

even then beginning to get scarce. These are now at the Royal Institution.

In all these prisms the end faces were the natural crystal faces, only smoothed and polished; and the plane of section made an angle of  $87^{\circ} 30'$  with them, or  $21^{\circ} 30'$  with the length-axis of the prism.

In none of them was Canada balsam used as the cement (I have not used it for this purpose for thirty years past), but a special material.

C. D. AHRENS.

Swiss Cottage, King's Road, Upper Teddington,  
October 13.

#### AN ENGLISH STATION FOR BOTANICAL RESEARCH IN THE TROPICS (CEYLON).

THE Royal Botanic Gardens of Ceylon, under the direction of Thwaites and Trimen, to go no further back, have long been known as one of the most important centres of scientific work in systematic and economic botany. Thanks to the British Association for the Advancement of Science, a small room next to the director's office was fitted up as a laboratory, in which have worked many botanists, chiefly English. Among those who have worked in Ceylon during the last decade may be mentioned Profs. Bower, Farmer, Goebel and Potter, and Messrs. Freeman, Keeble, Pearson, Parkin, and others. During the last two years the laboratory has been very much overcrowded, being used by the staff of the gardens as well as by visiting botanists. With the commencement this year of a new research laboratory, now being erected by the Department of Public Works, and to be completed probably before the end of the year, this difficulty will be overcome, and there will be ample room for several workers from abroad in addition to the members of the staff. This being so, it may not be amiss to give at this time an account of the facilities now available in Ceylon for research in the tropics. While the laboratory is primarily intended for botanical research, there is no intention of excluding workers in other lines so long as there is room for them, though of course money cannot be spent in providing special apparatus for their work.

The Royal Botanic Gardens form a department of the public service in Ceylon, under a director. The headquarters of the department are at Peradeniya, near Kandy, where the principal garden was established in 1821 by Moon. There are now smaller branch gardens in four other places in different climatic regions of the island. A brief account of these may be of interest.

The original Peradeniya garden lies within the municipality of Kandy, about four miles from the centre of the town. It may be reached by driving in a carriage or rickshaw, or by trains which run at intervals to a station near the garden. The roads here, as almost everywhere in the island, are excellent for cycling. The garden has an area of about 150 acres, and lies in a very beautiful situation, in a loop of the Mahaweli river, and in very mountainous country. Its elevation above sea is about 1550 feet, so that it has a much more pleasant climate than the low country. During the day the difference is but little, but the nights are very much colder than in Colombo, so that refreshing sleep can always be had; indeed, during most of the year a blanket is necessary. The mean annual temperature is  $76^{\circ}$  F., that of the hottest months (March and April) being  $79^{\circ}$ , that of the coldest (January and June)  $74-75^{\circ}$ . The highest shade temperatures ever reached are not excessive, rarely exceeding  $90^{\circ}$ , and in the present laboratory the highest in the last two years has been  $82^{\circ}$ , the lowest  $65^{\circ}$ . Work can thus be carried on with as little discomfort as in any European laboratory. The annual rainfall is about 90 inches, but owing to the great violence of tropical rain the number of rainy hours or days is very much less than in England. The number

of days with rain averages 170 per annum, and it rarely rains more than four hours on any one day. Rain in the morning is also rare. The weather of the year depends on the monsoons. In the end of May the south-west monsoon begins to blow, and there is much wind and rain, the weather gradually becoming finer through the months of June and July. August and September and the first half of October are delightful months. In October the north-east monsoon begins, and until Christmas it is very wet. In January begins the "dry season," and during the next two or three months there is less rain than at any other time of year, and the weather becomes gradually very hot, though until April the nights are cold. March and April are the only really unpleasantly warm months in the year. The best time on the whole to visit Peradeniya is from October to March, but from July onwards is very nice, the objection to travelling at this time from Europe being the heat in the Red Sea, which, however, is much less formidable than is usually supposed in these days of swift boats and ice chambers.

The garden contains a splendid collection of tropical plants, and, being arranged like an English park, with wide spaces of lawn, the specimens are easily seen and photographed. In the centre lie the buildings of the museum, library, herbarium and laboratory, close together. The museum is chiefly devoted to the economic products of Ceylon, and contains a very good and interesting collection. The herbarium consists primarily of Ceylon plants; but there is also a general tropical herbarium, and a herbarium of the plants contained in the gardens. In the same building is the library, which contains about two thousand books and papers. There is an excellent collection of books relating to economic and systematic botany, and recently a large number of works on the other branches of botany have been added; a considerable number of journals is also received regularly, including such periodicals as the *Annals of Botany*, *Botanical Gazette*, *Botanische Zeitung*, *Flora*, &c.

The laboratory lies a few yards to the north of the herbarium (a plan is given on p. 33). It consists of a one-story bungalow of brick on a stone foundation, and with cement floor and tiled roof. The length of the building runs approximately east and west, and on the north and south sides there are no verandahs. At the east end is a verandah 8 feet wide, the ends of which are built up so as to form—one a lavatory, the other a dark room for photographic work, fitted with sink, &c. At the west end is also a verandah of the same size, not built up in any way.

The building has six entrances, provided with French windows, two at each end and two on the south side. The other windows stand above the ground, and open outwards. There are doors leading from each room into all the adjacent rooms, so that free ventilation can be obtained, and at the same time any room can be completely shut up if required to prevent draughts without interference with the accessibility of the others.

The principal room, the general microscopic and morphological laboratory, lies to the north-west, and is 36 feet long and 18 feet wide. It has four working windows facing north, each with table, shelves, sink, &c., and two other windows facing into the west verandah, which can also be used as microscoping windows if required. The central part of the room will contain larger tables for microtome and other apparatus, and writing table.

To the east of this room is the smaller room devoted to physiological and pharmacological investigations. Leading out of this room is a French window, which gives access to the little eastern verandah, which may be used for cultivation experiments, &c. This room has two good working windows facing north, besides the French window. It is provided with three sinks and a

large stone bench. South of the physiological is the chemical laboratory, of the same size and construction, and with the dark room opening out of it. West of the chemical laboratory is the economic, a large room 26 feet by 18 feet, with two good working windows, one French window, and a fireplace. This room is intended for experiments in the preparation, &c., of economic products, such as rubber, fibres, &c. Lastly, in the south-west corner of the building, is a small private laboratory for the director or for work requiring special privacy from interruption. This room is 18 feet by 10 feet, with one working window on the south side, and another looking into the western verandah.

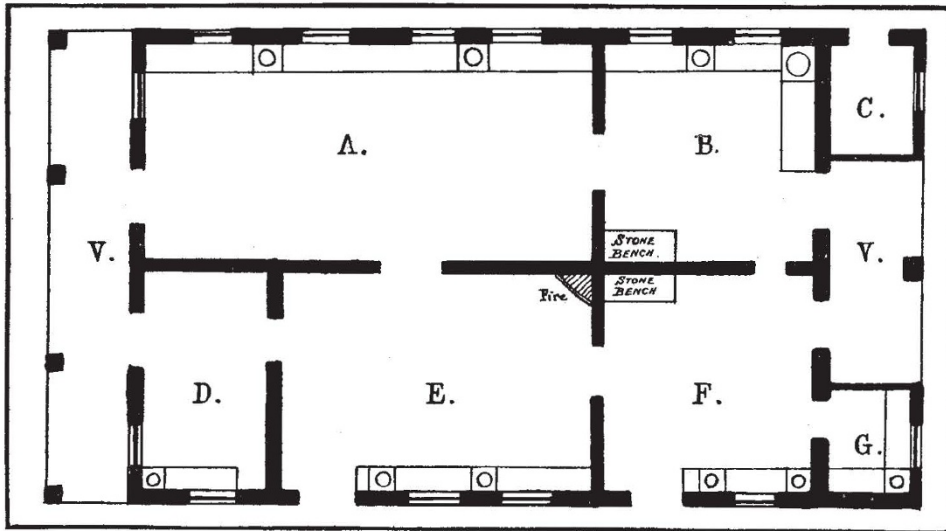
The whole laboratory is well supplied with water from a pipe running round it, and starting from a cistern in the museum, at a height of about 15 feet above the laboratory. Gas unfortunately is not at present available, but of course there is no need for artificial light, the day in this country always lasting until 6 p.m.

When ordinarily filled, therefore, the laboratory can accommodate eleven workers, and at a pinch room can be made for four more. For persons working at systematic botany there is accommodation in the herbarium.

Eliya in five, hours by rail. The trains are comfortable, and provided with refreshment and sleeping cars.

For a few economic and other plants the climate of Peradeniya is somewhat too cold at night for complete success, and for trial of these and for the supply of the needs of the populous low-country of the south-west of the island, a second botanic and experimental garden is maintained at Henaratgoda, on the main line of railway, seventeen miles from Colombo. It lies only about twenty feet above the sea, in a very uniform steamy climate, with a mean temperature of about 82° F. The garden comprises forty acres, about twelve of which are still covered with jungle, forming an interesting feature in the garden. There is a very fair collection of plants in this garden, especially economic, including the original rubber trees sent to the East through the agency of Kew Gardens and the Government of India. *Helminthostachys zeylanica* is abundant in the district, and many interesting plants can be seen in paddy fields and elsewhere. There is a rest-house close to the railway station, a mile from the garden, and the garden contains a small laboratory with two working places.

A third garden is maintained at Hakgala, about six



Plan of the new Laboratory, Royal Botanic Gardens, Peradeniya. A, General laboratory; B, Physiological laboratory; C, Lavatory; D, Private laboratory; E, Economic laboratory; F, Chemical laboratory; G, Dark room; V, Verandahs. Scale 1/16 inch to 1 foot.

Of the eleven places, the present staff and workers living in the colony will use five or perhaps six, so that there is room now available for five or six workers from Europe and elsewhere. The value to a botanist of a period spent in the tropics can scarcely be overrated, and with the accommodation now afforded at Peradeniya and in Java, the ease and comparative cheapness of the journey, and of living and travelling in Ceylon, there is no reason why many more should not visit and work in a tropical station than have so far done so.

The neighbourhood of Peradeniya is very beautiful; it is mostly cultivated in rice, tea, coco-nuts, fruit, &c., but there are some interesting pieces of wild vegetation within easy reach, and many fine pieces of forest, &c., can be reached within a short time by rail or road. The river below the gardens contains most of the known Ceylon species of that very remarkable order the Podostemaceæ. Kandy is within easy reach, and contains several good hotels, a good English club, tennis, croquet, cricket and football clubs, &c.; and there is a considerable society of English people in the town and suburbs. Colombo can be reached in four, Nuwara

miles from the chief sanatorium of Ceylon, Nuwara Eliya. The garden occupies an extremely beautiful situation on the side of Hakgala Mountain, with an extensive view over a wide expanse of mountain country. It comprises about 550 acres of land, only about thirty-five of which are in cultivation, the rest being untouched natural country, some covered with jungle, some being grass land (pätänä, as it is locally called). The vegetation in the district all around here is very interesting, having been but little interfered with by cultivation in any way, and that only in a few spots. The interesting Horton Plains are eighteen miles from Hakgala, through wild country. There is a rest-house at the Plains, which lie 7200 feet above sea-level. The flora of these up-country regions is of great interest to a botanist. Many European genera are here represented, such as buttercups, violets, valerian, brambles, &c. Lycopods, Selaginella, Psilotum, &c., are very common. Many interesting biological features exhibit themselves in this vegetation.

The garden at Hakgala lies at 5600 feet above sea-level, and has a comparatively cold climate, with a mean

annual temperature of 61° F. Frost never occurs, though it is frequent at slightly higher elevations, such as Nuwara Eliya (6200 feet). There is, unfortunately, no accommodation for visitors at present nearer than Nuwara Eliya, six miles away; but it is hoped to erect a small laboratory in the garden, with a small living room attached, where workers may live and sleep.

A fourth garden is kept up at Badulla, the capital of the Uva province, at an elevation of 2200 feet, on the eastern side of the mountains. The chief botanical interest of this district lies in its somewhat drier climate, so that it has much more pātānā land than the western side of the mountains, and in the fact that its dry season comes, not in the north-east but in the south-west monsoon, so that the periodicity of the vegetation is different. Fruit, which at Peradeniya ripens in March and April, ripens at Badulla in August, and so on.

Yet another garden is maintained at the ancient capital of the island, the famous "buried city" of Anuradhapura, the capital of the north-central province. This lies in the middle of the dry country, which makes up about three-fifths of the island, and has an Indian climate, with rain almost confined to the last three months of the year, and drought during the remainder, including the south-west monsoon. The flora of this district is therefore, as might be expected, very different from that of the rainy south-western and central provinces.

The island can show, within an area of rather less than that of Ireland, a most remarkable range of climate and flora, rendering it very interesting to the traveller and naturalist; in this respect it is unrivalled in the tropics. The working botanist or student has, further, the great advantage of having at his hand the excellent flora prepared by Dr. Trimen, and finished after his death by Sir Joseph Hooker. There are doubtless many new species still to be found in the eastern and south-western districts, as well as many unrecorded species; but the student who does not desire to specialise in this department of botany will be grateful for the useful flora, which renders the identification of his collections, or of the plants he may be experimenting with, a matter of comparative ease. The vascular cryptogams and many of the mosses have been identified, but there is much to be done at the lower forms of vegetation.

Peradeniya is easily reached from any part of the world, Colombo being one of the greatest ports of call. Direct lines of steamers run to Europe, China, Japan, Java, Queensland, Adelaide, Melbourne and Sydney, Mauritius, South Africa, and all Indian ports. Madras may be reached in thirty-eight hours by boat and rail. To England there is a very large choice of steamers. The favourite lines with Ceylon people are perhaps the Bibby and the Norddeutscher Lloyd, but the P. and O., the Orient, Messageries Maritimes, British India, and many others, are much used. The first-named is the cheapest of the large English lines, but is first-class only. First-class returns to Colombo, available for six months, are from 70*l.* to 90*l.* Second-class, which is very comfortable on the largest lines, is from 50*l.* to 60*l.* A few pounds are necessary on the voyage for tips, sports, trips on shore, &c. Banking accounts may be opened in Kandy, and money easily remitted to and from Europe. The value of the rupee is now 1*s.* 4*d.*, and seems likely to remain at that figure.

Very little is necessary in the way of outfit. Drill and khaki clothes can be bought here for less than half their price in England; also topees (sun-hats). At Kandy the usual dress is similar to that worn in England in summer; at Nuwara Eliya it is colder, and tweed suits are often worn. All articles of clothing can be bought here, and usually as cheaply as, or more so than, in Europe.

The usual division of the day is as follows: Rising at daylight, a light early tea of eggs and toast is taken about 6.15, after which a walk in the garden is pleasant, com-

mencing laboratory work at 7.30, and continuing till 11, which is the breakfast hour. After breakfast follows a rest indoors, but not sleep, and work may be resumed at about 1.30 for a couple of hours or so. After tea the remaining two hours of light are given to tennis, cycling, and other forms of exercise, followed by a bath, and dinner at 7 or 7.30. The evening is devoted to amusement.

Travelling in Ceylon is easy in all but the most out-of-the-way or sparsely populated parts. Railways and good roads intersect the greater part of the island, and there are coach services to a great number of places not served by the railways. Rest-houses or Government inns are found in all towns that have no hotels, and at intervals of 14 miles along all main roads. The average cost of living while on tour may be put down as about Rs. 7 or 8 per diem exclusive of fares by rail or coach. Steamers run round the island, calling at all the chief ports.

There is at present no rest-house or hotel at Peradeniya itself, and visitors must live in Kandy, where arrangements have been made with some of the hotels to board persons working in the laboratory at from Rs. 5 to Rs. 7 per day. There is a convenient service of trains, but the most satisfactory way is to cycle in and out. The road is in excellent order, and the distance from the furthest hotel under five miles. It is hoped that accommodation may be provided at Peradeniya itself before long.

Assuming that six months are spent from starting to date of arrival back in Europe, the cost of the trip should not much exceed 185*l.*, made up thus:

Fare (first return) ... ..	£85
Twenty weeks' board ... ..	66
Travelling ... ..	20
Sundry ... ..	12 to 20
	£191

This might be much reduced by economy, and by travelling second-class from Europe, and the proportionate cost would of course be less if the visit were of longer duration. If much travelling is to be done in the island the amount shown above will have to be increased, the 20*l.* being allowed for four weeks only. By very close economy and reduction of travelling, and by travelling second-class, the total might be reduced to perhaps 140*l.*

Trustworthy information about Ceylon may be obtained in various books. The most interesting are Sir E. Tennent's "Ceylon," which is now out of print; and to a botanist, Trimen's paper "On the Flora of Ceylon as affected by Climate," in the *Journal of Botany* for 1886. Ferguson's Handbook and Directory contains a vast mass of information and statistics, and his "Ceylon in 1893" is also of interest.

Intending visitors should communicate some time in advance with the director, mentioning what line of work they propose to take up, and any special facilities they may require.

JOHN C. WILLIS.

#### THE STOCKHOLM INTERNATIONAL FISHERIES CONFERENCE.

THE International Conference, which met in Stockholm from June 15 to June 23 last, and had for its object the arrangement of a scheme for the exploration of the northern seas in the interests of fisheries, has now issued its report. The Conference assembled at the invitation of the Government of Sweden, and official representatives attended on behalf of the Governments of Germany, Denmark, Great Britain, Norway, Holland, Russia and Sweden.

The formal resolutions unanimously passed by the delegates—Messrs. Archer, Cleve, Drechsel, Ekman, von Grimm, Heincke,