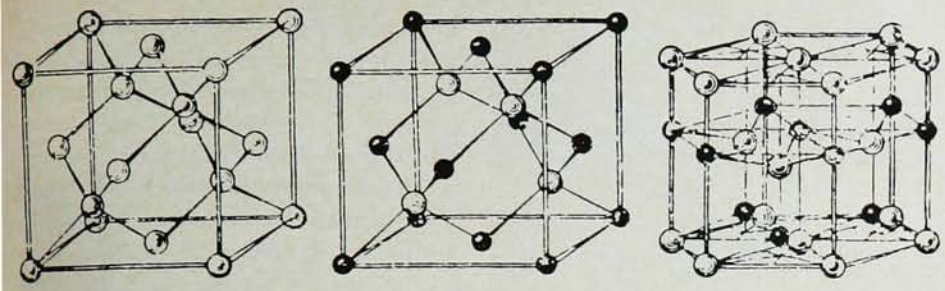

a b c

CRYSTAL STRUCTURES of (a) diamond, (b) sphalerite and (c) wurtzite. From the book ***The Chemistry of Diamond-Like Semiconductors*** by N. A. Goryunova.

sion of complex tetrahedral phases. In a systematic program the compositions of diamond-like substances are predicted on the basis of the following two criteria: (1) the average number of valence electrons must be four, and (2) normal valence must be achieved (this means that the anion must have a completed octet). Goryunova finds, for instance, that of 35 possible ternary phases formed from the seven elements of a row in the periodic table, only five can be considered analogs of elements of Group IV. There are four seven-component analogs.

It is characteristic of the author's approach that she remains aloof from theory-lets nucleating on observable trends. Thus she is also modest in assessing the value of her own proposed scheme which separates binary compounds into two groups with tetrahedral and octahedral coordination on the basis of electron affinities of the constituent elements rather than quantum numbers and electronegativities as suggested by Mooser and Pearson.

The translation is excellent as a whole, yet there are spots where Chinese-box sentences contain very little meaning. One of the tables is useless because bold and ordinary type cannot be distinguished. However, these are minor flaws compared with the more serious one of organization. The book is too slanted to appeal as an introduction to the subject as named by the title yet there is too much peripheral encyclopedic information to make it a good monograph on a special aspect of the subject.

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Surface phenomena for everybody

RECENT PROGRESS IN SURFACE SCIENCE, VOLUME 2. J. F. Danielli, K. G. A. Pankhurst, and A. C. Riddiford, eds. 541 pp. Academic Press, New York, 1964. $18.00.

by M. E. Straumanis

The cover of this book reveals that this serial publication brings together reviews of different disciplines within the general field of surface studies. The articles collected provide newest information (the years 1956 to 1961 are covered) on surface studies to all those who are interested in them: physicists, physical and colloidal chemists, electrochemists, plant and animal physiologists, botanists, zoologists, industrial chemists and even graduate students. Accordingly, the book covers topics from physics of adsorption to cell membranes and the articles are well written and understandable.

The three editors collected 10 articles for the book. The first article is written by M. M. Dubinin, B. P. Bering, and V. V. Serpinskii, all three from the Institute of Physical Chemistry of the Academy of Sciences of the U.S.S.R. in Moscow, and deals with physical adsorption at the gas-solid interface. Especially valuable are the references because they include the work done by Russian scientists, not so easily available in the West. Only physical adsorption is discussed, as the authors tried to avoid chemisorption. Some of the sections of the article are as follows: theoretical calculation of adsorption energies, adsorption heats and entropies, capillary condensation, properties of substances in the adsorbed state, adsorption of gas and vapor mixtures and sorption on major adsorbents. Some equations are given in the article but not their derivations.

The second article is on heterogeneous catalysis and is written by D. Brennan (The Donnan Laboratories of the University of Liverpool, England). It covers the topics: heterogeneous atomization of hydrogen and oxygen, the hydrogen-deuterium exchange reaction and the ortho-para hydrogen conversion, the hydrogenation of ethylene and the decomposition of formic acid.

"Contact angles" is the third article, written by G. E. P. Elliott and A. C. Riddiford (Dept. of Chemistry of the University of Southampton, England). It covers Young's equation, critical surface tension, polymers, and contact-angles studies.

J. T. Davies of the Department of Chemical Engineering of the University of Birmingham (England) wrote the next article which is on emulsions. It contains, among others, sections on formation and stability of emulsions, electrical and solvation barriers, coalescence and stability, breaking, creaming and viscosity of emulsions.

The last article still of interest for metallurgists or physical chemists is on flotation by A. S. Jay and A. J. Robinson (Warren Spring Laboratory, Stevenage, England). This article covers the topics: fundamental principles, kinetics of flotation, flotation performance, cell design, plant practice and other applications of the flotation process.

The last five articles of the book are of lesser interest for a physicist

or chemist. They are "The genetic control of cell surfaces" (G. H. Beale), "The physiology of pinocytosis" (R. C. Rustad), "Plastron respiration" (D. J. Crisp), "Preparation and properties of isolated cell surface membranes" (C. H. O'Neill) and "The cell membrane: image and interpretation" (P. F. Elbers). The book has an author index (on 20 pages) and a subject index (on 17 pages). All the articles are essentially review articles and are valuable as such. The outward appearance of the book is good.

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Nonlinear control

STABILITY OF NONLINEAR CONTROL SYSTEMS. By Solomon Lefschetz. 150 pp. Academic Press, New York, 1965. $7.50.

by Peter L. Balise

Scientists and engineers working in control theory will generally recognize Solomon Lefschetz as the coauthor with Joseph LaSalle of the 1961 volume, *Stability by Liapunov's Direct Method* (No. 4 in the publisher's series on mathematics in science and engineering). That volume did much to give wider attention to Liapunov's method, which is certainly of major importance in control theory even though it is probably not the general answer to nonlinear stability problems. Indeed there appears to be no really general answer.

The present volume, No. 13 in the same series, is similar to the earlier volume in its concise and accurate exposition. It outlines some recent developments in stability theory that have come from Liapunov's method, developments to which the author has contributed in his work at the Research Institute for Advanced Studies. It does not seem so much a monograph as the earlier volume—its content is more diverse.

The first six chapters, beginning in an elementary way with the concept of system characterization by state variables, discuss various conditions for stability in systems with "direct" and "indirect" control (distinguished by whether the feedback is direct or through a derivative). The seventh and eighth chapters are of major importance, presenting work of Popov and Kalman which makes it possible to replace a matrix by a number as a criterion for absolute stability. The last chapter reviews some material basic to the earlier work, including the Jordan canonical matrix and Liapunov's stability theorems.

Although the book presumes only a background in matrices and differential equations, the theory is difficult enough and the presentation concise enough that the book would not be considered as a text in the usual sense. It is however, an excellent reference (with well annotated bibliography), and the assiduous student could obtain from it valuable material on stability theory as well as enhanced appreciation of the use of system state vectors.

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The reviewer, a professor at the University of Washington in Seattle, has developed several courses in control, and is writing an introductory systems text.

Arithmetic of higher mathematics

METHODS OF MATRIX ALGEBRA. By Marshall C. Pease. 406 pp. Academic Press, New York, 1965. $13.75.

by Thomas Kailath

Richard Bellman called matrix theory the arithmetic of higher mathematics and wrote a book on matrices (McGraw-Hill, 1960) to support his claim. Bellman's numerous and well chosen examples were drawn mainly from the mathematics literature. The present book is similar in its aims to Bellman's book, but the examples are drawn mainly from physics and electrical engineering (mostly classical electromagnetic and network theory). The contents include the standard material on matrix manipulation, eigenvalues and eigenvectors, diagonalization, dyads and projections and functions of a matrix. Some space is devoted to a "pet" concept of the