theory where they exist, and to a remarkable extent he finds the time to explain discrepancies between naïve theoretical predictions and the facts. This attitude lends an air of intellectual stimulation and is bound to capture the respect of the reader. I was most impressed by the lucid presentation of the simple electrostatic explanation for the geometry of molecules. It alone is worth the price of the book.

This otherwise excellent little book is badly marred by confused symbolism and typographical errors, particularly in the first two chapters. On the other hand, there are few errors in content, and the book is handsomely printed and sturdily bound. Students and instructors alike will find this book valuable and stimulating.

RICHARD H. EASTMAN
Department of Chemistry,
Stanford University

Nuclear Physics

Nuclear Reactions. vol. 2. P. M. Endt and P. B. Smith, Eds. North-Holland, Amsterdam; Interscience (Wiley), New York, 1963. x + 542 pp. Illus. $18.50.

This second volume of the series published about four years after its companion volume, consists of four articles that review recent progress in various aspects of nuclear reactions (247 pages). The remainder is devoted to tables of the coefficients $C^{N}{}_{KM}$ which apply to the analysis of angular correlation measurements of the radiative decay of aligned nuclei. The tables are preceded by a 23-page introduction and guide to their use. Thus, the second half of the book is devoted to mathematical tables which make completely dull reading for those not interested in using them, but which are invaluable to experimentalists who need them for present or future planning and analysis of experiments. This extensive section, by Philip B. Smith, seems particularly appropriate in view of the anticipated wave of experimentation using multiparameter analyzer systems.

The four articles in the first half of the book are: (i) "Nanosecond experimentation with pulsed machines," by Stewart D. Bloom (41 pages); (ii) "Nuclear fission," by J. R. Huizenga and R. Vandenbosch (71 pages); (iii) "The giant resonance of the nuclear photoeffect," by E. G. Fuller and Evans Hayward (82 pages); and (iv) "Vibrations of spherical nuclei," by J. M. Araújo (53 pages). The authors are all distinguished experts in their fields, and their articles are generally very well-written reviews in which they attempt to summarize advances and new developments made in these areas in the time that has elapsed since the last major review article on the topic to about 1960. Their attempts to avoid the repetition of material covered in previous reviews frequently results in the complete omission of important areas of the subject.

The first article is devoted to experimental methodology, with particular emphasis on machine techniques for obtaining concentrated nanosecond width bursts from accelerators, and time-to-pulse height circuits suitable for nanosecond time-of-flight studies. Bloom includes many suggestions for future areas of experimentation which should be of considerable interest to those planning experiments in this field. To benefit fully from the somewhat sketchy tour provided in this article its readers must do several times as much reading from the extensive lists of references. (This is also true of the other articles.)

The second article emphasizes developments since Halpern's extensive article on nuclear fission in the *Annual Reviews of Nuclear Science* (1959). The rapid developments since Halpern's article are quite impressive.

I found the third article, by Fuller and Hayward, especially interesting. A large fraction of their article is devoted to a systematic development of the theory of the absorption and scattering of photons in the giant resonance region and to a critical discussion of the present status of the experimental work in this field, work to which the authors have made major contributions. All experimental results are critically reevaluated to provide an extremely valuable up-to-date analysis of the field. For a complete picture the reader should also read the earlier treatments by Bishop and Wilson, by Wilkinson, and by Stephens and the recent book by J. S. Levinger (listed in the references).

In the fourth article Araújo omits discussion of the vibrational states of deformed nuclei and concentrates on the more controversial subject of the collective vibrational motion of "spherical nuclei" near closed shells. The alternate interpretation of Davydov and his collaborators is mentioned but not discussed. The article is mainly devoted to the theoretical aspects of the subject.

The review articles are well written and authoritative, and they are comparable to the better articles found in *Annual Reviews of Nuclear Science* and similar works. The reader is expected to have a reasonably sophisticated background, and formulas and symbols are occasionally used without definitions of all symbols.

The book should prove to be a must for physicists working in these areas, but its price is such that access to a library copy will probably satisfy most users. The exponentially increasing pace of physics publication places an increasing emphasis on the need for frequent review articles as essential instruments for the effective dissemination of new knowledge to a wide audience.

JAMES RAINWATER
Department of Physics,
Columbia University

Russian Translation

Radio Wave Propagation and the Ionosphere. Ya. L. Al'pert. Translated from the Russian. Consultants Bureau, New York, 1963. x + 394 pp. Illus. $22.50.

This is an English translation of a Russian book first published in Moscow (1960), and it represents a considerable expansion and updating of a previous monograph entitled *Propagation of Radio Waves* (1953). The book is divided into two well-organized parts, the first of which covers the ionosphere and the second the propagation of radio waves of different frequencies. The translation is well done and exhibits a minimum of idiomatic awkwardness.

The presentation of the material on the ionosphere is closely linked to the radio methods by which most of the information on the ionosphere has been obtained. The main topics are the structure of the ionosphere, its formation, the regular variations in its electron density, effective collision frequency and absorption of radio waves in the ionosphere, and irregular phenomena in the ionosphere.

In the second part the general laws of the propagation of radio waves are reviewed, and then the details of propagation are presented in different wave

length ranges from long waves through microwaves.

The text is only partially referenced in a bibliography of 243 items which are arranged in the order of their appearance in the text. This arrangement unfortunately makes the bibliography rather difficult to use.

The coverage of recent advances is rather spotty. For example, in the discussion of the use of satellite signals to measure electron density, no reference is made to the Faraday effect. Several papers on this subject were available as early as 1958, but they are not mentioned. One of the author's own references discusses the Faraday effect, although the topic is not mentioned in the text itself. Another omission is in the discussion of whistlers, which contains very little information beyond that available in Storey's 1953 paper. There is no mention of nose whistlers, although they represent an important advance in the field and were described in the available literature as early as 1956.

In the chapter on long waves, a calculation of field intensity in the earth-ionosphere waveguide, assuming a spherical earth, is outlined. The author's assumptions have been questioned by J. R. Wait in a recent review of a separate translation of this particular chapter (National Bureau of Standards, T5-60). To date there have been no responses to Wait's criticisms, and therefore the validity of the author's treatment remains in doubt.

Despite the limitations mentioned above, this book provides an impressive coverage of a rapidly growing field of research, and it is a valuable addition to the literature.

R. A. HELLIWELL
Radioscience Laboratory,
Stanford University

Industrial Chemistry

Chemical Analysis: The Working Tools. vols. 1–3. C. R. N. Strouts, H. N. Wilson, and R. T. Parry-Jones, Eds. Oxford University Press, New York, ed. 2, 1962. vol. 1, 483 pp.; vol. 2, 489 pp.; vol. 3, 280 pp. Illus. $23.55.

Like the fleur-de-lis seal on a bottle of Bordeaux wine, the seal of Oxford University Press on a book bespeaks excellence and awakens anticipation. I was disappointed, therefore, when I opened volume 2 of this treatise and read (p. 4) that "The *p*H of this solution is *defined* as having the value 4 exactly at 15°C." Of course this is true, and the book does mention the indeterminacy of single-ion activities and cites the work of R. G. Bates. But one would expect the authors to provide at least an outline of the reasoning behind their choice of a *p*H scale. A greater disappointment is the account of overvoltage, 1930 vintage, in the chapter on electrodeposition. The chapter on chromatography (in volume 1) disclaims the intention of treating theory, but the theoretical plate concept, so essential to the intelligent use of elution chromatography, is barely mentioned, Glueckauf's distinguished work, which he has carried on since 1950, is not cited in the bibliography, and the paragraph about flow rates and elution volumes (p. 412) is, to put it mildly, misleading.

The field of chemical analysis has two aspects, practical and theoretical. Those of us who teach chemical analysis in universities like to make the subject intellectually respectable by emphasizing its fundamental principles, which range in an intriguing way from the thermodynamics of electrolytes through electrode kinetics to the theory of atomic and molecular spectra. Yet chemical analysis is essentially a utilitarian matter; principles are adapted to specific purposes, and when a better method is found the old one becomes obsolete. What was analytical chemistry today may not be so tomorrow. The academician is hard put to know which methods are actually being used and which are merely ingenious intellectual exercises.

Thus, *Chemical Analysis: The Working Tools* will be a boon to the teacher, for the three volumes describe the methods used in a very large industrial complex, Imperial Chemical Industries. It is a cooperative work by members of the Analytical Chemists' Committee of ICI, and it is a revised edition of a book published in 1955. Volume 1 treats sampling, weighing, precipitation, volumetric solutions, gas analysis, and fractional distillation, as well as chromatography, titration in nonaqueous solvents, isotope dilution, and vacuum fusion methods. Volume 2 deals with potentiometric and conductometric methods, electrolysis and coulometry, polarography, absorptiometric methods (in the visible, ultraviolet, and infrared), atomic absorption spectroscopy, emission spectroscopy, and x-ray methods. Volume 3 discusses organic analysis, including elemental and functional group analysis, and the determination of molecular weight.

Each method is richly illustrated by practical examples, most but not all of which are from the activities of ICI. These range from titanium metallurgy to insecticides and polymers. Instruments and equipment are described in detail, and the practicing analyst will note many ingenious and simple devices such as "bottled end points," or null-point reference electrodes for specific titrations. Yet there is no mention of the Schöniger combustion method!

In a cooperative work such as this some sections are always better than others. But among the really outstanding sections of this treatise are some that even a carping professor will enjoy—those on ultraviolet and infrared absorption spectroscopy and the painstakingly practical one on the standardization of volumetric solutions.

HAROLD F. WALTON
Department of Chemistry,
University of Colorado

Coherent Light

Lasers. Generation of light by stimulated emission. Bela A. Lengyel. Wiley, New York, 1962. xii + 125 pp. Illus. $6.95.

The current laser panic certainly justifies a publication intermediate in its sophistication between a review article and a textbook. I have only praise for Lengyel's monograph, which combines sound pedagogy with a competent technical review and references that the devotee as well as the initiate will find very useful. I think the book will be excellent for technically alert people who want to begin and do not know where to start. The research and review articles currently available do not have the appeal of a monograph that has an explicitly tutorial intent. Professionals who are active in the laser arena, or in fields of technology that are attempting to exploit the unique properties of these novel light sources, will certainly find many parts of Lengyel's work most helpful.

It would be easy to criticise this volume: questions could be raised, for example, about the development of some theoretical matters, about the