SCIENTIFIC BOOKS.

The Influence of Light and Darkness upon Growth and Development. By Daniel Trembly MacDougal, Ph.D. Published by the aid of the David Lydig fund bequeathed by Charles P. Daly. Memoirs of the New York Botanical Garden, Volume II. New York, 1903. (Issued January 20, 1903.) Large 8vo. Pp. xiv + 319.

This notable contribution opens with a short historical account (34 pages) of investigations bearing upon the subject under consideration, the earliest of which was that of John Ray in 1686, followed in 1727 by Hales, in 1754 by Bonnet, in 1776 by Mees, in 1782 by Senebier, and in 1783 by Tessier. This brings the record down to the opening of the nineteenth century, in which we find seventeen names in the first half, among which are DeSaussure (1804), DeCandolle (1806), Davy (1815), Knight (1841), Payer (1842) and Draper (1844). Shortly after the middle of the century Sachs began his work (1859), and continuing for thirty years or more, added 'an enormous number of facts concerning growth and the relations of light to plants,' and 'led the way to nearly all of the modern work upon this subject.' No doubt he revolutionized this part of the science of plant physiology, and yet it is a curious fact, as Dr. MacDougal remarks, that 'scarcely a single one of his conclusions concerning etiolation and the influence of light upon growth is tenable at the present time except in modified form.' Stimulated by the work of Sachs, a host of investigators sprang up, their number increasing rapidly during the closing quarter of the century. The latest names recorded are those of Ricome and Noll (both in 1902), immediately preceded by Livingston, Goff, Wiesner, Nabowick, Neljubow and Schulz (all in 1901).

The body of the book (166 pages) is made up of careful records of observations upon ninety-seven different species of spermatophytes and pteridophytes. Here, as one reads page after page of observations, it is made very plain that this portion of the book required a deal of patient work. By means of drawings made from photographs the text is helped out and made much plainer than would have been possible otherwise. The earlier work was done by the use of small portable dark-chambers of zinc or wood, but after the removal of the author to the New York Botanical Gardens in 1899 a specially constructed room in the middle of the museum building was used. Here the temperature was very constant, and a normal atmosphere was secured by proper ventilating apparatus. Entrance to the room was through double doors with a vestibule between, and the plants under observation were examined by means of a single-candle or a four-candle power electric lamp.

As a matter of course, the most obvious result of the growth of plants in total darkness, aside from the loss of green color, is the more or less complete suppression of the leaf-blades and an elongation of the internodes of the stems. There are also marked changes, which, however, are not readily seen, in the minute anatomy of the leaf and stem, as are well shown by many excellent figures. In some cases the histological changes are quite remarkable, as in the leaf of *Oxalis lasiandra*, the stems of *Galium circæzans* and a seedling oak. The epidermis of *Opuntia opuntia* shows very striking differences, as is the case to a less degree in most plants observed. Here, however, while the epidermal cells are usually much modified, the stomata themselves are but little changed on the etiolated leaves. Among the interesting modifications figured, none are more so than those of the 'pitcher leaves' of species of *Sarracenia*.

In a discussion of the effect upon the plant of prolonged or continuous light, the author concludes that "increase in the total duration of illumination to which a plant is exposed, during its vegetative period, either by artificial nocturnal illumination, or by cultivation in Arctic regions, results simply in a correspondent acceleration of the seasonal development of the plant, by which a greater amount of work is accomplished within a given number of days. The extinction of the daily 'resting period' brings no distinct reaction so far as important anatomical features are concerned, although an exaggerated produc-

tion of certain substances is found to take place. Neither is any retarding or paratonic effect to be seen as a result of this continuous illumination."

The chapter on the theories as to the nature of etiolation is curious and interesting. The theories of the earlier investigators quite naturally were very crude, and it is not too much to say that something of this crudity continues even to the present day. Apparently we are not yet ready to formulate a satisfactory explanation of the action of a plant when grown in darkness. The 'adaptive theory' of Boehm (1886) as elaborated by Godlewsky (1889) appears to be the one most favored by botanists just now. It interprets etiolation as a direct adaptation, and assumes that 'the attenuation or elongation of axial organs is a means of lifting chlorophyll-bearing organs past theoretical obstructions.' Of this the author says, however, that 'the forms presented by the shoots of a greater majority of the species examined do not exhibit any beneficial adjustments by which the plant might free itself from encompassing darkness, and lift its leaves and reproductive organs past the obstruction that intercepts the rays.'

We should like to refer to the chemical composition of etiolated plants, the rate and mode of growth of such plants, the stimulative influence of light, etc., taken up in this most interesting book, but space forbids further discussion at this time. The author is to be congratulated upon having added so valuable a book to the growing list of his publications.

CHARLES E. BESSEY.
THE UNIVERSITY OF NEBRASKA.

International Catalogue of Scientific Literature, first annual issue, R—Bacteriology. Published for the International Council by the Royal Society of London. London, Harrison and Sons, 45 St. Martin's Lane. Vol. VIII. December, 1902. Pp. xiv + 314.

This is a comprehensive bibliography of books and other contributions to bacteriological literature which appeared during 1901. Author and subject lists are given, the latter arranged according to a decimal system. The plan and essential features of this undertaking, which is an outgrowth of the 'Catalogue of Scientific Papers' formerly published by the Royal Society of London, have already been described in SCIENCE, N. S., Vol. XIV., p. 861. In the present issue there are 2,206 titles indexed under the authors index and presumably the same are grouped under the subject classes. To cover the literature of any scientific subject in all languages is a stupendous task, and for those who use the catalogue it will doubtless be found a valuable aid. While it is always easier to criticise than to construct, yet there are certain features of the present volume to which attention deserves to be called.

Exception could be taken to the admission of articles on malaria, Texas fever, surra, fungus and nematode diseases, etc., as well as many other titles that are even more remotely connected with the subject of bacteriology, but particular attention at this time is desired to a single feature.

One at all acquainted with the literature of the subject is at once struck by the paucity of reference to articles published in the United States. A careful examination of the contents of the volume revealed but about eighty titles of books, addresses, magazine articles, etc., nineteen different periodicals being represented in the list. The *Journal of the Boston Society of Medical Sciences* is first in the list with fifteen references, followed by *Popular Science Monthly* with nine, the *Journal of the American Medical Association* with six, and the *Philadelphia Medical Journal* with the same number, the others having from four to a single title indexed. None of the publications of the U. S. Department of Agriculture nor of any of the Experiment Stations are mentioned, although during 1901 there were published from these institutions many articles relating to the bacteriology of plant diseases, dairying and veterinary science. For the sake of confirming the catalogue references a number of publications of 1901 were examined to see if they were prop-