

book has necessarily greatly diminished. It is therefore most satisfactory to note that Mr. T. Forster Brown, an eminent mining engineer, and Sir Warrington Smyth's successor as chief inspector of the mines of the Crown and of the Duchy of Cornwall, has edited a revised and extended edition, in which the principal changes and improvements in coal mining are treated. The chief additions made are two chapters dealing with blasting and explosives and with coal washing. In the latter, coke making (a subject usually included in metallurgical treatises) is also discussed. Mr. Forster Brown has very wisely been careful to retain the general character of the book. He has perhaps carried to too great an extent his unwillingness to alter the original text. The prices mentioned throughout the book, for example, refer to the years 1864-6. The Saxon coal production is given in the long obsolete units of *Scheffel*; and references are made to New Granada, a country that changed its name in 1861, and to "the flourishing empire of Brazil," which ceased to exist in 1889. Again, with regard to the speculation that the Palæozoic rocks may be continuous from the Severn to the Rhine, which is described as of little practical importance, no allusion is made to the discovery of coal at Dover. Mr. Forster Brown, too, omits to point out that the statement that there are very erroneous ideas of the overwhelming importance of the American coalfields as compared with those of Europe is no longer accurate in view of the fact that last year the United States produced more coal than any other country in the world.

BENNETT H. BROUGH.

*Untersuchungen über die Chemischen Affinitäten.* Von C. M. Guldberg und P. Waage. Herausgegeben von R. Abegg. Pp. 182 and 18 tables. (Leipzig: W. Engelmann, 1899.)

THIS latest addition to Prof. Ostwald's invaluable series of reprints will be welcomed by all chemists. The work of Guldberg and Waage is now well known, and is abstracted at some length in the larger books on theoretical chemistry; but we have here the complete series of papers with some recent annotations by Prof. Guldberg, and an interesting biographical and critical notice by Prof. Abegg.

The student of chemical history will do well to read this volume in conjunction with No. 74 of the series, which is a reprint of Berthollet's "Recherches sur la loi d'affinité." Berthollet's work was published in 1801; Guldberg and Waage's first paper is dated 1864. Between these years nothing advancing the mathematical theory of the subject had appeared except the unrecognised paper of Wilhelmy on the rate of inversion of cane-sugar, and the papers of Berthelot on esterification. When this is borne in mind it will be realised how great and how sudden was the advance made by the two Norwegians.

The three papers contained in the reprint, and dated respectively 1864, 1867 and 1879, show how, with the progress of time, the ideas of the authors grew in simplicity and generality, until in 1879 we have their theory in a form differing but little from that in which it is employed at the present day. The two earlier papers were very little known up to 1879, and several investigators worked unwittingly in the same field discovering facts a second time. This, however, can hardly be a matter for regret except in so far as it tends to bewilder the student. In other respects it has only served to strengthen the foundations of chemical dynamics.

A. S.

*How to Know the Ferns.* By Frances Theodora Parsons. Pp. xiv + 215; and plates. (New York: Charles Scribner's Sons, 1899.)

THIS book is intended to serve as a popular handbook to the ferns of the United States. It will probably fulfil its purpose, in enabling the reader to identify the majority of

the ferns described by means of their general habit, aided by the form of the sorus. To this result the numerous original illustrations, which are clear and accurate, will largely contribute. An artificial key to the species is provided, in which the authoress depends to a considerable extent on the degree of difference between sterile and fertile fronds to characterise the main groups. It is to be regretted that attention is not directed to the artificial nature of these distinctions, and that the natural arrangement was not adopted in the part devoted to the description of the species. In this we find the species of *Osmunda* separated in two groups, while the *Ophioglossaceae* are placed in the midst of the true Ferns. The brief account of the reproduction of ferns on pp. 30-35 leaves much to be desired. The figures illustrating this are poor, notably the drawing of a sporangium on p. 31, while the description is bald and in places misleading. No mention is made of the peculiar subterranean prothalli of the *Ophioglossaceae*. Had space been found by the omission of irrelevant matter in the opening chapters for a clear, simply written, and well-illustrated account of the life-history of ferns, with special reference to the native species, the book would have been none the less popular, while its educational value would have been greatly increased.

W. H. L.

*Laboratory Note-Book for Chemical Students.* By Prof. Vivian B. Lewes and J. S. S. Brame. Pp. viii + 170 (with alternate blank pages). (Westminster: A. Constable and Co., 1899.)

THE authors of this book, which is essentially one for the laboratory bench, are of opinion that there is room for a small volume containing all the necessary description for the laboratory preparation of gases, &c., together with the reactions of metallic and acid radicles, in a concise form, and some of the more simple quantitative experiments suitable for students. In the treatment of a few technical matters, such as the valuation of fuel, the simple examination of oils, the viscosity of oils, and the characteristics of explosives, the volume is in advance of most similar laboratory manuals, but the plan of interleaving the text with blank pages for the student's own notes cannot be unreservedly recommended. Many teachers find that such an arrangement is conducive neither to neatness nor originality in the pupil's expression of his own observations. The method has, however, its advantages; and the objection to it does not affect the text, which provides a good course of experimental work in chemistry suitable for technical students and others.

*The Elements of Co-ordinate Geometry.* "The University Tutorial Series." Part II. The Conic. By J. H. Grace and F. Rosenberg. Pp. viii + 315. (London: W. B. Clive, 1899.)

SO many text-books are available to day that the issue of a new one is generally accompanied by an explanation of its *raison d'être*. The one before us is that the present book seeks to develop the subject in a more gradual and more explanatory manner than its predecessors, and to pay more attention to curve tracing. That it succeeds in this endeavour will be gathered from a perusal of its pages, for no pains seemed to have been spared to lead the reader up small but ever rising steps. To gather a general notion of the scope of the book, we may say that, after briefly describing the three varieties of conics, the student is made acquainted with the general equation of the second degree, and the classification of curves which are represented by such an equation. This is followed by more detailed information relating to various properties of curves, taken at first generally and afterwards individually. The exercises are graduated as much as possible as regards difficulty of solution, and are very numerous.