

OPEN LETTERS.

THE RESEARCH STATION OF THE ROYAL BOTANIC GARDENS OF CEYLON.

I SHOULD like in a few words to call the attention of American botanists to the new research station which is now almost completed in these gardens, and to the advantages which are offered here to botanists desiring to work in the tropics. A more detailed account of the establishment under my charge, with plan of the new laboratory, will be found in *Nature* of November 9, 1899.

The Royal Botanic Gardens of Ceylon form a department of the public service, dating from 1812. In 1821 the headquarters were established at Peradeniya, a suburb of Kandy, from the center of which town the garden is about four miles distant. There are several good hotels in Kandy, and the gardens can be reached by rail or road; a bicycle is perhaps the most convenient, and will be found very useful in traveling in the island, the roads being on the whole excellent. The garden lies in a very beautiful situation, in very mountainous country, at an elevation of 1550 feet above the sea. To this fortunate circumstance the garden owes the great advantage in the matter of climate and healthiness that it possesses over most other tropical stations. The nights here are always cool, and the neighborhood of Kandy is practically free of malarial fevers, so that with reasonable care no risk of health need be run in living here. The mean annual temperature is 76° F. The hottest months are March and April, with a mean temperature of 79°; the coolest January and June (74°). The laboratory and library are cool buildings, and in them during the last two years the extreme range of the thermometer has been between 65° and 82°. The annual rainfall is about ninety inches, fairly evenly distributed over the year; the wettest periods are in June and July and in November and December, at the beginnings of the southwest and northeast monsoons respectively. On the whole, the best time to visit Ceylon is from October to March; but once here the climate is much the same all the year round, the objection to coming from Europe in the summer being the heat in the Red Sea and the discomfort of returning to a cold climate in winter.

The area of the garden is 150 acres; it contains a splendid collection of tropical plants, and is arranged like an English park, with wide lawns. In the center lie the buildings of the museum, library, herbarium, and laboratory, close together. The museum is chiefly devoted to economic botany,

and contains a very good collection of local products. The library contains about two thousand books and papers, and is rapidly growing. About seventy periodicals are taken or received in exchange, and among them are included most of the important scientific botanical journals. The herbarium contains a Ceylon collection, a general tropical collection, and a collection of the plants growing in the gardens. The new laboratory for research lies to the north of the herbarium, and is a single-storied building 75×40 feet, including veranda on the west end. The length of the building runs east and west. On the north side are two rooms, one for general microscopic and morphological work, 36×18 feet, with four good working places, and one for physiological work, 18×18 feet, with two places. On the south side is a room for chemical work, 18×18 feet; a room for work in economic and pharmaceutical botany, 26×18 feet; and a small private laboratory, 18×10 feet. On the east end is a veranda, 8 feet wide, of which the two ends are built up so as to form a dark room and a lavatory, while the intermediate part forms a space 18×8 feet in which experimental work causing unpleasant smells or requiring open air can be carried on. The west veranda is partially closed in with a low trellis and wire netting to form a room for the breeding of insects, etc. The laboratory is fitted with the usual apparatus for work in botany, chemistry, and entomology. It contains altogether eleven good working places, of which five or six are usually occupied by the resident staff, leaving five or six available to workers from abroad, who will be heartily welcomed and given all reasonable facilities and assistance in prosecuting their researches.

The value to a botanist of a period spent in the tropics is inestimable, and there is no country more favorable than Ceylon for the study of every form of tropical vegetation within a limited area. Every variety of climate is found within the island, which has about six times the area of Jamaica, and can be easily reached by railway and coach, and there are good accommodations for travelers in almost every part of the colony. Branch gardens are kept up in four places in different climatic zones of the island. At Henaratgoda, on the main line of rail to Colombo, and eighteen miles from that town, there is a small garden of about forty acres, of which twelve are occupied by untouched jungle, the remainder being cultivated chiefly in economic plants; there is a small laboratory room in the garden and a resthouse about a mile away at the station. The climate here is very hot and steamy, the garden lying at thirty feet above the sea level. The rainfall is about 110 inches per year, distributed much as at Peradeniya, and the mean temperature is about 82° F.

A second branch garden is at Hakgala, at an elevation of 5600 feet. It occupies an extremely beautiful situation about six miles from the great sanitarium of Ceylon, Nuwara Eliya. The total area of the garden is 550 acres, of which 40 are cultivated, and contain a fine collection of European, American, Australian, and other temperate plants. The rest of the garden consists

of untouched jungle and savannah land, occupying the steep side of the Hakgala mountain to an elevation of 6800 feet. The vegetation of this high level region is very interesting; the flora contains a large proportion of European genera. The Horton Plains, where there is a resthouse at an elevation of 7200 feet, form a magnificent collecting ground for the botanist, and lie about eighteen miles from Hakgala. Nuwara Eliya, at an elevation of 6200 feet, contains good hotels, has a temperate climate (mean temperature 57°), and is surrounded by hills on which the natural vegetation remains untouched.

A third garden lies at Badulla, on the eastern side of the main mountain mass of the center of the island, at an elevation of 2200 feet. Here the climate is different from that at Peradeniya, in having the driest period at the end of the southwest instead of the northeast monsoon, so that the periodicity of the vegetation is different, and fruits which ripen at Peradeniya in April ripen at Badulla in August.

A fourth branch is at Anuradhapura, the famous "buried city" in the north of the island. Here there is an Indian climate and flora, the weather being dry during the greater part of the year, so that only xerophytic plants occur.

A visit to the branch gardens alone thus introduces the botanist to a great variety of climates and floras; but there are several other types of flora to be seen, *e. g.*, that of the coast, of the river estuaries, the mangroves, and so on: all are easily reached by rail or road. Ceylon is very easily reached, there being direct lines of steamers from Colombo to almost all parts of the world. Round the world tickets at a cost of \$525 to \$625, first class, can be obtained, which enable a visit to be paid to Europe, thence to Egypt and Ceylon, and home *via* Australia, or *via* Singapore, Hongkong, Japan, and Honolulu to San Francisco. Return tickets to Colombo from London are from \$350 to \$450 first class, \$250 to \$300 second class; the latter is very comfortable, especially on the French and German lines. No outfit is necessary beyond a supply of the clothes usually worn in summer; drill, khaki, and flannel clothes can be bought here more cheaply than in Europe. The cost of living in hotels and resthouses is from seven to nine rupees per day, and three rupees are equal to \$1.

Information about Ceylon may be obtained in many books, of which the following may be specially mentioned: *Ceylon*, by Sir E. Tennant (now out of print); *Ceylon in 1893*, by J. Ferguson; "The flora of Ceylon as affected by climate," Trimen, *Journal of Botany*, 1886; *Flora of Ceylon*, Trimen, 1893-1899, 5 vols.; "Botanic gardens in the equatorial belt," Goodale, *American Journal of Science* 42: 173. 1891.

Intending visitors should communicate with me some time in advance, mentioning the line of work they propose to take up, with any special facilities they may require, *e. g.*, the planting before their arrival of special

experimental beds, the provision of any unusual apparatus or materials, and so on.—JOHN C. WILLIS, *Director Royal Botanic Gardens, Peradeniya, Ceylon.*

PATTERN FLOWERS AND METAMORPHOSIS.

C. R. B., in reviewing my text-book on p. 69 of the January GAZETTE, asks :

Why assure a student that "a flower will obey certain well-defined laws," when the bulk of the chapters on the flower are concerned with explaining how they "disobey" these "laws," and in defining terms that are used to describe departures from a purely imaginative pattern? The whole treatment of the flower, indeed, proceeds upon the pernicious theory of metamorphosis.

Since the question has been asked, I trust that you will allow me to answer it, and in my own way.

My critic's quotation falsifies me, in sense as well as in word, and this falsification furnishes the only basis for his question. The statement is : "The typical flower will obey certain well-defined laws of structure as regards the following characters : " It may be wrong, but it at least allows its author the defense of reason, which is denied him by the misquotation. That statement was written in the light of an individual acquaintance with hundreds of such typical flowers, which the critic says are "purely imaginary." Since there are scores of thousands which vary from the pattern, the proportion of pages devoted to classifying such variations was considered appropriate. Is it not proceeding *ex cathedra* to call the theory of metamorphosis "pernicious" ? May we not be credited with at least a knowledge of the attempts which have been made to get away from it, and a personal conclusion that that course leaves us no working basis which does not fail at the first test? To me the reading of Engler and Prantl's *Pflanzenfamilien*, and the actual study of the great number of flowers which I have examined during the last ten years is more convincing than any of the speculative "thought" or unproved theories which have been brought forward.—H. H. RUSBY.

[Dr. Rusby is quite justified in claiming misquotation, and I sincerely regret having been guilty of giving a false impression of his meaning, through my own misapprehension of the chapter criticized. My impression was derived from the chapter heading :

LAWS OF FLORAL STRUCTURE AND THEIR (*sic*) DEVIATIONS, and from the conspicuously printed "laws," thus :

LAW 3: REGULARITY.—*The parts composing one circle are all of the same form and size.* A flower all of whose circles obey this law is regular. . . .

Having examined these various laws and been impressed by their nullity, I was *not* impressed by the word *typical*, which occurs in two sentences of