Book Reviews

The Forces behind Technology

America by Design. Science, Technology, and the Rise of Corporate Capitalism. DAVID F. NOBLE. Knopf, New York, 1977. xxvi, 384 pp. $12.95.

In recent years it has become increasingly common for scholars to assert that the development of modern technics, far from being a self-generating, impersonal, and irresistible force, has actually been brought about through the conscious choices and purposeful activities of individuals and groups imbued with particular attitudes, values, and aspirations. The obvious corollary is that tendencies once considered inevitable can in fact be redirected through the exercise of collective will if enough persons can be enlisted in the pursuit of alternative priorities and goals. Noble's *America by Design*, written from the perspective of radical historiography, ably exemplifies this trend. As the author succinctly observes at one point, "Technical imperatives define only what is *possible*, not what is *necessary*; what *can* be done, not what *must* be done."

Arguing the thesis that "the history of modern technology in America is of a piece with that of the rise of corporate capitalism," Noble contends that the industrial transformation that took place in the United States between 1880 and 1930 owed much of its impetus to a relatively small cadre of scientists and engineers who shared a devotion to the spirit and objectives of large-scale private enterprise. By spearheading key changes in the development of professional societies, the conduct of organized research and invention, the administration of higher education and vocational training, the formation of federal regulatory agencies, and the adoption of modern techniques of personnel management, such persons deliberately accomplished a social revolution whose results still pervade American society.

The names of Noble's major protagonists are scarcely household words, even among professional historians. They include such figures as Magnus Alexander, a German-born electrical engineer who played a leading role in transforming technical education and helped found the National Industrial Conference Board; Samuel P. Capen, a linguist who, after becoming director of the American Council of Higher Education during World War I, took advantage of the crisis atmosphere to extend the power of industrial and military interests over colleges and universities and worked toward the establishment of the ROTC; Charles R. Mann, a physicist who was ubiquitous in the efforts of the National Research Council and other organizations to promote a tighter integration of professional and vocational training with the needs of capitalist corporations; Edwin J. Prindle, a mechanical engineer and patent attorney whose activities and publications did much to bring invention, previously an individual process, under the control of such giant firms as General Electric, Westinghouse, and AT&T; Herman Schneider, dean of engineering at the University of Cincinnati and a prime mover in the establishment of cooperative programs combining college-level instruction with on-the-job training, which still flourish on American campuses; and William E. Wickenden, who conducted "the most comprehensive study of technical education in history" under the egis of the Society for the Promotion of Engineering Education prior to becoming president of Case Institute of Technology. These men and others like them, Noble's evidence suggests, played an indispensable role in building the foundations of what later came to be called the "military-industrial complex."

Noble lays heavy stress on the ways in which scientific knowledge and engineering expertise were applied to what he calls "the production of men as commodities," showing how standardized tests, behavioral conditioning, and other forms of psychological manipulation were used to elicit dependable employee performance and conformity to entrepreneurial goals, both on and off the job. Here and elsewhere, as Christopher Lasch writes in his foreword, the author usually manages to be "deeply critical of industrial society without offending the reader with left-wing pieties, so often associated with radical scholarship." Nonetheless, the depth of Noble's ideological commitment is evident at all times, and indignation occasionally erupts, as in a statement that begins one chapter on the growth of organized research and development: "Patents petrified the process of science, and the frozen fragments of genius became weapons in the armories of science-based industry." In fact, genius could and did flourish in large industrial research laboratories, as the careers of such persons as Irving Langmuir and William D. Coolidge indicate. Noble's antipathies are clear at another point when a single incident involving rudeness on Capen's part toward a steerage passenger on an ocean liner is used to stigmatize the attitudes of the entire group of scientific and engineering educators whom Capen represented.

Though such passages cast some doubt upon the quality of "detachment" for which Lasch praises Noble's analysis, Noble's findings are generally consistent with those of many previous authors, such as Samuel Haber, Richard Hofstadter, Brenda K. Shelton, and Robert Wiebe, who have emphasized the power of conservative reformism in the late 19th and early 20th centuries, and with the work of such scholars as Reinhard Bendix, Alfred D. Chandler, Peter F. Drucker, and Lewis Mumford, who have traced various ways in which entrepreneurial strategies and ideologies have been pursued and inculcated during the course of modernization in the United States and other countries. Indeed, apart from its underlying animus against corporate capitalism, *America by Design* has deep affinities with the studies of John R. Bodo, David Brion Davis, Clifford S. Griffin, Lorman A. Ratner, and other analysts of the pre-Civil War era who, in tracing the development of revivalism, the temperance crusade, prison reform, anti-Masonry, and the public school movement, have stressed the significance of organized efforts aimed at achieving and maintaining social control.

Within the period covered by his book, Noble has explored, with many acute insights, a series of key developments whose connections have not been previously examined. Combing a wide variety of scientific and engineering journals and making effective use of existing monographs by such scholars as Kendall Birr, Monte A. Calvert, Thomas Parke Hughes, and Edwin T. Layton, he has produced a valuable addition to recent works dealing with the social and cultural dimensions of modern technology. My main reservations are two. First, many of the developments the au-

thor analyzes had a beneficial side, in promoting efficiency, productivity, and economies of scale, which are not given their due. Second, in light of Noble's own insistence upon the importance of human choice and the wider framework within which his findings can be fitted, it is arguable that corporate capitalism is not the crucial underlying variable that the title and general tenor of the book would suggest it to be. In the final analysis, people, not machines or economic systems, harbor the motives and make the decisions that affect the course of history. The human urge to manipulate, exploit, dominate, and control can assume many poses and wear many masks. No system or ideology, however compelling the rhetoric enlisted in its behalf, can in itself bring about a better future.

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Nonverbal Communication

Face-to-Face Interaction. Research, Methods, and Theory. STARKEY DUNCAN, JR., and DONALD W. FISKE. Erlbaum, Hillsdale, N.J., 1977 (distributor, Halsted [Wiley], New York). xvi, 362 pp. $18.50.

Past research on nonverbal communication, or face-to-face interaction, the term these authors prefer, has been notably lacking in conceptual models. Some investigators have even resisted theoretical formulations or the derivation of hypotheses as being prematurely restrictive given the shortage of careful descriptive work on nonverbal behavior. Duncan and Fiske are identified with this conservative position, as is exemplified by their insistence on beginning with exhaustive descriptions of face-to-face interactions before attempting a conceptual model of the structure or grammar of such interactions.

This book, which is aimed primarily at researchers, is divided into four sections. Initially, the area of investigation and the research strategies deemed appropriate to it are outlined. The authors reject experimental methods, such as the use of programmed confederates, in favor of careful observation of interactions that are "as close as possible to natural conditions." The second part of the book describes correlational patterns emerging from such observations of seven-minute videotaped conversations between pairs of 88 graduate students. Thirty thousand acts were coded and correlated with other acts of the same participant, with acts of the partner, and with several self-report measures of personality. Little relation was found between nonverbal acts and self-descriptive scores. The sex differences that emerged led the authors to recommend that future research take the sex of the interactants into account because it appears that men and women do different things in social interactions and that these behaviors differ whether conversations are with a member of the same or the opposite sex.

The third section of the book reports the fine-grained analysis of eight conversations (four of them from the first study). The focus is on the patterned organization of interactions, and the expressed goal of the investigation is to discover the "manner of segmentation" of the interaction into units. The transcription of speech into segmental phonemes provided an anchor for further analyses of paralanguage and body motion. These analyses in turn led to the identification of a unit called the "speaking turn" and its six constituent cues. This section of the book dramatically illustrates both the arduous nature of fine-grained analysis and its considerable rewards. Many researchers will react with dismay to the seemingly tedious nature of these procedures, but the authors make a compelling case that such an approach provides more interpretable data than does the pursuit of arbitrarily derived hypotheses.

Finally, the authors offer a conceptual model with which to organize this wealth of detailed description. The model gives considerable weight to the coordination of mutual expectations in structuring conversations and to the importance of observed conventions in guiding the smooth flow of interactions. The primacy of organized sequences is restated in the model, making the model more descriptive than predictive, which is as the authors would have it.

Overall, this is a difficult and valuable book for those interested in nonverbal communication. Of the three components offered by the title (research, methods, and theory), the book delivers more on the first two than on the third. The model makes good sense of the research findings, but theory it is not; it neither yields testable hypotheses nor connects conventions with any broader interactional framework.

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Mammalian Behavior

African Ungulates. A Comparative Review of Their Ethology and Behaviorial Ecology. WALTER LEUTHOLD. Springer-Verlag, New York, 1977. xiv, 308 pp., illus. $31.70. Zoophysiology and Ecology, vol. 8.

Birds and primates have been the focus of most of the recent hypotheses relating vertebrate behavior and social organization to ecological variables. This book, a scholarly compendium of findings from recent descriptive and quantitative field research, particularly in East Africa, recognizes that the burgeoning number of studies on ungulates provides a corpus of data on another taxon against which the general validity of such hypotheses can be tested.

The arrangement of the subject matter is along classical ethological lines, thus permitting ready access to comparative summaries of maintenance behavior (for example, feeding, drinking), use of space (for example, migratory movements and ranging), agonism, sexual behavior, and social organization (that is, mating systems in relation to territoriality, group size, and hierarchies).

Although such compartmentalization is time-honored and is appropriate for many purposes, it precludes the kind of synthesis that many field workers today see as the goal of behavioral ecology. A list of communication signals, for example, is presented (in chapter 8) without reference either to the social organization of the species using them or to the environments in which they are employed. The treatment thus discourages consideration of such questions as which ungulates use predominantly vocal, which visual, and which olfactory signals for, say, agonistic encounters as a function of habitat structure and interindividual spacing. Deficiencies of this sort, however, do not detract from the usefulness of having such a thorough catalog, supported by a comprehensive bibliography, of ungulate behavior.

The treatment of concepts underlying classes of behavior is uneven in quality; however, it never rises to creative peaks or sinks into troughs of error. There is an excellent discussion of territory, home range, and dominance, concepts that are frequently confounded. On the other hand, similar care is not taken to disentangle the concepts of aggression, threat, agonism, antagonism, and combat, these being as frequently misused in the literature as those in the preceding list, although Leuthold himself is always carefully correct in his use of them.

If Leuthold had been equally careful