himself on the matter of whether or not we can see surface waves on water. Likewise, his definition of a wave as "something that can be treated by wave mathematics" seems less satisfactory for his purpose than the common dictionary one of a wave as a motion periodic in space and time.

The book ends with an index, a list of symbols, and a short but far-flung bibliography. One might have to travel a long way to discover a copy of his first reference, *Waves and Ripples in Water, Air, and Aether*, London Society for Promoting Christian Knowledge, 1912. The text contains about a hundred line drawings which are very useful, and 4 plates which are fair. In general, I think the author and publisher have produced a worthwhile and inexpensive book.

Statistical Thermodynamics. By John F. Lee, Francis W. Sears, and Donald L. Turcotte. 374 pp. Addison-Wesley, Reading, Mass., 1963. $10.75

Equilibrium Statistical Mechanics. By Frank C. Andrews. 206 pp. Wiley, New York, 1963. $5.00

Reviewed by Joseph L. Katz, University of Copenhagen.

During the last four years several good introductory statistical mechanics textbooks have been published. To the growing list of worthwhile texts these two books must be added.

Statistical Thermodynamics is a well-written careful survey of the applications of statistical mechanics, but its discussion of the basic ideas is very brief, and its proofs are of the Lagrange-multiplier hand-waving type. In reality the reader is asked to accept the dubious foundations because of the excellent agreement with experiment. The agreement with experiment is very thoroughly documented, better than in almost any other text, as the reader works through chapters on the kinetic theory of gases, the Einstein and Debye crystals, fluids, chemical equilibria, and almost all the other easily solved problems in statistical mechanics. It even includes two well-written chapters on fluctuations and irreversible systems, covering Brownian motion, Johnson noise, the Onsager reciprocal relations, and related phenomena. In their preface the authors clearly indicate that this book is intended as a text for engineering students. For engineering students, for organic and biochemistry majors, and for any other science students who wish to learn the applications, but not the foundations of statistical mechanics, thoroughly and with a minimum of effort, this book can be highly recommended.

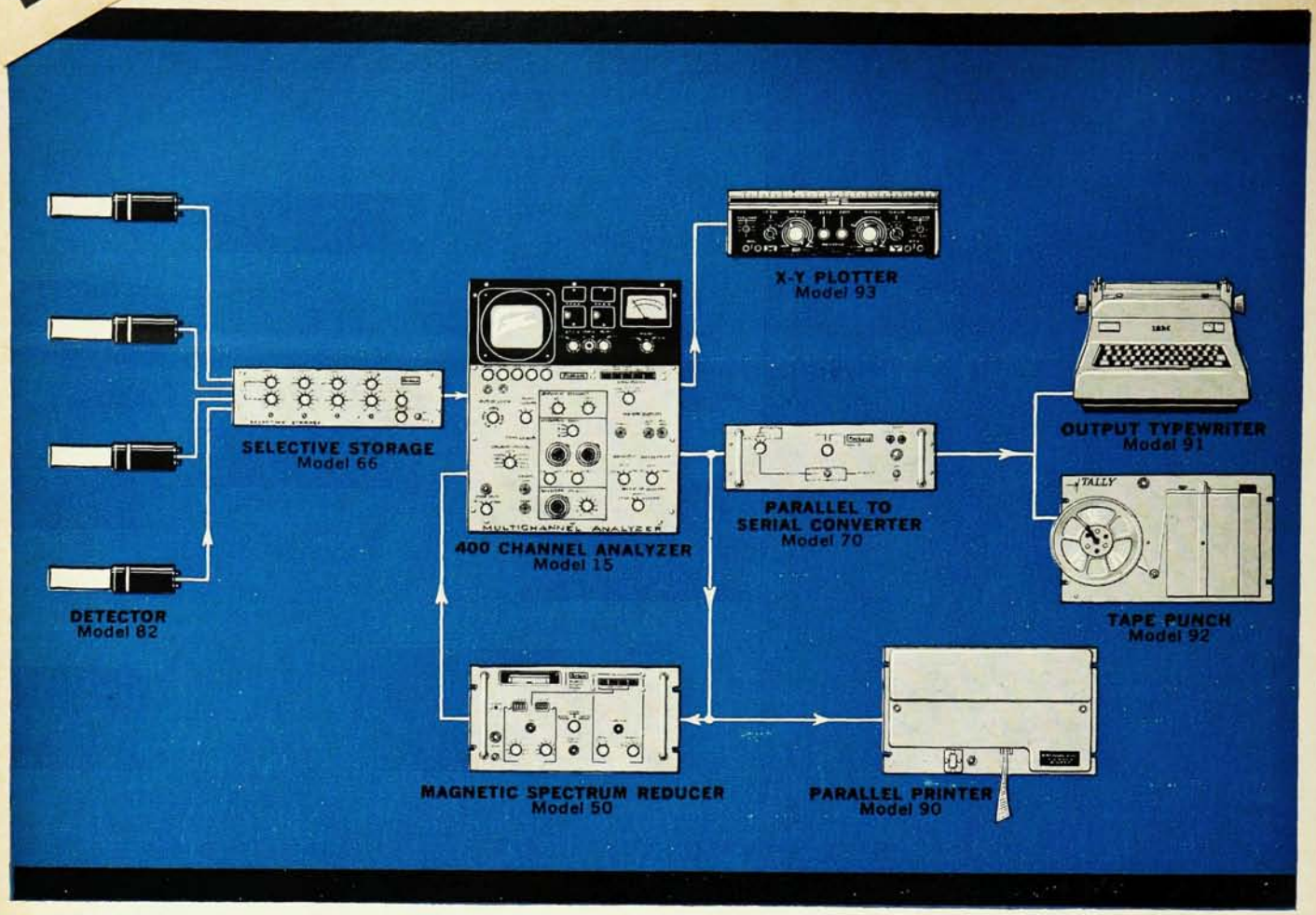
Equilibrium Statistical Mechanics perfectly fills the void left by the above book. It is a thorough text which does a good job of covering the fundamentals. The book is brief (only 200 pages) and cheap, an added attraction with today's high textbook prices, but still manages to cover all the traditional topics: the ideal gas, both classical and quantum, metals, the photon gas, perfect crystals, and dense fluids. There is no hand waving here. The derivation of the canonical distribution, for example, is rigorously obtained in only one page, and without the use of Lagrange multipliers. Because of the large number of topics covered in such a brief volume, and to some extent, because of the author's almost completely successful attempt at rigor, large parts of this book are too difficult for the beginner. I strongly recommend this book, but only as a refresher text for someone who has already had an introductory course, or as the text in a course where the instructor will greatly expand the material in his own lectures.

Mass Spectrometry of Organic Ions. F. W. McLafferty, ed. 730 pp. Academic, New York, 1963. $24.00

Reviewed by Stuart A. Rice, University of Chicago.

This compendium of articles on mass spectrometry comes close to achieving the aims set forth in the preface: the volume is, it is stated, intended to give comprehensive and up-to-date reviews of particular fields of mass spectrometry and to provide other scientists with references to the theory and applications.

The first few chapters give good surveys of the quasi-equilibrium theory of mass spectra and of ion molecule reactions. In suggesting these articles to graduate students, I have found the second subject to be much more clearly presented than the first.



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A large number of articles deal with the problem of determining the structure of organic molecules from fragmentation patterns. Considerable space is devoted to correlations of spectra with structure and related problems, and numerous examples are given for a wide variety of classes of compounds. There are, in addition, surveys of appearance potential data for organic molecules and negative ion mass spectroscopy. Since I am not an expert in mass spectroscopy, I can judge most of the volume only in terms of the second aim and I believe that the editor has succeeded there.

For a physical chemist or physicist, the articles of greatest interest are those concerned with ion-molecule reactions and kinetics. These surveys should do much to stimulate work on problems related to chemical kinetics.

Astrophysics. The Atmospheres of the Sun and Stars (2nd ed.). By Lawrence H. Aller. 650 pp. The Ronald Press Co., New York, 1963. $15.00.
Reviewed by M. F. McCarthy S.J., Vatican Observatory, Castel Gandolfo, Italy.

One of the outstanding astronomical lacunae after the last war was the lack of a reasonably modern compendium of astrophysics in English. With the first edition of the present work in 1953, astronomers were presented with the first adequate coverage of both the fundamentals and the current developments in the study of stellar and solar atmospheres. The scope of the revised and amplified (138 additional pages) edition remains the same: to present the basic data and principles of the physics required for a study of stellar atmospheres, together with a description of the practical methods in current use. These include, besides the fundamental methods of spectrum analysis, the newer tools of radio astronomy, plasma physics, and space probes.

Among the many additions and improvements in the text, the following are noteworthy: an illuminating description of term splitting in isoelectronic sequences; a fuller treatment of statistical mechanics and of the relation of gas pressure and electron pressure to the chemical composition of the gas; an extension of the treatment of the continuous absorption coefficient of atomic hydrogen; a detailed exposition of methods used to evaluate the temperature distribution in the sun; a brief but clear analysis of nonthermal emission and synchrotron radiation; a comprehensive survey of methods for classifying stars according to temperature and luminosity criteria with special reference to the differences in chemical composition observed in certain types of stars; the addition of a description of energy measurement in the rf region. All these changes, plus generous references to basic papers and monographs, increase very much the value of this edition. The prominence accorded by the author to the work of Kolb and his associates is well deserved; this theory, developed in the years since the publication of the first edition, has been too long overlooked by most astronomers.

Several improvements in the presentation of material are noted. The author places the diagrams of relative strengths for LS coupling in an appendix and has added a bibliography and an index of symbols to the indices of names and subjects. The general quality of the reproduction of photographs throughout this edition is poor and should be improved in subsequent printings; the plates reproduced on pages 7, 92, 391, 396, 445, and 460 are of extremely inferior quality. Readers will do well to refer to the photos in the first edition or to the original sources.

As the best available survey in English of practical and theoretical physics of stellar atmospheres this book will be read and used by Professor Aller's colleagues including an ever growing number of physicists who are contributing their talents and energies to the growth and development of modern astrophysics.

Self-Organizing Systems 1962. Marshall C. Yovits, George T. Jacobi, Gordon D. Goldstein, eds. Conf. Proc. (Chicago, May 1962). 563 pp. Spartan Books, Washington, D. C., 1962. $12.00.
Reviewed by Joseph G. Hoffman, State University of New York at Buffalo.

The title is provocative; and the subject has interdisciplinary ramifications extending to mathematics, physics, biology, psychology, engineering, and neurophysiology. There are twenty-six papers that touch on information theory, logic, and even philosophy. Whatever classification one finally accepts for this subject, its newness and range of imagination are exciting.

The preface gives a definition as follows: "A Self-Organizing System is a system which changes its basic structure as a function of its experience and environment." A perfect example of a self-organizing system, given by D. M. MacKay in this chapter on "Self Organization in the Time Domain", is a growing crystal. He also points out that there are two fundamentally different kinds of self-organizing systems: the first is "a typical self-optimizing process-controller" which is usually a complex gadget whose goal-structure is imposed externally. This might be a quality control machinery involving the measurement and optimization of several parameters. The second is much more complex and has an internally evolved goal-structure, which in living systems, for example, has yet to be discovered. MacKay points out that these two "form the extremes of a continuum along which lie most of the human and artificial situations which are our present concern".

The description of the self-organizing systems in the broad continuum from man-made devices to man himself is the job at hand. And the concepts presented here are fascinating. Four chapters deal with the most famous of all such systems, the human neurologic system. Then there are remarkable models based on current knowledge of neurology: there are two chapters, one each on the Neuristor and the Adeline neuron, and two chapters on the Perceptron. For the newcomer these chapters afford a clear and concise description of the gadgets that man thinks resemble the physical devices by which he thinks. It should be said that much of the book deals with current concepts of how man can think. One encounters questions like: "Does consciousness exist?"

One direct approach to the problem of living things, for example, is given by H. J. Bremermann in "Optimization Through Evolution and Recombination". Given that evolution is a fact, he calculates basic rates of information processing known to be