that he 'cannot conceive of the antipodes' he uses the word differently from Huxley in the sentences he quotes, for Huxley only says that he believes that something will be accomplished, though he cannot conceive how. It happens that J. S. Mill uses Professor Brooks' example to explain the proper use of the word, writing (*Logic*, II., p. 321): "Antipodes were really, not ficticiously, inconceivable to our ancestors: they are, indeed, conceivable to us." Everyone will agree that conceivability in Professor Brooks' sense is not a necessary condition of truth, but this does not concern his subsequent argument.

Professor Brooks states in his last letter that Aristotle held "that our business in this world is to learn all we can of the *order* of nature, leaving to more lofty minds the attempt to find out what it is that 'produces anything and makes it what it is.'" Yet very curiously in his previous article to which he refers (SCIENCE N. S., Vol. I., p. 126) he wrote: "I should like to see hung on the walls of every laboratory * * * the older teaching of the Father of Zoölogy [Aristotle] that the essence of a living thing is not what it is made of, nor what it does, but why it does it." Professor Brooks seems to have proceeded from the *ignoramus* of his preceding paper to *ignorabimus* now, but he is not justified in taking Aristotle with him.

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## SCIENTIFIC LITERATURE.

*A Text-book of Gas Manufacture for Students:* By JOHN HORNBY, F. S. C. 12mo, pp. 261; 6 plates. London, 1896, Bell & Sons. New York, Macmillan & Co., 66 Fifth Ave. $1.50.

A concise little book setting forth the chief points in gas manufacture in a manner that students can readily grasp has been a desideratum. The manufacture of coal gas, with its attendant by-products, is very extensively developed in England; hence to that country we look for excellent treatises on this subject, and this 'Text-book' meets the requirements.

After a short consideration of the properties and value of various coals for gas making, the author discusses carbonization; the construction and setting of retorts and furnaces; the various appliances usually found in the retort house; the effect of temperature on the quantity and quality of the gas and on the by-products; condensation of tar; removal of ammonia and the elimination of other impurities; methods of testing purity and illuminating power; the various problems incidental to the distribution of gas to the consumers, and the construction of meters and burners. In Chap. XX., on the Composition of Coal Gas, is shown the effect of the various components of gas on its illuminating power.

The American reader will notice the slight attention given to water gas. Very little of this is used in England, it having been developed within the last fifteen years, while in most cases the English coal-gas works, with their plants for saving by-products, have been established much longer. A short description of the Lowe process, together with a plate, is given.

The author divides the water-gas process into 'continuous,' in which the reaction between carbon and steam takes place in an externally heated retort, and 'intermittent,' in which the carbon is raised to incandescence by an air blast, and then steam is blown into the hot mass. He adds that the continuous process has not proved a success. But in this country the term 'continuous' is applied to those processes in which a non-luminous water gas is made in a generator and stored in a gasometer, being afterwards carburetted in externally heated retorts. Processes of this character, notably that of Wilkinson, have proved very successful here for large works.

A short description of Peeble's gas-enriching process is followed by a chapter on sulphate of ammonia, which closes the book.

The print and plates are excellent and the illustrations are generally good, excepting two indistinct views of mechanical charging and drawing apparatus. FRANK H. THORP.

*Repetitorium der Chemie*: DR. CARL ARNOLD, Professor der Chemie an der Köngl. Tierärzlichen Hochschule zu Hannover. Siebente Auflage, Verlag von Leopold Voss, Hamburg und Leipzig. 1896.

This octavo-volume contains six hundred and six pages, of which three hundred and forty-six are devoted to organic chemistry and the remainder to inorganic chemistry. Concise and correct statements regarding the more important data of the various elements and their derivatives are given. No fault can be found with the matter presented. One is impressed with the fact that the most recent chemical literature has been carefully gleaned. It is stated in the preface that when preparing this book the author had mainly in view the needs of medical and pharmaceutial students, and the impression made upon the reviewer, after careful examination of the text, inclines him to the opinion that Prof. Arnold has truly succeeded in making a valuable 'quiz compend' for a class of students who study chemistry chiefly as a side issue. The typography and binding are well executed. S.

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## *SCIENTIFIC JOURNALS.*

### AMERICAN JOURNAL OF SCIENCE.

THE June number opens with an article by M. Carey Lea, 'On the Color Relations of Atoms, Ions and Molecules.' This is the second part of an investigation, the earlier results of which were published in the *Journal* for May, 1895. In the present paper the author discusses first the interaction of ions. It is shown that if a colored substance be formed by the union of a colorless kation with a colorless anion, the color belongs to the molecule only. The colorless ions have so modified each other's vibration periods that selective absorption is exercised. As soon, therefore, as the molecule is divided into ions the color must disappear. Consequently a solvent which is capable of separating the ions gives a solution, which when dilute must be colorless, no matter how intense the color of the compound. This is illustrated by the case of the highly colored $Sb_2S_5$, which forms colorless solutions because the ions, antimony and sulphur are colorless.

Furthermore, in regard to the combination of ions, it is shown that two or more similar colorless ions may unite to form colored elementary molecules; on the other hand, if colored, they may unite to form a colorless or white molecure or polymer; or to form a molecule of a wholly different color, as when blue copper ions unite to form red copper. Still, again, two or more dissimilar colorless ions may unite to form a colored molecule, as sulphur and silver to form black silver sulphide. The use of acid indicators, for example, of litmus, is discussed, and it is shown that the change of color on contact with an alkali in no way depends upon dissociation.

The relation of the subject in general to the classification of the elements is taken up and extended beyond the point where it was carried in the earlier memoir. The failure in certain cases of Mendeléef's periodic law is remarked upon and it is shown that the relation of ions to the visual rays leads to a classification which is in complete harmony with the chemical characteristics of the elements.

C. C. Hutchins and F. C. Robinson have a paper on the making and use of Crookes tubes to be employed in studying the phenomena connected with the Röntgen rays. The authors show that, with suitable choice of material and some skill in glass-blowing, tubes of the most favorable form may be made and exhausted in the laboratory. They have repeatedly made one, exhausted it and used it, all within an hour's time. The particular form of the tube, and the shape and distribution of the electrodes which are most favorable for producing a rapid result are discussed. It is stated that excellent impressions of the bones of the hand through thin sheet zinc have been obtained in two minutes. Incidentally some suggestions are given in regard to the best method of pumping in order to produce the high degree of exhaustion called for.

A. M. Mayer gives the results of researches on the Röntgen rays. He shows, in the first place, that they cannot be polarized by being passed through herapathite, or the iodo-sulphate of quinine, discovered by Herapath. The details of the experiments leading to these results are given, and incidentally the density of the material was found to be 1.557. In studying the transmission of the rays through certain materials the following results have been obtained, taking the amount of transmission