economic, political, social, and biological problems inherent in regulating the salmon fishery and notes that none of these were resolved by the simple device of transferring jurisdiction. The underlying pattern of cutthroat competition in the free and open fishery is unchanged. It remains to be proven that the new state government can cope with the situation better than the federal bureau. In any event, this clearly written volume will provide everyone involved with a much better perspective of the problem.

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## Comprehensive Resume

**Tektites.** John A. O'Keefe, Ed. University of Chicago Press, Chicago, 1963. xii + 228 pp. Illus. $10.95.

Tektites, small glassy objects that are found in limited regions on Earth under circumstances which preclude a volcanic origin, have intrigued those scientists who have examined them carefully, ever since they were first mentioned (1788, from Bohemia) in scientific literature. However, until about 10 years ago, these scientists were comparatively few in number, and much of the earlier literature is widely scattered and not easily accessible. The great upswing in meteorite research in the postwar years attracted more general interest in tektites, and the suggestion that they may represent lunar material has provided a further stimulus to their intensive investigation. As a result a tremendous amount of new data has become available. These data, and the deductions that can be drawn therefrom, are admirably presented in this book. It consists of the following nine chapters: "Form and sculpture of tektites," by George Baker (24 pp.); "Tektite strewn-fields," by Virgil E. Barnes (26 pp.); "The petrographic and chemical characteristics of tektites," by E. C. T. Chao (44 pp.); "The chemical composition of tektites," by C. C. Schnetzler and W. H. Pinson, Jr. (35 pp.); "The physical properties and gas content of tektites," by Irving Friedman (7 pp.); "Isotopes in tektites," by J. Zähringer (13 pp.); "Aerodynamic analysis of tektites and their hypothetical parent bodies," by Ernest W. Adams (17 pp.); "The origin of tektites," by John A. O'Keefe (22 pp.); "Asteroid—or comet—impact hypothesis of tektite origin: the moldavite strewnfields," by Alvin J. Cohen (24 pp.).

The authors are all men who have been in the forefront of tektite research, and John O'Keefe deserves congratulations and thanks for having persuaded them to join with him in preparing this book, which fills a real need. All the papers are thoroughly up-to-date, with references as late as 1962, and a tremendous amount of new information, particularly on the chemical composition—major, minor, and trace elements—is presented. With all this new information, however, the basic question—"Are tektites meteorites?" or perhaps more carefully stated "Are tektites of terrestrial or of extraterrestrial origin?"—remains a matter of opinion and controversy. However, the possibilities appear to have been narrowed to an origin by meteorite splash from the lunar surface or to one by asteroid or comet impact on the Earth's surface. A refreshing feature is the careful separation of fact from deduction and hypothesis and the absence of dogmatism. Although individual authors usually favor one or the other of the above possibilities, they present their data fairly and do not minimize the unsolved problems that remain. This book is an outstanding synthesis of our present knowledge of tektites, and it should be a stimulus to further investigations on these remarkable and enigmatic bodies.

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## Mitosis

**The Cell in Mitosis.** Proceedings of the symposium held under the provisions of the Wayne State Fund Research Recognition Award (Detroit, Michigan), November 1961. Laurence Levine, Ed. Academic Press, New York, 1963. xii + 274 pp. Illus. $10.

This is one more incarnation of one more symposium on a popular topic—mitosis. To invoke those standards of judgment which should be applied to a *book* would be unfair to the editor and the contributors; fully to ignore those standards would be unfair to prospective readers. My dilemma is a familiar one, and my easiest out is to say that this particular volume matches the quality of a number of others which have been published in the past two years. The topic is necessarily diffuse and almost impossible to deal with both comprehensively and pithily. Any symposium organizer who manages to achieve a pattern of discussion different from that of the preceding symposia on the same topic is to be congratulated; this much Levine has achieved.

Although the book contains discussions on both structural and metabolic features of mitosis, the weight of emphasis is in favor of the structural ones. A venerable and classical topic, the centriole, is discussed lengthily by Cleveland and Burke. The fine structure of the cleavage furrow is treated briefly by Buck. Rehbun roams extensively about the subject of cytoplasmic particle movements and their possible significance in interpreting mechanical work performed by the endoplasmic reticulum which, in turn, could possibly be related to polar movements in mitosis. Elliott interrupts the sequence of generalized titles with a contribution on the fine structure of *Tetrahymena* during mitosis, but his article together with Ray's discussion of it are as broad in their target as the others. Zimmerman effectively summarizes chemical analyses of the isolated mitotic apparatus, supplemental information being supplied by Rustad in his discussion. Bloch discusses a now popular topic, the regulatory functions of histones; his discussion, though pertinent to mitosis, is framed in the general context of genetic regulation. Andrew Szent-Gyorgi analyzes the problem of contractility; he correctly makes no effort to center his analysis on mitosis but restricts himself to the much better studied phenomenon of muscle behavior. Two articles are addressed to metabolic problems. Scherbaum sets forth the chemical prerequisites for division based on studies of *Tetrahymena*, and the discussant, Gelfant, initiates a discussion that leads to some questions about the validity of this organism as a general model. Wilson covers the work of his group on the action of antimitotic agents, and Biesele rounds out the presentation with a broad discussion of Wilson's findings.

A reader who turned to this book for a general knowledge of mitosis would, of course, be disappointed. So too would one who sought for a deep analysis of all the major problems underlying mitosis. I prefer to assume,

however, that most biologists are now aware that the proliferation of books is an almost casual response to the unmanageable inflation of channels of traditional communication. The average book neither deifies scholarship nor especially berates it. Against such a background this book will pass as an interesting account of some mitotic problems, as these problems are conceived by some workers in the field.

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## "Life" Science Library

**Mathematics**. David Bergamini and the editors of *Life*. Time, Inc., New York, 1963. 200 pp. Illus. $3.95.

To enjoy this book is easy. To evaluate its contribution to the public understanding of mathematics is more difficult.

Attempting the latter made me recall a conversation at the high table in Proctor Hall at Princeton in the mid-1930's. Einstein and Dean Eisenhart were discussing the books by Jeans and Eddington that gave popular accounts of the then fashionable cosmological theories. The Dean asked Einstein if he did not think such books were useful, and Einstein replied that he did but that he had misgivings lest the readers mistake the speculative fringe of scientific investigation for the great body of firmly established knowledge. This richly illustrated and handsome first volume in the new series, *Life* Science Library, does not, I think, risk this particular danger.

That the story progresses, in the first 30 pages, through counting methods from hand signals to digital computers does imply great brevity and some superficiality in the treatment, so I fear some readers may have reinforced their impression of mathematics as an impenetrable mystery. Hopefully, the rich detail woven into the visually delightful presentation will lead many to read other books, perhaps chosen from among the 36 listed in the bibliography.

"The shapely thinking of the ancient Greeks," which disposes of ancient geometry in a dozen pages, is followed abruptly by photographs of 11 men now working as mathematicians in the United States. Of these deservedly distinguished 11 only one, Eilenberg, would be regarded as working in the heartland of current research in pure mathematics; the others spread as far afield as Godel (mathematical logic at the level of philosophy) and Szebehely (space mechanics). This points up a partial and necessary failure of the book: the solid center of today's mathematics depends so heavily on symbolism and is so far removed from sensual reality that it cannot be described in nontechnical language or illustrated visually. It also underscores the folly of regarding research in mathematics as dominant over the practice of mathematics.

The format is one in which historical development leads to contemporary topics within each chapter of the four which describe algebra, analytic geometry, calculus, and probability. The work of Gauss, Riemann, and Einstein provides an exciting chapter, which is followed by "Mathematics today: Deeds, doubts, dreams." A 4-page appendix gives an inadequate description of the changes that are being made in mathematical education. There is an index.

My favorite quotation is on page 169: "Like the hordes and horses of some fabulous khan, today's mathematicians have ridden off in all directions at once, conquering faster than they can send messages home."

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## Earth Sciences

**The Earth Sciences**. Arthur N. Strahler. Harper and Row, New York, 1963. xiv + 681 pp. Illus. $9.95.

**Elements of Geology**. James H. Zumberge. Wiley, New York, ed. 2, 1963. xii + 342 pp. Illus. $6.50.

Strahler's book is directed to geology teachers. In the preface, the author states that "the teaching of the full spectrum of the earth sciences should be recognized as the responsibility of each geology department within the larger fold of the natural sciences. Too long has the conventional two-semester sequence of physical and historical geology dominated our offerings; around us an explosive growth of new scientific knowledge of the atmosphere and oceans, the earth's interior, and the solar system have largely been ignored in the introductory offering." Thus, Strahler believes that the earth sciences should be introduced as a unified whole, rather than as a more detailed treatment of geologic principles that pertain only to the crust of the earth.

The distribution of major topics in Strahler's book reflects his views: About 27 percent of the book is devoted to the earth as a planet, including the earth's orbit, time, illumination, tides, the solar system, and the earth's gravitative and magnetic fields. Nearly 25 percent is devoted to the atmosphere and the oceans, including physical meteorology, physical oceanography, and climatology. Over 40 percent is devoted to topics that pertain to physical geology, including rocks and minerals, the earth's interior, the oceanic and continental crusts, ground water, stream systems, erosion, landscape evolution, and weathering and soil. About 2 percent is devoted to the mtehods of historical geology, and the remainder of the book consists of appendices illustrating principles of maps. It is suggested that professional geologists may find Strahler's book an excellent reference source for basic information on those aspects of the earth sciences missing in their own backgrounds.

Strahler's book is well written and contains an abundance of clear and forceful illustrations. The line drawings are exceptionally well done, although most of them appeared in the author's book, *Physical Geography*, which was published in 1960.

Zumberge's book is intended as a text for a one-semester introductory course in which physical and historical geology are combined. It is addressed to beginning students of science. Its scope is more or less traditional. About 60 percent of the book is devoted to topics pertinent to physical geology, including the earth's setting in the universe and in the solar system, rocks and minerals, the earth's interior, weathering and soil, ground water, and wind, rivers, and waves as agents of erosion and deposition. The remaining 40 percent is devoted to historical geology, which is approached period by period. The book is also well written and is accompanied by judiciously chosen photographs and by line drawings of exceptional clarity and simplicity. One might question the merit of a period-by-period approach in historical geology in a book whose emphasis is on principles. It might have been more appropriate to dwell on the methods by which historical geology is