

tribution (and a very important one) appears to be evidence that tritium-labeled extra univalents found after heat treatment in his grasshoppers result from genuine heat-induced depression of crossover frequency later than the major premeiotic DNA synthetic period, rather than from complete chiasma terminalization.

Several symposium participants (D. G. Catcheside; D. E. A. Catcheside; Holliday, Lindsley, Sandler, Nicoletti, and Trippa) demonstrated ingenious use of meiotic mutants to study the mechanics of the process and pointed to their potential utility.

There are many other outstanding findings, deductions, and constructive speculations offered in the volume which cannot be mentioned in a brief review. The entire symposium is probably an indispensable reading and reference source for students of genetic recombination.

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## Impact Structures

**Shock Metamorphism of Natural Materials.** Proceedings of a conference, Greenbelt, Md., 1966. BEVAN M. FRENCH and NICHOLAS M. SHORT, Eds. Mono, Baltimore, 1968. xii + 644 pp., illus. \$25.

In 1807, Thomas Jefferson wrote in a letter concerning an alleged meteorite fall: "It may be difficult to explain how the stone you possess came into the position in which it was found. But is it easier to explain how it got into the clouds from whence it is supposed to have fallen?" Sixty years ago, few imagined that the earth had been bombarded throughout history by meteorites large enough to form impact craters. Yet in the past ten years more than 35 circular terrestrial geologic structures have been described as impact structures and have been accepted as such by most geologists. Many more have been recognized on the moon and Mars by manned and unmanned space probes. Impact may be a quantitatively significant geological process, for some postulated impact structures, such as the eastern shore of Hudson Bay, are hundreds of kilometers across, and others, such as Sudbury, Ontario, are large and of economic significance.

In order to recognize impact structures, certain criteria of impact must be developed. One of these criteria, and

perhaps the main one responsible for the identification of so many new impact structures, is the presence of shock metamorphism. Investigations of shock metamorphism are concerned with the changes caused by shock waves in rocks and minerals, the mechanics of cratering, and the phase equilibria and changes in structure of materials subjected for short times to temperatures above 2000°C and pressures in the megabar range. The applications of such studies to extraterrestrial structures, and to the interpretation of meteorite and tektite mineralogy, are obvious. The field is new, active, and multidisciplinary, so that by 1966 it was ripe for that mixed blessing, a symposium, and a consequent symposium volume.

The 44 papers and 10 abstracts in the book may be classified in one or more of four categories: the physics of shock waves in solids; the effect of shock experiments on rocks and minerals; the geology, mineralogy, and petrography of cryptoexplosion structures; and (each the subject of a short section) the mechanics of cratering, shatter cones, and static high-pressure experiments.

There are many good papers, and several excellent ones, which more than justify the book's existence. French's introduction is a very concise summary of the field, and his discussion of the evidence for an impact origin for the Sudbury Basin is an excellent paper that is of particular interest to mining geologists. His microphotographs are the best in the book, where the general standard is high. Chao's and Von Englehardt's papers on progressive impact metamorphism are excellent discussions, although a joint paper perhaps would have been even better. Roddy's paper as a case history of a cryptoexplosion crater is outstanding. He discusses the geology and geophysics of the structure and compares them to those of volcanic craters, impact craters, and artificial craters. In so doing he develops a set of geological and geophysical criteria for impact. Cummings and Carter present tight papers on progressive shock metamorphism of biotite and quartz, respectively.

The book is patchy. Some papers are far too long, and filled with dreary descriptive detail, even to the inclusion of well logs. Admittedly the field is at a descriptive stage, but to devote approximately 120 microphotographs and 80 pages of text to shock quartz is out of balance when one or two competent

review articles would suffice. One paper devotes 13 pages to a negative result. One or two other papers are merely rehashes of talks and papers which people in the field have heard now for several years.

Now that so much descriptive work has been accomplished, the next step is the understanding of the mechanisms of impact metamorphism from the crystallographic scale to the mega scale. No doubt detailed crystallographic analysis, which was lacking in the present volume, will be performed on shocked minerals, and the studies on the nature of high-pressure glasses and their pressure-temperature histories, as presented by Bunch *et al.*, Duke, and Bell and Boyd in this book, will become more extensive. The results of a second shock metamorphism symposium in about four years should be even more interesting than those of the first. In the meantime, a textbook on impact metamorphism and cratering is needed.

ROBIN BRETT  
*Geochemistry Branch,  
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## Books Received

**The Archaeology of Martha's Vineyard.** A Framework for the Prehistory of Southern New England. A Study in Coastal Adaptation. William A. Ritchie. Published for the American Museum of Natural History by the Natural History Press, Garden City, N.Y., 1969. xviii + 254 pp., illus. \$15.

**Audience Analysis for Technical Writing.** Thomas E. Pearsall. Glencoe, Beverly Hills, Calif.; Collier-Macmillan, London, 1969. xxii + 114 pp., illus. Paper, \$3.95.

**Audio-Tutorial Introductory Biology: Principles.** Marvin R. Barnum, Robert J. Gillespie, Arnold J. Greer, and Louise K. M. Peardon. Glencoe, Beverly Hills, Calif., 1969. vi + 266 pp., illus. Paper, \$4.95. Revised version of the 1967 edition.

**Basic Technical Mathematics.** Thomas C. Crooks and Harry L. Hancock. Macmillan, New York; Collier-Macmillan, London, 1969. viii + 472 pp., illus. \$8.95.

**Beyond the Milky Way.** Galaxies, Quasars, and the New Cosmology. Thornton Page and Lou Williams Page, Eds. Macmillan, New York; Collier-Macmillan, London, 1969. xvi + 336 pp., illus. \$7.95. Macmillan Sky and Telescope Library of Astronomy, vol. 8. Material first appeared in slightly different form in *The Sky, Sky and Telescope*, and *The Telescope*.

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(Continued on page 147)

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**Biology Laboratory Manual.** A. M. Winchester. Brown, Dubuque, Iowa, ed. 4, 1969. x + 358 pp., illus. Spiral bound, \$5.25.

**A Biology of Higher Invertebrates.** W. D. Russell-Hunter. Macmillan, New York; Collier-Macmillan, London, 1969. xiv + 226 pp., illus. Paper, \$3.95. Current Concepts in Biology Series.

**Computer-Aided Design of Magnetic Circuits.** Alexander Kusko and Theodore Wroblewski. MIT Press, Cambridge, 1969. xiv + 114 pp., illus. \$6.95.

**Computerized Approximation and Synthesis of Linear Networks.** Jiri Vlach. Wiley, New York, 1969. xvi + 480 pp., illus. \$14.95.

**The Concept of Community.** Readings with Interpretations. David W. Minar and Scott Greer. Aldine, Chicago, 1969. xii + 372 pp. Cloth, \$7.95; paper, \$4.95.

**Concepts in Physics.** Robert K. Adair. Academic Press, New York, 1969. xvi + 792 pp., illus. \$12.50.

**Concepts of Ecology.** Edward J. Kormondy. Prentice-Hall, Englewood Cliffs, N.J., 1969. xiv + 210 pp., illus. Cloth, \$4.95; paper, \$2.95.

**Control Systems for Technicians.** G. T. Bryan. Hart, New York, 1969. 328 pp., illus. \$12.50.

**Croissance de Composés Minéraux Monocristallins.** No. 2, 1967-68. J. P. Suchet, Ed. Masson, Paris, 1969. viii + 172 pp., illus. Paper, 55 F. Séminaires de Chimie de l'Etat Solide.

**Current Topics in Radiation Research.** Vol. 5. Michael Ebert and Alma Howard, Eds. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xii + 292 pp., illus. \$15.50.

**Darwin's South America.** Robert S. Hopkins. Day, New York, 1969. 224 pp., illus. \$5.95.

**Diseases in Free-living Wild Animals.** Proceedings of a symposium, London, 1968. A. McDiarmid, Ed. Published for the Zoological Society of London by Academic Press, New York, 1969. xxiv + 336 pp., illus. \$14.50. Symposia of the Zoological Society of London. No. 24.

**Distributions and Fourier Transforms.** William F. Donoghue, Jr. Academic Press, New York, 1969. viii + 320 pp., illus. \$16. Pure and Applied Mathematics, vol. 32.

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**Elementary Quantum Mechanics.** Morten Scharff. Translated from the Danish edition (Copenhagen, 1963). Interscience (Wiley), New York, 1969. viii + 216 pp., illus. Paper, \$5.95.

**Les Eléments des Terres Rares.** Jean Flahaut. Masson, Paris, 1969. xii + 168 pp., illus. Paper, 56 F. Collection de Monographies de Chimie.

**Episomes.** Allan M. Campbell. Harper and Row, New York, 1969. xiv + 194 pp., illus. \$5.95. Modern Perspectives in Biology.

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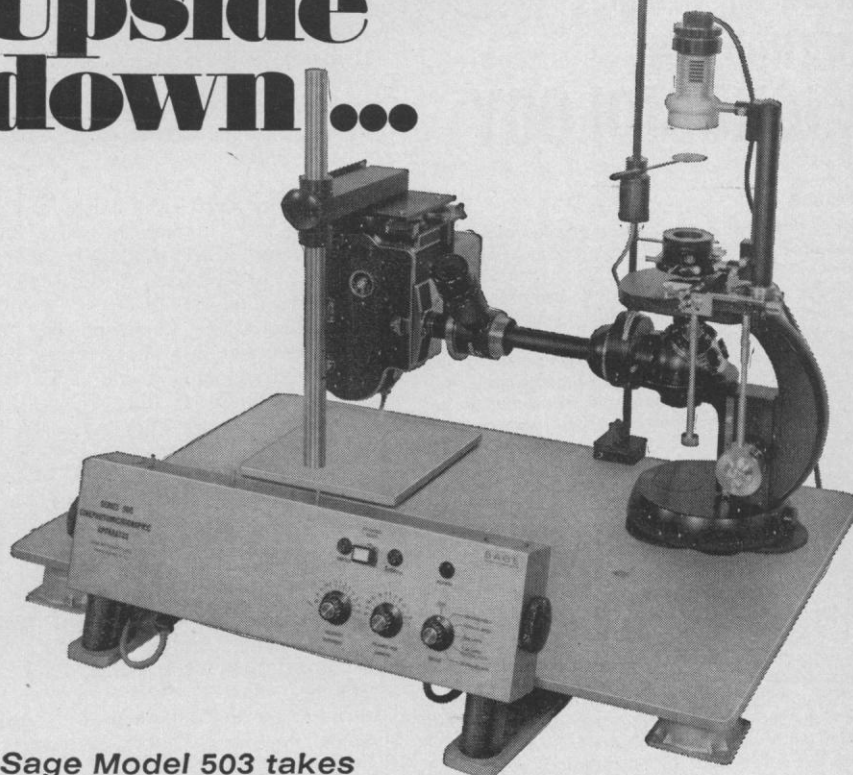
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**Glass Microelectrodes.** Marc Lavalley, Otto F. Schanne, and Normand C. Herbert, Eds. Wiley, New York, 1969. xviii + 446 pp., illus. \$22.50.

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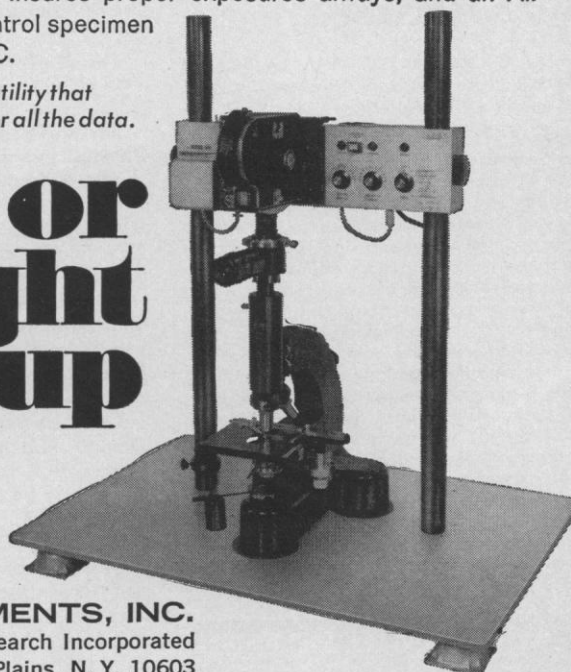
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J. Vinken and G. W. Bruyn, Eds., in collaboration with R. Garcin. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xii + 704 pp., illus. \$67; by subscription, \$57.

**Hydraulic Servo Systems.** Analysis and Design. M. Guillon. Translated from the French edition (Paris, 1961) by R. T. Griffiths. Plenum, New York; Butterworths, London, 1969. xvi + 464 pp., illus. \$45.

**Ideology in America.** Change and Response in a City, a Suburb, and a Small Town. Everett Carl Ladd, Jr. Cornell University Press, Ithaca, N.Y., 1969. xvi + 384 pp., illus. \$11.50.

**Improving Office Environment.** 1968 Business Equipment Manufacturers Association Management Conference. Business Press, Elmhurst, Ill., 1969 (distributor, Taplinger, New York). x + 86 pp., illus. \$7.

**Information Processing for Management.** 1968 Business Equipment Manufacturers Association Management Conference. Business Press, Elmhurst, Ill., 1969 (distributor, Taplinger, New York). viii + 200 pp., illus. \$9.25.

**An Introduction to Coherent Optics and Holography.** George W. Stroke. Academic Press, New York, ed. 2, 1969. xxii + 362 pp., illus. \$11.50.

**Introduction to Mathematics.** Bruce E. Meserve and Max A. Sobel. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1969. xii + 420 pp., illus. \$7.95.

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**Introduction to Spectral Theory in Hilbert Space.** Gilbert Helmsberg. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xvi + 348 pp., illus. \$19.50. North-Holland Series in Applied Mathematics and Mechanics, vol. 6.

**The Invisible Giants.** Atoms, Nuclei, and Radioisotopes. Vivian Grey. Little, Brown, Boston, 1969. x + 156 pp., illus. \$4.50.

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**The Kidney.** Morphology, Biochemistry, Physiology. Vol. 1. Charles Rouiller and Alex F. Muller, Eds. Academic Press, New York, 1969. xiv + 562 pp., illus. \$28.05.

**The La Roche Sites.** J. J. Hoffman. Smithsonian Institution Rover Basin Surveys, Lincoln, Nebr., 1968. vi + 124 pp., illus. Paper. Publications in Salvage Archeology, No. 11.

**Late Seventeenth Century Scientists.** Donald Hutchings, Ed. Pergamon, New York, 1969. xii + 184 pp., illus. Cloth, \$6; paper, \$4.50. Commonwealth and International Library: Liberal Studies Division.

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1969. vi + 466 pp., illus. Paper, \$6.50.

**Lewis and Clark.** Pioneering Naturalists. Paul Russell Cutright. University of Illinois Press, Urbana, 1969. xvi + 510 pp. + plates. \$12.50.

**Linear Piezoelectric Plate Vibrations.** Elements of the Linear Theory of Piezoelectricity and the Vibrations of Piezoelectric Plates. H. F. Tiersten. Plenum, New York, 1969. xvi + 212 pp., illus. \$15.

**Logical Design of Switching Circuits.** Douglas Lewin. Elsevier, New York, 1969. xii + 368 pp., illus. \$10.50.

**The Logic of Explanation in Psychoanalysis.** Michael Sherwood. Academic Press, New York, 1969. x + 278 pp. \$9.50.

**Mammalian Fertilization.** An Atlas of Ultrastructure. Robert Hadek. Academic Press, New York, 1969. xii + 300 pp., illus. \$14.50.

**The Manipulation of Air-sensitive Compounds.** D. F. Shriver. McGraw-Hill, New York, 1969. xvi + 304 pp., illus. \$17.50.

**Materials and Processes in Manufacturing.** E. Paul DeGarmo. Macmillan, New York; Collier-Macmillan, London, ed. 3, 1969. viii + 952 pp., illus. \$12.95.

**Mathematical Methods in Kinetic Theory.** Carlo Cercignani. Plenum, New York, 1969. x + 230 pp., illus. \$15.

**Mathematical Methods in Solid State and Superfluid Theory.** Scottish Universities' Summer School in Physics, St. Andrews, 1967. R. C. Clark and G. H. Derrick, Eds. Plenum, New York, 1968. xvi + 400 pp., illus. \$26.50.

**Mathematics.** An Introduction. Charles N. Podraza, Arlys W. Hanson, Larry L. Blevins, and Harry C. Prall. Goodyear, Pacific Palisades, Calif., 1969. xii + 260 pp., illus. \$8.50.

**Mathematics in Management.** The Language of Sets, Statistics and Variables. P. Rosenstiehl and J. Mothes. Translated from the French edition (Paris, 1968) by A. Silvey. Interscience (Wiley), New York; North-Holland, Amsterdam, 1969. xvi + 392 pp., illus. \$14.50.

**Mid-Nineteenth-Century Scientists.** John North, Ed. Pergamon, New York, 1969. x + 190 pp. + plates. Cloth, \$6.50; paper, \$4.75. Commonwealth and International Library, Liberal Studies Division: Science and Society, vol. 4.

**Molecular Approaches to Ecology.** Marcel Florkin and Ernest Schoffeniels. Academic Press, New York, 1969. x + 204 pp., illus. \$10.

**The Nature and Properties of Soils.** Harry O. Buckman and Nyle C. Brady. Macmillan, New York; Collier-Macmillan, London, ed. 7, 1969. xviii + 654 pp., illus. \$10.95.

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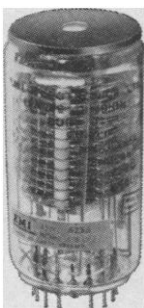
**Organic Electronic Spectral Data.** Vol. 5, 1960-61. John P. Phillips, Robert E. Lyle, and Paul R. Jones, Eds. Interscience



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(Wiley), New York, 1969. x + 1022 pp. \$34.95.

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**The Pattern of Vertebrate Evolution.** L. B. Halstead. Freeman, San Francisco, 1968. xii + 210 pp., illus. \$7. University Reviews in Biology, vol. 10.

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**Philosophy and Ethics of Medicine.** Michael Gelfand. Livingstone, Edinburgh, 1968 (U.S. distributor, Williams and Wilkins, Baltimore). viii + 176 pp. \$5.50.

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**Physics of Semiconductor Devices.** S. M. Sze. Interscience (Wiley), New York, 1969. xvi + 814 pp., illus. \$19.95.

**Plant Structure and Development.** A Pictorial and Physiological Approach. T. P. O'Brien and Margaret E. McCully. Macmillan, New York; Collier-Macmillan, London, 1969. x + 118 pp., illus. Cloth, \$9.95; paper, \$5.50.

**Politics in the Altiplano.** The Dynamics of Change in Rural Peru. Edward Dew. Published for the Institute of Latin American Studies by University of Texas Press, Austin, 1969. xviii + 222 pp., illus. \$6.

**A Practical Guide to the Study of the Productivity of Large Herbivores.** Frank B. Golley and Helmut K. Buechner, Eds. Published for the International Biological Programme by Blackwell Scientific Publications, Oxford, 1968 (U.S. distributor, Davis, Philadelphia). xii + 308 pp., illus. Paper, \$7. IBP Handbook No. 7.

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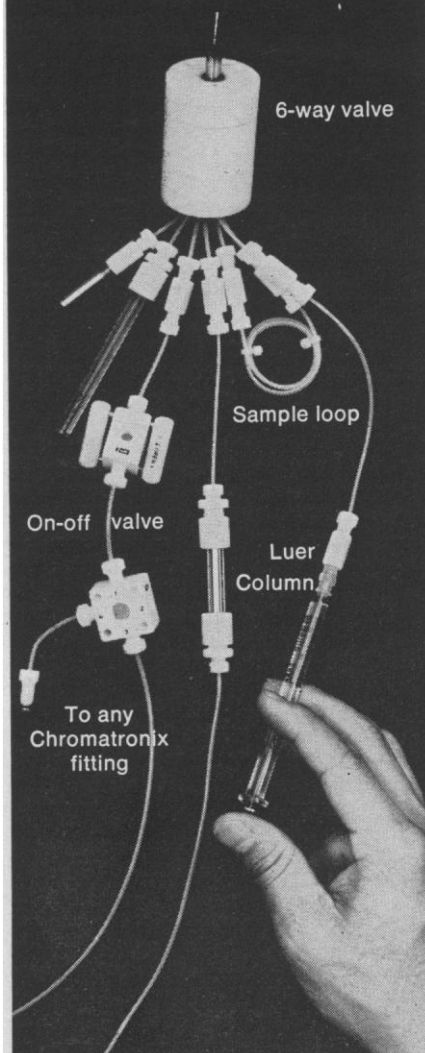
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