based on nutritional needs." Nor are these considerations confined to problems of nutrition, though this may provide the simplest and most urgent field for their application. The almost equally elementary requirements of housing and clothing will also call after the war for comprehensive policies, the lines of which are already beginning to shape themselves. The same principles might easily be applied to some of the more sophisticated requirements of modern civilization. Mr. Morrison spoke of standards in education and in leisure; and Mrs. Hamilton invited science to bring into the kitchens of the workers those hitherto expensive "appliances and fittings" which would rationalize the burden of housekeeping for all classes and release a store of female capacity and energy at present absorbed by household duties.

Thus the conference did not disdain the domestic view. But its international composition was calculated to ensure that the problems under discussion would be placed in their world setting. Like all great modern problems, the contribution of science to the advancement of human welfare is a world-wide issue. It has been realized for many years that the substantial increase in standards of nutrition, which science has shown to be necessary on grounds of health and efficiency, provides the one prospect of overcoming the chronic crisis of so-called "over-production" which has overtaken every agricultural country in the world in the past twenty years. Sir John Orr quoted some striking figures to illustrate the expansion of agricultural production which would be needed in order to bring the nutrition of the whole population up to standard even in the United States, the richest country in the world; and he went on to argue that a policy of meeting nutritional needs everywhere would rule out any danger of an agricultural slump for many years to come. What is true of the crisis of agriculture is true in a scarcely less marked degree of the crisis of industry. As Sir Harold Hartley suggested in his paper on world heat and power requirements, the economic vicissitudes of the present century may be largely due to the failure of the world to adjust itself to the "closing of the frontier"—the cessation of natural and automatic expansion into virgin territories—which approximately coincided with the end of the nineteenth century. Science continues to increase the world's productive capacity as rapidly under the new conditions as under the old. What it must now teach us to do, by releasing new sources of energy, is to substitute an organized and intensive expansion of consumption for the unorganized and extensive expansion of the previous period.

But, though science shows the way, it would be presumptuous to believe that science alone can lead us to the goal. The men of science themselves have moved far since the era of uncritical optimism, when progress was regarded as automatic and science as its predestined instrument. We need no evidence to-day that science can serve evil ends as well as good. It can be invoked to bolster up narrow sectional interests as easily as to promote the welfare of the community. This is no reproach to the instrument, but a reminder that the ultimate test of its value lies in the moral quality of the human purpose directing it. The most important service rendered by the conference of the past few days has been to bring to public knowledge the almost unlimited potentialities of human development and human well-being which science has to offer. Science provides the opportunity. There must also be the will to use it aright.—*The London Times.*

SCIENTIFIC BOOKS

CHEMISTRY

Laboratory Manual for General College Chemistry. By JOSEPH A. BABOR and ALEXANDER LEHRMAN. 289 pp. + appendices + 10 pp. graph paper. New York: Thomas Y. Crowell Company. 1940.

THIS laboratory manual is designed primarily for those students who have some background for chemistry. Accordingly, emphasis is placed on laboratory technique and on stressing the limitations of quantitative measurements. The numerous problems in the experiments elaborate upon principles and involve numerical calculations to illustrate quantitative relationships. It is interesting to note a detailed description of weighing has been omitted.

The material is presented in the "Work Book" or "Fill In" type of arrangement. An innovation in the manner of printing is the use of two columns per page as employed by the scientific journals. Accordingly, it is not as difficult to read the printed matter as when the single column arrangement is used. It is unfortunate, however, that the amount of space provided for answers is too limited for the usual response that a teacher would expect.

Extensive appendices which include data frequently used in the solution of problems and in the performance of experiments are designed to place the responsibility upon the student for selecting pertinent information for use in a particular problem.

The exercises are especially well planned and given very explicit directions on laboratory technique. Each exercise begins with a discussion of principles and is followed by directions and problems.

An abridged Hubbard "Periodic Chart" is printed

on the back cover and will be very useful both to the teacher and the student. An ample supply of graph paper is furnished for use in the many experiments where data are plotted in order to illustrate the principles involved. The manual is on $8\frac{1}{2} \times 11$ paper and bound with one of the newer type spiral binders.

The laboratory manual for "General College Chemistry" is very adaptable for use in the elementary chemistry laboratory.

L. L. QUILL

Experimental General Chemistry. By J. W. NECKERS, T. W. ABBOTT, K. A. VAN LENTE. 282 pp. New York: Thomas Y. Crowell Company. 1940. $1.75.

SIXTY-ONE carefully selected experiments designed for a year's course in elementary general chemistry have been assembled in this laboratory manual. One distinctive feature of this book is the use of "Preliminary Exercises" which contain leading and pertinent questions about the purpose and the problems of each experiment. Each experiment is preceded by these preliminary exercises which are to be assigned in advance and handed in at the beginning of each laboratory period. These exercises are printed separately from the laboratory exercise with which they are associated. The fact that the student must do a certain amount of work previous to starting the actual laboratory study should facilitate the performance of the experiment as well as making the laboratory work more interesting.

The authors have utilized the term "spatula spoonful" whenever accurate quantities of solid reagents are unnecessary. This innovation is being used widely by teachers of chemistry at the present time. The scheme saves considerable time for experimental work and eliminates the necessity of waiting for a balance. Frequent references to industrial processes are included throughout the book.

The manual is a very practical, well-arranged and teachable book, on $8\frac{1}{2} \times 11$ format. Adequate space in which the students may answer questions and do calculations is allowed. The custom of correlating the laboratory manual with several elementary text-books has been followed by these authors.

L. L. QUILL

Physical Chemistry. By A. E. MOELWYN-HUGHES. viii + 660 pp. Illustrated. New York: The Macmillan Company; London: Cambridge University Press. 1940. $9.50.

THIS book is an ambitious attempt to present a complete development of modern theoretical chemistry in one volume. Actually it is a simplified version of Fowler and Guggenheim's "Statistical Thermodynamics," which any mathematically minded graduate student might follow regardless of his preparation. The first 282 pages takes up the physical foundations—the fundamental constants, elementary quantum mechanics and statistical mechanics. The rest of the book applies these principles to thermodynamics, atomic and molecular spectra, dipole moments, chemical equilibria, kinetics of gas reactions and crystal structure. Every effort has been made to make the mathematics complete, often at the expense of brevity. "All theorems are derived; no proof is taken for granted." A large amount of carefully selected experimental data illustrates the physical principles. No problems to be worked out by the student are given.

The treatment of kinetic molecular theory is excellent, except for the use of the old values of the fundamental constants. The experimental basis of quantum mechanics is very complete. The mathematical derivation of quantum mechanics follows the historical approach and the reader is led through a maze of old Bohr theory which he must unlearn before starting the next chapter. Fifty pages are devoted to elementary wave mechanics, but the treatment does not get beyond the hydrogen atom. Perturbation methods and the nature of chemical bonds are not discussed. The chapter on thermodynamics is concise but not critical. For example, Trouton's rule is stressed but no mention is made of Hildebrand's modification. Intermolecular forces are discussed at some length. Diatomic spectra are stressed but predissociation is not mentioned.

The treatment of equilibria is the best feature of the book. Extensive tables of equilibrium constants, entropy and heat changes, etc., are given together with the original references. Some of the better known equilibria are studied in detail from both the experimental and theoretical angles.

The section on the theory of reaction rates is surprisingly weak. The contributions of Eyring are hardly mentioned. No calculation of an actual reaction rate is made. No mention is made of entropy of activation, and no attempt is made to interpret unusually fast or unusually slow reactions. Although Moelwyn-Hughes is a master of solution chemistry, no reactions in the liquid phase are considered.

A very useful summary of different types of rate equations and their integrated solutions is given in the appendix.

This book is far too advanced for an elementary course and too limited in scope for the usual course in advanced physical chemistry. Moelwyn-Hughes had an excellent goal in trying to systematize physical chemistry, but he placed so much emphasis on physical preliminaries that he did not have sufficient space to consider the chemical problems adequately.

JOSEPH O. HIRSCHFELDER