"Animals of the Past," of which the last edition was published in 1902, with the addition of a prefatory note bearing a picture of the mounted skeleton of *Allosaurus* on the reverse side of the leaf, and a final chapter containing a retrospect of the last twelve years, and summarizing the latest additions to our knowledge, especially such as have been gained through the medium of exploration.

The printing is from the original plates, which ultimately became the property of the author, and the general appearance of the book, the paper cover of which bears Gleeson's spirited restoration of *Tylosaurus,* is of the degree of excellence which one is led to expect in publications of the American Museum.

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*A History of Chemistry from the Earliest Times to the Present Day.* By the late James Campbell Brown, D.Sc., LL.D., Professor of Chemistry in the University of Liverpool. Philadelphia, P. Blakiston's Son & Co. 1913. Octavo. Pp. 558, with 107 illustrations. Cloth. $3.50 postpaid.

As stated by the editor (a cousin of the author) the present work comprises a course of lectures which the late Dr. Campbell Brown was accustomed to deliver before the chemistry students of Liverpool University. The lectures were left as manuscript notes which the author intended to revise for publication, but his sudden death in 1910 prevented the execution of this plan. Notwithstanding the imperfect shape of some of the material, the friends of the author considered that it would be a cause for regret if the information, which represented years of patient research and study were not made available to former students and to any others who might be interested in the history of chemistry. The lectures have, therefore, been printed, in much the same shape as delivered, the editor making such changes and revisions as seemed necessary for proper presentation in book form.

Following the example of Kopp (whose monumental "Geschichte der Chemie" must form a basis for every historian of chemistry) the author has divided his subject into five sections—the Prehistoric, the Alchemical, the Iatrochemical, the Phlogiston and the Quantitative Periods. The lectures upon the first four of these periods cover their ground most minutely, and indicate that the author must have had a particular fondness for ancient chemical lore. This section of the book is profusely illustrated with old drawings of alchemical apparatus, mystical diagrams and specimen pages of Greek, Syriac and Arabian texts. The lists of writers and of bibliographies are very full, making the book of service, both to those who wish to consult the old authors as well as to the collector of rare books. For the abundance of material supplied in this particular branch of chemical history, we know of no other book in English with which it can be compared.

In discussing the work of the ancient Greek and early medieval alchemists the author has made extensive use, as every historian of chemistry must, of the invaluable researches of Berthelot. The lecturer cautions his students to distinguish carefully between the genuine works of Democritus, Geber, etc., and those of their pseudo-namesakes; it seems that the editor has not heeded this caution in revising the late author's notes. The story told on page 30 of the miraculous opening which Democritus saw in the pillar of the temple at Memphis and the two prescriptions for making gold on page 31 are found in sections 3, 4 and 5, of the "Physica et Mystica," a work which belongs, as the author correctly states elsewhere (pp. 43, 182), to the pseudo-Democritus and not to the founder of the atomic school.

We fear that the remarks of the author upon page 14 regarding the chemical knowledge of the Hebrew law-giver Moses may cause considerable perplexity. The statement that Moses comminuted the golden calf and "rendered it soluble by fusion with an alkaline or alkaline-earthy sulphide" revives a strange speculation indulged in by the ancient alchemists. The verse in Exodus 32:20, which states that Moses took the golden calf "burnt it in the fire and ground it to powder and strewed it upon the water and made the

children of Israel drink it" stimulated the search for a life-giving tincture of gold (the *aurum potabile*). It was held that Moses possessed wonderful chemical knowledge, acquired from the Egyptians, and theories were advanced that he dissolved the golden image in *aqua regia* or else alloyed it with lead or mercury. Stahl in 1698 advanced the new explanation that Moses dissolved the gold by treatment with supersaturated liver of sulphur (*hepar sulphuris supersaturatum, ex æquis partibus salis alcali et sulphuris citrini*). From Stahl, evidently, the late author borrowed his own idea, which we can of course interpret only as a piece of lecture-room pleasantry.

The famous *ænigma chemicum* concerning the nine-lettered name of the philosopher's stone, which is translated in part on page 154, is another interesting example of the speculations in which alchemists were wont to indulge. The answer "arsenicon" which the author gives, is only one of many solutions that have been proposed; φαοσφόρος (phosphorus), κινάβαρις (cinnabar) κασίτερος (tin) and other Greek words have been distorted in a vain effort to meet the requirements of the riddle.

A critical reader might object to several statements in the book for reasons of inaccuracy. It is wrongly stated, for example, on page 17 that sugar was employed by the ancient Egyptians. The earliest reliable information—that found in old Chinese writings—places the probable date of the earliest manufacture of cane-sugar between A.D. 300 and 600. The σάκχαρ of Galen and σάκχαρον of Dioscorides and other Greek writers was not our modern cane-sugar, but in all probability the eastern *tabaschir*, a gummy silicious exudation of the bamboo.

The statement (p. 183) that Aristotle originated the idea of a fifth element (the ether or quintessence) requires to be modified. The same conception occurs earlier in Plato, who, in the Timæus (end of Chap. XX.), mentions a fifth substance or essence (ἕμπτη σύστασι), which included the four elements of fire, air, water and earth. This notion, which foreshadowed later assumptions concerning the unity of matter, is also found in the writings of the early Pythagoreans, from whom the idea was probably first borrowed.

The fifth section of the book was not finished by the late author and this part of the volume shows in consequence considerable evidences of incompleteness. Many of the chapters are in fact so fragmentary that a student can obtain only an imperfect and confused idea of modern chemistry. The chapter upon physiological chemistry, for example, makes no mention of the work of Claude Bernard and leaves the subject of fermentation where it was left by Dumas. The editor's arrangement of the author's lecture notes in this part of the book seems particularly unfortunate. We wonder, for example, in the grouping of chemists by chapters, why Wöhler was not associated with Liebig rather than with Stas, and why Bunsen was not placed with Kirchhoff rather than with Victor Meyer. There is also in places a lack of agreement between different sections. The discovery of columbium, for example, is credited to Wallaston in 1809 on page 348 and to Hatchett in 1801 on page 521. In some ways it would have been better to have closed the history with the end of the life-work of Liebig and Dumas. This marks fairly well the end of an epoch and would have enabled the editor to eliminate fragmentary chapters and thus give the book a greater appearance of finish.

The typography of the new book is, as a whole, excellent. The method of printing the formulas of propyl and isopropyl iodides on page 469 is faulty, as it gives them the appearance of being unsaturated compounds. There are also several cases of careless typesetting, a most glaring instance being the heading of chapter 32.

A posthumous work published under adverse conditions must necessarily receive due consideration for evidences of incompleteness and mistakes of revision. After a careful reading of the book, we believe that the publication of Dr. Campbell Brown's lectures upon the history of chemistry was well worth while. The finely

executed photograph of the author and the nine-page biographical sketch will be appreciated by those who knew him and to those unfamiliar with his life will convey the pleasing impression of a strong unique personality.

C. A. Browne

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## *CHINA'S FOREIGN TRADE IN MEDIEVAL TIMES*

The history of commercial intercourse, bound up as it is with the history of the origin and development of navigation, is a most fascinating subject, more especially the study of the commercial relations between the different Oriental peoples. A valuable contribution to this subject has recently been issued by Professor Friedrich Hirth, of Columbia University, and Mr. W. W. Rockhill. This is a translation from the Chinese, with introduction and commentary, of the work by Chau Ju-Kua, treating primarily of products, and incidentally of the customs of the various countries known to the Chinese in the twelfth and thirteenth centuries of our era. The introduction by the translators supplies us with much valuable information on Chinese trade derived from a number of other sources.[1]

Of the many interesting facts to be gleaned from a perusal of this book, we can only very briefly touch upon a few of the more striking. The work appeals especially to careful and thorough students of the subject.

The trade of Canton was the object of earnest solicitude to the Chinese government, because of the large revenue derivable from it. One of the port regulations implies a determination to give all importers an equal chance, as far as possible, for as each ship arrived its cargo was discharged, and the merchandise placed in the government storehouses and kept there until the last ship of the season sailed in. Only then were goods placed at the owners' disposal for sale, the government retaining thirty per cent. as customs duties. Thus the first comer was not allowed to secure the cream of the market to the prejudice of those who might have had a longer voyage, or else have been detained by stress of weather.[2]

Toward the close of the tenth century the Chinese government, realizing the great value of its Canton trade, undertook an active propaganda to encourage its development, envoys being despatched with the wherewithal to secure the good-will of the South Sea traders. Among other inducements special trading licenses were offered. The results were soon apparent, merchandise poured in so freely that the difficulty was to find a good market for it. The rapid increase under this fostering care is shown by the fact that while from 1049 to 1053, elephants' tusks, rhinoceros horns, strings of pearls, aromatics, incense, etc., were annually imported to the value of 53,000 "units of count," these annual imports had risen in 1175 to over 500,000 "units of count." While the monetary equivalent is an unknown quantity, the figures suffice to show the great increase of the Canton trade.[3]

The government import duties amounted to thirty per cent. from the middle of the ninth century A.D. and this rate remained practically unchanged for several centuries thereafter. If any part of a ship's cargo was removed without the knowledge of the officials the whole cargo was confiscated and the offender was punished according to the gravity of the offense. Therefore we need not wonder that a Chinese authority (the Pingchou-k'o-t'an) should be able to state: "so it is that traders do not dare to violate the regulations."[4]

The Chinese author does not confine himself to a description of the chief productions of each of the regions he passes in review, although this is the principal aim of his work, but he also gives many brief notes regarding the customs, dress, etc., of the different peoples and details of the court ceremonials.

[1] Chau Ju-Kua = his work on the Chinese and Arab trade in the twelfth and thirteenth centuries, entitled "Chu-fan-chi." Translated from the Chinese and annotated by Friedrich Hirth and W. W. Rockhill, St. Petersburg, Printing Office of the Imperial Academy of Sciences, 1911. Pp. x + 288. 8°.

[2] *Op. cit.*, p. 15.

[3] *Op. cit.*, p. 19.

[4] *Op. cit.*, p. 21.