a specific topic is provided by the next chapter, by June East, on "Immunopathology and neoplasms in New Zealand black (NZB) and SJL/J mice." However, just as Schlesinger's chapter is mostly devoted to antigens other than those associated with neoplasia, so much of East's paper is necessarily devoted to a general description of the immunopathology of the NZB mice, because relatively little is known about nonreticular tumors in these animals. The chapter gives enough of a general discussion of the immunological distortion in these animals to show how the different aberrations can be distinguished by comparisons between NZB and SJL strains, and presents some interesting data on the appearance of malignant reticulum cells, not known to be plasma cell precursors, in a lymphoproliferative spleen. Parts of this article are quite detailed, but as a whole it gives insights into differences in the immunopathology of spleen, lymph node, and thymus.

"Lymphocyte proliferation and lymphoproliferative disorders," by H. Rubin, L. I. Johnson, and S. M. Brown, is in part a general survey of these disorders but deals in considerable detail with ribosomal and RNA changes in lymphoid malignancies. There are several disturbing errors, for example the statement that "in the presence of PHA 60 to 80 percent of normal blood lymphocytes transform into DNA synthesizing blast cells in 2 to 3 days," the 60 to 80 percent having been shown by several excellent kinetic studies to be the result of clonal proliferation of a responding population. Such inexactitudes detract from the value that can be placed upon this otherwise most interesting paper, which does, as the editor claims, give the beginning of an understanding of the molecular biology of the phenomena.

As a whole the book does not give an adequate representation of the emphases and developments in tumor immunity. Perhaps it was felt that such topics as the carcinoembryonic antigen, the development of information about the cytotoxic effects of lymphocytes from cancerous subjects, and the blocking of these effects by serum have been adequately covered in other sources. In all, a very readable book, misleading in part, but also instructive and innovative.

D. BERNARD AMOS
Duke University Medical Center, Durham, North Carolina

Metabolism of Plant Organs

The Biochemistry of Fruits and Their Products. Vol. 1. A. C. HULME, Ed. Academic Press, New York, 1970. xxii, 620 pp., illus. $30. Food Science and Technology.

About 50 years ago physiologists investigating the process of fruit ripening for the first time considered it a special aging phenomenon. They used the word "climacteric," with the meaning of "change in life," to designate biochemical changes taking place during ripening. With our increasing insight into particular aspects of the aging of plant organs, we now realize that fruit ripening is not distinctly different from other aging processes. The biochemical pathways, the induction of hydrolytic enzymes, and the changes in the respiratory patterns are very similar to those in other senescing organs. This has made the writing of this book difficult, but the result is very valuable. The authors, with the skillful guidance of the editor, have produced more than merely another plant biochemistry book. This is to say that the editor has carefully selected the topics, and the contributing authors have been so adept that the reader finishes the book with the feeling that he has read a book about fruits and not about general pathways common to many plant organs. At the same time, those who are interested in the pathways themselves will get detailed information.

Any book written by a group of authors will contain variations in its treatment of the subject. The chapters that are selected as best will depend on the reader. One certainly should mention the chapter on lipids by P. Mazliak and the chapter on physiology and nutrition of developing fruits by E. G. Bollard as clearly outstanding.

The book, of course, has shortcomings. I, for one, would like to see an anatomical discussion of the substructure of fruit cells. Most readers probably would not know that most of the mature fruit cells are filled with a single vacuole, nor would they know the biochemical consequences of this. Other shortcomings of the book are the chapters on physiological disorders of fruit after harvesting and on apple scald. Although much is known about the biochemical aberrations leading to physiological disorders, these chapters do not discuss them in depth. The authors consider only the inducing factors and never mention that the fruit can be protected if certain pathways are operational and that some of these pathways can be induced.

In the chapter on hormonal factors in growth and development, only the most general physiology, rather than fruit physiology, is discussed. Although the information presented is interesting, the authors include results obtained with corn kernels, bean seeds, pharbitis seeds, lupin seeds, and bean endocarp, which only loosely can be classified as fruits.

Other chapters deal mainly with the chemistry of the groups of compounds found in fruits, with special reference to their specific roles in the fruit metabolism. The reader will find a wealth of information in the book about sugars, amino acids, proteins, phenolic compounds, pectins, aroma components, carotenoids, and vitamins in addition to enzymatic and hormonal changes occurring during critical stages of maturation and senescence.

The present work and probably its companion volume to come will be among the most effective and widely used books on this subject. This volume stands by itself, however, and can be highly recommended to all plant physiologists and biochemists, student and professional alike, who have an interest in the physiology or biochemistry of fruits.

MIKLOS FAUST
Plant Science Research Division, U.S. Agricultural Research Service, Beltsville, Maryland

A 1969 Flare

Intercorrelated Satellite Observations Related to Solar Events. Proceedings of a symposium, Noordwijk, the Netherlands, Sept. 1969. V. MANNO and D. E. PAGE, Eds. Springer-Verlag, New York, and Reidel, Dordrecht, 1970. xvi, 632 pp., illus. $38.20. Astrophysics and Space Science Library.

A solar flare is the most cataclysmic event that occurs in our solar system. Typically an energy equivalent to 10 billion 1-megaton hydrogen bombs is released in less than 15 minutes. Despite the enormous quantity of data already collected, the basic physics involved in the flare process is still the subject of much acrimonious debate.

The problem lies with the fragmentary nature of the observations. Different observers look at different

events with different techniques and get different results. What is badly needed is a serious attempt at intercorrelating many different observations of the same event. This book is the proceedings of a symposium whose purpose was precisely that.

The event chosen for study was the 2B flare of 25 February 1969. Unfortunately there were four other flares from the same active region within 24 hours of the 2B flare. As a consequence it is difficult to determine which flare caused some of the delayed events (for example the shock wave), although for the majority of observations there is no ambiguity.

The first half of the book is devoted to a series of review papers concerned with the various effects produced by flares. The important subjects of solar x-rays, energetic particles, and changes in the solar wind are well summarized by C. de Jager, F. B. McDonald, and A. J. Hundhausen respectively. The earth's magnetosphere, bow shock, magnetotail, and ionosphere all respond to solar flares, and there are several review papers about each of them. There are two noteworthy shortcomings in the first half of the book. Some of the review papers are extremely narrow in perspective, amounting to little more than presentations of the authors' own data. Furthermore, the inclusion of at least one discussion of the numerous current theoretical ideas about the physics of solar flares would have been desirable.

The rest of the book consists of short contributions describing a variety of observations of the 25 February flare. About half of them present satellite and rocket data giving time histories, fluxes, anisotropies, and energy spectra of the solar protons, electrons, and alpha particles. The combined coverage is extensive (for example protons are observed over a range in energy from 100 kev to over 25 Gev) and therefore quite valuable. There are also papers on the solar wind, the interplanetary magnetic field, and auroral zone phenomena.

In conclusion W. I. Axford wisely suggests that future solar satellites be designed to provide more complete coverage (including multiple satellites and satellites at high ecliptic latitudes) and better particle composition measurements.

ANDREW S. TANENBAUM
Space Sciences Laboratory,
University of California, Berkeley

Mathematical Astronomy

Celestial Mechanics. Vol. 1, Dynamical Principles and Transformation Theory. YUSUKE HAGIHARA. M.I.T. Press, Cambridge, Mass., 1970. xiv, 690 pp. $25.

Judging by the contents of this first of five projected volumes, the series promises to be an exhaustive treatment of its subject. It is clear that the series is not intended for students but for those who are already knowledgeable in the field.

The author states that his goal is "to examine on rigorous mathematical grounds the question of whether the deductive process [of determining the motion and figure of celestial bodies by pure mathematical deduction based on the laws of dynamics] can be logically justified." This is a serious question, for until recently very little was known even about the convergence of the series expansions customarily employed by celestial mechanicians. With the current second flowering of the field due to the space age and the invention of electronic computers, this is indeed a worthy undertaking.

This first volume is almost entirely devoted to classical topics. Most of the material was well known by 1950, and the bulk of it is much older. Such basic topics as the theory of Hamiltonian mechanics and canonical transformation theory, quasiperiodic and almost-periodic functions, and exact solutions of the n-body problem are treated in great detail in part 1. Part 2 is devoted to the applications of transformation theory to celestial mechanics, with particular emphasis on Lie's theory of continuous groups. Here will also be found a discussion of Bruns's and Poincaré's theorems on the nonexistence of certain types of integrals to the n-body problem.

Despite the importance of the topics covered and the detail into which the author goes, this is a difficult book to read. Part of the difficulty is due to the author's frequent choice of obsolete or unusual terminology and notation. For example, his treatment of differential forms and their applications to celestial mechanics closely follows that of Cartán's classic work, *Leçons sur les Invariants Intégraux*, despite the fact that Cartán's notation is seldom used any more. There is nothing wrong in this, but it seems that the book could reach a wider (and younger) audience if its notation were more in line with current practice. Again, the word "symplectic" is used (p. 90) not to describe the symplectic group of matrices in the usual sense but to describe the general matrix with complex entries.

A particularly disturbing feature of the book is that important terms and concepts are introduced long before a proper discussion of them is presented. For example, "group" is used on page 92 and defined 200 pages later and "involution" is used on page 136 and defined on page 304. On page 207 the elliptic functions *sn* and *cn* are used (together with some of their important properties), but there is no discussion of these functions anywhere in the book; true, the information can be found elsewhere, but these functions are unfamiliar enough that they should be explained in the text. There are many other examples.

Finally, there is often insufficient motivation for the introduction of many topics and terminologies. The book does not lead one easily from one topic to another.

Nevertheless, this is a valuable book despite its deficiencies. The series promises to bring together in one place the relevant material in the field of celestial mechanics, and that is very much needed at this time.

WILLIAM H. JEFFERYS
Department of Astronomy,
University of Texas, Austin

Books Received

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Advances in Pharmacology and Chemotherapy. Vol. 8. Silvio Garattini, A. Goldin, F. Hawking, and I. J. Kopin, Eds. Academic Press, New York, 1970. x, 260 pp., illus. $14.50.

Advances in Reproductive Physiology. Vol. 5. Marcus W. H. Bishop, Ed. Academic Press, New York, 1971. viii, 218 pp. + plates. $15.

African Elite. The Big Men of a Small Town. Joan Vincent. Columbia University Press, New York, ed. 2, 1971. x, 310 pp., illus. $11.

Atomic Absorption Spectrochemical Analysis. B. V. L'vov. Translated, with revisions, from the Russian by J. H. Dixon. Elsevier, New York, 1971. xii, 324 pp., illus. $43.

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