individual organisms of that species. Wilson has also pointed to the fact that social behaviors contribute in significant ways to environmental modification by species other than humans. All organisms help to shape their environments, but, through cooperation, social animals can significantly alter both their environments and themselves.

Wilson's framework is not powerful enough to comprehend the details and content of all social behaviors, particularly those which are complex and largely learned. However, by focusing attention on individual organisms making compromises to pass on genetic material, it does provide a useful way of looking at the emergence and persistence of many behavioral pat-

terns of interest to ecologists. Perhaps, at present, sociobiology is a more useful complement to ecology than to human sociology, psychology, or anthropology. Likewise, ecological perspectives appear to have added more to sociobiology than have the social sciences. Sociobiology's potential contribution to sociology and anthropology is, nonetheless, considerable. It raises and attempts to answer rarely confronted questions: Why sociality? How do forms of behavior originate? How are they maintained? Wilson's discussion of sociality and social mechanisms is in itself a refreshing alternative to the sterile typologizing of much social science.

This volume follows in the wake of a number of ethologically based popular books which purport to explain the evolutionary foundations of human behavior. It has received enormous publicity in the popular press as well as the scientific establishment. Some reviewers have praised its broad coverage and attractive presentation. Others have criticized its implied "social Darwinism," sexism, racism, and other popularly condemned views. We suggest that sociobiology is still too immature a scientific endeavor to be presented to public scrutiny as a *fait accompli.* For his boldness, perhaps arrogance, Wilson deserves some of the denunciations he has received. He does occasionally lapse into the advocacy approach which he rightly criticizes in his predecessors. Yet advocacy of natural selection explanations for social traits is not employed to justify any aspect of social life. *Sociobiology,* like most evolutionary paradigms, is a retrospective statement: It explains the past, but contributes little to the solution of contemporary problems. Wilson's work cannot be dismissed for its obvious shortcomings in the analysis of human behavior. He has brought us up to date on what is known about social behavior among most social animals. Moreover, his efforts mark an important step in the comparative study of humans.

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Fragile Structures: A Story of Oil Refineries, National Security and the Coast of Maine. By Peter Amory Bradford. Harpers Magazine Press, New York, 1975, xiii + 392 pp., notes, index, $12.95 (cloth).

Fragile Structures is the story of the political maneuvering behind the attempts — so far unsuccessful — to establish oil refineries at various points along the Maine coast. It is a story of corporate intrigue and competition for a prize

worth a fortune — the first oil refinery in New England. While Bradford covers all of the important events and decisions pertaining to oil refineries in Maine between 1961 and 1974, his book concentrates on the period between 1968 and 1971. During this time, oil companies attempted to build a refinery at Machiasport in depressed Washington County, and another in the Portland area far to the west. Subsequent efforts to establish refineries at Sear's Island and Eastport receive more cursory coverage.

Fragile Structures chronicles events in Maine, but its lasting contribution may be the fact that it gives us a first-hand look at the interplay of powerful corporate, congressional, bureaucratic, and international forces shaping U.S. oil policy in the era immediately before the current energy crisis. Bradford's account also conflicts with the prevailing view of oil politics which is held by Maine residents. The public and the newspapers believe that critical decisions concerning oil refineries were made within Maine or by men closely connected with the state. Bradford makes it clear that the power to make decisions concerning energy is concentrated in the hands of the federal government, and that many of the critical decisions concerning Maine refineries were made on the federal level, largely in response to pressures originating outside the state of Maine. The author spends little time reporting on Maine and Maine politics *per se,* but rather focuses attention on Congressman Hale Boggs' attempts to establish a free trade zone in Maine; the maneuvering by various oil company executives to obtain an import quota from the Department of the Interior; and the report of the President's Cabinet Task Force on Oil Imports. After reading the book, one cannot doubt that these national events were the critical elements in the decision. Despite secondary involvement by such groups as the Maine Environmental Improvement Commission, the governor's office, and the Maine congressional delegation, the people of Maine and their government were largely pawns. Unfortunately, Bradford is unable to give us much of a picture of what did happen at the national level. If the book does nothing else, it underlines the fact that the formulation of national energy policy is a mysterious process concerning which the U.S. public has little understanding and perhaps less input.

Bradford's framework is that of the historian or investigative journalist. He is not writing social science. He makes no attempt to abstract general principles, but rather contents himself with describing the interplay of personalities, the quirks and decisions of the leading corporate and government officials, and the unique events. He makes no serious attempt to get at the legal or institutional parameters within which such leaders work. The reader, for example, gets no picture of the internal workings of the oil companies or the pressures on officials of the Department of the Interior.

Bradford's treatment of events is chronological rather than topical. In the first chapter this makes for difficult reading. However, after the cast of characters is established, the reader becomes accustomed to the style, and the story flows along more easily. It is made all the more interesting by the author's dry

wit, his vignettes about important personalities, and his eye for the ludicrous aspects of mass media politics. The success of the book is due in no small part to the fact that it was written from the unique vantage point of an aide to Governor Kenneth Curtis of Maine. As such, Bradford was intimately involved in many of the decisions he is reporting, and was in an advantageous position to gather information on events occurring at the national level.

Fragile Structures has some problems. Bradford tends to assume that the reader has a detailed knowledge of the subject, and a familiarity with Maine and its politics. He often focuses on the interplay of personalities at public hearings, and underplays information on what the hearings were really about or what was at stake. He has a tendency to drop names which conjure up varied images to those familiar with Maine politics, but which will certainly mean very little to a national audience. Most important, Bradford alludes to a great variety of ecological problems, but does not analyze any of them. Those seriously interested in ecology will be disappointed, for example, with the lack of technical details on supertankers, the biological effects of oil spills, and the economics of oil production. Bradford doesn't even explain the reasons for his own position. We know, for example, that he is opposed to the quota system or "drain America first" policy, but nowhere in the book does he explain the reasons for his stand. In places the book is verbose, and is laced with run-on sentences. Even worse, Bradford's penchant for details, combined with his inability to resist adding a clever comment, often leaves the reader flipping pages in search of the main point.

Fragile Structures was written at a critical juncture in U.S. energy policy. Before 1972, oil was in oversupply relative to world demand. The problem for the oil companies was to maintain an "adequate price" for their product. One of the means used was to push the federal government into establishing a quota system strictly limiting the amount of oil that could be imported from foreign fields. Much of the book is concerned with the maneuvering by representatives of minor oil companies to secure a quota. They failed. Bradford makes it very clear that attempts to establish refineries in Maine were killed by the major oil companies, if not directly, at least through the workings of the quota system they had worked so hard to establish and protect.

In the few short years since Bradford began writing his book, the entire situation has changed. Prices for oil have increased markedly, domestic supplies have decreased, the muscle of the OPEC cartel has been amply demonstrated, and the United States has suffered a serious recession. Perhaps most important, Bradford tells us that the quota system has at last been replaced. In short, many of the factors which worked to defeat oil refineries on the Maine coast even a few years ago are no longer present. At present, the Pittston Company is making a serious bid to establish a refinery in Eastport – the most depressed community in the state. Whether it succeeds is beside the point. The fundamental question is national in scope: How is U.S. energy policy shaped? Do the people of the

United States have any more understanding and input into today's energy policy than the people of Maine had in the events described by Bradford?

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Photosynthesis and Productivity in Different Environments. By J. P. Cooper. Cambridge University Press, New York, 1975, xxiv + 715 pp., illustrations, bibliographies, index, $65.00 (cloth).

This book is the third in a series that discusses the results of International Biological Programme activities initiated in 1964. It reprints parts of the reports presented at the IBP Synthesis Meeting on the Functioning of Photosynthetic Systems in Different Environments held during April 1973 in Aberystwyth, Wales. Thirty-two papers are authored by 49 contributors from 16 countries and a multitude of disciplines.

Papers are grouped under seven major headings. Parts One and Two focus on primary production in terrestrial and aquatic ecosystems and include many of the data obtained from various IBP projects throughout the world. The next four parts discuss basic processes of photosynthesis; the distribution of carbon dioxide and radiation in plant communities; the effect of water, temperature, and other environmental stresses on photosynthesis; and the use of assimilation and growth through the processes of respiration and translocation. Most of these are substantive and authoritative survey papers, but they make very little use of IBP data. Part Seven assesses actual and potential production in photosynthetic systems primarily from the standpoint of solar energy conversion efficiency.

Symposium proceedings usually suffer from unevenness in quality and depth of analysis as well as gaps in the subject matter. Here these defects are minimized. The book gives an excellent account of present research frontiers and future needs.

Data for primary production provide new insight into variations in different environments and improve global estimates presented in the September 1973 issue of *Human Ecology*. Kira has found that the effect of the long growing season in the tropics is more apparent on gross production than on net production and that the net productivity rates of many temperate evergreen forests are comparable to those of tropical forests. In a Japanese oak forest, summer canopy respiration was increased by high temperatures to such a degree that net productivity was depressed to a level below the winter value. For U.S. grasslands both the total biomass production and the efficiency of solar radiation utilization were lower in the southern than in the northern states.

Loomis and Gerakis conclude that C_4 species of agricultural crops excel at low latitudes and are inferior to C_3 species at high latitudes. Careful examination of the data indicates that only perennial indeterminate C_4 species such as Napier grass and sugarcane have high productivity. According to field and experiment data, annual determinate C_4 species such as maize actually have lower yields in the tropics than in the temperate zone. Since the ratio of economic yield to total biomass varies widely for different crops and environments, it is doubtful that primary production alone is a useful guide for planning land use. However, the discussion of physiological and structural differences between trees and annual herbaceous crops should serve to dispel common misconceptions that the high productivity of some young trees in the tropics is indicative of high yield potential for annual crops.

Several investigators have used conversion of photosynthetically active radiation into biomass as an index of production efficiency in different ecosystems. Such a measure is at best crude and may be misleading because the maximum efficiency varies widely in different climates. Ultimately this simple measure of energy conversion should be replaced by sophisticated models of potential photosynthesis, which take into consideration all the important physical and physiological processes. The symposium clearly indicates that major gaps now lie on the physiological side. Our knowledge of both basal and synthesis respiration and the source and sink relationship is particularly weak.

Information provided by the IBP has not offered much hope for a rapid increase of productivity in the foreseeable future. In some ecosystems we are approaching the limits set by incoming radiation. One possible way to enhance the carrying capacity of the earth is to increase the proportion of the more useful biotic yields through rearrangement of ecosystems on a global scale. This is indeed a noble goal for human ecologists. The present volume may well offer some guides for designing intelligent strategies.

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The Alaska Pipeline: The Politics of Oil and Native Land Claims. By Mary Clay Berry. Indiana University Press, Bloomington, 1975, 302 pp., photographs, notes, bibliography, index, $10.95 (cloth).

Alaska — the very name tingles the spine like an Arctic wind, evoking images of rugged frontiersmen, hearty Eskimos, and exotic Indians. The forty-ninth state was once Seward's Folly, then a gold rush magnet, later a military outpost

against Japanese imperialism and Soviet communism, and now the petroleum hope of an oil-starved nation. To Mary Clay Berry, Alaska of the past decade was the arena in which two political issues emerged and converged. These two issues were the pipeline from the North Slope oil fields to the ice-free port of Valdez and the native land claims. Both transcended the state's boundaries — the pipeline because of heavy consumer demand from the "Lower 48," and the native land claims because a paternalistic Washington had evaded the problem in the 1958 Statehood Act.

While the two issues were conceptually distinct, events of the late 1960s and early 1970s drove the two together. The Alaska Pipeline Co. needed land rights to begin construction, but who owned the land? Indeed, who owned the oil fields themselves? Noting the success of the civil rights movement and Indian militancy, the state's Eskimos and Indians organized the Alaska Federation of Natives (in 1966) to seek political and economic power. Their efforts cluminated in the Alaska Native Land Claims Act of 1971. Pipeline legislation took 2 years longer. In December 1973 President Nixon signed the Federal Lands Rights-of-Way Act which expedited the pipeline, in part by evading environmental standards.

The Alaskan case brings to the fore a number of basic issues: economic development vs. land preservation, modern vs. traditional life styles, states rights vs. Washington. Berry sets forth a detailed chronology of the interwoven story of the pipeline and the land settlement. She stresses the complexity and the crosscurrents — native against white, native against native. She follows the specific legislative steps one by one — who lobbied whom, who voted for which amendment. She names names — dozens of them, ranging from a judge who issued an injunction, to an Interior Department bureaucrat, to a writer of a letter to the editor of an Eskimo newspaper. The book offers a wealth of facts.

This wealth of facts is as much a weakness as a strength, for the book lacks a theoretical framework on which to nail these countless hard facts. The author overpowers the reader with detailed information beyond his capacity to absorb. Accounts of intricate behind-the-scenes political maneuvering exhaust without enlightening. The book needs strategic simplifications of the specifics in order that the whole may be understood. In small doses the narrative engrosses; but, in sum, it numbs.

The generally weak theoretical structure of the book lessens the impact of what analysis there is. Perceptive insights appear unexpectedly throughout the study without adequate buildup or follow-up. For example, after showing how the Environmental Impact Statement delayed the pipeline and forced direct congressional action, Berry argues (p. 277) that the Environmental Impact Statement was merely a "procedural minuet." While this conclusion may be valid, it does not derive from the logic of her argument.

A less serious failing is the avoidance of an economic dimension. The essence of the subject is economic: who shall own and profit from the land? Yet

the book never asks the value of this land. The author discusses the politics of alternative economic arrangements (such as regional native corporations and a single statewide corporation), but fails to inquire into the economic consequences of these alternatives. Would there be economics of scale, problems of management, or differing strategies of development? Did it really make any difference what economic structure resulted? If it did not, why study the issue?

In balance, *The Alaska Pipeline* is strong on facts and weak on analysis. This is first, foremost, and entirely a book about the unique politics of the forty-ninth state.

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The Design of Rural Development: Lessons From Africa. By Uma Lele. The Johns Hopkins University Press, Baltimore, 1975, xiii + 246 pp., maps, diagrams, tables, appendix, bibliography, $12.00 cloth, $3.95 paper.

As Robert McMamara acknowledges in the foreword of this book, raising productivity among the rural poor of the Third World is an immense problem. Uma Lele's ambitious attempt to confront this problem achieves only mixed success. Her contribution is one product of the World Bank's African Rural Development Study (ARDS) and should be seen as a companion to another World Bank publication, *The Assault on World Poverty: Problems of Rural Development, Education and Health.* Both are attempts to fill the chasm that exists between theory and practice in rural development, and to provide a framework for design, implementation, and evaluation of policies.

Lele sees her task as "an understanding . . . of the many administrative, technological, sociopolitical, and environmental factors that influence the quality of rural planning and that often explain the ineffectiveness of its implementation at the micro level" (p. xi). In analyzing these problems, the author utilizes World Bank data from 17 sub-Saharan rural development programs which involved the participation of multilateral, bilateral, and national agencies. This information is supplemented by interviews with persons actively engaged in the implementation, design, and evaluation of each project. The strength of the study's perspective, as the author sees it, is "not so much in a set of definite solutions as in a way of analyzing the diverse sets of specific constraints and potentials that are encountered in rural areas" (pp. xi-xii).

Ms. Lele's credentials as an economist in the World Bank's East Africa Projects Department are quite impeccable, and the thoroughness and organization

with which her study is conducted pay testimony to this experience. In addition to a brief introduction covering the magnitude of rural development problems and a classification of sample African programs, the study has six basic themes. Two lengthy but particularly thorough and well-documented chapters focus on the nature of production systems, mechanization, migration, regional inequity, and diversification of productive activities. Three others cover agricultural extension and credit services, and the marketing of agricultural output. A third section on social services discusses the mobilization of resources in rural regions, the social choices regarding allocation of — and willingness to pay for — resources, and the organization of low-cost delivery of services. Two further chapters discuss autonomous and nationally planned forms of rural development administration and include a useful comparison of the Special Rural Development Program in Kenya and the decentralist *ujamaa* movement in Tanzania. Brief coverage of training for rural development constitutes a fifth focus. Finally, a summary chapter contains a lucid statement of the African rural development study's implications for other projects. The organization, layout, cartographics, and documentation are generally flawless. The bibliography and literature review are more than comprehensive. Helpful skeleton descriptions of each project are contained in the appendix, and the price is modest.

Overall, Ms. Lele comes fairly close to achieving the somewhat lofty aims she sets for herself. The focus of the study is explicitly operational and design oriented, and the main objective is more than adequately dealt with. While solutions may not be the primary intent of the book, much practical insight does emerge and the study rightly documents the need for, and to a certain extent the form of, an overall policy and institutional framework conducive to development. In particular, the author is skeptical about the macrolevel integrated rural development paradigm and calls for more microlevel emphasis pertaining especially to the constraints felt by the individual farmer. Certainly the major strength of Lele's contribution lies in this somewhat unorthodox perspective and her examination of the broad institutional and participatory issues related to rural development rather than orthodox evaluative comments on specific programs.

Nonetheless, it is perhaps inevitable that in taking on so much, her coverage tends to be patchy and uneven. The author's sociological and ecological emphasis hardly meets the standards implied in the preface. In spite of an apparently well-balanced geographical distribution of projects, there is also a bias toward the East African experience, and a neglect of significant contributions by geographers.

Finally, one cannot help feeling a certain uneasiness about a book which offers us the problem of rural development in a new guise but fails to confront some of the fundamental underlying questions. In the final analysis, these reservations are probably minor and it is heartening to see an important publication authored by a World Bank researcher deviating from the conventional and stressing both the import of "traditional" African resources and the microlevel

of analysis for future rural development studies. While the book may not be best employed as a didactic device, it will no doubt find its way onto the bookshelves of most persons sharing Lele's interest in the design of rural development.

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Middle Mississippi Exploitation of Animal Populations. By Bruce D. Smith. Anthropological Papers, No. 57, University of Michigan, Ann Arbor, 1975, xii + 233 pp., figures, tables, appendixes, bibliography, $4.00 (paper).

Bruce Smith is something of an anomaly in ecology. He's a human ecologist who doesn't work with humans. At least not directly. Bruce Smith identifies animal bones and many human ecologists will probably hold this against him. I don't.

What Smith has done is this: by analyzing the archeologically recovered physical remains, he has reconstructed both human and animal adaptations that operated in the central Mississippi Valley from A.D. 700 until European contact. These Mississippi people were agricultural, so their subsistence was heavily reliant on plant foods. But, stipulating this, Smith has focused his study on the exploitation of animal populations. Three specific hypotheses were considered: (1) Middle Mississippi hunters exploited all the available animal populations in direct proportion to the potential yield, or (2) hunters selectively exploited animals according to the principle of maximization, or (3) they relied on a few carefully chosen species. These three notions were tested on a sample of seven carefully selected archeological sites in Missouri, Arkansas, and Tennessee. Over 36,000 fish, mammal, bird, and reptile bones were identified, most of them by Smith himself.

Smith has demonstrated a remarkable feel for bones. In addition to simply identifying bones as to genus and (where possible) species, he has determined the age and sex of the food animals through a variety of techniques: dental eruption, pelvis morphology, condition of antlers (when present), canine thickness, tooth wear, development of tarsometatarsus spurs in the wild turkey, and the degree of epiphyseal closure on long bones. Yet as detailed as the analysis becomes, these techniques never gain the upper hand. The medium does not become the message. This is why Smith is a human ecologist rather than just a bone identifier.

Instead of endless species lists and pottery types, Smith gives us a clear picture of prehistoric human and animal ecology during the Middle Mississippi period. Bless Bruce Smith. Would that more ecologically minded archeologists and anthropologists progress beyond defining *ecology* as the blissful interaction of species lists and defining *cultures* as the asymmetrical intersection of pots-

herd tempers and projectile point attributes. Archeologists will always analyze pottery, measure arrowheads, and identify animal bones: how else would we recognize them as archeologists? But scholars like Smith demonstrate that one need not stop there. There will also always be the danger of transcending potsherds and broken arrowheads, of course; just look about at some misguided devotees of Lewis Binford who are returning to the nineteenth-century sin of too-much-ridiculous-speculation-from-too-little-rock-hard-fact. Lord and Lewis Binford help them. Smith has avoided the pitfall of inelegant means to irrelevant ends.

The pedant should love this volume. Because of the detail involved, there are ample nits to pick. For example, some of Smith's assumptions could be faulted: raccoons were never hunted by Middle Mississippi hunters at night, all prehistoric deer were born on June 1, and so on. These are matters that must remain forever unknown. I don't find Smith's assumptions at all unreasonable. At least he's explicit about them.

One could also unfairly berate Smith for jargon. He's a child of a revolution, the revolution perpetrated by the "new" archeologists. Among myriad objectives, the "new" archeologist has attempted to place archeology squarely among other sciences in the quest for timeless, spaceless regularities. Many of these regularities are ecological in nature. The revolution is now over. Most archeologists are now "new." Smith's study can be considered a successful outcome of the revolution.

But no revolution is without cost. "Explicitly scientific" archeology has some built-in chasms, and one of them is jargon. Smith's style is quite readable, but the obfuscating idiom of the new archeology still creeps in from time to time: "the concept of differential palatability" (translation: deer prefer some plants more than others) or the "initial synchrony of conception" (translation: most rabbits start breeding at the same time). We must not hold jargon against Smith. His volume is a revised doctoral dissertation, and without the jargon he probably couldn't have convinced his professors that he can successfully compete in the arena of "new" archeology. But I suspect that Smith, like many of us, will bridle his jargon in the future, once he realizes that his papers no longer need the signature of a doctoral thesis committee.

A reviewer could also dwell on trivia. The word "data," for instance, is actually plural, not singular as Smith uses it. And the discussion of the aboriginal dog should more properly employ the coefficient of variability rather than the variance. The same is true for Figure 11. The extreme variability (high variance) of wapiti and bear (as, say, compared to opossum and cottontail) is doubtless due in large part to the disparate sample means. Bears are much bigger than bunnies. The coefficient of variability is a measure designed to factor out the sample mean size; variances only confound that distinction.

But the critic who focuses on these points has nobody to blame but himself for missing the strengths of this truly insightful reconstruction of a pre-

historic ecosystem. Smith tackled an inherently difficult field of observation, generated a massive set of data, dealt with the abundant bias involved, and eventually discovered the way things really were in the Middle Mississippi Valley 1000 years ago. Studying human ecology without recourse to humans is a serious handicap. Smith overcame the handicap.

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