

that Victor Meyer now seals up bulbs of oxygen and hydrogen (electrolytic gas) in a similar way, and that these, like their confrères of Cl and H, can be kept not only in the dark for any time, but, unlike these, also in the light without undergoing any change. The fact that many gases when perfectly dry do not combine is illustrated by the case of chlorine and metals—brass and sodium, pp. 84 and 85—as well as of carbon monoxide and oxygen, for these gases will not explode if dry, p. 189. A more striking way of illustrating this latter case than that with the eudiometer is not mentioned. I will add it. Dry a current of carbonic oxide over glass balls moistened with strong sulphuric acid; light the stream of gas issuing from a horizontal tube; then plunge over the blue flame a cylinder full of air which has been previously dried by shaking it up with a little strong sulphuric acid. The flame instantly goes out. Another case of the kind observed by Arnold lends itself to a lecture experiment. He found that powdered iron will not burn in pure dry oxygen, and in order to be able to estimate hydrogen in iron it was found necessary to insert a small tube containing a drop of water, through which the oxygen passed before coming into contact with the iron, this tube being of course weighed both before and after the experiment. This may well be included in the next edition, which I hope will soon be called for. Another capital experiment to show that iron can be carbonized by contact with a diamond was recently described to me by Mr. Gilbert Fowler, of Owens. A loop of pure thin iron wire is placed in a vertical glass tube surrounded by an atmosphere of hydrogen. Below the loop is a splinter diamond (or some diamond dust) placed on the top of a glass rod working through the lower end of the tube. After heating the wire by a current to the highest possible temperature without fusion, bring the diamond carefully into contact with the heated iron. The metal at once fuses. But of good experiments “there is no end” (Mr. Newth describes 620 for the non-metals alone) whilst of a review of a book in *NATURE* there must be a speedy end, and I will end by advising all those who like to see and to show good experiments to get Mr. Newth’s book.

H. E. ROSCOE.

A MANUAL OF PHOTOGRAPHY.

A Manual of Photography. By A. Brothers, F.R.A.S.
(London: Charles Griffin and Co., 1892.)

MR. BROTHERS has in this well-illustrated book brought together a great amount of information relative to the history, processes, apparatus, materials, &c., which will be welcomed by all who are interested, even if only in a general way, in the fascinating art of photography. The work covers about 360 pages, is divided into five parts and is accompanied by a full index.

In the short historical sketch which is introduced as the opening chapter, the author by means of quotations and otherwise gain much information which is not readily accessible, and many facts that are not inserted in our treatises, and which consequently are not generally known. At the present day, when so many possess a

camera of some sort or other, it is very curious to carry ourselves back to the time of Daguerre and to picture to ourselves the idea which he put forward when he wrote in his pamphlet, “Those persons are deceived who suppose that during a journey they may avail themselves of brief intervals while the carriage slowly mounts a hill to take views of a country.” Whether this is or is not the case now we will not stop to discuss, but we may mention that many other very interesting extracts are made from the same source.

The next three chapters deal with the chemistry, optics, and light as applied to photography. In these there seems to be nothing that calls for special attention, unless it be to state that the author has written them in a charming manner, as for instance the short summary under the heading “Magnesium Light,” which one reads with quite renewed interest.

Coming now to Part II., Processes, we find the most important section of the whole book. As Mr. Brothers rightly observes, the old processes previous to the introduction of the gelatine bromide methods have been put completely in the shade, not because they have been surpassed by better and more trustworthy ones, but simply because they require a little more care in manipulation and consequently the consumption of more time. In order to remedy this to some extent he has given great prominence to them, devoting nearly 140 pages to them, including working details of the more important later processes. For the sake of facility of reference they are arranged in alphabetical order, and in many cases they are accompanied by illustrations which show the actual results that can be obtained by the uses of the methods under consideration. To cite them in anything like detail would carry us too far away, but we may mention one or two briefly. The (wet) collodion process is of course here fully described: the author lays special stress on the advantage of this process, for there is no doubt that where dry plates are now used far better results could be obtained by employing this old wet process. The photo-mechanical process, collotype, receives also a rather lengthy description, but its utility and the excellence of the results obtained necessarily give it some prominence. A specimen illustration of the last mentioned is inserted, as well as one of a recent application of this method for printing in colour. Printing on wood, photo-lithography, platinotype, &c., together with photogravine Woodbury type and a host of others, are all described, some briefly, others of greater importance somewhat more in full.

Parts III. and IV. deal with the apparatus and materials used in the production of a finished picture. In the former the author describes the particular characteristics of many of the various kinds of cameras and accessories, while in the latter are explained the chief uses and actions of the chemicals employed.

Part V., the last, contains short notices of the applications to which photography has given rise. Astronomical Photography is referred to at some length, and we may mention that we have an excellent reproduction of one of Mr. Rutherford’s beautiful lunar photographs taken at first quarter. The practical

hints in the concluding chapter should be found very serviceable.

Mr. Brothers has produced a very serviceable and useful addition to our photographic literature; as a handbook for students it perhaps is somewhat too bulky, but nevertheless it will be very much used by them. Every photographer who wishes to know something about the art with which he is working, and who does not wish to limit himself to the mere cut-and-dried manipulations, should at any rate make himself acquainted with the volume.

W. J. L.

MATRICULATION CHEMISTRY.

Matriculation Chemistry. By Temple Orme. (London: Lawrence and Bullen, 1892.)

THIS is still another elementary manual dealing with the non-metals and their compounds. According to the author it can be studied most advantageously if the rudiments of chemistry have first been acquired. The book is built on pretty much the same plan as many already in existence; here and there, however, the reading is enlivened by ideas which, if not altogether commendable, have some pretensions to novelty.

The author is evidently of opinion that much of the ordinary chemical knowledge can be presented in other ways. Mass and weight first receive attention. In this book there are no atomic weights; atomic masses reign supreme. In using a balance we are told that we do not find weights, but "only masses." Indeed to bring this idea home the following curious question is set:—"When you 'weigh' a thing in an ordinary balance, do you find its weight?"

After a passing allusion to constitutional formulæ, in which they are likened to pyrotechnic frames, the next important alteration with which the author concerns himself refers to the nomenclature of oxides. Such a name as sulphur dioxide or carbon dioxide is discarded, for it is "founded upon a formula which is liable at any time to be altered so as to suit our knowledge of atoms and molecules." Anhydride is described as, "etymologically at least, a still more atrocious term"; hence we find that throughout the book SO_2 , CO_2 , &c., are spoken of as acids. P_2O_5 is said to be a tribasic acid, N_2O_5 a monobasic acid. CS_2 is called sulphocarbonic acid, P_2S_5 thiophosphoric acid, N_2O hyponitrous acid, and so forth, in spite of the fact that such compounds as that formed from "hydric oxide and phosphoric acid (*sic*) are often called acids by modern chemists."

The definition of a salt is thus summarily disposed of:—"You are often asked what a salt is; the only possible answer is that it is a compound."

Such methods of tampering with terms which have a generally-accepted meaning should, it seems to us, meet with no encouragement. They can only end in muddling the reader who wishes to pursue his subject by the aid of any of our standard works. But matter which is liable to do more immediate harm is frequently to be noted. For instance, it is stated that there is no such thing as the Law of Multiple proportions—it is only a corollary of

the atomic theory. If, according to its usual interpretation, a law is a generalized statement of fact, it is rather hard to see how its existence is affected by its relations to any theory.

To most chemists the brilliant work of Moissan has sufficed to settle the question of the isolation of fluorine; the author is, however, still sceptical on this point. P_2O_3 is given as the formula of phosphorous acid (*sic*); recent research has shown P_4O_6 to be correct. The valency of potassium is said to have been fixed by a "minute study of its gaseous compounds," water is stated to be elastic with regard to shape, and from Avogadro's hypothesis molecules of different gases are stated to be equal in size.

Even when the author is apparently trying to be precise he is apt to mislead. The following definition is an example:—"A chloride means a compound of chlorine with some other substance which, though it is not itself metallic in its general characteristics, possesses that important property of a metal, the capability of uniting energetically with chlorine." Is it to be understood from all this that a chlorine compound which is not produced by energetic union—say an endothermic compound like C_2Cl_4 —is not a chloride?

These extracts may serve to show that the book requires to be carefully overhauled before it can be placed with confidence in the hands of a beginner.

OUR BOOK SHELF.

Vegetable Wasps and Plant Worms; a Popular History of Entomogenous Fungi, or Fungi parasitic upon Insects. By M. C. Cooke, M.A., LL.D., A.L.S. [364 pp. 4 pl. and figs. in text] (London: S.P.C.K., 1892.)

It is somewhat surprising that a book on a subject of such importance alike to the entomologist and fungologist has not been forthcoming long ago. It is true that a Memoir on the subject was undertaken thirty-five years ago by Mr. G. R. Gray, but, being privately printed, was limited in circulation. To this work Dr. Cooke admits his indebtedness for a large amount of information bearing on the entomological aspect of the subject, and it is to be regretted that he was not aware of the existence of a much extended manuscript revision of the same work, at present in the Botanical Department, Natural History Museum.

Dr. Cooke's book is professedly a popular work on the subject, and consequently does not deal with the economic side, relating to such matters as the "muscardine" or silkworm disease, further than to indicate the nature and affinities of the fungus causing the disease.

The fungi parasitic upon insects are arranged under four primary groups: the *Cordyceps* group, the *Laboulbeniaceæ*; the *Entomophthoræ*, and lastly a heterogeneous collection of moulds, which, with few exceptions, are not truly parasitic and destructive. The structure and general characteristics of these groups, with glimpses of their life-history, are dealt with in an introductory chapter. Entomologists, whose main interest will be to ascertain the name of any fungus parasitic on an insect, will find this a comparatively easy matter, as the general arrangement is an entomological one, commencing with the Hymenoptera; and under each is given an account of all the fungi that are known to be parasitic upon species included in the order. Numerous woodcuts in the text and four plates assist very materially in the determination of species. From the mycological standpoint the arrangement indicated above is purely artificial, and introduced