

logical conditions is duly considered, and Mr. Havelock Ellis summarises his conclusions as follows:—

“We cannot, therefore, regard genius either as a purely healthy variation occurring within normal limits, nor yet as a radically pathological condition, not even as an alternation—a sort of allotropic form—of insanity. We may rather regard it as a highly sensitive and complexly developed adjustment of the nervous system along special lines, with concomitant tendency to defect along other lines. Its elaborate organisation along special lines is often built up on a basis even less highly organised than that of the average man. It is no paradox to say that the real affinity of genius is with congenital imbecility rather than with insanity.”

The criticism will doubtless be made that in many cases the individuals dealt with by Mr. Ellis are too few in number to give trustworthy results; but this is a matter that was beyond his control, and no one can say that he has not made the most of available material.

#### TEXT-BOOKS OF PHYSICAL CHEMISTRY.

*Introduction to the Study of Physical Chemistry.* By Sir William Ramsay, K.C.B., F.R.S. Pp. 48. (London: Longmans, Green and Co., 1904.) Price 1s. net.

*The Phase Rule and its Applications.* By Alex. Findlay, M.A., Ph.D., D.Sc. Pp. lxiv + 313. (London: Longmans, Green and Co., 1904.) Price 5s.

IT will be readily admitted that there is on the part especially of our younger chemists, a growing appreciation of the methods and results of physico-chemical investigation, and the issue of a series of text-books of physical chemistry under the able supervision of Sir William Ramsay will be a welcome stimulus to the prosecution of study and research on these lines. Dr. Findlay's book on the phase rule is the first of the series, and other volumes are promised, dealing respectively with stoichiometry, relation between chemical constitution and physical properties, electrochemistry, spectroscopy, thermodynamics, chemical dynamics and reactions. The advance being made in some of these departments is much more rapid than in others, and the plan of having a volume for each branch of the subject will make frequent revision possible where there is a call for it.

Taken altogether, these volumes will be an acceptable addition to our chemical literature, for up to now the English student of physical chemistry has been dependent chiefly on translated text-books for detailed treatment of certain advanced portions of the subject. One or two of the promised volumes, it is true, will cover well trodden ground, but they are requisite in the interests of the treatise as a whole, and the editor will doubtless see that harmony and uniformity are preserved in the several parts. He has written a general introduction to the series, giving a rapid survey of the main lines along which the development of physical chemistry has proceeded, and indicating the scope of the subjects to be dealt with in the special volumes.

The mere mention of the phase rule usually strikes dismay in the heart of the non-mathematical chemist,

but it may be said at once that Dr. Findlay's treatment of the subject is almost entirely descriptive. The phase rule can be formulated in a simple enough manner, and its application can be appreciated even by those who may not feel at home with Willard Gibbs. Its merit is that it has rendered possible the classification of the various kinds of equilibria on a rational and scientific basis. The parallelism between many cases of physical and chemical equilibrium becomes intelligible; the phenomena of polymorphism, as exhibited, for example, by sulphur, tin, and benzophenone, can be treated systematically, and the conditions of stability of various polymorphic forms can be definitely formulated; the equilibrium between solid and liquid in binary systems can be fully interpreted, even when the two components form mixed crystals. In the exposition of these and many other points Dr. Findlay has done excellent work, and he has succeeded in producing an interesting and comprehensive estimate of the value of the phase rule in the classification and interpretation of equilibrium phenomena.

It is a very gratifying feature of the book that it contains full and up to date references to original work, and it is to be hoped that this feature will be prominent also in the subsequent volumes. After all, the best text-book can serve only to introduce the student to the actual workers in his science, and the more of such contact the better. Dr. Findlay has very properly been liberal in the reproduction of figures, for the exposition of the phase rule would be a difficult task indeed without those graphical methods of representation that have been so characteristic of its application. Tables of numerical data, taken from original papers, are abundant, and assist materially in the realisation of the actual experimental groundwork.

As a result of the physicochemical activity of the last twenty years, and of the corresponding introduction of mathematical methods of treatment, more demands than formerly are made on the reasoning powers of the chemical student. This is probably true also in connection with the phase rule, but no one who considers the material collected by Dr. Findlay will doubt that the application of these exact methods has secured a rich harvest of coordinated knowledge.

J. C. P.

#### OUR BOOK SHELF.

*Notes on Electric Railway Economics and Preliminary Engineering.* By W. C. Gotshall. Pp. iv + 251. (New York: McGraw Publishing Co., 1903.)

*Engineering Preliminaries for an Interurban Electric Railway.* By E. Gonzenbach. Pp. 71. (New York: McGraw Publishing Co., 1903.)

THE economic side of engineering is one which the student is generally left to pick up as best he can on his way through life. Little attention is paid to it as a rule in the course of his technical training, and it is not until he starts on practical commercial work that he begins to realise that pounds, shillings and pence enter as much into the engineer's formulæ as the fundamental units of length, mass and time. These two books should be very useful, therefore, not only to the budding electric railway engineer, but also to all students of engineering, as serving to show the many