into two parts: a little over half is devoted to basic principles, and the remainder applies the principles to particular kinds of situations. Thus, the first half is mainly concerned with properties of the ground, with atmospheric turbulence, and with radiation; the second half considers air flow, temperature, and moisture over bare ground, plants, water surfaces, and cities. Special sections are devoted to mountain-valley flow, sea breezes, and air pollution.

The book is most successful in its purely descriptive second part. In the first, largely theoretical part, it suffers from the necessity of having to cover difficult material in little space. The space problem is aggravated by the fact that terms familiar to meteorologists had to be explained to scientists in other fields. Thus most of the theoretical arguments are extremely brief and must appear rather mysterious to the uninitiated reader. Further, many of the arguments are inexact, and, on rare occasions, incorrect. The book is well written and printed, and unusually free from typographical errors.

H. A. PANOFSKY
Department of Meteorology, Pennsylvania State University, University Park

Irreversible Processes

Kinetic Equations of Gases and Plasmas. TA-YOU WU. Addison-Wesley, Reading, Mass., 1966. 304 pp., illus. $12.50.

A kinetic equation for a gas of classical point particles is generally understood to be an equation for advancing the one-body distribution function f_1 $(\mathbf{x},\mathbf{v},t)$ in time, according to the relation

$$\partial f_1/\partial t = F(f_1),$$

where $F(f_1)$ is some functional, generally nonlinear, of f_1. The example everyone knows is Boltzmann's equation, usually met for the first time in elementary statistical mechanics courses.

If one wants to improve, in any direction, upon the elementary intuitive picture of Boltzmann, the subject rapidly becomes more mathematical, and intuition must be used only with restraint. Even to derive kinetic equations (apart from the much harder problem of solving them) has been a problem upon which much energy has been expended since 1946. In one form or another, the starting place is usually assumed to be Liouville's equation and nonequilibrium ensemble theory. Wu's book is a collection of a large portion of the calculations which have been done along these lines.

The three physical limits which have received most attention are those of dilute gases (Boltzmann), weakly interacting gases (Fokker-Planck), and ionized gases (the "plasma" case). The plasma case has perhaps been the most tractable, partially because the linearized Vlasov equation (the low-density or high-temperature limit of plasma dynamics) is unique in being solvable by elementary means. The book being reviewed here reflects this emphasis in being devoted to a large extent to the plasma case.

Considerable space is devoted to the work done by Choh and Uhlenbeck, Guernsey, and others on the basis of the Bogolyubov "functional assumption." There is a presentation at some length of the Frieman-Sandri multiple-time-scale method (a generalization of the Krylov-Bogolyubov methods of nonlinear mechanics). There is an introduction to the Prigogine-Balescu diagrammatic perturbation theory. Some attention is given to the contributions of Cohen, Green, Dupree, and others. Finally, some connections are established between kinetic theory and macroscopic fluid dynamics.

The book is a useful one, designed for specialists. It contains a large amount of material. Particularly valuable is the rather comprehensive presentation of the important thesis of Guernsey, never published and now difficult to obtain. Some criticisms, however, must be added to these plaudits.

First, the book is more likely to be of use to someone who already has a fair grasp of the material than to a student in search of information. Insufficient attention has been paid to reordering and organizing the material to make clear which equations (among the—quite literally—thousands) the author regards as fundamental and which as peripheral: all are given approximately equal weight. Second, there is little indication that the quantities being calculated bear or should bear any relation to laboratory numbers. This is no real fault of the author's, in one sense: the increasingly refined calculations of transport coefficients which have preoccupied kinetic theorists of neutral gases for over a generation seem to have little relevance to the present rough-and-ready state of experimental plasma physics. But it seems that one ought at least to pay lip service to some happy future time when it will be possible to find more plasma quantities that are simultaneously measurable and calculable to better than order-of-magnitude accuracy. On this possibility the continued existence of plasma physics as a research area seems increasingly to depend.

DAVID MONTGOMERY
Department of Physics and Astronomy, University of Iowa, Iowa City

A British Physician

Dr. Thomas Sydenham (1624–1689). His Life and Original Writings. KENNETH DEWHURST, Ed. University of California Press, Berkeley, 1966. 201 pp. illus., $6.

As an outstanding figure in the evolution of British medicine, Thomas Sydenham has naturally received much attention from historians of medicine and science. Since the end of the 19th century there have appeared at least four biographies (Picard, 1889; J. F. Payne, 1900; Newman, 1924; Riesman, 1926). To these may now be added this edition of the original writings of Sydenham together with a biography prepared by Kenneth Dewhurst.

Primarily this volume is intended to present Sydenham's extant English writings. The fact is that his works were translated into Latin by various friends, and the subsequent English versions are retranslations into a smoother, less robust language than Sydenham had himself employed. To the original English versions of these items Dewhurst has added the extant letters. Payne referred to five letters; Dewhurst reprints 11 letters by Sydenham, as well as several letters and documents about him. The writings and correspondence comprise the second part of this book.

The first part is a brief biography which offers a background for the writings. Dewhurst has made use of the Lovelace collection of Locke's papers, incorporating some new material in his biography. Although he does not materially alter the picture of Sydenham's life presented by earlier writers, he does enrich our knowledge of various aspects, particularly Sydenham's medical practice and his relations with Locke. Furthermore, Dewhurst shows quite clearly that Sydenham

could not have been influenced by the French physician Barbeyrac, with whom he was alleged to have studied. The discussion of the influences on Sydenham's theory tends to be somewhat thin, however. For example, Dewhurst does not make clear that Sydenham was an Aristotelian in philosophy, who rejected the mechanical concept of nature but who recognized an order in nature expressed in a hierarchy of creatures. This position is most clearly stated in the *Theologia rationalis* reprinted in this volume. Indeed, Dewhurst hardly comments on this document. Yet he might have referred the reader to R. S. Westfall's *Science and Religion in Seventeenth-Century England* (Yale University Press, 1958), where it is discussed in an appropriate context, namely, the development of a concept of natural religion among the scientists of 17th-century England.

The other writings in the second part deal with the use of anatomy in medicine, coughs, smallpox, dysentery, intercurrent and intermittent fevers, pleurisy, the four constitutions, and the art of medicine. All in all this is a useful book to have and a welcome addition to the literature on Sydenham.

GEORGE ROSEN
School of Public Health and Administrative Medicine, Columbia University, New York City

Neoliberal Economics

Public and Private Enterprise. The Lindsay Memorial Lectures given at the University of Keele, 1964. JOHN JEWKES. University of Chicago Press, Chicago, 1966. 100 pp. $2.25.

Presumably the main object of an endowed lectureship is to give distinguished authors an opportunity to express their old ideas in a new and more palatable form for a more general public. These three lectures conform admirably to the purpose and may be strongly recommended to anyone who wishes to get the principal ideas of John Jewkes in a compact and attractively written form. Jewkes is perhaps the leading representative in England of what might be described as the "neoliberal" school of economists, who might be described perhaps as free-market Keynesians. They do not usually deny the necessity for economic policy designed to maintain full employment; apart from this, however, they are suspicious of the intervention of the state, particularly in regard to manipulating the price system. They are dubious of the value of planning, especially where this involves detailed forecasting; and they have a great deal of faith in what might be called a well-regulated invisible hand, with the price system performing most of the functions of the allocation of resources and even the distribution of income. The keystone of their attack on the planned economy is the virtual impossibility of detailed forecasting, and here, of course, it is very easy to collect and present horror stories of failures in forecasting, although it is not so easy to demonstrate that these have had any disastrous consequences. Jewkes's first lecture essentially deals with this problem. In the second lecture he goes on to analyze in greater detail the arguments in regard to the proportions of the economy which should be in public and in private enterprise. Here again the attack on the nationalized industries, mainly on the grounds that they are too large organizations and have diseconomies of scale, is fairly easily made. In this lecture there is also an attack on educational planning, which again is a favorite subject of the neoliberals. Jewkes, however, is much milder than some of the neoliberals. He would certainly not advocate turning education or health back to private enterprise, and seems to give at least a mild benediction to the present British model. The third lecture he devotes mainly to an attack on the "growthmanship" of the British National Economic Development Council (familiarly called Neddy), and it concludes with a plea for the civilizing effect of a free market as producing equality, status, a constant social learning process, and a distribution of the decision-making power. He concludes with a mild plea even for a free market in land.

This little volume is by no means a treatise, and it is not intended to be one. It is somewhat casual in its arrangement and by no means complete in its coverage of the subject. In a short space, however, it can give the reader a good deal of insight into a school of thought which should not be dismissed lightly, even if one does not agree with it; and it may be recommended on these grounds.

KENNETH E. BOULDING
Department of Economics, University of Michigan, Ann Arbor

Set-Theoretic Mathematics

Fundamentals of Abstract Analysis. ANDREW M. GLEASON. Addison-Wesley, Reading, Mass., 1966. 416 pp., illus. $13.75.

The purpose of this text is to explain the relation of set-theoretic mathematics to mathematics itself. The following excerpts from the preface are refreshing and give some indication of the views of the author and his purpose in writing this book:

> . . . the books [on "modern" mathematics] that I have seen all explain the axiomatic method, not the set-theoretic point of view. There are mathematicians who claim that there is no difference between mathematics and set theory. . . . No mathematician of my acquaintance would abandon his field if an apparently insurmountable contradiction were discovered in the general concept of subset. Obviously, mathematics has a real content which transcends the inadequacies of our efforts to formalize it. . . . It is unfortunate that the technical devices necessary to maintain an abstract approach often obscure the origins of the problems they are designed to handle. The result has been a widening of the intellectual gap between pure and applied mathematics . . . Those who find the precision of set-theoretic formulations fascinating often lose sight of mathematics itself, while those who are repelled by formalisms often dismiss all abstractions as mere axiom-pushing and turn a blind eye to the insights that abstraction may provide. . . . I do not suggest any retreat from abstraction, far from it, but I do believe that our students will find set-theoretic mathematics easier to understand and at the same time more valuable if it is presented with a frank acknowledgement that it is only one of the possible ways to record mathematical ideas. . . . It is a very abstract and highly formalistic book, but at several strategic places I have tried to point out how formalism is related to the elusive "real mathematics" which exist only in our intuition.

The basic ideas in this book should be mastered by all students who desire to become mathematicians. The book is a welcome addition to the class of "modern" mathematical texts concerned with the foundations of mathematical analysis and should prove to be one of the best in this category. It can be recommended not only to the student of mathematics but also to the philosophically inclined nonmathematician. The book will do very little to bridge the gap between pure and applied mathematics, but this appears to be not the author's intent.

MAGNUS HESTENES
Department of Mathematics, University of California, Los Angeles