'Treating the whole subject.' Indeed, the topics are in large part derived from chapters in the life of Harold Clayton Urey . . ." (p. xvii). Even among the very great men in science, few can expect such a birthday present.

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Technology for the Layman

Masers and Lasers. How they work, what they do. M. Brotherton. McGraw-Hill, New York, 1964. xvi + 207 pp. Illus. $8.50.

The Story of the Laser. John M. Carroll. Dutton, New York, 1964. 181 pp. Illus. $3.95.

Masers and Lasers. H. Arthur Klein. Lippincott, Philadelphia, 1963. 184 pp. Illus. $3.95.

These three volumes were written to provide accounts that would give the layman some understanding of the new field of laser technology and of its great potential. The three books have much in common. Each consists of roughly 200 pages of lucid, nonmathematical discussion of lasers, stimulated emission, waves, electromagnetic theory, atoms, and certain aspects of solid-state physics.

Brotherton's book is distinguished by unusually careful and clear discussion of the physical principles and details of maser and laser operation. The great communications potential associated with the unusually large bandwidths available in the optical region and the problem of attenuation in long distance transmission are treated very nicely. It is evident that Brotherton writes about all these things with a deep understanding. Carroll's book is distinguished by the discussion of many possible applications and by his description of the construction of lasers. Klein places more emphasis on the basic physics, and his book appears to be intended for readers at the level of the high school.

There are inaccurate features. The speed of signaling by use of wires is determined by the group velocity of electromagnetic waves guided by the wires. Carroll suggests that the electron drift velocity determines the signaling speed. Also he appears to be unaware of the principle of complementarity.

The reader whose knowledge is limited to facts gleaned from Klein's book will be surprised to learn that the present time standard is a cesium beam clock and that there can be coherence in spontaneous emission processes of an assemblage.

Brotherton and Klein imply that all noise is due to heat motion. The spontaneous emission noise that really limits all voltage amplifiers is not discussed.

The free electron vacuum tube amplifier operates by stimulated emission of photons from the electrons in the interaction region. Masers and lasers differ only in the use of different kinds of quantum states. All three authors appear to be unaware of this as well as of other issues relating to the comparison of maser devices with free electron devices. Thus, the statements that masers provide a great improvement in noise performance over free electron devices are indeed true for microwave free electron devices, but at low frequencies, above the flicker noise range, free electron amplifiers can have noise performance comparable to, or better than, the performance of a microwave maser. Brotherton tells us that a black body must be at a temperature of 10^{15}K to match the laser brightness. However, a black body must be at 10^{27}K to match microwave klystron brightness.

The early history of masers and lasers is complex. Objective judgments with respect to the importance of principles, and of what constitutes reduction to practice, are somewhat difficult to make. None of these authors does a sufficiently careful job in this respect. The history presented is incomplete and inaccurate and appears to be based on newspaper accounts. There is a traditional respect for published work, arising from the fact that a scientist who publishes assumes responsibility, runs the risk of criticism, and makes his results available to large numbers of other workers. All three authors have only partially accepted this view. Among the important published work not discussed is a paper by R. H. Dicke and his 1958 patent proposing the Fabry Perot cavity.

To be consistent a historian who includes unpublished work should include all such work about which information can be obtained at the expense of reasonable effort. The well-documented unpublished work of G. Gould (1957 and early 1958) contained proposals for a Fabry Perot cavity, an optically pumped alkali vapor laser, the enhancement of inverted populations by collisions of the second kind, the achievement of laser action in electrical discharges, and the ruby as a possible working substance. But this aspect of the history is not considered in any of these volumes.

Each book is good for an evening of enjoyable reading. Brotherton's book will appeal especially to one whose interests are mainly in the physics of these devices, Carroll's book will appeal most to the engineer, and Klein's book will appeal most to the young reader.

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Protozoology

Progress in Protozoology. Proceedings of the First International Congress, Prague, 22–31 August 1961. J. Ludvík, J. Lom, and J. Vávra, Eds. Czechoslovak Academy of Sciences, Prague; Academic Press, New York, 1963. 730 pp. Illus. Plates. $24.

As the chronicle of an important international conference [see *Science* **135**, 110 (1962) for a meeting report], this volume presents a valuable cross-section of protozoological studies recently completed or now in progress. All major aspects of protozoology are represented—taxonomy, cytology, genetics, ecology, biochemistry, biophysics, and electron microscopy. There is also a section devoted to toxoplasmosis, and an assortment of papers dealing with a variety of parasitic protozoa.

Only a few of the contributions are extensive articles. The majority of the entries are less than five pages in length, and many are short abstracts. If we include the synopses of speeches offered at the opening and closing sessions of the congress, there are about 200 contributions. Recent studies by protozoologists in the United States, Czechoslovakia, Poland, the U.S.S.R., and England are particularly well represented.

Most of the papers and abstracts are in English, and the few that are in French or German have been given English titles in the table of contents. Line drawings are incorporated directly