devastating atomic blitz of Soviet urban and industrial areas) and military means (insufficient bombs and bombers) as well as between strategic doctrine and American ethical standards and wartime political objectives.

The exclusive dependence of the United States on its atomic arsenal meant that news of the Soviet atomic explosion in August 1949 was particularly shocking. The response of American policymakers was to opt immediately for the "superbomb," that is, the hydrogen bomb. The quest for superiority in nuclear weaponry, Herken maintains, had become a psychological as well as a military imperative. Without fully understanding just how the new or old atomic weaponry fit into a theory of deterrence or constituted a superior war-fighting capability, American officials nevertheless had become habituated to a position of atomic superiority. Hence neither assumptions nor goals were adequately reassessed when the H-bomb decision was made. The arms race took another leap forward as American officials were convinced that security could be achieved only through nuclear superiority.

Herken's book appears at a propitious moment. With the Reagan Administration embarking upon another round in the arms race, indeed the most costly one in the history of the Cold War, it is imperative to consider assumptions, conclusions, and alternatives. *The Winning Weapon* suggests that the quest for strategic superiority is elusive and shortsighted—elusive because it simply triggers a commensurate, if not larger, effort by our potential adversary, and shortsighted because superiority, even if possible, does not easily translate into diplomatic leverage, meaningful deterrent doctrine, or usable war-fighting strategy. By demonstrating that at the inception of the Cold War the United States made little effort to negotiate arms control accords in a serious manner, the author underscores the need to approach such talks in an open, imaginative, and constructive manner. The assumption that such agreements are more likely to be achieved when the United States is in a position of strength is belied by the author's account of atomic diplomacy between the bombing of Hiroshima and the Korean war.

But what are the alternatives? On this point the author is conspicuously silent. Although he intimates that a more flexible stand by the United States would have elicited reciprocal Soviet concessions, the author is unable to demonstrate this persuasively. Suggesting throughout the volume that American policy-makers disregarded the best advice of scientists regarding prospective Soviet development of the bomb, the author informs us in a footnote at the very end of the book that at least two of the nation's most prominent scientists reversed their initial view and believed it would take the Russians much longer than, in fact, was the case. Predicting Soviet capabilities was not as easy as the author occasionally suggests. Nor was it a simple matter either to reconcile military strategy with American ethical standards and political goals or to develop a force structure that fulfilled the requirements of both deterrence and war fighting.

The Winning Weapon is a welcome addition to the literature on atomic diplomacy and strategy. If Herken sometimes underestimates the dilemmas encountered by American officials, he nevertheless demonstrates that a return to the shibboleths of the past is unlikely to curtail the arms race, elicit Soviet cooperation, or produce a safer and more peaceful world.

MELVYN P. LEFFLER
Department of History, Vanderbilt University, Nashville, Tennessee 37235

Medicinal Drugs and Public Policy

Taking Your Medicine. Drug Regulation in the United States. PETER TEMIN. Harvard University Press, Cambridge, Mass., 1980. xiv, 274 pp. $18.50.

Researchers of many disciplines have been attracted to the complex subject of drug regulation in the United States. Their work has illuminated significant aspects of the public policy problems that drug regulation seeks to address, but the light has been refracted by the disciplinary lenses through which it was focused. Peter Temin is an economic historian, but *Taking Your Medicine* is much more than an economic history of drug regulation.

Temin describes three "modes of behavior" that pertain to the real and ideal worlds of medicinal drug use and regulation. The instrumental mode is the type of behavior that economists assume prevails in market settings and that they generalize to all circumstances where rational man confronts choices that enable him to maximize his utility. The customary mode is behavior by tradition or habit: Individuals and organizations operate by rules of thumb until they can no longer perform above a threshold; then they temporarily search for new rules that can restore satisfactory achievement levels. The command mode is behavior determined by the direction of an authority figure; you do as you are told to do. These three modes provide a useful analytic framework for the examination of drug regulation because each has a parallel institutional structure—markets, communities, hierarchies, respectively—and because the faults of regulation can be seen as mismatches between the assumed and actual behavior patterns of the actors in the system.

Temin recounts history that will not make the reader complacent about the legislative and administrative processes of U.S. drug regulation. The legislative process is slow, and final action appears without exception to have been stimulated by crises that are largely irrelevant to the provisions of the bill under consideration. Temin is not the first to recognize this characteristic of the legislative process, but he provides new insight regarding the role of the Food and Drug Administration and its predecessor agencies in shaping bills that are passed and, more important, in interpreting their intent through implementing regulations.

The most striking example of administrative discretion in the interpretation of new legislation is the prescription-only regulation that was promulgated to enforce the Federal Food, Drug, and Cosmetic Act of 1938. During hearings, FDA told the Congress that the 1938 Act would improve and facilitate self-medication, but the implementing regulations greatly curtailed it. The regulations went so far as to require that directions for use of prescription drugs "appear only in such medical terms as are not likely to be understood by the ordinary individual." This is the origin of the product descriptions and prescribing information that now appear in the form of official package circulars, which are largely uninformative even to the medical audience to which they are directed.

Temin's careful examination of the FDA administrative process tends to undermine the arguments of those who attribute the decline in new drug introduction in the 1960's to the 1962 Drug Amendments. These explanations, advanced by several economists, do not recognize the considerable delay between the 1962 amendments and the implementing regulations that, without question, served to make the drug-approval process more stringent. The mes-

sage is that simple explanations of regulatory outcomes do not stand the scrutiny of those who study the intricate details of the regulatory process.

One might expect that an economist, finding major deficiencies in the efforts of his colleagues to explain regulatory behavior in terms of the instrumental model of utility maximization, would look for ways to improve the model rather than accept different models. The major strength of this book is that Temin is willing to break free of disciplinary constraints when doing so facilitates understanding the behavior of the various actors in drug regulation—the FDA, the pharmaceutical manufacturers, the physicians, the pharmacists, and the medicine-taking public. His concern is not whether the instrumental behavior mode is pertinent, but when.

Current drug policy is predicated on the assumption that individuals cannot be expected to act instrumentally in selecting medicines for self-treatment. This assumption appears to be correct at least for some modern medicines, for many diseases, and for most individuals. However, it does not necessarily follow that a paternalistic regulatory system can transfer the individual's proxy for instrumental behavior to those who can and will exercise it in his or her best interest.

Extensive pre-marketing assessment of new drugs is predicated on the assumption of physicians' incapacity to act instrumentally in choosing drugs for their patients. With very few exceptions, the patient population of a single physician provides an inadequate data base for determining whether or not a particular drug is an effective treatment for a particular disease. Hence, an FDA role in approving new drugs seems justified, but the appropriate character and amount of regulation are more problematic. For example, when is information on safety and efficacy sufficient for the physician to act instrumentally on the patient's behalf? Is the answer the same for subspecialists and for generalists?

As a patient, one might be reassured by the thought of a medical professional carefully choosing, from among a menu of medicines evaluated by the federal government, the one that is optimally suited to treat one's particular condition. Temin's review of the literature on prescribing behavior does not support this reassuring view of physician decision-making. Customary behavior based on community norms and personal habit is most common; instrumental behavior is the exception.

The patient is the subject of the command behavior of the physician. The logic of this hierarchical arrangement lies in the physician's superior knowledge about diagnosis and treatment and in the patient's psychological and physical vulnerability. But the patient's willingness to accept the hierarchy logically assumes that it acts instrumentally in his or her behalf. Temin argues persuasively that, in general, the medical hierarchy has neither the analytic framework nor the data to evaluate drug therapy instrumentally before issuing prescription commands to the patient.

Taking Your Medicine is a comprehensive and scholarly examination of the history and policy issues surrounding drug regulation. Temin uses the work of researchers from many disciplines extensively and effectively, but the most impressive aspect of the book is his own synthesis, which is an insightful policy analysis unhampered by disciplinary barriers that obscure facets of complex problems.

Temin's analysis of current regulatory policy alternatives is broadly in the instrumental mode, but it acknowledges the institutional and cognitive limits of the actors in the process. He presents a persuasive case for reforms such as more patient information to support more patient responsibility for risk-taking, less pre-marketing and more post-marketing surveillance of new drugs, and a system of phased or restricted release of new drugs that takes explicit account of differences in physicians' qualifications. In the past, such logically attractive proposals have unfortunately evoked customary responses from the various communities that are involved with drug regulation. *Taking Your Medicine* should convince some participants in the policy process to evaluate them more objectively.

ALBERT P. WILLIAMS
Rand Corporation,
Santa Monica, California 90406

A Simple Behavioral System

Bacterial Chemotaxis as a Model Behavioral System. DANIEL E. KOSHLAND, JR. Raven, New York, 1980. xiv, 194 pp., illus. $18. Distinguished Lecture Series of the Society of General Physiologists, vol. 2.

In Daniel E. Koshland, Jr., the field of bacterial chemotaxis has one of its most visible and vocal advocates. The strength of this book derives from his irrepressible enthusiasm about the beauty of biological mechanisms and the direct applicability of observations in bacterial systems to the complex problems of behavior in higher organisms. The weakness of the book derives from the compromises involved in its having been "written for both the educated layman and the specialist."

A common theme throughout the book is that the study of simple biological systems yields principles that can be applied to complex organisms. The first two chapters and the final chapter are aimed at the general reader. The first two introduce bacterial chemotaxis and may well seduce the reader into venturing into subsequent chapters. The final chapter, "Bacteria and higher behavior," discusses observations showing how behavior includes genetic and biochemical components and how defects in these components can result in abnormal behavior.

The bulk of the volume (chapters 3 through 7) is a description of the current understanding of bacterial chemotaxis, emphasizing the interests and contributions of the author and his laboratory. These chapters are directed toward readers with biological training, who will likely find much of interest in them. A chapter on adaptation, a central feature of most sensory phenomena, is weighted toward consideration of mathematical models for adaptation, which may slow down some readers. Since biochemical components are not as yet identified for most of the features of the models, I think the chapter would have been more informative if emphasis had been on the specific experiments that relate adaptation to protein carboxyl methylation. The correlation between the two processes is particularly relevant to the theme of the book, since this specific protein modification occurs in many higher cells but its role is understood only in bacterial chemotaxis.

The successes of molecular biology demonstrate the power of deducing principles from the study of simple biological systems and then applying those principles to the understanding of more complex systems. Koshland does a service in trying to communicate to the general reader that this strategy is likely to prove powerful in the study of behavior. As yet the only applicable lessons derived specifically from the study of bacterial chemotaxis are that the principles of molecular genetics and biochemistry established in the study of metabolism and macromolecular synthesis also apply to the components of a sensory system.

Throughout the book, examples of chemotactic studies are used to illustrate the way in which those principles apply to simple behavioral systems and might apply to complex systems. The fervor