are two crucial reasons for wishing that Laughlin and Brady had paid far more attention to avoiding the pitfalls of the Parsonian model.

One of these is stylistic: Laughlin and Brady have unwittingly reinvented the painful prose style of the functionalists. Take, as an example, Laughlin and Brady's most general proposition:

> If a decremental shift in basic resources is due to recursivity in the environment of an individual organism or society, then the adaptive infrastructure of that organism or society will at all times be organized to respond and adapt to that eventuality. This proposition may be referred to as the Principle of Adaptive Diaphasis.

Granted that theory construction demands careful phrasing and technical use of terms, the statement cries out for a translation into plain English, such as C. Wright Mills provided for Parsons in *The Sociological Imagination*.

The second issue is more serious. After years of debate over functionalist theory construction, George Homans pointed out that the theory is not a theory at all. Laughlin and Brady, like Parsons before them, have written what Homans calls an "orienting statement," which identifies an area of concern without making it possible to quantify variables, apply the framework precisely to particular situations, or infer anything from the theory. As even one of the contributors points out, applying a cyclical theory to contemporary events is difficult, since one never knows what part of the cycle a group is on. The authors and editors of *Extinction and Survival in Human Populations* are aware of some of these logical problems of application of the abstract theoretical framework to particular events but are a long way from solving them.

In a passage expressing irritation with his critics, Turnbull suggests that anthropologists have a "mystic mountain" called Statistics, for which they play a ritualized "numbers game." The editors and authors of this book are completely innocent of this charge: only Dirks, in his extremely interesting account of the West Indian slave societies, uses numerical data in a systematic way. But success in the difficult project these authors have undertaken would seem to call for more, not less, attention to operationalization of variables, quantification of observation, and statistical description and inference.

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Physiological Adaptations

Environmental Stress. Individual Human Adaptations. Proceedings of a symposium, Santa Barbara, Calif., Aug. 1977. LAWRENCE J. FOLINSBEE, JEAMES A. WAGNER, JULIAN F. BORGIA, BARBARA L. DRINKWATER, JEFFREY A. GLINER, and JOHN F. BEDI, Eds. Academic Press, New York, 1978. xvi, 394 pp., illus. $16.

This volume is a collection of papers read at a symposium held to honor Steven Horvath, who is an environmental physiologist with a long record of significant contributions to research in human adaptability. His approach has emphasized factors that modify individual responses and cause people to respond in different ways to environmental stress. The volume considers factors that seem to produce significant variation in response between people.

The papers are by collaborators and former students of Horvath's who have studied the impact on human physiology of stress arising from the physical environment. Topics include heat, cold, altitude, air pollution, and the physiology of work. Each topic is introduced with a short summary by a senior investigator, which is followed by four or five more limited experimental papers. The experimental papers emphasize age, sex, acclimatization, and ethnic background. Horvath has written a concluding summary suggesting some unsolved problems.

To the reader who has kept up with the field of stress physiology and is seeking some new insight, this collection will be disappointing. Most of the material has been seen in major physiological journals for some time and many of the experimental presentations are simply reviews of earlier publications. However, the volume is not entirely devoid of new material. Kuehn *et al.* report on a study of the relationship between ethanol consumption and body heat balance in a cold environment. They found that, contrary to what has been believed, there was no appreciable increase in heat loss or in surface temperature as a result of ethanol consumption. Spurr *et al.* make some interesting observations on the influence of childhood malnutrition on adult work capacity. They suggest that despite dietary supplementation in childhood early malnutrition still results in a reduction in adult work capacity. In a more general way, Rowell gives an excellent update of his earlier work on cardiovascular function, emphasizing heat acclimatization changes.

The strength of the collection is in its emphasis on human variation in response to physiological stress. All too often in our quest for basic mechanisms we have tended to treat the results our human subjects give us as if emanating from clones of laboratory rats. Age, sex, acclimatization, and ethnic background have been ignored as factors producing variations in response. As Grover puts it, "Such variability is usually considered anathema to the physiologist for he believes that he will be unable to see the forest for the trees" (p. 327). A quick pass through this book will certainly help delineate the forest. The book should be of interest to the environmental scientist because it provides an up-to-date compendium of factors that serve to differentiate human response to the environment. The book is not comprehensive or complete, but many sources of variation are described and the up-to-date bibliography should assist in the collection of background material.

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A Renewable Source of Fuel

Wood as an Energy Resource. DAVID A. TILLMAN. Academic Press, New York, 1978. xiv, 252 pp., illus. $13.50.

During the last four years much has been written on the prospects of utilizing more wood for energy. There has been much conjecture, some denigrating and some bordering on fantasy.

Tillman's book goes a long way toward developing a more reasonable perspective. He makes projections of the total use of wood for energy in the United States to the year 2000 based on logical and reliable projections of total employment, availability of alternative fuels, characteristics and quantity of wood supply, and changes in fuel cost relationships. His estimate that wood will supply 4.2 percent of our energy requirements with a contribution of 4.1 quads (1 quad = 10^{15} Btu) in 2000 is lower than some other recent projections, which range up to a constant supply of 15 quads. He shows overall efficiency advantages for the use of wood fuels both in solid form and converted to gas or to gas plus oil and char and points out difficulties of using wood fuels as a base for liquid fuels.

Wood is combusted at around 70 percent efficiency. A multiple-product pyrolysis system producing oil, gas, and char and a wood gasification system

have comparably high efficiencies; methanol production and use for fuel and heavy oil production and use for fuel have overall efficiencies of about 30 percent. Tillman shows that as a material for gasification wood, with an overall process efficiency of about 78 percent, is less desirable than coal at about 85 percent but better than manure at about 33 percent and municipal waste at about 66 percent. He also considers other factors, including the energy costs of extraction, transport, and conversion, and concludes that wood is a prime candidate for use in systems such as cogeneration that are aimed at high efficiency of energy recovery.

Tillman explains why fuel farms are unlikely sources of fuel wood and why increases in fuel wood will come from the residues generated by forest management, forest harvesting, and forest products manufacturing until the end of this century. He believes that such requirements for energy farms as a minimum size of 28,500 acres and intensive land management, including the extensive use of fertilizers, makes their use unrealistic prior to 2000. Tillman presents statistics to show that, if fuel farms become established, crops such as sugar cane that have high productivity and high yield rates are most promising. He also shows, through an energy trajectory analysis, that fuel farms have a trajectory efficiency of only 20.33 percent, compared to 52.8 percent for residue fuel wood use.

Because of the emphasis of the book on prospects for the future, there are numerous assumptions and conclusions that can be debated, but this is not because Tillman's work lacks documentation and rigor. He presents a detailed historical account of the use of wood and other fuels in this country, and he tries to back up his interpretation of statistical data with numerous chi-square contingency tests, coefficient-of-correlation determinations, and trajectory analyses.

Sometime he places too much emphasis on mathematical analysis, and the results appear forced and, in one case, meaningless. In that case he takes heating values for seven different species of wood as determined by different methods with different assumptions by four different authors, averages them, and compares the resulting mean heating value (8613 Btu per pound) with a mean value (8559 Btu per pound) obtained by another mathematical formula using average assumed lignin and holocellulose percentages for the same seven species and assumed heating values for lignin and holocellulose. Although the heating values for lignin and holocellulose are applied to all species, they were actually derived for the lignin and holocellulose in Douglas fir. They are values for separated lignin and separated holocellulose, which are not necessarily the same as the values for the native wood constituents. Given the lack of precision in these data, the compared values are surprisingly close.

Unfortunately, the comparison of heating values for wood at different moisture content with other fuels is not readily understood, and much that has been written recently, instead of clarifying the subject, has created more confusion. Tillman's handling of the matter may add to the confusion. It would probably be better to base comparisons on high heating values rather than on inadequately defined net heating values as he has done.

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