

cally guilty of DUI should be viewed as a "killer drunk." This vindictiveness complements strong enforcement efforts and severe penalties but fails to acknowledge the actual diversity among DUI violators. And labeling this group as villains promotes punitive responses while slighting possibly more cost-effective interventions, such as restricting the sale of alcoholic beverages.

Social Control of the Drinking Driver gives us a more thorough account of the criminalization of DUI than of non-punitive methods of social control. The principal alternative to the criminal law is the imposition of greater restrictions on the availability of alcohol. Recent research has demonstrated the effectiveness of two types of restriction on availability—the minimum legal purchase age and taxes on alcoholic beverages. There is clear evidence that increasing alcohol taxes or the minimum age reduces highway fatality rates among youths (P. J. Cook in *Alcohol and Public Policy*, National Academy Press, 1981, p. 255; P. J. Cook and G. Tauchen, *Journal of Legal Studies*, Jan. 1984, p. 169; H. Saffer and M. Grossman, *ibid.*, June 1987, p. 351). These effects are quite large compared with what can be reasonably accomplished through criminal law enforcement, yet they are scarcely mentioned by the authors in this book. Ragnar Hauge's review of the effects of changes in availability of alcoholic beverages concerns itself with minor interventions (liquor store strikes, Saturday closings) and neglects the important ones. Geller and Lehman give a hopeful assessment of the effectiveness of training alcohol beverage servers to ration customers, but the potential gains here are necessarily small. In the array of promising countermeasures against DUI, reducing availability through higher taxes must rank at or near the top. It deserves more attention in a book that aspires to comprehensiveness.

Compilations always have gaps, redundancies, and unresolved inconsistencies, and this one is true to form. Readers who wish a briefer and more accessible account of this literature may want to wait for the publication of James Jacobs's new book (also with the University of Chicago Press) on drunk driving. But the advantage of this collection is that we are given a picture of the "frontier" by the scholars whose work has defined it. They give us a fascinating account of the punitive approach of the 1980s and some suggestions of what might be considered as alternative strategies for controlling the drinking driver when this decade has faded.

PHILIP J. COOK
Institute of Policy Sciences
and Public Affairs,
Duke University,
Durham, NC 27706

The Construction of Voids

Innovation and the Rise of the Tunnelling Industry. GRAHAM WEST. Cambridge University Press, New York, 1988. xvi, 355 pp., illus. \$80.

The tunnel is a unique type of structure, a significant void distinguished by the absence of material rather than a construct of form. Although frequently overlooked by scholars, the history of tunnels dates to ancient times when they were first built as *qanats* to drain natural groundwater strata in arid regions. In the Greek and Roman eras they were critical components of aqueducts used to connect cities with distant water sources. In particular, tunnels achieved importance in systems that required the maintenance of even gradients regardless of topographic irregularities. They were expensive, labor-intensive projects and were undertaken only when necessary for the success of a larger system. In the 19th century railroads spurred major interest in tunnel construction because they required constant grades for right-of-ways to ensure reliable locomotive operation. Later, the technology received a major boost as transportation interests sought ways to traverse rivers, harbors, and even the open sea (witness the on-going "Chunnel" project planned to connect Brit-

ain and France) without relying upon bridges that could impede ship navigation.

In this book, West elucidates the origins and major uses of key tunneling innovations from the 1830s to the present. Disclaiming any attempt to write a comprehensive history of modern tunneling, he is content to focus on technological development using a methodology that largely avoids social and economic analysis. In the parlance of modern-day historians of technology, his is an "internalistic" approach that eschews general contextual discussion while concentrating on how certain important technologies were created and utilized. Despite an attempt to generalize on the nature of innovation in technological systems, the heart of the book lies in the detailed descriptions of how tunnels are constructed. These descriptions are grouped into the categories of hard-rock techniques, soft-rock techniques, and specialized tunneling machines. Although the book is written primarily from a British perspective (the author is associated with the British Transport and Road Research Laboratory), it contains data on several projects in America, Europe, and Japan. In particular, considerable attention is given to the hard-rock drilling and blasting techniques developed for the Hoosac Tunnel in western Massachusetts and the Mont Cenis Tunnel between France and Italy (both



"Blow in Haskin's tunnel under the Hudson River (1880)." Blows (sudden loss of air pressure followed by inrush of water) occurred in a number of early compressed-air tunnels. In this instance, "the miners took refuge in the air lock, but one of the doors was jammed . . . and twenty men were drowned." This contemporary print shows the airlock on the left. Haskin's tunnel "is thought to be the first in which telephones were used . . . although the . . . wires must have been routed in a different way from that shown by the artist otherwise they would have been cut the first time the air lock door was closed!" [From *Innovation and the Rise of the Tunnelling Industry*; Smithsonian Institution]

completed in the early 1870s). For soft-rock technology, discussion concentrates largely on projects designed to connect the two sides of the Thames in London. For tunneling machines West examines a variety of mechanical devices used to expedite construction under a wide range of geological conditions. As part of this last section, he provides brief, yet fascinating, discussion of late-19th-century efforts to tunnel under the English Channel.

In summary, is this a book warranting widespread general interest among historians of technology and the engineering community? No. Is it a scholarly, readable treatise that will appeal to engineers and historians specifically interested in tunnel construction? Most decidedly yes. Although it does not pretend to be a definitive treatment of tunnels and their place in the growth of civilization, it is an excellent reference work that will be useful for years to come. With luck, it may spur others, or even West himself, to undertake further research into the broader impact of tunnels on social and economic development in both ancient and modern society.

DONALD C. JACKSON
504 South 46th Street,
Philadelphia, PA 19143

Primate Sociobiology

Primate Social Systems. ROBIN I. M. DUNBAR. Comstock (Cornell University Press), Ithaca, NY, 1988. viii, 373 pp., illus. \$49.50; paper, \$24.95.

Descriptive accounts of the social behavior of the nonhuman primates, both in the laboratory and the wild, have been available for some time. Dunbar has set himself the ambitious task of going beyond descriptive studies to examine the diverse social systems in which behavior is embedded, demonstrating in the process how these systems result from, and at the same time set limits on, individual behaviors. Emphasizing the importance of theory-building and testing throughout, he takes an approach to the analysis of behavior that is steeped in sociobiology, acknowledging nonetheless that ecology and demography shape the arena within which sociobiological principles operate.

After several chapters that provide necessary factual and theoretical background, the book covers the basic biological problems that primates must confront in order to survive; special attention is paid to the effect of the environment on demographic processes and the way these animals adjust the amount of time expended on different be-

haviors in order to cope with changing conditions. The second half of the book is devoted largely to different behavioral strategies pursued by individuals within particular social systems, strategies that allow them to survive, acquire mates, and rear young. The last two chapters are intended to tie together the points made earlier and deal with models of socioecological systems and the evolution of social systems respectively.

There are many stimulating ideas to be found here, for Dunbar is not one to accept conventional wisdom unquestioningly. For instance, he challenges the notions that avoidance of inbreeding is the ultimate cause of emigration in primates (p. 82), that monogamous mammals arrive at this particular mating system because of female dispersal (p. 274), and that territoriality in primates evolved as a means of protecting access to resources (p. 290). In the current debate over whether primates live in groups in order to acquire and protect resources or in order to provide a defense against predators, he supports the latter hypothesis. Kin selection need not be the main reason why animals form groups with relatives, he suggests; convenience and efficiency may be more plausible causes. Dunbar's positions on these and other issues are often bolstered by mathematical modeling, much of which derives from his earlier work with gelada monkeys in Ethiopia.

Perhaps, the least satisfying part of the book is its concluding chapters. Under the heading "Socio-ecological systems" Dunbar explicates a model taken from his 1984 gelada monograph, briefly shows how the model may be applied to other primates, and then devotes most of the chapter to a discussion of monogamy with an afterword on territoriality. Rather than draw general conclusions, the final chapter seeks to apply previously derived theoretical principles to account for the social evolution of baboons (*Papio*, *Theropithecus*, and *Mandrillus*) and the great apes. Although it is probably not possible, given the present stage of our knowledge, to create an overarching theory that accounts for the social organization of all the living primate species (and Dunbar does not pretend to do this), still the reader is left with a sense of anticlimax, a feeling that a more general resolution may have been close at hand but eluded the author's grasp.

The book is a valuable one, nonetheless. Perhaps its most useful contribution is the author's uncompromising refusal to oversimplify, as others have done, in the face of the complexity that characterizes the relationship between these unusually intelligent animals and the environmental and demographic pressures that shape their behavior.

The mathematical models that he has developed to deal with this complexity may or may not be appropriate, but testing them and pursuing their implications should lead to a fuller understanding of primate social systems.

ROBERT S. O. HARDING
Department of Anthropology,
University of Pennsylvania,
Philadelphia, PA 19104-6398

Some Other Books of Interest

A History of Neurophysiology in the 19th Century. MARY A. B. BRAZIER. Raven, New York, 1987. xvi, 265 pp., illus. \$69.

This account of neurophysiology in the era in which it "began to be recognized as a specific field (though it did not yet have its name)" takes a biographical approach, discussing under separate headings the work of some 60 experimentalists. Chapter 1 begins with the statement that "for students of the nervous system the 19th century opened with the shock of Galvani's claim for animal electricity," and the first three chapters describe work centered on this claim. There follows a chapter on investigations of the spinal cord. Further chapters cover work by researchers who opened "the great era of experimental physiology" and by the "great German schools," studies of nerve and muscle stimulation and of localization of function in the brain, findings made through microscopy, elucidation of the neural origins of muscular movement, electroencephalography, and the work of the "great Russian schools." A portrait of each researcher and an illustration from his work are included, and each chapter includes, in addition to bibliographic footnotes, a selected bibliography. The book also includes author and subject indexes.—K.L.

Evolution and Coadaptation in Biotic Communities. SHOICHI KAWANO, JOSEPH H. CONNELL, and TOSHIKATA HIDAKA, Eds. University of Tokyo Press, Tokyo, 1988 (U.S. distributor, Columbia University Press, New York). viii, 256 pp., illus. \$72.50. From a symposium, Kyoto, Japan, Nov. 1986.

In 1985, to celebrate the 60-year reign of the Emperor of Japan, an International Prize for Biology, to be awarded by the Japan Society for the Promotion of Science (an institution set up by the Japanese Ministry of Education, Science, and Culture) was established. The first prize was awarded to E. J. H. Corner of Cambridge University, and the proceedings of the symposium held in conjunction with that award were pub-