schemes for community development and organization in Tzintzuntzan. In the course of his analysis he makes it clear that the plans were ill conceived and poorly executed, that the projects failed not because the Tzintzuntzeños were unwilling to accept change (even at the "cost" of outstripping, outshining, and getting ahead of their fellow villagers), but because such relevant factors as skills, demand, and marketing outlets were ignored by the planners. Thus he notes: "A happy future for Tzintzuntzan will depend on sound economic and social planning and on the effective execution of the programs that are decided upon."

In a number of places Foster makes it apparent that he does not belong in the camp of those simplistic analysts who used to assume that resistance to culture change of any kind was inevitable. For example, he points out that "Tzintzuntzeños are pragmatic in analyzing possible benefits and losses from any course of action, and they do not let sentiment, in the form of overriding family loyalty or long-standing grudges stand in their way." And: "With respect to . . . economic motivation, it is clear that there are few Tzintzuntzeños who, seeking a new opportunity to make money, and knowing how to go about it, will not attempt to change their traditional behavior to reach this goal." Yet on the preceding page Foster has described Tzintzuntzan as "a community in which shared poverty is the goal." Elsewhere he refers to Tzintzuntzeños as "among the least change-prone people to be found in . . . Mexico . . . Village culture and society [reflect] a cognitive orientation that views all good things in life as finite." In short, Foster—perhaps because he is strongly influenced by his knowledge of the community as it was as well as as it is—tries to have it both ways: the image of limited good inhibits the impulse to change; it does not. Naturally it would be as absurd for one to deny the significance of world view as an element involved in receptivity to culture change as it would be to deny Tzintzuntzan's present dependence upon and involvement with an economy and a polity that lie outside its own village borders.

As with other peoples elsewhere, the cognitive orientation or world view of the Tzintzuntzeños is historically derived. But world views are, as Foster himself admits, dynamic things. They too are subject to alteration when they alteration find. The cognitive orientation of the Tzintzuntzeños may, at any particular moment, show holdovers from the past and from past circumstances; but it reflects also the "real" conditions of contemporary life, including the social and natural circumstances in which the villagers live and the political controls and economic forces imposed upon them. World views, cognitive orientations, and values are not born in a cultural vacuum. Nor will they remain for long unchanged in the face of radical alterations in the socio-political-economic environment in which a people finds itself. Tzintzuntzeños are now, Foster reports, living in such a changing ambience. In this respect they do not differ radically from North American Indians, South African blacks, or urban American Negroes. But Foster seems to have built a kind of metaphysic into his world view of the limited good which implies, among other things, that the hearts and the minds of men and not their circumstances must be altered before they will accept new values. Or else he implies the reverse.

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Factors in the Shaping of Our Society

Technology in Western Civilization. Vol. 1, The Emergence of Modern Industrial Society, Earliest Times to 1900. MELVIN KRANZBERG and CARROLL W. PURSELL, JR., Eds. Oxford University Press, New York, 1967. 814 pp., illus. $8.50.

Someone has said that the degree of man's civilization is shown by his interest in history. In recent years American readers have shown an increasing concern not only with their own history but with the history of earlier ages and with prehistory. This volume—the first of two (the second to be published later this year)—is evidence of the interest of a large number of people in the historic processes that have brought us to our present technological status. The volumes grew out of a conference held at the University of Wisconsin in 1963, at which a panel of historians of technology met to see whether they could prepare a course of study for the U.S. Armed Forces Institute. They will be used in a one-year course to be given by that institute, and are frankly designed as textbooks; but volume 1 can be read with interest and profit by anyone concerned with the origins of technical processes. It supplies an enormous amount of information about technological developments from the beginnings of man's emergence in the Early Stone Age to the end of the 19th century. Volume 2 will bring the story of 20th-century technology down to date.

Volume 1 is composed of five main parts with a total of 45 chapters, each written by a specialist. Lynn White, Jr., writes on Technology in the Middle Ages, Shepard B. Clough deals with Economic and Political Developments, 1600–1750, G. E. Russell treats The Agricultural Revolution, 1600–1850, Bern Dibner has two chapters, one on The Beginnings of Electricity and one on Communications, and Robert P. Multhauf discusses Industrial Chemistry in the Nineteenth Century—to mention at random only a few of the chapter headings. Naturally the style of the exposition varies with individual authors, and not all chapters manage to focus attention upon essentials, but by and large the writing is clear and the presentation effective.

One of the most fascinating chapters is White's discussion of the remarkable advances in the Middle Ages and the rapid and often unexplained spread of the knowledge of certain inventions and techniques throughout the known world. Someone in the 10th century introduced the Javanese fiddle bow, and soon it was being used to make music all over Europe. White shows that the late Middle Ages were years of extraordinary inventiveness, and A. Rupert Hall in the next chapter, Early Modern Technology in 1600, comments: "The Renaissance is regarded as one of the most creative and glorious periods in human endeavor. Yet in terms of the history of technology it perhaps does not rank as high as the Middle Ages with its power revolution and its agricultural innovations." Some historians will wish to debate this statement, but it does serve to emphasize the advances made during a period which most people think of as given over to feudal quarrels and baronial wars.

In the condensation required for the vast amount of information packed into these chapters, some oversimplifica-

tion occurs, and many statements cry out for further explanation. The statement about the Renaissance cited above is an illustration. Though some of the technical operations of the 16th century may have been known in China centuries before, or in the Middle Ages, their development and utilization were an outgrowth of the intellectual ferment of the Renaissance. For example, the improvement in English methods of building and handling ships increased that nation's potential as a sea power and helped to change the course of world history.

Wars have had an enormous impact upon technological development, especially during the past century and a half. In a chapter on Military Technology, Thomas A. Palmer, after enumerating developments during the Civil War, comments: "The Civil War proved to be the first occasion when the achievements of the Industrial and Scientific Revolutions were put to large scale military use—a war in which the artisan, the farmer, and the mechanic as well as the soldier played essential roles in determining the final outcome of the conflict." Presumably volume 2 will devote much of its space to describing the complete utilization of a nation's technological potential in time of war and the byproducts for peaceful use that have resulted.

Although specialists will find many statements throughout this volume with which they may not agree, few will fail to profit from reading it from beginning to end. For those who wish to pursue special subjects further, the authors have provided 28 pages of bibliographical references.

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The Sense of Location

Human Spatial Orientation. I. P. HOWARD and W. B. TEMPLETON. Wiley, New York, 1966. 541 pp., illus. $13.50.

Pilots of high-speed aircraft and space vehicles become disoriented during flight maneuvers. They may misjudge the location of a visible target, misreach for an object, or report seeing motion where objectively there is none. These consequences of man's exposure to the unusual circumstances created by technological advance dramatically emphasize that orientation in space is dependent upon a large variety of environmental factors, some obvious, others unexpected. Howard and Templeton have done a considerable service by bringing together, from very diverse sources, many of the experimental results that bear on the human capacity to orient with respect to objects and events. In addition, they have examined the manner in which the orientation of the body in space affects the perception of objects.

The text begins logically by considering the first step in any act of orientation, the reception of sensory stimulation which provides the basic information concerning the location and spatial properties of either objects or events. Accordingly, the early chapters of the book are devoted to a discussion of the stimulation available to, and processed by, the visual and auditory systems. Kinesthesis, the sense understood to be responsible for discrimination of movement and position of bodily parts, is considered in a separate chapter, as is the closely related vestibular system. Three chapters deal with oriented responses in which gravity can be assumed to play a role by defining a unique reference direction.

Having considered the sensory basis for orientation, the authors go on to discuss the available data on the conditions which influence the accuracy and precision of oriented responses. In addition to this material, references are made throughout the book to studies of alterations in orienting behavior produced by atypical experiences. These changes may be provoked by prolonged exposure to particular constellations of stimuli. Sensory inputs rearranged so as to produce altered feedback initially cause inaccuracies in localizing behavior, but as exposure continues these effects are cancelled by adaptation. The authors indicate that since the sensory feedback in a stable environment is patterned, this information may be used for adaptive modification as well as for maintenance of orienting behavior. Consequently, the technique of rearranging stimuli provides a tool for analyzing normal spatial behavior. Howard and Templeton's review of this topic is the most balanced account in the literature of a field which has become the subject of much controversy in recent years. Several chapters deal with the effects on perception of the locus and orientation of shapes relative to the observer. A final chapter discusses what is publicly known of orientation in the weightless state.

This book is largely a compendium of relevant literature, and its 78 pages of bibliography attest to its thoroughness. The authors make their contribution in several ways. First of all, they have interspersed clear-cut analyses of particular issues among the reviews of various topics. Occasionally they present their own very reasonable interpretations of controversial issues. However, in their efforts to cover a diversity of topics, they have been unable to show very much overall coherence in the material. The reader might have hoped for an organization of contents based on a more general theoretical analysis. This lack of continuity probably reflects more about the state of the field than about the efforts of the authors. They are to be commended for their industry and the resultant benefit to a field which is attracting increasing interest.

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Cytogenetics

Sex Chromosomes. URSULA MITTWOCH. Academic Press, New York, 1967. 316 pp., illus. $14.

A little over a decade ago, dramatically improved techniques began to give superlative results with the previously obstinate chromosomes of the higher vertebrates, including man. New discoveries have been appearing at a remarkable rate, but often from workers whose primary interest has been not in genetics or cytogenetics but in the clinical implications or in the organisms themselves. The reports are very widely scattered through biological and medical publications. Thus any attempt at summary and assessment against a background of general genetics, cytogenetics, and biology is welcome.

The most intriguing variations in genetic mechanisms among the vertebrates and by far the widest range of known chromosomal abnormalities in man involve the sex chromosomes. The longest chapters of the present volume are devoted to these chromosomes in man and other mammals, and to the related problems of "sex chromatin," a phenomenon evidently confined to mammals. There are shorter chapters on the sex chromosomes of the other classes of vertebrates, the sex chromosomes of *Drosophila*, sex determination in the Lepidoptera, and such mech-