throughout thoroughly impartial and judicial, and shows a healthy scepticism as regards theories unsupported by adequate fact. There can be no doubt that a translation into English of this admirable book would be of great assistance to all those students of bacteriology who are unable to read it in the original.

Lehrbuch der Entwicklungsgeschichte des Menschen. Von Dr. J. Kollmann, o.ö. Professor der Anatomie in Basel. Pp. xii + 658. (Jena: Gustav Fischer, 1898.)

THIS work appears to approach in method the ideal of an elementary text-book of science, since it gives a sound and well-balanced *résumé* of its subject to date, with references to authorities sufficient to place the student in direct touch with original description of detail. The pages of the book never pall, and in treatment and mode of expression it is one of the least "German" of German text-books with which we are familiar. It is illustrated by 386 excellent processed drawings, many of which are coloured, and where original these are very good and such as are likely to become popular. The investigations of His, of course, come in for a full share of recognition, and good use has been made of those of Keibel, Mall, Röse, Toldt, and others among recent workers. The book is divided into five leading sections. An introduction of sixteen pages is followed by portions dealing with the earlier stages of development ("Progenie" and "Blastogenie"), treated as far as is necessary comparatively. The fœtal membranes and progressive development of the human fœtus next come in for consideration; but the bulk of the work (405 pages) is of necessity devoted to a description of the development of systems and organs, and there is appended a twenty-page dissertation on heredity. Not the least pleasing feature of the book is its consummately artistic plan. Illustrations never obtrude themselves upon the margin nor overpower the text. In the placing of the figures, choice of their colour and descriptive letterpress, there are evidences of the bestowal of great care and forethought and of painstaking consideration of detail, which are alone a strong recommendation of the work. It is carefully written and non-pedantic, and should be deservedly popular.

Missouri Botanical Garden. Ninth Annual Report. Pp. 160. (St. Louis, Missouri: published by the Board of Trustees, 1898.)

ADMINISTRATIVE details occupy but a small part of this report, the chief contents being a collection of scientific papers and notes on interesting plants, illustrated by several half-tone plates. The results of the studies of the American Lemnaceæ occurring north of Mexico, by various botanists, are brought together by Mr. C. H. Thompson, and are combined with his own researches into a revision of the order. Mr. H. C. Irish contributes to the report a revision of the genus Capsicum, with especial reference to garden varieties. Mr. J. N. Rose describes five species of agaves which flowered in the Washington Botanic Garden in 1897, and were identified by him. One of these (*A. Washingtonensis*) appears to have been hitherto undescribed. Among the notes, Mr. William Trelease, the Director of the Gardens, records some interesting observations on Yuccas. He points out that *Yucca gigantea* is distinct from *Y. gloriosa* and *Y. Guatemalensis*—its nearest allies—and gives a figure of an Azorean specimen which is a good example of the species. With reference to the extent of the pollination of Yuccas by the Yucca moth, Mr. Trelease has now obtained information which proves the moth to be "the active agent in the pollination of Yuccas from Florida northward as far as fruit is set as a result of *Pronuba* activity, westward as far as southern California, and into the mountains of northern Mexico to the south."

LETTERS TO THE EDITOR

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Liquefaction of Hydrogen.

YOUR last issue contains a report of Prof. Dewar's remarkable achievement in the liquefaction of hydrogen and helium. In his account of it, which you quote, Prof. Dewar describes the apparatus employed as an enlarged plant of the same type as that used in his hydrogen-jet experiments discussed in his paper before the Chemical Society of December 19, 1895 (see *Proceedings*, No. 158), and in his lecture at the Royal Institution (see *Proceedings*, 1896), and illustrated in a figure printed with this lecture. An examination of that illustrative figure and of the description shows that the type of apparatus used involves an entirely new departure as compared with the methods of all who had liquefied air before 1895, including Prof. Dewar himself. The new self-intensive method then and now employed is a combination of the following four points: *a long tube conveying compressed gas, expansion of the compressed gas through a nozzle or throttle-valve, direct return of all the expanded gas over the tube of compressed gas, good interchange of temperatures between the compressed and expanded gas.* The new method embodying the above combination will be found fully described and illustrated in my patent, No. 10,165, 1895 (May 23). What is equally important historically: in November 1894, more than twelve months before Prof. Dewar first showed this new method in action, liquefying air, I had called, with an introduction, on his chief assistant, Mr. R. N. Lennox, at the Royal Institution, had there explained to him this self-intensive method, and had proposed it as a means of obtaining intensely low temperatures. By employing this method I was afterwards the first in this country to liquefy air and oxygen without employing other refrigerants. Since then, at the Royal Institution, where alone sufficient means are available for the prosecution of these researches, the same method has bridged over the space, impassable by former methods, between the temperature of liquid air and that of liquid hydrogen and helium, thus proving itself a new and valuable scientific instrument.

Under these circumstances I think that Prof. Dewar, seeing he was aware of the facts at the time of his account, ought not to have been content with eulogising the services of his assistant Mr. Lennox, but should also have given me credit for the invention of the method which has procured him so great a success. Although he has been easily able to find in old patents the separate elements which go to make up the new method—this can be done for any new invention—he has nowhere found, before the date of my communication to Mr. Lennox, that combination of the four points given above which is absolutely necessary to his apparatus for liquefying hydrogen.

The facts referred to above are stated and discussed in greater detail in a paper, to be printed shortly, which was read by me before the Society of Chemical Industry at Burlington House on the 2nd inst., with illustrative diagrams, and in letters by me to *Engineering* for April 15 and May 6. W. HAMPSON.

Concerning the Thermodynamic Correction for an Air-Thermometer.

IT is common in works on thermodynamics to give a formula for the thermodynamic correction applicable to an air-thermometer; the following is substantially the usual proof.

Accepting the current theory of the Joule-Thomson experiments, we may show that

$$t\frac{dv}{dt} - v = k\frac{\delta t}{\delta p},$$

where k is the specific heat at constant pressure measured dynamically. From this we obtain

$$t\frac{dv}{dt} = v + k\frac{\delta t}{\delta p}$$

and

$$t = \left(v + k\frac{\delta t}{\delta p}\right) \div \frac{dv}{dt}.$$

Thus t is seen to consist of two terms; the second term