Technological Choices

Appropriate Technology and Social Values. A Critical Appraisal. Papers from a symposium, Racine, Wis., June 1978. FRANKLIN A. LONG and ALEXANDRA OLESON, Eds. Ballinger (Harper and Row), Cambridge, Mass., 1980. x, 216 pp. $19.50.

We live amid the elements of modern technology, accustomed to swift transport across oceans or continents, instantaneous global communication, a level of agricultural productivity that permits a handful of Americans to feed the rest, and much more. And new things keep coming along.

Are we getting too much of a good thing? Define good.

Is the acceptance of continuing technical change a necessary evil of life in this corner of a crowded planet? Define evil.

Can an industrial society find sensible ways to control emergent technologies so as to encourage the valuable and limit the damaging ones?

These questions have been raised and debated periodically in the Western world since the first Industrial Revolution. The latest manifestation of Western man's long-running love-hate relationship with technology centers on the concept of "appropriate technology." In essence, this concept reminds us that alternative technologies are available or could be developed for many tasks; as the old adage goes, there's more than one way to skin a cat.

That premise is widely shared; the argument begins when advocacy of the principle of "appropriate" technology is turned into a critique of the inappropriateness of technologies in use. The critics ask why the Western world chooses "hard," that is, centralized, environmentally degrading, technologies when it has available "soft" alternatives. Despite an apparent concern with technology, the critique is really aimed right at the dominant institutions and values of the Western industrial societies.

A second debate centers on the role of technology in economic development. The distinctive institutions and values of the developing nations logically should influence basic technical choices in directions quite different from those taken in Western societies. How can those nations manage the development process in ways that keep options open in the face of forces encouraging replication of Western technologies suited to a markedly different social and cultural milieu?

This interesting book makes available to a wider audience the papers prepared for an international symposium on these issues. A distinguished group of social scientists and public servants discusses the conceptual, philosophical, and practical issues wrapped up in these debates. The papers are thoughtful, informative, and readable.

The book is in two parts. The first, Appropriate Technology as Concept, is a set of diverse and engaging explorations of the linkages between technological choice and social values. As Paul DeForest observes, "the judgement of appropriateness requires a choice among values, and since values are often in conflict the selection of appropriate technologies is deeply imbedded in the political process."

In the industrialized world, the marketplace often provides the mechanism by which those conflicts are resolved. In that setting, "appropriate technology" provides a rubric for the advocacy of "alternative technologies" and a challenge to established institutions. Langdon Winner traces the intellectual history of appropriate technology as a social movement that illuminates "a crisis of authority . . . in which formerly sacrosanct institutions of modern technology have become the object of direct philosophical and political criticism."

A rebuttal of the critique of modern technology is offered by Harvey Brooks. Brooks suggests that current technologies and their alternatives are complementary rather than mutually exclusive and hence likely to coexist in different "ecological" niches. Part 1 ends with a paper by John Montgomery tracing the ways in which values are embedded in the processes of social choice.

The papers in part 1, together with Franklin Long's concise and useful introduction, could stand by themselves as valuable reading for anyone interested in the subtle and complex interactions of technology and society.

Part 2, Appropriate Technology in Practice, is principally a review of experience in parts of the developing world. It begins with an analysis by Gustav Ranis of the role of technology in the development process and ends with an imaginative and challenging essay by Kenneth Boulding. In between are four authoritative chapters characterizing a variety of approaches to social control of technological choices in development of the economies of China, Ghana, India, and Korea.

In sum, this book offers a coherent and dispassionate review of issues of central concern. While the energy and creativity of the more impassioned advocates will surely continue to provide the driving force in the necessary discourse on technology and values, the sober voice of academic appraisal provides the necessary counterpoint. Long and Oleson have provided a baseline against which future developments of the themes of appropriate technology can sensibly be appraised.

RICHARD S. ROSENBLOOM
Graduate School of Business Administration, Harvard University, Cambridge, Massachusetts 02163

Mass Concentration

The Large-Scale Structure of the Universe. P. J. E. PEEBLES. Princeton University Press, Princeton, N.J., 1980. xvi, 424 pp. Cloth, $30; paper, $9.95. Princeton Series in Physics.

The author of a book with the title *The Large-Scale Structure of the Universe* has license to talk about anything, with the attendant risk of being taken to task for not talking about everything. This book is a thorough and scholarly account of the development of structure in the universe through the gravitational aggregation of very large distributions of matter. This is the presumed mechanism by which galaxies, clusters, superclusters, and the universe itself evolve.

A major part of the discussion uses only Newtonian gravitation. This is not a cheap pedagogical trick. The approximation is carefully justified on the basis of general relativity. For example, the Newtonian gravitational potential in an infinite universe is carefully defined. The six chapters of the book are divided into 97 sections, and 23 of these are devoted to Newtonian dynamics. Fourteen of the later sections deal with situations where space-time curvature cannot be neglected.

The heart of the book is chapters 3 and 4. Chapter 3 covers the descriptive statistics necessary to "see" the large-scale

structure in the mass of observational data. These 37 sections contain at least as much as one wants to know about statistics and n-point correlation functions. Chapter 4 discusses the dynamics of these statistics, primarily in terms of the BBGKY hierarchy of moment equations. These chapters are not for the beginner or the statistics-scarred. One is expected to be familiar with autocorrelation functions, power spectrum analysis, and the BBGKY hierarchy.

The author shows remarkable restraint in his choice of topics, making no mention of the current speculations of grand unified theories of the early universe. Nor do we find much attention to computer simulations of n-body dynamics. The emphasis is on analytic solutions. There is surprisingly little discussion of the universe itself, and there is no critical discussion of the galaxy catalogs, or even much discussion of the results of applying all of this machinery to the catalogs of data. Observations are mentioned in only a half-dozen of the sections.

The book has been carefully prepared. The writing is excellent, and the author has taken pains to give proper credit for ideas. This scholarly monograph is a pleasure to read, as well as scientifically valuable, a Rolls-Royce version of a review article. It will be indispensable for the specialist in the field, and every student of the universe should at least browse through it.

WILLIAM L. BURKE
Boards of Studies in Astronomy and Astrophysics and in Physics, Lick Observatory, University of California, Santa Cruz 95064

Wintering Birds

Migrant Birds in the Neotropics. Ecology, Behavior, Distribution, and Conservation. Papers from a symposium, Front Royal, Va., Oct. 1977. ALLEN KEAST and EUGENE S. MORTON, Eds. Smithsonian Institution Press, Washington, D.C., 1980. 576 pp., illus. Cloth, $27.50; paper, $15.

Much of ornithologists' early understanding of the life histories and ecology of birds was based on studies of birds in the temperate zone in Europe and North America. This "temperate zone bias" led many investigators to interpret the adaptations associated with both intraspecific and interspecific interactions as primarily reflecting selective pressures during the temperate breeding season.

Two-thirds of the individuals of many North American bird communities migrate to Mexico, the Bahamas, Cuba, Hispanola, Central America, and even into South America. They are away from their temperate-zone breeding sites for over half the year, yet there have been few studies evaluating their behavior during their migrations or, especially, on their tropical wintering grounds. The low number of studies is attributed to the difficulty of access to many of the wintering areas, especially early in the century, and more recently to the tremendous diversity of resident tropical birds that has occupied the attention of ornithologists working in the neotropics.

As access to the neotropics has become easier and as ornithologists have, with the help of pioneering investigators such as Alexander Wetmore and Alexander Skutch, learned more about the natural histories of neotropical birds, interest in the activities of migrants has increased. The symposium that resulted in this publication came at an opportune time, for it caught the beginning of what appears to be a surge in interest in neotropical migrants. The 40 contributors include over a dozen recent Ph.D.'s as well as long-term students of tropical ornithology.

The authors have only scratched the surface of this neglected aspect of ornithology. Water birds are found in only one paper, and less conspicuous species like thrushes are conspicuously absent. This type of initial compilation of studies makes a valuable contribution, however, for the juxtaposition of such a large number of studies allows one to sort out patterns, or their lack, from a broad range of treatments. As with any symposium, the papers are variable, with some offering sound, unambiguous data to support clear hypotheses and others offering a great deal of speculation with little firm support. It is not useful, however, to discuss the merits and defects of the individual contributions, because the importance of the volume lies in the questions that are raised by the collection as a whole and the directions for research that are indicated.

The generally accepted view of the behavior and ecology of North American migrants in the tropics has been that migrants concentrate at mid-elevations and reside primarily in disturbed habitats. Some investigators present evidence here to support these hypotheses and others present evidence that is contrary. The result that emerges, and that is hinted at or stated by several authors, is that the North American migrants do not

"Wing shape of 5 migratory warblers and 2 resident Santa Marta species compared. Wings of the Least Flycatcher (*Empidonax minimus*), Tyrannidae, and Golden-crowned Kinglet (*Regulus calendula*) are included for comparison." Examination of wing length and area (relative to weight) and shape as related to migration distance has led to the conclusions that "1) there is a basic 'migratory parulid' wing type; 2) this does not differ to any extent between long- and short-distance migrants; 3) in terrestrial and thicket-dwelling migrants, where the vertical takeoff component is important, the wing is shorter relative to body weight; 4) in neotropical resident species, which undertake no seasonal movements and live in the middle sections of the forest, the wing is shorter, broader and more rounded than in the migrant species. Thus the wing . . . varies somewhat with the demands placed upon it. Within the migratory species there are no differences, however, that 'predispose' species to winter in different areas." [From a paper by A. Keast in *Migrant Birds in the Neotropics*]