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REPORIS







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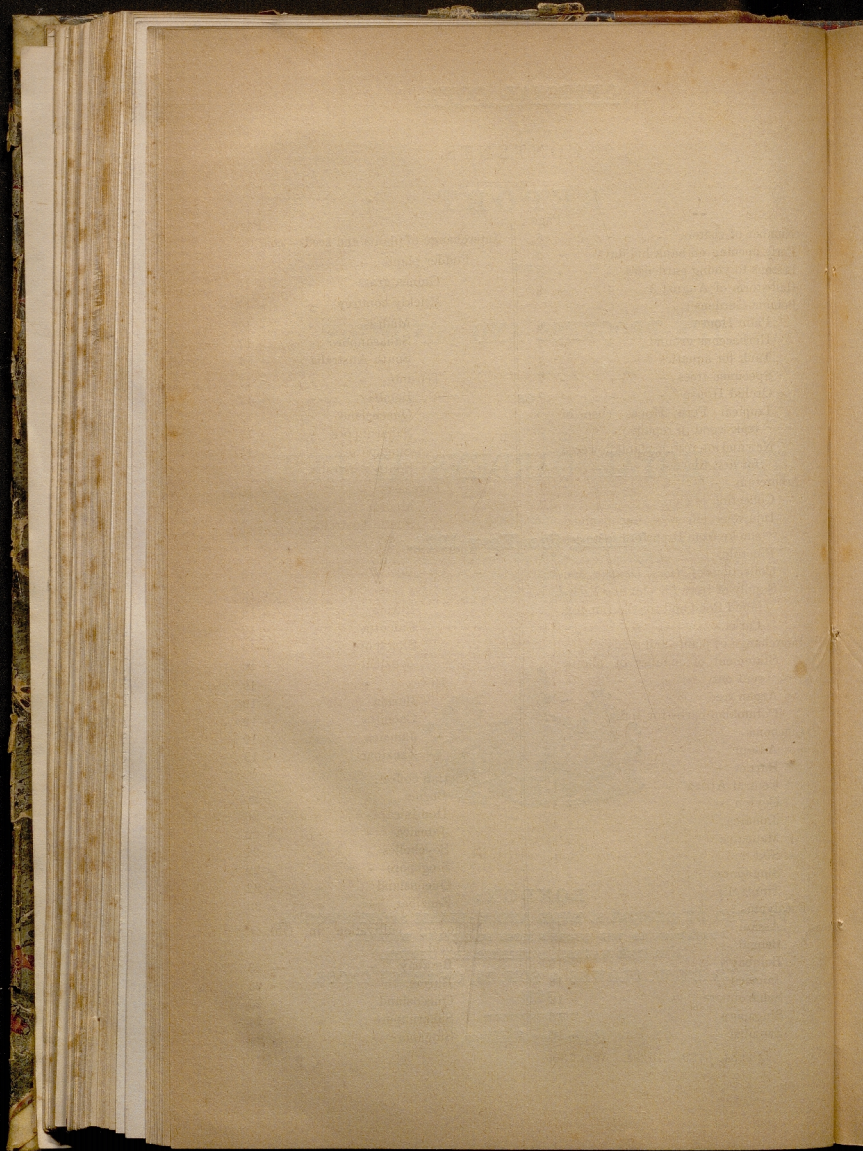
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REPORT
ON
THE PROGRESS AND CONDITION
OF
THE ROYAL GARDENS AT KEW,
During the Year 1879.



LONDON:
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REPORT
ON
THE PROGRESS AND CONDITION
OF
THE ROYAL GARDENS AT KEW,
During the Year 1879.

Royal Gardens, Kew, January 1, 1880.

SIR,

THE number of visitors (569,134) to the Royal Gardens during the past year exhibits a very great falling off (156,288) as compared with 1878. No return so small has been recorded since that for 1872. The deficiency may, with confidence, be attributed to the miserable weather which prevailed during the whole of last summer, and which culminated in the disastrous hail-storm of the morning of August 3, which wrecked the greater part of the glass houses and compelled their closure to visitors for the remainder of the summer.

The bank holiday of the following day, August 4, brought the greatest number of visitors (51,949) admitted in any one day during the year.

The experiment of opening the gardens at 10 a.m. on the mornings of the four bank holidays still appears to me to be scarcely justified by its success. The following figures give the total numbers admitted during the day, and also the numbers of persons who on each occasion entered before 1 a.m.

	Total number during day.	Number before 1 a.m.
April 14	19,430	2,557
June 2	15,205	1,094
August 4	51,949	3,008
December 26-	752	286

The lessons given to the young gardeners in the evening twice a week through about nine months of the year still continue to give satisfactory results, and may be regarded as having settled down into part of the routine of the establishment. The demonstrations in elementary meteorology, physics, and chemistry have been given in the large room of the Jodrell Laboratory, which during the dark winter months is seldom required for the purposes of physiological study, the smaller rooms being sufficient for any investigation which may be then in progress.

Hail-storm.—Early in the morning of August 3, Kew was visited by a severe hail-storm, which is believed to have inflicted damage upon the Royal Gardens to which their previous existence fortunately supplies no parallel. There is, in fact, no record of breakage of glass by hail in Kew on any previous occasion. The hailstones averaged 5 inches in circumference, and descended with such violence as to bury themselves in the ground.

The amount of glass broken was necessarily very great and was unavoidably increased in the repairs. The total number of panes replaced is shown in the accompanying enumeration:—

No. 1 House	-	-	-	186
" 2 do.	-	-	-	1,152
" 3 do.	-	-	-	412
" 4 do.	-	-	-	3,500
" 5 do.	-	-	-	2,059

New Range - - -	3,946
Palm House - - -	4,558
Water-Lily House - -	581
Temperate House - -	8,666
Nursey Pits - - -	3,194
21 House - - -	1,028
Forcing Pits - - -	900
Old 18 House - - -	460
Propagating Pits (glazed with Hartley's rough plate)	239
Herbaceous Ground Pits -	1,293
Decorative Department Pits	4,194
Store Pits - - -	523
Cinchona House - - -	500
Geranium House - - -	54
Bulb Pit - - -	831
Engine House - - -	208
Herbarium, Official Resi- dences, &c. - - -	165
Total - - -	38,649

Some idea of the magnitude of the destruction may be obtained from the fact that the broken glass amounted to 18 tons.

The large extent of the repairs which had to be immediately undertaken involved much replacement of decayed woodwork and extensive repainting. The progress of the works was rendered still more a matter of anxiety and labour by the comparatively low temperature and heavy rains which closed the summer of last year. This involved a heavy expenditure in tents and tarpaulins to temporarily protect the denuded houses. Two large temporary buildings had also to be erected for the protection of the workmen. Thanks to the energetic action of the Board, the necessary works were carried out with the aid of contractors with promptitude and despatch. The whole expenditure was covered by a supplementary vote in the Estimates. Although the collections generally suffered much from exposure to wet and cold, the actual number of losses has not been large. The injury done under such circumstances can, however,

only be expected to slowly reveal itself.

BOTANIC GARDENS.

Palm House.—As the hot-water apparatus described in the Report for 1877 is of a novel construction, I think it necessary to state that it gives entire satisfaction, whether as regards wear, the economical consumption of fuel, or the diffusion and easy control of heat. Many plants now flourish which had for many years previous to its introduction led a languishing life, and even some that it was impossible to cultivate at all, such as the cocoa-nut palm, grow well; and I have no reason to doubt that the original intention of the building, namely, its devotion to palms and plants of that class, may be eventually carried out. Already some of these from tropical regions flower and fruit to perfection, whilst the collection of *Cycadæa* and *Pandæa* has increased greatly in extent and beauty. Of the *Pandæa*, the finest specimen in Europe, that in the northern wing facing the entrance, has now reached the glass, not only over its head, but on both sides, and as from its bulk and weight it cannot be removed from its position, if accommodation is not given for its further development in its present position it must be destroyed. The tub in which it grows stands on the iron grating over the hot-water pipes; if the latter were removed the tub might be lowered 4 feet, and so much top and lateral (the roof of the building being curved) space be obtained for its further spread of foliage. This is of course a question of expense, and the object to be attained being only temporary the desirability of incurring it or not will have to be carefully considered. Having regard to the great attraction of the plant to the general public and to the scientific visitors from all parts of the world, I think it only

right that the assurance should be given, that whatever conclusion may be arrived at, it will not be hastily formed. I should add that the specimen has been lopped on various occasions and will stand no further mutilation without complete destruction of its distinctive features.

Herbaceous Ground.—The collection of Liliaceæ has been arranged along the west side of the wall bounding the Herbaceous Ground on the west, and the *Amaryllideæ* to the south end of the Herbaceous Ground.

A quantity of duplicate herbaceous plants have been sent for the ornamentation of the London Parks.

A cemented brick tank has been built for open air water plants, 80 feet long by 20 broad, and raised 20 inches above the ground. It is divided into bricked compartments, and a constant run of water through it is provided.

The planting of named specimens of rare plants along the principal walks of the Botanic Garden has been proceeded with; the path from the gate leading to Brentford Ferry from the broad walk is now lined with exotic, chiefly Asiatic and American, maples of which 23 kinds are thus disposed, and a collection of rare oaks has been planted on the left of the path between the Brentford Gate and that opening on the Sion Vista.

The wooden staging which occupied the centre of the **Orchid House**, and which was in a state of decay, has been replaced by one of brick and slate.

The ruinous condition of the **Tropical Fern House**, alluded to in the Report for 1878, has been remedied, and the repair of the wood-work of various other houses has been overtaken at the same time as the replacement of the glass destroyed by the hail-storm in August 1879, the effects of which are else-

where detailed. In effecting these repairs pine wood has been largely replaced by teak, which it is hoped will eventually prove a great economy. I may mention that the teak-wood tallies, giving the names of the collection plants in the Arboretum, &c., which were placed in the ground in 1872, show no signs of decay.

The following **plants of special botanical interest**, amongst others of less importance, have **flowered** during the past year in the Royal Gardens:—

- Æchmea Lindenii*, K. Koch.
- Allium karatawiense*, Regel; Bot. Mag. 6451.
- Alloplectus peltatus*, Oliver.
- Alocasia scabriuscula*, N. E. Br. sp. n.
- Aloe Greenii*, Baker, sp. n.
- Androscepiæ gigantea*, Brong.
- Aphelandra pumila*, Bull; Bot. Mag. 6467.
- Arisæma concinnum*, Hk. f.
- ” *galeatum*, N. E. Br.; Bot. Mag. 6457.
- ” *nepenthoides*, Mart.; Bot. Mag. 6446.
- ” *utile*, Hk. f.
- Bæa hygrometrica*, R. Br.; Bot. Mag. 6468.
- Billbergia nutans*, Wendl.; Bot. Mag. 6423.
- Cajanus indicus*, Spr.; Bot. Mag. 6440.
- Chionodoxa nana*, Boiss; Bot. Mag. 6453.
- Chirita dimidiata*, Wall.
- Chusquea pallida*, Munro.
- Coreopsis aristosa*, Michx.; Bot. Mag. 6462.
- Crassula impressa*, N. E. Br.
- Crinum Kirkii*, Baker, sp. n.
- ” *podophyllum*, Baker, sp. n.
- Crawfordia speciosa*, Wall.
- Dendrobium Findlayianum*, Parish; Bot. Mag. 6438.
- Disa polygonoides*, Ldl.

Dracena floribunda, Baker;
Bot. Mag. 6447.

Ebermaiera nitida, S. Moore;
sp. n.

Eria stricta, Lindl.

Fourcroya cubensis, var. *inermis*,
Baker.

Gasteria Bayfieldi, S. Dyck, var.
minor.

" *squarrosa*, Baker, sp. n.
Habenaria intermedia, Don.

Hemigraphis colorata, T. And.

Heterostalis Heugeliana, Schott.

Hippeastrum vittato-solandrisflo-
rum, Baker.

Hymenocallis Harrisiana.

" *macrostephana*, Baker,
sp. n.; Bot. Mag. 6436.

Ixora, sp. aff. *Findlaysoniana*,
Wall.

Lamprococcus Weilbachii, Mor-
ren; Bot. Mag. 6435.

Leianthus longifolius, Griseb. var.
Liparis spathulata, Ldl.

Loasa prostrata, Don; Bot. Mag.
6442.

Luzuriaga radicans, Ruiz. et
Pav.; Bot. Mag. 6465.

Pandanophyllum humile, Hassk.?

Pitcairnia zeaeifolia, K. Koch.

" *Andreana*, Lind.; Bot.
Mag. 6480.

Polystachya rufinula, Rchb. f.,
sp. n.

Pleurothallis velaticaulis, Rchb.
f., sp. n.

Psychotria jasminiflora, Lind. &
André; Bot. Mag. 6454.

Rhododendron lepidotum, Wall.
var. *obovatum*;

Bot. Mag. 6450.
" *elaagnoides*, Hk. f.

Salvia nana, H. B.

Saracha Jaltomata, Schl.

Scutellaria purpurascens,
Swartz; Bot. Mag. 6464.

Trillium nivale, Riddell; Bot.
Mag. 6449.

Tulipa Schrenkii, Regel; Bot.
Mag. 6439.

Tulipa triphylla, Regel; Bot.
Mag. 6459.

Tillandsia bulbosa, Hook. var.
picta.

" *flexuosa*, Swartz.

" *streptophylla*, Schied.

Trichocentrum tigrinum, Lind.
and Reich, var.

THE ARBORETUM.

The efficient keep of this fine piece of ground, and its ever-increasing classified collection of hardy trees and shrubs, is a source of continual labour and much consideration, especially with regard to its future. The condition of Kensington Gardens is a standing warning as to the possible future condition of the trees at Kew. These grounds are in many respects similar; in both the soil is very bad and requires copious supplies of loam many of the trees are old and stricken with disease; and the increasing number of visitors renders it impossible to preserve them in the wild condition which was formerly their most attractive feature.

As the forested portion decreases, and what was wild wood becomes converted into a lawn with specimen trees and shrubberies, so does the expense of keep increase; and large spaces must be devoted to new plantations if the sylvan scenery, whether as forest or park, is to be kept up. This involves not only young trees (of which we have, happily, an abundant supply of our own raising of the rare as well as the common kinds) but trenching the ground for planting, good soil to put in with the young plants, and continuous labour in keeping the ground open to the rain and clear of weeds.

As in Kensington Gardens many years ago, so more recently at Kew, the brambles, thyme, and other wild plants which once (till within the

last 12 years at Kew) clothed the gravelly and sandy tracts, have, together with the ferns in the woods, disappeared, and their places are now occupied by lawn grass, which requires constant mowing.

The devotion of the Kew pleasure ground to the purpose of a classified Arboretum (for which it was so liberally and graciously relinquished by Her Majesty) has greatly complicated the problem of its keep; not only by involving an expenditure apart from that of the general care of the woods, lawns, and paths, &c., but by introducing a new demand in many respects antagonistic to the maintenance of the objects for which the grounds were originally laid out and planted with forest trees. During the first 10 years of the Directorship of Kew, nearly the whole of the ground was a game preserve, covered by timber, and the clearing of open spaces (whether for the purpose of replanting or for meeting the requirements of the Arboretum) was prohibited. The result was the loss of many old trees, the absence of young ones to replace them, and the ruin of the collections, which, being planted in the woods, were starved for want of light and of soil, as well as strangled by the roots and destroyed by drip from the surrounding and overhanging trees. For the last 15 years this policy has been modified; and the interest shown by the public, and especially by horticulturists, in the Arboretum, has led to its requirements being regarded as paramount.

Hitherto every effort has been made both to preserve the beauty of the grounds and to consider the necessities of the young collections of trees as to light, air, and freedom for growth. The principal clearances made for planting the specimens have been along the frequented paths and in the form of long, straight, or winding avenues cut

through the woods, thus bringing the collections into prominence and enabling the public to see the specimens and to find the way to them. In the coming year I hope to be able to report that the whole collection has been arranged in this manner, and that the principal walks and avenues are lined with objects of interest systematically disposed, with abundant space left for additions. In the course of this arrangement the majority of the trees have had to be planted much nearer to one another than they can remain; and after the lapse of a few years every alternate one in most cases, and two out of three in some cases, will have to be moved backwards to admit of the full development of itself and its neighbours. Though this plan of close planting has great disadvantages, it is in many respects advantageous; it is economical, the young trees being near to one another and to the path, less labour is involved in staking, weeding, watering, and cleaning; they are also kept better under inspection, and above all, the necessity for destroying many large trees growing in the ground behind them has been obviated.

I need not say that this plan of close planting with a view to subsequent dispersal would not have been adopted had it been possible to create the Arboretum by one effort, and had the formation of a complete collection of trees and shrubs been the only object to be attained. The Kew Arboretum has been the creation of a quarter of a century, and is the result of slender means. The sums expended on the area it occupies have been as much devoted to the preservation of its ornamental character, and to the formation and keep of walks, lawns, and paths, as to the requirements of the young specimen trees, &c.

The number of hands employed in the grounds has been the same

for 15 years, whilst the amount of kept ground has far more than doubled, and the collections have quadrupled in extent; consequently, large areas are insufficiently attended to, young plantations are left for years untrenched and unweeded, and the fences of evergreen shrubs planted for their protection get into a very ragged state. Under the present arrangement, caused by want of funds, a proportion of the otherwise constant labourers employed in mowing and watering during the summer months are dismissed during the winter months, when most needed for ground work, tree-logging, &c. Some of these men having been thrown out of work, and hence upon the neighbouring parishes, has led to representations being made by the guardians of the poor, and I would suggest that the present want of labourers in the Arboretum might best be met by the employment of these men (or some of them) during the winter months.

I now proceed to enumerate some of the principal improvements made in the Arboretum.

The ground along the path leading by the river from the Brentford Gate has been trenched in long beds, and the collection of elms replanted and greatly enlarged by species contributed, especially by Messrs. Booth of Hamburg, Van Volxem of Brussels, Lee of Hammersmith, and Osborne of Fulham. Further clearances have been made in the plantations between that path and the river, so as to expose the fine specimens of rare elms that were planted there by my predecessor 20 years ago. A top-dressing of good soil is urgently required for the whole of this area.

The trees of *Planera* and the allied genera have been removed into the adjoining Rhododendron Dell.

The plantations along the Grass Avenue skirting the river have all been greatly improved, very poor specimens removed and replaced by Holm oaks, which will eventually render the avenue practically an evergreen one.

I regret to say that this portion of the grounds suffers greatly from the unconsumed smoke of the gas works and manufactories at Brentford, which is not only most prejudicial to the plants, but so blackens the labels that they become illegible in a few years.

The old oak collection by the river, beyond the great Horse-chestnut, has been conspicuously ticketed with large wooden labels. This collection contains 100 trees upwards of 30 years old, chiefly Asiatic and American, together with younger specimens added within the last two years. It is grievously in want of trenching and a supply of better soil, without which these rare and interesting exotic forest trees will make little further progress.

The American oaks on the mound at the bottom of the Sion Avenue have been exposed to view by the removal of the shrubs by which they were being choked, and the more conspicuous of these have also been named.

The contemplated breaking up of the large beds of young specimen oaks, chestnuts, beeches, hornbeams, &c. (mentioned in last year's Report), and the planting of them in systematic sequence has not been accomplished this year, but preparations for proceeding with it in early spring are rapidly advancing.

In the new Pinetum most of the nurses have been removed, and many of the young pines which were suffering from overcrowding have been transplanted.

The specimens of *Cupressineæ* and allied genera of *Coniferae* along the walk skirting the Queen's Cot-

tage grounds having begun to suffer from crowding, the beds containing them have been enlarged and new ones made, so as to admit of those specimens being planted further apart. These specimens will have to be placed still further apart before space can be given for their full development. A choice collection of named Pyri, chiefly presented by Prof. Decaisne, of the Jardin des Plantes, has been planted on the left of the path leading westward from the Lion Gate.

The species of *Ribes*, *Deutzia*, *Philadelphus*, *Hydrangea*, and *Escallonia* have been removed from the neighbourhood of the Thorns, Pyri, &c. to beds prepared for them on either side of the long straight walk at the back of the Temperate House, beyond the Holly collection. More deciduous trees have been planted along the Pagoda Vista, where, however, the soil is so exceptionally bad that the results of these and previous plantations are far from satisfactory. Considering the importance of this avenue, and the miserable growth of the Deodars, now 30 years old (which it was hoped would be its grand feature), it is most desirable that no efforts or expense should be spared to encourage the growth of some good trees along it for the sake of both shade and ornament.

A small map of the Arboretum showing the positions of the principal walks and the collections arranged along them is attached to the last edition of the Guide Book, and is sold separately. Notice boards containing directions to the entrance gates and principal objects in the grounds, together with the names of the classes of the trees and shrubs planted along the walks and avenues, are being prepared for fixing at the entrance gates of the Arboretum, and at the points of divergence of the principal paths.

A miscellaneous assortment of duplicate trees from the Gardens and Arboretum has been planted along the east side of the Richmond Road by the proprietors of the houses built and being built there. These, together with those planted by ourselves on the west side of the road years ago, will form an avenue almost the whole way from the Cumberland Gate to the Lion Gate, to which there is no roadside rival near the metropolis.

INTERCHANGE OF PLANTS AND SEEDS.

The following is a statement of the **plants, &c. sent out** during the past year, and included in consignments:—

—	Ward's Cases.	Packets of Seeds.	Stove and Greenhouse Plants.	Herbaceous Plants.	Trees and Shrubs.	Number of Recipients.
Britain - -	—	1,253	3,815	1,010	1,327	118
Continent - -	—	286	194	61	34	25
Asia - - -	8	137	257	51	—	16
Africa - - -	2	441	127	—	—	11
America - -	6	220	182	—	16	19
Australia and New Zealand.	3	52	58	—	110	8
Total -	19	2,389	4,633	1,122	1,487	197

Argan Tree. — The account given of this interesting and useful tree (*Argania Sideroxylon*) in the appendix to the book by myself and Mr. Ball on Morocco and the Great Atlas has been reproduced in the gardening journals, and has excited a renewed interest in its cultivation. It is only known in the native state in an exceedingly limited area of Morocco, where the husk of the fruit is greatly valued for cattle food, while the seed kernel is the source from which an excellent oil is extracted.

At different times the seed has been procured and distributed to various colonies, where, however, its slow growth has led to disappointment. In 1870 a supply was obtained through the kindness of Mr. C. F. Carstensen, H.B.M. Vico-Consul, Mogador.

Amongst other places the Botanic Garden at Saharanpore was supplied, where, however, the plant, though probably well suited for N.W. India, does not appear to have survived. I am glad, however, to hear from Mr. F. Abbott, of the Royal Society of Tasmania's Gardens in Hobart Town, that the Argan tree has been fruiting there for some years.

Columbian Barks. — As stated in the Kew Report for 1878, p. 10, the number of plants of the Calisaya of Santa Fé was reduced to 15, and of Hard Carthagena bark to 10, at the close of the winter of 1878-9. These plants were, however, fairly vigorous, and it was therefore judged desirable to make the attempt to transmit part of them to India during the summer and autumn. Under instructions from the India Office, one plant of the Hard Carthagena bark was intrusted to Mr. W. B. Liddell, the managing director of the Nilgiri Tea and Cinchona Company (Limited). The case containing the plant was shipped

for Madras at the end of July, but the plant succumbed during the voyage.

Subsequently to this it was arranged that Mr. Adolf Biermann, the Curator of the Royal Botanical Garden, Calcutta, who was returning to India after absence on sick leave in consequence of the severe injuries he had received from a tigress which had escaped into the Botanical Garden, should take with him all the plants of Calisaya of Santa Fé and of Hard Carthagena bark which it was prudent to send out. The former were destined for the Nilgiris, the latter for Silkin. He accordingly left Kew on October 29 with two cases which had been carefully packed under the superintendence of Mr. Cross (the gardener employed by the Government of India in the culture and preparation of these plants at Kew), and which contained seven plants of the Calisaya of Santa Fé and four of the Hard Carthagena bark. On November 12, Mr. Biermann wrote from the Isthmus of Suez that so far the Cinchonas had travelled safely, and that "if nothing particular happens, I hope they all will reach their destination in fair condition." The four Hard Carthagena bark plants reached the Cinchona plantations at Darjeeling in capital order. Mr. J. Gammie reported (January 11 of present year): "There is every probability of their yielding a nice lot of cuttings soon after the warmer weather sets in. They have all lost their tops from canker contracted on the voyage, but the roots and lower parts of the stems are in excellent condition for yielding cuttings, which are what we want. They will give us a better start than twenty small plants would have done. I had them taken out of their pots at once and planted in a bed of good light soil under glass. With us

"Cinchonas are most apt to die of canker if kept long in pots."

Dr. King subsequently wrote:—
 "The last reports of the Carthagena Cinchonas are that they are growing vigorously. The sending of this species here is another matter for which the Indian Government is deeply indebted to Kew."

As a measure of precaution, in order to preserve the species in cultivation, and with the approval of the Secretary of State for India, a plant of the Hard Carthagena bark was also entrusted to Mr. Morris, Director of Government Gardens and Plantations in Jamaica, who succeeded in conveying it to that island, for which he left England on November 10th.

No report has reached Kew from the officials of the Madras Government with regard to the reception at Ootacamund of the valuable plants of Calisaya of Santa Fé, the establishment of which in the Old World is looked forward to with such anxious interest by all who are interested in Cinchona cultivation. At the commencement of the present year I received, through the kindness of Dr. King, the following statement from Mr. Biermann:—

"Five of the plants were alive on reaching Ootacamund, and before delivering them I drew attention to their precarious state after a long trying journey (38 days). After the plants had been for fully three weeks at Ootacamund they were in hopes of pulling through at least one or two of them. The plants began suffering in the Red Sea, about two days before reaching Aden I must say I received every possible assistance on board the P. and O. steamer 'Hydaspes.'"

At the date of this report there still remain at Kew, under the charge of Mr. Cross, five plants of the Calisaya and three of the Car-

thagena. With respect to the former, the enterprise is still by no means impossible of success. As to the latter, I am happy to be able to add, while this report is in preparation, the following satisfactory reports, which show that with respect to it no further anxiety need be felt. Mr. Morris writes:—

"Our specimen of Carthagena bark is in splendid condition. We have now 17 well-established cuttings, with promise of more."

Dr. King writes:—

"You will be glad to hear that the Carthagena Cinchona promises well. The four original plants are in excellent health, and Mr. Gammie has taken 36 cuttings from them, which are still too recent to speak confidently about, but which look most promising. From the free way the original plants grew I believe the Carthagena will turn out to be well suited to Sikkin."

Cinchona.—*Assam.*—Mr. Mann reports with respect to the small patches of Cinchona plantations below Nungklow, in the Khasia Hills:—"Cinchona officinalis" appears to be healthy, the other two species (*Cinchona succirubra* and *Cinchona micrantha*) all present a very sickly appearance, and most of them have only a few leaves at the extremities of the branches. Both species flower sparingly and form no good seed-pods. This condition of the plants is ascribed not so much to the climate and altitude as to the very steep slope and shallow surface soil resting on rock, which does not retain sufficient moisture to suit these plants. The plants of *Cinchona succirubra*, near Jirang, look very much better, and both altitude and situation, as well as the soil in that place, seem to be more suited to this species than in the Nungklow plantations."

Burma.—Major Seaton reports rather unfavourably on the prospects of Cinchona cultivation. The plantation appears to have been made as far back as 1871:—"All things considered, the Cinchona experiment does not promise well. The oldest trees dying off, and the trees of very small size flowering and fruiting freely, are only too sure signs that the tree finds itself in a site not adapted to its requirements." It appears, however, that a Ceylon planter has made inquiries about a grant of land in the neighbourhood. It is possible, that with the technical knowledge as to the methods of cultivation of Cinchona, and of obtaining a speedy financial return from it, which have been worked out in Ceylon, a better face may be put upon the experiment in Burma.

Central Africa.—Dr. Lowe, Inspector of Hospitals of the Soudan, informs me that at Gadarif, near the frontier of Abyssinia, *Cinchona succirubra* does well.

Ceylon.—The enterprise of the planters, and the necessity of obtaining a speedy return for invested capital, has led to much more rapid methods of harvesting the bark crop being adopted in this island than at the first commencement of the enterprise would have been thought possible. The following statement appeared in the "Ceylon Observer" for Sept. 13th, 1878:—"Over large areas in Ceylon it seems as if *Cinchona officinalis* came to maturity in four and a half years, while if trees begin to show signs of canker or decay at even two and a half years, the bark ought at once to be utilized. Bark of such trees will pay well for the gathering. We once sent to Messrs. Howard a specimen of bark from three and a half years old trees. The verdict was, 'good marketable bark as it stands.'"

Jamaica.—Mr. Morris writes:—

"My chief care at the Cinchona plantation is the establishment of large open air nurseries instead of the glass propagating houses which I found here. I sow the seed under thatched sheds and prick out the plants into beds shaded by ferns. This is a simple inexpensive style which is universally adopted in Ceylon, but unknown here. I fear that the system of glass houses and propagating and hardening frames has done much to frighten people from trying Cinchona here, and besides [the Government plantations] have never been able to distribute more than a few hundred plants, as they had not enough for their own use. In a few months, by next planting season, I shall have 80,000 which I can conveniently spare, and by the end of the year, possibly 500,000."

* * *

"Unless the trees are planted thickly enough to 'bower' the ground, as the planters say, the cost of weeding is nearly 4l. per acre per annum. By the third year the trees, if well planted and well supplied, ought to cover the ground and save all subsequent weeding."

Mauritius.—Mr. Cantley reports:

"The Cinchonas have grown but slowly. Few experiments have been made with the plants, owing to more pressing work. The plants planted in the forests at a greater altitude than that of the gardens have not grown satisfactorily, but it is hoped some method of growing this useful plant, which will give beneficial results, may still be hit upon; only it must differ considerably from that of other countries."

Sikkim.—In his report for 1878-9 on the Government Cinchona plantations in Bengal, Dr. King states:

—“The most interesting feature in the details of the crop is the fact that four acres of yellow barks (*Cinchona Calisaya*) planted during 1871-2 yielded, when coppiced, at the rate of no less than 1,882 lbs. per acre. The present is the first season during which *Calisaya* has been cropped, and if this result can be taken as an indication of the rate of produce to be expected, the future prospects of the cultivation of this species are reassuring.”

No locality with perfectly suitable climatic conditions having yet been found for the growth of *Cinchona Calisaya* in British Sikkim, Dr. King was authorised by the Government of Bengal to visit Java to examine the conditions under which the Dutch have there succeeded in growing the tree successfully.

The Government of Bengal, in reviewing the operations of the *Cinchona* plantations in British Sikkim for 1878-9, arrives at the satisfactory conclusion that the enterprise is in every way a financial success. “The total amount of capital, with interest at 4 per cent., that has been sunk in the *Cinchona* plantations and in the manufactory is approximately 10 lakhs of rupees; the receipts for the year 1878-9, therefore, after paying all expenses, yielded interest of about $4\frac{1}{2}$ per cent. on the capital outlay, and even if subsequent years show no improvement, as it may be confidently assumed they will do, a sufficient annual income would almost have been realized.

“But this system of computing profits falls very far short of doing justice to the real benefit which the Government has derived from the *Cinchona* plantations. The 5,500 lbs. of alkaloid taken by the different medical departments replaced an equal amount of quinine that would otherwise have been

“purchased and supplied to hospitals and dispensaries. At the very moderate rate of Rs. 80 per lb., the cost of this would have come to Rs. 4,40,000, and this amount, *plus* the actual sales to the public and Straits Settlements Rs. 41,540, in all Rs. 4,81,540, is the true measure of the gain to Government from the *Cinchona* manufacture. Looking at the financial question in this way, as may most fairly be done, the plantations by the end of the current year will have cleared off the entire capital that has been invested in them.”

Up to the end of 1878-9 Dr. King shows that the total saving effected to Government by the use of febrifuge in the place of quinine had already amounted to $7\frac{1}{2}$ lakhs of rupees. He continues: “As for the febrifuge itself, extended experience of its administration appears to have increased the confidence both of the medical profession and of the general public in its virtues as a febrifuge. Complaints of its nauseating effects are now seldom heard of, and there appears to be little doubt that these were originally largely due to the practice of giving too large doses of a drug which is really about as powerful a febrifuge as quinine.”

With regard to price, Mr. C. H. Wood, the Government Quinologist, anticipates that the cost of the febrifuge will ultimately be brought to about eight annas an ounce.

Singapore.—Mr. Murton (Superintendent of the Botanic Gardens) reports:—“All attempts to grow this here have proved fruitless, but *Cinchona Calisaya* and *Cinchona succirubra* are likely to do well at 2,000 feet elevation in Perak.”

Tinnevely.—Col. Beddome reports:—“A few plants were sent from

" the Nilgiris for trial in this district (1856), and the *Cinchona succirubra* plants were put down at an elevation of about 3,000 feet, in a small clearing in the ghât forests; they have been left entirely to nature, but owing to the moister climate, the growth contrasts very favourably with that of Neddivattum or elsewhere on the Nilgiris. During my last inspection I found one of the larger trees to be nearly 50 feet high; it had three large stems at about 1 foot from the base, the leaves having, it was said, been broken by a monkey when young."

Eucalyptus.—Seeds of species of this Australian genus are continually asked for, and supplied from Kew. The following notices represent the progress made in their cultivation in various parts of the world:—

Assam.—Mr. Gustav Mann reports:—" *Eucalyptus Globulus* is by far the fastest growing species cultivated in the Khâsi Hills, and next to it comes *Eucalyptus rostrata*."

Bengal.—Dr. King remarks:—" The Eucalypti from Queensland give little more hope of success than the more southern species, by the planting of which in the plains of Bengal sanguine people hoped to abolish malaria."

Bombay, Northern Division.—Mr. Shuttleworth reports:—" Seeds of different varieties of Eucalyptus were sown, nearly all failed. A few of *E. rostrata* are surviving."

Bombay, Southern Division.—Col. Peyton reports that the plantations of different species of Eucalyptus do not appear to prosper, and " their numbers are rapidly diminishing." . . . " They are weedy and whip-like in growth, and require to be propped up to prevent falling over." Near

Dharwar what is supposed to be *E. resinifera* appears to prosper. " Four trees are remarkably fine, although only six years old. They have attained on an average 40 feet high, and are 5 inches in diameter 5 feet from the ground."

Jamaica.—Mr. Morris reports:—" Of Australian trees the most desirable here is *Grevillea robusta*, which is adapted for nearly all elevations, and stands wind well. The gums (*Eucalyptus*) get very much blown and seldom look well except in clumps, where, for the first four or five years they are sheltered on the outside by other trees."

Saharunpore.—Mr. Duthie reports:—" There are at present upwards of 31 species under cultivation in these gardens. . . . The healthy appearance of some of the kinds and the rapid growth they are making are sufficient reasons for encouraging their extensive cultivation in India." This is in accordance with what is known of the climate of that (extra-tropical) part of India.

Singapore.—Mr. Murton reports:—" When sown *in situ* they seem to thrive fairly well in Singapore, but do not appear to stand transplanting. *Eucalyptus siderophloia*, *E. Baileyi*, and one or two other species are growing well in the nursery."

Zanzibar.—Dr. Kirk informs me:—" The *Eucalyptus citriodora* from Queensland is now in less than two years from seed about 18 feet high, with wide branches."

Fodder Plants.—1. GUINEA GRASS.—Dr. Imray informs me that this grass (*Panicum jumentorum*) takes the place of all other fodder grasses in Dominica, " it requires so little cultivation, and is so hardy, for our climate that is. By keep-

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"ing the weeds down and a little manure occasionally, it may be cut down crop after crop for many years. I have had a guinea grass piece treated in this way for full twenty years."

2. PRICKLY COMFREY. — Extended trials have shown that this plant (*Symphytum peregrinum*), although possessing great merits as an early fodder crop in cool and temperate countries, is physically unadapted for cultivation in hot countries. I quote the following statements—in addition to those published in last year's Report (pp. 12, 13)—from Australia and India.

Madras.—The Agri-Horticultural Society report:—"Experiments with Prickly Comfrey have failed, the plants which were in the gardens, though receiving rather more than their fair share of attention, having one by one perished."

Saharunpore.—Mr. Duthie reports:—"I do not believe that the conditions at Saharunpore, as regards either climate or soil are favourable for the profitable cultivation of this plant." At Chajuri it thrives fairly well. Three crops were taken during the year from 35 roots growing 3 feet apart. The average weight of each crop was 30 lbs."

South Australia.—Dr. Schomburgk reports from Adelaide:—"Prickly Comfrey has again been a thorough failure, and it is now a fact that this plant is of little use, at least on the South Australian plains."

"Prickly Comfrey" has been identified by Mr. Baker with a plant long known as naturalised in the neighbourhood of Bath, from which locality specimens are to be found in herbaria in this country under the name of *Symphytum asperrimum*.

The accompanying plate is borrowed from the Botanical Magazine, where, under Tab. 6466, an account

of its botanical characters will be found. The knowledge of this plant and of its capabilities being now widely diffused, it will not be necessary to refer to it again.

3. TÉOSINTÉ. — *Bombay.* — Mr. Woodrow reports:—"Euchlana luxurians produced a heavy crop of forage when treated as a garden plant, but not better than would be given by sugar-cane in the same circumstances. When treated as a fixed crop, under the same conditions as Jowaree, the produce was inferior to that crop."

Queensland. — Mr. Walter Hill reports from Brisbane:—"The seeds received by me were duly planted, and grew both strong and healthy, flowering about the month of May. From the opportunity I have had of judging of its nutritive qualities, I am not of opinion that it can be grown to much advantage in this colony, the stalks appear to be too fibrous and hard to possess much nourishment. I shall, however, make further experiments."

Saharunpore. — Mr. Duthie reports:—"As far as cultivation is concerned success has been complete. The majority were fine healthy plants, and an abundant supply of excellent seed was produced."

Singapore. — Mr. Murton reports:—"This grass, although useful, does not bear out its reputation in the Straits. Large quantities of seeds have been distributed, but all accounts from the Native States state that it pays far better to grow maize, as the same ground that will grow Téosinté will produce excellent maize."

South Australia. — Dr. Schomburgk reports from Adelaide that, notwithstanding the disastrous drought of the early part of 1879, the prevailing dryness did not injure the plants, showing not the slightest effect on their leaves,

“ which preserved their healthy green, while the blades of the other grasses suffered materially. . . .
 “ At the Government garden at Palmerston, in the Northern Territory, the growth of the *Euchlœna* has been surprising. In the course of five or six months the plants reached the height of 12 to 14 feet, and the stems on one plant numbered 56. The plants after mowing down grew again several feet in a few days. The cattle delight in it in a fresh state also when dry. Undoubtedly there is not a more prolific forage plant known. . . . I can recommend it as a most valuable summer forage plant in our dry climate, especially if it can be planted in a moist soil. The only drawback with us will be that the ripening of the seed crop will be problematical, as early frosts will kill the plant.”

4. TAGASASTE.—We are indebted to Dr. G. V. Perez for seed of this forage plant (*Cytisus proliferus* var.). It is a shrub indigenous to the Canaries, the leafy branches of which are said to be a useful fodder. It requires a light dry soil, and is rather intolerant of frost in winter. The plants should be placed six to ten feet apart, may be cut two or three times a year, and will last 10 to 20 years. Thirty-five pounds of fresh chopped Tagasaste mixed with 20 lbs. of chopped straw is said to be sufficient for the daily nourishment of a horse or cow. The seed is very slow in germinating.

The seed was pretty widely distributed from Kew. It is too soon to expect the results of trials at present.

Madras.—Most of the seedlings died off after germination. Colonel Grant reports at commencement of present year:—“At present only two or three are looking healthy, and from them I should think very little fodder could ever be obtained.”

South Australia.—Dr. Schomburgk reports from Adelaide:—
 “The seeds were sown, and all came up. The growth of the plant is vigorous. Some of the plants having reached two to three feet, looking healthy, not in the slightest degree affected by the severe dry weather we have had to contend with. I have many plants for distribution.”

India-rubber.—According to Hecht, Levis, and Kahn's Report for 1879, Para rubber (*Hevea*) is still the largest source of supply. The total import into England during the year was 4,651 tons. Liverpool received 25 tons of Ceara Scrap rubber, and 900 tons of African (*Landolphia*), while London imported 350 tons from Assam (*Ficus elastica*), 250 tons from Borneo (*Willughbeia*), and 550 from Mozambique (*Landolphia*). Considerable attention has been paid at Kew during the past year to the examination of the African *Landolphias* and Malayan rubber-yielding *Willughbeias*, and the results will be given in the next report. Owing to the unflinching interest in Kew of Dr. Kirk, H. B. M. Consul-General at Zanzibar, a considerable stock of *Landolphias*, of which in 1877 we had none in cultivation (Kew Report, 1877, p. 32), has been got together. Plants of one kind will be distributed to tropical colonial gardens in the course of the present year.

The following extracts from reports and other documents carry on the history of the introduction of the South American species into Old World cultivation (see Kew Report, 1878, pp. 14 and 15).

1. CASTILLOA.—*Singapore*.—Mr. Murton reports:—“The plants of *Hevea* and *Castilloa* in the gardens are now large plants, but hitherto propagation from the strong growths they are making

"seems rather difficult, whereas they used to propagate freely from the weak wood produced while in pots."

2. CEARA SCRAP (*Manihot Glaziovii*).—*Burma*.—Major Seaton reports:—"A quantity of seed of this India-rubber tree was received during the latter part of the season from the Botanical Gardens, Peradeniya, Ceylon; and at the request of Dr. Thwaites, an intelligent lad was deputed to Ceylon to receive instructions in the cultivation of India-rubber plants."

Calcutta.—Dr. King reports:—"The Ceara rubber promises to grow well in Calcutta. The seedlings received from Kew have thriven vigorously, and some of them are now 20 feet high. The Director of the Botanic Garden in Ceylon having, at the request of the Secretary of State for India, undertaken the propagation of this species, a quantity of seeds of it were distributed by him to Indian officers during the year. Supplies were, I understand, sent to the Conservators of Forests in Burmah and Assam, and to the Inspector-General of Forests for Madras. A large supply was received at this garden, and a thousand seeds were sent, at the request of the Conservator of Forests for Bengal, to the officer in charge of the forest plantation near Chittagong. The seeds received here have begun to germinate, and I expect before long to be in a position to issue supplies of seedlings for trial in different parts of the country. The plant appears to thrive very well in Upper India, and if the quality of rubber yielded by it in this country turns out to be good, its introduction may prove of much importance."

Singapore.—Mr. Murton reports:

—"Ceara Scrap rubber must be omitted from the list of rubbers adapted to the climate of the Malayan Peninsula, as it has invariably rotted off during continued wet weather."

Zanzibar.—Dr. Kirk informs me that with him the Ceara rubber yields seed most abundantly, but the seeds are slow to germinate.

3. HEVEA.—*Burma*.—Major Seaton reports:—"At Mergui eight Para India-rubber trees, the survivors of the batch of seedlings received from Dr. King in 1877, continue to do well in the office compound, and vary in height from 8 feet to 25 feet. . . . They are large enough to admit of a considerable number of cuttings being taken from them."

Calcutta.—Dr. King reports:—"Para rubber, of which fourteen plants were alive in the garden at the date of last report, continues to be as disappointing as ever. Most of these 14 plants are still alive, but they have not grown much, and it is quite clear to me that it is vain to hope that this species can ever be cultivated to profit in this part of India. Plants may be coaxed into growing in conservatories, but the species is by far too thoroughly tropical to withstand without protection the vicissitudes of the climate of Northern India. As I have before reported, I believe it is useless to try it anywhere in India except in the south of Burma or the Andamans, and perhaps in Malabar. I learn from Dr. Thwaites that in the Botanic Garden at Peradeniya, in Ceylon, there are plants of *Hevea* of about 30 feet high, and that these are of the same age as the plants here, the highest of which is barely 6 feet in height."

Jamaica.—Mr. Jenman reported:—"I regret to say that there are

“ only two plants of the Pará rubber in the garden, one which I brought with me, and which is now a vigorous young tree 10 feet high, the other, the only one saved out of a case of 16 plants sent from Kew Gardens over two years ago, but which unfortunately on its arrival in Kingston was locked up in the Custom House for a fortnight, to the influence of which, after the voyage, all but the one succumbed. The atmospheric conditions of this district appear favourably adapted to the successful cultivation of the Pará rubber.”

Zanzibar.—Dr. Kirk states :—“ The Pará rubber is a less quick grower than the Ceara, and does not branch. It is 10 feet high.”

Liberian Coffee.—The following extracts will show the progress made in different parts of the world of this important plant. (*See Kew Report, 1878, pp. 15-17.*)

Burma.—Lt.-Col. H. P. Hawkes, Honorary Superintendent of the Government Gardens at Rangoon, reports :—“ The Liberian coffee continues to thrive. It is now showing signs of flowering, and will be in full bloom about the middle of next month. I hope, therefore, to be able to venture upon some estimate of the probable economic value of this coffee at the close of next year.”

Dominica.—Dr. Inray writes to us :—“ I am glad to say that the Liberian coffee cultivation may now be fairly considered as established in this island. The fine, healthy, luxuriant trees on my small plantation, with a crop of berries on many of them, afford sufficient evidence of the climate being congenial to the plant. The cultivation is successful, and only awaits extension by others taking it up. I have several thousand seedlings planted out in

“ the open, and thriving well. I lost a good many seedlings, however, by putting them out when too small. To ensure their rooting they should be pretty well grown before they are transferred to the field. Protection of some kind or other is also advisable at first, as well from the scorching rays of the mid-day sun as from strong winds. When fairly rooted and growing, the plants are hardy enough, and will bear a good deal of exposure and neglect.”

“ My trees still remain free from the attacks of that dire scourge of the coffee plant in this part of the world, the *Cemistoma Coffeelum*, and yet not altogether exempt from its attacks, especially in the first stage of its growth. As I shall relate, I had planted many hundred seeds in boxes and bamboo joints, and they showed above ground at the usual time, about six weeks after planting. At first the seedlings appeared quite healthy, but after a time I observed brown spots on the cotyledonary leaves. I did not pay much heed to this appearance, believing the plant altogether impervious to the assaults of the white fly, but as they rapidly became all affected in the same manner, I carefully examined some of the brown spots on the leaves, and found to my horror that the destruction was unmistakably caused by the larva of the white fly! I was quite taken by surprise, as the grown plants had escaped its ravages. It was, however, only the seminal leaves that had been attacked, but if they were destroyed before the stem leaves were formed the plant would certainly perish; and, indeed, in this manner many were lost. I killed the larva in the leaves, and brushed off the chrysalis wherever it appeared, and thus saved most

"of the seedlings until the stem leaves began to grow; and these, as you may suppose, I watched with great interest as they grew, and to my intense relief discovered that the insect left them untouched. The seedlings steadily increased in size, throwing out fresh leaves, and most of them have been planted out in the field, and are thriving well, with not a speck of the blight on them.

"This is a notable and curious fact in the history or study of this destructive creature. There were no blighted coffee trees growing very near to these seedlings, but in the adjacent field were some trees with the blight on them. From these the moth, by a marvellous instinct, or whatever the impulse that guides it may be called, had found out among myriads of other leaves the cotyledons just as they had emerged from the ground, and decided that they were exactly suited for the deposit of its eggs, and the nourishment of the larva when hatched.

"This, however, is not the only attempt the insect has made to gain a footing on the Liberian coffee. On carefully examining the large trees some six or eight months ago, a few leaves were found where the insect really had established itself, but in a very feeble manner. Some of the larvæ were lively enough, but others small and weak, and the skeletons, if I may so speak of others that had died, were found in the brown patches of the leaf, when the upper and under cuticle were separated. Very few cocoons were observed, and these were smaller than usual.

"There must have been something exceptional in the structure of those leaves that the insect had selected to deposit its ova, and

"from the blight not having extended it may be inferred that, although the eggs of the fly were deposited, and the larva when hatched had found its way to the cellular structure of the leaf, this was not found in sufficient quantity, or of such quality, as to form a healthy pabulum; hence the larva either died in the leaf, or formed a small and weak chrysalis which failed to produce the moth. Be that as it may, the very reassuring fact remains that the blight did not spread, and that at the present time the insect is not to be found in any of its stages among the well grown trees or the seedlings, although carefully searched for. The most striking point is, that though the seminal leaves were rapidly devoured, the stem and branch leaves of the seedlings remained untouched. Doubtless the soft juicy substance of the seminal leaf affords suitable nourishment, while the reverse is the case with the comparatively dry and fibrous parenchyma of the ordinary leaf.

"The fact of the *Ceniosstoma* attacking the seminal leaves of Liberian coffee has a very important practical bearing in the cultivation of the plant in the countries where this blight exists. For if nurseries of Liberian coffee are formed near to a single tree with the blight on it, the seedlings will be quickly attacked and, possibly, all destroyed. Nurseries should be established as far distant as possible from the blighted coffee trees, and the seedlings should be assiduously watched, so as to destroy the insect in its larva state as soon as a brown spot indicates its presence, and this may be done by simply scraping the spot with the nail. When the stem leaves appear, and have grown somewhat, the plant is safe. I gave a few seeds to several

“ persons in the island, but these, so far as I learn, have for most part failed, the plants having died, and from the description given of brown spots having been seen on the leaves, I have no doubt the white fly was the cause of their destruction. I purpose sending some remarks to the local paper soon, giving instructions as to the mode of cultivating Liberian coffee, and warning all of the absolute necessity of protecting the seedlings from the ravages of the white fly, or very few will be saved.”

Jamaica.—Mr. Jenman reported, 22nd February 1879:—“There is a great demand for this coffee, which the garden is quite unable to meet at present. All attempts which have come to my knowledge on the part of private parties to import either plants or seeds have proved failures. Another small parcel of seed received some months ago from Kew Gardens produced between four and five dozen plants, the majority of which I have planted out to increase the number of our stock plants. . . . I am glad to be able to report that the first few trees received have this year (1878) borne a small crop of fruit, which has recently been gathered and sown.”

Seychelles.—Mr. C. S. Salmon, the Chief Commissioner, writes:—“About 150 plants of Liberian coffee—mostly raised from seed you sent—have been planted at Mahé Island at elevations varying from the shore to 1,500 feet above sea-level. It comes best, apparently so far, in the open without shade. One plant at an elevation of about 300 feet, without any shade and close to a granite rock giving out considerable heat, has about 100 strong looking flowers on it. This plant is 18 months old.”

Singapore.—Mr. Murton reports:—“The Arabian coffee here is severely attacked by the disease [*Hemileia vastatrix*], which has destroyed all hopes of our being able to supply seeds for planters in the Peninsula. The Liberian coffee has not yet shown any signs of being attacked, although some Perak planters have been scared by yellow blotches on the younger parts of the branches.” [They appear to have no connection with the disease.] “The species is evidently very impatient of deficient drainage. The plants raised from seeds received from Kew in May 1878 are now blooming profusely. Eight hundred fruits from our plants have been sent to Government Hill, Penang, and 500 sent to Perak. Very favourable reports have been received from the Native States regarding the progress of the plants of this species there, and there can be now no doubt that the Liberian coffee has found a congenial home in the Malay Peninsula and adjacent islands, and its future propagation may now be left to planters.”

Queensland.—Mr. Bernays informs me that the Liberian coffee introduced [Kew Report, 1877, p. 17] from Kew “has found a firm footing on the Herbert River, where it gives high promise of attaining complete success. The foliage of many specimens is rich and full, and, as there are signs of bloom also, it is not unlikely that ripe berries may this season follow.”

Zanzibar.—Dr. Kirk writes while this report is in preparation:—“Several useful plants take well to the climate; my Liberian coffees (the last lot) are now in flower.”

Mahogany Cultivation in Old World.—This may now be regarded as an accepted success. The tree grows well in many parts of India and in Ceylon, and in the former

there is a local demand for the wood. In this country new uses are found for it, one of the most recent being for the linings and panellings of railway carriages instead of teak, which is now exclusively used for ship-building. It is not easy to see any valid arguments against the cultivation of a tree the timber of which is of admitted excellence for a variety of purposes and the growth of which is apparently attended with little difficulty. As late as 1876 the Government of Bengal was adverse to mahogany planting. This policy has now, however, been modified, and in his report for 1878-79 Dr. Brandis, the Inspector-General of Forests, reports:—"Of the exotic trees which are cultivated by way of experiment, mahogany is the most important, and its success seems not improbable, though it is too early yet to form final conclusions upon the subject." Mahogany is also cultivated as an experiment in Burma and the Chittagong district of Bengal. The tree is known to thrive well near Calcutta, and every effort should be made to cultivate it in those forest districts where climate and other circumstances are favourable.

Bombay, Southern Division.—Col. Peyton reports:—"A small parcel of seed was received from the Superintendent of the Botanical Gardens. It was not understood how to treat them, and only 18 germinated. They were put out at Yellápur, and are now splendid specimens, varying from 1 foot 8 inches to 4 feet 7½ inches. Subsequently another parcel of seed was received. They are now understood, and are germinating famously. They require much watering, good air and light, and a light covering only of earth."

Burma.—Lt.-Col. H. P. Hawkes, Honorary Superintendent of the Government Gardens at Rangoon,

reports:—"The mahogany experiment has been an unqualified success. The seeds were sown on the 7th September 1878. When the plants were exactly a year old three of them were measured, and found to be 8 feet 3 inches, 7 feet 5 inches, and 6 feet 1 inch in height respectively, with a girth of from 3½ to 3¾ inches, a rate of growth which, as far as my experience goes, is altogether unprecedented, even in the case of indigenous trees. In addition to this rapid growth, the mahogany tree appears to be very hardy, and promises to bear with impunity the extremes of heat and moisture characteristic of the Burmese climate. Of the last 112 plants raised from seed not one has failed. We have a large number planted out, and they seem to thrive in the poorest soil where it is difficult to keep other plants alive."

"I believe that this tree has a great future before it. The Forest Department now plant teak almost exclusively, and there is no other tree which can altogether take its place, especially in those situations where structures made of it are liable to the attacks of white ants. But there are many purposes for which a light handsome wood is required; this want would be met by the mahogany, and there would doubtless be a considerable demand for export."

Major Seaton reports:—"In the Tenasserim Circle, the four mahogany trees planted out in 1875, near a monastery at the foot of the Toungwine range, near Moulmein, continue to thrive, the maximum and minimum heights of the trees being 17 feet and 7 feet respectively."

Queensland.—A supply of seed of Honduras mahogany has been sent from India to the Acclimatisation Society, Brisbane, which has

distributed a portion to the Botanic Gardens of Bowen, Rockhampton, and Maryborough.

Saharunpore.—Mr. Duthie reports:—"The tree appears to thrive well in these gardens. There are some fine large specimens about 60 years old, one of which measures 8 feet 9 inches in girth at 4 feet from the ground. The tree flowers regularly every year, but as yet no seed has been produced."

Singapore.—Mr. J. Fisher writes to me:—"The mahogany raised from the seed sent me some 11 years ago looks very healthy indeed, and is now about 50 feet in height."

Mesquit Beans.—**Bengal.**—Dr. King reports:—"The plants of *Prosopis juliflora* continue to thrive, but have not yet flowered."

Punjab.—From a report furnished to the Government it appears that the general result of experiments is to show that with ordinary care and with good seed there is no difficulty in growing *Prosopis juliflora* in the Punjab."

With regard to the caution given in the Kew Report for 1877, p. 20, it is pertinently remarked:—"Any new kind of food given in quantities to animals unaccustomed to it may cause disease, or, under certain special circumstances, may cause death. Opinions are divided as to what it is that causes cattle in this country in certain seasons to sicken and die from eating 'jowar' stalks; but there is no doubt that under certain not very well understood conditions cattle do die from eating 'jowar' stalks, though ordinarily such stalks are good for fodder."

Saharunpore.—Mr. Duthie reports:—"The plants of *P. glandulosa* are very healthy looking, and have grown considerably during the past year, though in a straggling, bramble-like fashion.

"... Every plant of *P. pubescens* died before the rains were over."

Writing June 15, 1879, he remarks: "I am glad to tell you that several plants of *Prosopis glandulosa* are bearing fruit abundantly, and I believe it is doing the same at Cawnpore."

South Australia.—Dr. Schomburgk reports great difficulty in establishing *P. pubescens*. "Notwithstanding all the care used we lost them all. The plants seem to fail during winter. The other species, *P. juliflora*, does uncommonly well in our climate. . . . I hope that the seed will grow and the trees flourish, so as to induce a further demand for large quantities wherewith to stock the arid plains of South Australia on a large scale, thereby vastly increasing the resources of that peculiar country in a stock-raising view."

Pithecolobium Saman.—**Bombay, Northern Division.**—Mr. Shuttleworth reports:—"Success was very fair; germination took place in 8 to 10 days, and at the end of the year some of the plants were from 6 to 8 feet high. . . . In Satara 400 plants are thriving, and seem to be hardy and able to stand drought during the cold and hot weather months."

Bombay, Southern Division.—Col. Peyton reports:—"Came up splendidly everywhere. About 2,500 plants were raised from the small parcel of seed received. The growth is very rapid and vigorous, and many of the plants put out have attained a height of from 3 to 8 feet. To germinate them they require copious watering, and some are now noticed germinating over the old sowings of last year."

Burma.—Major Seaton reports:—"Pithecolobium Saman has been distributed throughout the Pegu

"circle, and from all quarters is reported to have grown luxuriantly."

Calcutta.—Dr. King reports:—"The rain trees in this garden seeded for the second time, and large quantities both of seed and seedlings have been distributed. The sweet succulent pod of this tree is said to be an excellent food for cattle, and if it proves acceptable to the Indian bullock the rain tree may become highly useful as a fodder plant, while its rapid growth and umbrageous habit will certainly make it a favourite for planting by road sides and near cantonments."

Dr. King further informs me:—"Pithecolobium Saman seeds in India only in the Botanic Garden, Calcutta, and our trees are quite unequal to supply the demand. It seeds also in Ceylon, but Dr. Thwaites told me that he had great difficulty in saving the pods from frugivorous bats. At Calcutta, where the same species

"of bat is common, it has not found out yet how nice the pods are."

Saharunpore.—Mr. Duthie reports:—"The effect of the cold season on this plant obviously indicates the undesirability of attempting its extensive cultivation in this part of India."

Sind.—Major McRae:—"The seed sown last July has succeeded very well, the plants (a month later) being of an average of over 6 feet in height."

Tasmania.—Mr. Abbott reports:—"From seeds received from Kew, plants of *Pithecolobium Saman* have been raised. . . . It is probably better suited for cultivation in warm climates, but hitherto the plants have done well with us."

The receipts have been during the past year 3,754 living plants of all kinds, and 2,900 packets, bags, and boxes of seeds from 196 contributors. They were distributed as follows:—

—	Ward's Cases.	Packets of Seeds.	Stove and Greenhouse Plants.	Herbaceous Plants.	Trees and Shrubs.	Number of Contributors.
Britain - -	—	350	656	511	587	102
Continent - -	—	599	124	185	389	15
Asia - -	7	740	218	5	4	24
Africa - -	6	102	128	158	—	20
America - -	5	743	234	53	443	22
Australia and New Zealand.	2	366	59	—	—	13
Total - -	20	2,900	1,419	912	1,423	196

I. Britain.

The usual exchanges have been made with the Botanic Gardens of Dublin, Edinburgh, Glasnevin, and Oxford; with the Royal Horticultural Society, Chiswick; with

the Royal Botanic Society, Regent's Park; also with the principal nurserymen, especially with Messrs. Backhouse of York, Barr and Sugden of Covent Garden, Bull of Chelsea, Carter of Holborn, Dickson and Co. of Edinburgh, Dickson and

Sons of Chester, Henderson of St. John's Wood, Jackson and Son of Kingston, Laing of Forest Hill, Lee of Hammersmith, Little and Ballantyne of Carlisle, Low and Co. of Clapton, Osborn of Fulham, Rodger, McClelland, and Co. of Newry, Thompson of Ipswich, Veitch of Chelsea, Ware of Tottenham, and Wills of South Kensington.

Contributions have been received from upwards of 100 different sources; of these the principal have been:—

Ashburton, Lady; box of Cape *Irideæ*, bulbs, &c.

Atkins, J.; *Pulmonaria dalurica*, *Saxifraga primulina*, &c.

Bagwell, Mrs.; seeds of *Anemone coronaria* and others.

Bradford, E.; seeds *Perilla ocimoides*, *Polygonatum tinctorum*, &c.

Briggs, T. A.; *Pyrus Briggsii*.

Briggs, Sir T. G.; Ward's case of plants from Bermuda.

Broome, C. E.; *Habenaria chlorantha*, *Lysimachia thyrsiflora*, *Eryngium alpinum*.

Christy & Co., T.; seeds *Duboisia myoporoides*.

Clark, Col. T.; hybrid *Haemanthus*, *Hymenocallis Harrisiana*.

Crewe, Rev. H.; *Gladiolus permegibilis*.

Darwin, Ch.; fruit of supposed hybrid *Solanum*, *Drosophyllum lusitanicum*.

Egerton, Sir. P.; *Hymenocallis macrostephana*.

Ellacombe, Rev. H. N.; *Tritoma Burchelli*.

Elwes, H. J.; *Arisæma nepenthoides*, *Milla longipes*, *Tulipa* sp.

Hall, —; *Gentiana bavarica* and other Swiss alpinæ.

Head, A., Crystal Palace; large clump of *Rhapis humilis*.

Hillhouse, W.; *Riccia fluitans*.

Henry, I. A.; *Alstrœmeria* sp., *Gunnera* sp., *Stenomesson Hart-*

wegii, *Lychnis apetala*, *Clematis Colensoi*, *Hibiscus corylifolius*, *Perezia multiflora*, *Rhodostachys littoralis*, *Puya andina*, *Puya paniculata*, *Veronica Lyallii*, *V. salicornioides*, *Primulas*, roses, &c.

Jennings, R.; *Eucalyptus Gunnii* (Cider Gum of Tasmania).

Joad, G.; *Falkia repens*.

Judge, J. H.; *Mormodes aromatica*, *Peonia Whitmanniana*, &c.

Latham, J.; seeds *Raphia* sp.

Lawson, Rev. W. L.; *Adiantum cuneatum*, var. *Lawsoni*, *Asplenium septentrionale* and other ferns.

MacLeay, Sir G.; Hardy orchids.

Masters, Dr.; seeds *Fischeria* sp.

Maw, G.; *Hyacinthus Pulzolzii*, *Colchicum* sp., *Chionodoxa*, *Crocii*, *Narcissi*, &c.

Melville, D.; collection of *Gallanthus*.

Murray, Maj.-Gen.; seeds *Commidendron robustum*.

Nares, Capt. Sir G.; Ward's case containing *Callisene* sp., *Campsidium* sp., *Hymenophyllum cruentum*, *Philesia buxifolia*.

Peacock, J.; *Aloe socotrina*, *Echeveria pulverulenta*, *E. Funkii*, *Foureroya variegata*, &c.

Peek, Sir H., Bart.; collection of cultivated musas.

Philpotts, Canon; large plant of *Cattleya crispata*.

Post, Rev. G. E.; *Ornithogalum latifolium*.

Rawson, Rev. A.; *Moræa tristis*, *Rashleigh*, J.; *Pinus Edgariana*.

Redhead, M.; seeds of choice palms, *Chorisia speciosa*, *Ipomæa aurea*, &c.

Routledge, T.; *Bambusa arundinacea*, *Dendrocalamus strictus*.

Thompson, R.; seeds of *Befaria glauca*, *Cobæa penduliflora*, *Gaultheria* sp., *Lobelia* sp., *Espeletia nerifolia* (Incense tree), *Solanum* sp. bearing beautiful fruit, cinchonas, musas, &c.

Walker M. A.; *Hibiscus* sp., Natal

Wilkie, J. F.; choice succulents.
Woodbridge, J.; *Hymenocallis macrostephana*.

II. Continent.

Jacob Makoy, & Co., Belgium;
Croton Demei, *Eurya angustifolia*,
var. *variegata*, *Maranta Kerchoreana*,
M. Binotii, *Paulinia thalictroides*,
var. *argentea*, *Simonsia chrysophylla*.

Kreuter, Dr., Vienna; seeds of
melon from Kurdistan.

Max. Leichtlin, Baden-Baden;
Allium Sewerzowi, *Iris Kochii*,
I. Cingiatti, *Ixiolirion montana*,
Incarvillea Olga, *Tulipa Kaufmanni*,
Milla longipes; seeds of
choice plants, including *Crawfordia speciosa*,
Ampelidearum gen. n., &c.

Orr, J., Cannes; *Saxifraga florulenta*.

Perez, Dr. V., Canary Islands;
seeds *Cytisus proliferus* (Tagasaste).

Regel, Dr., St. Petersburg; many
choice Aroids, *Carludovica Wallisii*,
Corydalis Kolpakowskiana, *Leontice altaica*,
Orithya dasystemon, *Tulipa triphylla* and many other
choice bulbs, Irids, seeds of *Rhododendron kamschatcicum*.

Salviati, Marquis Corsi, Florence;
Conophallus Titanum, *Heterospathes elata*, *Musa sumatrana*.

Reichenbach, Prof., Hamburg;
Calla palustris, *Polygonatum latifolium*,
Salvinia natans.

Smet, Louis de, Ghent; succulents, ferns, &c., *Anthurium Lancheanum*.

Todaro, Prof., Palermo; seeds of
trees, shrubs, &c.

Van Houtte, Louis, Ghent;
Cycas Boddami, *Encephalartos Ghellinckii*,
Macrozamia Perowskiana, &c.

Van Volxem, J., Brussels, *Berberis quindiuensis*,
Carica erythrocarpa, true "Lacquer Tree" from Japan.

Wendland, M. A. L., Hanover;
new and choice palms, aroids, &c.

III. Asia.

Aitchison, Dr., Afghanistan;
collections of seeds of trees, shrubs, &c.

Baker, Sir S., Cyprus; seeds
Smilax sp.

Beck, J., Cashmere; seeds of
Indian trees, shrubs, &c.

Brandis, Dr., Madras; seeds
Thamnocalamus spathiflorus.

Bushell, Dr. S. W., Peking; fruit
of *Pistachia sinensis*, and of
Crataegus pinnatifida, from which
a delicious sweetmeat is made by
the natives.

Cattell, Surgeon-Major, 10th
Hussars; seeds *Pinus* sp. n.,
Afghanistan.

Cooper, W. N., Ningpo; seeds
of "Pai-Cha" (*Euonymus* sp.).

Collett, Major H., Afghanistan;
seeds of *Buddleia* sp.? *Dionysia tapetodes*.

Duthie, J. F., Saharanpore; seeds
of *Euchlena luxurians*.

Ellis, R., Forest Dept., Punjab;
seeds of trees and shrubs with
Native names, and of *Trillidium Govanii*.

Ford, C., Hong Kong; many
packets of seeds, including those of
Nymphaea pygmaea, *Phoenix Hanceana*,
Symplocos decora, Japanese
Gourd (*Luffa* sp.), &c.

Gammie, J., Darjeeling; *Alsophila Oldhamii*, sp. with branching
habit, *Arisema*s and other aroids;
seeds of *Pandanus unguifer*, *Chirita*
sp., *Impatiens*, &c.

Hance, Dr. H. F., Hong Kong;
seeds of *Zingiber corallinum*, Hance
sp. n.

India Office, Ward's case of
Arracacha esculenta.

King, Dr., Calcutta; Ward's case
containing *Arca* sp., *Calamus* sp.,
C. latifolius, *Caryota* sp., *Korthalsia*
sp., *Myristica longifolia*,
Talamia Hodgsoni, &c., *Nipa fruticans*,
seeds of *Chirita dimidiata*,
Euryale ferox, *Hodgsonia heteroclitia*,
Styrax serrulata,

various palm seeds, box of bulbs, rhizomes, &c., *Begonia Josephi*, &c.

Murton, H. J., Singapore; two Ward's cases containing *Durio zibethinus*, *Dipteris Horsfieldii*, *Davallia* sp., *Phyllagathis rotundifolia*, &c.; Ward's case of "*Gutta Susu*" or "*Singgarip*," *Faradaya papuana*, seeds, &c.

Rama Varnia, First Prince of Travancore; seeds of *Areca Dicksoni*, &c.

Scheffer, Dr., Buitenzorg; *Orania macroclada*, *Polypodium Dipteris*; seeds of *Kentia costata* and other palms.

Scott, J., Calcutta; seeds of hybrid Date palms.

Thwaites, Dr., Ceylon; box of *Dendrobium McCarthiae*, *D.* sp. *Monochilus regius*, *Sonerila robusta*, *Cinchona* seeds, &c.

IV. Africa.

Ayres, C., Cape Town; *Disa grandiflora*, large bulb from Walwich Bay; various other Cape bulbs.

Barkly, Sir Henry; *Hoodia* sp.

Bolus, H., Cape Town; seeds of *Protea cynaroides*, &c., *P.* sp.

Horne, J., Mauritius; Ward's case of ferns, small palms, &c., various palm seeds.

Hutton, H., Beaumont; seeds of *Strophanthus* sp.

Kirk, Dr., Zanzibar; three Ward's cases containing *Euphorbia* sp., *Hypoxis villosa*, seedling and other *Landolphas*, *Meyenia* sp., *Keranthus Kirkii*, *Musa Livingstoniana*, *Actinopteris radiata*, *Pelteia Doniana* and other ferns, *Aroidae*, *Chlorophytum macrophyllum*, *Angracum* sp. and other orchids; seeds of *Landolphia*.

Lanyon, Col.; seeds of *Baobab* from Transvaal.

Letourneux, M., Alexandria; Egyptian bulbs, *Allium subhirsutum*, *Bellevalia* sp., *Muscari* sp., *Lepotidium alexandrinum*.

Lyle, W. B., Natal; *Eulophia* sp., *Disa polygonoides*, &c.

McOwan, Prof., Somerset East; various seeds, stapelias, and aloes, *Olinia cymosa*.

Ohlson, —, Damaraland; seeds of "*Narras*" (*Acanthosicyos*).

Perry, W. W.; orchids from Pemba Island, *Boucerosias*, seeds of *Canavalia obtusifolia*, *Mucuna pruriens*, &c.

Tidmarsh, E., Grahamstown; various seeds.

Wilson, Rev. C. S., Uganda, Central Africa; seeds of wild coffee, *Loasa* sp. and "*Bombo*" (native name).

Wilson, J., Port Elizabeth; tubers of *Herschelia celestis*.

Wood, J. M., Natal; seeds of "*Gerrardanthus*."

V. New World.

Austin, Mrs. R. M.; Californian seeds.

Booker, W. L., H.B.M. Consul, San Francisco; seeds of *Brahea*.

Department of Agriculture, Washington; various seeds, including those of *Prosopis juliflora*, Early Minnesota amber *Sorghum*, &c., seedling *Abies*, &c.

Ernst, Dr., Caracas; seeds of the "*Cow tree*," *Brosimum galatrodendron*, "*Caricillo*" (native name), *Ipomœa muricata*, *Menispermacearum*, gen. nov., *Smilax* sp. n., real Caracas sarsaparilla, *Solanum Karstenii*, &c.

Espeut, W. B., Jamaica; seeds of *Aristolochia gigas*.

Gabb, F. E., Honduras; box of orchids, bromeliads, &c., *Anthurium tetragonum*?

Imray, Dr., Dominica; Ward's case of plants, including *Blakea*, *trinervia*, *Costus* sp., &c.

Jenman, G. S., Jamaica; Ward's cases of ferns, &c., including *Acrostichum pallidum*, *Asplenium hastatum*, *A. myriophyllum*,

Gymnogramma schizophylla, *Hemionites pinnata*, *Lygodium volubile*, *Nephrodium hastatum*, *N. Jenmani*, var. *setosum*, *Rhipidopteris peltata*, *Polypodium hastatifolium*, &c.; various palm and other seeds, including those of *Victoria regia*; six casks of Mahogany seeds, box of *Orchids*, &c.

Laffan, Major-Gen. Sir R. M., Bermudas; *Adiantum* sp., *Aspleniums*, *Nephrodium bermudianum*, Baker sp. n., *Polypodium taxifolium*, *Pteris heterophylla*.

Prestoe, H., Trinidad; Ward's case containing *Bertholletia excelsa*, *Caryocar nuciferum*, *Dipteris odorata*, *Hemionitis cordata*, *Hevea pauciflora*, *Hyospathe pubigera*, *Maranta* sp., *Myristica fatua*, *Schizaea trichomanes*; two boxes of orchids; various seeds, including those of *Attalea Cohune*, *Simaba Cedron*, &c.

Portella, Dr. F., Rio de Janeiro; Ward's case containing *Citrus* sp., "Cipo-bravo" or "Cruzeiro" (*Bignonia* sp.?), *Costus* sp., "Pacoba" (*Anomaceae*), &c.

Sargent, Prof. C. S., Harvard; large collections, including seeds of many choice trees, shrubs, &c., two large cases of seedlings of rare *Abies*, *Pinus*, &c.

Wittig, E., Rio de Janeiro; seeds of *Casalpinia ferrea* (Iron Wood).

VI. Australia and New Zealand.

Bernays, L., Brisbane; box of cycads, orchids, seeds, &c.

Colonial Museum, Wellington; seeds of Australian shrubs.

Corrie, A., Eastney; seeds of *Melaleuca nodosa* (Tea tree), *Lophostemon australe*, *Smilax glycyphylla* (Sarsaparilla vine).

Field, H. C., Waganui; *Asplenium trians*, *Hymenophyllum scabrum*, *H. dilatatum*.

Hill, W., Brisbane; Ward's case containing sugar canes with local

names, *Antidesma Dallachiana*, *Bignonia Turneri*, *Bowenia*, *Faradaya splendida*, *Ficus Cairnsi*, *Milletia megasperma*, two large stems of *Catakidozamia MacLeayi*; seeds of cycads, *Eucalypti*, *Areca Alicia*, &c.

Johnson, A. F., Christchurch; *Gleichenia Cunninghamii*.

McKelvie, —, through Dr. Allman, New Zealand; seeds.

Moore, C., Sydney; Ward's case of palms, &c.

Mueller, Baron F. von, Melbourne; many packets of seeds, including those of choice *Eucalypti*, *Claytonia* sp., *Gossypium australe*, *Glyptostrobus heterophyllus* (Chinese swamp pine), *Ipomoea Davenportii*, *I. sp.*, *Neptunia monosperma*, *Verticordia grandis*, &c.

Schomburgh, Dr., Adelaide; seeds of *Eucalypti*, *Gossypium Sturtii*, &c.

SUPPLY OF SPECIMENS FOR SCIENCE AND ART DEPARTMENT, &c.

A supply of plants for the Art schools, and for the examinations in botany of the Science and Art Department, have been regularly furnished. A large number of specimens of flowering plants, as well as other botanical materials, have been supplied for the various examinations of the University of London.

INDIAN AND COLONIAL BOTANIC GARDENS.

The following botanical appointments have been made by the Colonial Office, on the recommendation of the Director:—

H. Trimen, M.B. Lond., F.L.S., Senior Assistant in the Department of Botany, British Museum, to be Director of the Royal Botanic Garden, Ceylon, in the place of Dr. Thwaites, C.M.G., F.R.S., who retires on a pension, with the title of Honorary Government Botanist.

D. Morris, B.A., Trin. Coll. Dub-

lin, F.G.S., Assistant Director of the Royal Botanic Garden, Ceylon, to be Director of the Botanical Department, Jamaica.

H. Marshall Ward, Scholar of Christ's College, Cambridge, to be employed for two years as cryptogamist, in the investigation of the Coffee-leaf disease in Ceylon. He will be subordinated to the Director of the Botanic Garden, and will have the use of the Assistant Director's house.

G. S. Jenman, Superintendent of the Botanic Garden, Castleton, Jamaica, to be Superintendent of the Botanic Garden, Georgetown, Demerara.

G. Syme, late foreman in the employ of Messrs. W. Barron & Son, Borrowash, Derbyshire, to be Superintendent of the Botanic Garden, Castleton, Jamaica, in the place of G. S. Jenman.

J. Waby, Gardener, Botanic Garden, Trinidad, to be Head Gardener, Botanic Garden, Georgetown, Demerara.

T. B. Songer, in the employ of the Royal Gardens, to be Gardener, Botanic Garden, Trinidad, in the place of J. Waby.

The following appointment was also made by the India Office, on the recommendation of the Director:—

R. Pantling, in the employ of the Royal Gardens, to be Gardener in the Sikkim Cinchona Plantation.

SELECT NOTES FROM OFFICIAL CORRESPONDENCE.

Candelillo.—In the Kew Report for 1877 (p. 29) reference is made to a disease of the coffee plant, which is known in Venezuela under this name, in the following terms:—"The young twigs and the under surface of the leaves are densely covered by a white felted mycelium, strings of which appear to pass from the former to the latter. Professor Ernst has accordingly

"proposed for it the name of "*Erysiphe scandens*. The Rev. M. J. Berkeley remarks that it is similar in appearance to the "leaf rot" of Mysore, which is "produced by a distinct fungus, "*Pellicularia Koleroga*, Cooke " (see Kew Report for 1876, p. 20). "It is possible that the disease "mentioned as having occurred in "Jamaica may be identical with "the Candelillo."

Professor Ernst has forwarded to Kew copious specimens of diseased coffee leaves affected with this fungus, and these have been carefully examined by Dr. Cooke, who independently confirms Mr. Berkeley's suggestion as to its identity with the *Koleroga*. Professor Ernst referred the fungus in Venezuela to the genus *Erysiphe* with doubt. Dr. Cooke reports:—"I have carefully examined the leaves. I found in some cases, plentifully, "the globose rough spores of the "*Pellicularia* on short branches "or pedicles, the latter remaining "persistent after the fall of the "spores. The habit and character "of the mould is entirely different "from *Erysiphe*, which latter is "always more or less pulverulent, "and never, as far as I am aware, "are the threads connected into a "stratum by a gelatinous film. "Neither is the action upon the "leaf at all similar in its destructive character to the *Koleroga*. "Although the stratum is thinner, "and much less dense than in Mysore specimens, the character "is the same, and so characteristic are the features which the "threads present (an unusual occurrence in fungi of this kind) that I "recognized under the microscope "the identity of this with the *Koleroga*. From the character of the "threads, apart from all other evidence, I should doubt its ultimate "development into an *Erysiphe*."

The occurrence of a parasitic fungus of a very specialized type in coffee plantations, both in the Old and New World, is a somewhat remarkable circumstance. It is, however, possible that it has been introduced into Mysore from South America or the West Indies.

Dominica Pimento.—Dr. Imray writes:—"Mr. Thiselton Dyer has informed me that the species of *Pimenta* sent to Kew is not *P. acris* but *P. officinalis*. I was not aware that we had two species of this tree in the island until pointed out by Mr. Dyer; such is the case, however. I find them very distinct on examination, and the people of the island who are acquainted with our forest trees are aware of the fact. *P. officinalis* is, I suppose, the same as *P. vulgaris* of Griesbach. No doubt this is the species that produces the Jamaica pepper of commerce, and unfortunately it is the leaves of this species that are selected for the distillation of bay oil (although both kinds are used) of which I spoke in one of my letters to you, part of which has been transferred to the pages of the Kew Report. Nearly all the northern district of the island is already exhausted of these leaves, which means that most of the trees have been destroyed. It is not only the Crown lands that are thus denuded of a valuable timber tree, the seeds of which might also be turned to account, but private property is invaded, the bay-leaf gatherers not being very particular about boundaries. It is to be regretted that the Government of the colony does not interfere to prevent the wholesale waste of this most useful tree."

Food-products.—1. *Arracacha*.—The Indian Government are desirous of introducing this esculent vegetable into India. *Arracacha*

Esculenta is cultivated in the cooler mountainous districts of South America, where the roots form the staple diet of the inhabitants. Steps have been taken at Kew (where plants are now growing) to procure the seed, and as success in cultivation appears to depend on the method of treatment, I place on record here some particulars obligingly communicated to me by Mr. Henry Birchall, of Bogotá.

"About 6,000 feet is nearly the upper level of any extensive cultivation of this plant, though it produces at points a good deal higher. It is rather difficult to obtain the seed, as from habit the peons invariably pull up the flowering plants, as they do not produce the edible root. I have several times missed getting the seed by the stupidity of the men who weeded the plantations.

"As regards cultivating from seed, my own experience is *nil*; but my neighbours assure me that by repeated replanting of the young plants at last the roots are developed.

"When this is attained the plant throws out a multitude of shoots from the crown. These being broken off are prepared by slicing the base neatly and then putting them in a hole dibbled about 5 or 6 inches deep, and require no further care than ordinary weeding, for which the rows and plants should be 3 feet apart.

"In our climate the root comes to perfection in eight to ten months, and the weight of a good specimen will be 8 to 10 lbs. No doubt if scientifically cultivated, and in properly loosened soil, much larger roots would be obtained. We do not even plough, but stick the seed in immediately after burning off the forest or the brushwood, as the case may be. It is cheaper to take new ground

" than to cultivate properly the old, " as we have no command of skilled " labour or good apparatus."

2. *Chestnut-flour*.—We are indebted to Mr. D. E. Colnaghi, H.B.M.'s Consul at Florence, for specimens of the dried chestnuts, flours, and *necci* (the cakes made from them), which are so important an article of subsistence in the Apennines. The collection of the specimens for Kew was due to the kindness of Dr. L. Bacci, of Castigliano, in the mountains of Pistoja.

The fresh chestnuts are dried, or rather roasted, for three days and nights in a *seccatoio*, or drying room, on a latticed floor covering a chamber in which a fire is lighted. The husk is then easily removable, and the kernel is ready to be ground into flour, which is of a pinkish colour. This is mixed to the consistency of cream with water, and poured on fresh chestnut leaves to be baked into small circular cakes, *necci*, between heated stones.

The collection having been divided between the Museum of the Royal Gardens and the Food Collection, Bethnal Green, Professor Church, who has charge of the latter, has obligingly furnished us with the following analysis of the flour :—

Moisture -	-	-	14.0
Oil or fat -	-	-	2.0
Proteids -	-	-	8.5
Starch -	-	-	29.2
Dextrin and soluble starch	22.9		
Sugar -	-	-	17.5
Cellulose, &c. -	-	-	3.3
Ash -	-	-	2.6

100.0

The cakes were found to contain only 6.7 per cent. of proteids, with 3.4 per cent. of flour. The large amount of dextrin is due to the high temperature to which the chestnuts are subjected in the process of

drying. Professor Church thinks that chestnut-flour ought to be of easy digestibility, and a suitable children's food, considering that it contains over 40 per cent. of nutritious matters soluble in pure water.

3. *Thé de Montagne*.—The Museum of the Royal Gardens is indebted to Mr. George Maw for a specimen of a product used, according to the Rev. Wentworth Webster, who procured it, as tea in the Basses Pyrenées in France, and on the Spanish side of the Pyrenées in Navarre. It was found to consist of the dried shoots of a species of *Lithospermum*, which was identified with probability as *L. officinale*.

Paper Materials.—1. *Bamboo*.—The energy and persistence with which Mr. Routledge has advocated the claims of bamboo as a paper material have attracted much attention in India. The nature of the problem which has to be solved has been discussed in previous Kew Reports (1877, pp. 35, 36, and 1878, pp. 42 to 44), and need not be further dwelt upon. It is now generally conceded by those interested in the matter that the young bamboo shoots must be cropped so as not to impair the vitality of the clumps. Dr. King, Superintendent of the Royal Botanical Garden, Calcutta, remarks that the plan of taking a few shoots annually from each clump is the principle on which bamboos have been cut in India from time immemorial.

That without such caution the bamboo cannot be cut indefinitely, even in countries where it is merely used for local purposes, is shown by the fact that in the Government forests in India it has been found necessary to give the bamboos rest. For example, Dr. Brandis, Inspector-General of Forests, states in his recent report that "in some forest " tracts of the Damoh district the

"growth of the bamboo had been so greatly restored by four years' protection against cutting that it was lately found possible, subject to certain restrictions, to reopen these blocks for the cutting of bamboos." Dr. King lays down very clearly the questions which now remain to be settled. They are "whether commercial success can be obtained (1), by forming plantations of bamboos for the collection of succulent shoots; (2), by collecting the immature shoots of wild bamboos in the forests and carrying them to a paper factory; or (3), by fitting up a floating paper stock mill and moving it about on rivers by the banks of which bamboos naturally abound."

2. *Broussonetia papyrifera*.—The bark of the well-known paper mulberry supplies the material from which the tappa cloth of Polynesia and the bulk of the paper of Japan and China is manufactured. The Japanese cultivate the plant very much in the same way that we grow osiers, and they use only the young shoots for the manufacture of paper. A sample of the bark which came into the hands of Mr. Routledge is stated by him to be "nearly, if not quite, the best fibre I have seen." . . . "I must admit it is even superior to bamboo." . . . "It requires very little chemicals, and gives an excellent yield 62·5 per cent. in the grey, *i.e.*, merely boiled, and 58 per cent bleached."

3. *Esparto*.—It is evident from the mode in which this grass (*Macrochloa tenacissima*, also known as Alfa) is collected in Mediterranean countries that the supply must eventually materially diminish, if it does not altogether die out. It grows sporadically in strong ground under conditions which do not admit of any steps being taken for its cultivation. Mr. Routledge writes

in the early part of last year:—"I have just had two large cargoes of Alfa from Tripoli, and the rapid deterioration of this comparatively new district is striking; the grass when first it was introduced was long and strong; now some of it is as fine and short as the shortest Spanish. I have a quantity varying from 6 to 10 inches only. It is the inevitable result of overcropping."

Esparto is consequently becoming relatively scarcer in the market, while its price is rising. Paper manufacturers are therefore anxiously on the look-out for some material equal in quality to esparto and procurable with as much facility, and at as reasonable a price as esparto was when first introduced.

4. *Guadua*.—The gigantic bamboos of the Old World belonging to the genera *Bambusa* and *Dendrocalamus* are represented by those belonging to *Guadua* in the tropics of the New World. In order to ascertain how far a supply of this kind of bamboo would be available, Mr. Routledge and some other gentlemen interested in the matter sent Mr. Thomson (late Superintendent of the Cinchona Plantations, Jamaica) on a mission to Venezuela, to explore the bamboo forests. The species met with by Mr. Thomson appeared to be *Guadua amplexifolia*. He reports:—"This *guadua* grows about the same size as *Bambusa vulgaris*, viz., from 50 to 60 feet in height, with culms 5-6 inches in diameter. The latter are much thicker in texture than the bamboo stems, and their fibrous tissue is much tougher, so that much more labour is required to cut them down than in the case of the bamboo. And this applies equally to the young stems, *i.e.*, young shoots of bamboo, say 10 feet high, are easily cut with a knife, but each stem of *guadua*

" of a corresponding size and expansion requires more than one blow from a sharp axe."

The bamboo (*guadua*) forest over large extents of country is generally of the same age, and consequently the plants flower and die simultaneously, a circumstance which only happens after protracted intervals, but which when it does happen is succeeded for a time by an almost total disappearance of the plant. This had happened in Venezuela about the time of Mr. Thomson's expedition and Mr. Routledge informs us : " I regret to say that I do not see much inducement to proceed with the undertaking I proposed. To do so would involve laying out regular plantations, and having regard to the uncertain political condition of the country, the difficult and dear labour, and

" some other drawbacks, the prospect of commercial success is not sufficiently tempting for me and my friends to embark in the undertaking."

5. *Indian Forest Fibres*.—The important collection of Indian forest products transmitted to Kew by the Indian Forest Department (see Kew Report, 1878, p. 50) included an extensive series of bark fibres. Specimens of all these were placed in the hands of Mr. Routledge, of the Ford Works, Sunderland, to whom Kew is under constant obligation for information and assistance in connection with the paper manufacture. He was good enough to test them all as regards their yield when converted into rough (paper) stock, and he has furnished us with the following report :—

	Green Yield.	Bleached.
	Per cent.	Per cent.
1. <i>Bauhinia Vahlü</i> ; excellent strong fibre; hemp character and tough -	60	54·7
2. <i>Bombax malabarica</i> ; coarse, harsh, woody; tender and short, bleached -	48	37·5
3. <i>Butea frondosa</i> ; very coarse and woody; rotten and short, bleached -	56·25	37·5
4. <i>Careya arborea</i> ; coarse, rather harsh and woody; somewhat tender, bleached -	47	45·3
5. <i>Eriolana Hookeriana</i> ; very strong but harsh; better felting properly than 8 to 12 -	50	42·8
6. <i>Ficus bengalensis</i> ; fairly strong and fibrous; rather tender, bleached -	61	54·7
7. <i>Ficus infectoria</i> ; good, strong, and fibrous; fair quality, bleached -	54·7	51·5
8. <i>Grevia tiliaefolia</i> ; strong harsh, wiry, hard; same bleached -	50	43·7
9. <i>Helicteres Isora</i> ; very strong, green; better than 8 and 10 to 12 bleached -	68·8	61
10. <i>Sterculia colorata</i> ; similar to 8 and 11; harsh and wiry -	60·7	59
11. <i>Sterculia urens</i> ; similar to 7; rather better -	59·3	47
12. <i>Sterculia villosa</i> ; similar to 8, 10, and 11 -	60	51·5

"Of these fibres, No. 1 is decidedly best, possessing the characteristics of strong linen rags, i.e., of coarse flax and hemp; the raw bark is worth 7*l.* to 8*l.*, possibly 9*l.*, per ton; the bleached stock 20*l.* to 22*l.*

"No. 7 is the next best bark, worth 6*l.* to 7*l.* per ton raw. None of the others are of much value for white papers, excepting, perhaps, Nos. 5 and 9; say 5*l.* to 7*l.* for No. 5, and 5*l.* to 6*l.* for No. 9. It would, however, be necessary to make a practical working trial, that is, to make paper from all of them (excepting No. 1) before pronouncing positively as to value. No. 1 I believe fully worth what I have appraised it at."

"All of these raw barks required a very large dose of bleach to bring them to even the low colour they are. No doubt opening them out by willowing or teasing them, both before and after boiling, would materially improve them. I do not consider, with the exception of Nos. 1 and 7, it would pay to import them from India."

6. *Molinia carulea*.—The proposition of using this common British grass for the purpose of paper-making was mentioned in the Kew Report for 1878, p. 45. Mr. N. G. Richardson, of Tyquin, county Galway, has since actively promoted its experimental cultivation in the west of Ireland. At a private meeting held at Athenry a committee was formed to raise subscriptions to plant ten Irish acres of bog with it at Tyquin. Mr. W. Smith, of Golden Bridge Mills, had manufactured paper from this grass, with which he was so well satisfied that he was prepared to buy 1,000 tons "if any one would supply him."

7. *Portuguese esparto*.—A grass sent for identification by Mr. Rout-

ledge under this name was determined to be *Stipa capillata*. He informed us that it would make paper, but that the yield of fibre was not even equal to straw, say 33 per cent.

8. *Rye-straw*.—The claims of rye-straw (*Secale cereale*) have been urged as a paper material by Mr. Noble. It has the primâ facie merit of being a home-grown material. Mr. Noble says:—"Rye (not 'rye-grass') should be sown early in October, so as to be cut green in May and June, in time to get the land clear for turnips and other vegetables. I have found it best to sow four bushels per acre for the purpose of getting a heavier crop, stifling the weeds, which would be injurious to the purpose for which it is intended; and the thinner and longer the stems are grown the more fibre they produce."

Mr. Noble believes that rye-straw will make paper not inferior to that made from esparto, and that paper-makers can afford to give a price for it which will be sufficiently remunerative to the farmer to grow it.

Mr. Routledge remarks upon the proposal to use it:—"It is very largely used in the States, also on the Continent. It will make a harder and firmer paper than any other cereal straw, except, perhaps, maize."

Razor-strops.—1. *Agave americana*.—H.E. W. Robinson, the Governor of the Bahamas, sent to Kew for report specimens of "perpetual razor-strops," which were apparently cut from the dried flowering stem of this plant. On inquiry in London they were not found to meet with much favour. They, however, afforded a striking instance of Governor Robinson's determination not to overlook the development of any product of the colony he administered, however apparently

insignificant. I may add that a razor-strop of this material imported from Peru, now many years ago, was in daily use by a member of my family for a very long period, and highly approved of.

2. *Herminiera elaphroxylon*.—We are indebted to Messrs. Thomas Christy and Co. for a sample of a similar article, of which the opinion was more favourable, and which was apparently made from the wood of the "Ambash" (*Herminiera elaphroxylon*), the curious pith-wood of the Nile. It has the advantage of being obtainable in larger pieces than Agave stems, and can, therefore, be cut into strops with a more uniform texture. According to Colonel Grant it may be obtained in abundance. He informs me that "in three years it almost choked up the channel of the Bahr-el-Gazelle," and the natives use its light logs to assist them in swimming across rivers.

Textiles.—1. *Bunkuss*.—In the Bengal Catalogue of Indian products shown at the London Exhibition of 1862 (Section I., pp. 137, 168) mention is made of a grass known by this name, which grows in the Terai, and is used in N.W. India for making ropes. A specimen sent to Kew from Saharunpore, for identification, by Mr. Duthie, proved to be *Spodiopogon angustifolius*. Mr. Duthie states that it is also known under the name of Baib grass, and he has furnished the Kew Museum with an interesting series of articles made from it, including, besides rope, shoes, door-mats, floor-matting, and a lota-holder for drawing water from a well.

2. *Curculigo latifolia*.—The Kew Museum is indebted to Mr. F. W. Burbidge (now Curator of the Trinity College Botanic Garden, Dublin) for a very complete series of specimens illustrating the manufacture of cloth in Borneo (where

they were obtained by him during his travels) from a species of *Curculigo*, which has been identified by Mr. Baker with *C. latifolia*, Dryand. The Dusan in N.W. Borneo, near Kina Balu, prepare the fibre by macerating and beating the leaves. It is woven into a very close cloth, about ten inches wide, in a loom of very simple construction, such as is used in Brittany for weaving saddle girths. A heavy wooden sword is used for driving close the woof after it is thrown by the shuttle between the threads of the warp. The strong fibrous leaves of *Curculigo seychellensis* are employed in the Seychelles for wrapping plugs of tobacco (Baker, *Flora of Mauritius*, p. 368), and this is apparently the only other known instance of the economic use of a hypoxidaceae plant.

3. *Ningpo hats*.—In a Foreign Office Report on the trade of Ningpo (Commercial Reports, China, No. 7 (1878) pp. 113, 114), Mr. W. M. Cooper, H.B.M. Consul at Ningpo, referred to these hats as follows:—"The export of hats woven by hand from a small species of *Carex* (sedge) has grown within three years to great proportions, no less than 15,000,000 having this year been exported. The plant is indigenous, and is to be found in damp spots among the hills, but that employed for the manufacture is cultivated in rice grounds. The hats are made by the women and children at their homes, and sold by them at $\frac{1}{2}$ d. to 2 d. each. They are strong and serviceable, and are bought wholesale by the foreign merchants, who send them to London, whence, I believe, they are shipped, principally to the Southern States of America." These hats were very abundant in London last year, and we thought that specimens obtained for the Kew Museum were made of some kind of

rush. Mr. Cooper, has, however, obligingly sent us a specimen of the plant actually used for the purpose, which proves to be identical with that from which China matting is made, and which Dr. Hance has determined to be *Cyperus tegetiformis*, Roxb. The only difference is, that in making the hats the culms are used whole, while for matting they are split into two.

Woods and Timbers. — 1.

Eagle-wood.—The gradual extermination of this tree (*Aquilaria Agallochum*) in the islands in the Mergui Archipelago was pointed out in the Kew Report for 1878, p. 36. Major Seaton reports that 200 seedlings have been procured and planted out in South Tenasserim.

2. *Lin-a-Loa.*—Our attention has been drawn to a scented wood used in San Francisco in the manufacture of furniture. By the kindness of Mr. W. L. Booker, H.M.'s Consul in that city, a specimen of the wood and a box lined with it have been obtained for the Kew Museum. Mr. Booker states:—"It comes in pieces about the size of a railroad sleeper from the highlands of Mexico, but I have been unable to ascertain what it is botanically. The wood is only used for veneering or in the manufacture of small fancy articles."

We had no difficulty in identifying Mr. Booker's specimens with a wood which already existed in the Kew Museum, and which appears to be yielded by a species of *Bursera*. It has indeed been known in Mexico for the last half century, and was referred to by Guibourt under the name of *Bois de Citron du Mexique* [see Journal of the Pharmaceutical Society, 2nd series, Vol. X., pp. 590-593]. Further material in the shape of dried specimens, with both fruit and flowers, is much to be desired for the purpose of ascertaining defi-

nately the tree which produces it. The name Lin-a-Loa is clearly a corruption of Lign Aloës, which has been identified with *Aquilaria Agallocha*, otherwise known as Eagle-wood [Kew Report, 1878, p. 36]. This is, however, a tree confined to the Old World, and the Mexican one has no connection with it. The wood of the latter is imported into this country for manufacture into perfumery, a fragrant oil known as otto of linaloe being distilled from it.

3. *Nan-mu Tree.*—Reference has already been made, in the Kew Report for 1877, p. 33, 34, to this interesting Chinese timber-tree. Through the kind intervention of E. Bradford, Esq., F.L.S., Deputy Inspector-General of Hospitals, Mr. Arthur Davenport, H.B.M.'s Consul at Shanghai, made inquiries with a view to obtain better botanical data for its determination. He obtained the following information from Mr. Baber:—"Two days journey south-east of Chungking, in Szechuen, I found several specimens of about a foot in diameter, one of them having a straight branchless trunk of 100 feet in height, with the branches and foliage rising 25 feet above that; another had 70 feet of bare straight stem, and 90 feet of total altitude. Although the trunks are branchless, yet in many cases they send out shoots resembling saplings, which rise parallel with the trunk. The wood is white and close grained, and I do not believe that the pillars at the Ming tombs near Peking are of this wood. They look more like true teak. I have seen some much larger trees than the above, some two feet and more in diameter, straight and of great altitude. They are used in Szechuen for bridge work. I almost despair of procuring the flowers, for people who have spent their lives beneath the trees have never seen them in

"flower, and the young trees which the missionaries have planted in places do not flower, possibly on account of their youth. If the tree produces any noticeable flowers at all it must be on the summit, which is inaccessible."

Eventually, however, through the instrumentality of Père Vincot, who resides at Chungking, flowering specimens were transmitted to the Kew Herbarium. From these the accompanying figure has been prepared, and they entirely confirm the previous identification of the tree by Professor Oliver (from the leaves alone) as a near ally of *Phoebe pallida* (one of the Laurel family). The genus *Phoebe* is now merged in *Persea*, and Professor Oliver has described the Nan-mu under the name of *Persea nan-mu*, distinguishing it from *Persea* (*Phoebe*) *pallida* chiefly in stature, in the form of the acumen of the leaves, and the character of the indumentum."

4. *Pai-cha wood*.—We are indebted to Mr. W. M. Cooper, H.B.M. Consul at Ningpo, for a block of this wood (*see* Kew Report, 1878, pp. 41 and 42), and a carving showing the extremely delicate work of which it admits. The wood was placed in the hands of Mr. R. J. Scott for report. He informs us:—"The most striking quality I have observed in this wood is its capacity for retaining water and the facility with which it surrenders it. This section, which represents one-tenth of the original piece, weighed 3 lbs. 4½ ozs. At the end of 21 days it had lost 1 lb. 6¾ ozs. in an unheated chamber. At the end of another 14 days, in a much elevated temperature, it only lost ¼ oz. In its present state of reduced bulk, its weight is 1 lb. 10 ozs. It is not at all likely to supersede box; but it may be fit for coarser work than that for which box is necessary."

5. "*Rhus Thunbergii*."—We were indebted to Mr. H. Hutton, of Albany, S. Africa, for a quantity of seed of the plant sent and distributed under this name (Kew Report, 1877, p. 20). It is, however, no species of *Rhus*, nor is it allied to that genus, and was supposed to be *Sideroxylon argenteum* (of which *R. Thunbergii* is a known synonym). Having some doubt about the identification, he has sent us specimens, and it is clear that the seeds distributed do not belong to *Sideroxylon argenteum* (*Rhus Thunbergii*) but to *Sideroxylon inerme*. Mr. Hutton writes:—"It is the white milkwood of the Cape, of which I have sent the seeds, our most durable hardwood, and we are fencing extensively with it for standard poles."

Mr. Duthie reports from Saharunpore:—"Seeds received from Kew last year (1878) were sown in April, and took one month to germinate; the growth since has been slow, but the plants are perfectly healthy."

MUSEUMS.

The principal objects received during the past year have been:—Towards the end of the year the vast accumulated collections of vegetable products and matters relating to them were transferred from the department of the Secretary of State for India to the First Commissioner of Works, and deposited at Kew under conditions which were still under consideration at the end of the year. Arrangements are being taken for the disposal of the whole by intercalation with the existing collections at Kew, and by distribution of the duplicates.

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 duplicates.

Aitchison, Dr.: twenty specimens
 of vegetable products from Afghan-
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Bartley, Gray, and Co.: samples of



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oil-cakes from *Eleis guineensis* and *Cocos nucifera*.

Barrow Flax and Jute Company; specimens of Kalameit tapestry made of jute, also jute yarns.

Bradford, E.; fruits of Manchurian jute (*Abutilon Avicennia*), portions of plant of Manchurian indigo (*Polygonum tinctorium*), and leaves of Nan-muh tree.

Burgoyne, Burbidges, Messrs., & Co.; a collection of forty samples of drugs of vegetable origin, specimens of thymol prepared from *Ptychotis Ajowan* and menthol from Chinese oil of peppermint.

Canto, Don José da; sample of tea grown and manufactured at St. Michael's, Azores.

Carter, James, & Co.; eighteen specimens of forage grasses.

Chantre, C.; double Lisbon Copal, oil of Japan mint *Mentha arvensis*, and other specimens.

Christy, T.; various new commercial vegetable products.

Clark, J. & Co.; specimens of birchwood illustrating the manufacture of spools or reels.

Cooper, W. M.; (Ningpo) wood of Pai-cha (*Euonymus* sp.) used for carvings, frames, cabinets, &c., also carving in same wood representing opium smokers.

Cordua, Carl; seeds of four species of *Lupinus*.

Ducie, Earl; fruits of cherry plum (*Prunus cerasifera*, Ehr.).

Fry, J. S., and Sons; seeds of the various kinds of cocoa (*Theobroma Cacao*) known in commerce; also samples of prepared cocoa.

Fryer, John; samples of Poo-urh tea from Yunnan.

Gamble, J. S.; seventeen specimens of Indian woods.

Gardner, Joseph, and Sons; Cornel wood used for making bobbins for flax spinning, and specimens of the bobbins; also specimens of Caucasian box-wood, with "bushes" for

"bushing" the ends of cotton and woollen bobbins.

Glasgow, City Industrial Museum; ancient hand quern, formerly used for grinding oats, from N. of Ireland.

Henriques, J.; basket made of *Juncus* sp. by peasants in neighbourhood of Coimbra; straw hat and straw veneered box made by prisoners at Oporto; samples of various kinds of toothpicks made at Coimbra, and wood of *Salix* sp. used for making the same.

Horne, John; trunk of Fiji Island sandal wood (*Santalum Yasi*, Seem.).

India Museum; its entire collection of raw products of India.

Jenman, G. S.; caudices of *Cyathæa Nockii*, pods of *Pithecolobium Saman*, fruits of *Grias cauliflora*, &c.

St. John, Spencer; fruits of Cherimoyer (*Anona Cherimolia*) from Lima.

Macfarlane, J. F., Edinburgh; seven samples of Opium alkaloids, specimens of Salicin and Bibirine sulphate.

Manning, Collyer, and Co.; five specimens of foreign-made hats of various vegetable fibres.

Ormerod, Miss E.; various morphological specimens.

Parry, C. C.; vegetable products from Mexico.

Protector Fluid Co.; specimens of raw and boiled Gum euphorbium, and sample of anti-corrosive paint prepared from the gum, used for painting ships' bottoms.

Robinson, His Excellency Governor; tobacco grown and cured in the Bahamas, and cigars made from the same.

Ross, Mrs.; specimens of flour of chestnuts (*Castanea vulgaris*), and cakes made from the same, Tuscany.

Routledge, T.; specimens of paper-stock prepared from barks of various Indian trees.

Sargent, C. S.; specimens of coniferous woods.

Senier, Harold; "Loofah" flesh-brushes (*Luffa aegyptiaca*).

South Kensington Museum; twelve specimens illustrative of food and tobacco selected from Bethnal Green Museum.

Treutler, Dr.; specimens of wood and bark of *Quercus Robur*, var. *pedunculata*, showing arrested branch-buds.

Trevelyan, Sir W. C.; excrescence on trunk of ash tree. Result of the injury of the young stem by the larvæ of *Prays Curtissellus*.

PHYSIOLOGICAL LABORATORY.

The principal researches conducted in the Laboratory during the past year have been those of—

H. Marshall Ward, on the Development of the Embryo-sac, published in the Journal of the Linnean Society, vol. xvii., pp. 519-546.

Prof. Church, continued Investigation on Albinism in Leaves, published in the Journal of the Chemical Society, January 1880.

The Laboratory has also been employed for the experimental demonstrations given to the employés of the Royal Gardens, *see infra*, p. 5, and for the examination of the University of London for the degree of Doctor of Science in the subject of Physiological Botany.

HERBARIUM.

The most important accessions to this department consist of:—A very complete set of the plants collected in Sumatra by Prof. Beccari, of Florence, presented by himself.

An almost complete herbarium of the Canadian Flora, formed by Prof. Macoun, of Belleville, the joint property of that gentleman and of the Canadian Commissioners of the Paris Exhibition.

A herbarium of upwards of 1,500 Fijian plants collected by Mr. Horne,

F.L.S., Director of the Mauritius Botanical Gardens, when on a mission to the Pacific Islands to procure sugar-canes.

A very large collection of Mexican and South U.S. plants, collected by Dr. Parry when on a botanical expedition from Central Mexico to the United States.

A continuation of M. Glazion's Brazilian collections (nearly 1,500 species); also of Welwitsch's West African ones, presented by the Government of Portugal; and the completion of Brown's Australian Herbarium; the British Herbarium of the Botanical Exchange Club; a very fine collection of European roses and rubi from G. C. Joad, Esq., of Wimbledon.

The principal contributors have been:—

Europe.

Bennett, A. W.; *Polygaleæ* (9). Botanical Record Club; Herbarium of.

Cooke, M. C.; British and miscellaneous Fungi (125) (purchased).

Danford, Mrs.; Levant (18).

Fitch, W. H.; Servian (45).

Gandoger, —; *Rosæ* (411) (purchased).

Joad, G. C.; *Rosæ* and *Rubi* (420).

Henriques, J.; Portugal (107, and drawings).

Heldreich, Prof.; Greece (177, purchased).

Kunze; *Fungi exsiccati* (200, purchased).

Larbalestier; Lichens (purchased).

Sanio, Dr. C.; German (42).

Société Dauphinoise pour l'Échange; (471, purchased).

University College, London; a miscellaneous collection.

Van Thumen, F.; *Mycotheca Universalis* (300, purchased).

Westendorp, —; Belgian cryptogams (100).

Wittrock, V., and Nordstedt, O.; *Algæ* (100, purchased).

Vise, Rev. J. E.; *Microfungi* (100 purchased).

Various European plants have been received from Dr. Archangeli, Dr. Huntingdon (Italy), J. A. Jenner, J. C. Mansell Pleydell, H. T. Menzell, Prof. Olver, Rev. W. H. Painter, Rev. W. Rogers, J. Sanders, C. E. Browne, Rev. W. A. Leighton, J. E. Williams.

North and Temperate Asia.

Aitchison, Dr.; collections made as botanist to the Kuram field force in Afghanistan (about 1,000).

Collett, Major H.; Afghan (81.)

Ford, Chas. S.; China and Hong Kong (108).

Markham, Capt. A. H.; Nova Zembla (80).

Perry, W. Wykeham; Scind and Persian Gulf, &c. (95).

Post, Prof.; Syria (137).

Preston, Rev. T. A.; China (22).

A few Japanese plants have been received from J. Bissett; Chinese, from E. Bradford, A. Davenport, and Dr. Hance.

Tropical Asia.

Beccari, Prof.; Sumatra (900).

Beddome, Col.; Madras Presidency (200).

Duthie, J. F.; N.W. India (10), and drawings.

Meyer, Dr. A. B.; Riedel's Timor plants (17).

Murton, H. J.; Singapore (94).

Small contributions have been received of Himalayan plants from Robt. Ellis and J. Gamble; and of Bornean orchids, collected by F. W. Burbidge, from Messrs. Veitch.

Africa and African Islands.

Barber, Mrs. M. E.; Gold Fields (44).

Bolus, H.; Cape Restiacea and Ericaea (115).

Cosson, Mons.; Letourneux's Egyptian (138).

Kirk, Dr. J.; Zanzibar and Comoro (43).

Perry, W. Wykeham; Madagascar and Comoro (15).

Schweinfurth, Dr.; Egypt, &c. (76).

Portugal, Government of; Welwitsch's African (665).

Stone, General; Purdy's Darfur (132).

Wood, J. M.; Natal (657).

Smaller contributions have been received of S. African plants from Sir H. Barkly and T. T. Chamberlain; of Madagascarian, from Miss Gilpin; and of Liberian, from E. H. Holmes.

North America.

Curtiss, A. H.; Florida (250 purchased).

Farlow, Anderson, and Eaton; *Algæ* (30).

Macoun, J.; British N. America (2,805, partly purchased).

Parry, C. C.; Mexican and New Mexican (1,250).

Ravenel; American *Fungi* (200, purchased).

Smaller contributions have been received from Drs. Eaton and Engelmann, Messrs. Hemsley, Lemmon, Mohr, Townshend, Sereno Watson, and Miss Frances J. Myers, and (Bermuda plants) from Sir J. H. Leftroy.

West Indies.

Brace, L. J. K., communicated by H.E. Gov. Robinson; Bahamas (150).

Holme, Rev. H. K.; Montserrat (60).

Meyer, G. L.; Tobago (33).

Murray, H. B.; St. Lucia (39).

Prestoe, H.; Trinidad (10).

Central and South America.

- Coppinger, Dr. ; Patagonia (17).
 Ernst, Dr. ; Caraccas (8).
 Glaziov, A. ; Brazils (1,447).
 Kalbreyer ; New Grenada (298).
 Lorentz, Dr. ; Argentine Provinces (51, purchased).
 Thurn, E. F. in ; British Guyana.
 Türkheim, Mons. ; Guatemala (108, purchased).

Australasia, Polynesia, and Antarctic Islands.

- Bennett, the late J. J. ; completion of Brown's Australian Herbarium (1,056).
 Berggren, Dr. ; New Zealand (30).
 Buchanan, Rev. ; New Caledonia (61).
 Carson, D. ; Australia (9).
 Cheeseman, T. F. ; New Zealand (10).
 Gray, Dr. A. ; Kerguelen's Land (55).
 Hill, Walter ; Frazer's Island (5).
 Horne, John ; Fiji Islands (1,530).
 Kirk, Thos. ; New Zealand (7).
 Mueller, Baron von ; Australia (6).

An excellent microscope has been presented to the Herbarium by Mr. B. Daydon Jackson, F.L.S.

Many engravings and drawings of plants have been presented, in augmentation of the classified collection in the Library, by Messrs. Fitch, Duthie, J. Henriques, Dr. Kirk, the Director, and the Assistant Director.

The botanical correspondence of the late W. Wilson, the eminent muscologist, has been presented by Dr. James Kendrick, of Warrington.

Mr. C. B. Clarke, F.L.S., late of the Education Department in Bengal, and for some time Superintendent of the Royal Botanical Gardens in Calcutta, has been deputed by the

Indian Government to devote three years at Kew to assisting in the publication of the Flora of British India.

BOTANICAL PUBLICATIONS prepared in connexion with the work of the Herbarium.

Bentley and Trimen's "Medicinal Plants," containing numerous figures of plants drawn in the Royal Garden, has been concluded.

"Icones Plantarum," vol. xiv., part. i., has been published, illustrating new and rare plants communicated to the Herbarium.

"Biologia Centrali-Americana," Botany, by W. B. Hemsley (formerly an assistant in the Herbarium). Two parts of this magnificent work, with 13 quarto plates, have been prepared in the Herbarium, and the work is being actively progressed with.

Balfour, Dr. I. B., has published in the "Philosophical Transactions," the Botany of the Transit of Venus Expedition to the Mascarene Islands, in 4to, with forty plates.

The plants collected in Kerguelen's Land, by the naturalists attached to the branch of the Transit Expedition despatched to that island, have been published, also in the "Philosophical Transactions," by the Director and other botanists, with five plates.

Mr. Elwes has published part vii. of his folio illustrated work on the genus *Lilium*.

The 105th volume of "The Botanical Magazine" has been published by the Director, containing chiefly plants that have flowered in the Royal Gardens.

Dr. Berggren, of Sweden, who was commissioned by the Swedish Academy to explore the cryptogamic botany of New Zealand, has been collating his collections with those at Kew.

Dr. R. Braithwaite is preparing monographs of the genera and species

of British mosses, and M. Cogniaux, of Cucurbitaceæ.

Prof. Trail, of Aberdeen, has been publishing in the Journal of the Linnean Society an account of his collection of Amazon Palms, which are preserved at Kew; also his remarkable collection of plants whose leaves are tenanted by tropical ants.

Mr. B. Daydon Jackson has been occupied in the Library in preparing for publication a supplement to Pritzels "Thesaurus Literaturæ Botanice."

Dr. Aitchison is actively employed by the Indian Government in working up his Afghan collections made whilst Botanist to the Kuram Field Force.

Baron von Ettingshausen and Mr. J. A. Gardner have been employed

on a special study of English Tertiary fossil plants.

Mr. C. B. Clarke is engaged on a monograph of the Commelynaceæ for De Candolle's "Monographiæ Phanerogamarum," and on Indian Ferns for the Linnean Society's Transactions.

Mr. J. Horne has been engaged on the arrangement, &c. of his extensive Fijian collections.

Dr. M. Masters has been preparing the Ericaceæ for the Flora Capensis.

Messrs. H. and J. Groves have been engaged on the Characeæ, with the view of publishing a complete monograph of the Order.

The "Flora of British India" by the Director, assisted by various botanists. The 6th part of this work, completing the Polypetalæ, has been published.

I have, &c.

(Signed) Jos. D. HOOKER, *Director*.

To the Right Honourable

The First Commissioner of Her Majesty's Works and Buildings.

APPENDIX.

Number of Visitors in the Year 1879, as compared with 1878.

			1878.	1879.
Total number on Sundays	-	-	267,113	239,540
Total number on weekdays	-	-	458,309	329,594
			<u>725,422</u>	<u>569,134</u>
Greatest monthly attendance (August)	-	-	-	142,963
Smallest monthly attendance (January)	-	-	-	4,252
Greatest weekday attendance (August 4th)	-	-	-	51,949
Smallest weekday attendance (January 18th)	-	-	-	13
Greatest Sunday attendance (July 27th)	-	-	-	21,909
Smallest Sunday attendance (February 23rd)	-	-	-	73

Number of Visitors in each month.

			1878.	1879.
January	-	-	10,134	4,252
February	-	-	14,017	5,127
March	-	-	24,338	20,515
April	-	-	110,440	51,913
May	-	-	81,426	41,538
June	-	-	140,342	112,310
July	-	-	109,357	82,587
August	-	-	134,360	142,963
September	-	-	57,491	69,654
October	-	-	30,587	23,185
November	-	-	8,194	10,501
December	-	-	4,736	4,589

Bank Holidays.

April 14th	-	19,430	(before 1 p.m.	2,557)
June 2nd	-	15,205	(	1,094)
August 4th	-	51,949	(	3,088)
December 26th	-	752	(	286)

