

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.

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28 MAY 1971

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.

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Books Received

Actions of Alcohol. Henrik Wallgren and Herbert Barry, III. Elsevier, New York, 1970. In two volumes. Vol. 1, Biochemical, Physiological and Psychological Aspects, xvi + pp. 1-402. Vol. 2, Chronic and Clinical Aspects, xii + pp. 403-872. \$64 the set.

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.

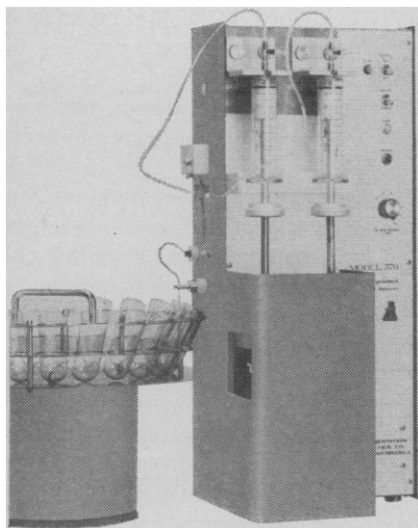
African Elite. The Big Men of a Small Town. Joan Vincent. Columbia University Press, New York, ed. 2, 1971. x, 310 pp., illus. \$11.

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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(Continued on page 974)

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BOOKS RECEIVED

(Continued from page 933)

Jacques Gomila. Presses de l'Université de Montréal, Montreal, 1971. xiv, 276 pp. + plates. Paper, \$13.75.

Biology. Observation and Concept. James F. Case and Vernon E. Stiers. Macmillan, New York, 1971. viii, 502 pp., illus. \$9.95.

Bone Marrow Transplantation and Leucocyte Transfusions. Georges Mathé, Jean-Louis Amiel, and Leon Schwarzenberg. Thomas, Springfield, Ill., 1971. xvi, 208 pp., illus. \$18.50. American Lecture Series, No. 793.

California Environmental Law. A Guide. Gerald R. Mylroie, with additional material compiled by Patricia A. Flanagan. Center for California Public Affairs, Claremont, Calif., 1971. 172 pp. Paper, \$6.50.

Ceramic Glazes. Kenneth Shaw. Elsevier, New York, 1971. viii, 166 pp., illus. \$11.

Chemical Reactivity and Biological Role of Functional Groups in Enzymes. A symposium, Oxford, January 1970. R. M. S. Smellie, Ed. Academic Press, New York, 1970. xii, 236 pp., illus. \$12.50.

Chemistry and Biology of Pteridines. Proceedings of the fourth international symposium, Toba, Japan, July 1969. K. Iwai, M. Akino, M. Goto, and Y. Iwanami, Eds. Editorial Committee for IPS Proceedings, c/o Sasaki Institute, Kanda-Surugadai, Tokyo 101, Japan, 1970. xviii, 482 pp., illus. \$17.

The Chemistry of the Cyano Group. Zvi Rappoport, Ed. Interscience (Wiley), New York, 1971. xvi, 1044 pp., illus. \$44. Chemistry of Functional Groups series.

CIPAC Handbook. Vol. 1, Analysis of Technical and Formulated Pesticides. R. de B. Ashworth, J. Henriët, and J. F. Lovett. G. R. Raw, Ed. Collaborative International Pesticides Analytical Council, Harpenden, Herts, England, 1970 (U.S. distributor, National Agricultural Chemicals Association, Washington, D.C.). xvi, 1080 pp., illus. \$28.

Dictionary of Chemistry and Chemical Engineering. Vol. 1, German/English. Louis De Vries and Helga Kolb, with the collaboration of Joachim Thuss. Verlag Chemie, Weinheim, and Academic Press, New York, 1971. viii, 708 pp. \$17.

The Discovery of Nuclear Fission. A Documentary History. Hans G. Graetzer and David L. Anderson. Published for the Commission on College Physics by Van Nostrand Reinhold, New York, 1971. viii, 120 pp., illus. Cloth, \$5.95; paper, \$2.95.

Economic and Social Development. A Process of Social Learning. Edgar S. Dunn, Jr. Published for Resources for the Future by Johns Hopkins Press, Baltimore, Md., 1971. xvi, 328 pp. \$10.

Environmental Psychology. Man and His Physical Setting. Harold M. Proshansky, William H. Ittelson, and Leanne G. Rivlin, Eds. Holt, Rinehart, and Winston, New York, 1970. xiv, 690 pp., illus. \$15.75.

Evolution by Gene Duplication. Susumu Ohno. Springer-Verlag, New York, 1970. xvi, 160 pp., illus. \$16.50.

Fair and Equal Districts. A How-To-Do-It Manual on Computer Use. James B.

Weaver. National Municipal League, New York, 1970. x, 130 pp., illus. Paper, \$3.50.

The Future of the Oceans. Wolfgang Friedmann. Braziller, New York, 1971. xii, 132 pp. Cloth, \$5.95; paper, \$2.45.

The Genetic Markers of Human Immunoglobulins. R. Grubb. Springer-Verlag, New York, 1970. xii, 154 pp., illus. \$11.60. Molecular Biology, Biochemistry and Biophysics, vol. 9.

The Growth of Word Meaning. Jeremy M. Anglin. M.I.T. Press, Cambridge, Mass., 1971. xvi, 108 pp., illus. \$5.95.

Handbook of Geochemistry. Vol. 2, part 2. K. H. Wedepohl, Ed. Springer-Verlag, New York, 1970. Various pages, illus., in loose-leaf binder. \$58.30.

Investigations in the Theory of Stochastic Processes. V. N. Dudakov, Ed. Translated from the Russian edition (Leningrad, 1969). Consultants Bureau, New York, 1971. viii, 98 pp. Paper, \$15. Seminars in Mathematics, vol. 12.

Ion Propulsion. Technology and Applications. George R. Brewer. Gordon and Breach, New York, 1971. xvi, 534 pp., illus. \$42.

Ionic Interactions. From Dilute Solutions to Fused Salts. S. Petrucci, Ed. Vol. 1, Equilibrium and Mass Transport. Academic Press, New York, 1971. xiv, 410 pp., illus. Physical Chemistry, vol. 22.

Linear Algebra for Social Sciences. Menahem E. Yaari. Prentice-Hall, Englewood Cliffs, N.J., 1971. xvi, 174 pp. \$9.95.

Migraine. The Evolution of a Common Disorder. Oliver W. Sacks. University of California Press, Berkeley, 1971. 298 pp., illus. \$8.50.

Mononuclear Phagocytes. Proceedings of a conference, Leiden, September 1969. Ralph van Furth, Ed. Davis, Philadelphia, 1970. xvi, 654 pp., illus. \$23.

Origins of Psychometry. Johan Jacob de Jaager, student of F. C. Donders, on Reaction Time and Mental Processes (1865). Translated and edited by Josef Brozek and Maarten S. Sibinga. De Graaf, Nieuwkoop, 1970. 78 pp., illus. \$20.

Pacific Insects Monograph 24. Cerambycid-Beetles of Laos (Longicornes du Laos). J. L. Gressitt, J. A. Rondon, and S. von Breuning. Bishop Museum, Honolulu, 1970. vi, 652 pp., illus. Cloth, \$17.50; paper, \$16.

Paper Chromatography and Electrophoresis. Gunter Zweig and John R. Whitaker. Vol. 2, Paper Chromatography. Joseph Sherma and Gunter Zweig, with contributions by Arthur Benveniste. Academic Press, New York, 1971. xiv, 614 pp., illus. \$27.

Pathology of Domestic Animals. Vol. 2. K. V. F. Jubb and Peter C. Kennedy. Academic Press, New York, ed. 2, 1971. xx, 698 pp., illus. \$26.

Pay and Organizational Effectiveness. A Psychological View. Edward E. Lawler III. McGraw-Hill, New York, 1971. xii, 318 pp., illus. \$8.95.

Physiological and Behavioral Temperature Regulation. Proceedings of a symposium, New Haven, Conn., August 1968. James D. Hardy, A. Pharo Gagge, and Jan A. J. Stolwijk, Eds. Thomas, Springfield, Ill., 1971. xxiv, 944 pp., illus. \$75.

Plant Growth. Arthur C. Gentile. Natural History Press, Garden City, N.Y., 1971. 144 pp., illus. \$5.95.

Plastic Design of Frames. Vol. 2, Ap-

plications. Jacques Heyman. Cambridge University Press, New York, 1971. viii, 292 pp., illus. \$14.

Pollen and Spores of Chile. Modern Types of the Pteridophyta, Gymnospermae, and Angiospermae. Calvin J. Heusser. University of Arizona Press, Tucson, 1971. xiv, 168 pp. + plates. \$15.

Practical Nonparametric Statistics. W. J. Conover. Wiley, New York, 1971. xii, 462 pp., illus. \$11.95.

Principles of Functional Analysis. Martin Schechter. Academic Press, New York, 1971. xx, 384 pp. \$15.

Principles of Turfgrass Culture. John H. Madison. Van Nostrand Reinhold, New York, 1971. viii, 420 pp., illus. \$18.50.

Probability and Statistics. L. Daniel Massey. McGraw-Hill, New York, 1971. viii, 180 pp., illus. \$11.50.

Probability Theory. A. Renyi. Translated from the Hungarian and the German. North-Holland, Amsterdam, and Elsevier, New York, 1971. iv, 668 pp. \$21.50. North-Holland Series in Applied Mathematics and Mechanics, vol. 10.

Proceedings of the Fifth Leukocyte Culture Conference. Ottawa, June 1970. Jules E. Harris, Ed. Academic Press, New York, 1971. xx, 688 pp., illus. \$17.

Programarea Matematica în Industria Petroliera. Manea Manescu, V. Dumitru, V. Ionescu, and Gh. I. Barbatu. Editura Academiei Republicii Socialiste România, Bucharest, 1970. 274 pp., illus. Lei 18.

Protection against Neutron Radiation. Recommendations of the National Council on Radiation Protection and Measurements, Washington, D.C., 1971. vi, 154 pp., illus. Paper, \$3.

Protein Sequence Determination. A Sourcebook of Methods and Techniques. Saul B. Needleman, Ed. Springer-Verlag, New York, 1970. xxii, 348 pp., illus. \$23.10. Molecular Biology, Biochemistry and Biophysics, vol. 8.

Psychoanalysis and Philosophy. Charles Hanly and Morris Lazerowitz, Eds. International Universities Press, New York, 1971. vi, 362 pp. \$13.50.

The Silverlake Experiment. Testing Delinquency Theory and Community Intervention. LaMar T. Empey and Steven G. Lubeck. Aldine, Chicago, 1971. x, 354 pp., illus. \$12.50.

Singular Integrals and Differentiability Properties of Functions. Elias M. Stein. Princeton University Press, Princeton, N.J., 1971. xiv, 290 pp. \$11.

Soil and Water. Physical Principles and Processes. Daniel Hillel. Academic Press, New York, 1971. xvi, 288 pp., illus. \$14.

Solid Acids and Bases. Their Catalytic Properties. Kozo Tanabe. Kodansha, Tokyo, and Academic Press, New York, 1971. viii, 176 pp., illus. \$11.50.

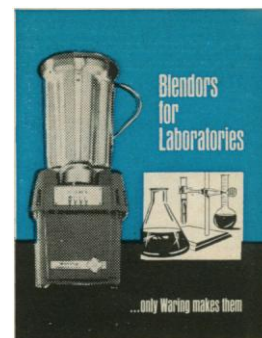
Space Shuttles and Interplanetary Missions. Proceedings of a conference, Anaheim, June 1970. L. Larmore and R. L. Gervais, Eds. American Astronautical Society, Tarzana, Calif., 1970. xvi, 474 pp., illus. \$17.75. Advances in the Astronautical Sciences, vol. 28.

Space Stations. Proceedings of a conference, Anaheim, June 1970. L. Larmore and R. L. Gervais, Eds. American Astronautical Society, Tarzana, Calif., 1970. xiv, 592 pp., illus. \$18.75. Advances in the Astronautical Sciences, vol. 27.

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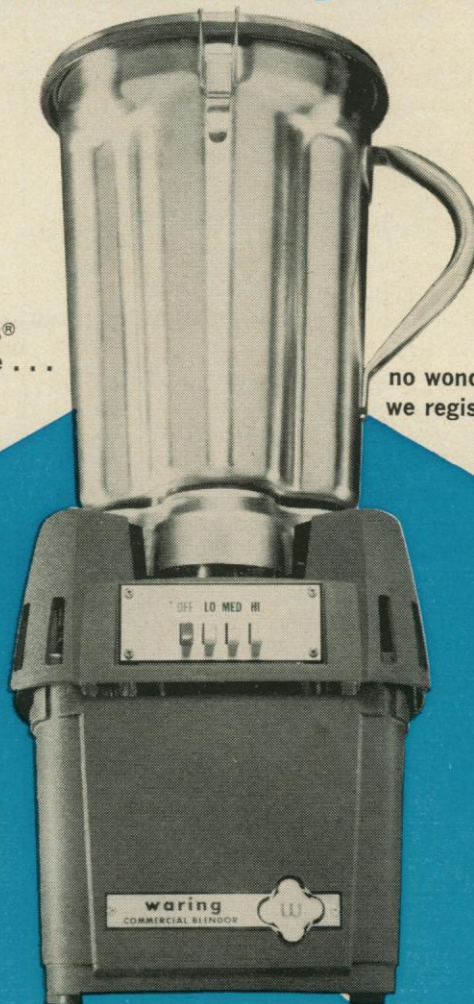


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periments. Peter W. M. John. Macmillan, New York, 1971. xii, 356 pp. \$14.95.

The Story of Margarine. S. F. Riepma. Public Affairs Press, Washington, D.C., 1970. viii, 158 pp., illus. \$6.

The Strategy of Technology. Winning the Decisive War. Stefan T. Possony and J. E. Pournelle. Dunellen, New York, 1971. xxxii, 190 pp., illus. \$7.50.

Studies in Statistical Mechanics. Vol. 5. J. de Boer and G. E. Uhlenbeck, Eds. North-Holland, Amsterdam, and Elsevier, New York, 1971. xvi, 240 pp., illus. Paper, \$13.75.

Surgery on Compact Manifolds. C. T. C. Wall. Published for the London Mathematical Society by Academic Press, New York, 1970. x, 280 pp., illus. \$14.50. L.M.S. Monographs.

Teaching about Families. Textbook Evaluations and Recommendations for Secondary Schools. Hyman Rodman. Doyle, Cambridge, Mass., 1971. xii, 96 pp. \$4.50.

Telecommunications Pocket Book. T. L. Squires, Ed. Newnes-Butterworth, London, 1970 (U.S. distributor, Transatlantic Arts, Levittown, N.Y.). viii, 144 pp., illus. \$4.95.

Third Pollution. The National Problem of Solid Waste Disposal. William E. Small. Praeger, New York, 1971. xvi, 174 pp. \$6.95.

Those Inventive Americans. Robert L. Breeden, Chief, National Geographic Special Publications Division. National Geographic Society, Washington, D.C., 1971. 232 pp., illus. \$4.65.

Toi, Ce Petit Dieu! Essai sur l'Histoire Naturelle de l'Homme. Pierre P. Grassé. Albin Michel, Paris, 1971. 288 pp. Paper, 24 F.

Undergraduate Topology. Robert H. Kasriel. Saunders, Philadelphia, 1971. xvi, 286 pp., illus. \$10.50.

The Unemployment-Inflation Dilemma. A Manpower Solution. Charles C. Holt, C. Duncan MacRae, Stuart O. Schweitzer, and Ralph E. Smith. Urban Institute, Washington, D.C., 1971. 112 pp., illus. Paper, \$2.95.

Veillon/Nobel Medical Dictionary. Spanish Supplement. A. Garrido Juan. Editorial Científico-Médica, Barcelona, and Springer-Verlag, New York, ed. 5, 1970. xii, 536 pp. \$16.50.

Venomous Reptiles. Sherman A. Minton, Jr., and Madge Rutherford Minton. Scribner, New York, 1971. xii, 276 pp., illus. Paper, \$3.50. Reprint of the 1969 edition.

The Waves. The Nature of Sea Motion. George M. Hidy. Published for the Commission on College Physics by Van Nostrand Reinhold, New York, 1971. vi, 150 pp., illus. Cloth, \$7; paper, \$3.95.

Weed Control Handbook. Recommendations. Vol. 2. Issued by the British Crop Protection Council. J. D. Fryer and R. J. Makepeace, Eds. Blackwell, Oxford, ed. 6, 1970 (U.S. distributor, Davis, Philadelphia). xvi, 332 pp., illus. \$8.

The World of Geology. Peter Cattermole. Muller, London, 1969 (U.S. distributor, Transatlantic Arts, New York). 174 pp., illus. \$6.95.

Zinc-Silver Oxide Batteries. Arthur Fleischer and John J. Lander, Eds. Wiley, New York, 1971. xx, 544 pp., illus. \$27.95. Electrochemical Society Series.

Samford University's, Dr. J. H. Langston:

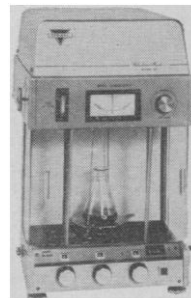
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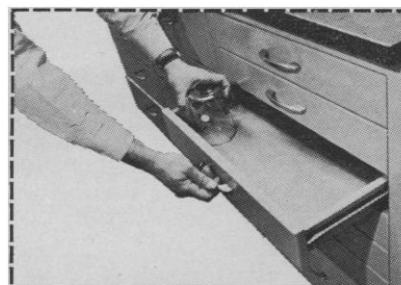
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