used that way. Rather, I believe, it is meant to remind one of a formula with which one is already vaguely familiar and give its exact form, including the constants which one is likely to forget.

Personally, I have never succeeded in using a book such as the present one because, in the absence of a derivation, I always felt unsure of the range of validity of the equation. Also, without the derivation, the formulas appear to me lifeless, not expressions for an actual relation. Surely, I am not typical and others have greatly benefitted from collections of formulas of this nature. I opened the book at random and was confronted with the formulas for integral transforms. The first two, the Fourier sine and cosine transforms, were familiar to me; but I wonder whether the reader who is unfamiliar—and for whom, presumably, the formulas should be useful—can guess what their range of validity is in the cruder sense (x, y real and positive) and what their range of validity is in the more subtle sense, as square integrability or continuous nature of the functions. Neither type of condition is mentioned. Only the second, and perhaps for a physicist less serious, problem arises with respect to the third example, the exponential Fourier transform. The first type of problem returns, however, with the fourth example, the one-sided Laplace transform. In addition, the second formula contains a constant c, the meaning of which is not stated and its position with respect to the singularities not given. The same applies to the fifth example, the two-sided Laplace transform. If one is not familiar with these formulas, particularly that for the one-sided Laplace transform, it is definitely misleading, as a comparison with the formula for the two-sided Laplace transform reveals. I dare not criticize the other six examples because I am not sufficiently familiar with the transformations involved. However I surely would not dare to use them.

A few pages further on, where a great number of explicit formulas are given, the criticism is surely inapplicable. The authors are distinguished mathematicians who know their subject very well, and this reviewer is sure that their book will be used to great advantage by many. Nevertheless, this reviewer continues to believe that collections of formulas would be more useful if a reasonably serious attempt were made to specify the range of validity of all the equations and to provide some little background for them. For total given page number, this would require some restriction on the number of subjects treated. Opinions will differ whether it would be worth taking such a restriction into the bargain.

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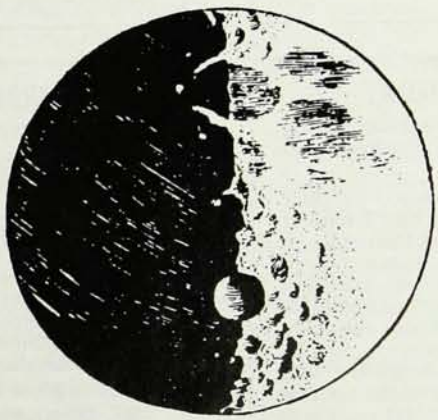
Have you read . . . ?

GALILEO GALILEI: HIS LIFE AND HIS WORKS. By Raymond J. Seeger. 286 pp. Pergamon Press, Oxford, 1966. Paper $3.50

by M. W. Friedlander

Students of literature read the classics of their languages, but how many physicists have read Galileo, Newton or Maxwell? The book under review is one of a new series, *Selected Readings in Physics*, in which over a dozen books have so far appeared. "The purpose of the series. . .is to present a set of reasonably priced books which give. . .reprints of those papers which record the development of new ideas. . . ." One can go further: Not only is it good for students to see the development of their subject but also to sample styles that are mercifully far removed from most of today's jargon and pomposity. How often do we find among the acknowledgements to a paper one such as that by Maxwell: "Mr. Gassiot, with his usual liberality, placed at my disposal his magnificent battery of 2600 cells charged with corrosive sublimate."? Instead, we have to suffer through "The audience for these studies are biological and physical scientists, working under the canvas of many important Government programs, who are willing to share in or partake of the adventure of helping a biological systems science to burgeon." (From a NASA report.)



THE MOON. This drawing was made by Galileo from telescopic observations.

Unfortunately there are probably few physicists who have read Galileo's works. Modern editions are available (some in paperback form), but the leisurely pace of exposition makes random sampling inefficient though enjoyable. Selections have appeared in various anthologies, but the volume under review is unique because it presents, with care in selection and with annotations, many selections in a single booklet.

Raymond Seeger has written extensively on Galileo and has performed a fine service with this collection. I can well imagine using it as an adjunct to courses in the history of science, and I shall probably use sections of it myself in a course for nonscience majors. Since most of the book consists of Galileo's writings, my comments are in the main on the actual choice and on the notes.

Four introductory chapters set the stage by discussing Galileo's career, both scientific and political. These sections are brief—perhaps a shade too brief—with a total of only 37 pages. For instance, when mentioning the 1604 nova (p. 12), he could have appealed to modern interest by pointing out that this is now known as Kepler's nova; as one of the strong radio sources and one of only three recorded supernovae in our galaxy, it is an object of considerable interest. The description of Galileo's troubles with the Church can hardly be more than an outline, but I am surprised that there is no mention that an additional factor was Galileo's choice of popular Italian rather than scholarly Latin for his major work.

The discussion on Kepler and the invention of the telescope (p. 15) is misleading: It seems as though Kepler's failure to construct his own device prevented him from making ob-

servations. In fact, Kepler *did* make observations, also in 1610, with a telescope made by Galileo and lent to him by Elector Ernest of Cologne; thus he was able to show that Jupiter's moons obey recently deduced planetary laws.

The bibliography is disappointingly confined. Obvious works are cited, but, surprisingly, Koestler's readable *Sleepwalkers* is not included nor are any references to journals. There have been numerous articles, for example in *Sky and Telescope* and in the *American Journal of Physics*, that could have been included. One might also have wished to find a few references to associated workers—Brahe, Kepler, Newton—for additional reading.

As regards the extracts themselves, a good cross section is presented: mechanics, hydrostatics, machines, kinematics, astronomy. These extracts give a vivid picture of the range of Galileo's interests and styles. Chapter 6, though, from the *New Sciences*, starts at a poorly chosen place. The original has a preceding diagram without which the quoted section is almost meaningless. Chapter 9, "Apparent Lightness" (by far the longest section), is from "On Motion and Mechanics," as is Chapter 13, "The Screw as a Machine." For the latter, it would have been worthwhile to include some of the footnotes of Drabkin and Drake, who prepared the translation. Chapter 16 draws together extracts from several sections of the *New Sciences* and then presents them as a single portion, but the resulting discontinuities could have been indicated for clarity. The extracts starting on pages 207 and 236 should show that the speaker is Salviati. Chapter 18 also runs together some sections not originally contiguous but fails to mention that they are taken from *Siderius Nuncius* (the reference quoted covers many other works in addition).

Despite these detailed criticisms, this should still be a most useful volume. It makes more accessible such gems as Galileo's description of accurate weighing with a fine wire wound round a balance arm for measurement of the pan position: "Since the wires are very fine, as is needed for precision, it is not possible to count them visually, because the eye is dazzled by such small spaces. To count them easily, therefore, take a most sharp stiletto and pass it slowly over said wires. Thus, partly through our hearing, partly through our hand feeling an obstacle at each turn of wire, we shall easily count said turns."

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Stat mech and thermo: integrated

FUNDAMENTALS OF STATISTICAL AND THERMAL PHYSICS. By Frederick Reif. 651 pp. McGraw-Hill, New York, 1965. $12.50

by Stuart A. Rice

It is often said that one cannot fully understand the implications of thermodynamics until one has studied statistical mechanics. Despite the wide currency given this statement, few elementary treatments of these subjects attempt an integration and synthesis. At first sight it might appear that the complications of statistical-molecular theory are such as to defy presentation at an elementary level. Moreover, integration of thermodynamics and statistical mechanics raises important pedagogical questions with respect to division of emphasis between study of general theorems and specific molecular models. That both of these difficulties can be overcome is triumphantly demonstrated by Reif in *Fundamentals of Statistical and Thermal Physics*, a text designed for third-year undergraduate physics students.

The text begins with the nature of the statistical description of systems of particles, including a careful discussion of the nature of ensembles and constraints. It is at this stage that the fundamental postulate of equal a priori probabilities is introduced. The thermal and mechanical interactions between two systems are studied from the point of view of changes in the occupation and structure of the energy-level spectrum, and entropy is first introduced in a study of the properties of the distribution of energy between two interacting systems. Included in the general presentation are incisive descriptions of properties of the absolute temperature scale, heat reservoirs, fluctuations and stability conditions, and the limiting behavior of the entropy as absolute zero is approached. Chapter four, which deals with the macroscopic definitions of heat, work, etc., is in my opinion weaker than the preceding chapters. Reif uses a logically satisfactory method of constructing an internal-energy function, but mars the generality of the treatment by referring to the previous statistical definition of heat. Similarly, the importance of the second law of thermodynamics in defining the absolute temperature scale is not emphasized. I wish to emphasize that these comments refer only to matters of preference and are not intended to imply that there are errors in the text.

Chapters five through eleven are concerned with various applications of thermodynamics and statistical mechanics to systems of interest, for example, ideal gases (5,9), black body radiation (9), conduction electrons (9), solids (10), classical nonideal gases (10), magnetism (10,11). Interspersed with numerous digressions on subjects of interest in chapters five, six, seven and eight, is a considerable amount of general material dealing with thermodynamic relationships in homogeneous substances, properties of the canonical ensemble and canonical partition function, a brief description of the grand canonical ensemble, a discussion of the Gibbs paradox and the equipartition theorem, elementary kinetic theory of gases, phase equilibrium and chemical equilibrium in gases.

Chapters twelve through fifteen are concerned with transport phenomena: An elementary treatment is given in chapter twelve, a somewhat more sophisticated relaxation-time theory in chapter thirteen, and a description based on the full Boltzmann equation in chapter fourteen. Chapter fifteen discusses linear response theory and several examples of irreversible processes, for example, Brownian motion.

One of the most satisfactory features of Reif's book is the use of interspersed interpretive remarks and worked examples. These are set apart in the text by background boxes col-