

dustrial chemists, but that the education of the latter as physical chemists will open up new points of view, and gradually lessen the purely empirical methods by which the industrial chemist often tries to progress. The salt industry is next discussed; this is followed by an exposition of Cohen's experiments on allotropic tin, a short and masterly exposition of the metallurgy of iron, and the relations between  $\alpha$  and  $\beta$  ferrite, pearlite, cementite, and carbon.

In considering the bearing of physical chemistry on physiology, the measurement of osmotic pressure by *tradiscantia discolor*, and by blood-corpuscles, and the curious experiments on the human eye by Dr. Massart are discussed, as well as Loeb's discovery of the rôle of osmotic pressure in fertilisation. The influence of enzymes as accelerators or retarders of chemical action, and their effect in promoting synthesis as well as decomposition are particularly alluded to.

The last chapters, dealing with geological phenomena, are suggestive; the type chosen is the very complicated relationships between the Stassfurt salts, in which no fewer than twenty-six components are present. A graphic representation of the conditions under which these salts are capable of existence is annexed.

Prof. van 't Hoff possesses in an almost unique degree the power of simple exposition and suggestiveness. On reading this book one is tempted to exclaim, "Why was all this not thought of ages ago?" But the fact is, all great discoveries can be simply stated, but it usually needs a great discoverer who can add to his discoveries simple methods of exposition. The magic consists in clearness of thought, and this is admirably illustrated in this interesting book.

W. R.

#### SCHOOL MATHEMATICS.

*A School Geometry.* Parts i.-v. By H. S. Hall, M.A., and F. H. Stevens, M.A. Pp. xii+340+ix. (London: Macmillan and Co., Ltd., 1903.) Price 4s. 6d.

*Exercises in Theoretical and Practical Geometry.* By R. B. Morgan. Pp. 96. (London: Blackie and Son, Ltd., 1903.) Price 1s.

*Graphs: or the Graphical Representation of Algebraic Functions.* By C. H. French, M.A., and G. Osborn, M.A. Pp. vii+64. (London: W. B. Clive.) Price 6d.

PART V. of the new geometry by Messrs. Hall and Stevens has been recently issued, and the whole work, so far as it is completed, is now conveniently published in one volume. The final part, dealing with solid geometry, is in preparation, and will be awaited with interest in many quarters.

The authors follow the reform movement cautiously, on strictly orthodox lines, and adhere closely to the recommendations of the Mathematical Association and to the new Cambridge syllabus. The advantages of the newer methods of teaching geometry are very manifest in this excellently written text-book. A great change has been effected in the country in a compar-

tively short time, but the subject is not yet sufficiently emancipated from the older influences. The field of elementary geometry is at present only partially covered. We are strongly of opinion that examiners, teachers and writers should take a more comprehensive view of the scope of the subject. The scheme still generally followed in schools deals only with the shapes and sizes of figures, and takes no account of their relative positions. That is, attention is confined to scalar properties, and a vital portion of this essentially vector subject is ignored. It seems to us that boys at school should receive some account of the geometry of space, that is, they should be introduced to the conception and domain of vectors. This domain is far reaching and of supreme importance, and in subsequent study is seldom fully comprehended because, in the supposed interests of logic, persons responsible for the teaching of geometry have neglected a part of their duties and have failed to treat the subject in a thorough manner. The foundation of a knowledge of vectors should be laid in the geometry and drawing classes, where it can be done appropriately and effectively, and able writers like the present authors could exert much influence for good by introducing the subject in their deservedly popular text-books.

Mr. R. B. Morgan's book consists of a collection of more than six hundred exercises in geometry, together with a few specimens of recent examination papers, the purpose of which seems to be to illustrate the course of geometry as outlined in the new Cambridge schedules. No answers are given to the examples, or hints for solution or explanations of any kind, and the book is only adapted for use in conjunction with an ordinary text-book. In the latter sufficient examples are usually provided, and generally of a superior merit to those under review, so that the sphere of usefulness of Mr. Morgan's book seems likely to be very restricted.

The text-book by Messrs. French and Osborn is one of the University Tutorial Series. It is a supplement to the "New Matriculation Algebra" of the series, and is intended primarily for students preparing for the London matriculation examination. The subject is introduced by some typical examples of statistical graphs, in which special attention is paid to the choice of scales and the kind of information to be obtained from graphs. The authors then at once proceed to the development of the properties of algebraical functions by means of graphs, the examples being confined mainly to equations of the first, second and third degrees. The problems dealt with relate to maxima and minima values, the solution of equations, limiting values and asymptotes, symmetrical properties, and the determination of algebraical curves to pass through two, three, or four points.

It will thus be seen that trigonometrical, exponential and logarithmic functions are outside the scope of the work, as are also considerations relating to slope, rate of increase, and the calculus. But the ground that is mapped out by the authors is well covered, and the book will be found very useful to the class of students for whom it is intended.