

least one thing is certain—the writing-fluid used by the ancient scribes for such records as the foregoing must have possessed in a high degree the property of durability.

In one form or another, the basis of these early writing-fluids was carbon. For example, Chinese ink, the so-called "Indian" ink of the modern artist, which according to the native historians has been made since 2600 B.C. or thereabouts, was at first a vegetable varnish, and later a mixture of lampblack and glue. Inks containing gallate of iron did not come into use until a much later period. Thus Sir Humphry Davy, examining some documents recovered from the ruins of Herculaneum, "looked in vain amongst the MSS. . . . for vestiges of letters in oxide of iron," and he concludes that the Romans up to the time of Pliny had never used "ink of galls and iron" for writing purposes. Gradually, however, in the early centuries of the Christian era, there came a transition from carbon inks to those containing iron; and Blagden, in "Some Observations on Ancient Inks," communicated to the Royal Society in 1787, records that the writing fluid employed in various MSS. on vellum, dating from the ninth to the fifteenth centuries, was an iron and gall ink. Somewhat earlier than the date of Blagden's paper logwood began to find employment as a constituent of inks, and soon after the middle of last century came the next notable modification, namely, the use of aniline dyes in the manufacture of both black and coloured writing-fluids.

Of these and other matters bearing upon the history, composition, and methods of preparing the various kinds of inks, Messrs. Mitchell and Hepworth have much to tell us in the volume under notice. They have brought together, and made convenient for reference, material that has been hitherto chiefly scattered amongst periodicals and isolated dictionary articles. In so doing they have saved their contemporaries some labour, and earned for themselves much gratitude.

The book is divided into three sections. The first of these deals with writing inks, including those of which carbon, tannin, logwood, and aniline respectively form the characteristic ingredients. It comprises chapters upon the sources of the tannin materials, the chemical nature of iron-gall inks, and the best methods of examining both the fluid itself and the characters on the written page. Printing inks form the subject of section ii., in which an interesting chapter treats of colour work, including three-colour printing and inks for use in the production of cheques and bank-notes. In the concluding section there is a description of inks intended for miscellaneous purposes; these comprise copying, marking, safety, and sympathetic inks, and fluids for writing on glass, wood, ivory, or leather. Many formulæ are given, some of which the authors have personally tested, and the work closes with a list of English patents relating to the subject.

Despite occasional incoherency of style, the two collaborators have produced a useful and attractive little volume. One or two slips may be pointed out; thus the equation on p. 101 is incomplete, and the

specific gravity of dilute hydrochloric acid is given wrongly on p. 208. In the historical introduction we are told, *apropos* of a certain document (p. 11), that "it was probably written at the end of the sixteenth century by a man past middle age, who learned to write just about the time that Shakespeare was born (1504)." At first it seems an unnecessarily cautious understatement to call such a man "past middle age," but a little reflection shows that it is those kittle cattle the figures that are to blame.

The book is a serviceable addition to the literature of chemical technology. C. SIMMONDS.

OUR BOOK SHELF.

Naturbegriffe und Natururteile. By Hans Driesch. Pp. viii + 239. (Leipzig: Wilhelm Engelmann; London: Williams and Norgate, 1904.) Price 4s. net.

THIS book deals chiefly with three topics. Starting on a Kantian basis, it seeks to state the *a priori* principles of pure physical science. (*A priori* is conveniently defined as "independent of the amount of experience.") Next, the leading principles of "energetics" are discussed, and their relation on the one hand to the *a priori* principles of pure physical science, and on the other hand to the ordinary laws of thermodynamics. Incidentally, the "laws" of conservation (of substance and the like) are examined, and entropy has a good deal of attention. Last of all the results attained are carried over to a discussion of biology. The point of view is neo-vitalistic. It would be hazardous to say that the author has run to earth the x which is the object of all our search, the vital principle or whatever other name may be applied to it; the term which he uses is the blessed word *entelechy*.

Herr Driesch is well known to be at his best a clear, original and suggestive writer. Much of the present work is excellent, but we doubt if the last eighty pages are either clear or convincing. Perhaps one would require to read the author's other works in order to accustom oneself to his point of view and his independent modes of statement. He is occasionally unsatisfactory as well when dealing with the theories of others, for example, with Prof. Clerk Maxwell's "sorting demon." The discussion occurs under the heading "Declarations of Physicists regarding Biological Subjects," and Herr Driesch almost seems at times to suppose or to imply that the conception may have been formed in order to limit the second law of thermodynamics to inanimate bodies. True, Lord Kelvin's statement of the second law has the words "in inanimate material." But Lord Kelvin's declaration is explicit ("Popular Lectures and Addresses," 1889, vol. i. p. 141):—"The conception of the 'sorting demon' is merely mechanical and is of great value in purely physical science. It was not invented to help us to deal with questions regarding the influence of life and of mind on the motions of matter." On p. 103 the accurate reference to Helmholtz's work is—Ostwald's *Klassiker* Nr. 124, p. 30, Anm.

Higher Text-book of Magnetism and Electricity. By R. Wallace Stewart, D.Sc. Being vol. iv. of "The Tutorial Physics." Pp. viii + 672. (London: W. B. Clive, University Tutorial Press.) Price 6s. 6d.

We have several times noticed this work as successive editions have appeared, and can speak as appreciatively of it as we have on other occasions. The present volume is based on the older one, but it has been wholly