'Light and life,' 'The plant calendar,' 'From pole to equator,' 'From sea-level to eternal snow,' 'What the forest tells of itself,' 'Grapes and wine,' 'The rose,' 'Insectivorous plants,' 'Botanical studies on the sea-shore,' 'The world in a water-drop,' 'Bacteria,' 'Invisible enemies in the air,' 'Gardens in ancient and modern times.'

The lectures are written in an entertaining style, and vary in interest as little as the inequality of the subjects will allow. The two on 'Light and life' and 'The cell state' are especially happy, particularly the latter in an apt comparison of a plant to a state.

The design of the book is laudable, and its execution admirable. We commend both as models to our American biologists and physicists, who owe it to the American public to provide better opportunities for a general acquaintance with scientific problems and methods.

REPORT ON SORGHUM-SUGAR.

Investigation of the scientific and economic relations of the sorghum-sugar industry; being a report made in response to a request from the Hon. George B. Loring, U. S. commissioner of agriculture, by a committee of the National academy of sciences, November, 1882. Washington, *Government*, 1883. 152 p. 8°.

A PROBLEM, which, if not the most important, is certainly the most prominent, agricultural problem of the day, is that of the profitable production of sugar from sorghum. The experiments made during the last few years at the U. S. department of agriculture and elsewhere have attracted general attention, both on account of the interesting scientific questions involved, and still more because they promise to create a new branch of agricultural industry, and to greatly enlarge our domestic supply of sugar.

The report of the committee of the National academy on this subject must prove very valuable to all interested in the promotion of this infant industry, because it contains a very full summary, prepared by thoroughly competent and impartial persons, of all that has been accomplished in this direction up to the date of the report, and thus collects in one publication information previously scattered through numerous state and other reports. That the work has been well done is sufficiently guaranteed by the names of the committee. They were Prof. William H. Brewer, Ph. D., of the Sheffield scientific school; Prof. Charles F. Chandler, Ph.D., of Columbia college; Prof. S. W. Johnson, M. A., of the Sheffield scientific school; Prof. B. Silliman, M.A., M.D., of Yale college; Prof. J. Lawrence Smith, M.D., late of the University of Louisville; and also, not of the academy, Gideon E. Moore, Ph.D., of New York. Prof. C. A. Goessmann, of the Massachusetts agricultural college, was also a member of, and acted with, the committee until Sept. 15, 1882, when he resigned.

The committee begins its report with several pages of citations from earlier (chiefly American) investigations upon sorghum as a sugar producing plant, showing the conflicting opinions upon almost every essential point of the subject entertained by the authorities quoted. On such points as the kind of sugar present in the juice, the best varieties of sorghum, the proper time for harvesting and working, etc., diametrically opposite opinions, each by reputable authorities, are quoted.

This was the state of the question, when, in 1878, the U. S. department of agriculture, by its chemist, Dr. Peter Collier, began its well-known investigations, which went far to decide many of the points just spoken of. This work the committee does not review in detail, but contents itself with a favorable criticism of the analytical methods employed, and with pointing out the material value of the results and the need of further investigation.

At the time when this report was prepared, the successful work of the department of agriculture consisted chiefly of chemical examinations of sorghum-juice, attempts to produce sugar from it on a manufacturing scale having proved partial failures: the committee therefore closes its report with brief accounts of the results of practical attempts to make sugar from sorghum. Among these are noted two failures, and seventeen cases of more or less pronounced success, several on a manufacturing scale.

In an appendix are collected divers interesting papers bearing upon the subject of the report. Some of them present fuller details of experiments referred to in the report, and some contain accounts of later successes in sugar-production. This portion of the report concludes with a 'Bibliography of sorghum,' which cannot fail to be of great value to investigators in this field.

It is evident from the facts collected in this report, and from the experience since gained, that, with skill in working, sugar can be successfully made from sorghum. It is also equally evident, that, without that skill and the proper appliances, failure is more probable than success. Sirup can easily be made from sorghum on a domestic scale, but not sugar.

Finally this report makes very evident the need for further investigation in regard to such important points as the best varieties of cane, and the possibility of their improvement by selection and crossing, the most suitable soil for sorghum, the effect of fertilizers on its growth and content of sugar, the methods of extracting the sugar from the cane, and the prevention of losses in the further treatment of the juice. In a word, while sugar can be made from sorghum, it yet remains to be seen how economically it can be manufactured, and how completely the great waste involved in the present crude processes can be avoided; and the committee closes its report by urging upon the U. S. department of agriculture especially, the duty of continuing the investigations which have already yielded such important results.

HANN'S CLIMATOLOGY.

Handbuch der klimatologie. Von Dr. JULIUS HANN. Stuttgart, *J. Engelhorn*, 1883. (Bibliothek geographischer handbücher.) 10 + 764 p. 8°.

THERE are many treatises upon the subject of climate. The larger number of these are devoted to the consideration of the special characteristics of the climate of some particular country, and contain numerous statistics derived from meteorological observations, together with a description of the prevailing weather conditions. A few discuss the subject from a broader stand-point, and take account of the general conditions which prevail over a large area, with their causes and modifications. The treatise before us, however, differs from its predecessors in its aim as well as in its execution. It is designed to give a view of climatology as the result of certain forces which are at work in nature, and to investigate the result of the operations of these forces as they are exhibited in the climate of the world. Its author is the acknowledged head of meteorological science in Austria, — one who has done much to place meteorology on a scientific basis, and who is especially qualified to speak with authority upon the subjects which he treats, on account of his well-known familiarity with the current work of other investigators, and his ability as a critic. It is to be expected that a work written by such an author will be comprehensive, thorough, and masterly, that it will indicate the present condition of the subject from a scientific stand-point, and be as accurate as the best data at hand can make it. All these conditions are fulfilled and abundantly satisfied in the work before us.

The aim of the treatise is to present a comprehensive view of climatology. First the word is defined, its object specified, and the various climatic factors mentioned, briefly discussed, and illustrated. After this introduction, which is, in fact, a concise treatise upon the subject of climatic statistics rather than a simple introduction, the author proceeds to treat the subject in two divisions, — general and special climatology. Under the former head are considered, 1°, 'solar climate,' or that which would result directly from solar radiation; then, 2°, the modifications introduced by atmospheric and terrestrial conditions, resulting in climate as actually existent. Under the latter head are considered the special climatic characteristics of different portions of the globe, with copious illustrations. In carrying out this plan, the author treats the various topics with conciseness but with singular clearness, and advances in logical progression without dwelling too much on the minor details, or retarding the course of thought by discussing the many collateral subjects which are naturally suggested. In a few instances, where a controverted subject is discussed in the text, an elaborate footnote is devoted to a defence of the author's position, or a statement of the dissenting opinions of others; and several appendices contain fuller explanations of the special topics touched upon in the main portion of the treatise. In this way the author preserves the unity of the work, and at the same time calls attention to important considerations to which he cannot give much space in the body of the treatise. The work is not exhaustive: indeed, that would be impossible in so comprehensive a subject. In many cases it does not enter into the details of an investigation, but gives the results obtained without discussing the methods of investigation employed.

At the outset the author carefully defines the word 'climatology,' and shows the relation between climatology and meteorology. By climate is to be understood the average weather conditions of different places on the earth's surface, together with the extent of the deviations from the average conditions. The climatologist, in treating the causes of climate, necessarily makes use of the laws which the meteorologist in his broader study of atmospheric phenomena has deduced, and, in turn, furnishes the latter with facts which he must account for by the meteorological principles he has established. The two sciences are therefore intimately connected; and we may, if we wish, regard climatology as a part of the