

cell has not been measured, and the figures quoted can only be considered as crude guesses not even correct as to order of magnitude. Another example in which research problems are discussed in the manner of textbook material is the description of fluctuations in a cell. Concentration fluctuations of ions, charges, and molecules are shown to cause large changes in other cell parameters. Discussions of this kind make for an unorthodox but nevertheless highly interesting textbook.

As the title indicates, and as the authors state carefully, the subject matter represents a selected area from the entire, large field of biophysics. It comprises a timely and also much needed survey of the molecular bases of biophysical processes. The fifteen chapters are generously illustrated and their materials made readily accessible by a table of contents, an author index, and a subject index. The book is not only highly commendable to students in the life sciences, it is required reading for biophysicists.

This Universe of Space. By Peter M. Millman. 117 pp. Schenkman Publishing Co., Inc., Cambridge, Mass., 1962. Paperbound \$1.95. *Reviewed by Alan G. Henney, Naval Ordnance Laboratory.*

A BRIEF account of what astronomers have learned about the universe is given by Dr. Millman, who takes the reader on a tour of outer space that ranges from the small bodies in the immediate neighborhood of the earth to the immense galaxies at the outermost limits of the universe. A number of concepts and theories, such as the oscillating- and steady-state universe, are briefly described. The style of writing is interesting and clear. The author has succeeded in presenting an account of modern astronomy that should be understandable to the person with limited scientific training.

Advances in Catalysis and Related Subjects, Volume 13. D. C. Eley, P. W. Selwood, Paul B. Weisz, eds. 458 pp. Academic Press Inc., New York, 1962. \$15.00. *Reviewed by H. Wise, Stanford Research Institute.*

TO measure scientific progress in terms of calendar units must impose a responsibility upon the editors of *Advances in Catalysis* matched only by the predicament faced by many scientists when preparing the infamous quarterly progress report. However, a quick glance at the contents of the volume makes it apparent that, similar to a progress report, the contributions describe the current state of the art of catalysis. Whether they represent scientific advances is a question left for the reader to decide.

Our knowledge (or lack thereof) of the mechanism of interaction of simple gases (CO , O_2 , H_2) with the surfaces of metallic oxides is summarized in the first article, "Chemisorption and Catalysis on Metallic Oxides" (Stone). The story goes back some forty years when the Bristol school began to investigate some of the fundamental properties of metallic oxides in terms of the kinetics of chemisorption and catalytic reaction.

Geometric considerations as well as electronic properties of the solid are discussed in an attempt to explain the complex and sometimes diverging experimental observations of the "simple" reactions studied. Although this article produces more questions than answers, it offers a stimulating review of the "versatile role of individual gases . . . in the chemisorbed state".

Two additional review papers deal with radiation catalysis (Coekelberg, Crucq, and Frennet) and catalytic effects in isocyanate reactions (Farkas and Mills). Both areas of scientific research are of fairly recent origin. The radiation effects are examined primarily on solids such as alumina, silica, and activated charcoal, in contact with gaseous reactants such as N_2O , C_2H_4 , and $\text{N}_2 + \text{O}_2$. Under such conditions, the solid is interpreted to be an energy-transfer agent for the reactants, in contrast to modification of catalytic activity by irradiation preceding the heterogeneous reaction. Because of its technical importance, the chemistry of organic isocyanates has been given considerable attention from both theoretical and experimental viewpoints. Specifically, the steric effect associated with such catalysts as tertiary amines is invaluable in interpreting reaction mechanisms in the liquid phase.

One of the major problems in the study of solid surfaces is the lack of experimental tools for their detailed examination. Germer, in his brief and concise description of the low-energy electron-diffraction technique applied to crystal surfaces, offers a new approach to an old problem, i.e., the visualization of a surface during the initial stages of gas adsorption. The author of this article considers the techniques "potentially applicable to research in catalysis". There is little doubt that the experimental procedure described has initiated an entirely new era of study of solid surfaces.

A chapter by Weisz on polyfunctional heterogeneous catalysis examines a process of considerable importance to catalyst technology. The quantity of "tailor-made" chemical products that has been achieved by empirical choice of catalysts in admixture is truly remarkable. The author elucidates the mechanism of poly-step catalytic reactions in terms of mass transport and chemical reactivity. Although the identity of the intermediates leading from reactant to product is missing, the analysis shows some of the physical requirements and general characteristics of these catalytic reactions.

The final contribution by Wei and Prater deals with the structure and analysis of complex reaction systems. It is a most formidable undertaking and is bound to include certain assumptions such as monomolecular, i.e., linear systems. Yet it offers a mathematical approach to the interpretation of experimental reaction kinetics in a system of coupled reactions. In their attempt towards generalization, the authors have introduced a considerable degree of mathematical formulation.

In conclusion, the thirteenth volume carries on the tradition of its predecessors and provides for the specialist a stimulating review of a complex and fascinating field of scientific endeavor.