The succeeding chapters are concerned with applying some of these ideas on stability to investigations of various systems. They include sections on beam-plasma interactions in one-dimensional systems (in both cold and warm plasmas), transverse interactions, the effect of finite dimensions, and the interaction with ions in a hot electron plasma. There is a tendency to go from one case to another, write down the dispersion equation, derive the results, classify them with respect to the nature of their instabilities, and make perhaps too few comments about the physical aspects of each case. I did find that the practice of comparing some of the interactions to known microwave amplification mechanisms, such as the reactive wall and resistive wall amplifier, backward-wave amplifier, and the like, was useful and that it provided clarification for some cases which would otherwise be a little less comprehensible.

All in all, I think the book will be valuable as a reference source that, in a systematic and useful way, lists and classifies a majority of the interactions which can occur between streaming particles and a plasma.

MARVIN CHODOROW
Microwave Laboratory, Stanford University

Annotated Problems in Physical Chemistry

Numerical Problems in Advanced Physical Chemistry. J. H. Wolfenden, R. E. Richards, and E. E. Richards, Oxford University Press, New York, ed. 2, 1964. xvi + 258 pp. Illus. $4.80.

The working of problems, usually requiring numerical answers, is justifiably regarded as an essential part of a college course in physical chemistry. Most college teachers rely on problems found at the ends of chapters in the textbooks that they use, often supplemented with their own collections of problems, home-grown or picked up here and there. Some local collections have given rise to published books that serve as additional sources for teachers and students. In addition to the volume reviewed here, these include Adamson's *Understanding Physical Chemistry* (Benjamin, 1964); Bareš, Černý, Fried, and Pick's *Collection of Problems in Physical Chemistry* (Pergamon, 1962); Guggenheim and Prue's *Physicochemical Calculations* (North-Holland, 1955); and Sillén, Lange, and Gabrielson's *Problems in Physical Chemistry* (Prentice-Hall, 1962).

The present book is a second edition, considerably revised and somewhat expanded. The problems contained in it are relatively few in number (144 with answers plus 15 short exercises without answers, compared with 400 to 700 problems in some of the other books mentioned), but they are high in quality, intellectual content, and research flavor. They are based on real (and often relatively raw) experimental data taken from important papers in the original literature. Most of them are annotated with additional remarks and references. The subject matter represents reasonably well the main areas of "classical" physical chemistry (equilibria, thermochemistry, solutions, electrochemistry) as well as modern developments in physical chemistry and chemical physics (chemical kinetics and photochemistry, spectroscopy and molecular structure, crystal structure, radiochemistry). The level is generally within reach of undergraduate introductory physical chemistry courses in the better institutions. The book should be well suited to honors or advanced undergraduate courses or graduate review courses. (In all of these respects the book resembles that by Guggenheim and Prue, except that the latter contains not problems but completely worked-out examples.) The problems are naturally somewhat harder, and take longer to work, than most problems placed at the ends of chapters in introductory textbooks, but these problems are a welcome contrast to the multitudes of the latter that are constructed with synthesized or hypothetical data, pruned of side issues and complicating factors, and somewhat out of touch with the real world of research and practice.

The book is decidedly Oxonian in flavor; all three authors are or were at Oxford. Not surprisingly, the name of C. Hinshelwood is mentioned in more problems than the name of any other person. The section on crystal structure, with seven problems, was contributed by D. Crowfoot Hodgkin, 1964 Nobel laureate in chemistry.

DAVID P. SHOEMAKER
Department of Chemistry, Massachusetts Institute of Technology

Applied Physics

Optical Masers. George Birnbaum. Academic Press, New York, 1964. xii + 306 pp. Illus. $9.50.

Like a well-known cigarette, the book *Optical Masers,* by George Birnbaum, might be described as a "treat" instead of a "treatment." Therein lies some of its strengths and some of its weaknesses.

True to the title and the author's intent, the book is concerned mainly with the physical principles and technology of optical masers or lasers and gives only fleeting attention to associated technology such as detectors and modulators and possible applications. The subject of nonlinear optics (optical mixing, harmonic generation, and scattering) is described with a detail that is on a par with the description of optical masers.

The organization of the book is extremely good, with the not unique arrangement of theory first and then experimental description. The book reads extremely smoothly, and the reader is carried forward at a pace somewhat uncharacteristic of a treatise. Examination of the author's style indicates how this is accomplished. The material is described in a fairly intuitive or physical way and the more detailed or rigorous treatment that can be found in the original literature is sketched very lightly.

It would be extremely unkind to characterize the book as merely an annotated bibliography, but to some extent it can be and was intended to be used that way, especially by someone active in the field. On the other hand, the reader new to the field can develop a quick but shallow appreciation of the fundamentals; the book was not intended to be, nor is it, a definitive treatise on the subject.

For my own taste the treatment of gaseous optical masers is somewhat meager and contains some erroneous statements. For example, the gain dependence on diameter of the discharge tube is generally attributed to the need to destroy certain metastable states of the atom by wall collisions. A more careful study of the literature would indicate that the metastable states are quite efficiently destroyed by electron collision and that the variation of electron temperature, and hence excitation rate, produces the dependence on diameter. Another lapse occurs in a paragraph on photography. The entire subject of holography, which is one of the more fascinating applications of laser technology, is discounted with the statement