War II. Both have also been amongst the most active research workers in celestial mechanics. This book is unequivocably the finest volume to appear in its field in the English language in the present century. The compromise referred to above is simply that it is not an exhaustive treatise. Nor is it a volume which could have appeared two decades ago. It sets forth the combined wisdom of the authors, based on their extensive experience up to the present, and includes some material (dealing with artificial satellites) not in existence two or three years ago.

The early chapters cover the usual introductory material: elliptic motion, expansions, and attraction of finite bodies. Then follow a few "practical" chapters on finite differences, numerical integration, aberration, precession, nutation, least squares, etc. The meat of the volume is in the chapters entitled General Integrals, Variation of Arbitrary Constants, Lunar Theory, Perturbations of the Coordinates, Hansen's Method, Disturbing Function, Secular Perturbations, and Canonical Variables. While the material is the same, there is nothing of the stereotyped presentation of classical treatises. It is here that the authors have given their own distinctive flavor to the work. Many features could be cited; for example, a deliberate effort to present Hansen's method in its most favorable light, and a correction method for deriving trigonometric series for the negative powers of the distance.

Whether this will prove to be a good textbook in an advanced graduate course is not easy to say without having tried it. That it will prove to be a valuable reference volume for a wide variety of workers both inside and outside this field of specialization is indubitable. For the long-term good of Celestial Mechanics this reviewer is of the opinion that an advanced text is needed which presents the material in the terminology that is familiar to present-day graduates in mathematics and physics; that is, vectors, matrices, gradients, dyadics, tensors, etc. But this is a different objective from that which the authors have set for themselves.

The volume has been meticulously prepared, both by the authors and the publisher, and competently proofread by G. Hori. If errors exist, it would be a shame, but reviewers delight in spotting what they can. To set the record straight, we note that Cowell's method (p. 186) had the incentive of its origin in the discovery of the eighth satellite of Jupiter (*Monthly Notices of the Roy. Astr. Soc.*, v. 68, p. 576). The calculations for Halley's comet came later. But such items cannot detract from the permanent value of this monumental volume.

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47 [S].—A. N. ZAIDEL', V. K. PROKOF'EV & S. M. RAISKII, *Tables of Spectrum Lines*, Pergamon Press Ltd., Oxford, 1961, xliii + 554 p., 24 cm. Price $14.00.

These tables, compiled largely from the M. I. T. Wavelength Tables, were first published in Moscow in 1952. In 1955 the tables were reprinted in Berlin as an International Edition, with introductory text in German, English, and French. The new edition appears to be identical with the Berlin edition except for rearrangement of the introductory sections.

The tables are in three parts. Part I lists the spectral wavelengths of 32 of the more common elements in order of decreasing wavelength between 8000 and 2000A. Intensities in arc, spark, and discharge tube are given, and air lines are included.

Part II lists the stronger lines and intensities of 93 elements. Excitation energies in electron volts are given for about 75 per cent of the lines. In Part III are presented several short auxiliary tables, mainly of physical properties and sensitive spectral lines, which are designed especially to aid in spectrochemical analysis. These include ionization potentials, atomic and molecular weights of the elements and their oxides, with their melting and boiling points, a table of the elements in sequence of their appearance in the spectrum of the carbon arc, a short list of sensitive lines of the elements in order of wavelengths and by elements, a table of strong lines between 2000 and 1800A, a table of iron lines suitable for intensity standards, and spectra of the hydrogen molecule and of deuterium.

A major feature of this book lies in the selection and arrangement that was made of the more important data on wavelengths and intensities. Many weaker lines, especially in the spectra of the less common elements, were omitted. The inclusion of excitation energies in Part II provides the first extensive compilation of such data in convenient form. These features and the useful auxiliary tables should be helpful particularly to the spectrochemical analyst. However, some caution should be observed in using the tables, since errors that were present in the M. I. T. tables may be found in this book; for example, 2592.627 Cu I, intensity 1000, is in error and should appear as 2392.627. The translations between languages may result in misspelling; for example, on page xx, Muir should be Moore (C. E.). However, these minor errors do not detract seriously from the general usefulness of the book.

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48 [S, V].—L. S. BARK, P. P. GANSON & N. A. MEĬSTER, *Tablit͡sy skorosti zouka v morskoĭ vode* (*Tables of the Speed of Sound in Sea Water*), Moscow, 1961, xiii + 182 p. + inserts, 26 cm. Price 1.73 rubles.

These tables of the speed of sound in sea water were computed in 1960 on a Strela-3 computer and a T-5 tabulator in the Computation Center at the request of the Institute of Oceanology supported by the Institute of Acoustics (all of the Academy of Sciences USSR).

Since the authors believe that previous tables, published by the British Admiralty [1], were based on formulas less accurate than Del Grosso's formula [2], they have based their tables on the Del Grosso formula

$$v = 1448.6 + 4.618t - 0.0523t^2 + 0.00023t^3 + 1.25(S - 35) - 0.011(S - 35)t + 0.0027 \times 10^{-5}(S - 35)t^4 - 2 \times 10^{-7}(S - 35)^4(1 + 0.577t - 0.0072t^2),$$ where t is the temperature in degrees Centigrade and S is the salinity in parts per 1000.

The tables consist of two parts, supplemented by appendices consisting of eight nomograms of the speed of sound and by tables of corrections for depth. These appendices are inserted in a cover pocket. The tables are divided into two parts because the Del Grosso formula yields a guaranteed accuracy of 0.2 m./sec. only when the salinity is more than 19 parts per 1000. The first part of the tables (pages 1–36) gives values of the speed of sound for a range of temperatures from