Historia. Thus, the series now represents an example of successful international cooperation in science.

The main purpose of the *Yearbook* has always been to reproduce photographically some of the more significant articles of the particular year in the broad field of physical anthropology. This has served to give them more emphasis and wider distribution, especially to members of the profession in out-of-the-way places where library facilities are meager. Because the editors of all the volumes have been teachers, the utility of the contents for students' use probably has been an important, if not always a stressed, factor in the process of selection.

Lasker was faced with a formidable task in deciding on the composition of the interim volume, since he had nine times more material to review, but no more pages to fill, than for a normal issue. He seems to have approached the task without qualms, and perhaps even with relish, conditioned to it as he must be by having served as editor or coeditor of all but one of the previous volumes. His 22 selections are irregularly representative of the 9-year period; none is from the year 1955, but nine are from the years 1956 and 1957. As for the articles themselves, I would agree with Lasker's opinion that the selection "has taken into account not only wide coverage of current trends and knowledgeability of the authorities included, but also whether the mode of expression is intelligible even to those with a minimum prior familiarity with the technical lingo of the science." In addition, each article is given perspective in an editorial comment which usually includes citations of pertinent references. All articles are in English.

From the 1962 publications Kelso selected 28 articles, including three in French and one in German, which required only 50 pages more than volume 9 contains. Only three of the authors represented in volume 9 reappear in volume 10. However, one looks in vain for the useful editorial comment on each article. In the absence of any such indication of editorial guidelines, the basis for selection is not always clear and, in my opinion, the "mode of expression" is not quite equal to that of the previous volume.

Whatever one may think of the individual selections, and this gets into the realm of personal interests, the present review is not the place to enter into such details. Both volumes eminently serve their purposes, not the least being simply the indication by members of the profession of the contributions regarded as particularly useful. In general, it is safe to say that anyone interested in the latest chapters of the story of man, and willing to tackle articles at the technical level, will find much of interest in these selections.

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Chemistry and Biology

Chemical Background for the Biological Sciences. Emil H. White. Prentice-Hall, Englewood Cliffs, N.J., 1964. viii + 152 pp. Illus. Paper, $1.95; cloth, $4.95.

The series of small textbooks in biology for which the present book proposes to serve as a chemical background includes a number of distinguished volumes each of which has rather successfully summarized one specific aspect of biology. Whether the present attempt to provide a "chemical background for the biological sciences" in 152 pages is also successful is, in some degree, a matter of taste. Patently, any book so restricted in length must fail in some regard to satisfy an already knowledgeable reader. The space available scarcely permits an introduction to chemistry, much less an indication of the relationships between the operation of the chemical principles which are presented and structure or function in the living world. The following remarks are offered with this restriction in mind.

The author has constructed an excellent introduction to organic chemistry. Modern electronic concepts of organic molecules are presented clearly, with excellent illustrations, and electronic mechanisms of organic reactions serve as the theme of the entire volume. One might have hoped, however, that even within the treatment of organic chemistry the illustrative examples chosen would bear some close relation to the problems of biological chemistry. Thus, the reactions used to synthesize polypeptides or degrade carbohydrates must surely be of greater interest to the presumptive reader of this series than, for example, the synthesis of saccharin or group migration during the reaction of aliphatic amines with nitrous acid.

In contrast to the excellent outline of organic chemistry, there is a decided paucity of information concerning the nature and properties of inorganic compounds, of organometallics, or of chelates. Physicochemical principles receive short shrift generally, and the brief statement of thermodynamic principles appears quite inadequate. A total of 23 pages is devoted to a sketchy catalog of "natural products," a catalog that conveys little understanding, whereas many of the compounds so listed are treated in extenso in other volumes of the series. Accordingly, I would have preferred omission of this catalog and a more extensive use of such natural products as the examples used to illustrate organic reactions. Alternatively, the space thus conserved might well have been used to extend the treatment of physical principles, to discuss the relationship between absorption spectra and molecular structure, or to discuss *why* asymmetric compounds rotate the plane of polarized light, among other topics. Perhaps this is but the prejudice of a biochemist, but I must conclude that, whereas White has provided an elegant introduction to organic chemistry from the standpoint of an organic chemist, the student of the life sciences will not find this a sufficient introduction to chemistry for his purposes.

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Botany

Laboratory Techniques in Botany. M. J. Purvis, D. C. Collier, and D. Walls. Butterworth, Washington, D.C., 1964. viii + 371 pp. Illus. $11.50.

This book makes available a wealth of technical detail. The authors, technicians at University College, London, have apparently pooled the useful information that has accrued to them through broad experience in the botanical laboratory. Copiously illustrated, the book carries 155 figures (line drawings and photographs) and includes 14 tables. The line drawings are adequate but not attractive. Users of the book who reside in the United States will find that many of the supply sources and trade names listed are unfamiliar, since those provided are predominantly British, and some read-

ers may hesitate upon encountering such terms as *secateurs, rubber bungs,* and *nail varnish.* These should prove to be minor distractions, however, in view of the book's overall usefulness as a laboratory reference source.

The breadth of information embraced by the 17 chapters can perhaps be best summarized by the following list of contents—(chapter 1) general laboratory apparatus and techniques; (chapters 2, 3, and 4) histology, including preserving, fixing, embedding, cutting, mounting, and staining; (chapter 5) special histological techniques such as maceration, whole mounts, fossil peels, and autoradiography with stripping film; (chapter 6) some useful tests for biologically important substances; (chapter 7) care of house plants and aquaria; (chapter 8) museum and herbarium work—for example, techniques of liquid and dry preservation; (chapter 9) culture and sterilization techniques and specifications for approximately 30 useful media; (chapter 10) inoculation and culture techniques; (chapter 11) demonstration and measurement of growth; (chapter 13) plant-water relations; (chapter 14) manometry; (chapter 15) paper and column chromatography; (chapter 16) distillation; and (chapter 17) analysis of soils, water, and plant materials.

Each chapter is followed by a list of references or a bibliography, a very valuable feature. Of less use to readers in the United States are two short sections that follow chapter 17, which provide supply sources (all of which are in the United Kingdom) for various forms of plant material and sample examination questions (two to five questions per chapter) for use by those who seek certification as laboratory technicians in England.

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Geometry

Regular Figures. L. Fejes Tóth. Pergamon, London; Macmillan, New York, 1964. xii + 339 pp. Illus. $12.

This book seems to have everything that could be desired in a mathematical monograph—a pleasant style, careful explanation of all technical terms used, a great variety of topics with a single unifying idea, a good bibliography and index, and many beautiful illustrations, including four plates and a pocketful of stereoscopic anaglyphs. Although the work is mostly concerned with geometry, it has connections with art, crystallography, biology, city planning, and the standardization of industrial products.

Chapter 1, "Plane ornaments," includes the first complete and readable proof in English that there are exactly 17 essentially different wallpaper patterns, a fact that was utilized unconsciously by the Moors in decorating the Alhambra. It was first proved by E. S. Fedorov in 1891 and has been rediscovered as a mathematical theorem at least three times since then. This chapter ends with an almost incredible tour de force due to H. Voderberg—a systematic (but completely asymmetric) tessellation of the Euclidean plane with congruent tiles, each of which is an irregular enneagon (9-gon).

Using the notation of L. Schläfli (1814–1895), Fejes Tóth defines the regular tessellation $\{p, q\}$ as consisting of equal regular p-gons, q round each vertex. In chapter 2 he uses the same notation for a regular *spherical* tessellation, and proves that such a pattern exists for every pair of positive integers (except $p = q = 1$) satisfying the inequality

$$\frac{1}{p} + \frac{1}{q} > \frac{1}{2}.$$

For instance, $\{2, 1\}$ has one face (a digon), one edge (a semicircle such as a meridian), and two vertices (the north and south poles). In this connection, he should perhaps have mentioned the beautifully illustrated paper by H. Emde, "Homogene Polytope" [*Math. Revs.* **21**, 1105 (1960)].

In chapter 3, reversing the above inequality, Fejes Tóth obtains the infinite family of hyperbolic (non-Euclidean) tessellations $\{p, q\}$. As background for this discussion, he gives a clear but concise account of the theory of inversion, the invariance of cross ratio, and the two conformal models of the hyperbolic plane. On page 97 the drawings of $\{3, \infty\}$ and $\{\infty, 3\}$ are particularly striking. (Some readers may be puzzled by the unusual notation $\sin^{-1}\beta$ for cosec β on page 93.) It is interesting to be reminded of the contrast between the successful career of Lobachevsky and the tragic life of Bolyai, "unhappy in his marriage, broken in health . . . hated and cast out by the philistines of a small town owing to his uncompromising straightforwardness, separated from mathematical life, books and periodicals, but fully aware of the significance of his epoch-making discovery and in full possession of his sound judgment."

Chapter 4 deals with the most important kinds of polyhedra—regular, semiregular, and so on. Fedorov's five parallelohedra are constructed by the method of B. N. Delaunay, who "succeeded in giving a complete enumeration of their 4-dimensional analogues (whose number of types turned out to be 52)." This remark leads naturally to the treatment of regular polytopes in chapter 5, where the discovery of n-dimensional geometries (by Grassmann and Schläfli) is described as enabling us "to create an infinite set of new universes, the laws of which are within our reach, though we can never set foot in them."

Despite the high quality of these first five chapters, it is in the remaining five that the author reveals the full scope of his mathematical ingenuity. Here we see many examples of the extremal problems for which he and other Hungarian geometers are justly famous. The spaces considered are the same (and in the same order) as in chapters 1–5. For instance, chapter 7, on spherical figures, deals with such problems as distributing n points on a sphere so that the minimal distance between pairs is maximized. This "problem of Tammes" is introduced on page 226 with a charming description of its botanical origin. Its difficulty is made evident by the fact that, despite the best efforts of the world's geometers for 35 years, it has only been solved for $n \leq 12$ and for $n = 24$ (the last case by R. M. Robinson in 1961).

We have another example on page 253—two particularly fine drawings to illustrate the theorem that, if the hyperbolic plane is packed or covered by equal circles (of finite or infinite radius), then the packing density $\leq 3/\pi$ and the covering density $\geq 2\sqrt{3}/\pi$.

Among the few misprints that I noted, only the following are serious —$\{3, 4, 4\}$ for $\{3, 4, 3\}$ on page 140, line 7; $(2n-1)/2$ for $(n-1)/2$ on page 202, line 5; R for $(RR_1R_2)^2$ at the end of page 290; and "consequent" for "consistent" on page 306, line 14.

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