stances a given statement applies. Furthermore, as I have pointed out elsewhere, the concept of a "pre-contact situation" or the "ethnographic present" is a tricky one to handle in dealing with Central Asia. This difficulty makes itself felt particularly in the section on social structure: the accounts by 19th-century Russian scholars to which Krader refers for data on the social organization of the nomadic tribes cannot, in the nature of things, reflect the precontact situation. On the other hand, if the intention was to bring the account of the social structure up to date, there is a great deal of current Soviet literature that could and should have been cited but was not. However, this is an arguable point, and hardly damages the overall value of the work.

The system of annotation, by the way, is unnecessarily clumsy, requiring as it does, two separate references—one to the footnotes at the end of each chapter and another to the bibliography at the back of the book.

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Dipole Moments

Tables of Experimental Dipole Moments. A. L. McClellan. Freeman, San Francisco, Calif., 1963. x + 713 pp. $14.

This is a compilation of all of the experimentally determined dipole moments reported through 1961. The data are recorded in three tables: Compounds Without Carbon, Compounds Containing Carbon, and Compounds of Unspecified Formula. The third table includes data on oils and on natural and synthetic polymers. The compounds in the first two tables are listed by formula following the arrangement used in *Chemical Abstracts*.

In addition to dipole moment values, the percentage of electronic polarization used for atomic polarization in the calculation of the dipole moment is listed for compounds whose dipole moments were calculated from dielectric constant measurements. For other determinations the method of determination is listed. For about 50 compounds for which sufficient data were available the author has calculated a recommended value of the dipole moment. The methods used for evaluating the data in these cases are given in an appendix.

A bibliography with 2178 entries, an author index, and a tabulation of organometallic compounds under the respective metals add to the usefulness of this book. Scientists who use dipole moments in their work will find this a valuable compilation.

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Theoretical Physics

Lectures in Theoretical Physics. vol. 5. Lectures delivered at the Summer Institute, University of Colorado, Boulder, 1962. Wesley E. Brittin, Ed. Interscience (Wiley), New York, 1963. viii + 585 pp. Illus. $12.

This volume represents the fifth installment of the Boulder lectures delivered at the Summer Institute for Theoretical Physics at the University of Colorado. The contents comprise the 1962 proceedings. There are nine lectures delivered by eight lecturers. The topics cover a wide and diverse spectrum: general quantum theory (Furry and Bloembergen), solid state and related topics (Barut, Phillips, Blount), general relativity (Wheeler, two lectures), group theory (Biedenharn), and particle physics (Barut).

The brief preface states that it is the hope of the editors that "the lectures will prove to be of value to students who wish an *introduction* to current research as well as to experts in one field who wish to familiarize themselves with other fields" (my italics). It is the first part of this statement that causes me some concern. Although it may be true that the lectures presented in previous volumes did fulfill this hope, it is doubtful that a similar claim can be made here. To be sure, some of the lectures in the present volume are admirable and are exempted from the criticisms hereby made.

Specifically, I find it difficult to escape the impression that a potential lecturer, invited to contribute to such institutes on a topic of his choice, is too often tempted, and succumbs to the temptation, to speak on the subject closest to his current interests—his own research. In many cases he has attained a degree of specialization from which it is difficult to descend. Too often he is carried away by his own enthusiasm and is unaware that he has failed to make the translation that is necessary to enable a student with little or no prior knowledge to profit from the lectures as much as he might. The net result is something in the nature of a review article for experts.

Approximately half of the lectures in the present volume suffer from the malady described. The others are to be highly commended. If 50 percent efficiency is acceptable, this book is recommended for all those with at least the training of an advanced graduate student.

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High Pressure Research

High Pressure Physics and Chemistry. vols. 1 and 2. R. S. Bradley, Ed. Academic Press, New York, 1963. vol. 1, xii + 444 pp., $15.50; vol. 2, xii + 361 pp., $12.50. Illus.

Since the publication in 1949 of Bridgman's classic, *The Physics of High Pressures*, at least six books published in English have recorded the dramatic progress that is being made in research at very high pressures. This two-volume treatise is the most comprehensive yet written, and extensive bibliographies at the end of each chapter cite most of the important studies up to early 1963. Although 20 authors have contributed essays based on their special knowledge, there is admirable unity of style and comparative freedom from the repetitions and omissions that so often mar collective works. In a field that depends so heavily on the strengths of materials and their maximum use in the design of apparatus, one might expect to find emphasis on experimental techniques to the exclusion of theory, but this is not the case. A fine balance has been achieved between theory and experiment.

Chapter 1 gives an historical overview of the progress that has been made during the 20th century and singles out those centers that have made principal contributions to various phases of high-pressure research. The principles that underlie the main experimental routes to the generation of high pressures and the present state of

measurement and calibration are outlined in the second chapter. Writing this chapter must have been difficult for it is in just these aspects of the subject that progress has been most apparent but where uncertainties related to the development of a pressure scale are also much in evidence. For example, although pressures obtained in the laboratory now approach 500 kilobars, Bridgman's widely accepted value for the freezing pressure of mercury, which has been the secondary standard for the calibration of resistance gages, has been reexamined and found to be about 1 percent too low. An average of the results obtained for this important point by five groups using the free piston balance for absolute calibration establishes it as 7566 ± 4 bars at 0°C. Fixed points on the pressure scale up to 100 kilobars for which there is general consensus are: Bi I–Bi II at 25.40 ± .08 kilobars, Tl II–Tl III at 37.1 ± 0.1 kilobars, and the barium point at about 59 kilobars. Above 100 kilobars calibration becomes increasingly difficult and uncertain.

The major part of volume 1 is devoted to the properties of matter in the gaseous, liquid, and solid states. Chapter 3 is concerned with the special techniques that are needed for handling gases at high pressures and with the measurement of equilibrium, transport, and spectroscopic properties. Similar aspects of liquids are considered in chapter 4; water, because of its unusual properties (for example, decreasing viscosity with increasing pressure), receives particular attention. Various approaches to the derivation of equations of state are reviewed as an introduction to the subject of solids, including the theory of finite strains, the Grüneisen relation, Debye's theory of specific heats, and the Lindemann and Simon equations for melting. Equations of state for extremely high pressures may be derived from the Thomas-Fermi model, assuming a continuous distribution of electronic charge density and applying a temperature perturbation to obtain the thermodynamic state functions. Electron exchange interaction and spin correlation are ignored in this approximation, leading to positive errors for the energy of the system. Correction for these terms leads to equations of state which approach validity for pressures in the neighborhood of 10^4 kilobars for elements of high atomic number. An excellent discussion of phase changes is given, including the anomalous melting behavior of He^3. At about 0.3°K, dP/dT passes through zero and the entropy of solid He^3 exceeds that of the liquid below this temperature. Paradoxically, this means that liquid solidifies on heating at constant pressure below 0.3°K! Other topics include the effect of pressure on diffusion in solids, the electrical properties of normal metals and semiconductors, and superconductivity. The transition temperature of most superconducting metals is lowered by pressure, although thallium, bismuth, and some alloys display anomalous presssure dependence. The discussion of the optical behavior of solids under pressure is particularly interesting. The ultraviolet absorption edges of ionic and molecular compounds typically exhibit a red shift with pressure, but the behavior of germanium and some of the III–V semiconductors is more complex.

The same high standards are maintained in volume 2, which opens with a comprehensive survey of the geochemical applications of high-pressure research. The consideration of chemical equilibrium in gases and liquids is followed by an interesting discussion of chemical kinetics based upon transition state theory, with experimental results drawn from diffusion-controlled reactions and reactions that involve molecules and ions. The theory of shock waves is developed in chapter 9, with an excellent treatment of measurement techniques and applications to a variety phase transitions in metals and compounds. The wealth of information revealed by magnetic resonance investigations at high pressure is recounted in chapter 10. Chemical shifts in the zero field nuclear resonance of Fe^{57} are a linear function of pressure and may be useful for pressure calibration. Variation of the nuclear spin-spin relaxation time with pressure in solid hydrogen, in aliphatic compounds and in alkali metals, have yielded valuable information on their diffusional motions. Nuclear quadrupole resonance studies in certain molecular compounds indicate negative Grüneisen coefficients (decreasing lattice vibrational frequency with increasing pressure), contrary to normal behavior in solids. The direct examination of phase transitions by means of x-ray diffraction measurements is outlined in chapter 10; although it is a comparatively old technique, the use of diamond anvils during the last decade has greatly extended the range of accessible pressures.

This excellent treatise is especially welcome at the present time, for research in the properties of matter under very high pressures is undergoing its most vigorous development.

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History of Pharmacy

Kremers and Urdang's History of Pharmacy. Revised by Glenn Sonnedecker. Lippincott, Philadelphia, ed. 3, 1963. xii + 464 pp. Illus.

Seldom does the revision of a book do so much to enhance its physical appearance and utility. Changing the format to a two-column page and using numerous subheads as well as the usual division heads, combined with the addition of many attractive and pertinent illustrations, has produced a book in which each page seems to cry out, "Read me!"

Although it has long been a classic in its field, the original Kremers and Urdang "reference and text" left something to be desired. In this third edition the faults have been corrected. The number of illustrations and figures has more than tripled. These excellently reproduced illustrations breathe life into the printed words and contribute immeasurably to the instructional value of the book. It is indeed refreshing to find a volume that can be used as either a reference or a textbook without one aspect overshadowing the other.

The arrangement is essentially the same as that used in the second edition. The ancient and medieval antecedents of pharmacy are covered in the first part, while pharmacy in Europe from the Renaissance to modern times is developed in the second. The development of the profession in the United States is thoroughly covered in the third part. The chapters that deal with American associations, legal standards, education, and literature have been enlarged and brought up to the minute. Contributions made by pharmacists to society are considered in the final part. The splendid glossary and the bibliographical notes have been brought up to date. Welcome additions are the appendixes in which are listed drugs used by the American Indians, the founding