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Write Princeton Applied Research Corporation, Scientific Instrument Division, P.O. Box 2565, Princeton, New Jersey 08540, or telephone (609) 452-2111. In Europe, contact Princeton Applied Research GmbH, D8034 Unterpaffenhofen, Waldstrasse 2, West Germany.

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Three short reviews of recent developments complete the book. One, on new vacuum pumps, gives a useful overview, but little critical guidance of the practical advantages. The second review provides thumbnail sketches of instruments for surface analysis and gives reference to extended reviews of each. The final article, on sputtering, is interesting but probably misplaced in a manual that otherwise ignores thin-film technology. The handbook on this latter subject edited by Leon Maissel and Reinhard Glang provides a more informative text.

The early sections and tables in this manual use SI units, a valuable point since the conversion from Torr to Pascal is inevitable; unfortunately, the text reverts to older units at an early page. The book contains innumerable typographic errors and, despite some good sections, remains a disappointment.

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Galileo: A Philosophical Study

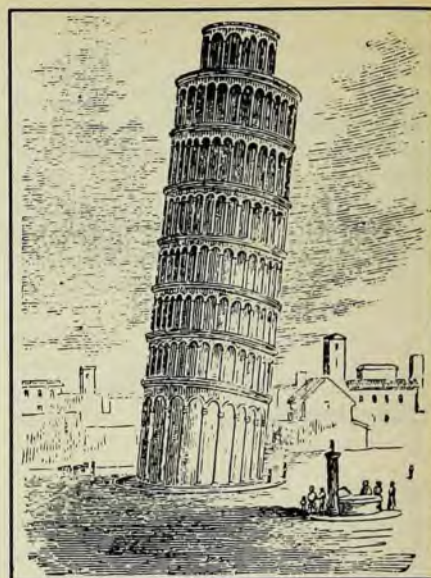
D. Shapere

161 pp. U. of Chicago Press, Chicago, 1974.
\$9.75 hardcover, \$2.95 paperback

Galileo continues to be a source of endless fascination for many historians and philosophers of science. One of the latter, Dudley Shapere of the University of Illinois, has thus chosen some aspects of Galileo's studies in motion for the first of a series of examinations of "important episodes in the development of science . . . which are of relevance to the philosophical questions concerning the rationale of the scientific enterprise."

One of the major issues of contention in interpretations of Galileo has been the significance for him of the ideas of Plato and Aristotle. Shapere provides a valuable background for this issue by analysing the views of nature held by these two Greeks. In addition he examines various theories of impetus held by several medieval thinkers, especially John Buridan and Nicole Oresme. Shapere continues with a brief study of Galileo's early thoughts on motion, which, he says, consisted of applying principles of Archimedean analysis to the Aristotelian view of natural motions, combined with one version of impetus theory.

Shapere then examines Galileo's mature studies of motion, especially with regard to the extent to which Galileo did or did not possess a clear idea of inertial motion. Shapere's interpretation revolves about his conviction that circular motion was central to Galileo's view



of the universe. He cites numerous passages to argue that Galileo could not break the spell of circularity, and treats Galileo's straight lines as approximations to arcs of large circles. But Galileo's occasional use of tangential motions never qualify as inertial for Shapere, because they are "the result of an acquired impetus."

Shapere examines and rejects the earlier interpretations of Galileo, such as the empiricist version of Ernst Mach, and the Platonist version of Alexandre Koyré. He finds that Mach paid too little attention to the debt that Galileo owed his predecessors, and that Koyré's apriorist views are not suitable either for Galileo or for physics. Shapere suggests that Galileo may have used hypothetico-deductive analysis, and that experiments "could have been important in his achievements."

By concentrating on the unity of Galileo's world-view (held together by circles), Shapere continues the view of Galileo as philosopher that has become so popular in recent decades. Shapere seems to have cleared a lot of weeds from the field of Galileo studies, but the tender shoots he has left appear pretty sparse.

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Nonequilibrium Statistical Thermodynamics

D. N. Zubarev

489 pp. Consultants Bureau, New York, 1974. \$25.00

D. N. Zubarev is well known for his many important contributions to statistical physics. His book is very well prepared, referenced and edited, and also

very well translated from Russian by P. J. Shepherd. In the first three chapters (half the book), Zubarev discusses the basic foundations of statistical mechanics dealing with classical and quantum systems in equilibrium and driven by mechanical perturbations. The last chapter details the method of the nonequilibrium statistical operator, which was principally developed by the author and his research group.

Throughout, discussions are thorough and thoughtful with logical and straightforward presentations. The college professor who teaches a course in statistical physics at the upper undergraduate or first-year graduate level may find the first half very helpful because Zubarev discusses many questions about the foundations of statistical mechanics that are glossed over in standard textbooks—and he clearly points out what has been established and what has not. In other words the book serves as a first-rate reference about these questions.

The second half is considerably more difficult to follow; it deals with more complicated nonequilibrium processes. He introduces the more involved physical concepts as well as the more sophisticated mathematical tools. This part will be useful for study by advanced graduate students and researchers. In summary, the monograph is an excellent addition to the growing literature in nonequilibrium statistical thermodynamics.

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Introduction to Quantum Optics

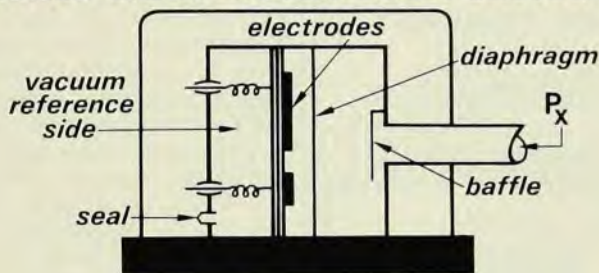
H. M. Nussenzveig
246 pp. Gordon and Breach, New York,
1973. \$19.95

Physics has been profoundly influenced in the last three decades by the availability of sources in different octaves of the electromagnetic spectrum. The 1950's saw the application of coherent radio and microwave radiation to the elucidation of atomic, molecular and even field-theoretic physics. Nuclear magnetic resonance is a prime example of the first two, while the Lamb shift and anomalous moment of the electron shook field theory out of the doldrums. With the advent of the laser in the early 1960's physics again took a great leap forward. As an intense source of electromagnetic radiation, the laser led to the field of nonlinear optics, and its unique coherence properties led to many fascinating phenomena such as photon echo, self-induced transparency and optical nutation. The great bulk of

the electromagnetism mentioned above is most appropriately described via the classical Maxwell equations. However, in many laser-based problems, the quantum nature of the electromagnetic field is apparent; this observation has occasioned much study over the past ten years. For example, the fundamental understanding of the linewidth and photon statistics of laser radiation requires the quantum theory of radiation. It now appears likely that the 1970's will see the advent of the x-ray laser and the quantum properties of the emitted radiation will be of even greater interest.

It is in this context that H. M. Nussenzveig's *Introduction to Quantum Optics* fits. It begins by developing the notion of coherence in the electromagnetic field both classically and quantum mechanically and applies these concepts to such topics as laser theory and superradiance. It is perhaps worth noting that "Dicke-superradiance" has not had much impact on laser physics to date, but with the advent of uv and x-ray lasers (involving swept excitation), it promises to be of considerable interest. This has been borne out by recent studies. Nussenzveig has consistently aimed his presentation at the maximum

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