from page 543 to page 673, presumably to cover the explanatory leaves facing the plates.

J. A. ALLEN

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK

Nature and Development of Plants. By CARLTON C. CURTIS, Professor of Botany in Columbia University. Illustrated. New York, Henry Holt & Company. 1914. Pp. vii + 506.

A few years ago it fell to the reviewer's lot to discuss in these columns the first edition of this excellent text, and it is with pleasure that he offers herewith his comments on its recent revision.

It is well that a book of this kind has met with that degree of appreciation and success which has warranted its third edition in so short a time. It is rare among our text-books of botany that the essential facts of the science are presented in a style at once so clear and attractive as to hold the attention of the casual reader, to say nothing of its acceptability to students. Too often is it the tendency among writers to kill, in the average student, all interest in a subject naturally engaging, by a dictionary style of composition and a pedantic devotion to technical terminology. Technical terms are well enough in their place, but their acquisition is not the end of botanical study, and to present the nature and development of plants accurately and in simple language demands a keener appreciation of the facts and their relations, than it may require to clothe the subject in the diction of a specialist.

One of the points in which this book is especially to be commended is the effort of its author to direct attention to the economic bearings of the subject. While the deeper thinker has no difficulty in appreciating the practical value of pure science, so-called, the fact remains that most students are stimulated by a perception of the relation of this or that fact to human welfare, and the more the facts of such relation are emphasized, the less will botany have to contend for its just place in the academic program.

It is the aim of the author, as stated in the preface, that the mastery of this text shall exact strenuous effort on the part of the student, an excellent motive from the pedagogical standpoint, but an end which is better reached in the laboratory than elsewhere. Such a purpose would hardly be achieved in the present volume with its clear and simple style, unless it be in the mass and suggestiveness of its fact, which we take to be the author's intent.

The book before us is divided into two parts. The first deals with the plant as an organism, definite, vital, dynamic. In this the topics of photosynthesis, transpiration, absorption, growth, reproduction, etc., as well as the structure of the tissues concerned, are treated with special reference to the seed plant and introduces the significance of plant structures and life. Part two presents the subkingdoms of the plant world and their more common representatives, setting forth the principal features of relationship and evolution. The book should form the basis of a year's study, supplemented by lectures and laboratory work. The illustrations are excellent and well chosen.

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MISSOULA, MONT.

BOTANICAL NOTES

THE ANNIVERSARY OF A GREAT GARDEN

SEVERAL months ago the botanists of the world were asked to come to St. Louis about the middle of October to celebrate the twenty-fifth anniversary of the organization of the board of trustees of the Missouri Botanical Garden. And in planning the celebration those in charge wisely provided for a dignified program of scientific papers of notable merit, rather than for a series of congratulatory addresses. Of course there were some congratulations, but these were confined to the after-dinner speeches, at the close of the anniversary exercises. So there was a minimum of inane congratulations, and a maximum of notably meritorious botanical papers. The example of the managers of this program is commended to other managers of anniversary exercises.

Here it should be remembered that Henry

Shaw was born in England in 1800, and that coming to America he amassed a fortune by middle life, and retired from business, spending the remainder of his life in beautifying his estate in the suburbs of St. Louis. Eventually this became known as "Shaw's Garden." About 1860 it was opened to the public, and in 1889 was transferred to a board of trustees to administer the estate under the provisions of Mr. Shaw's will, as the Missouri Botanical Garden. The garden has thus no legal connection with the city of St. Louis and it even pays taxes on all of its real estate excepting only the land actually occupied by the garden itself. The garden has been fortunate in its immediate management, which is vested in its director. The first director was Professor William Trelease, who filled this position with distinguished honor until his resignation in 1912, and he was followed by Doctor George T. Moore, whose two years of service have already proved his fitness.

The general program as announced in SCIENCE for September 11, 1914, was carried out with some additions and changes due to the disturbances caused by the European war. The mornings were spent in visiting places of interest in the city, and at the garden. The midday lunches afforded excellent opportunities for extending personal acquaintances. The program of the first afternoon (October 15) included after Director Moore's address of welcome (mainly historical), eight papers, six of which were actually presented, the remaining two being read by title only. Thus the papers by Director Britton (New York), Professor Wille (Norway), Professor Bessey (Nebraska), Professor Conzatti (Mexico), Professor Coulter (Chicago), and Assistant Director Hill (Kew) were presented in full, while those by Doctor Lipsky (Russia), and Director Briquet (Geneva) were not in hand, and were presented by title only.

The program of the second afternoon (October 16) included ten papers, of which those by Professor Czapek (Prag), Director MacDougal (Desert Laboratory), Doctor Appel (Berlin), Professor Setchell (California), Director Westerdijk (Amsterdam), Professor Atkinson (Cornell), and Doctor Smith (Washington) were presented in full, while those by Director Fitting (Bonn), Director Klebs (Heidelberg), and Professor Buller (Manitoba) were presented by title only.

The closing banquet was worthy of the occasion. Those who have been fortunate enough to be bidden to the "Shaw Banquets" need no description as to what this one was like. It was notable for the profusion of floral decorations, public report asserting that more than six thousand plants were used for this purpose, including about six hundred varieties of decorative plants. In a second matter this banquet was notable in that for the first time there were women among the guests, as should be, of course, when we remember the very considerable number of women who are engaged in botanical investigation, and in botanical teaching.

TRICARPELLARY AND TETRACARPELLARY ASH FRUITS

FOR several years I have been watching some of the green ash trees (*Fraxinus pennsylvanica*) along the streets of Lincoln, having found many years ago that some of them were in the habit of producing tricarpellary fruits, in addition to their usual bicarpellary samaras. As a result, several months ago I found one tree that produced these fruits in such numbers that the case seems to me to be worthy of record. One of my assistants, Mr. F. F. Weinard, collected from this tree 87 clusters of the fruits, and found that the average number of fruits in each cluster was 25, of which on an average ten were tricarpellary. In other words of the whole number of samaras examined (2,183) there were 876 that were tricarpellary. This means that almost exactly 40 per cent. of the whole number of fruits were tricarpellary, a proportion that is quite unlooked for. In the same collection there were found four tetracarpellary fruits, that is about one fifth of one per cent.

Elsewhere in the city other trees were found that produced tricarpellary fruits, but it is a well established fact that most green ash trees produce very few, if any, of these abnormal fruits.

STAMENS AND OVULES OF CARNEGIEA GIGANTEA

Through the courtesy of Director MacDougal of the Desert Botanical Laboratory at Tucson, Arizona, a lateral branch of the giant cactus (*Carnegiea gigantea*), measuring about a meter in height and twenty centimeters in diameter has been blossoming at intervals since May in the botanical plant houses of the University of Nebraska. No less than five distinct sets of flowers have appeared in this time.

From the first the number of stamens interested us, and some estimates were made of their number, but these varied so much that at last it was determined that the only thing to do was to make an accurate count of the stamens. Accordingly Mr. R. E. Jeffs, a fellow in botany, was asked to determine the number by enumerating every stamen, not making any *estimate* whatever. The result was astonishing, for it was found that there were 3,482 stamens in the flower, probably the largest number recorded for any flower.

This quite naturally raised the question of the number of ovules in the same flower, and Mr. Jeffs accommodatingly counted these also, with the result that he found 1,980 ovules. Here again the number is unexpectedly large, but the result is by no means as astonishing as in regard to the stamens. These figures are deemed worthy of publication.

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SPECIAL ARTICLES

ACTIVATION OF THE UNFERTILIZED EGG BY ULTRAVIOLET RAYS

The sterilizing effect of the ultraviolet rays suggested the possibility that with their aid unfertilized eggs could be induced to develop, since the writer's previous experiments have shown that any substance which acts as a cytolytic agency can also produce artificial parthenogenesis. It was found, indeed, that the unfertilized eggs of the sea urchin *Arbacia,* as well as those of the annelid *Chætopterus,* can be caused to develop by a short treatment with the Heraeus quartz mercury arc lamp. The lamp was fed with a current of 3.4 amperes, the voltage of which was 220. The alleged candle power of this light was 3,000. The eggs were at the bottom of a glass dish covered by a layer of 2 cm. of sea water. The dish was open on top and it stood directly under the lamp at a distance of 15 cm. In order to prevent the temperature of the eggs from rising above the normal room temperature the glass vessel containing the eggs was surrounded by melting ice. The eggs formed a single layer on the bottom of the dish, since it seemed that the eggs lying on top screened the eggs under them from the effect of the ultraviolet light.

When unfertilized eggs of *Arbacia* were exposed to the ultraviolet light for ten minutes, many and sometimes all formed fertilization membranes. In some of the eggs this membrane was only the fine gelatinous film which the writer called an atypical membrane; others possessed a typical normal fertilization membrane. When nothing further was done with the eggs they underwent, at room temperature, cytolysis without segmentation. When the temperature was below room temperature (about 12° C.) some of the eggs segmented into two or four cells, but then perished. When the eggs were put for twenty minutes into hypertonic sea water, about ten minutes after the treatment with ultraviolet light, they developed into larvæ. The eggs had suffered, however, since few developed beyond the gastrula stage. When the eggs were exposed too long to the ultraviolet light (*e. g.,* twenty minutes) they formed fertilization membranes, but were injured to such an extent that they could no longer segment or develop.

It was of interest that a cover glass of 0.1 mm. thickness prevented all effects of ultraviolet light even if the eggs were exposed forty or sixty minutes. Such eggs remained normal. A layer of from 2 to 6 cm. of sea water did not prevent the effect of the ultraviolet rays. Neither did the rather thick walls of a quartz test tube.

The membrane formation by ultraviolet rays took place in the absence as well as in the presence of oxygen. When unfertilized eggs were put into quartz test tubes from which all the oxygen had been driven out by sending a powerful current of hydrogen through for four