tory College Mathematics by Jaeger and Bacon. This new edition, of increased scope, is primarily designed for the student who will need some elementary mathematics and who can devote only a 1-year course to its study. Topics covered range from algebra through introductory integral calculus. The text seems to be carefully written by experienced teachers, who are well aware of student stumbling blocks. The treatment is traditional and employs the degree of rigor commonly used at this level, with the material arranged so that a choice of topics may be made for a shorter course.

The claim to novelty of Miller and Walsh in *Elementary and Advanced Trigonometry* lies in the second part of the text, which includes complex numbers and hyperbolic functions (often considered as elementary topics), solutions of trigonometric problems by methods of finite and infinitesimal calculus, Fourier series, and Tschebyscheff polynomials. In the first section, on elementary topics, the treatment is, in my opinion, substandard. Definitions are unnecessarily vague and sometimes incomplete. The logic is at times faulty. Average students *would* be confused, and good students *should* be confused, by the presentation.

The alleged purpose of the second part of the Miller-Walsh text is to answer the student's question about what can be done with trigonometry (if it is assumed that the student is not inclined toward flagpole sitting). No satisfactory and understandable answers are given, and one is likely to conclude that mathematics is a lot of nonsense. The claim that this material can be taught at this level is no reason why it should be taught there. Only those students who will continue in mathematics should study trigonometry, and they should not spend time on special problems treated in a watered-down manner. I fail to see to whom this text can be properly directed; thus, I cannot agree with the authors' intended purpose in giving us the book. We need concrete courses covering purposeful material.

The study of lines and planes using vectors differentiates Wexler's *Analytic Geometry: A Vector Approach* from the usual texts. This approach provides an interesting simultaneous study of some aspects of the geometry of two and three dimensions. Apart from this early use of vectors, the text is not particularly different from others, although a late discussion of tangents and normals is included. Wexler has included a large amount of optional material (without exercises) early in the text, dealing with properties of abstract vector spaces which are of doubtful digestibility at this level. A part of the author's motivation for this text was his dissatisfaction with the late appearance of analytic geometry in the popular course that unifies geometry and calculus. Usually geometry ends up as the neglected partner in a marriage that is much more apt to succeed if each partner strengthens the other. A student who completes this text will have a good supply of functions and ideas that will make his study of calculus more interesting and meaningful.

Foundations of Geometry and Trigonometry by Levi is a radically new text. It is new because it presents a logically rigorous development of affine and Euclidean geometry, in which analytic geometry and trigonometry play an integral part. The text is composed throughout of two parts: the formal development, in large type, giving content in the spirit of modern mathematics; and an informal discussion, in small type, telling the student what is going on and helping to motivate him to study the formal development. As a result, the distinction between mathematics and talk about mathematics is clear. As Levi indicates, the text is for a course not generally given in this country. One reason for this is that most students lack a proper background which would include a knowledge of elementary set theory and a good understanding of the real number system [such as is found in Levi's earlier text, *Elements of Algebra* (Chelsea, New York, ed. 4, 1961)]. An equally great obstacle for the average student is his inability to understand definitions and proofs. This inability is in part due to the nonrigorous, hand-waving type of mathematics that has composed his earlier training. Levi deplores the principle that mathematics "must be learned in a wrong version before it can be learned in a right one." Most mathematicians dislike the principle, but we will not be able to teach otherwise until more bold ventures, such as this text, indicate that we may be released from our bondage. This text could afford an exciting experience for well-fortified students, endowed with a patient and able teacher.

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Trace Elements

Atomic-Absorption Spectrophotometry. W. T. Elwell and J. A. F. Gidley. Macmillan, New York, 1962. vii + 102 pp. Illus. $5.

One of the newest physical methods to join the arsenal of analytical techniques used to determine trace elements is atomic-absorption spectrophotometry, first proposed by Walsh in 1955. Information on the determination of 23 metallic elements has since been published, including detailed applications for a much smaller number of these in both biological and metallurgical materials.

In view of the newness of the field and the limited number of studies, one might regard the publication of a book at this time as premature; however, the compilation of the pertinent information in one source in an organized fashion is welcome and should do much to arouse interest in this promising technique. At the outset the authors state that "an attempt has been made to bring the reader up to date with developments in those fields of analysis in which atomic-absorption spectrophotometry has, or is likely to have, useful applications. Because limitations of the technique are equally important, this aspect has also received due attention and comment." This objective has been faithfully fulfilled in a very clear and concise fashion.

The book systematically treats the theory, equipment, and technique; the concluding chapters provide a collection of specific methods for the determination of the elements zinc, lead, magnesium, manganese, iron, calcium, sodium, potassium, copper, and cadmium.

In their treatment of theory, the authors have faithfully followed Walsh's original presentation [*Spectrochimica Acta* **7**, 108 (1955)]. The chapter on equipment includes an elementary discussion of the essential components, namely, a sharp-line source, a means for vaporizing samples, a wavelength selector, and equipment for measuring and recording intensity. The method of producing hollow-cathode lamps is given in great detail, however, optics and instrumentation are neglected. The comparison of atomic absorption and flame photometry is valuable.

It is in presenting the compilation of the admittedly limited number of specific methods available in the literature that the book makes its best contribution. This information permits the fullest possible use of the technique during the present early stage of development. The discussion of the technique's limitations and the comparisons with other techniques are most appreciated.

It is obvious that no single method of instrumental analysis is capable of solving all of the analyst's problems; however, atomic absorption spectrophotometry has much to offer, and this small book serves as a good introduction.

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Nuclear Physics

Physics of the Nucleus. M. A. Preston. Addison-Wesley, Reading, Mass., 1962. x + 661 pp. Illus. $15.

The author of this book, M. A. Preston, has attempted to navigate between the Scylla of elaborate theoretical detail and the Charybdis of descriptive superficiality. On the whole, he has been successful.

Preston's point of view is completely modern. A surprisingly small number of the references are dated prior to 1950, and the median date appears to be 1956 or 1957. These dates, of course, reflect the enormous progress that has been made in the field since 1950. Of the 19 chapters, five are concerned with matters that have arisen since 1950. These chapters are entitled "Individual particle model," "Correlations in nuclear matter," "Collective nuclear motion," "The optical model," and "Direct reactions." Further, three chapters deal with very old questions that have recently been developed afresh: the two chapters on the internucleon force and the chapter on beta radioactivity.

This very timeliness also gives rise to the book's major faults. On occasion Preston draws an unwarranted conclusion, because he is unaware of all the facts. One such instance, for example, which is subjectively of interest to me, is in the experimental curve for the proton-proton depolarization at 150 Mev. Later experiments, available while the book was in preparation, have shown that the data displayed at large angles are incorrect, completely altering the conclusion Preston gives on page 112. An occasional error of this type is no doubt a small price to pay for such an up-to-the-minute treatment.

I find myself in more serious disagreement with the author on matters of emphasis. For example, it is difficult to understand why the polarization of elastically scattered nucleons was dismissed with a single sentence on page 548. Many of the topics treated do not lend themselves readily to exposition at the level of theoretical sophistication that the author has assumed to be typical of his readers. In this connection, the chapter on the Brueckner method comes immediately to mind. The student who here encounters this material for the first time may emerge more confused than enlightened. On the other hand, it is difficult to suggest how a better treatment could be made at this level in the space allotted.

This book must be strongly recommended as the only book devoted to this material; thus, no serious student of nuclear physics can afford to be without it. Further, the book's own merits entitle it to recommendation, and my criticisms do not alter my basic judgment that this treatment is, all things considered, very good indeed.

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A Hypothetical Model

Physics of the Solar Chromosphere. Richard N. Thomas and R. Grant Athay. Interscience (Wiley), New York, 1961. x + 422 pp. Illus. $15.50.

This monograph deals with a part of the solar atmosphere whose complexity has fascinated its investigators for almost a century. In the present era of widespread interest in radiative, magnetic, and mechanical phenomena at high temperatures, the title of this book will attract many students and nonastronomical scientists who seek a review discussion of physical processes in the chromosphere. These readers must be warned that writing such a review was not the intent of the authors.

The aim of this highly detailed research monograph is to infer, almost entirely from optical spectra, a structural model of the chromosphere (that is, a specification of the temperature and density at each height).

The authors, R. N. Thomas and R. Grant Athay, bring to this monograph the experience of years of collaborative study of the chromosphere. Most of the content has already appeared in the scientific literature. However, anyone who has tried to assemble, into a cohesive whole, the bits and pieces of journal articles whose publication dates extend over a decade, will appreciate the value of having all of the material assembled in one place, revised and corrected where necessary.

The authors have chosen to alternate in writing successive stages of the analysis, but this practice does not affect the continuity of their presentation. Thomas begins with an introductory discussion of the nature of stellar atmosphere, the particular problems of the solar chromosphere, and the validity of the concept of local thermodynamic equilibrium. Next, Athay reviews the spectroscopic data derived from eclipse measurements, and he describes mass motion and structural variation in the chromosphere. Thomas then sets down the equations that govern the level populations and radiative transport for the case of a statistically steady state. In this chapter (the fourth), he devotes considerable attention to terminology and the forms of the equations. These equations are the core of an "analytical methodology," which the authors employ throughout the remainder of the monograph.

Despite its emphasis on the development of a particular formalism, the treatment of deviations from thermodynamic equilibrium (in chapter 4) should interest anyone concerned with the spectroscopic properties of gases and plasmas. Few readers who are not specialists in the field of stellar atmospheres will wish to venture beyond this chapter.

The authors make little effort to interpret their conclusions in simple, readily understandable form. An occasional recapitulation, in relatively nontechnical language, would certainly have simplified the problem, even for the specialist.

The chromospheric model constructed seems a highly artificial one, based solely on chromospheric spectra obtained at total solar eclipses and mainly on a single eclipse—1952. Thus, the discussion is purely descriptive. The authors make no attempt to evaluate the physical processes that produce the solar chromosphere. A few references to "superthermic" processes (never clearly defined, but presumably shock