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 feasible in any material system. He squeezes the available numerical data hard until only speculation remains. In another phase of living things, L. Brillouin examines "Information and Imagination Theories", in an assessment of the limitations of thought and of imagination.

I recommend this book for its presentation of many new ideas. Those readers not familiar with the subject may need to learn some new words necessary to describe new concepts. The expert will find here an excellent summary, as of 1962, of a flourishing science. The format is excellent, but there is no index.

Relativistic Kinematics. A Guide to the Kinematic Problems of High-Energy Physics. By R. Hagedorn. Part of the series Lecture Notes and Supplements in Physics, John D. Jackson and David Pines, eds. 166 pp. W. A. Benjamin, Inc., New York, 1963. $8.00
Reviewed by Ernest P. Gray, Applied Physics Laboratory, The Johns Hopkins University.

Here is a book that should be on the shelf of anyone who has ever struggled through relativistic coordinate transformations—so simple and elegant in principle, yet often so involved and tedious in practice. The key virtue of Hagedorn's refreshingly informal volume is his ability to drive home to the reader the most important trick of the trade: the great economy to be derived from a determined use of relativistic covariance and invariance whenever feasible. The usefulness of applying these concepts is well known, of course. But in no other book known to the reviewer are they applied so consistently and with such manifest relish.

The book is an edited and slightly enlarged version of a set of lecture notes for an informal course given by the author at CERN, Geneva, during 1961-62. The author states in the preface that his aim was to provide "an aspirin for the kinematic headaches" of experimental high-energy physicists, and to impart the know-how to "prevent a recurrence". In meeting these objectives the author has succeeded handsomely.

Hagedorn starts out with the development of standard relativistic kinematics. Even here he takes a somewhat unusual approach by his immediate emphasis on the central position of relativistic invariance. Thus the Lorentz transformation is derived from the form of the invariant line element, itself a direct consequence of the constancy of the velocity of light in all inertial systems. After this introduction, he proceeds to illustrate the manifold uses of invariants by means of numerous interesting examples worked out in detail. Among these are center-of-mass transformations, the transformation of cross sections, and the change of the shape of a momentum spectrum under a Lorentz transformation.

One interesting chapter is devoted to coordinate systems and variables. The three systems most convenient for the usual collision and particle production problems—the laboratory, center-of-mass, and "brick wall" systems—are described and interrelated through the use of invariants. The s, t and u variables—each the square of the center-of-mass energy for a different observer—which are used, for example, in formulating the theory of Regge trajectories, are introduced, and interpreted graphically and through physical examples.

In another chapter, some of the uses of invariant phase space are described, and illustrated by a consideration of the mass distribution of groups of particles resulting from high-energy collisions. This distribution will be governed, in general, partly by the dynamics of the collision (i.e., the matrix element) and partly by the kinematics. In many situations the kinematical factor dominates, leading to a "pure phase space" distribution. Thus it was through the appearance of sharp peaks above the background of "pure phase space" in the mass distribution of certain groups of reaction products that the ω-meson and some of the other recently discovered resonances were first identified. Another illustration of the power and utility of this type of phase space averaging is the Dalitz plot for the energy distribution of three reaction products, which has been used, for example, to determine the spin and parity of the ω-meson.

Perhaps the most interesting chapter is the last one, where Hagedorn