Ramifications of Technology

Technology, the Economy, and Society. The American Experience. JOEL COLTON and STUART BRUCHEY, Eds. Columbia University Press, New York, 1987. xv i, 287 pp. $35.

During the first half of the 1980s the International Commission on the History of Social Movements and Social Structures sponsored interdisciplinary research into the ubiquitous impact of technology on life in the modern world. Joel Colton of Duke University and Stuart Bruchey of Columbia University directed the United States research team and were asked by the commission to publish the American essays as a separate book. The collection that has emerged from this process contains an instructive summary introduction by the editors and ten essays of very uneven quality.

Alfred D. Chandler, Jr., sets a rigorous standard of analysis early in the book with a discussion of the evolution of managerial structures and marketing practices engendered by the new transportation and communication systems of the late 19th century. Although Chandler identifies differences among nation states that have influenced the shape of business organization, he argues that the cause of reorganization per se is to be discerned by comparisons among industries rather than among countries. It was the need of capital-intensive industries to integrate mass production and mass distribution that produced the structures of modern management, whose evolution he attributes to functional adaptation.

The contributions of Harold G. Vatter, Geraldine J. Clifford, and Morton Rothstein are essentially summaries of the recent literature dealing with large topics. Vatter discusses the contours of American economic growth from 1870 to 1980, emphasizing a fundamental shift from the accumulation of "material capital goods to investment in human capital" (p. 41) over the course of the present century, which has consistently increased the importance of academic training. Clifford chronicles the development of formal education during the same period, but rather than wrestling with the implication of Vatter's point, she focuses on problems that confronted the educational system—problems that, she insists, are not essentially technical. Rothstein treats farmers' movements. Although he analyzes the economic roots of farmers' protest movements, he is more concerned with self-help movements, and especially with the roles of agricultural societies, county agents, and agricultural colleges as nurseries of technological innovation. Brief essays are also provided by Kenneth Jackson on patterns of urban life, David Hammack on forms of political mobilization made possible by the technology of the 1830s and the 1960s, and Martin E. Marty on questions posed for religious thought and practice by modern technology.

Three chapters deserve close attention: those by Harry N. Scheiber, Melvyn Dubofsky, and Derk Bruins. Scheiber deals with American law. In the 19th century, he argues, courts and state legislatures redefined older legal standards in such a way as to encourage the development of new technology and to relieve entrepreneurs of inhibitions to its use and responsibility for its social costs. During the first four decades of this century increasing priority was given to national needs, administrative law, and expert determination. After World War II had stimulated unprecedented levels of federal promotion of innovations, the assignment of responsibility for their social costs and perils not only gave the government a pervasive regulatory role but also unleashed in the courts "a fundamentally new 'litigative order' " (p. 107). Public interest lobbies and judicial decisions uncoupling liability from fault introduced a new variant of legal realism and, in response, the "originalist" doctrine with which recent controversies over Supreme Court nominations have made the reading public familiar. Scheiber's essay is present-oriented history in the best sense of the term.

Dubofsky draws upon the last 30 years' creative work in labor history to show how technological innovations have given new contours to industrial conflict, rather than eliminating it. Despite the assistance lent employers by new machinery and new styles of management in restraining or even eliminating craft unions before World War I, the new methods of production proved by the 1930s to have augmented the power of relatively small groups of workers to bring a factory to a halt and to have introduced new industrial unions with which management had to collaborate if shop floor militancy was to be curbed. Even where automation has given corporations the capacity to destroy unions today, as they did for example in the 1920s, Dubofsky thinks that few

companies would pursue the option. Intransigent resistance to unions has been more evident in computerized clerical and service work than in factories where unions have already been recognized.

Bruins's theme is the battle to preserve social hierarchies in defiance of new technologies that have undermined their reasons for existence. He makes the argument by examining the response of the U.S. Navy's officer corps to innovations in the armament and propulsion of vessels. Line officers were warriors, whose historic task had been to assault enemy sailing vessels with close bombardment and hand-to-hand combat. Steam turbines and 16-inch guns placed many trained specialists on the ships, but the line officers kept the influence of such men marginal and blocked their access to promotions as late as World War II. For enlisted men the impact of new fighting ships was different. Above all, native-born Americans were trained to replace the global pool of seafarers on which sailing ships had traditionally relied.

Although it is neither necessary nor desirable that all authors in a collective volume agree with one another, differences of opinion emerge on some rather fundamental questions in these essays without being explicitly addressed. First, there is the problem of defining "technology." Although the editors employ a very narrow conception based on "the way we transform and use energy" (p. 1), other authors expand the notion to embrace the mode of production in all its aspects. Second, although most of the essays implicitly accept technological determinism, only Chandler's functional adaptation theory makes the causal relationship explicit, and Hammack and Bruins repudiate the idea that changes in technology lead irresistibly to determinate changes in other aspects of human life and thought. No one raises the question of what determines choices among alternative available technologies.

Finally, although no author in the collection opposes the belief that the onward march of innovation has made life unequivocally better today than it was for our ancestors, several authors (especially Scheiber) express deep anxiety over the ecological future of the planet. Moreover, Vatter's generally optimistic account of economic development since 1870 poses two ominous questions: whether a "technosuperstructure" tied to educational credentials has rigidified racial inequality and whether the recent surge in capital-saving innovations has so diminished opportunities for productive investment of accumulated wealth as to generate an economic crisis that neither relocation of industry nor military spending can prevent. If this book stimulates its readers to fresh thinking on these vexed questions, it will have made an important contribution to debates over public policy.

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Ancient and Modern Reefs

The Evolution of Reef Communities. J. A. FAGERSTROM. Wiley-Interscience, New York, 1987. xviii, 600 pp., illus. $74.95.

This volume crosses disciplinary boundaries to amalgamate data on reefs from a broad spectrum of the biological and geological literature. Fagerstrom notes that the book aims to "integrate the broad scope of research on modern (Holocene) and ancient reefs with consideration of the major environmental factors and processes that influence their success or failure." It is successful in doing this, with abundant, up-to-date information that is woven into a lively and readable narrative.

The book is divided into three sections of unequal length that deal with the reef phenomenon, the ecology and geological history of major reef-building organisms, and the ecology and geological history of pre-Cenozoic reef communities. Part 1 treats chemical, physical, and biological definitions, factors controlling reef growth and distribution, and processes such as sedimentation, binding, and early cementation. Fagerstrom develops the ecological concepts of communities and guilds as they pertain to reef development in present and past geological time. This recognition that guilds of various species perform particular functions within the reef community provides the author with a framework for much of his analysis of modern and ancient reefs and the reader with a means to relate changing components of reef communities through time. The guilds recognized in this volume are constructors, bafflers, binders, destroyers, and dwellers. This first section, constituting well over half the volume, thus deals rather exhaustively with a large number of topics. For example, Fagerstrom presents almost eight full pages on the relationship between scleractinian corals and their symbionts the zooxanthellae. Here biochemistry, zoology, ecology, and paleobiology all enter the discussion; that they are intelligently summarized is one of the strengths of the work. The fourth chapter, which treats the simultaneous processes in play during a reef's existence, focuses on five processes (construction, destruction, sediment transport, sediment deposition, and binding), thus breaking an extremely complex topic into manageable portions.

Part 2 (the shortest section) presents the autecology and geological history of the major reef-building groups, the algae (including cyanobacteria), sponges, corals, and two groups important in the geological past, the highly specialized brachiopods of the late Paleozoic (Richthofeniacea) and the somewhat analogous specialized bivalves of the late Mesozoic reef communities (Hippuritacea, or rudists). This part of the book will be of special usefulness to biologists and sedimentologists wishing information on extinct reef organisms. It may be disturbing to some specialists to see the prokaryotic cyanobacteria lumped with all photosynthesizers as algae with little discussion of other possibilities. Fagerstrom also describes the morphology and history of the Cambrian reef-building Archaeocyatha in the chapter on the Porifera, without noting the problematical taxonomic position of the former group. These arguing points seem minor in the face of the very large amount of biological and paleontological information in this section of the book.

Part 3 provides much of the raison d'être of the book, presenting the history of reef communities and their changing guild composition through Phanerozoic time up to the Cenozoic Era. Precambrian reef-community structure was dealt with in part 2, and much of part 1 was concerned with the development of models for sedimentary, biological, and post-depositional modification of modern and fossil Cenozoic reefs. This section summarizes the salient paleobiological data on fossil reefs in a chapter each on early Paleozoic (Cambrian and Early Ordovician), Middle Paleozoic (Middle Ordovician to Late Devonian), Late Paleozoic (Late Devonian to Late Permian), and Mesozoic reef communities. The organization of each chapter proceeds through a series of examples of well-documented individual occurrences of fossil reefs, a discussion of evolutionary (and extinction) events, and a summary of changes in community composition, trophic structure, and guild structure within each of these segments of geological history. This sequence of chapters provides a clear synthesis of the geological history of reef communities and illustrates the interplay between organic evolution, extinction, and radiation of new reef organisms to wherever opportunities existed. In the last chapter, Fagerstrom presents his conclusions: reef communities have evolved over time and reefs are defined by the presence of constructing organisms, topographic prominence, and faunal diversity.