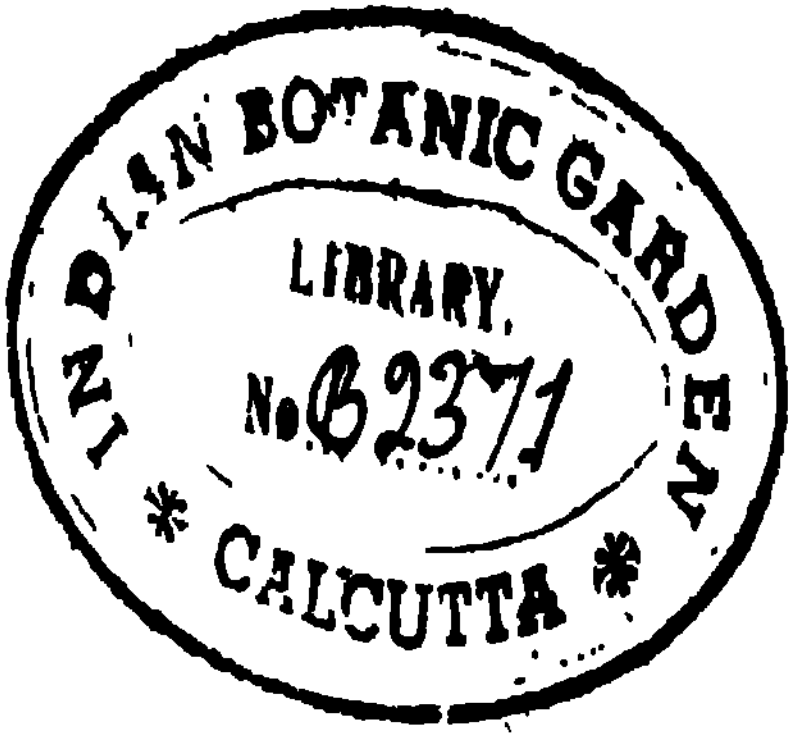

Report of the Botanical Survey of India for 1922-23.

I. SystematiC—Easferw *India and Burma.*—Apart from the tours of the Director undertaken primarily in connection with Cinchona work but taken advantage of fox Botanical purposes as well, no touring was possible during the year. Work in the herbarium has therefore I&een confined to collections already awaiting examination and to identifications of current consignments from outside collectors.

On the systematic side a great variety of study during the year calls for record. With the development of Botanical Schools in connection with Indian Universities and Colleges the range of study tends yearly to increase. Practically all the main groups of the vegetable kingdom now have their students and an increasing amount of attention is being given to many groups of plants which for one reason or another have received soant attention in the past. Thus the Algae, the Liverworts and the Fungi now have their taxonomists and a mass of literature on these as well as on the higher plants is finding issue in new botanical journals and papers.

Mr. Haines' further study of the flora of Bihar and Orissa and the Central Provinces has revealed the existence of the following four species new to science [f].—*Stereospermum angiistifolium, Premnd calycinaXexicas heUcterifolia* and *Curcuma sulcata.* Full descriptions of these have been published in the Decades Kewensis section of the Kew Bulletin.

In Notes from the Royal Botanic Garden, Edinburgh, are published the last diagnoses by Prof. Balfour of a large number of Asiatic Rhododendrons. Seventy species in all are dealt with including some 29 from Burma and the North East Himalaya collected by Messrs Farrer, Kingdom Ward and Cooper, also a large number from China and Tibet collected by Forrest. Mile Camus has described a new genus of the Bambuseae, *Neohouzeaua,* one species of which under the name *Teinostachyum Dullooa,* Gamble has been known from Bengal eastward in North East India and inBurma. It is now reported from French possessions in South East Asia. Another species belonging to the same genus,. *N. tavoyana,* Gamble originally *Bambusa Helferi* has been redescribed by Mr, Gamble in the Kew Bulletin wheTe he gives an account of the new genus and the effect of its adoption on the nomenclature of certain previously known Bamboos, An excellent local flora dealing with the vegetation of the Andamans from the forest officers' point of view has

appeared in Mr. C. E. Parkinson's latest publication. The keys grten furnish the field botanist with a ready means of identifying material as he goei along and the fuller descriptions in the body of the work supplement the information of the keys which are artificial. From Mr, Parkinson's collection in the islands Mr. Hutchinson has described a new species—*OJphea torulosa*—belonging to the Anonaceae.

In Burma thi temporary dis-organisation caused by the transfer of the Cinchona plantations and the heavy work entailed in opening up the new area have prevented Mr. Russell and his assistants from doing as much field botanical work as might have been possible under more normal conditions. During a tour to the Mergui area late in the year the Officiating Director took occasion to collect and supervise collections. An additional mass of material over that collected in Tavoy is accumulating and will form the basis for future work on the systematic botany of the jungles lying between Mergui and the gulf of Siam.

The Algae of Bengal has been made the special subject of study by Prof. Bruhl and his assistants in the Biological Laboratories, Calcutta. Treatises on Indian bark algae and *Cempsopogon* have appeared in the Journal of the Department of Science during the year; several species of bark algae new to science have been described while the distribution in Bengal of numerous previously known forms is being recorded.

The Polyporaceae of Bengal forms a subject of study for Prof. S. R. Bose; the results of his researches are being issued in the Bulletin of the Carmichael Medical College.

Northern India.—The most important botanical work having a special reference to this area published during the year has been Mr. Osmaston's treatise on the Forest Communities of the Garhwal Himalaya. The work is an oecological study of the tract and the conditions affecting the vegetation. The formations, associations and societies are all described and a series of excellent photographs illustrates the work.

The following new species of plants from Northern India have had their descriptions published:—*Acacia pseudoeburnea*, from Kumaon, Hardwar, etc.; *Indigqfcra rubro-violacea* from the Chamba State and Kashmir; *Leptodermis humaonensis* from Garhwal and *Astragalus aegacanthoides* from Kumaon.

Mr. W. B. Turrill has a paper on a question of nomenclature in the Cyperaceae raised in connection with his work on this group for the Flora of the Upper Gangetic Plain.

The Liverworts of the North West Himalaya are the special subject of study of Prof. Kashyap and his school at the University of the Punjab. Amongst others Prof. Kashyap has interested himself in plant immigrants, *hi* a paper read at the meeting of the Indian Science Congress

he gives an account of foreign species establishing themselves about Lahore.

During theyear Prof. Hallberg, late of St. Xavier's College, Bombay, made an expedition to the North West to discover the distribution, abundance, times of flowering, etc., of the forms of *Artemisia* found over the area and known to contain santonin. So far as obtaining material rich in santonin was concerned the expedition failed, but a whole crop of questions on the reasons why santonin was not found have been raised. Quite an appreciable amount of the drug had previously been extracted from the same plant growing in the same area. The reasons why no santonin was obtained on this occasion are obscure, but the subject is of great economic importance and it deserves to be further investigated. As regards plants from the North West the collections of the Botanical Survey are the richer by many thousands of sheets as the result of Prof. Hallberg's tour.

Western India.—Preliminary to a continuation of his work on the physiological anatomy of the plants of the Indian desert Prof. Sabnis is compiling a list of plants of the deserts of Sind. Localities in Sind and the general distribution of the different species found are cited. In 1918 Prof. Saxton and Mr. Sedgwick published in the *Records of the Botanical Survey of India* an account of the plants of Northern Gujarat. Since then many additions have been made and these, with the intention of supplying information supplementary to the main account, have now been published.

In the same publication a further part comprising the families Labiatae to Ceratophyllaceae of Ethelbert Blatter's Flora Arabica has appeared.

A very handy account of the ferns of Bombay has appeared in Messrs. Blatter and D'Almeida latest publication on this group. The work is illustrated by figures showing the essential morphological details and in many cases the general appearance of the frond or plant is also given.

A new Indian grass—*Urochloa marathensis*—from the Bombay Presidency has been described by I. T. Henrard in the publication of the Van's Rijks Herbarium. The new species comes near *U. Helopus* described by Stapf but material is not sufficient to determine it as being identical. In the small amount of material available differences are evident and the author has thought these sufficiently marked to warrant, tentatively, specific distinction.

Southern India.—Mr. Gamble has described the following new species from the Southern part of the peninsula—*Torenia courtallensis, Didymocarpus Fischeri, Toxocarpus Beddomei, Toxocarpus palghatensis, Legustrum travancoricum, Brachystelma Bourneae* and *Brachystelma Rangacharii*—while Dr. Stapf in Hooker's Icones has fully described and figured new combinations in *Cyrtococcum trigonum* and *Capillipcdium*

glaucopsis, two new grasses. The most important botanical work dealing with the higher plants and connected with this division at present under preparation is Mr. Gamble's Flora of the Madras Presidency, Amongst the lower plants a new genus of Moss.—*Beddomiella*—founded on material collected many years ago by Beddome in the Nilgiris has been described by Mr. H. N. Dixon.

General.—Prof. P. F. Fyson has completed his study of the Indian Eriocaulons. His results are published in the Journal of Indian Botany and in the reprint form a handy guide to the student in this rather difficult group of plants.

The Indian Ophioglossums are dealt with by Prof, I. D. D'Alineida of St. Xaviers' College, Bombay. The extreme variability of the individuals comprising the different species has been the cause of much splitting in the genus. Prof. D'Almeida has reviewed the characters which seem to him to merit consideration from the systematist; the group is keyed, re-arranged and described; Indian distributions are dealt with and references made to the various collections on which the work is based.

The Fungi of Ceylon continue to receive the attention of Mr. T. Petch. Additions to the Fungus flora of the island are being published in the Annals of the Royal Botanic Garden, Peradeniya. All additions, no matter to what group belonging, are taken up. As most of the fungi are not endemic in the island but extend their distribution to the Indian Peninsula the work is of much value to students of the fungus flora of India.

A new colonial member of the Isokontae, a group of algae, collected in tlje inland fresh waters of Ceylon by Prof. F. E. Fritsch, is described by W. B. Crow in the Annals of Botany where the comparative morphology and systematic relationships of the new species are described.

Besides the above many works on systematic botany dealing with groups of plants, some numbers of which extend their distribution to India, have found publication during the year. The genus *Calendula* is dealt with by Hallier, the genus *Ptyssiglottis* by Moore, the Euphorbiaceae-Phyllanthoideae-Phyllantheae by Pax and Hoffman and the Compositae-Hieracium by Zahn, the last two in the Pflanzenreich. Pfeiffer has a monograph of the Isoetaceae in the Annals of the Mis* souri Botanical Gardens.

Dr. Church has published an Introduction to the systematy of Indian trees, being notes arranged for students of Indian Botany at Oxford.

Sir J. C. Bose has studied the physiology of the ascent of sap in plants Prof. Bruhl and his assistants have papers on Vitamines and an interest-* ing and timely account of the new pond pest Eichhornia Messrs Dastur and Saxton have studied the vegetative methods of reproductioi

in certain plants and also the oeeology of some plant communities in the Savannah formation.

A preliminary note on the life history of *Cedrus Deodara,* with, special reference to fertilisation and the structure of the prothallua has also been given by Mr. Saxton. Papers on the anchoring pads of *Gymnopetalum cochin-chinensis,* floral prolification in *Nymphea rubra* and a note on an artifice of nector sipping birds are some of the result! of Mr. Debbarman's observations during the year.

II. Economic.—The most important item under this heading continues to be Cinchona cultivation. Reference was made in last year's report to proposals for the transference of work to the Mergui District of South Burma. Conditions in the Tavoy area proved impossible and it became evident that a new location for Cinchona was inevitable. After very careful preliminary investigation of the soil and climatic conditions in the neighbourhood of Tenasserim, proposals for a fresh start in this district were sanctioned and Mr. Russell, Superintendent of Cinchona Cultivation, with park of his essential establishment moved from Tavoy to fresh quarters situated in the foothills south of tlw Tenasserim Hevea plantations at Nyaungbinkwin. As conditions here seemed to provide all the essentials for Cinchona, work was started on a fairly extensive scale but not on such a scale as would prove ruinous if unforeseen events negatived th« area as a source of supply of bark. By the end of the year some 1,500 * kamras' for seelings were in course of construction of which 150 were already carrying their stock awaiting transplanting; a mixed labour force was busy reducing the jungle to order while roads were feeing pushed through to link up Cinchona camp with the outside world and to get sufficient stores through in anticipation of the time when the rains would put an end to all but the minimum of communication. The original programme provided for a ' break' of 500 acres and clearing for a considerable part of this had already been done when the need for retrenchment forced a reduction to 250 acres. Sufficient seed for this minimum only was therefore sown and in far less time than they take to germinate in the Bengal plantations the seedlings were pushing their way through and looking the picture of health. It is, of course, much too early yet to claim success, but so far nothing has happened to cause apprehension or to create misgivings as to the ultimate result. Indeed all the evidence up to the present points strongly to the area being well suited for the purposes of a Cinchona reserve. In their early stages the seedlings were thriving so well that it seemed likely that a second transplanting before being put out in permanent sites could be dispensed with. With a large number of seedlings this is what must now happen. Growth has been phenomenal and it has become impossible for lines to be built on a scale large enough and

sufficiently quickly to accommodate all the seedlings. In the process of hardening the seedlings to the sun, methods which have never been deemed possible in Bengal have been successfully proved this year in Burma. The most encouraging feature of the whole scheme is, however, now available from analyses carried out on very young barks grown in the Tavoy area. The writer felt that there was a certain danger of the alkaloid content failing on account of the low elevation at which extensions had to go out. This would have been in accordance with experience gained from elevation tests in Java. No means of proving the point seemed possible until barks sufficiently old for analyses gave ua data for Mergui but it was felt that an analyses of Tavoy barks grown on an average at much lower elevations than is the case in Bengal might afford useful evidence of a parallel nature.

If the Tavoy bark analyses now tQ hand can be taken as an indication of what may be looked for in Mergui, no more promising evidence of future success could be sought. These barks are twice as rich in quinine as Bengal barks of their age and species. When Cinchona trees grown under such adverse climatic conditions as have been experienced in Tavoy give at 2 years of age an alkaloid content of 4% and at one year old between 2% and 3%—percentages attained by Bengal trees at 4 to 7 years of age—it may be argued that Cinchona planting in South Burma has one factor of prime importance in its favour. Climatic conditions have been almost ideal; the temperature in the hot weather goes a little higher than Cinchona likes, but it is not excessive and light shade planting should easily counter its effects; rainfall possesses none of the terrors it did in Tavoy and the soil seems capable of growing any crop. Under the careful supervision of Mr. Russell and his staff a very successful fresh start has been made.

Ipecacuanha, the only other crop at present experimented with, shows evidence of being much more amenable to ordinary methods of cultivation in Burma than has ever been found to be the case in the more trying climate of Bengal. When last seen in the nurseries the young plants had developed a nice bloom and looked healthy and robust. Seed for the extended cultivation of Ipecacuanha will be made available this year from Mungpoo. Meanwhile experiments on the extraction of the drug from the dried root are being carried out at the Bengal factory, the idea being to place emetine, the finished product, on the market.

III. Industrial Section, Indian Museum.—The appointment of a Curator from the beginning of the year rendered possible the initiation of a scheme for the re-arrangement of this section. A revised plan for the gallery, involving the removal of exhibits which were out of place in a collection devoted to economic plants and their uses, was drawn up and a beginning made to render the gallery less like a home for stray

miscellaneous products having no other fixed place of abode. The bays devoted to foods and medicinal products, the first to be begun, already show considerable improvement. A study of the exhibits one by one is being undertaken by Mr. Bal, the newly appointed Curator,, with a view to the preparation of a catalogue of the section. Besides this fresh work, the routine of renewing and overhauling existing exhibits dtfent on throughout the year.

IV. Publications.—During the year the following parts of the ***Records of the Botanical Survey of India*** **appeared :—Vol. VIII, No. £** being a continuation of the *Flora Arabica* by the Rev. Father E. Blatter, **S. J., Vol. IX, No. 3 being *Additional notes on plants of Northern Gujarat*** by W. T. Saxton, F.L.S., I.E.S. In the Press at present are Mr. I. H. Burkill's account of the *Botany of the Abor Expedition.* A list of the more important extra departmental publications concerned with Indian Botany is appended to this report.

V. Purchase of Cinchona Bark and Quinine.—During the year 777,035 lbs. of bark and 39,682 lbs. of quinine sulphate were received from Java under terms of the Bark and Quinine agreements. Some 404,387 lbs. of Java bark were worked up at the factory at Mungpoo to produce 22,086 lbs. quinine sulphate and 4,892 lbs. Cinchona febrifuge, the average quinine percentage being 5-46. The factory extracted about 92% of the theoretical possible. The stock of quinine sulphate belonging to the Government of India on the 31st March 1923, amounted to 229,575 lbs. By arrangement, as a matter of convenience, large indents of Quinine sulphate on the Bengal Cinchona Department are met on occasion from Imperial stocks at the Museum, an equal quantity being added to the Government of India stocks at Mungpoo from provincial stocks, there. During the year 8,215| lbs. Quinine sulphate were issued to Government Departments and to Local bodies in the Punjab. Revenue from this source amounted to Us. 2,80,565.

VI. **Financial.**—The total allotment for the year was Rs. 27,15,000 of which Rs. 53,000 were for the Botanical Survey proper and the Industrial Section of the Indian Museum, Rs. 3,17,000 for Cinchona and Rs. 23,45,000 for purchase of bark and quinine from Java. The total expenditure was Rs. 16,86,208-11-4, the saving of Rs. 10,28,791 being almost entirely due to bark and quinine consignments being below * estimates and to plantation work in Tavoy closing down.

VII. Staff.—Lieut.-Colonel A. T. Gage, I.M.S., was Director from 1st April 1922, to 2nd January 1923, when he went on leave preparatory to retirement. Thereafter the undersigned held the post till the end of the year. Mr. S. N. Bal was appointed to the post of Curator, Industrial Section, Indian Museum, from 1st April 1922, and held the appointment throughout the year. Mr. P. T. Russell continued to hold his post of Superintendent, Cinchona Cultivation, Burma,

until he went on leave for three months from 1st June to 31st August 1922 when Mr. H. Thomas, Assistant Superintendent, acted for him. Mr. Thomas reverted to Bengal to succeed Mr. Green as Manager of Munsong Cinchona Plantation on the latter's retirement towards the end of the year. Maung Sine was appointed Overseer in the Cinchona Plantation, Burma, from the beginning of the year. His knowledge of local conditions and his energy and trustworthyness have proved of much help to Mr. Russell on whom the burden of opening up in Mergui has had to fall. The services of Mr. P. M. Debbarman, Assistant for Systematic Work, were transferred to the Government of Bengal from 3rd January 1923, as Officiating Curator of the Herbarium, Royal Botanic Gardens, which post fell vacant by the transfer of the undersigned to officiate as Director, Botanical Survey of India. The post vacated by Mr. Debbarman remained unfilled in order that efiect might be given to retrenchment proposals made by Government. Mr. V. Narayanaswami held his post as Assistant for Systematic Work throughout the year. Messrs. E. F. Vieux and U. C. Pal were respectively Assistant Curator and Head Clerk throughout the year. Babu Hemendra Chandra Banerji, one of the Upper Division, Clerks, retired from Government service during the year. Babu S. B. Banerji, a Lower Division Clerk, was promoted to the Upper Division and a Lower Division Clerkship thus falling vacant was abolished by order of the Government of India as a result of retrenchment. All executive and ministerial officers of the Department have done their duties with commendable zeal throughout the year.

C. C. CALDER,

Offg. Director, Botanical Survey of India.

LIST OF PAPERS.

ANONYMOUS . . . **Indian Orchids.** *(Orchid Review, xxx, 354, 1922, p. 356.)*

ARRHENIUS, 0. . . **A new method for the analysis of plant communities.** *(Journ. of Oecokgy, x, 2, p. 185.)*

BALPOUR, I. B. . . ***Rhododendron,* Diagnoses specieium novarum II.** *(Notes from the Roy. Bot. Gard., Edin., xiii, 65.)*

BOSE, S. B. . . . **Polyporaceae of Bengal, (part v).—** *(Bull Carm. Coll., in, p. 20.)*

BRUHL, P. & BISWAS, K. **Algae epiphyticae epiphloiae indicae or Indian Bark Algae.—***(Journ. Deptt. Sc, Cal. Univ., v.)*

„ „ . **On a species of *Compsopogon* growing in Bengal.—***(Journ. Deptt. Sc, Cal. Univ., v.)*

CAMUS, A. (MUe) . . **Un genre nouveau de BambusSes.** *(Bull ' Mus. Nat. UHist. Nat, 1922, p. 100.)*

CROW, W. B. . . . ***Dynorphococcus Fritschii,* a new colonial Protophyte from Ceylon.** *(Ann. Bot.9 xxxvii, 145, p. 141.)*

DASTUR, B. H. . . **Vegetative reproduction by root runner in two species of *Clerodendron.* *(Journ. Ind. Bot., Hi, 5,* p. *145.)***

DEBBARMAN, P. M. . **A case of axial floral prolification of the flower of *Nymphaea rubra.* *(Journ. Ind. Bota., in, 1922, p. 66.)***

„ „ . **Some observations on the anchoring pads of *Gymnopetalum cochinchinense, etc.* *(Journ. Ind. Bot., %ii, 1922, p. 52.)***

DIXON, H. N. . . . **Some new genera of Mosses.** *(Journ. Bot,, h, 712, p. 101.)*

HALLIER, H. . . . **Beitrage zur kenntniss der Thymelaeaceen, etc.** *(Meded. van Rijks Herb. 44.)*

MOORE, S. L. M. . . **The genus *Ptyssighttis.* *(Journ. Bot., lx, 720, p. 355.)***

PERCIVAL, J. . . . **The wheat plant.** *(Journ. Bot. h, 714.)*

PFEIFFER, N. E. . . **Monograph of the *Isoetaceae.* *(Ann. Missouri Bot. Gard., ix} 2, p. 79.)***

KIDLEY, H. N. . . The distribution of plants. *(Ann. Bot.,r xzxvii, 145, p.* 2.)

SAXTON, W. T. . . Mixed formation in time.—A new concept in 0ecology. *(Journ. Ind. Bot., Hi, 1922\ p. 30.)*

„ „ . . Some observations and suggestions regarding Nyctinasty. *(Journ. Ind. Bot.% m, 5,1923, p. 127.)*

SPRAGUE, T. A. . . Notes on Theaceae II. *(Journ. Bot., Ixi, 723,1923, p. 82.)*

TUBILL, W. B. . . Notes on Cyperaceae. *(Kew Bull* 3, *1922, p. 122.)*

VILLANI, A. . . . Sulla classificazione delle Grocifere. *(Ann. di Bot.9 xvi, fasc. i, 1923, p. 71.)*

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Report of the Botanical Survey of India for 1923-24.

I. Systematic.—*Eastern India and Burma.*—The financial stringency which has been influencing the development of the Department for some years has again made it imperative for the year's work to be confined to headquarters. No purely botanical tours could be indulged in although opportunity was taken during tours connected with other work to add to the collections at headquarters.

By much the most important botanical results for the year concerning this Division must be considered Mr. I. H. Burkill's ' Flora of the Abor Expedition * which has just appeared as Vol. X of the Records of the Botanical Survey of India. For a work of this description, one which might well be taken as a sample for future work of the same nature, something more than a mere passing reference seems necessary. Mr. Burkill accompanied the Abor Expeditionary force during the months of November to March 1911-12 into a field where the observations and collections made prove to be of the highest scientific value. The area seems to be a particularly suitable one for the study of questions concerning the ecology and geographical distribution of plants. Abor land forms the meeting point of several very distinct types of flora all of which are carefully analysed by the author and a flood of light is now thrown on the origin of the Flora, its history and relationships. The work divides itself into 8 parts as follows :—(1) Introductory and a general view of the outer Abor Hills and of the plain just under the hills in which are described the lines of work taken, the nature of the country, the climate, the soils, the occurrence or non-occurrence of certain genera of high geographical importance and the effects of man on the Flora. The biology of the flora of Abor land forms part 2 in which are described the various ecological formations chief amongst which is the *Skingkeng* formation. A list of the higher plants, their zones, altitudes, distribution and a comparative analyses of altitudes in the Sikkim Himalaya are given in part 3, while parts 4, 5 and 6 deal with wider aspects of distribution. Part 7 deals with the genesis of the flora and the work ends, Part 8, with a complete enumeration of the species found, their localities, elevation, etc. A map of the country and a series of interesting photographs illustrate the volume.

Professor W. W. Smith and Mr. 6. Forest have descriptions of the following further new or interesting species belonging to the area in

Notes from the Royal Botanic Garden, Edinburgh.—*Primula Yalcntiniana* Handmzt. *Primula brachystoma* W. W. Sm., *Primula calliantha* Franch, *Primula Dichieana* Watt. *Primula lacerata* W. W. Sm.

A new fungus *Trametes cincta* is described by Prof. S. R. Bose in the Bulletin de la Societe Mycologique de France. A collection of *Mycetozoa* from Northern India has been worked out and published in the Journal of Botany by Mr. G. Lister. Comparatively few *Mycetozoa* seems to have been collected previously and the present series is said to be specially valuable in extending our knowledge of the distribution of species. Prof. S. R. Kashyap, the authority on Indian Liverworts, has a short paper in the Journal of the Indian Botanical Society on *Monoselenium tenerum,* a liverwort described by Griffith 80 years ago and not found again till it turned up in a collection made in 1920. An interesting account from the ecological standpoint is given of a part of the riverine tract of Burma by Messrs. Dudley Stamp & Leslie Lord in the Journal of Ecology. The authors limit their analyses to those plants or group of plants which characterise the different formations, a method which while giving only a partial picture of the whole, eliminates the disadvantages attaching to long lists of plant names while yet making it possible for the average reader unacquainted with the area to reconstruct the main scene. In concluding the authors refer to a difficulty experienced by most workers in this field of knowledge and not avoided by them, namely the present day complexity of nomenclature when dealing with ecological questions.

Northern India.—In. the Indian Forester Mr. H. G. Champion has discussed the influence of the hand of man on the distribution of forest types in the Kumaon Himalaya. The main divisions are made from the Forest officer's point of view, forest species of economic importance being allowed to characterise the divisions. The main conclusions aimed at are that population and its effects cause certain species naturally belonging to certain areas to be driven to contiguous and less favourable areas and that the balance is shifted from the more mesophytic to the more xerophytic type of vegetation. The same author has another paper of ecological interest where he deals with the interaction between *Pinus longifolia* and its habitat in the Kumaon hills.

The succession of epiphytes in the *Quercus incana* forest at Landour has been studied by Prof. W. Dudgeon. The various stages in the succession are distinguished and described. A noteworthy and surprising result is reached in the relative abundance of the lower orders of plants among the epiphytes of this region. An examination of the forests of the Eastern Himalaya would almost certainly

shift the balance in favour of an increased proportion of the higher plants appearing amongst the epiphyte flora.

Reference was made in the last year's report to the question of Santonin yield from *Artimisia* in the North West. Since then the subject has been further investigated. Prof. Hallburg has returned from leave in Europe and is now engaged in furthering the original enquiry. Another investigator has also been in the field. Material is being sent from the North West to Calcutta where it is being successfully extracted in a small way.

Western India.—As in several other provinces the chief work in Western India has been of an ecological nature. In the Journal of Ecology Prof. W. T. Saxton has discussed the phases of vegetation under monsoon conditions in a tract of low lying country near Ahmedabad with a well marked and fairly regular summer monsoon. The procession of plant communities in relation to the stage of the monsoon and consequent humidity of the area is clearly brought out. Eight Synusia or aggregations of plants belonging to the same life-form and making similar demands upon a similar habitat, are distinguished. The ecological interest of the paper lies chiefly in that the observations relate to an area in which for no great length of time duiing a year are the plant communities allowed to make their demands on constant climatic or edaphic conditions. It would be interesting if the results obtained from Prof. Saxton's observations could be compared with those from an area giving fairly constant edaphic conditions of a humid nature. As Prof. Saxton has now left India the subject is suggested for other botanists interested and with opportunities for working in the same field.

Southern India.—Another part, being the 5th, of Mr. J. S. Gamble's Flora of Madras has appeared during the year. This brings the revision down to the middle of the family Scrophulariaceae. The work is likely to remain for many years a standard one for students of systematic botany belonging to this province. In the Decades Kewensis section of the Kew Bulletin Mr. Gamble has described the following **new species.—*Strobilanthes Lawsoni, Strobilanthes urceolaris, Andrographis Lawsoni,. Lepidagathis Barberi*—all from Peninsular India. In** the Journal of the Indian Botanical Society Mr. P. M. Debbarman of the Botanical Survey has a critical note on *Crotalaria madurensis* W. and *Crotalaria candicans* W. & A., These plants originally believed to be specifically distinct were first combined by Baker in 1876 and most subsequent authors follow Baker in keeping them together. Mr. Gamble in his new Flora has, however, reinstated *C. candicans* as a good species. Mr. Debbarman while inclined to think that the two species are inseparable, realises th.it minute examination in the field

is necessary to clear up the point. Mr. Debbarman deals in the same Journal with an instance of staminody and multiplication of petals in *Cadaba trifoliala* W. & A. another S. Indian species. The vegetation of Lalitpur in Central India has been studied by Miss Mabel Hartog who distingùishes and enumerates the constituent elements of some six formations.

General.— Besides a large increase in the attention paid to ecological problems concerning the higher plants there is evidence of an increased interest in all the lower groups. The fresh-water Plankton Algae from Ceylon, a group hitherto neglected, have been studied by Dr. W. B. Crow. The character of the material and the limitation of the investigation to certain classes of organisms of the phytoplankton, preclude any account of the Plankton as an association. The author deals with the material from a systematic point of view. Four new species are met with. Thirty-six have not been recorded previously from Ceylon though a large number of them are not uncommon in the tropics. The geographical range of each species is cited and further evidence obtained of the cosmopolitan nature of this group of plants. During the year a paper on the Indian Charophyta by Mr. J. Groves was read before the general meeting of the Linnean Society. The paper included descriptions with figures of two new species *Nitella Wattii* and *N. mirabilis.* An appeal is made for investigation of the group in the field and a promise given of ample results to any student of Indian botany who cares to take it up.

The methods of attachment of certain Algae has been studied by Prof. Iyengar while Prof. Kashyap continues his work on Indian Liverworts. A new species of the group *Fysonia tenera* has been described from Madras. Students of the fungus flora of India include Mr. Mitra, Prof. Bose and Mr. Petch of Ceylon all of whom have published results of their investigations during the year.

In the Botanical Gazette Dr. A. Arber has discussed the morphology and development of the leaves of certain Gramineae while in another paper she deals with the leaf-tip tendrils of certain Monocotyledons. Part of the material foT this investigation was sent from the Royal Botanic Gardens, Calcutta.

The most important general w°rk concerning the higher plants and a work likely to be a constant source of reference in the bookshelf of eve:y systematist is Mr. J. Hutchinson's Contributions towards a classification of Flowering Plants. The work has been undertaken with the object of preparing a phylogenetic system of classification of natural families and genera and Mr. Hutchinson intends in due course to publish the full results of his studies as a separate work. The utility of such a work appearing in English cannot be overestimated

II. Economic.—As regards work of immediate economic importance Cinchona cultivation claims a precedence that it is now likely to maintain. The Burma scheme must still be considered as in an experimental stage, but there is a growing volume of evidence that at no distant date it may emerge as a well established and flourishing industry. There have been times of misgiving but no industry in a new sphere can remain entirely exempt from its initial difficulties. In the Bengal plantations, during their early history, the appearance of a certain disease gave rise to all kinds of pessimistic prognostications, yet these plantations, outliving their era of misfortune, emerged to a state that belied all that had been predicted for them, and it can now be said of the Burma scheme that nothing short of an accident or a misfortune that cannot be foreseen will prevent its successful development.

Last year experience had still been confined to plants in the nursery where a luxuriance of growth spoke well for their future but the real test was to come when they reached the open. The present report can now speak of how the young plants behave when they have passed the nurseryman's hands. As early experience might mean a saving in time and expenditure afterwards it was decided to get a stock of older plants from the abandoned Tavoy area and also to ship several wardian cases full of plants from the Bengal plantations, the idea being to immediately get a stock of plants under observation in the open, in conditions exactly similar to those that the oncoming seedlings in Mergui would have to meet. The Bengal shipment did not prove the success that was hoped for, the long sea journey with several transhipments proving too much for the plants but the Tavoy lot, which weie taken down by Mr. Russell personally and had expert attention throughout, stood the much shorter journey well and in the event were to prove of very great experimental value. They were immediately put out to permanent situations in a site exactly similar to what Mergui reared plants will get. At first they hung back as if objecting to the change but signs were not long in coming that the fresh conditions had been found congenial. Line by line the plants picked up ; there was scarcely a casualty and in a few months time the experiment gave results a year ahead of what could have been looked for had it been carried out with local stock. It was evident that very large nursery plants could be transplanted with every success, at least at this time of year. An experiment with a different object in view therefore suggested itself. If plants much larger than would normally be called upon to withstand a transplanting would succeed what about seedlings put out to permanent situation before they had reached what had hitherto been considered transplanting age ? Could nursery existence on these new conditions be shortened ? It was not

advisable to gamble with any large stock but the results obtained showed without any remaining doubt that the gamble was worth while. As in the case of the Tavoy plants there was an immediate check and it is possible that a prolonged period of drought would have brought the experiment to an end, but in this new area rainfall is much more evenly distributed than it is on any of the Indian plantations, a factor of very great importance during the early existence of plants in the open. Rain came and the tiny seedlings went ahead. Thereafter nothing would stop them. They now constitute the Mergui "None such ", an area of young Cinchona ahead even of the much older plants from Tavoy. It is at once evident that nursery existence for Cinchona in Mergui can be shortened. Whether this is the best stage for transplanting or not remains for further experiment but it is already proved that Cinchona can go out to the open at a stage viewed as impossible in the Bengal plantations and in practice not attempted in Java. While experiments in the open were giving these encouraging results the main bulk of seedlings still in the nurseries were writing their own plain lesson to anyone qualified to read. A comparison between them and young plants in the open at once showed the advantage of early permanent situation. At the same time nursery seedlings had exceeded expectations. They were already getting inconveniently large for handling and they would be much larger ere the land was ready to take them. Several *Kamras* were therefore cut back to within a few inches of the ground, treatment which killed a number of plants under the conditions in which it was carried out. Although the results of cutting bark do not belong to the year under review it is at the date of writing known that seedlings can be cut back under conditions different from those in which it was first tried. Unless the beds be well soaked before the operation bleeding to death may ensue, but if the precaution of watering be taken the mortality is reduced to a degree that makes the operation a success. This is a result of ^considerable importance in view of the likelihood of seedling development getting ahead of land preparation.

So far the above experiments relate to 0. *Ledgeriana* only. *Cinvhona succirubra* has also been sown but in this species the results are far behind Ledger. They cannot be called a failure and it is quite passible that further experiment may prove succirubra a success. In the writer's opinion a hybrid in cultivation on the Bengal plantations may well take the place of succirubra in Burma and already seed of this hybrid has been collected for trial. It thrives very well at low elevations in Bengal, a point in its favour for trial in Burma.

When seedlings were cut back opportunity was taken to have the very young bark analysed; the results obtained agreed generally with those got from young Tavoy barks referred to in last year's report.

The year's experiences of Cinchona in Burma merely go to confirm the optimism expressed earlier. There are still dangers ahead and disease to the plant is always the danger that suggests itself when plantations of any kind are attempted in untried areas. A defoliating catterpillar was found troublesome towards the end of the year but its effects were never really serious and it disappeared when the rains came. More recently there have been some signs of canker though again not as yet to a degree to cause misgivings. So far, *Helopeltis,* the great scourge of Cinchona in Bengal, is absent from Mergui. A constant watch for disease is being maintained. Given a continuance of freedom from attacks by insect and fungoid pests Cinchona Cultivation in Burma should now present no difficulties that expert plantation management cannot cope with.

Ipecacuanha.—This is at present the only other plant under experiment in Mergui where it is obviously much more at home than it ever can be in the Bengal plantations. Nursery lines of the plant are looking well and though a certain amount of rhizome is already formed and might be extracted there has been no cropping. The present policy confines itself to multiplication of stock. The experimental cultivation of Ipecacuanha in the shade of bamboo jungle may give results enabling us to dispense with the cost of erection of nursery lines and preparation of beds. As under such conditions there would inevitably be a certain mortality, the experiment cannot be attempted on any scale until stocks are sufficiently large.

III. Industrial Section, Indian Museum.—Some 127 specimens mpst of which were food substances and medicinal drugs, were added to the collections during the year. Numbers were collected by the Curator and others purchased in the local markets. The most welcome addition is a collection of preserved fruits donated by the Agri-Horticultural Society after the exhibition in the Eden Gardens in December. The Cinchona exhibit has been renewed and the usual work of overhauling existing exhibits carried out, some two thousand old labels having been renewed. The scheme of rearrangement of the gallery on the lines of the revised plan is progressing and the preparation of a catalogue of the medicinal bays is well under way. Experiments on the preservation of specimens in liquids have been carried out.

The number of enquiries received and replied to regarding economic and medicinal plants from private individuals, firms and Government Departments both in India and elsewhere are too numerous to mention in detail. Amongst others enquiries relate to the following:—***Gymnema sylvestre, Podophyllum Emodi, Astragalus fascicularis, Carum copticum, Ferula sp. Saussurea Lappa, Atropa Belladonna, Hyoscyamus***

sp. Denis elliptica, Myristica fragrans, Canarium bengalense, C. resiniferum and C. strictum.

IV. Publications.—Vol. X, No. 1 of the Records of the Botanical Survey, being Mr. I. H. Burkill's Flora of the Abor expedition, has appeared and is under distribution. No. 2 has gone to the Press with orders for printing. Several papers by members of the staff and outside contributors are awaiting the issue of No. 2 before going into print.

V. Cinchona Bark and Quinine.—During the year 608, 103 lbs. of bark and 39,682 lbs. of quinine sulphate were received from Java under terms of the Bark and Quinine Agreements. The Quinine Agreement between the Secretary of State and the Dutch Combine dated the 8th April 1921 which came into operation from the beginning of that year, expired with the close of the calendar year 1923. Under the terms of this agreement the total quantity of quinine sulphate received is 60,000 kilos, equivalent to 132,276 lbs.

The arrangement by which the Bengal Factory took all the Government of India bark coming forward has now been modified by allowing the Madras Factory to extract half the deliveries. The new arrangement allows of the Madras factory being kept iii commission while at the same time the pressure on the Bengal factory is relieved.

Some 430,604 lbs. of bark were worked up at the Bengal Government's factory at Mungpoo to produce 24,956| lbs. of quinine sulphate and 4,983 lbs. of cinchona febrifuge. The total stock of quinine sulphate on the 31st March 1924 amounted to 282,986 lbs. of which 131,418 lbs. were in the Indian Museum in 3,806 original cases and 151,568 lbs. at Mungpoo.

During the year a bark shed for storage of Government of India bark had to be erected at Mungpoo as the storage capacity of the factory already existing was found insufficient for the provincial and imperial stocks together.

Distribution of Quinine.—During the year 10,328 lbs. of quinine sulphate were issued against 8,215*75 lbs. during the previous year to Government Departments and to local bodies in the Punjab. The quantity of cinchona febrifuge issued was 351 lbs. All large indents are met from stocks in the Indian Museum by the issue of original cases and small indents from stocks manufactured from the Government of India bark at Mungpoo. An exchange supply of 2,075 lbs. in original cases was issued from the Indian Museum on behalf of the Government of Bengal, an equal quantity being added to the Imperial stock at Mungpoo from the Provincial stock there.

Revenue by the sale of Quinine.—The **total revenue during** the year was Es. 2,77,896 against Rs. 2,80,565 during the previous

year. The decrease is due to the fall in the price of quinine. Of the total revenue *(viz.* Rs. 2,77,896) Rs. 40,574 were by cash sales to local bodies, etc., and Rs. 2,37,322 by credit to Government Departments in the Punjab. The revenue does not include Rs. 46,298 being proceeds from the sale of 5,722f lbs. of cinchona febrifuge by the Government of Bengal as the same was deducted from the cost of extraction of quinine paid to the Local Government.

Area of Supply.—The Punjab is the only province which is, at present, supplied with quinine from Imperial stocks. The question of the final allotment of the area of supply to the Governments of India, Bengal and Madras as recommended by the Cinchona Conference held at Delhi on the 11th December 1923 is still under the consideration of the Goyernment of India.

VI. Financial.—The total budget allotment for the year was Rs. 18,06,970 of which Rs. 45,200 were for the Botanical Survey proper and the Industrial Section, Indian Museum, and Rs 17,61,770 for cinchona including Rs 15,75,000 for the purchase of bark and quinine from Java. The total expenditure was Rs 16,82,115 leaving a saving of Rs. 1,24,855. The saving was chiefly under purchase of bark, freight charges and cost of extraction of quinine. The expenses of the new bark shed amounting to Rs. 3,500 and the cost of recruitment of labour for Burma, Rs. 14,000, were met by reappropriation from the budget grant under cost of extraction of quinine.

VII. Staff.—In the absence of Lieut.-Col. A. T. Gage, C.I.E., I.M.S., the undersigned held charge as Director. Mr. P. T. Russell, Mr. Braybon and Mr. Maung Sine all held their respective posts in Burma while at headquarters Mr. Bal was Curator, Mr. Vieux, Assistant Curator and Mr. Narayanswami, Assistant for systematic work. Under orders of Government the second post of systematic Assistant remains vacant. Amongst ministerial officers Babu U. C. Pal was head clerk and in both the Botanical and Cinchona sections of the Survey his praiseworthy efforts in dealing with much additional work concerned with the distribution of quinine deserve special mention. Babu R. K. Das was cashier except for a period of leave when his duties were performed by Babu H. S. Ghose. All executive and ministerial officers have done their duties with commendable zeal.

C C. CALDER,

Offg. Director, Botanical Survey of India.

LIST OF PAPEES.

GAMBLE, J. S. . . Flora of the Presidency of Madras. No. 5 (1923).

GHOSE, S. L. . A systematic and Ecological account of a collection of blue-green Algae from Lahore and Simla. *(Journ. Linn. Sec. XLVI, 309, 1924, p. 333.)*

HARTOG, M. . . The vegetation of Lalitpur—an ecological sketch. *(Journ. Ind. Bot. Soc. Ill, 8, p. 211.)*

HUTCHINSON, J. . . Contribution towards a phylogenetic classification of flowering plants. (Kew Bull. 7, 1923, p. 241 & 2, 1924.)

IYENGAR, M. 0. P. . Two instances of short-cuts by animals to the nectaries of flowers. *(Journ. Ind. Bot. Soc. Ill, 9 & 10, 1923, p. 285.)*

KASHYAP, S. R. AND SETHI, M. L. . . A new liverwort from Madras *(Fysonia tenera). (Journ. Ind. Bot. Soc. III. 7, 1923, p. 201.)*

KRANZLIN, F. . . *Orchidaceae-Monandrae-Pseudomonopodiales. (Das Pflanzmreich'83 Heft (IV. 50) 1923.)*

LISTER, G. . . . *Mycetozoa* from N. India *(Journ. Bot. LXII, 733, 1924, p. 16).*

MERRILL, E. D. . . Distribution of the *Dipterocarpaceae. (Philipp. Journ. Sc. 23, 1, 1923, p. 1.)*

NITSCHKE, VON R. . Die Geographische Verbreitung der Gattung *Acalypha. (Bot. Archiv. 4, 4, 1923, p. 277.)*

SABNIS, T. S. . . The Flora of Sind. *(Journ. Ind. Bot. Soc. Vols.III & IV.)*

SAHNI, B. . . . On the structure of the cuticle in *Glossopteris angustifolia. (Rec. Geol. Surv. Ind. LIV, 3, 1923.)*

SAXTON, W. T. . . Phases of vegetation under Monsoon conditions. *(Journ. Ecol. XII, 1, 1924, p. 1*

SCHMUCKER, VON T. . Zur Morphologie und Biologie Geophile) Pflanzen. *(Bot. Archiv. IV. 3. 1923, D. 201.)*

SCHULZ, 0. E. . . *Cruviferae-Brassicae. (Das Pflanzenreich, 84 Heft. IV & V, 105, 1923.)*

SINGH, S. . . . Oecology of Indian Savannah Plants *(Ind Forr. XLIX, 7, 1923, p. 356.)*

SMITH, W. W. AND FORREST, G. . . New *Primulaceae. (Notes fr. R. B. G. Edvnb., XIV, LXVIII, 1923.)*

STAMP, L. D. AND LORD, L. . . . The Oecology of Part of the Riverine tract of Burma. *(Journ. Ecol, XI, 2, 1923 p. 129.)*

STEBBING, E. P. . . The Forests of India.

CALCUTTA : PRINTED BY SUPDT. GOVT. PAINTING. **INDIA, 8, HASTINGS STRMT.**

Report of the Botanical Survey of India *fot* 1924-25.

I. Systematic.—*Eastern India and Burma.*—The absence through illness of Mr. P. M. Debbaiman durjjig a large part ot tbe year combined with a reduction in staff effected to secure the objects of retrenchment,, has brought the Survey so far as field exploration is concerned to the position of being a Department in name only. There was no officer available for deputation to do field survey work and until a staff adequate for the duties at headquarters is provided it is inevitable that there should be suspension of certain important functions for which a Survey exists, namely, the systematic collection of plants throughout the year and recording of data in the field to give materials for an analysis of the vegetation and for the production of local floras. Mr. Narayaaa-swami, second assistant in the Survey, was, during Mr. Debbarman'a absence, deputed to take charge of the herbarium and this left the Survey for the greater part of the year without a single whole-time officer for systematic work. On the systematic side, therefore, a partial suspension of the normal activities of the Department has been inevitable although this suspension has been more than balanced by the added duties which continue to fall to the Survey so far as economic work is concerned.

A considerable amount of systematic botanical work by students of Indian botany both in India-and abroad is, nevertheless, due to be recorded. It would eeem that the pronounced tendency to the study of ecological problems referred to in recent reports has brought about a realization that the proper ground-work for all such study lies in a broadening of the knowledge of systematic botany, and a leaning towards the systematic as reflected in descriptions of new or rare plants and in the compilation of local lists is now evident from a perusal of the botanical / literature of the year.

In connection with his work on the Flora of Siam Prof. W. G. Craft has published full descriptions of a large number of new species collected by Dr. Kerr from this country. His lists comprise, in particular, new species of the families Anonaceae, Violaceae, Guttiferse, TernBtrcemiacess, Sterculiaceae, Leguminosse and Tiliacese. Under the auspices of the Siam Society Prof. Craib ha3 also published the fir3t part of A List of Plants known from Siam. Besides giving the records and distribution in Siam of the various species cited the list is enriched by the addition of local vernacular names the responsibility for which has been undertakes by **Dr. Kerr.**

Tke Flora of the Abor expedition referred to at some length in last year's report has now been distributed but eome of the lower orders of plants and in particular the Algae remain for publication. The revision of these has been undertaken by Dr. N. Carter and an analysis of thd list together with descriptions of new species will appear in a forthcoming number of the records at an early date. During the year a very important piece of. botanical and geographical exploration work has been carried through by Mr. Kingdon Wajd who, after traversing the usu^l passes into Tibet, proceeded eastward to explore the completely unknown region where the Brahmaputra breaks through the Eastern Himalayan range. A number of new species as the result of Mr. Kingdon Ward's exploration is a certainty of the near future. In part at least the vegetation of this unknown region partakes of a Chinese rather than aa Indian character. This fact was to some extent indicated by the analysis Mr. Burkill carried, out on the Flora of Abor land. A comparison of the results obtained by Mr. Kingdon Ward with those appearing in the last issue of the Records will therefore be of very special importance from the point of view of plant geography. In conne tion with Mr. Kingdon Ward's tour the Botanical Survey lent aid where possible in the supply of field presses and pressing material and also in the preparation of Wardian cases for the safe transport of the valuable collection of Rhododendrons, etc., to Europe. Mr. Kanjilal continues hiB work on the Flora of Assam. From the Cachar Hills Mr. R. N. Parker has described and figured in the Indian Forester a new species of Alseodaphne with much smaller and thinner leaves and with more slender shoots than any of the other species of this genus from the district. In his materials for the annual report of the Lloyd Botanic Garden Mr. 6. H. Cave notes on the effect which the very severe winter experienced had on plants usually hardy at the elevation of Darjeeling. Amongat exotics the chief sufferers were *Oestrum auranliacum, JwsicBa peruviana, Fwhsia macrostemina* and *Doryanthes Palmeri.* Amongst plants indigenous to the district such species as *Luculia gratissima, Cassia lavigata, Solanum.verbascifolium, Sauraujafasciculata, Musa nepalensis* and *Curculigo recurvata,* usually quitp at home under the normal conditions of the Darjeeling climate, may be cited as those that felt the adverse effects most. From the Darjeeling District Mr. Banerjee has described a new species of Swertia, *8. pediceUata* nearly related to Wallich's *S. purpurascenti.*

Southern Indta.—The fifth and sixth parts of the Flora of Madras, Ebenace® to Plantaginaceae, completing the Gamopetate have now been published, and Mr. Gamble has drafied a series of notes, published in the Kew Bulletin, explaining the views he takes regarding certain critical genera and species worked up during the course of his revision In the course of hin work Mr. Gamble found a number of hitherto uakmowB or

-misplaced species. Full descriptions of the following are given in the Decades Kewensis section of the Kew Bulletin for the year. *Plectranthue Bishopianus, P. Bournece, Anisochilus argenteus* and *Teucrium plectranthoides, Apama Barberi* and *Piper Barberi.* From the Tinnevelly Hills Messrs. Tadulingam and Jacob have described a new species under the name *Biophytum longibracteatum* and have also had under examination cases of plant teratology in Chlorophytum, Indigofera and Curcurbito in South India. In the Journal of the Indian Botanical Society Mr. M. 0. Parthasarathy Iyengar has descriptions of two new Algaj found about Calcutta and Madras. A new Hydrodictyon from Madras is also described by him in the same Journal. In the Annals of the Royal Botanic Garden, Poradeniya Mr. Petch has papers on the relationship of *Cassia Lechenanlliana* in Ceylon to other members of the genus, ou the interesting subject of grcgarioua flowering and on meristic variation in the genus LoranthuB. In a forthcoming paper of ths Records will appear Mr. C. E. C. Fischer's account of the same genus in aosociation with its host plants in Southern India.

Northern India.—-MeosrR. Parker and Gupta have added a further 197 new Irdian specieo of Forest importance to the large list already compiled at Dehra Dun. This compilation will shortly be supplemented in a paper by the writer and MT. NaTayanaswami in which will be brought together a comprehensive lint of Indian specieo of plants of every description not doslt with in Booker's Flora of British India. The manuscript of thia liat io now in the Press and its appearance should not to delayed much longer. A very interesting account of the cultivation of Conifers in Northern India is furnished by Mr. Parker in the Indian Forester. For some years efforts have been made to get together a representative collection of this group of plants for the Arboretum of the Forest Research Institute and, though the trees are still quite young, it has been possible to collect data likely to be of U6e in determining the possibilities for successful growth in N. India of the various species now under observation.

Botanical notes on some plants of the Kali Valley a little knowA region on the boundary between Kumaon and Nepal forms the subject of another paper by the same author. As a result of Mr. Parker's tour to thin valley he is able to rcdescribe Mr. Duthie's Leptcderniis formerly in *L. lanceolata.* During his tour Mr. Parker had evidence that the sudden appearances and disappearances of plants in the Himalayan valleys are evidently due to the considerable differences in rainfall and elevation that occur in placea only a few miles apart and that these factors seem to affect the wocdy species more than they do the herbs.

Fiom material collected in N. W. India Mr. S. T. Dunn has descriptions of the following species new to Science *Draha obscura, Astragalus*

Isabella, Ootoneaster humilis, Pimpinella Itmhmirica, Pituranthos Stei Mr tii, Campanula tenuissima, Rochelia lissocarpa **and** ***Scutellaria teucrii-folia.*** Mr. B. 0. Coventry's wild flowers of Kashmir published during the year gives opportunity for acquaintance with the rich flora of this part of India. The work is of special importance on account of the success attained in the production of the autochrome plates. As the publication of these plates entails considerable expenditure it is to be hoped that financial support will be forthcoming from Government to allow 01 further series of the work appearing.

Western India.—Messrs. Burns and Ranade have carried out and published an excellent piece of pure and applied botanical work on *Cyperusrotundus,* This agricultural pest, one of the worst and most widely distributed throughout the East, is responsible yearly for a vast amount of damage to agricultural land and in gardens to lawns and courts. The life-history of the plant has been very carefully followed and while no easy specific to its eradication is given the authors have been able to indicate the best methods of dealing with it. The methods employed should aim at bringing to the surface for the maximum length of time at the hottest season of the year as many of the tutors as can in practice be exposed. Preliminary to a continuation of his work on the physiological anatomy of the plants of the Indian desert Prof. Sabnis continues to compile a list of the plants of the deserts of Sind.

General.—Of general botanical works having relation to India the following may be mentioned : Mr. I. H. Burkill's list of oriental vernacular names of the genus Dioscorea, Cogniaux and Harms monograph in the Pflanzenreich of part of the Cucurbitacese. Mr. Hutchinson's continuation of contributions towards a phylogentic classification of Flowering plants, Kunths monograph of the Dioscoreaceae in the Pflanzenreich, Pax and Hoffmans monograph of part of the Euphorbiacese and Schultz monograph of the Crucif erae.

During the year an important event to the Botanical world was the holding of the Imperial Botanical Conference in London at the time the Wembly exhibition gave opportunity for the union of botanists from all over the world. In the systematic section Dr. Hill discussed the best means of promoting a complete botanical survey of the Empire. It was resolved to form a central body to co-ordinate certain lines of botanical research throughout the Empire.

XL **Economic—**A further year's experience of Cinchona in Burma emphasises the truth of the statement that one seldom dreads what in the event is most to be feaTed but is ever apprehensive of what seldom materialises. A very anxious time during which the future of Cinchona in Burma hung in the balance was experienced towards the end of the rainy season of 1924. A collar disease exhibiting sympt oms of canker

made itself alarmingly evident with the progress of the rains by causing a mortality estimated at 18 per cent, over an area of very promising Cinchona put out when operations were first started. The trouble is first made evident by a flagging of the whole plant from its crown downwards and by a thickening, darkening and longitudinal cracking of the bark at ground level and a few inches above. The general effect so much resembles fungoid action that it was considered desirable to get the Imperial mycologist to Mergui to investigate the disease on the spot. In spite of repeated attempts with ample material to work upon no fungus capable of producing such an effect could be isolated, no culture from affected parts would develop in media and microscopic examination too failed to reveal the presence of organic growth. Had the tests been made with scanty material or on plants at one stage of collapse doubt might have remained as to whether a fungus was the cause but the negative result was too persistent and attention had to be turned to causes other than fungoid for the trouble. While the sides of ridgea were not free of the condition Cinchona in a state of collapse was much more in evidence on" the flat damp wind swept crests. The effect produced indicated the advisability of an improved system of drainage and care at the time of planting and hoeing for as no specific disease could be found there was the strong possibility of something wrong with the system of cultivation. A set of careful observations made by Mr. Russell during the rainy season just passed supports the theory that the collar thickening and collapse is a physiological effect of deep planting combined with wind action which creates a local water-logging at the base of the stem. With the swaying of the young plants on the wind swept crests a hollow cone shaped depression, smooth and capable ot retaining water for a considerable time, forms at the collar. Mr. Russell's observations go to show that the collapsed condition is seldom found in plants which have their root system almost on the surface and the collar completely free of earth. The prevention of the trouble probably lies in an improved drainage system, shallow planting and the removal at hoeing time of all earth from about the base of the plant. The present year shows a very marked improvement over the affected area as regards this unhealthy condition. The percentage of sickly plants has been reduced to an almost negligible quantity and another distinct advance recorded in the experimental cultivation of Cinchona under these new conditions. In order to minimise the effect of the high winds experienced, belts of natural jungle will in future be left across the main directions of the storms to act as wind breaks.

The appearance of Cinchona at the end of the year under review left little to be desired. Plants three years old were already eight feet high and had developed in proportion to an extent that made it a matter of difficulty to push one's way between the branches of neighbouring

trees. This is a condition that one would be glad to have in trees of double the age in the Bengal Plantations. The entire absence of *Helopeltis* the scourge of Cinchona in Bengal, from the Mergui area was scarcely to be expected. The insect has a wide distribution and it would have been a matter for wonder had it failed to appear in the new area. During the year it did appear and at times became troublesome but the rapidity with which growth is made counteracted its effects and it was never really serious.

No large or representative analysis of barks was carried out, a check on alkaloid content being done only on the bark of trees that had on account of sickness to be taken out. The results obtained with tb« were in accordance with early analyses and go to show that a high grade bark is to be expected as the trees mature.

Labour conditions during the year left much to be desired. Labour was not too plentiful and an attempt made through business agency to recruit coolies from South India towards the end of the year was largely a failure. If the area of Cinchona laid down as necessary for planting yearly is to be maintained and the area already out kept in proper cultivation, some help other than the mere granting of money for coolie recruitment will be necessary. A successful year in the rubber and mining industries has made labour, at all times difficult to obtain for pioneer work, scarce and shy of engaging for Cinchona Camp and it may be necessary in the near future for the Government agency that controls recruitment to earmark a certain proportion of the labour available, for Cinchona purposes.

The history of Cinchona during the year provides »••* cause for

more evidence now than there was even a year ago to indicate that the experiment will end successfully and that a prosperous industry may result. The most pressing difficulty is associated with the su ly of labour for as the plantati necessity. W ay not bour for opening up and maintaining even a few hundred acres the difficulties are immensely increased when the hundreds approach the thousand mark. They are further increased by a growing knowledge amongst labourers ready for recruitment that the work required of them is of a rough, heavy, pioneering kind and that the

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large Quinine producing belt extending from the Tenasserim River eastward to the borders of Siam should not result and production on a scale sufficient to affect controlled prices and bring the drug within the reach of India,'s malarial millions.

III. Industrial Section, Indian Museum.—Some 380 specimens were added to the collections during the year. They were mostly food substances, medicinal drugs and timbers. Of these the following may be mentioned as of special interest: (1) a set of Margosa exhibits from the Calcutta Chemical Company, (2) varieties of *Solarium tuberosum* from Assam, (3) a set of some 130 specimens of Assam timbers, (4) models of edible fruits, the work of a Marathi turner in Calcutta. These models are turned or shaped from the wood of *Eriodendron anfractuosum* and painted to the natural colours of the products, make quite a desirable and interesting addition to the show-cases. (5) Products—fans, etc.—**made from the grass *Andropogon mmicatus.***

The work of overhauling the specimen exhibits was continued and over three thousand old labels were replaced by typewritten ones. A new show-case has been added to the Gallery during the year to take exhibits of oils and oil seeds. Side by side with the exhibits stand coloured drawings of the plants from which the oil seeds are procured. Some 184 specimens of plants mostly economic were collected by the Curator during a tour in Assam and added to the Herbarium of the Industrial Section. Materials for a catalogue of the medicinal plants have been completed and a start made on a catalogue of the food plant exhibits.

IV. Publications.—The second part of Mr'. Burkill's Flora of the Abor Expedition being Vol. X, No. 2 of the Eecords of the Botanical Survey of India, has been published and distributed. The following works are in the Press:—Dr. Nellie Carter's Freshwater Algae from India, Mr. C. E. C. Fischer's Loranthacese of Southern India and their host plants and the writer's and Mr. Narayanswami's List of Spe̊cies of Indian Plants not mentioned in Hooker's Flora of British India.

V. Cinchona Bark and Quinine.—During the year 234,821 lbs. of bark were received from Java of which 127,474 lbs. were received in Calcutta and sent to Mungpoo and 107,346 Its. in Madras for despatch to this Government's Quinine Factory. At Mungpoo 495,279 lbs. of bark were worked up to produce 26,723 lbs. Sulphate and 6,695 lbs. Febrifuge. At Naduvattam all the Java bark received there, 107,347 lbs. were worked up to produce 5,580 lbs. Sulphate and about 1,500 lbs. Febrifuge. The year ended with a stock of 1,329,542 lbs. of Java bark in hand, all held at Mungpoo. Imperial stocks of Quinine on the 31st March amounted to 303,130 lbs., of which 120,616 lbs. were held at the Indian Museum, 176,934 lbs. at Mungpoo and 5,580 lbs. at Madras.

Areas of elitfnfcwJtdw.—Final orders regarding a readjustment of the areas of distribution were issued during the year. The allotment of areas has been geographical; the whole of Southern India including Indian States therein receive supplies from the Madras Department; Bengal, Bihar and Orissa and Assam depend on the Bengal Department while the remaining areas in Northern India including Indian States therein are supplied from Government .of India stocks.

Issue of Quinine.—During the year 12,159 lbs. Quinine Sulphate were issued against 10,328 lbs. during the previous year. As the Punjab has taken some 600 lbs. less than during 1923-24 the increased issue is due entirely to the enlarged area allotted to the Government of India. Next year the issues should show a'further increase as for only a short period of the year were Government of India stocks called upon to meet indents from the enlarged area. AH large indents are met direct from stocks held at the Indian Museum, small indents and broken balances only being met from stocks at Mungpoo. An exchange supply of 750 lbs. in 17 original cases was issued from the Indian Museum on behalf of the Government of Bengal, an equal quantity being added to the Imperial stocks at Mungpoo from provincial stock housed there.

Demand over the year has shown a marked tendency to the substi* tution of the relatively cheap Febrifuge for Quinine. In view of the high price of Quinine this is not surprising but there is a well defined limit to the extent to which substitution can go. Febrifuge while a very valuable product, is of the nature of a bye-product in the manufacture of Quinine* Roughly for every four pounds of Quinine extracted there is one pound of Febrifuge. As the demand for Febrifuge exceeds supply the amount available has been rationed and attempts are being made to distribute this product to provinces in proportion to the amount of Quinine taken. While a certain amount of Febrifuge is extracted from Government of India bark no departmental distribution of this product is attempted. The amount which belongs to the Government of India is not known till well after the close of the financial year and it would be impracticable to attempt to allocate shares of the product while distribution of it is going on. The Bengal Jail Department, therefore, undertakes the complete distribution of this product to all areas in Northern India as also the distribution of other minor products.

Revenue by the sale of Quinine.—The total revenue during 1924-25 amounted to Us. 3,16,953 against Us. 2,77,896 for the previous year. The increase is accountable to issues to the added area but: the excess over last year's receipts is modified by the fall of Rs. 2 per lh which took place in the price of Quinine in November 1924. Of the total revenue Rs. 56,231 were by cash sales to local bodies and Indian States and Rs. 2,60,722 by credit to Government Departments. The revenue does

not include the sale proceeds of Cinchona Febrifuge belonging to the Government of India which are in the first instance credited to the Govern* ment of Bengal and ultimately deducted from the cost ot extraction of Quinine payable to this Government. As Bengal sold over 6,000 lbs. of India Febrifuge a further credit of the order of Rs. 60,000 will be due to the Government of India. Full details will be given when materials for the exchange account are available.

VI. Financial*—The original budget allotment for the -year was Bs. 6,62,000 of which Rs. 2,18,700 were surrendered reducing it to Rs. 4,43,300 but subsequently a sum of Rs. 91,545 was added to meet additional expenditure under extraction of Quinine, Cinchona Plantation labour and implements bringing the net allotment for the year to Rs. 5,34,845. Of this allotment Rs. 48,280 were for the Botanical Survey proper and Rs. 4,86,565 for Cinchona and Quinine. This last figure includes Rs. 2,67,300 for the purchase of Java bark and freight charges thereon. The expenditure in the Botanical Survey proper was Rs. 2,280 short of the allotment. Under Cinchona the estimated expenditure is Rs. 2,39,075 including Rs. 50,000 as probable charges for extraction of Quinine at the Madras Factory. No bill for this extraction has, however, yet been received. When the accounts are closed the total saving under Cinchona will be about Re. 2,47,490. This saving is due to a large reduction in the quantity of bark received from Java consequent on an arrangement effected with Messrs. Howard & Sons.

VII. Staff.—During leave preparatory to retirement of Lieut-Co]. A. T. Gage, C.I.B., I.M.S., the writer held charge as Director throughout the year. In the Botanical Survey proper Mr. S. N. Bal was Curator of the Industrial Section, Mr. V. Narayanaswami was Assistant for Systematic Work and subsequently officiated as Curator of the Herbarium, Sibpur, in addition to his own duties. Babu U. C. Pal and Babu R. K. Das acted respectively as Assistant Curator, Industrial Section and Head Clerk during the absence on leave of Mr. E. F. Vieux and when this officer retired from the 17th December 1924, were appointed permanently to these posts. After the close of the year the Survey sustained a serious loss in the death of Mr. P. M. Debbarman, Senior Assistant for Systematic Work. His quiet and unobtrusive industry combined with tactfulness and a spirit of helpfulness to make Mr. Debbarman an officer whose advice and help were always worth having. The Survey is the poorer in the loss of one to whom the work it stands for was ever a first consideration*

In the Cinchona Department special credit is due to Mr. Russell and his Assistants Mr. Braybon and Maung Sine for the thorough manner in which they have tackled an arduous year's pioneer work in Burma and to Babu U. C. Pal at headquarters for the trouble he has taken and

ability shown in making himself acquainted with a growing volume of work in Cinchona and Quinine. All executive and ministerial officers of the Botanical Survey in both Departments have done their duties with commendable zeal throughout the year.

G C CALDER,
Director, Botanical Survey of India.

MGIPC—M—IV-8-7-M2-2S-4GO,

Report of the Botanical Survey of India for 1925-26.

I. Systematic.

General.—During the period under review the Systematic Assistant has been officiating as Curator of the Herbarium at the Royal Botanic Gardens and the second Systematic Assistant's post has beenvacant, so that Systematic work has again been confined to head quarters. Some thousands of specimens have been identified for correspondents and considerable additions have been made to the Herbarium. The Curator of the Industrial Section of the Indian Museum made an extensive tour in Assam and Eastern Bengal and collected medicinal and economic plants required for the Museum, otherwise no field exploration work has been undertaken. It is to be regretted that this important function of the Botanical Survey should have been neglected and it is hoped that staff and funds will permit of a certain amount of field work being undertaken next year.

The desire of Indian Botanists to know more about the morphology, physiology and anatomy of indigenous plants especially of cryptogams" has led to the publication of numerous articles, the most important of which are cited under the respective geographical subdivisions. There have also been two important publications on ecology, one relating to Burma, the other to Tehri Gharwal.

Among botanical publications of general interest the following maybe mentioned :—

Mr. Hutchinson's " The Families of Flowering Plants " which is the outcome of his contributions towards a phylogenetic classification of flowering plants is a work of exceptional labour and care. It has an elaborate key and a list of families with constant characters which is helpful, especially, in the identification of material in the field. This list might perhaps be extended.

" The Flora of the Malayan Peninsula " in three volumes by Mr. H. N. Ridley carries to a conclusion the work of the late Sir George King and Mr. J. S. Gamble and fulfils a long-felt want. If the author had quoted King's numbers the rearrangement of the Malayan species in the Calcutta Herbarium would have been facilitated.

Miss Ida Colthurst has written a popular account of the Friiirii'.il Indian Trees.

The following papers are also worthy of mention (J) " The Growth of the Cotton Plant in India " by R. S. Inamdar, S.B. Singh and T. D.

Pande, (2) " The Distribution of the Magnoliaceæ " by R. D'O. Gccd, (3) the " Anatomy and the Morphology of the Flower of Euphorbia " by Dr. Julia Haber, and (4) the " Morphological Study of Monocotyledons " by Dr. Agnes Arber, all in the Annals of Botany. An interesting essay on the question of " species " by Mr. W. B. Turrill and Mr. T. A. Sprague's paper on the classification of Dicotyledons in the Journal of Botany are valuable to systematists. Dr. Ralph Holt Cheney has written an illuminating monograph on the economic species of *Coffel*.

It is also of interest to note that the Kew authorities are the inclusion in the 7th Supplement to the Index Kewensis of references for the Wallichian species in Donn's General System (1831-37).

By the death of Mr. J. S. [illegible] India has lost a devoted Botanist and Indian Botany its standard work and his contributions made known to Botanists throughout India. His "List of the Darjeeling Plants" (1895), his "Monograph on the Bambusæ" (1896) and his "Flora of Madras," the sixth part of which appeared before his death, were his chief contributions to Indian botanical literature. His herbarium has, since his death, been presented to Kew.

Eastern India and Burma.—Attention is directed to "The Vegetation of Burma from an Ecological Standpoint" by Professor L. Dudley Stamp, Professor of Geology [illegible] Rangoon which appeared just before [illegible] Professor Dudley Stamp's new book will appeal [illegible] terbutto all who are interested economically or otherwise in the vegetation of the country and his classification [illegible] the main types of vegetation characteristic of the [illegible] feature of the book is [illegible] aerial photographs and sketches. The Forests suggest that this method might be very useful in the preparation of stock maps of forest vegetation on a large scale. Professor Stamp acknowledges his indebtedness to Forest Department Working Plans. These, though published, are not available to the general public and contain valuable information which would, in many cases, merely require correlating and expanding to complete general surveys of the vegetation of a great part of India itself and it is hoped that the lead given by Professor Stamp will be followed elsewhere.

During the year, the Department has been [illegible] to Mr. C. B. Parkinson of the Burma Forest Service for a [illegible] supply of botanical specimens.

[illegible] of Colonel Gage and Mr. Russell from Tavoy, worked [illegible] naswamy, have yielded [illegible] new species which will be described in due course.

Mr. Parker has described two new species from Tavoy, *viz. Plectronia* *tavoyana* and *Lasianthus longipedunculatus* **and** Mr. Fisher another **from** the same area, *viz. Elccocarpm quadratics.*

During the year the first part of the Flora of Bihar and Orissa by Mr. Haines was published which completes this valuable work.

The revision of Gamble's list of the Darjeeling Plants by A. M. and J. M. Cowan has been completed and is being published by the Government of Bengal under the title, " The Trees of Northern Bengal." Over 400 species from the Darjeeling District have been added.

During 1925, the mosses of the Mount Everest Expedition were described by Professor Dixon in the Journal of Botany and the Lichens of the same rcg'on were described by Mr. Robt. Paulson in the same journal. Of the 31 species of lichens enumerated only two are new species.

Professor Briihl and his assistants are continuing their work on the fresh water Algde of Bengal and have published two papers, one on the subserial Algae of Burkuda Island in the Chilka Lake of the Ganjam District and another paper on the Algal Flora of the Maidan tanks in Calcutta.

***Southern India.*—Mr. J. S. Gamble until his death was engaged on the 7th part of his Flora of Madras. This part was published during this year and brings the revision down to the Euphorbiaceae.**

In the Kew Bulletin Mr. Gamble described the following fifteen new species of Lauraceae all from Southern India :—*Cryptocarya anamalayana,* *C. Beddomei, C. Bourdilloni, C. Lawsoni, Cinnamomum riparium, C. travancoricum, Aclinodaphne Bournecce, A. Bourdilloni, A. Lawsoni, A. Tadulingami, Litsea mysorensis, L. insignis, L. Baurdilloni, L. travuncorica* and *Neolitsea Fischeri.*

From the same region he has described a new genus *Pseudo-glochidion* and the following new species of the Euphorbiaceae :—*Pseudoglochidion* *anamalayana, Glochidion Bourdilloni, Phyllanthus Narayanaiwami, Emblica Fischeri, Reidia Beddomei, R. Gageana, R. megacarpa* and *R. sfipulacca.*

Mr. Fischer, formerly of the Tndian Forest Service, has described two new species *viz. Caralluma stalagmifera* from Vandular and *Ficus Augladi* **from the Pulney Hills. From additional material collected in the Madrps Presidency he has been able to publish a full description of the little known species, *Euphorbia cadutifolia** Haines. The Department is ind^bted to him for contributing specimens to the Herbarium to replace those lost at sea during the war. A new species of *Pavonia,* from Coimbatore *P. Coxii* is also described in the same journal by Messrs. C. Tadulingam and H. C. Jacob.**

The Cryptogamic Flora has received the attention of Profeesci J. F. D. Almeida and Mr. M. 0. P. Ayengar. The fonneT in the Journal of the Indian Botan'cal Society has published a detailed account of the

fcni3 of the High Wavy mountain in the Madras District recording one new species *Rivallia Hdllbergii.* The latter, who has been for some years engaged in the study of the marine and fresh water algie has described in the same journal a new species *Hydrodictyon indicum* fr[onl] Madras.

Western India.—From this part of india the following papers were published :—(1) The Cause of Cotton Wilt in India by S. L. Ajrekar, (3) The Morphology of the Rice Plant and of the Rice Inflorescence by B. Mundkar, "The course of the Vascular bundles in *Achyranthes aspera* by R. H. Dastur and (4) The Abnormal Sporophylls of Cycas circinal by Professor S. R. Kashyap. Two new species of Ranunculus *viz.* *Munroanus* and *R. palifolius* from Kashmir are described by Mr. S. 1 • Dunn in the Kew Bulletin. In the Journal of the Indian Botanical Society a new moss *Trematodon brevicalyx* Dixon from Lahoreis described in detail by L. N. Mathur of Lahore.

Northern India.—The Ecology of Tehri Garhwal, an elaborate and instructive paper by Professor \V. Dudgeon and L. A. Kenoycr in th" Journal of the Indian Botanical Society justified its claim to be a critical study of the ecological factors determining the vegetation of the area and the value of the paper is enhanced by numerous illustrations.

Mr. R. N. Parker of the Forest Research Institute has published notes on the genus *Sonneratia* wherein he attempts to clear up the confusion regarding the proper determination of the Indian species of this genus. He lays emphasis upon the shape of the fruits rather than the presence or absence of petals as the distinguishing factor in determining the species. Further notes are published by him on a hybrid *Terminals arjuna* X *tomentosa,* with general remarks on tree hybrids.

Mr. B. B. Osmaston has described a new species of Smilax *viz.* >S. *erecta* from Garhwal in the Kew Bulletin.

In the Journal of the Indian Botanical Society R. K. Saksena and L. N. Mathur have recorded an *Ophioglossum,* viz. 0. *fibrosum* Schum. from the Indo-gangetic plain and have appended notes on conflicting points raised when comparing their specimens with that described by D'Almeida.

IL Economic.

Although it is still too early to regard the Cinchona area in' Mergui as other than experimental, the evidence of a further year's working goes to prove, that on certain aspects at all events, Cinchona is capable of withstanding fairly well the severe droughts and sudden downpours to which this area is subjected. These appear to be fairly frequent in occurrence and are a source of grave anxiety to the planter. Everything went well during the earlier part of the year, and plants of ail species made vigorous growth. In AuguBt and September

however heavy torrential rain fell, the downpour lasting for 22 days and exceeding any rainfall previously recorded. The rain was accompanied by strong monsoon winds. The heavy winds caused havoc among plants jiot securely anchored to the soil and water logging of the soil consequent to heavy rain increased the mortality and a repetition of the experience in Tavoy was apprehended. On receipt of this alarming information Mr. Calder hastened to the Plantation in November and witnessed the damage which had been done.

Messrs. Calder and Russell agreed that instead of risking complete failure by having the whole area in one place, it should be divided. With this object in view Mr. Calder approached the Government of India with the suggestion that another area removed from the boisterous monsoon conditions slioulcl be looked for in Upper Burma. With the sanction of the Government of India Mr. Russell was deputed to find another suitable site for chinchona cultivation. After a careful search over a wide area, occupying three months, Mr. Russell reported the discovery of a suitable site in Mogok in the Katha District. This site he considered most favourable, enjoying climatic and soil conditiens exactly similar to those in the- Bengal plantations. The question whether the area selected should be taken up is under consideration.

By the end of the year although there were still vacancies in the Mergui Plantations, many of these had been filled and the aspect of the plantation was not altogether unfavourable.

During the year there was less appearance of canker disease in the plantations and this at no time appeared formidable. The trouble was minimised by improved drainage systems, shallow planting and by leaving belts of natural jungle across the main direction of the storms to protect the plants from the high winds.

With regard to labour, although the health of the labour force was better than might have been expected, difficulties were again experienced owing to shortage. Recruitment of some 200 coolies towards the end of the year temporarily removed this difficulty.

Cultivation of Medicinal Plants.—Ipecacuanha **cultivation is ako** still in the experimental stage. The plants are healthy and are growing well but the root is not yet ready for the factory.

III. Industrial Section, Indian Museum.

Some 7E0 specimens were registered during the year and 504 were deposited in the gallery. Most of the specimens were food materials, others were timbers, fibres, medicinal plants, oils, dyes and gums. These collect'ons were made principally by the Curator during his tour in East Bengal and Assam. Of the rew exhibits the most noteworthy are 191 varieties of cultivated rice, a number of specimen^

o[p] silk cocoons and cloths, edible fruits from Manipur and the Naga Hills and baskets and mats made of different species of *Calamus* by the different hill tribes.

The whole of the exhibit in connection with the manufacture ot Quinine has been replaced by fresh material.

The re-arrangement of the gallery in accordance with the new scheme* which was reported in the Annual Report of 1922-23 has been undertaken during the year with considerable improvement in effect and educational value.

The overhauling of specimens was continued and over four thousand old labels were renewed and a new show-case has been added.

Experiments, on the preservation of fresh specimens in liquids with a view to retaining the natural colours, gave satisfactory results in the case of green fruits and leaves.

Information regarding the sources of supply, etc., of numerous econoniic products were given to a large number of correspondents, and exhibits were supplied to universities and colleges in the United States, Canada, Straits Settlements and elsewhere.

The catalogue for medicinal plants and their products reported in the Annual Report of 1924-25 has now been completed.

IV. Publications.

The following works have been published and distributed :—

(i) Records of the Botanical Survey of India, Vol. IX., No. 4 Fresh-water Algae from India by Nellie Carter, (ii) Records of the Botanical Survey of India, Vol. XI., No. I (1) list of Species and Genera of Indian Phanerogams not included in Sir J. D. Hooker's Flora of British India by C. C. Calder, V. Narayanaswami and M. S. Ramaswami (2) Loranthaceae of Southern India and their host plants by C. E. C. Fisher.

V. Cinchona bark and Quinine.

During the year 491,549*7 lbs. of bark were received from Java of which 248,697*8 lbs. were sent to the Bengal Government Eactory at Mungpoo and 242,851*9 lbs. to the Madras Government Factory at Naduvattam.

Manufacture of Quinine.—kt Mungpoo Factory 626,137 lbs. of bark were worked yielding 38,036 lbs. of Quinine Sulphate and 9,769 lbs. of Cinchona Febrifuge. At Naduvattam Factory the whole of the bark received viz. 242,851*9 lbs. was worked yielding 7,556 lbs. of Quinine Sulphate and about 2,400 lbs. of Cinchona Febrifuge.

Stocks of Quinine.—The total stock in hand on the 31st March 1926, amounted to 334,732*138 lbs. of which 110,386-670 lbs. were held at the Indian Museum in 3,329 original cases, 211,201*081 lbs. at Mungpooand 13,144-437 lbs. at Naduvattam.

The stock at the Indian Museum is entirely Java Quinine contained in original cases. These cases are of two kinds : (1) war time Quinine received iji 1919 under Agreement with the Association of Quinine Manufacturers in Allied Countries and packed in cases each containing 25 lbs. of Quinine Sulphate in 4 unsoldered tins and (2) Quinine Sulphate received under Agreement with the Dutch Combine (1921-23) contained in cases of 20 Kilo3 or 44*092 lbs. of Quinine Sulphate in 4 hermetically sealed tins. The 25 lbs. cases on account of the containers being insufficiently packed have shown shortages in weight due to the loss of water of crystallisation. The loss, however, does not affect the medicinal value of the drug but, as indenters claimed compensation for shortages, it was decided by the Government of India in 1924, to stop the issue of the war-time packed (25 lbs.) cases .until such time as it can be utilised in the proparation of special products.

Areas of distribution.—The allotment of areas has been geographical, the whole of Southern India including Indian States therein receive supplies from the Madras Cinchona Department; Bengal, Bihar and Orissa and Assam including Indian States receive supplies fiom the Bengal Cinchona Department and the rest of Northern India'including Indian States therein are supplied from the Government of India stock.

Issue of Quinine.—During the year 13,999*152 lbs. of Quinine Sulphate were issued against 12,159 lbs. during the previous year. The increase is due mainly to larger consumption of Quinine in the Punjab including the Indian States within it. During the year the Funjab alone took 11,565 lbs. against 9,731 lbs. in the previous year or an increase of 1,834 lbs.

Cinchona Febrifuge.—The demand for Cinchona Febrifuge was persistently high on account of its relative cheapness. Owing to the limited outturn of this drug, which is in the nature of a bye-product in the manufacture of Quinine, it was decided by the Quinine Conference held in December 1925, that Cinchona Febrifuge should be issued t. provinces in proportion to their Qu nine consumption in the previous year. It has now been arranged to give effect to this decision during the ensuing year. During the year under review 9,770 lbs. of Cinchona Febrifuge were manufactured at Mungpoo from the Java bark, of which 9,658 lbs. were sold by the Government of Bengal. The t..tal stock of Febrifuge on the 31st March 1926, amounted to 8,297 lbs. of which 4,079 lbs. were held at Mungpoo and 4,218 lbs. at Naduvattam. No departmental distribution is undertaken by the Government of India for the reasons explained in last year's report and the Bengal Jail Department continue

to issue (his drug as well as other minor products to all areas in the Northern India.

Revenue by the Sale of Quinine.—The total revenue during 1925-26 amounted to Rs. 3,90,715 against Rs. 3,16,953 for the previous year. Of the total revenue Rs. 91,354 were by cash sales to local bodies and Indian States and Rs. 2,99,361 by credit sales to Government Departments. The revenue does not include the sale proceeds ot Cinchona Febrifuge belonging to the Government of India which are in the first instance credited to the Government of Bengal and ultimately deducted from the cost of extraction of Quinine payable to this Government. As Bengal sold over 9,000 lbs. of India Febrifuge a further credit of the order of Rs. 81,000 will be due to the Government of India. Full details will be given when materials for the exchange account are available.

VI. Financial.

The original budget allotment for the year was Rs. 7,07,000 from which Rs. 1,74,000 was surrendered reducing it to Rs. 5,33,000. The surrendered amount was distributed as follows:—(1) Pay of Systematic Assistant Rs. 5,000, (2) Purchase of Cinchona bark Rs. 1,20,000 and (3) Extraction charges Rs. 49,000. Of the nett allotment, Rs. 49,880 were for the Botanical Survey proper and the Industrial Section, Indian Museum, and the balance Rs. 4,83,120 was for the Cinchona Department. This last figure included Rs. 2,85,000 (as reduced by the surrender of Rs. 1,20,000) for the purchase of Java bark and freight charges thereon. The expenditure in the Botanical Survey proper was Rs. 50,057 showing an excess of Rs. 177 after re-appropriation of Rs. 100 from Cinchona. Under Cinchona the expenditure was R3. 4,49,180 showing a saving of Rs. 33,940, The saving falls chiefly under purchase of bark and extraction charges.

VII. Staff.

Mr. C. C. Calder held charge as Director throughout the year. In the Botanical Survey proper Mr. S. N. Bal was Curator of the Industrial Section, Indian Museum, and Mr. V. Narayanaswami was Assistant for Systematic Work and officiated as Curator of the Herbarium Royal Botanic Garden, Sibpur, throughout the year in addition to his own duties. Babu U. C. Pal was Assistant Curator except from 3rd October 1925 to 20th February 1926, when he was on leave. During his absence Babu R. K. Das, Head Clerk, acted as Assistant Curator and Babu K. N. Banerjce acted as Head Clerk.

In the Cinchona Department Mr. P. T. Russell and Mr. A. Braybon he'd charge as Superintendent and Assistant Superintendent, Cinchona

Cultivation, Burma, respectively throughout the year. Maun Sine was Overseer in the Cinchona Plantation, Burma. All the executive and ministerial officers of the Department discharged their duties with commendable zeal.

J. M. COWAN,
Offg. Dimtcr, Botanical Survey of India.

MGlrC-M--IV.3S- 3 11 26 - 130.

Report of the Botanical Survey of India for 1926-27.

I. BOTANY IN INDIA.

General.

Three publications of particular value to Indian Botanists on three different branches of Botany were published during the year; " Aims and Methods in the Study of Vegetation " by A. G. Tansley and T. E. Chipp, published by the Britisli Empire Vegetation Committee, Dr. E. Blatters " The Palms of British India and Ceylon " and, a revised edition of " Fresh Water Algae " by West. There is no doubt that the first of these works will stimulate the study of Ecology in India, a subject of the greatest importance to the economic development of the country. Our knowledge of the vegetation is extremely incomplete —to be found principally in the introductions to the various Floras; in Forest Working Plans which unfortunately have until recently not been published for general circulation and, scattered in various Journals. Of the changes in the Vegetatiqn which ensue on interference by man we know even less and we owe a debt to those authors who have set out clearly, practical methods of study and a classification of plant communities which will make for uniformity in investigation. The second work gives detailed descriptions with excellent illustrations not only of Indian Palms but also of those of the Mauritius, the Seychelles and Malaya with notes on their culture and distribution. The third work, which has been re-written brought up to date and elaboratel with generic keys by Dr$_t$ F. E. Fritsch, is indispensable to those researching on Indian Algae.

Mr. Hutchinson has written another interesting paper entitled " Contributions towards a Phylogenetic Classification of Flowering Plants *\ The second part of Professor W, G. Craib's "Florae Siamensis Enumeratio" was issued during the year and he also continued to contribute to the Flora of Siam in the Kew Bulletin, Mr, H. N. Kidley's " Additions to the Flora of Malaya " are of interest. The detailed accounts of the " Dipterocarpaceae of the Dutch East Indies " by `Dr. D. F. .Van Slooten supplemented by Dr. L. G. Den Bergerti publication entitled " Unterscheidungsmerkmale von rezenten und fossilen Dipterocarpaceen Gattungen " will be of considerable use to oriental botanists.

Eastern India and Burma.—Dr. Brühl has published a practical "Guide to Sikkim Orchids" and with his research scholars continues to issue bulletins on the lower Cryptogams. * The

"Algae of the Loktak Lake", Manipur, Assam, by P. Brühl and Biswas contains descriptions with figures of 122 Indian species prepared from materials presented by the late Dr. N. Annandale, Other papers include "Indian Slime Fungi" by P. Briihl and J. "The Flora of the Salt Lakes" by K. Biswas and "On the occurrence of *Limnocharis Flava*, Linn, in Burma" by P. Briihl and S. Sen. Mr. Fischer has described 38 new species from South Tenesserim and genus from Lushai; Mr. Ridley 19 from the Malayan Peninsula.

Northern India.--Dr. B. Sahni of the University of has contributed to the Journal of the Indian Botanical of which he became the Chief Editor this year, an interesting account "The Floating Island and Vegetation of Khajiar, near Chamba in Nortli-West Himalayas". Bhagat Rain Vasisht has written an account on "The Comparative Anatomy of *Ophioglosum Aitckisoni*, d'Almeida and *Ophioglossum vulgatum*, Linn." One new species has been described from the North-West Himalayas.

Western India.—Dr. E. Blatter, C. McCann and T. S. Sabnis have contributed to the Journal of the Indian Botanical Society the first instalment of a series of lists on "The Flora of the Indus Delta." This is a valuable contribution to our knowledge of the flora of this region. Mr. T. F. R. d'Almeida has continued his work on ferns and described a new species *Nephrolepis pavcifrondosa.* Some notes on the structure of *Nymphaea pubescens* written by the same author are interesting. Professor S. L. Ajrekar, who is engaged on mycological research, has written a paper entitled "Observations on a disease of Jowar [*Sorghum vulgare*] caused by Sphacelia (conidial stage of Claviceps).

Southern India.—In Kew Mr. C. E. C. Fischer has been continuing his work on the completion of Gamble's "Flora of Madras". He has also published a note on the obscurities of *Pyreuaeantlia volubilis* H. at Wight. Burkill in the Kew Bulletin has a note on the inland occurrence of *Ipomea peo-carpae.* Two new species have been described from the area.

Botanical Survey of India.

During the year endeavours were made to revive the purely scientific activities of the Botanical Survey of India, which for a number of years have been almost in abeyance, through lack of funds and staff. Although for the greater part of the year the single Systematic Assistant was again acting as Curator of the Herbarium in the Royal Botanic Gardens, Sibpur, and the Director has to devote most of his time to administrative work, a good start in some directions was made by the end of the year.

The botanical laboratory at the Royal Botanic Gardens, Sibpur, was partially re-equipped for the identification and investigation of the lower

forms of plant life and research on Indian Mosses and Algu) was begun. The Cryptogamic Herbarium, in which some of the specimens are of considerable value, was in a state of confusion and is being re-arranged and re-housed. Professor Briihl of Calcutta University has undertaken the preparation of a " Census of Indian Mosses[3y] with a generic key and notes on their morphology and anatomy. This work, which will shortly be published in the Records of the Botanical Survey of India, will greatly facilitate the study of Indian Mosses. Considerable collections of Mosses were made in Sikkim and in Burma by the Director while on tour.

An excursion was made to the Chakaria Sundarbans in Chittagong, a mangrove area of interest, as its vegetation shows characters intermediate between those of the vegetation of the Sundarbans of the Gangetic Delta and of the mangroves of the Irrawaddy. An ecological study was also made of the Forests of the Kalimpong Forest Division in the District of Darjeeling. As the result of this work several papers are now in the Press and will shortly appear in the Records of the Botanical Survey.

In the Herbarium in addition to the routine identification of about 1,275 plants for correspondents in different parts of the Indian Empire, some 3,900 plants formerly collected by the writer in Chittagong and The Chittagong Hill Tracts districts of Eastern Bengal were classified and named. At the same time the preparation of a Catalogue of Chittagong Plants was begun.

The rate of growth of Cinchona and the production of bark and quinine per tree and per acre, a subject on which very little information is available, has also been a subject of research, the results of which will be ready for publication in the near future.

During the year 65B books and journals were added to the library and arrangements for the exchange of publications have been established with a number of botanical institutions in various parts of the world not already on our list. The Records of the Botanical Survey of India are in much demand not only in India but outside also and it will soon be necessary to increase the number of copies for distribution on exchange.

H. INDUSTRIAL SECTION, INDIAN MUSEUM.

The single gallery in the Indian Museum now utilised for the exhibition of the economic products of India—food stuffs, drugs, oils, dyes, fibres, gums, timbers, etc.,—usually with exhibits of the sources of the products as well, is inevitably much overcrowded. Not only is there no room foi[f] many products and processes of wide interest and importance, deserving of a place in the gallery, but also there is insufficient space for the labelling and proper display of those already included in the collections, With the annual a4dition of new specimens, the congestion

naturally becomes worse. An upper gallery now used as the office of the Botanical Survey of India would be available if room were found for the office elsewhere and it is hoped that it may be possible to do this during the ensuing year.

The investigation of medicinal plants and their products has received considerable attention and arrangements are being made for the collection and tabulation of the information already available, filed in the office of the Botanical Survey. The undertaking of a survey of the quantities of important medical plants to be found in different localities in certain provinces, the collection and investigation of plants which have a therapeutic value and the possibility of extending the cultivation of medicinal plants has been under consideration.

The Curator's time has been occupied chiefly with the ordinary routine work of the museum. As usual, information regarding the sources of supply of economic plants and their products was given to numerous correspondents and a considerable number of plants and plant products were identified on behalf of Government Departments and the general public. Seeds of various economic plants were sent to England, Italy, America and Russia for experimental purposes. The Curator toured in Behar, the United Provinces, Rajputana and in Bengal collecting about 500 specimens of which 486 were deposited in the gallery. A very good collection of minor forest products, most of which are of medicinal value, was obtained through the courtesy of the Officer-in-Charge of the Minor Forest Products Section of the Forest Research Institute at Dehra Dun. Among other new exhibits worthy of mention are wood carvings from Saharanpur, lint length charts and muslin cotton purchased from the Economic Botanist at Dacca and samples of silk cocoons and silk grown and manufactured at Bhagalpur.

The re-arrangement and over-hauling of the specimens in the gallery continued and over 3,000 labels were re-written, the descriptions being in many cases supplemented by coloured drawings which were prepared during the year. A considerable number of specimens were replaced by material obtained from the Royal Botanic Gaidens, Sibpur. In February 1927, exhibits illustrating the production and manufacture of cinchona and quinine were sent to the Calcutta Health Exhibition.

in. CINCHONA AND QUININE.

General*

It will not be out of place to summarise briefly the position in India at the present time as regards the production pf cinchona, a subject of paramount importance to a malaria-infested country.

Cinchona was introduced into India and plantations were started in the early sixties of the last century. Almost simultaneously the Dutch

began to plant in Java. In India over-production between 1880 and 1890 killed the industry, whereas the Dutch have continued to develop their industry till, with over 90 % of the world's output, they now control markets and prices.

Since 1916, India has been making a serious effort towards independence, at least as far as her own demands for quinine are concerned and, it is a sign of the times that other countries too are making endeavours in this direction. Russia talks of growing cinchona on the Black Sea Coast, France is considering how much of her cinchona requirements may be produced in her African colonies and Italy, whose estates in Java are approaching the harvesting stage, will shortly be independent of foreign quinine.

That there has actually been comparatively little advance in the extension of cinchona cultivation in India has been shown in the evidence given before the Royal Commission on Agriculture during its recent sittings. India remains in the position of being able to supply less than half of the Indian demand for quinine while the prospects are that in ten years' time her output may be even less than it is at present.

The failure to attain independence must be attributed to several causes, foremost perhaps the lack of centralisation, the need for which was first expressed by Sir David Prain thirty years ago. The absence of a central department entirely devoted to the carrying out of a definite cinchona policy has made it almost impossible for any great advance to be made.

It has now been proved by experience that however well-suited for cinchona a locality may appear to be, there may be unforeseen or unknown factors which render it quite unsuitable for this fastidious plant. The only safe method of testing the suitability of a locality is to plant experimentally. Small plots of 50 acres or even less will in three years' time indicate the capability of a soil. There is no doubt that much time has been wasted in India on large scale ventures in untried regions. Had a large number of small experiments been made in places which have been explored and are believed to be favourable to the growth of cinchona, there is little doubt that by now the production of quinine would have been sufficient to meet at least the Indian demand.

As a third reason the fact that no systematic research has been undertaken cannot be neglected. Our methods of cultivation have not been sufficiently improved. Although India and Java started with similar plants, the percentage of quinine in Javan bark is now much higher than in Indian. Every unit of increase in the percentage of quinine means an increase of about 20 per cent, in the total production and the percentage in Indian bark could undoubtedly be greatly increased by selection. We have made no sustained effort to shorten the rotation

period nor the period of ten or twenty years during which land is follow. is ed by the growing of a forest crop, before a second crop of cinchona or produced upon it. There are no recorded programmes for the futuie or Working Schemes for the existing plantations; ^re neither know n d attempt to obtain from them their maximum yield. Our planting an 'e harvesting are more or less haphazard. Under such conditions * in- cannot look for a sustained annual yield. Economy in European trai t a ed staff is very largely responsible for these defects, for withon specialized knowledge of horticulture such problems cannot be tackled.

Re-organisation is needed and ought not to be delayed. If accom e plished soon, there need be no fear of a decreased production, rather w le may confidently expect that India with her vast resources will be ab ut not only to supply her own requirements of cinchona, and quinine & also to aid in supplying the needs of less fortunate parts of the Ee mpir.

Departmental Operations.

Exploration for land suitable for cinchona was continued in Burma by Mr. P. T. Russell, Superintendent of Cinchona Cultivation in Burma, who after covering a considerable area with negative results* reported favourably on a locality situated near Mogok in the Katha District. This area was visited later by the Director. It is certainly a locality in which the prospects qf growing cinchona with success are good but there are certain known adverse ecological factors which make it advisable to plant experimentally before attempting operations on « large scale.

The Director also visited the Anamallais where the Madras Govern* ment have started planting. There is a large stretch of Reserved Forest here which to all appearance seems very suitable for Cinchona. There has however been a number of casualties so that here too, we must await the result of experiments before a definite pronouncement as to the fitness of this area can be made.

In Merguij weather conditions were more favourable than hitherto experienced. Rainfall was 116·19 inches and for the first time in the experience of the plantation, there was neither a severe drought nor a deluge.

The equable seasuu lias resulted in a better appearance and somewhat lower mortality in the 146 acres planted during the year. The plants, however, have had the benefit of a thick covering of shade as seeds of ***Cajanus indica*** **and** ***Crotalaria striata*** **were sown thickly in the area.** Both these species have proved themselves useful shade plants making a growth of 6 to 8 feet in one year and giving just the required amount of shade to cinchona in its earliest years of growth. For the recently planted area, however, a specially favourable site was selected on a north

to north-east slope, protected from the south-west winds, less directly exposed to the fierce sun and on steeper ground than the areas formerly planted. Such favourable sites are not easily found. The plants on this area did not, however, escape the ravages of disease. In common with the rest of the plantation, they were badly attacked with "pink disease", *Cortiaem salmonicolor,* while altogether over 21.000 plants were killed by < canker' while many more were affected with the disease. The aspect of the older blocks cannot be said to be satisfactory. The original area planted in 1923-24 on newly cleared soil stood fairly well but the area planted in the subsequent year shows a very large percentage of vacancies. The experiment has gone far enough to prove that contrary to expectations, even though the altitude is low, *Cinchona succirubra* is the least suitable species for planting in Lower Burma. The next least suitable species is the Cinchona hybrid *{Ledgeriana succirnbra)* while the least unsuitable species is *Cinchona Ledgeriana.* It has also been shown that it is almost hopeless to attempt planting except on newly cleared land.

The greatest enemy of Cinchona in Mergui is undoubtedly the very hot sun which is responsible for more deaths than insect pests and fungi. Hitherto the only shade tree used has been *Erythrina indica* which was planted just as much for a green manure as for a shade plant and gave little protection from the sun. Experiments have been made with a number of other species during the year. *Acrocarpns fraarinifolin** and *Leucaena glauca* have not done well but fair success has been obtained with *Grevillea robusta* which germinates profusely. By far the best species, however, in *GUricidia metadata* and 50 acres have now been planted with it.

Mr. Russell has spared no effort to make the plantation a success and has had to work under considerable difficulties.

The labour force was augmented by the addition of 2(J0 Nepalese coolies in March, 1926. These with a certain number of old coolies provided an adequate labour force for the plantation and the health of the labour was on the whole good.

Cinchona bath imported from Java.—During the year 272, 773-17 lbs. of bark were received from Java of which 143,974*27 lbs. were sent to the Bengal Government Factory at Mungpoo and 128,798*90 lbs. to the Madras Government Factory at Naduvattam.

Cinchona bark from the Mergui plantation.—During the year 18,965 lbs. of bark were collected from trees of all ages of which 2,765 lbs. were sent to Mungpoo Factory for manufacture.

Manufacture of Quinine.—At Mungpoo Factory 5.43,714 lbs. of bark were worked yielding 28,529 lbs. of Quinine Sulphate and 8,506^1*. of

Cinchona Febrifuge. At Naduvattaro Factory 300,544 lbs. were worked yielding 10,472 lbs. 10 *m* of Quinine Sulphate and 3,538 lbs. of Cinchona Febrifuge.

Stock of Qninine.-ne total stock in hand on 31»t March, *19i1*, amounted to 857,764-70 lbs. of which 100,421-88 lbs. were held at the Indian Museum in 3,103 original cases', 233,725-74 lbs. at the Mungpoo Factory and 23,617-09 lbs. at the Naduvattan, Factory.

As regards the disposal of the war-time Quinine referred to in last year's report, which has lost weight by evaporation of its water of crystallisation, it has now been decided by the Government of India to convert the stock into tablets. The Government of Bengal has install at Mungpoo Factory now an up-to-date plant for the manufacture of teblets and they have agreed to take up this work on behalf of the Gov e t of India. mlyTl9 28 **«*«** 'hat a beginning will be made

/HH *of Qninine.-Dnmig* the year 16,670-42 lbs. of Quinine Sulphate were issued against 13,999-15 lbs. during the previous year, an increase of 2,680 lbs. due mainly to increased consumption in the United P

S w !' I ; n t f P w » ^ 2,397 lbs., Baluchistan 564 lbs., North-Wat Fronfaer 145 lbs., Rajputana and Central India 956 lbs., Kashmir 177 lbs., Delhi Province 35 lbs, and Hyderabad in Sind 44 lbs.

Cinchona /Wn/^.-During the year under review 8,506 lbs. wen' manufactured at Mungpoo and 3,526 lbs. at Naduvattam from the Java •ark. lhe quantises sold by the Governments of Bengal and Madras duri T ^ ^ J T WCre *1M%* lbs> and 2,000 Ibs - respectively. The total ril^tn ruge on e 31st MarCh, 19E7, TM° unt«lto '0,4891bs. of wh.ch 4,743 lbs. were held at Mungpoo and 5,746 lbs. at Naduvattam.

J ' 6d ^ ^ ? 1 ^ continues and _ stated in " y^-

i«Frt, allotment d! flu. drug was made to each province in proportion t» ts consumption of Qumine Sulphate. 5,901 lbs. of Febrifuge were issued to the India area, almost half this quantity to the Pun jab alone. The Bengal Jail Department continues to issue this drug as well as other minor products to all areas in the Northern India.

Revenue by the Sale of Quinine.—"Che total revenue during 1926-27 am to TheT^n th BS- 3>o^67 againS* RS- 3,9^15 for the previous year. The fell in the price of Quinine by Rs. 6 in the 1b. which took place a m f begi of the year is re8 pDsible * the **TM«ii tie 1.. T SS*wl7*? Stts d R 1927 loca T T W W W B an 1,17,26 was * cash sates to Government Departments.

The reve belonging teT ^ ^ inClUde ^ * pi0Ceeds oi Ci h « na ^brifnge to the Government of India and sold by the Governments of

Madras and Bengal. These are. credited in the first instance to the local Governments and finally adjusted by deduction from the cost of extraction of Quinine payable to them. During 1926-27 Madras sold 2,000 lbs. of India Febrifuge and the cost thereof, *viz.*, Rs. 18,^00, creditable to the Government of India, has been adjusted by deducting the amount from the cost of extraction of Quinine during the year. Bengal has sold 7,842 lbs. of India Febrifuge and therefore a further credit of Rs. 7O,57S is due to the Government of India, which, however, will be adjusted by deducting this sum from the cost of extraction of Quinine due to Bengal.

IV. PUBLICATIONS.

During the year the following parts of the Records of the Botanical Survey of India appeared :—Vol. IX No. 4, "Fresh Water Algae from India" by Dr. Nellie Carter and Vol. IX No. 5, by Professor H. N. Dixon, "Mosses collected in Gilgit " etc., by J. Garrett and W. Lillie.

V. EXPENDITURE.

The original budget allotment for the year was Rs. 7,09,000 from which Hs. 2,53,300 were surrendered reducing it to Rs. 4,55,700. The surrender was distributed as follows: *(i)* From Botanical Survey Rs. 1,500 under Travelling Allowance—voted, *(ii)* from Cinchona Rs. 2,51,800, *viz., (a)* under Purchase of Cinchona bark Rs. J,80,000, («) under Freight and other Charges Rs. 18,300, *(c)* under Charges for Extraction of Quinine Rs. 51,000 and *(0)* under Travelling Allowance vuted Rs. 2,500. Additional allotments necessary to meet excess expenditure during the year were Rs. 8,500 for the Botanical Survey of India proper and for Cinchona Rs. 3,300 all under Travelling Allowance non-voted. The reduced grant was thus restored to Rs. 4,61,500 of which Rs. 58,530 was for the Botanical Survey of India proper including the Industrial Section, Indian Museum, and Rs. 4,02,970 for the Cinchona Department. The total saving in the whole Botanical Survey of India Department amounted to Rs. 7*2,691 due chiefly to the purchase of Cinchona bark from Java and savings on extraction charges.

VL STAFF.

Mr. C. C. Calder held charge as Director up to 20th May 19SJti, whei lie vent on leave. Dr. J. M. Cowan of the Indian Forest Service held charge as Director from 12th July till the end of the year. During th< intervening period Mr. G. E. Shaw, Quinologist to the Government o· Bengal and Mr. S. N. Bal, Curator of the Industrial Section, Indiai Museum, acted as Director, the former from 21st May to 4th Jr4y anc

the latter from 5tlitollth July. Mr. V. Narayauswami was A.s l-ant for Systematic Work and officiated as Curator of the Herbarium, Koyal Botanic Gardens, Sibpur, till 31et January and went on leave from 28th February 1927. Mr. U. C. Pal waft Assistant Curator, Industrial Section, Indian Museum, and Babu B. K. Das, Head Clerk, throughout the year.

On the Cinchona Plantation Mr. P. T. Russell was Superintendent of Cinchona Cultivation, Burma, except from 1st May to 30th November, 1926, when he was on leave. During his absence Mr. A. B»yb°n> Assistant Superintendent, acted as Superintendent and Maung S.''ie> Overseer, officiated as Assistant Superintendent and Chandra Lall as Overseer. The Assistant Superintendent Mr. Braybon, whose services were transferred here from the Bengal Gardeners' Service in 1923, did not fin" the conditions of service suitable and went on long leave from 1'tli March 1927, preparatory to retirement rendering altogether over 5 years service under both Governments.

All members of the staff have worked satisfactorily.

J. M. COWAN,

Director, Botanical Survey of India (Off<j)

MG1PC—82—lV-3-lJ—10-11-27—450.

Report of the Botanical Survey of India for 1927-28.

I. Systematic—A feature of the year has been the resumption,. So far as funds and pressure of work at headquarters would permit, of field survey work and a continuance of this activity is also to be recorded at the time of writing this. This resumption has been rendered possible by the filling of the posts of Curator of the Herbarium and Second Assistant for systematic work and the setting free of Assistants for systematic work to perform the duties properly pertaining to their appointments. Thus all three subordinate officers have recently had a period of field work. Mr. Srinivasan was deputed to the Garo Hills, Assam, from which he has brought back a carefully preserved and representative collection of some 1,000 specimens comprising about 250 species. The main work of identification on this collection has already been finished, but more detailed study is necessary to establish new records or other interesting botanical features not already recorded. Mr. Srinivasan, whose interest in Photography gives him a*i additional qualification for ecological work, made a special study of the Nullah vegetation near the village of Tura in the Garo Hill District and he i* being encouraged to specialise in this branch of field work.

During the year under review the work of the First Systematic Assistant was confined to headquarters where in addition to the normal routine of identification and incorporation and dealing with botanical questions from a wide circle of correspondents he brought to near completion his examination of the exact geographical distribution of the Malayan collectors Wray, Kunstler and Scortechini. A paper comprising the results of this examination is in course of preparation and has been promised place in the Journal of the Asiatic Society of Bengal where the materials for the Malayan Peninsula flora are already published.

In addition to his routine duties as Curator of the Herbarium Mr. Biswas continues his algblogical studies started in the Botanical Laboratory, Ballygunge. An analysis of the Algal Flora of the Chilka Lake and a paper on some fresh water algsB of the Malay Peninsula represent his chief* investigations in this line during the year. He has also had some of the Indian Avicennias under investigation.

In order to provide more space for the ever increasing collections of higher plants the cabinets containing the Mosses, Liverworts, Algee a&d Fungi have been relieved of their contents which have been removed to a spare room adjoining the garden office but even with the additional

two cabinets provided sp expedient of this removal provides the chance of incorporating sheets without crushing.

II. Botanical Divisions.—A very considerable amount of taxonomic work especially on t Indian Empire is due for record. Mmia, ^ i b, Geddes", Parkinson, Fischer and Dandy have numerous ues Ptions new OT rare plants * various contributions to the ew Bulle... Kew has resulted in the A 1 ^ *' Parkinson's Fesencc at lants some of which have CntlCaI f Xaminat ^ of a number of Burmese p has had the very difficur ^ genera nW *o 8cience - *• C. E. C. Fischer Asteria-stigma un xaminatio n c Hydmcar ^' *Taraktogenos* and values of their seeds. The affi ... * " 1 ** cn q«mesinto the oi y obvious pointe 0 ^mblance, are recognised by the which have man three are named • ..alaw ' with or without q ? f y ir Suffix A new part of ^ f. Craib's Flora Siamensis has appeared conte ining the families Con*** cese and L uminosæ.

in descriptions of new ... plants fa» South India interest on of this fc " represented ^ a paper in the Journal of the Indian Botanical ... on the original home of the Sandal wood tree, and an investi ... t h e t d ... axonom an nomenclature and the allied £lT ... leada on to a discussion of «i» distribution of S lum in India. Mr. Fischer seems to doubt "^* this important t S is truly indigenous With " and bases *". doub* o* the fact that B « U invariably occurs in altho ^ India in * my to ... l I S hd on the fact that the tree is very h* ruj indeed difficult to kill except in the ?oUnS state. ««d although it reproduces readily by seed it has ... d S iing Ularlyi « « P -W « with the truly indig e C ... as the influence of »u re<*des . There can be uP doubt, hoLe? that if non-indigenous tUe date of * arrival here is Jo* tn the ats^ Past, and the sancti ty of *" tree to Mians and its ** in their religious rites also would Point to its being no recent introduction.

Amongst other contributions to b0tanical a «'* ™ conned with the Peninsular flora may be mentioned Liv0ra>8 ^tablishment of a Be^ family Aeginetiaceæ, Petch's revision of Ceylon Fungi and Blatter'. list of Orchi' with some new ... The most ... nt production T 6 8 frOffi * e ^ ^ mountain9, of the year I 2c - C. Fischer's lo ... J M t after the *" a continuation of "the £e Mr. Gamble's '* of k** The families ... *^Xyridaceie are dealt with and the work follows the style of the earlier p

The botanical results of the recent effort on Mount Everest are represented by Mr. Dunn's description of several new high altitude

plants and D*. Bruhl's guide to the orchids of Sikkiin will supply a long felt want to those to whoin the variety and beauty of these Hiimalayan plants makes a special appeal. The text is arranged on tlie key system to allow of rapid and 6asy determination and the elimination of technical terms will make for the popularity of the work.

Dr. Cowan's analysis of the vegetation of Kalimpong, being an ecological account of the Forest Division formerly under his change, will shortly issue from the Press. It will form an excellent cdimp&hion to his Trees of Northern Bengal, a revision of the list of trees, shrubs and climbers found in the Darjeeling District published' by the late Mr. J. S. Gamble half a century ago. The native names, always a puzzle to those unacquainted with the facility a Lepcha or Nepali collector has m supplying them, are carefully collected and will prove a help and encoutagement to amateur botanists amongst the planting community of the district.

, Father Blatter in collaboration with Messrs. McCann and Sabhis continues his study of the Flora of the Indus Delta. Messrs. Burns and Kulkarni have an interesting paper on a line survey of grass land with reference mainly to rainfall between Sirur and Lonavla in the Bombay Presidency. Mr. R. N. Parker, I.F.S., has taken charge of the completion of the late Mr. Duthie's Flora of the Upper Gangetic -Plain and the issue of another part of this work is to be expected soon. The Indian Forest record contains an article on the Himalayan silver nrs and spru6e& by the same author.

Father Blatter has given us the first of what may be a two volume work of a systematic arrangement of the whole of the Kashmir flowers and another series of Mr. B. 0. Coventry's wild flowers of Kashmir continues in an attractive manner the autochrome pictures of the commoner and more beautiful plants found in this part of India.

Of general botanical interest is the approaching completion by Prof. Martelh of the work on Asiatic Palms left by the late Signor Beccari. With the issue of this volume of the Annals the way is cledT for the deferred publication of Sir David Prain and Mr. Burkill's monograph of the genus Dioscorea. A short paper in the literature of tlie year deals with some members of the genus from areas just east of India bii^ the monograph itself will bring[1] together in a way attempted for few groups of plants a knowledge resulting from a life'long study of all tlie[1] Dioscoreas of the old world excluding Africa and give geographic information such as has never before Been collected for any eastern gehtarf of plants. Several parts of the Fflanzenierch dealing witK groups of *ne CrucifeiaB and Malphigiacese have appeared since last taken note of in these reports. For the preparation of these, Indian material has keen under examination by the authors. All available information concerning the Mosses of India and adjacent areas has been brought

together by Dr. Bruhl. The manuscript is ready for the Press but awaits its turn when standing work already in type issues.

m. Industrial Section.-Some 400 specimens were collected for the Gallery during the year under report. The collection was made by the Curator, when he was on tour in Central India and the Bombay Presidency. Most of the specimens were oil seeds, industrial oils and medicinal plants whilst some were gums and resins.

The re-arrangement and overhauling of the specimens in the Gallery continued during the year and about 5,000 labels were re-written, the descriptions being in many cases supplemented by coloured drawings of plants which were prepared during the year.

A comprehensive exhibit of cinchona and its products explaining the details of the manufacture of quinine and other salts was made at the 7th Congress of the Far Eastern Association of Tropical Medicine, held at the Calcutta School of Tropical Medicine in December 1927. The exhibit was the most complete of its kind ever put up in India and was highly appreciated by the large number of visitors who spent time over it.

Regarding the investigation of medicinal plants and their products, arrangements have been made for collection of plants and their information available in the Library and files of the department.

Information was supplied to various applicants in different parts of the world :—*Cannabis sativa, Cassia fistula, Cassia msiformis, Derris elliptica, Melia Azadirachta, Achras Sapota, Corchorus capsularis, Bonducella, Crotalaria juncea, Eriodendron anfractuosum, Gossypium sp., Caesalpinia digyna, Smilax sp., Artemisia sp., Trichosanthes dioica, Datura sp., Hibiscus sp., Linum usitatissimum, Leycesteria formosa, Strychnos Nux-vomica, Carthamus tinctoria,* Castor, Cannabis, *Cucumis sativus* and Croton Tiglium.

A series of public lectures illustrated by lantern slides during the autumn of 1927 on "Food and Medicinal Plants of India" was delivered by him in March 1928.

A Catalogue of medicinal plants and products exhibited in the public gallery. Most of the plants that are mentioned in the Catalogue have been drawn up and it is expected to be ready for the press shortly.

The Clerks for the Museum have been engaged in collecting together literature on methods of cultivation, distribution and sources of supply

of plants of medicinal importance, came to an end at the close of th6 yea* as in the writer's opinion work of this description is no substitute for a survey in the proper sense of the term, nor does it help much when the practical problems of distribution of medicinal plants, the times and places at which they can be exploited and questions of the best methods of cultivation come to be settled. Such work, if to result in the development of the medicinal resources of India, calls for the botanist and chemist in the field and in the experiment station for the services of the qualified horticulturist. Whilst, therefore, the accumulated experience scattered in literature gains in being drawn together by the ledgering clerk this work of itself does nothing to forward the development of such plant resources. It is felt that in the entertainment of ledgering clerks lies the danger of side tracting the real work which must be done if these latent resources are to be developed as they can and should be.

IV. Cinchona and Quinine.—*Bark.* During the year 307,059 lbs. of bark were received from Java, of which 154,540 lbs. went to Bengal and 152,518 lbs. to Madras. The Government of India's own plantations in Burma supplied 57,920 lbs. to Bengal, of which 48,261 lbs. were harvested during the year. There was a small stock of 6,541 lbs. left in plantation store as a carry over. This together with 462,770 lbs. Java bark and 19,979 lbs. Burma bark at Mungpoo gave a total carry over of 489,290 lbs. All outside barks going to Madras were worked up there during the year. At Mungpoo 285,831 lbs. of India bark were worked up to yield 13,195-5 lbs. quinine sulphate and 4,169 lbs. Cinchona febrifuge and at Naduvattam 165,774 lbs. Java bark yielded 8,772 lbs. quinine sulphate and 3,078 lbs. Cinchona febrifuge.

Products.—The total Government of India stock of bought and extracted products at the end of the year was *(a)* quinine sulphate 361,495 lbs. comprising 90,016 lbs. held at the Indian Museum, 241,576 lbs. at Mungpoo and 29,904 lbs. at Naduvattam, and (6) Cinchona febri fuge 17,736 lbs., of which 8,912 lbs. were held at Mungpoo and 8,824 lbs. at Naduvattam.

Issues of quinine sulphate during the year amounted to 18,251 lbs. against 16,679 of the previous year. The increase is due to an outlet for Government of India stock in Madras which took 2,500 lbs. The issues were distributed as follows:—Punjab 12,164 lbs., United Provinces 1,988 lbs., Baluchistan 322 lbs., North West Frontier 259 lbs., Rajputana and Central India 906 lbs., Kashmir 86 lbs., Delhi Province 26 lbs. and Madras Cinchona Department for distribution in their area 2,500 lbs. There has been a decrease in the issues of febrifuge 3,833 lbs. this year against 5,961 lbs. last. The reason for this fall in popularity of the cheaper drug is not clear. Combined stocks have mounted to 17,786 lbsL or sufficient for over a year's normal distribution.

to i " f^e P4st the ^^ Jafl s Department distributed febrifuge
as £n ! T" Thei6 WM no di8c ribntion of India owned febrifuge
Bengal stocks were more than sufficient to meet all demands.

amounted to fS, of ?Miw ^-The actual receipts during 1927-28
Rs. 3,08,467 o 3>35>125 by * "* of «*» ^ sulphate «*»
demand from L PIeV10U8 yeOT The mcrease * due to an abnormal
Rs. 98,089 ^ on aCo0Unt Of short 8tock *«e. Of the receipts
D p 'en. 7C C ?7 .J Ca8h "feB ^ ^ ^S7 .036 b7 «edit to Government
m ! n f? ipal mer Udmg p*71"611*8 ^ Bank ^ t s in the case of Govern-
S d e the roce 2 ^ *he United Provinces Th e revenue does not
Se Wf1lP P 8 of Governmen t of India Cinchona febrifuge sold by
of J£i flaw on of » ? ta c ^ s e are adj^ted by deduction from the cost
W t uring to*8 from India bark Pay able to the Local Govern-
ments but a balance o 28 no India febrifuse was •« fe y other Govern,
from the 1926-27 accoun 18>030 remained for credit to Central revenues
Rs. 3,53,155. t bringing the total P ^ ^ fOT the yeaI *"

Plantations.—A somewhat pess^ t i c view was taken of these early in the year, but when facts and figures "" M be Miy g one ^ tt*86 proved cause for hope and further effort rather ** « ^ for des p on dency and a closing own o certain depend i . f the Venture Succ ^ i» this area will for distribution of on ^ 8mtability of the 8eason and es peoiaU y on *. bilities of the ramfaU "* H WM, P ^ P 8 , has ty to jJdge the possi; from a shortag C Whole ^ one year>8 ^tension fhat suffered ditions. 0Ur Combine(i with unfavourable weather con-

Experimental work haa now reached a stage wheo one can speak more freely. The Mergui reserve will never in the writer's opinion be free of difficulty for the Cinchona planter. Large harvests such as one gets from the Java plantations will never be reaped from it. The problems of cultivation here are quite different from what they are in Java and equally different from what they are in Bengal, but there are many areas in the Bengal plantations that have t i n n e d and paid under a poorer crop of Cinchona that is the average cro p in M ^. On a of comparison with an area in which Cinchona cultivation has won through to success the rgui " " cannot be doubted ^^ The greatest difficulty lies ! m bringing the plants through the dry season of Novem £ £ .Ss ^ e normally V ^ ^ g P rec ^ on occurs anxiety i» largely allayed. yeM ^ 8WBl ^ ** Peters

exctiL P al TSiLt r0Ugh Cultivation «* -*«» ^ains for the into theTiri ^ an7r on f^ **" Cinchona very successfully ing the beTt S t ^L t X ^ JT " ^ it8eU ^ one of find, lo retam fw mowture and keep the soil cool by »

catch crop in the first months of the year. In Mergui the rotation period will be shorter than it is in any of the Indian or Java areas, but even at early ages an extremely encouraging factor is the high percentage quinine content obtained. When one gets bark of an average of over 6 per cett., as recent analyses show the Mergui bark to be, every endeavour should be made to overcome the remaining difficulties to the successful raising of the crop. Under Mr. Russell's competent management the difficulties of the monsoon period may be said to be already successfully met and if the careful application of knowledge gained by experiment, scientific planting and industry will solve or lessen the remaining difficulties then Cinchona is in safe keeping. But it is not *« to leave a venture of this magnitude and importance to. th<> vagaries o* climate. Prudence dictates that the risk should be divided. An «ea in Upper Burma which has many obvious factors to recommend it to the Cinchona planter awaits a stable policy on the part of Government •«d should be relieving Mergui of its sole responsibility for future India Wk supplies.

Difficulties in the cultivation of this exotic will be present wherever one tries it but this is the better reason why attempts should now be made to find and prove new areas. Th* is the essence of the advice given *>y the Royal Commission on Agriculture. It is advice based on the evidence of many distinguished men who have had much to do with Cinchona in its earlier history and no one, who now has to carry on the work kgun by these pioneers, and has knowledge of the scourge Malariaisin this country and of the need for an ample and sustained suppty of the means to combat it, doubts the soundness of the Commission s advice.

V. Pinancial.-The total Budget allotment for the year was R*. M8.000 of which Rs. 58,000 (including Rs. 1,000 for English charge) were for the Botanical Survey proper and the Industrial Section of the Indian MuseuTTd is. 89,500 for Cinchona. Rs. 2,20,000 were provided for the purchase of Cinchona bark from Java. The total expenditure was Rs 4 48615 *viz.*, Botanical Survey proper Rs. 53,682 and Cinchona Rs. 3,94,933 leaving a saving of Rs. 98,885. Of this saving a surrender of Rs. 90,000 could not be acc

The saving fell under purchase of bark Rs. A·Rtftnt Quinine Rs. 45,104, Plantation and other charges Bj.. 11,467, Assistant Superintendents pay Rs. 5,142 and T. A. and other Miscellaneous heads Rs. 7,347.

VI. Steff.-Mr. C. C. Calder returned from leave on 21st Novem- S 1927, and resumed charge as Director, J * Cowan, M.A., D.Sc, officiated a, Director from 1st April to 20th November 1927. Mr. S. N. Bal, M.Sc., Ph.C., was Curai^^oiE the Industrial Section, Indian Museum, throughout the year· Mr. V· Narayanaswami, M.A., First Systematic Assistant, returned from leave on

2nd November 1927. Mr. T. D. Srinivasan, M.A., was appointed as Second Systematic Assistant from 1st November 1927. Mr. U. Pai, was Assistant Curator, Industrial Section, Indian Museum, throughout the year and held charge of the Government of India Store in the Indian Museum except for two months in December 1927 and January 1928 when Mr. R. K. Das, Head Clerk, acted for him. Mr. S. B. Banerji acted as Head Clerk during this period.

On the Cinchona Plantation, Mergui, Mr. P. T. Russell held charge as Superintendent, Cinchona Cultivation, Burma, throughout the year. The post of the Assistant Superintendent remained vacant throughout the year. Maung Sine was Overseer throughout the year.

All the members of the staff worked satisfactorily.

C. C. CALDEB,

Director, Botanical Survey of India.

MGIPC—M—II1-7-8-1-3-20-.452.

Report of the Botanical Survey of India for 1928-29.

I. Syste

are cone ?atiC ~~More settled couditions 80 far as staS aild finances barters an rf G rosulfcGd in considerable progress being made at Head- and add r? ^ co^ec ti°ns in several directions have been improved both at 1 "^Wo mem^ers °f ^he s^a^ were on ou^ survey work, and thei rpfi ?f ns and in the Museum the collections have been enriched by ^0 f th6ir Iab0ursiathefieId .

a ra yanaswami has added to the collections from North Travan- The to\,y fairly extensive tour in the district north of the Kallar River. c*act d >r W^S somcw^at m arred by difficult weather conditions and the strictlv lr^Ct^on Previously mapped out could not on this account be Present ^thered *°. Part of the route lay within country already re- all m ^ by collections in the Herbarium, but part was new, and in rich fi arava ftaswami has brought back in a well preserved state with have a n o*eS a c°N ection of some thousand specimens. Some of these pte8 J ne *° Kew in connection with work on the Flora of Madras at jj u*der preparation there.

out al Sri*Vasan, Second Assistant, worked at Headquarters through- year except for some field work in the neighbourhood of Madras during short periods of leave. At Headquarters he has been engaged in the e ^mination of his Garo Hill collections and in a study of the aims and metl*ods of ecological research. As opportunity for field work increases is proposed to allow the different assistants to specialise ia Mr g researcl1 for which they show aptitude and inclination, and sie *b rimvasan has spent part of the year befitting himself by study for to p ranch of botanical research—Ecology—that he wishes ultimately atud Urs ue. As the groundwork of this study is best laid in a general goin y °* systematic botany, Mr. Srinivasan has spent part of the year th8 over the herbarium collections in preparation and training for ^ toore necessary field work that has to follow. He has also had 8ele e^exai nination the specimens last collected in the Garo Hills, a district |or ^d for his work because believed to furnish problems of interest of u ecol°gist and because situated within comparatively easy reach 01 Head quarters.

for^? Curator of the Herbarium, Mr. K. P. Biswas, in addition to his of tf! r? Utinc work> has taken for immediate study the distribution ? wild Conifers in the Indian Empire, and has been called in to examine and report on the Calcutta water filter works. This results from

th I I c t ^ Bls T has done o thc A% TM of this p ^ of the world.
H I t ...on ... the Freshwater A...e of Manipur, Assam and of the Chilka Lake furnish ^ ^ for ^ ^ forthcomming p apers.

II. ... Wvision M.-A considerable amount of t^ ...nomic work J ^ ? ... ^ 1 ...insular bdk Tf 7, m ConneCtion with «* *» of Burma and P» the flora I? ...or reCOrd, Prof_ Craib continues his contributions • new iL c T Wlth de8cri P ^ of an unusually large number d parts of B i M r ong8t *• *"»•*»» of Dr. Kerr. From nB^ ...ecies of ...r, F f Her *" de8cribed - ^ongst others, two new » genus Hydnocarpu s' the outcome, possibly, of his examination of the ...us and as a source 0 ^ ^ ^ ^ ^ ^ New species of O * and Mr. *Dracontomelum* are now hoim *« *• ^ - " t a ba8in and Parkinson has an ampUfied descri P ti on of a hitherto imperfectly . known Bamboo, *Arundinaria* w flWfai^i; fe* i^^it to *knowledge* * Mr. Gamble's monograph of *• ««"* " *•» A» naIs of ^e Gardett. The material for this last has ^ c oUected in the Dawna Hills, Tenasserim and in other parts of From Mr. Parkinson's collections from the same area has been a new Legume, *Gymnocladus Burmanicus*, of which a complete ...tion has been given in a running list of contributions to the Flora of this part of the Empire.

...ular ...it of their *mtJL* • -T' J- L Wfl0 8« and Mrs. Parry and the fr r rsT ^ ... ^^ * the dc3cri P ti on for.the Jt time of »o*0 ...s amongst which we find a new *Gaertnera* and Be... bearing the name o... 7 o f th6ir " ^ «»»w *StroMarUhes*, *Didymocarpus* and JTIMMMA, named ^ honour of their collectors.

An examination of the Asiatic material of Gentianaceae by JJ...quand has resulted in the description of * * « a number of new ^ hailing from India or its borders. The explorations in Yunan, ...chuan, Tibet and Burma of Messrs. Forrest and Kingdom Ward have been responsible for most of these alpine additions.

Per
c0U^ w S f ^ Mr. C. E. C. Fischer ...8 a new orchid *Zeuxine* ... and a new ardd /i ... aud Halber« * «• High Wavy mountains new aroid Po^Ao* *ornatus* from amongst Barber's Malabar collections-

A co...uation of the Flora of Madras, Part VIII by the same author, dealing S ... the families Ulm... e period under ... w alt ou refe ^ *o b "•* year>s "Port-

Mr T n. ?*
the Journal oi ^»ia A. Ch*ro J>^ notes from Saharanpur, published * ZIT ^^?*"** to ^^? Societ y' Socit ^ds d his hi further observ... original papers in the tt T ked ^P of Planta, and ^eral other school of Indian w^ T... ...ing good wor pro Vo a . «"*« a «d industrious Indian ... ancient branches botany.

A co

^ PS^SJIII Blatter, Sabnis and McCann Flora of the Indus

Of thi a delta with i.at t0 an intereBting comparison of the vegetation Position of thp'.'A • of the Sundribuns- An examination of the oom- tIus ion that t^ g T nOUS floraS of the two areas bears the interesting con- E<*tern delta ur 6 u UttIe 8«>™d for the hitherto accepted belief that the autio rs see 1...e 8Ur Passes the western in the richness of its flora. The of the IndR neua reaSon foraSsuming that> wte* better known, the Flora dribuns. One W_oUldhaVethou ghtthatthe y ^und of sp Sundribuns area, the dumping plain and th ^ 8 brou 8llt from such different regions as the Gangetic ^taess f^n ^Eastern Himalaya Chinese Burma divide must surpass in an expk na.io n of elative Sundribuns poverty in thfi belief that the soil immigr e^co^ditio113 of the Ganges mouth have not been favourable to tw0 r e • ut Jt seems Possible that the geographical limits put to the result /1On8 ma^ re(lu^re rev is i on and a different comparison might Indus D a freer interpretation of what area botanically constitutes the j^ct ®™i what thfe Sundribuns. A comparison of such areas in res- Tf jy of the richness of their floras would seem to postulate a complex °ther atlo and eda Ptic likes ^ *^e two- To secur« these likes one or *tales ar t a may re(luire ul timately to be enlarged or reduced. Never- J[Colo S> the Paper is full of rich material and will suggest to the interested S^t other problems and lines of similar work.

Be Lo .^ Floras have welcome and useful additions in Father Blatter's tiy autifu* lowers of Kashmir and Mr. Coventry's second series of attrac- ® autoc hrome pictures of its wild flowers. It is to be hoped that the exPen6 of ^ ^ast wiU not bring its Pro duction to a premature close and (* amo ngst India's wealthy patrons of the arts and sciences may be tio pund someone wi th the means and will to help and sufficient appreciate \° ^ ^e artistic an< l scientific to see that such useful and beautiful ork fon as a suitable object for support.

III. ^ ^ W a l Sastion.—More than 500 specimens have been collected by the Curator during his tour in the Punjab and the Kashmir hills; aQ d of these some 400 specimens have been registered for exhibit- **8 ^ the GaHery. Of this collection, the more important are specimens of Wa^Ut Wood carved work8* Papier-mache work and a full exhibit of Match manufacture from the indigenous woods of *Bombax malabaricum*, *Populus nigra* and *Pinus excelsa* showing all stages of manufacture from the raw material to the finished splints and match boxes. The other collections were agricultural products in the shape of oilseeds and other s,?eds, etc., as*well as a good collection of crude drugs of the Kashmir hill9» a*id a number of Botanical specimens of medicinal and other econo- *lc Plants.

The re-arrangement and the overhauling of specimens continued during the year and about 6,000 labels were re-written. As usual a number of herbarium specimens exhibited in the Gallery were replaced by coloured drawings of plants prepared during the year. A new show-case has been added to the Gallery to take in the more important Industrial oils exhibit. A comprehensive exhibit of Cinchona and its Products explaining all the details of the manufacture of quinine and other salts was presented to the Ross Experimental station for Malaria Survey at Karnal. Another set of exhibits of Cinchona and its products was placed on view to the Public in the Health Welfare Exhibition held in Calcutta in March 1929. A number of specimens of medicinal and industrial value were presented to the Bengal Allen Medical College and to the Registrar, Calcutta University, for their Commerce Department Museum.

Information regarding the sources of supply of Economic plants and their products was given to numerous correspondents both from India and abroad, and a considerable number of plants and plant products were identified on behalf of Government Departments and the general public. Information on or material of the following was supplied to various applicants in different parts of the world:—

Ephedra vulgaris, Santalum album, Acorus Calamus, Dalbergia Sissoo, Derris sp., Carica Papaya, Daivca cannafnrdt Podophyilum Emodi, Terminalia Chebula, CMoronjlon Switenia, Hydnocarpus anthelminticus, Taraktogenos Kurzii, Strychnos tackys' Jatamansi, Musa textilis, Calamus sp., &c. Catechu, Aristolochia sp., Millingtonia hortensis, Papaver somniferum, Swietenia Mahagoni, Ilex paraguayensis, Boehmeria nivea, Psychotria Ipecacuanha, Aconitum heterophyUum, Papaver somniferum, Holarrhena antidysenterica, Digitalis purpurea, Myristica sp., Datura sp., Aleurites Fordii, Hordeum vulgare,

The catalogue of the medicinal plants already in manuscript is to be printed and the materials for a catalogue of Food, Spice and fodder plants are almost ready. Materials for a catalogue of Timber plants exhibited in the Gallery are being drawn up.

IV. Cinchona and Quinine.—*Bark* During the year 21,571 lbs. of bark were received from Java of which 118,998 lbs. were sent to the Bengal Factory at Mungpoo and 95,573 lbs. to the Madras Factory at Naduvattam. The Government of India's own Plantation in Mergui District, Burma, had during the the year a stock of 116,129 lbs. of bark of which 109,588 lbs. were harvested and 6,541 lbs. carried over. From this stock 82,464 lbs. were sent to the Bengal Factory leaving a balance of 33,665 lbs. in the Plantation store as a carry over. At Mungpoo Factory out of the total stock of 684,209 lbs. of

bark of which 581,768 lbs. were Java and 102 441 lbs Burma 140,277 lbs. (58,91- lt Glance of L, J JaVa and 81,361 lbs,, Bbrma) were worked leaving a of 95,573 Vh 2 lbs* aSa Carry over, At Naduvattam Factory out *0*ked Ie J*Va bark received durin g the 7eSLT 78 >506 lbs_ were close of tlT*1115 a balance of 17,067 lbs_ as a carr 7 over_ Thus at the to 594 664. nT68* tbe t0tal stocJc of India Government bark amounted l7>067 IK com Prisin g Java bark held at Mungpoo 522,852 lbs. and lb8'. and at Naduvattam and Burma bark held at Mungpoo 21,080 5,417·5 at the Mergui plantation 33,665 lbs. At Mungpoo Factory Powde r lbs. of S uinine Sul Phate and 3,130 lbs.of Cinchona Febrifuge tam p Y616 obtained froni 1*0,277 lbs. of India bark. At Naduvat- Pebrif acto ^ 5,048 lbs* of Quinine Sulphate and 1,350 lbs. of CSncTionn -age Were obtained .from 78,506 lbs. of richer India bark.

Stock of Quinine.—The total Government of India stock of Quinine Sulphate at the lo P'^hased as such and extracted from Java and Burma bark 82,123°IL38 of the year was ^ Quinine Sulphate 339,826 lbs. comprising lbs lbs. held at Indian Museum, 242,111 lbs. at Mungpoo and 15,592 lbs. at ^aduvattam and (6) Cinchona Febrifuge 22,216 lbs. held 12,042 Mungpoo and 10,174 lbs. at Naduvattam.

Sale t^ ®*uinine*—During the year 32,134 lbs. of Quinine Sulphate were iss^ ^ast 18,251 lbs. in the previous year. The increase is due to t.... Madras Cinchona Department taking over 19,360 lbs. from India stock in Kth estos; ks sold to Madras the consumption in the India area comes to 12,^ lbs. during the year against 15,751 lbs. during the previous year to ^lng a decrease of 2,976 lbs. This decrease is mainly attributable s.l l ler consum Ption in the PTMjab which was 9,367 lbs. against 12,164 l*s- previously. The shares of the provinces and the Indian States In tine distriblltion were Punjab 9,367 lbs., United Provinces 1,792 lbs., Balu V c...st an 326 lbs-> North-West Frontier Province 274 lbs., Rajputana and n entr^ India 846 lbs*> Kastmir 44 lbs-» Dellli Province 125 lbs_ and Mad ras Cinchona Department 19,360 lbs.

During the year 4,458 lbs. of Cinchona Febrifuge powder were distributed in the India area against 3,833 lbs. in the previous year. The distrib Utl Oa , Was done by the Bengal Jails Department from the local Gov^ 1 Kent's stock. No stock of India Febrifuge was taken over by Bengal as tW, ha(j sufgcjent stoct of this product of their own for distribution.

Revenue by the Sale of Quinine—During 1928-29 the actual receipts amou^fT to Rs - 3,86,144 by the sale of 32,134 lbs. of Quinine Sulphate against £s 8i 3>35,125 in the previous year. The increase is due to an abnormal demand from ^adras- As stated above Madras Cinchona Department took over 19,360 lbs. from the India Government's stock at their

Factory for distribution in their own area and paid in part Rs. 1,50,000 cash and the balance Rs. 1^1,510 remained payable in 1929-30. 0* the receipts Rs. 2,38,503 were by cash sales and Rs. 1,47,641 by credit to Government Departments including payments by Bank-Drafts in the case of Government Departments in the United Provinces. During the year there was no sale of the India Febrifuge either by the Government of Bengal or the Government of Madras.

Plantations.—A year's steady progress in experiment in the nursery and fieU marks certain definite stages reached in our. knowledge of Cinchona under South Burma conditions. The most important result achieved is a knowledge of what Cinchona already free of disease will withstand in the way of adverse weather conditions. The end of the yeaf saw a long period of rainless weather during which, little by little, » large area of the plant reached almost leafless condition. In order to minimise the risk of collar disease, shallow planting had been carried out wholesale, and the surface rooting combined with the long absence of rain threw an unusually heavy strain on the parched plants. That many of those showing disease should succumb was to be expected but that a whole area of Cinchona should meet this adverse condition successfully by leaf fall is something entirely new in this cultivation. The writer's visit to the plantation coincided with the termination of the period of drought. Within a week of rain falling a transformation that required to be seen to be believed had taken place, and from this period right to the end of the rains in October Cinchona stood out a picture of rude and healthy vegetative growth. That such prolonged conditions of drought should be experienced at all is disturbing. There is no record for the area nor for contiguous areas of an) thing like its severity, and it can certainly be looked upon as abnormal, but the record of Cinchona coming successfully through it and reaching such phenomenally rich growth on water being re-supplied shows how this crop can in certain conditions belie all the reputation it has gained as an exotic, delicate and difficult to rear.

Since the cultivation of the red bark species was abandoned, and since shallow planting and an ample drainage have formed basic considerations in the system of cultivation, much progress has been made with Cinchona in Mergui.

The finding and propagation of a robust Hybrid already gives promise of greater success and suitable shade crops both for land to keep it cool and for Cinchona to shield it from the direct force of the sun must be found and their fullest utility proved by experiment and exploited.

The advantages of fairly steep slopes with a northerly aspect ovei gently sloping or south facing hill sides have become quite apparent in the last two years' work, and here, as wherever Cinchona has been tried,

Npeatcd loosening of the surface soil is an indispensable operation for success. These site factors indicate that as planting extends South-eas%ard to the higher elevations of the reserve, we may expect to roach "auditions more favourable for Cinchona. But the main lesson of the *hole area is already proved. It will grow Cinchona and may grow » at some profit under present conditions of world prices but it will never Jo a first class area for the purpose. Much is certain to depend on the fortune of seasons, and while we can reasonably expect to have further f t o by perfecting cultivation both in respect of the operates and the t"aes of carrying them out, and gains from the acclmntong.of the df « * t speciesfwe must recognise the error of fixing to on• J -* " * 0 king the whole Government India eSort dependant on the vaganc s of the South Burma climate. Mergui can take, and until * * * • » » f Proved, must continue to take its part in a unified *ohoTM*?*nM **• supply. Indeed it is impossible to maintain a « W J * ba* *>w standing there, but there are many other areas J « » * J J ^ m e n t a l cultivation in a small way and to give p o o o s m t ^ r t y 8WW be going on with a view to relieving the Mergui area of^a respon^ 81b % r t s L l d not have to bear alone. Advice to prove other a r ^ «ai»not be overemphasised. The difficulties of production are soluble. ^ difficulties of an administrative and financial kind due to the stiffness of Operation in India's present unstable political s«te, Jo uld not hold production up. Failure in quinine production is indefensible. No reason is good enough to excuse the issue of a blank cheque now on the bank of India's future health. In spite of large reserves of quinine now rever the conditions held it rema

seem suitab

may for the present be fclt by reason of the ^{<*fe Cottcn. Nor altog-tar exorbitant cost of those * * £ * » ^0 dcrate and should it be forgotten that a combined attack W« a ion of the

jeserve within a period short J j « g | » for ? cars o{ ^ plantinf *o develop homo production. The f*. J the ^.^unproved Pwgramm3 on one of the Bengal T ^ T ^ ^ very markedly to value of the Anamalai area opened out, pom Ej h/jaig m ot her the folly of relaxing effort cls3where. W* are ^ cinchona land and Jwfaa. The competition of o t o ^P s for d roductio n ^ ^ ^ n0 the continued control of p« an ^ i b i t how ver remote for the Government with any degree of respon^i , iott M a or d health of over 300 millions of a malaria ^ ^ ^ them that * disregard. And there is the greater " ^ ^t/l twlawi a i n g the Planting pays and that - ^ SS ^^ S S U Ue can afford to scientific experiment and proof that boverome

A large scries of analysis of Burma bark samples shows that we may expect bark of good quality at an early age. Maturity is reached at earlier age in these conditions than in the Bengal or South India plantations. Trees set to ultimate form much quicker and it seems not unlikely that there may be some seasonal variation in quinine content. Collection for analysis differing as to time, age, species and part of plant are being collected regularly for the purpose of determining the best seasons and ages for cropping.

The results of a year's solid work and of all the years that have preceded it in this effort seem for the moment in danger of going lost through failure to overcome the financial and other difficulties associated with consumption of the drug, and it can only be hoped that the forthcoming examination of responsibilities for all India quinine will lead to a satisfactory settled and liberal quinine policy, and that a means may be found to the financial factory to the large interests of public health no less than to the benefit and interests of different Governments. It is time, perhaps, to call a halt and reflect whither all this leads. We seem to have moved far away from the spirit of the effort of three quarters of a century ago when the object was " a cheap and plentiful supply of febrifuge to the poor " and Perhaps it cannot do harm here to recall the original philanthropic object responsible for the Cinchona effort. The patent facts known to all who have experience are that the poor cannot afford the drug at the price asked and that Charitable dispensaries have to turn the malaria stricken away empty or with doses inadequate to their needs. There can be no worse advertisement for quinine, not even its presence in nostrums on sale allay the fever that Government quinine is blamed for producing.

V. Financial.—The total budget allotment for the year was Rs. 4,80,000 of which Rs. 61,100 was for the Botanical Survey proper including the Industrial Section, Indian Museum, and Rs. 4,18,900 for Cinchona. The actual expenditure was Rs, 56,917 for Botanical Survey proper and Rs. 3,46,844 for Cinchona, that is, a total of Rs. 4,03,761. The total saving accrued was Rs. 76,239. Out of this saving Rs. 68,000 was surrendered to Government leaving a net saving of Rs. 8,239. The surrondcr was distributed as follows : *(i)* from Botanical Survey proper Rs. 1,700 under Pay of Establishment and (ii) from Cinchona Rs. 66,300, *viz.,* RB. 60,000 under Purchase of Cinchona bark and Rs. 6,300 under Pay and Allowances of Establishment Non-voted. The net saving of Rs. 8,239, fell under Botanical Survey proper Rs. 1,900 and under Cinchona Rs. 6,339 and was distributed under several items.

VI. Staff.—The writer held charge as Director throughout the year. Mr. S. N. Bal, M.Sc, Ph.C, was Curator of the Industrial Section, Indian Museum, throughout the year. Mr. V. Narayanaswami, M.A., and T. D. Srinivasan, M.A., were Systematic Assistants throughout the year.

Mr. U. C. Pal was Assistant Curator of the Industrial Section, Indian Museum, and held charge of the Government of India Quinine Store in the Indian Museum throughout the year, and of distributions therefrom.

On the Cinchona Plantation, Mergui, Mr. P. T. Russell held charge as superintendent. He was without assistance throughout the year and as in previous years has fully lived up to his reputation for able management and trustworthiness. The difficulty and value of his work and the degree of success obtained are well known to Government.

All the other members of the staff and the Clerical establishment have worked satisfactorily.

C. C. CALDER,

Director, Botanical Survey of India,

MGIPC—S1—III-7-2—11-12-29—450

ReP○« of the Botanical Survey of India for 1929-30.

°^ the Bot ematic.— ^e endeavours made to revive the field activities aiu* staff h am cal ^urvey> so long kept in abeyance through lack of funds of field w' ¯£Ve teen viSorously continued during the year and the scope aild NorthF or U○W extendfi from tlie borders of India on the North-West illto the f "fif 8t t0 the extreme limits of Burma in the South-East and The -ur ermo 08t points of the Peninsula itself.

^eadquarf result *? a£a*n a rapidly accumulating mass of collections at new and ^^ PiUugUp faster than t i e officerB candi gest Jt but from which already • mteresting finds are steadily being extracted and added to the ,7 mc<*porated records.

side, co ' f.. ra yana8wami» until June still Senior Assistant on the systematic 8*vefai n mu 6d Work On his materials irom tte Soutl1 of tie Peninsula. °^ *&uch I 1 ^^ 8 °^ records resulted but the immediate examination • how*ve ? ismaterialJl as been interrupted by transfer of service. It is, Mm no/b hoped that his a6SOciation with the botany of ttis Part of India l^°Uth T A- elos ^ ^° ^e ^urvey and *^a^ *ke cessation of work on these to ^ n*aii collections is only temporary. He has taken with him ^ithia ^^ 8^ere °^ activity a set of his own plants and as he is now hoped, i easier reach of his areas, South India survey work may yet, it is Mr S^ by his past experience in this field-

at fiUr* r^vasan, now Senior Assistant, has spent only part of the year 8etvice ^ Work Proper» as during the absence of Mr. Bal on leave his Buthe S Were ^^red in the Industrial Section of the Indian Museum. te*ftarI? has continued his work on the Garo Hill plants and the following cativ S from a Preliminary note on the vegetation of the area is indi- (<e of tlle type of work done.

Collections were made spreading over an altitudinal range of from about ? ^ *o 4,000 ft. The general vegetation is a mixture of the deci- duous 8 an<* evergreen types. At elevations of about 3,000 ft. various decid Quer UoUS 8pec^es of lower elevations are associated with such trees as ^ Castanopsis, Schima, etc., of the higher altitudes.

Ge f Otm ^ enly up to about 2,000 ft. *Bambusa* and *Ageratum cmyzoides* iu e ma-in undergrowth, while pure formations of Phragmites occur Wet open situations.

Amo118 shrubs in frequent evidence about this elevation, *i.e.*, up to about 2,500 ft, are species of *Randw,* *Canthium, Clerodendron, Daedala-canthUs> Phlogacanthw, Ardisia, Eranthemum* and *Acanthus.* Strag-

gling over these and other small trees of species of *Calicarpa* Litsea,* are to be found a large variety of creeping and dim[bu]* such as *Eleagnus, Dalbergia, Holmskioldia, Dioscorea, Smilax, Hedyotis, Combretum* and *Entada,* while various herbs sprea[d] floor of the jungle. Of these the most common are species ol[www] and *Tmgia* with grasses and *Cyperaceae.* Trees in this zone ar[e] sented by species of *Albizzia, Gmelina, Grema₉ Sterculia, [Tr]f^, Dysoxylum, Amoara, Bwnbax, Alstonia, Acacia, Beilschmiedia, Litsea, Excoecaria, Wrightia, AgUia, Cedreh, Ghchidion, [f]* *Phyllanthus* and *Vitex,* associations which show close relational? pure Eastern Himalayan types.

Linocera, shrubs, *Stemona,* on the *Polygo-* *coparia* repre- *Shorea* *Aporosa,* *Terpinia,* with

At higher elevations the vegetation is closer and more luxuriant and several large trees of species of *Mesua, Pygeum, Schivna,* *Gynocardia,* *Myristica, Quercus, Hydnocarpus, Aesculus, etc.,* occur in [ass]oc[iation] with *Litseai Diospyros, Lyg^strum, Garcinia, Villebrunia,* etc.

A net work of lianes in which are prominent *Entada, Ar[M]* *botrys* and *Buettneria* spp. is often seen hanging in large loops and coils fro[m] *Nephelium* and other taller trees,

Among the genera of herbs and shruby undergrowth commonly mei[n] with in these higher elevations are *Strobilanthes, Artemisia,* ^°}^T^[e]J^ *Leea, Linocera, Elatostemon, Laportea, Marlea, Sonchus, Crepis, A[r]* *Gnap-* *sacrne, Ophiorrhiza, Achyrospermum, Pleclranbhus, Gomphostemon,* *halium* and *CUoranthus.*

Linostoma, Deeringia, Beaumontia and *Uvaria* represent cli[mbers] while epiphytes like *Agapetes₉ Coelogyne, Peperomia* also occur. *» hi-* *dophora* and *Poothos* abound while *Piper* is seen clothing [inan]?[r],-[o]J[1]g trunks. Several mud banks on these higher elevations show associati[ons] of *Curcuhyo, Ophiopogon* and *Hedychium.*

Of parasites *Loranthus,* though not confined to higher elevati[ons] is much in evidence while species of *Bahnophora* occur on Btfctf* A transition, though not very marked, from the open deciduous *iot&* the lower to the closer evergreen vegetation of the higher altitude* noticeable."

Mr. Biswas, Curator of the Herbarium, was on tour in the Bombay Presidency early in the year, and towards its close started work for a survey of the South Burma Cinchona reserve area. Collections h* accrued from this area for several years but it is proposed to systeina[tise] the collections and survey by having an officer on the spot for P[erl0]ds representing all seasons of the year. The thoroughness with which the flora of the Malay Peninsula has been explored and the rich acessio[n] to Botanical knowledge which the explorations of Dr. Kerr and othe[rs] in Siam and the work ou his collections that Prof. Craib has undertaken,

make it d ir
cularly of ?y able t tat work ou the Flora of Southern Burma and parti-
Ubcmr to b ^^ aiea be brougllt into line, That H wiU r€pay the
a*d the o .e e Xpended ifi ce rtain and the proximity of Cinchona camps
*** a ch Pemng UP of the heavy ^TMgle that Cincllona workB entail
a chance ^nce to the collector that is absent in heavy jungle conditions,
«* that is not to be lost.

From his first short tour Mr* Bi8WaB has retelled wit11 Bome 2,000
specimens and there exists L0W *rom ^ area an accumu la tmg ma ss
of material ready to y ield itsbotanical treasure to the systematist and its
oecological mterests as the field observations and photographic work
progress.

In all between 5,000 and 6,000 specimens were received in the her-
barium d rin 8 the year. Prominent amongst accessions from outside
were gi u of well preserved specimens from the Swedish State Museum
and from tl e National Museum, Washington, and a set of named grasses
from Prof. Hitchcock of the Smithsonian Institute, Washington.

The chief
927 E as distribution, so far as number of plants goes, was a set of
m<mt f £m ?imala y ail> Chittagong and Madras duplicates to the Depart-
hav e b o- ro pical Forest Botan y> University of Oxford. Many specimens
O etacea 6 *o "^er^u anc* *^e Southern India *Cyperaceue* to Kew in con-
clate h on with ^e -^ora o* Madras. These will be followed at an early
W ^ the ®ra^w«ae. To Kew also by way of loan in the first instance
there, has Possibly for permanent incorporation with the African collections
early la f gone a set of South African plants collected by Dr. Roxburgh
aP- s -P o priately housed at Kew with other African collections than at
ibpur.

Mr. Badhwar, the newly appointed Second Assistant, has been mostly
en an(p^a ID 8a^n^ng acquaintance with the collections at headquarters
previously 1 collection, but in addition to working up his moss material
collectior of the grasses and is to specialise in this group. Soon after
the close of the year he was deputed to examine the question of Santonin
i^ttf *Artemisias* in the North-West and will be almost fully engaged
ec on .Woi k *or a year at least. The problem is one of considerable
diffi o? lC inter est at present. The young industry is developing but
growth and ** was ult botanical and biochemical problems have arisen to hinder its
fl u c Operative that an officer with knowledge of the area
valen 56 technical experience should be on the spot to watch the yearly
essentia Nations in Santonin content and to plot the distribution and prc-
of the best yielding varieties, and generally to gain knowledge
to the development of the industry. But in addition to this

he is actively engaged in the collection of Kurram plants so that the collections work, in which the survey proper is chiefly interested likely to suffer but rather to gain by Mr. Badhwar's temporary absence.

Mr. Badhwar has also got ready in collaboration with Mr. Vaughan specialist in the group, a paper on the " Mosses of the North-Western Himalaya " in which several species new to Science or holding the interest such plants, are dealt with for the first time.

H. Botanical Divisions.-As of late years taxonomic work has been mostly on material from the lesser known areas of North-Eastern India, Burma and the Peninsula and there has been revealed a considerably larger number of new or interesting species than is usual in a year's work. Many new species hail from Siam, the result of work by Craib, Dandy and Geddes on Dr. Kerr's and others' collections. Mr. Fischer has several additions from Lushai out of material collected by Mrs. Parry, while the collections of Parker and Parkinson have given him numerous new records of the South Burma Flora and Malaya affinity with the Floras of Siam, the Malay Peninsula and Indo-China.

Individual additions from other parts of India make up the unusually large number of 87 new species or records that have been noted amongst the flowering plants during the year.

Several general works of more than usual interest and importance for students of Indian Botany have appeared during the year.

In speaking of his reasons for bringing up to date botanical knowledge on the Indian Bomboos, Father Blatter refers to the vast field for research existing in the group, for the forester as well as for the pure botanist, before the many and intricate problems in connection with the bamboo forests of India are brought nearer their solution. His paper published in the Indian Forester will have a special appeal for, apart from the volumes on Orchids, no volume of the Annals of the Royal Botanic Garden has excited the demand that Gamble's monograph of the Bamboos published some 30 years ago has done. For the Indian forester few groups of plants hold the importance that the bamboo does and Father Blatter's revision is certain to appeal as much to the Forester interested in the bamboos of his area as it will appeal to and help the systematist engaged often with scrappy material, in solving the identity of bamboo specimens sent in for determination.

No one who has had to work on herbarium material of the genera *Mallotus* and *Macaranga* can have failed to feel how unsatisfying such work in the absence of intimate knowledge of these genera & the field, and it is, therefore, doubly welcome to have the Malatas of North Bengal set in order by one whose wide interests and keen powers of observation are equalled by his opportunity for field work.

Mr. Shebbear and ^a banner ft ^ ' CoWan between tliem have set the 8 r o u P in order jt is to t h e f ^ w i l I b e a s useful to the systematist in tie herbarium as ln the field T K * botanist in ^rested in the identity of these plants at least ' --e Malatas form, from the numerical point of view Beng^i ' a m unim P°^ant element in the forests of Northern

Another number of the Pflanzenreicl1 bein 8 Knuth's revision of the Oxalidaceae has appear ^ during the year. The whole seven genera of the fa mil a runs to Jsq^ ^ea.t W^ *n ^e one vo.ume and the 8 enus OawK« itself 1 o taV0 pag6S com P risin S nearl y 800 species. The work follows th *p an of previous volumes and collects together for the botanist and esp e cia.y the s y s tematist the fullest material yet compiled on this ^S group cf world wide plants.

ably n o WOnC ^n tbe a^ o^ botan y *^at ^as appeared during the year w'll 6qUal in im P ortance tlie Index Londonensis to illustrations of flowering plants, ferns and fern allies. The want which the Index Kewensis aims to meet as regards references to plant names and descriptions, thi8 new work, an emended and enlarged edition of PritzePe Iconum ^tanicarum, will fulfil as regards plant pictures. One volume is j S f 6 d com prising some 84,000 references and four more are to come. It j s a work that W^ "je a standard in the libraries of all botanical and ^ttic l u.tural ^titutions and its appearance supplies a want that has °&ff b e eD felt ^ all who have to delve ir the scattered literature of plant icon o hirA ^a Phy» The references are of post Linnean date but owing to the a^ ^uai ity of the pictures in certain earlier works, these are given, and l[a j £ , others Rumphius Herbarium Amboinense and Kheedes Hortus ba ricus will gratify all students of Indian Botany.

III ' ^**flustrial Section.**—During the year under report about OQQ lle r y specimens have been registered in the Collection Register, of *JP** specimens have been exhibited. Most of the3e Pec. uch a ^ o Ut ^^ d ur im eiiB are of medicinal value and were collected by the Curator me S h** tour in Assam and East Bengal. Besides these gallery speci- ns froin ' \^0Ut lj400 P lant s P e{jimens liave been collected fc y tlie C^ator thp- and other Naga and the Manipur Hills in Assam and from Chittagong collection parts of East Bengal, representing about 500 species: this is taing worked out.

As **'e r^ a l mm^ei of herbarium specimens exhibited in the. Gallery The re^a d by coloured drawings of plants, prepared duiing the year. y**x an^ raD ^emei)t and overhauling of specimens continued duiing tho m a bout 4,000 labels were re-written.

A new Kashmere *w"«aBe has been added to the Gallery to take in the Silk exhibits.

A comprehensive exhibit of Cinchona and its products with photographs explaining the methods employed in the cultivation of Cinchona and details of the manufacture of Quinine and other salts, was placed on view to the Public in the Health Welfare Exhibition held in Calcutta in March 1930.

Information regarding the sources of supply of Economic Plant Products and their products was given to numerous correspondents, both from India and abroad, and a considerable number of plaDts and plant products were identified OP behalf of Government Departmerts and the general public. Information on materials of the following was supplied to various applicants in different parts of the world :—

Putranjiva Roxbwghii, Wall., *Boehmeria nivea,* Hk. *and Am., Ficus acuta,* Burm., *Litsaea polyantha,* Juss., *Grewia scte*?®, Wall., *Mukia scabrelk,* Am., *Turraea villosa,* Benn., *Cryptocarya ffl. Oxyaeantha,* Linn., *Grevillea sp., Triticum vulgare,* Vill., *Saccharum sp., Calamus sp., Carica Papaya,* Linn., *Alston* «?<* *phyUa,* Wall., *Cryptostegia grandiflora,* Br., *Atropa BeUad*** Lmn., *Adonis sp., Valeriana sp., Bambusa sp., Ephedra* W> *CttruUus Colocynthis,* Schrad., *Chloroxylon Swieimw,* ^ *Mundtdea suberosa,* Benth., *Cannabis sativa,* Linn., *T«*«*r CheMa,* Rete., *Panicum sp., Setaria sp., Psychotna Ipeca*^'T Stokes., *Mimtdus moschatus,* DougL, *Ludwigia parviflor*** R°*D" *Plantago amplexicaulis,* Cav, *Erythrina indica,* Lara., <*f*- *pium sp., Cynodon dadylon,* Pers., *Hibiscus MntabUis,* "UP" *Enodendron anfractuosum,* EC, *PenUa ocimoides,* IjjnD" *Artocarpus integrifolia,* L., *Artocarpus indsa,* Linn., *%zyphus Jujuba,* Lamk., *Ananas sativa,* Linn., *Semecarpus Aw"* Linn., *Plantago sp.*

The catalogue of medicinal plants, already in manuscript, is awaiting to be printed while another list forming a Catalogue of Food, and Fodder Pknts is now also ready in manuscript. Materials *i*«•• catalogue of Timber plants are being drawn up and^t is expected to » ready m manuscript during the ensuing year.

abr Td' *fO??*TM ""* *W»**-Bark.* No bark was imported *I*rom the year on the Burma plantations showed 149,749 lbs. which through dryage had become 142,263 lbs. as shown by weighment at the end of the year. There was a carry over of 33,665 lbs. from the year 1928-29 at the Burma plantation bark stores, so that the total carry over to 1930-31 amounted to 175,928 lbs. thoroughly dry bark.

No bark was despatched d any of the Indian factories. Mungpoo stocks of Java and Burma barks earned from

worked ... 28521 lbs, and 21,080 lbs. All the latter quantity was end of 1929 on ... lbs, Java bark as a carry over to 1930-31. At Was received ... a stock of 17,067 lbs. Java bark, none bark to ... Java lay at Mungpoo and ... mentioned ... 1?5,928 lbs, Burmala at Mer... From the above ... and Burma barks used at Mungpoo 1530-75 lbs. Feb... 6 and 452 lbs. Febrifuge and 559-25 lbs. Sulphate and 480 extracted ... total 2090 lbs. Sulphate and 932 lbs. Febrifuge were duced 1 09A-1 ... Java ... extracted at Naduvattam profar ... Quinine Sulphate and 288 lbs. Cinchona Febrifuge, so ... the ... Mungpoo is concerned relatively a better yield than Mungpoo ... was richer.

Stock of Quinine.—The total Government of India stock of Quinine ... Unrecorded as such and extracted from home and foreign barks ... 319,623-3 lbs. at the end of the year. This amount lay ... 41-6 lbs. at the Indian Museum, 239,471-9 lbs. at Mungpoo and ... 8 lbs. at Naduvattam.

Stock of Cinchona Febrifuge.—The total stock of India Febrifuge at the close of the year amounted to 26,422 lbs. held 15,960 lbs. at Mungpoo and 10,462 lbs. at Naduvattam.

Sale of Quinine.—Ecom. the different stocks of India Quinine there was a total sale of 23,312 lbs. against 32,134 lbs. last year. The latter figure, however, included a special order of some 10,998 lbs. given by the Madras Cinchona Department. True comparisons are furnished by the distribution in the India area of 12,314 lbs. during the year against 12,775 in 1928-29. The shares of the provinces and the Indian States in the distribution were, Punjab 9,260 lbs., United Provinces 1,760 lbs., North-West Frontier Province 357 lbs., Baluchistan 151 lbs., Rajputana and Central India 730 lbs., Delhi Province 46 lbs., Sind 6 lbs., Bushire (Persian Gulf) 4 lbs., and Madras Cinchona Department 10,998 lbs.

Sale of Cinchona febrifuge.—There was no taking over and, therefore, no sale by local distributing Governments of India Febrifuge and the stock of this product, therefore, continues to mount. During the year 3,770 lbs. of Cinchona febrifuge powder were distributed in the India area against 4,458 lbs. in the previous year. The distribution was done by Bengal, all from their own Stock of febrifuge.

Revenue by the sale of Quinine.—During 1929-30 the actual receipts amounted to Rs. 5,70,231 against Rs. 3,86,144 in the previous year. The receipts include Rs. 1,91,510 paid by Madras during the year, being arrear outstanding from 1928-29 accounts, and exclude Rs. 52,889 due

from that Government being the cost of 2,998 lbs. of Quinine sulph remaining to be paid in 1930-31. Of the receipts Us. 79,347 were cash sales and Rs. 4,90,884 by credit to the Government Departments including payments by Bank Drafts in the case of Government *V Y* ments in the United Provinces.

Plantations.—There is nothing fresh to add to the history of and all the remarks made" last year both for and against them still good. The year under review was not unfavourable for Cinchona, again experience emphasised the inadvisability of concentrating a Cinchona effort in the one area. The Cinchona Department has expend effort here that could more profitably and certainly with $ scientific advantage have been distributed over at least half a widely separated areas. It is, perhaps, inevitable that caution mark Cinchona policy while questions of public health and the Quinine has on them hang between a Central and Local Gover but the retention of effort in one area, whose value for Cinchona s years' experiment has now exactly assessed, is not necessary to tin tion. The distribution of effort need not be much more expensive its concentration and the better caution even dictates it. These r tions gain emphasis when it is realised that long and invaluable Cm planting experience is rapidly coming to an end with the senior m direct charge of experiment completing service. If anything at a true of Cinchona this is that now is the time to broaden the experimental planting. The very wide interest shown by Local Gov ments not immediately engaged in planting and by Native States, s how keen they all are that Cinchona should be extended. Scarce week passes without enquiry from one or other source for seed an information as to methods of cultivation. Often the enquiry emana from areas where Cinchona would stand no chance, but even wfce does stand a chance against the natural conditions, ignorance of special methods necessary to its cultivation militates against eucc Of all the many millions of Cinchona seeds distributed yearly it is tionable if ten in a million ever reach a bark yielding state and those do gain it by luck rather than by good management from the pla But the interest is there and is widespread. In no way can the fu of Cinchona in India and the Empire be better cared for than by establishment now of small experimental areas capable of develops on an economic basis when the experimental stage is passed. The c of such experiment may well be infinitesimal compared with the ultimo money gain and the gain in health by having ample means to com& malaria may easily cease to be referable to money values. Whether not caution is necessary it cannot be wrong to push ahead in other fid with the same experimental proof as has now been obtained in degree for the South Burma reserve areas.

The o •
** Cinoho Peratl0nS of the De Partmel?t in Burma have not been confined
im Porta nce Da, Anotller Plant> *te yielder of a drug, again one of immense
the mat ria, 'A 0 India,8 health, has been successfully exploited, and all
El netin e^T^ is now available for the building up of an Ipecacuanha or
of *ide ex ^ Work in Burma ™•this direction is in continuation
Pfeatatio ^6ri?ei)^ "tending over a quarter of a century in the Bengal
to find nS • partial success has alternated with failure and the fight
emerges now • SUCCeSSful methods has tad its advances and reverses. But it
valuable drug from tte experimental stage and a plentiful supply of this drug can now at any time lie with Government.

V. FinanciaL"~The total budget allotmeiit for the year was **Rs. 3,10,000, c** *l* **whi**cl1 Rs# 61,400 were for tlie Botanical Survey proper **including the** Industrial Section, Indian Museum, and Rs. 2,48,600 for C^cho
llHder ^ ^ SUIrender of Es. 40,000 was made from the total allotment
fcto or(^er8 of the Government of India in connection with the Haj
Surv **lury** Committee. This was effected by reducing the Botanical
ui)de **ey allot**ment b«v Rs- 6*300 and the Cinchona allotment by Rs. 33,700
8urr **ender** r several items. Thus the reduced allotment for the year after
Survey WaS Es, 2,70,000, of which Es- 55»100 was for the Botanical
2>U 9ftn^ro^er and *^e ^ustr^a^ Section, Indian Museum, and Rs.
Bot' • for Cinct<>na. The actual expenditure was Rs. 53,396 for
of **Rs. 2** J*mcal Survey proper and Rs. 2,06,906 for Cinchona, that is, a total
and »^>302. The saving under Botanical Survey proper was Rs. 1,704
^ ^ d er Cinchona Rs. 7,994, that is, a total of Rs. 9,698 and was
distributed under several items.

V. Staff.—Mr. C C. Calder held charge throughout the year,
jjr **S. N.** th ^a^was Curator, Industrial Section, Indian Museum, throughout
the **ear** ^ excepting for a<>uf; 2 months from 19th October to 23rd Decem-
ber 1929 when he Went on leave and Mr, T, D# Srinivasan, Systematic
Assistant, acted for him. Mr. Srinivasan availed himself of leave from
26th June to 27th July 1929. Mr. V. Narayanaswami left the Depart-
ment from 1st June 1929 to accept the post of Systematic Botanist in
th Mad IaS ^8"cu,tura^ Department, retaining a lien on his appointment
in^l! ^8"cu,tura^ Department, retaining a lien on his appointment
-?, ^ePartment. Owing to the vacancy caused by Mr. Narayara-
swaD?1>s leaving the Department, Mr. R. L. Badhwar was appointed
Pa **System**atic Assis*ant on probation from 5th November 1929. Mr. U. C.
for T*8 Assistant Curator, Industrial Section, Indian Museum, excepting
about 2 months in February and March 1930, and'held charge of the
GoV-er^ment of ^^ Q **uinine** Store in the Jndian Mliseiim and of dis•
tribution of Quinine. During the absence of the Assistant Curator,
Mr. R. K. Das, Head Clerk, acted for him.

O« the Cinchona Plantation, Mergui, Mr. P. T. Russell held charge
as Superintendent throughout the year. The post of the **Assistant**

Superintendent, which has been kept vacant since Mr. A. Bray was filled up temporarily by the appointment of Mr. L. G. Bevis of the Bengal Cinchona Department from 7th December 1929 to Mr. Russell's proposed leave early next year. Mr. Maung Sue was Overseer in the Cinchona Plantation throughout the year.

All members of the staff, both Executive and Ministerial, of the Department worked satisfactorily.

C. C. CALDER,
Director, Botanical Survey of India.

MQIPO-M—m-7-6—86-11-80—450

Report of the Botanical Survey of India for 1930-31.

I. Systematic.—While in common witt otlier departments the Botanic^s urVGy ^aS suffered from the long continued financial strin-gency witL * ltS 8ubse(luei]t Partial disruption of organisation and ciir-tailment o- Work, ** tas, witllin tlie limited means at its disposal, and with its all overtaxed staff, continued to maintain something of the traditionT the d down to ^ from more prosperous times. Particularly has this h een the case in the sphere of its economic botanical activities.

Mr. T. D. *^Ued'p" ^nivasan, the senior assistant for systematic work, con-UUmbe ^ls critical study of the flora of the Garo Hills. His collections ^sult^ f80^16 2>00o sPecimens> comprising about 800 species, and the able i s o. his ld work enrich very considerably the material now avail-or a floristic and cecological survey of the area.

Reference to the work of a preliminary character which has been done on t n e*i8t \ Co^€c^0n8 continues to show the intimate relationship which as rS ~etween tte Garo Hills and the true Eastern Himalayan region *fo oWe8ented by Sikkim ; and {t is interefiting t0 observe that while the ~ COnception that the region of the Sikkim Himalaya harboured Chin*Uatryx of several important groups of plants of a common Eastern cjam ese and North East Indian distribution has had to give way to the gZecn s c* the region further East, separating Burma, Assam and *Ud rfUailj ^o reP resent ^oth sections, the Garo Hills, lying much south -eta Ch€d from the main line of GeoSraPIlical distribution, tend rather to the Western than to the Eastern complement. Although much remains f^16 *o ^e exPlored before an area representing the most natural full e m ^ ^round o^ these Asiatic floras can be fixed, it is certain that, to a -er understanding of the problem of group distribution, an intimate knowledge of SUcl1 detached areas ^ the Garo Hills furnisl1 wil1 be essentia^- It has been with a view to linking up the evidence from this part of the world with that from similar exploration work undertaken of ag e /^ars 3n the rich floristic areas of Northern Burma and Szechuan, have V! aS t0 Prov^de material for an oecological analysis, that these hills have been selected for study. When the work will be carried forward to a degree of completion seems uncertain in the present state of financial difficulty and of uncertainty as to the future of official or-ganisation Ufo ritj but Mr, Snnivasan, who now leaves the Survey, has by assidu ^ and unsparing effort gathered together a mass of evidence that must mightily influence further work whenever this can be undertaken.

The hopes expressed in a previous report that Mr. Narayanaswami's transference to the Madras Agricultural Department would not mean a loss to Survey work have been realised in a double sense. His transference has proved to be temporary only, and during the period of his absence he has carried out extensive exploration work in the little known forests of North Coimbatore, Kollegal, Bolampatti ranges and in the Anaimalai Hills, and has accumulated considerable material for a plant analysis of these ranges and for an estimation of the part they play in the union of the floras of the East and West sides of the peninsula.

Mr. Narayanaswami observes that in Coimbatore there exists a very interesting flora, represented in the sholas of the North Western border of the district, localising more or less a meeting place in the distribution of Eastern and Western Ghat species. At the higher elevations the families *Laurineae, Ternstroemiaceae, Euphorbiaceae* and *Rosaceae* amongst tree and shrub forms and the *Liliaceae, Gentianaeeae* and *Wpericineae* among herbaceous vegetation are most prominent. The Bellagi Shola near the frontier of Mysore is typical.

The vegetation falls naturally into zonal types represented by a deciduous scrub at low elevations adjoining and merging into a semi scrub and bamboo area. Above this, between 2,500 ft. and 3,000 ft., come open deciduous forests with trees of moderate size and a carpet of undergrowth grasses reaching luxuriance during the North East monsoon. Scattered sholas occur between 4,000 ft. and 5,000 ft. represented by tall evergreen trees with accompanying colonies of mosses, ferns and other epiphytes, which formation is in turn succeeded by the grassy hill tops devoid of all the taller vegetation. It is a gradual procession from a dry hot climate through a cool moist atmosphere of middle upper elevations to conditions in which only carpet vegetation can survive The occurrence of evergreen forest is directly dependant on heavy rainfall and the presence of such vegetation in the Anaimalais at comparatively low elevations is attributable to this factor.

Mr. Badhwar, officiating second assistant in the Survey, continued and brought to completion, so far as the Survey is concerned, his investigations on the Santonin yielding Artemisias of the Kurram and North Western India. Very valuable results likely to be of far reaching importance to the future of the industry have been obtained, and, in view of the great progress made, it is for regret that the investigation had to be brought to a close on account of the urgent need for retrenchment. Difficulties associated with the time of production of Santonin in Artemisia and with the methods of drying and extracting the harvests have been cleared up, and valuable data established bearing on questions of geographical and altitudinal distribution. The edaphic conditions suit-

[a]Jk to the drug yielding varieties have also been studied and results Stained likely *I* determine the course of future work if cultivation • '^attempted <*» * Mention is confined to the »^ " $ * £££ yu' tf treatment of the crop by grazing and cutting. While* has been ignor*w of the facts now brought to light to has hitherto hmdered progres• and that has been responsible for much financialJoss. to col" lectors and to the firms importing the raw matenal for exfracfcon, the knowledge acquired by no means completes what must be gained before succeis assured to the industry. Although the services of Mr .ft udhwar *V yet not be lost to this young industry it cannot but be tor r egret ** such promising official work should have had to be brought to a close.

. Mr. Biswas, Curator of the Herbarium, made a ^ ^ " i pt early * the year to penetrate the Cinchona Beserve in t h J * - ^ and J lower Burma' The portion visited was toward J ^ ^ ta P ^ J forms a complement to the exploration work airea y *• collection * rich in grasses and bamboos m * * £ £ £ ^ •* Mr. Biswas' interest in the lower orders of planis resulted i. . *** acquisition of material of this kind also. All. **•*°* *terest •* as, relative to the flowering plants, attention has but sparing^^ been 8*en to the Cryptogams it is not unlikely that finds now to Scie^ ^ ^Ultwhenexa^nationofthe^terialco^e, En;oute to Burma J« visited the Chakaria Sundnbuns at C W J*»g» nd the ways J't a «the Arracan Coast. The £ - £ ' £ as Q{ late Reived attention but it was with the intenw of clea k up some Points regarding the Avicennia associations of A < ^ f oye BWamps J this part thafthe visit was paid. The r * £ £ £ ! o iat ion will [b]« found at an early date in his publication of the bystem position [of] the Indian Avicennias. particularly

. The sea shore in Cox's Basar region *%£%£££ brought, lading itself to study by the Ecologist, - * * J ^ ^ wondcr and f a manner that no description can, an • » ». * £ £, fcTWB-a Mr. Jeauty of dune and desert vegetation . Good «*» { nature Was' attempts at this form of recording £ £ nd « £ . • £or 8UCh tW own environment by the dunes ° [Co^a . ^ one to Assam yanical work has resulted. From his tours "^ - which ^collaboration with the Curator of the fedu k u J . * * £ thousands Terence is made below, Mr. Biswas has brought back several °f specimens.

The normal activities of the Herbarium of the ^ ^ ^ *ere maintained as usual although the stock is " J ^ J ^ and the difficulties of providing - ^ J T r S S S ^ W i S S - ^solved. Over 3,000 sheets were distributed to different »J - throughout *ike* world, while the services of the Department were freely

sought by a wide circle in connection with all sorts of ^)0*af10;iL_ariujn *s and material. One regular function discharged by the her ^ ^ ^ the giving of evidence in cases bearing on the illegal cultivate on Specimens taken as opium or ganja producing plants are tn e usual ma- terial for enquiries of this nature.

"Co-operation with other scientific departments has been free, given and their aid invited and obtained. Distance and the e*Pe7 naiveness of travel militates against the rich collections in the ierba- Cum and library being aB freely consulted as one could wish, but we ave had several visits throughout the year. In connection with wor k the Indian Brassicas the assistant to the Economic Botanist, Pusa, has here. Mr. Parkinson of the Forest Department spent some time critical material belonging to his own collections and rendered some much prized help to us with locally grown bamboos, while Mr. Kanjilal, also of the Forest Service, spent a considerable portion of his leave at work on the Assam section of the herbarium.

The need to divert funds for the preparation of botanical P1 to accompany forthcoming monographs hits the maintenance 01 badly, and no purchase of botanical literature beyond the mos t neces sary periodicals has been possible. The library does not lend in J he ordi nary sense, but its books and periodicals, with the exception of c ertain irreplaceable volumes, are always at the disposal of workers whose stand ing and whose need for them in the cause of research are known.

Contributions towards a knowledge of Indian botany during tW ear are too numerous to give in detail, and while it is for regret that there should be contraction in the purely official provision for this stu der a provision by the way that all countries and all Governments c<f101 lie it in their own interest to make—the loss is partly made good vj ou young and enthusiastic body of Indian botanists being tornejd In through the gradually enlarging scope for specialization of the Educational system. Some of the work done by these men is no w a Standard that is gaining recognition in the woild of botanical scien s and there is no doubt it is always gaining in importance. But tm the better reason why the historical collections that come down the new school should have at least the same care and attention and flt<u that was formerly given* to them. In the eyes of the scientific w°T of to-morrow it will take much more than a plea of financial string^0? to justify the neglect to-day of the priceless irreplaceable objects of » and science that have come down as treasures to us. The care of b°ta* nical collections presents difficulties similar to those attending the p1* eervation of art objects of a textile nature or fragile and susceptibly*0 change, difficulties that are only to a minor degree present in other bio-

?^Cc Ptiblet 0 th ogical matetiaL Their »»tuw renders them peculiarly in a state fit f 8°8 of time aud of climate, and to maintain them or study demands labour and unceasing attention.

ran g<* Publi 'hed oter materiaI deali ng directly or indirectly with Indian botany

^nc k trxo s+j C ^ °* ^ 6W ^ as numerou8 descriptions of new or interesting ^ Flora r ny esu ^ n § fr om examination of material in connection with ^8 brin Ju adra ^a> °* w ^ l(^ a new part has appeared during the year. re mai u U §S e flora dowat0 ^d including tlie *Otfperaoeae* and there ^ W o* tW o more parts whict wU deal with ttc lar 8 ° faiul / of *neae.*

bo f Mr. F. cher U6W s Pecios » a &oodl y number of which belong, as might *Inipjfo,* t o ^ le saer known hill districts of the peninsula, are,— ^*vlon* ns *Bur* l^oiiem laticornis, Impatient nilagirica, Erio- ^*Jata*^^' fo riocaulon OanMei, Scirpus JacM, Fimbristylis ag- ^monu't.) mbristylis COttto *i and *Fimbristylis Narayanii,* the last from a ^ Travan;ore collections of Mr. Narayanaswami. He has also th e si ^ enU8 ^ CO P^ S belonging to the *Cyperacrae* and represented by n gto species .4. *Gamblei* from near Ootaoamund.

c B riUa las yielded *Soimila collina, llornstedtia sulphurea, Crypto- v ^'olhida* and *Spathiclamys,* a new genus of the *Rubiaoeae* represented u a single species S. *ohloaga,* all described by Mt. H. N. Paiker, and f wr ^ Gentians *Gentiana bomareoides, Gentiana sinkuensis, Gentiana* ^*branacea* and *Gentiana crawfurdioides* var *macrophylla* given to ^ce for the first time by Marquand in the course of his work on the Viatic, particularly Chinese representatives of the family. Marquand Proses to rename as *Gentiana confusa* Clarke's *Crawfardia affinis* of le Flora of British India, as the specific epithet " affinis " has already ^u employed for a north west amorican plant of the genua to which bl8 species of Crawfurdia now comes.

K. 0 ut of Upper Bar.ua; b« seed J ^ f ^ l S ; by ^ngdom W M comeH a new apecu* ^ ^ ^ fully *icskym* tetesting because aberrant as to type. W (teBOTl fT. ' f m t L type ^ by Aity-Shaw, shows that it departs even further fora ttai in the Journal than does ite newest ally *Berber* in* 9 m.* ^ nly one having of Botany has given specific rank to a G l y < « he' « y Parkinson 'u 8 by hair on the vegLtive organs. This was coUected b in nomenclature and now bears his name. He has ^ ™ ° ^ X l ntia spinosa, tute in description., of *Atdantia sim/hotf*** " a Beddomei both species of fairly wide distribution and o f • J ^ J J an region, and *Seminia ,nom P hyUa.* From the Eastern i ^, has three Marqu^d, in his revision of the old world spedies of the en

new Buddleias-fl. *Hookeri, B. Gnffithii* and *B. hadata* all renamed fc«*: the collections of the older Indian botanists, while Parker has described a new *MiUeUia, M. nepalensis* from the same region.

New Assam additions are represented by *Gentiam Parryae* by *W*[1]' quand and by *Orthosiphon glandubsus* and *dsarum cordifolia* by Fischer, the first named after its finder, the second found by Wenger and the third being of Kingdom Ward's collection.

A new *Ceropegia, 0. polyantha,* generally growing on a species «| *Randm* and a new *Begonia, B. fhixoyhylla.,* have been described and figured by Blatter and McCUnn in the Journal of the Bombay Natural History Society and in the Journal of the Indian Botanical Society i[68]" pectively. Both species come from the Mahabaleshwar District of the Western Ghats.

Professor Oraib continues to add to the immense number of new sp[e]' cies already described from the collections of Kerr and others in Sian»- The publication of Volume 1, Pait I of his " Enumerate," which h*[8] recently appeared, deals with the families *Rosaceae* to *Cornaceae.* Although dealing with an area strictly outside the limits of this report, his work is one that should be in the hands of every botanist who h*> to deal with the floia of India beyond the Bay of Bengal.

So far reference has been made to work of a systematic kind only, and then restricted to the higher plants, but the lower groups alsd h»ve their devotees and a constantly increasing body of workers, the result** of whose labour are not mentioned here, are adding to our knowledge of these. The work of Prof. Kashyap on groups of the ThaUo-phy*"[8] M well known and the recent publication by Dr. Bcuhl of a Census of & Indian Moses, besides bringing together in unified and handy form existing knowledge of these plants, adds very materially to this knowledge Mr. Badhwar's work on the same group has not yet been published, but this is nearly a matter of time, and his research has already g»i[fle]f the attention and co-operation of leading European authorities interested in the moses.

Nor has material for local floras been neglected as the running I**: for a revision of the flora of the Bombay Presidency in the Journal *ot* the Bombay Natural History Society and similar papers in other joum*[18] show. Of special interest because of the wonderful advance made i» coloured photography which it proves, is another volume of Mr. Coventry * " Wild Flowers Kashmir ". Shades of blue, yellow and white pW*T minate in the flowers selected for illustration and all could wish *&»* the expensiveness of the process did not set a limit to the number giv[6]"[1] The examination of the Guetales of Indian origin for the purpose ma*[68] the publication, under the editorship of Prof. A. C. Soward, of the la*[6] Piof. Peareon'a work on this isolated group of special interest to Ind**[0]

botani ts.
With ft^6 P^^ation i^fl divided into chapters dealing separately the ¯J*-^e t^su^iec ts of the habit, distribution, Ecology and Taxonomy, ^ P ^ go y and anatomy, the Inflorescence and flower, and the repr ?-uct*0D> and the theoretical discussion on the inter-relationships or ^e Gnetales to other groups.

t\\ ¯ ·· 0 P^aP^ers published during the year are of such interest as *to* claim je attention of all botanists. Professor Blatter appeals in the " Journal the I Indian Botanical Society " for a united effort to bring Hooker's monument&1 work on the " Flora of British India " up to date. He recognises that a complete revision of the Flora is still far off and, asking the question of what can be done in the meantime to bring it up to date, he answers as follows :—" We can gathei all the material that has accumulated during the last 30 years and write short monographs on the families or genera embodying the results obtained by previous botanists, Those results may be descriptions of new genera or species, notes as J> the distribution of species, revisions of genera, changes in the airangement of genera, transfer of species from one genus to another, suppression of species, combination of new species, nomenclatorial changes, etc." By way of illustration of what might be done he furnishes a short pevision of the *Malpighiaceae,* a family with a limited number of Indian representatives, and material for which was readily obtainable out of rf °ent monographs. Amongst the younger generations of Indian Scientists there must be many willing workers whose eagerness in the cause ai*d whose work will gain in intensity and in direction from this veteran's summing up of the botanical need of the time.

ftf even wider interest must be Sir Arthur Hill's presidential address to the botanical section of the British Association when he discussed Present day problems on Taxonomic and Economic Botany. The ad-dress 5f^S8 ·*s pregnant with rectifying idea and sums up what many were thinking without being ablo to express. The mass of experience on which the speaker could draw brings point to his argument whom he seeks to illustrate, and to attempt to repeat here at any length the lesson «*ught might be to deprive the reader of the enjoyment of the address itself which may be had in the 125th Volume of " Nature ".

D. Industrial Sectioni—During the year under report about 200 specimens have been registered in the Collection Register, of which jttore than 100 specimens have been deposited in the Gallery, the balance emg kept in reserve for future use. Most of these specimens are of Medicinal value and were collected by the Curator during his tour in th« Naga and Manipur Hills. Botanical specimens collected during to^8 % are being worked out and a preliminary report has already been gu nitted.

Although the tour was mainly concerned with the acquisition of material for the Gallery -and for distribution, opportunity was taken of combining the efforts of the Curator of the Herbarium with those of the Curator of the Industrial Section, to furnish a general account of the vegetation with particular reference to the economic possibilities of the tries for the development of some of the smaller plant product in®*

Suggestions of particular interest relate to fruit cultivation amongst others the natural occurrence of edible grapes of fa. would seem to point to the possibilities of cultivation of this to those with the necessary knowledge and capital. During the p» years there has been great advance made by the local Calcutta n» m the quality, quantity and variety of fruits offered to the and though some of this is due to the greater facilities that exist w transport and for cold storage not a little has been gained by m» the quality of some of the more easily grown local kinds of fcci*

There is no doubt of the field that lies open to experience »* tiative in the production of better fruit culture in North Eastern The supply of Oranges has been enlarged out of all comparison * former meagre consignments, and although a second industry, plum cultivation, has as yet received only private attention this shows what results may be expected in this line. The recesses Eastern Himalaya offer a variety of shelter for fruit and vegetate tivation that is only just being realised, and the report now cited s» that in the Manipur Hills conditions exist for certain cultivations would still further enrich the Eastern India market.

The special interest taken by the Curator, of late, in the fl>2 exhibits at the Museum served to draw his attention in particular to *» the area offered of these, and the list of plants of a medicinal value curring wild that has been drawn up offers ground for the belief th»* tiis direction also there is room for small industry development.

The Drugs Committee has served to focus official attention o» *JJ ahnost unhmited field that offers in the rich flora and varied condit of India for the production of medicines of plant origin and the b o***

sup

able employment for the educated, the writer can think of no directions more likely to repay effort than those of fruit production and the exploration of India's medicinal resources. That advance in these matters has been so slow is certainly not due to the lack of opportunity offered by nature. The gulf between theory and practical effort can perhaps nowhere be profitably bridged than here.

As usual a number of herbarium specimens exhibited in the Gallery were replaced by coloured labels and over hauling of specimens continued and about One new Swings of plants prepared during the year. A number of herbarium specimens exhibited in the Gallery were replaced by printed ones,

fibres. A new show-case has been added to take in the more important

Paphg exhibit of Cinchona and its products, with photo-details of methods employed in the cultivation of Cinchona On view to the manufacture of Quinine and other salts, was placed in March 1929 public in the Health Welfare Exhibition held in Calcutta

A number of herbarium specimens, exhibited along with Timbers have been replaced or renewed.

The Catalogue of Medicinal plant exhibits is now going through the Press.

Information regarding the sources of supply of economic plants and their products was given to numerous correspondents both from India and abroad, and a considerable number of plants and plant products were identified on behalf of Government Departments and the general public information on materials of the following was supplied to various applicants in different parts of the world:—

Hibiscus Abelmcschus, Linn., Hibiscus cannabinus, Linn., Crotahria Juncea, Linn., Corchorus capstilaris, Linn., Boehmeria nivea, Hook & Am., Agave sp., IAnum usitatissimim, Linn., Cryptostegia grandifiora, Br., Zea mays, Linn., Andropogm Sorghum, Brot., Cannabis saliva. Linn., Triticum vulgare, Vill, CaesaVpiwa Bonditcetta, Fleming., Gossypium sp. Linn., Artemisia sp., Argyreia speciosa, Sweet., Ravenala madagasca riensis, Sonn., Carapa guianensis, Aubl, Salvia aegyptiam, Linn., Derris sp., Lour., Datura sp., Salam m M lovgena, Wall, Panicum brizarthim Hcchst, Atropa Belladonna, Linn., Swertia Chirata, Ham., Cinchona sp., Linn., Santalum album, Linn., My* risticafragrans9HouU.,Artocarjyussp., Forst., Hibiscus sabdariffa, Linn., Paullinia cupana, H. B., Paullinia. sorbilis, Mart., Ckome heptaphylla, Linn., Blumea sp. Be. Lallemantia Boyleana, Benth., Withania somnifera, Dunal, Herpestis Monnierm, H. B. K., Brassica campestris, Linn., Eugenia JambdUina, Dim., Xanthium Strumarium, Linn., Agave sisaUna, Perrine., Berberis aristata, Dc, Gymnema sylvestre, Br., Psychotria Ipecacuanha, Stokes, Cicer soongaricum, Steph, Croton Tiglium, Linn., Momordica cochiyichinensis9 Spreng., Coptis Teeta, Wall., Bauhinia variegata, Linn., Ipomaea digitata, IAnn., Papaver smniferum,*

Linn., Xanthoxyhm sp,, Akngium decapetdum, I*"[8]*" *Taraxacum officinak, Wigg., Abrus precatorius, Linn., Aea^ Catechu, WiUd., Cabtropi$ procera, Br., Hylrocotyk atW*** Linn.*

m. Cinchona and Quinine-Sari. No bark was imported fro* abroad on Government account. Bark harvests during the year on tho Surma Plantations amounted to 131,533 lbs. There was a carry over of 175,928 lbs. from the year 1929-30, at the Burma Plantations bark stores. Some 307,327 lbs. of bark were despatched from Mergui during the year to the Mungpoo Factory. Out of this 215,3044 lbs. reached Mungpoo during the year and the balance 92,0224 lbs. was on the way. Only 134 lbs. % 8t ^ BUma Plantatioaa St o™ ^ a carry over to 1931-32

Mungpoo stock of Java bark carried from 1929-30 was 492,625 lbs- This is 2,100 lbs. less than that given as stock last year. The error accounting for this discrepancy was discovered by auditors in calculate 1 ™,* ° P°™dsk one of the consignments received from Java. The stock o· Burma bark carried frAn 1929-30 was 343 lbs/ Amounts of Jav 111>121 lbs Bnrma barkB ™» woiked during 1930-31, leaving at the end of 1930-31 433,573 lbs. of Java and 104,526* lbs. of Burma rk Carty oVer te 1931,32 There ™8 n0 8tock o f Naduvattam Thus the total carry over of was 63>25e ba of *wuch* 433,573 lbs of Java and 92,022 lbs. of Burma bark was in shipment. From 170,173 lb» ot Java and Burma barks worked at Mungpoo Factory 5,959 lbs. of Quinine Sulphate and 3,266 lbs. of CinchonaFebrifuge were extracted.

Stock o/ *Quvnine.-ne* total Government of India Stock of Quinine bulphate purchased as such and extracted from home and foreign 0 305,561 lbs This number8> at Naduvatt ™m™> 230,610 lbs. at Mungpoo and 8,612 lbs-

Stock of Cinchona Febrifugc-The total stock of India Febrifug« at the close of the year amounted to 29,688 lbs. held 19,226 lbs. »* Mungpoo and 10,462 lbs. at Naduvattam.

Safe *of Qumme—Ftom* the different stocks of Quinine there was a total issue of 19,987 lbs. against 23,312 lbs. last year. The share of the provinces and the Indian States in the distribution were, Punjab 16,161 lbs., United Provinces 2,063 lbs., North-West Frontier Province 348 lbs., Rajputana 414 lbs., Central India 300 lbs., Delhi Province 106 lbs., Sind 6 lbs, Baluchistan 577 lbs. and Persian Gulf 12 lbs. The smaller distribution is to be accounted for by economic conditions and the absence of demand from Madras.

. «* *of CiMlvna F.brifuge.-Thete* was no taking over and no^ sale V the local distributing Government, of India Febrifuge, and^stockoi JJ" product, therefore, continues to mount. Durmg the | « W » ibs- of Cinchona Febrifuge powder were distributed in the Iadiajxea gainst 3,770 lbs. in the previous year. The distribution was done by Be&gal all from their own stock of Febrifuge.

Revenue by the Sale of < 2 « . - D » r i n g 1930-31 the actualjoipt. punted toV 4W73 against Rs. *£*£%$£ *he receipts include the balance of cost of 2,998 lbs. ot *ya* Out Phased by the Madras Government durmg the previous year' . . . of the total receipts Rs. 91,369 were by cash sales - J J ^ ^ ^ J ?«dit to Government Departments including paymentby Bank Dr in the case of Government Departments in the United Provinces.

. JWo^A, regards the ^J ons n in * Burma, there is little to say that has not Government's po icv in the P'evxous reports. The uncertam future of luction" of staff ^tter of bark production has reflected itself *^th ^ fficer now 0^ the plantations to a degree that leaves the one t ^ ^ one fining with responsibility and duty ^ £ ^ £ f i £ J dis- ^n. During the first part of the year Mr.^ Resell w -ell as they

workers who have followed hir ie new ex- tension opened out to the west of the existing plantations on a stretch of land differing from the main area in aspect and in the nature of soil, has proved one of the best so far employed, and at a time subsequent to that with which this report should, strictly speaking, deal, was report- ed to have stood the dry weather conditions better than any other.

IV. Financial.—The total Budget allotment for the year was Rs. 3,17,000 of which Rs. 62,200 (including Rs. 1,000 for English Charges on Stores, High Commissioner's budget) was for the Botanical Survey proper including the Industrial Section, Indian Museum, and Rs. 2,54,800 for Cinchona. A surrender of Rs. 12,300 was made from the total Budget allotment thus:-Rs. 641 from the Botamcal Survey and Rs. 11,659 ^om the Cinchona allotment under several fenu After^surrender: the allotments for the year were reduced to Rs. 61,559 for Botanical Survey ftad Rs. 2,43,141 for Cinchona. The total actual expenditure m the year was Rs. 2,96,957 (excluding English Charges on Stores) *viz.*, Ks. 57,634 for Botanical Survey and Rs. 2,39,323 for Cinchona. The sav,ng ander Botanical Survey proper (excluding that under Engl^h Charges, High Commissioner) was Rs. 2,425, and under Cinchona Rs. 4,318 under several items.

V. Staff.-Mr. C. C. Calder held charge as Director, Botanical Survey of India throughout the year. Mr. S. N. Bal was Curator, Industrial Section, Indian Museum, throughout the year. Mr. V. Narayanaswami the senior Systematic Assistant, who left this Department in 1929, was allowed to retain a lien on his appointment. Mr. T. D. Srinivasan was the First Systematic Assistant and Mr. R. L. Badhwar was the Second SystematicAssistant throughout the year. The latter was deputed to Darjeeling on Artemisia work in the Kurrum Valley in May, 1930, and was on deputation throughout the year. Mr. U. C. Pal was Assistant Curator, Industrial Section, Indian Museum, throughout the year and held charge of the Government of India Quinine Store in the Indian Museum and of distribution of Quinine except for the latter half of the month of March, 1931, when Mr. R. K. Das, Head Clerk, acted for him and Mr. S. B. Banerji acted as Head Clerk,

On the Cinchona Plantation Mr. P. T. Russell was Superintendent Cinchona Cultivation, Burma, except for 7 months from 10th April, 1930, to 9th November, 1930, when he was on leave. During his absence on leave Mr. L. G. Richards, the Assistant Superintendent, acted as Superintendent and Mg. Sine, Overseer, officiated as Assistant Superintendent in addition to his own duties. Mr. Richards reverted to a substantive appointment in Bengal with efiect from the afternoon of the 26th March, 1931. Since then the post of the Assistant Superintendent, Cinchona Cultivation, Burma, remains vacant.

All the members of the staff and the clerical establishment have worked quite satisfactorily.

C. C. CALDER,

Director, Botanical Survey of India

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Report of the Botanical Survey of India for 1931-32.

I. Systematic.—The absence on leave of the writer during part of the year combined with urgent demands for retrenchment left no opportunity for field work which has had to be restricted to the West. Work has, therefore, been on the main head quarters and has been primarily directed to keeping the permanent collections in some state of repair, to dealing with material already accumulated and awaiting attention and to answering the references that are normally directed to the Department.

But a survey of the work accomplished for Indian botany shows that in many ways effort has not been so restricted, and a goodly number of interesting papers, the result of the work of an ever-growing body of Indian botanists, has appeared over the period and is under review.

Mr. C. E. C. Fischer continues work on the Flora of the Madras Presidency initiated by the late Mr. Gamble. A new part, No. IX, has appeared in which the families *Commelinaceæ, Palmaceæ, Pandanaceæ, Aracem, Triuridacem, Altimacece, Aponogetonacece, Potamogetonacem, Naiadacem, Eviocaulacece* and *Cyperacem* are dealt with. A change has been made in the arrangement previously announced in that the part just published stops short of the Gramineæ, the families having two parts to be published to deal with this large family and with the index and other appendices.

In the part just published the treatment of the *Eriocaulons* differs materially from that recently given them by Prof. Fyson in his examination published in the Journal of the Indian Botanical Society. Several species have been reduced and new combinations made. In all some twenty-seven South Indian species are **now** recognised but the marked variations that occur amongst the *Eriocaulons* will probably leave the number to fluctuate according to the personal views of the worker as to what constitutes specific rank and it is likely that here, as in many similar unstable groups, an intensive study of living material in the field will prove the best method of approach to a knowledge of them.

Amongst the new Asiatic Gentians described by C. V. B. Marquand appear several belonging to India or areas immediately

adjoining. In the course of his work Marquand has reduced Wallich's genus *Crawfurdia,* originally based on two Bepaw species, as its treatment as a genus distinct from *Gentiana* could no longer be maintained.

In consequence of the reduction new epithets are unfortunately required for seven species as the specific terms were already occupied by species of *Gentiana.*

New species described are: —

*Gentiana crawfitrdioides Marq., Gentiana bomareoides Marq., Gentiana sinkuensis Marq., Gentiana iochroa Marq., Genti<W suhoceulta Marq., Gentiana gihostriata Marq., Gentiana macra*cena Marq., Gentiana Parry& Marq.,* the last from Assam, the others from Burma or South East Tibet. Besides these a considerable number of new varieties has been established.

The opportunity to examine the Kcenig collection in the Lund Herbarium through the loan of specimens to Kew has resulted & interesting observations being made by Mr. C. E. C. FischeT on several Indian species first described by Eetzius in his Observation** Botanicae published at Leipzig some 150 years ago. The ' dl9* covery ' of this material and its examination indicates that the conception arrived at from certain of Retzius' descriptions * erroneous, and it follows that nomenclatorial changes becotb involved with well-known specific names lapsing to synonymy. a complete published list of Kcenig's specimens sent to Retzi Mr. Fischer, corrects the botanical names according to practice and cites all the inscriptions actually on the sheets. find—for it amounts to this—is valuable as showing bow descrip* tive record taken by itself is liable fo mislead and how necessary the preservation of the actual material forming the type becomes.

Koenig was attached to the Danish Medical Mission at TrauqjJJ bar, South India, from 1768 to 1774, and was subsequently employed by the East India Company in Madras where he * associated with Dr. W. Roxburgh.

A revision of Griffith's * Itinerary Notes' edited by M'Clelland in 1848 has brought to light the omission from the Kew Inde* of certain names and the ascription to later works of others. Th names are now arranged for incorporation in the next supplement of the Index Kewensis. The ' Itinerary Notes' deal with plants from Khasyah, Bhutan and from between Shikapore and Peshowur.

In the Decades Kewensis Fischer has described a new genus of the Cyperacese, *AscophoUs* from material collected by the Mr. Gamble at Ootacamund. A single species named aft the

Rector at pi•e8ent represents the genus. The genus is placed between liariscus and Ascolepis.

. A new species of *Scirpus* from Madras, S. Jacobi, is also recog-»«ed by Pische,. in e a r i y collections confused with *Scirpus arUcnla-tui* Linn., as well as in new material now to' hand. The plant was noticed in 1929 in water along the margins of permanent tanks of g[a]«dur by Mr. Jacob of the Madras Agricultural College and was ^nt by him to Kew for comparison.

. *"*• Craib continues in his contributions to the Flora of Siam *<*i* to the large number of new species already describedjrom th' « region. The Rubiace* with which he has recently been dealing * Paving a particularly rich family. Part 4 ^ i j [6] * [1 1 1] * ; ^ [of] > Flora, Siamensis' Enumerate has been F j J ^ j J * *£ ^ the families Rosace* to Cornace* and contains over CCO species [of] which about a fifth are new to the Flora.

Wants new to Assam continue to be published as the resuH, ot 5* on n.terial supplied by Mis. ^ [4] ^ ^ £ z £ ^ » d and Wenger. Of particular interest from the area a. e a n [va] ^inum aud Mantisia both collected by Wenger and a new *[m]I>atiens—*Impatiem cothurnoides.*

.. Among contributions to the Flora of Bu^a hiclu,!^ newjn, [l]

;• & Parkinson: *Aheodaphne merguensi** C· E. Parkinson from **»•* Burma.

A Burmese climbing Bamboo, *Khviachloa detim*ns, sole repre-^tative of a new genus, is described by Mr. «• » Parker, from ^teiial from South Burma.

. Another issued volume of the Pfi.—i,.. '* ^[lkofer] ^ [wit]h the Sapindacese.

It is not always easy to regulate nomenclature in such a manner as to secure uniformity of treatment and yet preserve the value and convenience of long-established customary names amongst the better known forest trees. Name changes in Indian trees rendered necessary by a strict following of rule by Mr. Parker, in the October number of the Indian to smooth «« the difficulties of indexing for informa ion to be ompiled for W office„ and others. The list reviewed „ oi interc^ t « s showing ^ strict application of the rules may attec t now w' delj accepted •.« » « for some of the commonest of our Indian tree. *n examin-[a]»«on of the list will show how likely it *is* that a stn[t] app ^on [of] the rules of botanical nomenclature may be received amongst

Indian botanists with some of the puzzled dubiety that has characterised the resulting innovations elsewhere. It *is* disturbing, for instance, to know that theoretically, we mean *Bombax Ceiba*, when we talk of such a well-known and widely distributed species as *Bombax malabaricum*, and that the Mowha tree, Bassia, must henceforth become Madhuca.

There will be appreciation of the stand taken by Mr. Parker, for the retention of such a familiar name as Albizzia stipulata. A general agreement with him that acceptance of such changes should well await a monographing of genera. The start that the name *Poinceana regia* has established to designate the Goldmohur tree is likely to withstand the theoretical claims of *Delonix regia* to supplant it.

While on the subject of nomenclature it may be noted that the Indian Forester has decided to follow in future the practice, adopted now in several quarters, of spelling all specific names irrespective of their origin with a small letter.

Boergesen discusses in the Kew Bulletin some Indian Rhodophycese especially from the shores of the Presidency of Bombay. Very little work at all has been done on India sea algae and it is many years since a paper of significance has been published on Indian Seaweeds. An interesting and fairly comprehensive description is given and description drawn up, and the interesting observation made that in the collections of algae from the North end of the Arabian Sea, *e.g.*, Dwarka, Okha Port, and Karachi, several species are found which are the same as or closely related to species from the Australia, although in the hot belt between these two regions the same species appear to be wanting.

W. D. Francis has some interesting observations on the occurrence of buttresses in Rain Forest trees. Several theories have been advanced to account for the presence of these peculiar structures, and the observations of the author tend to raise objection to the supposition that winds acting on heavy crowns exert a direct action in the incipient production of buttresses. The exact significance of these structures remains in doubt, but their occurrence in mangrove vegetation as well as in Rain Forest would seem to suggest that the chemical and physical characters of the stratum in which the trees grow, has something to do with buttresses. Further, the theory of the root as well as stem entering into the development of buttresses seems to support the view that this structure is an adaptation to soil conditions rather than, as has hitherto been supposed, a reaction to air stresses. The many peculiarities to be found in the roots of mangrove species and the alliance of mangrove species

**th Rain Forest representatives suggest a root; peculiarity related to its medium.. The subject is referred to here as an interesting Problem for Indian students, for much matena l presents in this J^hbourhood (Calcutta) for further study· One, oteervau on made by Mr. Franci^ on tlle stressed trees of Austral an " the o resse d ^ «* be c01Toborated in local material, namely, ^atmg to the attenuation of the main asis of large.butt of Indian ^ards the base-One need only refer to some «peues Sleiculias to bring the peculiarity to mind.

T The publication by Col. Chopra of The tndignous Drugs^ *** and the increasing demand for a » - » J ^ J » timely *he fcatic exploitation of Indian medicinal resource tes on pergian Publication by Dr. Hooper, late of the Survey, of no e nearly ^ ***. These" drugs, all of vegetable origi",J« rf ^^ fleeted by Cowan and Darlington m tne ba rs the Empi ^ Market· Ramadan and Kirmandshah during a tour tor. new. ^ ^^ i»g Board in 1929. The list contains nothuig^ draw up & ^^ i^eed, a8 Dr. Hooper remarks, have bee * est as showill g how years ago by Abu Mansur but it u « inter in the East dieSj a8 also sWly the medicinal reputation of a pianx ce in WesterJ1 medicine, W slowly that reputation S*™^ medicinal properties of *** in the list appear many 8Pecf in m Burope an pharmacopoeias. *tich do not yet gain them a plac for the preserva·

The forthcoming organisation tq « ^ ^ 5 . fl-W i»*«- «on of Natural Fauna and Flora » A^ic 1 or ^^ preser- to the endeavour made in to *»,^«^^ Reservation of vation here. While interest jn ,the .w. j is ^^^ organise natural Fauna and Flora of ^ - P j U ve re central organ- tie effort on a sufficiently wide scale and rth scale agreed to-aBa aation aiming .t preservation on some wo or y anisatioQ g necessa,y it may be reasonably assumed that central g ^ must great. ^ oug t -the practical difficulties to cany^t out, ndian organisat on mu t be the results so far achieved by ft* A ^ ^ invita tion to to lie considered disappointing, nope may - thering in Lond o n where to 88nd observers to the W - ^ S A ^ relatio n t0 Afri t is the preservation of nature, . P ^ ™ e 8 . m India it is p ^ P re going to have the consideration J ^ e ional ^^ where t not yet too late to form « * J " J V £ ^d of man is ever busy, can have free play, but the ****£f* delayed indefinitely, and the formation of such " - ^ V J J ^ r t the Forest officer can No body of officers can * £ <£ ^ is receiving the^orest and it is good to know [illegible] Department's attention.

A study of the root tubercles of Podocarpus chinensis by H. Chaudhuri and A. R. Akhtar shows that there are reasons to suppose a balanced symbiosis between the host and the mycelium inhabiting the tubercles but further work on the fixing quantities of the fungus would seem *to* be required interrelation is fully established.

R. H. Dastur and G. A. Kapadia of the Royal Institute of Science, Bombay, have an interesting article on the results examination of the anatomy of climbing plants in the Bombay Presidency. The nature of the investigation itself is not new, but, based as it is on material that has not previously been examined for structural peculiarities associated with the climbing habit adds to and confirms the results previously obtained on material. In a few cases there is conflict of view as to the nature of the anomalous thickenings that take place. An examination of their paper suggests that plants of this kind grown under controlled conditions as to their twinings might yield anatomical data value for comparison with what has already been obtained and a comparative study is suggested.

Blatter and McCann have fully described and figured two new Utricularias from the Western Ghats—*Utricularia equisetifolia* and *Utricularia ogmosperma.* T. C. N. Singh continues his studies on the teratology of Indian plants. He deals with abnormalities in seedling, leaf, stem and seed in some eight fairly common Indian species. Mr. Mukat Behari Raizada has made certain additions to the list of plants appearing in Duthies' Flora of the Upper Gangetic Plains, from the neighbourhood of Dehra Dun. These plants have been omitted from the work either by oversight or because they have appeared in the area since the collection of the data for its writing.

II. Industrial Section.—During the year under report about 200 specimens mostly of oil seeds, medicinal plants and fibre plants have been exhibited in the Public Gallery. Further working out of the botanical specimens collected in the previous year is nearing completion. No tour could be undertaken by the Curator for want of funds due to retrenchment of expenditure. Additions of new specimens to the Gallery and other improvements cannot be effected until financial conditions improve nnd the work necessarily confines itself to proper upkeep and care of the specimens that are in the Gallery.

The exhibits showing the manufacture of safety matches were renewed and the latest Quinine and Cinchona products were added to the renewed exhibits of these in the Gallery.

About 3 ooo labels for exhibits were replaced by printed or typed ones.

As u
Gallery UJL a U Umber of herbarium specimens exhibited in the the fruits *n/ll* , laced by coloiired drawinp of plants which show u. a the leaves in their natural bearing.

A C a has b^n pin 10? 116 of Medici«al Plant Exhibits " in the Gallery Spice Plant F-T-- 811^ lnaterials for another Catalogue of Food and Inf ^kibit* «re almost ready *in* manuscript.

orm t
and their a^ re?arclin? the sources of supply of economic, plants In<*ia and pr K UCt8 WM ?iven to mmier(ms correspondents both from Pro<1Ucts w a-ro**' and a consiederable number of planta and plant the genera. T e l dentified on behalf of Government Departments and public.

Inform ation on niaterials of the number of following was supplied to a applicants in different parts of the world: —

Mallotus *PJlili* ***VV^eniis, MuelL, Podophylium emodi, Wall,*** ***Aconitum*** *hete7>* ***ophyllum9 Wall, Arachis Kypogcea, Linn., Pyre-thrum*** ***macrophylla, T)on.y Mushrooms, Zingihcr*** ***Stoke. Pe*** ***orientate, Rich., Strychnos Nux-vami.cn, Linn.,*** ***p a-a*** ***&ih Kipff'9 Ahrus precatorim, Linn., Digitalis sp.,*** ***pu*** ***Ver somniferum, Linn., Nelumhiwn $p., Derris sp., Hydnocar-*** ***sat*** ***wpina, Wight., Lathyms sativa, Linn., Artemisia sp., Vicia*** ***, Linn., Edgeworthia Gardneri, Meissn., Mimosa pitdica,*** ***» Bygrophila fyinosa, 7\ Anders., Carica Papaya, Linn.,*** ***Va bispinosa, Roxb., Coffea sp., Thalictrum folioloaum, DC,*** ***<*>lpiniasp, Ipomcea Batatas, Lamk., Myristica fragrans,Houth.,*** ***^kntago avata, Forsk.***

Hi. Cinchona and Quinine.—*Barh.* There was no im-P°rt of bark from abroad on Government account during the year. ****k harvests during the year on the Burma Plantations amounted ^ 177,061 lbs. Including the stock carried over from the previous y^r, *viz.*, 134 lbs. the total in the Plantations showed 177,195 lbs. out of which 63,019 lbs. were shipped to Calcutta for despatch to ^e. Bengal Government Quinine Factory at Munprpoo (but the entire quantity was on the way when the year closed) leaving at fte Plantations a stock of 114,176 lbs. as a carry over to 1932-33.

Munepoo stocks of bark carried over from the previous year were Java bark 433,572'7 lbs. nnd Burma bark 104,526-5 lbs., that is a total of 538,099*2 lbs. as opening balance for the year. To *the* stock was added 91,912-5 lbs. Burma bark bringing in a total of 630,011-7 lbs* During the year 29,100 lbs., of Java barij was

worked leaving 404,4727 lbs., Java bark and 196,439 lbs., ***** bark, that is, a Mn\ „T.wiMn. i,,i.<m•n nt 000 9117 lbs., aa a cm} over to 1932-31.

The total stock of India Government bark at the &>»'*% year w«s 778,100-7 lbs., comprised of 114,170 lbs., at the « * £ Plantations, 600,911-7 at the Mungpoo Factory and 63,019 Ib»- the way from Mergui to Mungpoo. a

1,6364 lbs., of Quinine Sulphate and 4593 lbs., of Cinchona *»fuge were extracted. This small extraction is due to the wr*»V as of the major portion of the grant under Extraction Charges consequence of the retrenchment campaign. t

Stock of Quvmne.-AX the close of the year the total Govem©«» ted of India Stock of Quinine Sulphate purchased as such and extras. ch fro « ? J ™ ava f, and Buma barks amounted to 290,148-928 lbs.,of £l» at 67,352-874 lbs. lay at the Indian Museum, 218,184-226 H* Mungpoo and 4,611-828 lbs. at Naduvattem.

Stock of Cinchona Febrifuge.—The total stock of C«achona Fel mfuBe at the close of the year amounts tn 29.953 lbs-, of which 19,491 lbs. were .held at Mungpoo and 10*62 lbs. at Naduvattam.

Safe o/ Qmmne.-During the year ™der report the sale of Quinine, from the different stocks amountS to 16,952 lbs. ^ II ,987 lbs v M' m the previous ^ar. The shares of the pW^'f-og the tonbution were P«njab 9,531 lbs., United Provinces 1.JJ lbs., North-West Frontier Province 380 IVs. Kajputana 488 l j ' C tral Ind 4 lbS Delhi Pro ™ ™ lb-, Baluchi «» lbs., Persian Gulf 11 ft, and Madm 4jflQ0 J

Excluding the quantities taken over by Madras Government *6 sal o on t £ T ... ecrease any indent from the In9pector Genera l o* Civil Hospitals in Punjab and by * S ? ^ total indent *• Medical Store Depot, Lahore. Civil Ho ector eneral of the indent ! & M ? against 3,500 lbs in and 7,000 lbs. Lahore, 1931-3~ was

Sale demand t^Tjv^T .—During the year under report the of India Febrifuge had To be ta tn % \ W a S h e a ^ ** 194 11>S" t P is anticipated tL.V ? " *? the Pro ^nekl Government be taken over by Bengali ar ** Stock of India Febrifuge ^ this produpt continues the «"suinpr year no demand for *

Revenue by

receiPta ani0uut^ ,e 5a i c °f 2«"W—During 1931-32 the actual f,revio^ year S n 3,1T>51o ^aiust Ks- 4,43,073 in the £s- 2,39,396 bv o, A? ^tal reteipt8 Rs, 78>114 we)e by <«* a»ld M Drafts in «ale Bulv Sale * The credit 8ale incudes payments by Pr<*ince8. mse of Government Departments in the United

The cost of Government of ^ "^ of CinclloI,a febrifuge taken over by the GoVe«iment * \ y al, viz IU 1 U * wiU be credited V that Plant mKevenues during 1932-33.

Gov«ami2r JITr pUrsuance of the general policy of resin.-(ing alrei% onen A Induction of bark, no extension of the area Of areas al reac, oUt Was made 5 Plants SoinS out being merely refills *est of th y IU cultivation- The area last opened out to the "^resn 6, freiVe tas doue vei 7 well during the year which in Pects has been the best of all for Cinchona.

IV.

fts.2 9S^?anCiaL~~Thc total budget allotment for the year was Charges on «of Which 1{s- 60,900 ("Eluding Rs. 2,000 for English Stores High Commissioner's Budget) was for the liota- nical Survey Proper including the Industrial Section, Indian Muse«m, and Rs. 2,37,100 for Cinchona. Surrender of Us. 77,646 was made from the total budget allotment boinjf IU. 0,448 from tlio botanical Survey proper and Rs. 71,198 from Cinchona. Xliere wu» also a surrender of Rs., 1,000 on account of English Charges on Stores. So that after surrenders the allotments for the year were reduced to Rs. 53,452 for Botanical Survey (including Charges on English Stores, High Commissioner's account) and Rs. 1,65,902 for ^Whoua. The total actual expenditure in the year was ?•• 2,15,554, *viz.*, Rs. 51,804 (excluding English Charges on Stores b*t including Rs. 13 on account of Loss or Gain by Exchange) for Botanical Survey and Rs. 1,63,690 for Cinchona. The net saving '"ider Botanical Survey of India proper was Rs. 1,180 and under Cinchona Rs. 1,620 under several items. A surrender of Rs. 2,278 was reported to Government of India.

V. Staff.—Mr. C.-C. Calder, the permanent Director, Botanical Survey of India, wasjbn leave from 30th May to 28th November, ^l, when Mr. G. ?. Shaw held charge as Officiating Director, Botanical Survey of India.

Mr. V. Narayanalwami, the Senior Systematic Assistant, who left this Department in 1929, leaving lien on his appointment, reverted to his substantive appointment in this Department on the 4th November, 1931. From this date Mr. T. D. Srmivasan who was acting as First Systematic Assistant became Second Systematic

Assistant. As a consequence of this reversion the services of Mr. R. L. Badhwar, the probationary Second Systematic Assistant who was deputed to carry on Artemisia work in the Kurram Va. terminated with effect from 5th November, 1931, under instruction from the Government of India. The post of the Second Systematic Assistant was abolished as a consequence of retrenchment and Mr. Srinivasan was served with three months notice of discharge from 16th February, 1932.

Mr. U. C. Pal, was Assistant Curator, Industrial Section, Indian Museum, throughout the year and held charge of the Government of India Quinine Store in the Indian Museum and of distribution of Quinine except from 1st April, 1931, to 12th August, 1931, when Mr. R. K. Das, Head Clerk, acted for him and Mr. S. B. Banerji acted as Head Clerk.

In consequence of the retrenchment campaign the following posts were abolished: —

One Upper Division Clerk, posts of two Plant Collectors, one Duftry, Jamadar, Industrial Section, Indian Museum, one Peon and four Temporary Bearers for the Public Gallery of the Industrial Section, Indian Museum.

The Government of India decided to abolish the post of the Assistant Curator but as no final decision was arrived at for the discharge of the duties of this Officer the post was provisionally retained. During the year Mr. R. K. Das, Head Clerk, & Mr. H. S. Ghosh, Upper Division Clerk, retired on superannuation. Both these Officers were able and conscientious workers. Special mention should be made of Mr. Das, who rendered over 36 years of service and held responsible positions for many years. By his retirement the Department has lost the services of one of its ablest officers.

On the Cinchona Plantation, Mr. P. T. Russell, was Superintendent, Cinchona Cultivation, Burma, and Mr. Mg. Sine, Overseer, throughout the year.

All the members of the staff and the clerical establishment have worked quite satisfactorily.

C. C. CALDEB,
Director
Botanical Survey of India.

MGIPC—L—III-7-3—2-6-33—450.

Report of the Botanical Survey of India for 1932-33.

I. Systematic- The activities of the Botanical Surveywere again
j «tild though causes that have become too I ^ ^ J T S J
***d specifying and worb has a «in had to be confined
at go on tour ;
so for replenish-
ing the collections and for the procuring of materu d for by cor-
respondents. That such help, when it can be given, is readily rendered
by by individuals
is de helpers may
be «• ate many questions that can only be set. kd ^nomically by
the *** botanist in the field, for he alone, can a k, « £ stride, when
m^ his general collections and notes, the *****£ ired in look-
ing after the diverse needs of all the <TM*?^J&^Jtom ielp.
Yet »*le the ready courtesy ?TM^»J^&Z -*
fail is we cannot escape the feebng that we can but t ' ility of those
ance that taxes not merely the ^ -* «W d t J^ore, that, con-
Jn wWn we have come to rely. » » to the 00. , rce been, there is
^1 to headonarters - ^ J ^ ^ ofte modern tendency
J1 ever widening army of workers-the res«« ^ ^ ^
n ^dia as elsewhere away from the artsj^ » al and
^ng-ready to co-operate in the work *| at t h e ^ gtands for. ^
2. There is a good deal to rev.ew some of^ jo k J^ or ^
!«r«nce to India, some of a more general Lind yet avin a h
Ornate bearing on Indian botany. nrt i« due for re-

3. At headquarters a considerable amount *£* sheets, It coffi.
y. Specimens determined ^ * £ % £ Some 2,246 speci-
P^es work on the Naga and Maiupur tt^^ Requests for the
^ have been received and ' ^ ^ ^ ' o f Europe, America
B«Pply of seeds and specimens from AftjJ* P 330 specimens ^ senfc
^ India have been complied with. About F
°W on loan for monographic work.

area o'
, 4. M, Biswas paid a further f ^ t t t Z T h l b a c e o u s
Southern Burma where he speeded » ^ g » ^ fem alUes,
*ata. Particular attention was given ts o f Indian boten y.
8Wnps that have been relatively neglected by stuaen

0. Mr. C. E. C. Fischer continues his work on the Flora of the &>»&#* Part of the Peninsula now in progress at the Kew herbarium. T"® large and difficult family Gramineae remains to complete the wot* which should prove as valuable a standby to the botanist in Southern India as its companion from the point of view of date—The Flora of «>e Upper Gangetic Plain--does to the botanist of the Korthern pl» inS< Mr. Fischer also describes some new species from peninsular India, on« recently collected by K. Cherian Jacob, a Hopea named aJter Im* one collected by Ranga Chariar in the Nil«nris>, an Eriochrysis similar named, while a sheet from Breslau originally collected by M*J°"J in Cochin is now named Isachne setosa. Three other new grasses fro"[1] Southern India are also reported :-Isachne Meeboldii from Mysore-Isachne Angladei and Isachne Boumeorum from the Pulni Hills, »[11] new to Science.

6. Mr. Mayuranathan's Flowering Plants of the district supplies a long felt need for a local flora dealins with the plants of Madras City and its environs. The book is primarily intended for the amateur who wishes a quick way to recognise the commoner species of pi*"* around him. It is a type of publication that could with advantage to all and for the cause of botanical study be repeated for the flor»» of the other larger towns of India. The same author with Mr. *G»«*l* discusses the Indian species of the genus Caralluma, and their &#*?! ment and descriptions with figures gain immensely from the fact tW the observations have been made not merely on dry herbarium mate"[8] but on wild plants and from material successfully cultivated for •«*** years under garden conditions.

7. Four species of flowering plants from the South Indian #$' lands are noted on by Fyson. Two are new, Osbeckia Rosea and tfo*[0]' THO CROVOVAIENSIS.

8. A new member of the Clerodendrales, Echallocystopsis in*** found growing at the Courtallun Falls in South India, is described W lyenger in the Annals of Botany, while contributions to existing k»[0]^ ledge of the Myxophyceae are given by Bharad.vaja from mate** collected m Kashmir.

9. Under Contributions to the Flora of Warn the late Prof. °**[1]J described, again from Kerr's collections, some 13 Canthiums *d*><*W*[11] *M* members of the genus Lasianthus and a few Paederias » examined and discovered as new during his woik on the Butf"** *lias* must be amongst the last descriptions of new plants from S^ drawn up by Prof. Craib, a one time Curator of the Ribpur Herbari^" His work grew in volume as he approached it and as he appears to bf feared, he has not been able to see it completed. His voluminous <*^ criptions of plants new to Science from Siam has frequently been rete[1]*

to in ... I
tinguished 8 ^ ^ ^ " his death Indi» has lost one of the most dis. jacent eastern Hn J ... mterested in her botany and that of the ad- 10 w -aJan 8d°m.

vide t^e sour ce for 8 co"ec^ons in Assam worked up by Mr. Fischer pro- little k&own or rec°gnition at Kew of several more interesting and descri Ption ni ok neW pIants from thui area. SoneriIa Khasiana has its lanth 38 trich op..or ana ti)e new species Begonia Wengeri, Strobi- are fu% describr US> SoneriIa viliosa and Lepidagathis hyalina var. pube ... A/ ed% Other species new to tbe area include Impatiens yunn^nsis J For estii and Wardii» Desmodium oblongum, Pueraria Swert ia nor Lactuca macrorhiza, Embelia Clarkii and myrtiflora, communis, vosa and panj^^^^ Strobilanthes glutinosus, ELsholtzia wallichiane ^etechampia Kurzii, Ehyncanthus longiflorus and Polytoca

ne
quarters in Assam Flora under preparation partly in the field, at head- the bands ot P- C Kanjilal and Mr. A. *Das.*

12. Blatter and McCann continue in the Journal of the Bombay Natural history Society their revision of the Flora *oi* the Bombay Presidency. The orchids are at present under revision under head- ings descriptive °t the plants, their localities in the Presidency and distribution e^eTv here in India. Besides these the Balsaminaceae, Rutaceae aud -^^P^aceae are also under revision. In the same luejjan Tre** " while Mr_ B_ B- Ewbank, I.C.S., continuing his interest in the grou P, has given copious notes on the Ferns of the Mahabaleshwar district.

13. {$od * flatter has also published in the Journal of the Indian Botanical ftea ety a ^ of Planta collected by Whitehead in Mesopotamia in 1918. tjct 7 *U the specimens come from the neighbourhood of Basra, a dis- jj^ Uriously enough less well known botanically than other parts of f°P°kmia. Although the collection was made mostly on the banks of irri Safcion creeks and in adjoining plantations of date palms the com- parative absence of woody species in the list is noticeable. The list shows, ** ^S natura^> a preponderance of Xerophytic and salt loving plants.

14. j>. Dr. Cowan, with ample material from Kew, Edinburgh, Aberdeen, as a &d Calcutta at his disposal, has published a very complete revi- fiio j°n o* Wendlandia, a genus of small trees and shrubs, natives of India, te Eastern Indian Archipelago and China. The confusion which previouaJy marked the nomenclature in this group *is* reduced to order and se*eral species new to Science result from the examination. The new species are:—Wendlandia Sikkimensis, Wendlandia foTmosana,

Wendlandia speciosa, Wendlandia grandis, Wendlandia Gamblei, Wendlandia ternifolia, Wendlandia philippinensis, Wendlandia Amocana, Wendlandia Burkill, Wendlandia andamanica, Wendlandia arborensis, Wendlandia Angustinii, Wendlandia Erythroxylon, Wendlandia yanensis besides numerous varieties of species fa[illegible]

15. Mr. Biswas has dealt in a very interesting pap[illegible] tribution of the wild conifers in the Indian Empire. [illegible] on the genus Quercus with, if possible, an extension of the range of the species. This proposal suggested to any worker who has material and literature a[illegible] Mr. Biswas has also published a paper on the living conifers [illegible] Empire in the Journal of the Asiatic Society of Benga[illegible] a very large number of these are plants introduced w[illegible] India, the bringing together of this list will prove useful to n[illegible] who, familiar with Conifers in other countries where this grou[illegible] widely represented than here, take a special interest in plants.

16. Macalpine has experienced the difficulties in identifying the Garjans, a difficulty felt by not a few forest officers, and has put up a useful note on their identification in the field of Cox's Bazar.

17. R. N. Parker examines the strictly Indian species of Vitis and of the much confused plant Vitis rugosa. The geographical distribution of the group is cited, carefully made analytical figures added to the TfllllC Of the diagnostic notes while herbaria references cited. In another paper Mr. Parker deals with the difficult genus Symbopogen. There has been a good deal of confusion regarding the grasses comprised under this genus which the present examination should help to diopel.

18. A revision of the genus Leycesteria has been underw[illegible] Airy Shaw. The examination of Leycesteria, a genus first [illegible] by Walh'ch in 1824, appears to have been prompted by the n[illegible] Kingdon Ward in Assam of a curious addition, L. crocothyrsos[illegible] pulate species related to Leycesteria formosa, the original of [illegible] It is a small shrub with bright orange flowers showing how [illegible] neous Leycesteria is, for this colour is not found in previously known species. Some species. The plant may form a desirable addition to gardens. 6 species with varieties are discussed.

19. The Provenance of Early Malayan plant collections, [illegible] minous work by Mr. Narayanaswami, a survey officer, has appeared in the Journal of the Asiatic Society of Bengal. This work has been in preparation for a considerable time. It entailed greater examination and fuller reference work than was at first anticipated, but as compiled it should add considerably to the geographical data incorporated in existing floras of the region as well as clear up doubt[illegible]

co-rcl8 of the i.ocati: On 0{ ^ a n P^ts. Mr- Narayanaswami has botany, jji preparation an extensive bibliography of works on Indian ias lilted'8, e5ramination of Travancore coUections recently made *hil e tv0 s m th e e *tension of some Ceylon plants to the mainland, lave been •°8?ected aew species an Actinodaphne and a Cinnamomum Ss of ce^° ...ām ated. He htts als0 ^tempted to clear up the relation- Cl lodoaa an<1 A Ittdian Cassias P articularl y the much confused 8 P ecies Ute ,,n j berg - Javanica. The nomenclature of these species has of study of m °ne mucl1 chan 8o in the hands of aystematists. A similar V 0f n W y cosi "s has also been made while notes on the current pori- of D e ^ f, dobium SW. and Desmotrichum Bl. and on the synonymy been* -ro blum Macr * a Lmdl. and Dendrobium plicatile Iindl. have P*Pared for publication.

k>*!l Mr> Biawas. Curator of the Herbarium, has published the follow- K\J Bers d «ring the year :-(a) A Census of Indian Algae, Scope of due ^f Studies « Inaim, (b) The role of Acrophilous Algae m pro- >g col OUr efiect Qn b a r « ;) (GK mpses f the vegetation of &uth l E * , « Herba rium Note^ on HomaBum bhamoense, (a) The Algal fc of ^ Chilka Lake, (/) Second Preliminary report o n l t e M t a d I S ? of Ca l«Utta and n o S on the o^garuisn* m the water filter bed.

of

* 21- Of interest at once from the botanical ^ ^ ^ on > « • Metcalfe's descriptions of the, +**£ Jf urse f ^amin- ^e l 'd « % of scented woods from the B'«* ^ « t confusion exxsted Je ^eae woods it has become evident that * « 7 J - d ^ ^ b n c t *8Mding their botanical identity due *> a ber ^ tra de nam^-

same general observation ... regarding the ...
the varied opinions that appear to exist regarding the ... that the confusion is not confined to woody pogons in India may indicate

"8pecie8_ v Survey of the San-

22. The account b y Mr. f ^ J pro- tonin bearing Artemisias of the, S « * JJ^ ^ the Press hould gress in the economic sphere. « is a , t toe at Mr. Badhwar's disposal ri the bnuted ^ of eviden ce has J- selec ^ portly issue. Considering the b n ^ adduced * this investigation, a very « * $ £ * can *•developedn^ ^ to show how a Successful S a n t o n m ^ ^ has be^ «ta ^ areas of the North West; * ? £ £ £ * * - { * * £ . can Badhwar • making good progress. J* thftt on retrenohmen^ apacity. <*Ily results« evidenced by the feetwork ^ 6 pn vate P had himself confidence to go over to tn«

23. The services of the Department were solicited by the Md*09 Survey of India in the production of a descriptive list of all kin* °l Indian water and swamp plants. The lack of a handy text confi^ to water vegetation has long been felt by malariologists and othe* engaged in work on the distribution and prevalence of mosquito larvae- It a known that vegetation in ponds and iheels has an active in**** on these larvae, and a forthcoming text with some 128 illustration ana with descriptions containing the minimum of technical terms w* it is hoped, stimulate this important study-the interrelation «M* plant and work k r ^ ^ of Indian m^' ponds » nd ^ ^ K work u, under preparation by the writer and Curator of the Herbal Ihe figures are prepared and descriptive matter well under way.

n

neglected. There is a good record of work on the Fungi, still mostly however related to the parasite members of the group, thile work o» £Vifc; E TS^ Mosses &>ges on. Mr. Blas has deal s& in ... t ***> S0ci^ ** the orgLms found in * filtered water sup? 7 , 1 Cakutta - a^ Works with ... account is given by Chaudhuri and ... of the wither tip disease of Citrus ...

One ... NiteUa ^ four of ®»™ « corded by ft 0. All f, I.C.S., ... the neighbourhood of Agra. The general absence of water in the neighbourhood militates against this group of plants and the author's observations are, as he states, mostly of a negative character. Nevertheless two new records result which show what can be accomplished in even the least promising situations when interest in a subject is present and when energy to find what exists pushes the field botanist to satisfy his curiosity.

26. Further evidence is adduced by Boergenson of relationship between the Algae of the Northern part of the Arabian Sea and Algae in other and distant parts of the world. The relationship which was known to exist between the Algae of Australia and the Northern shore of Western India is now extended, for species as widely distant as South Africa and Japan are now involved.

27. Prof. Kashyap has a very interesting article on the gamatophyte of Equisetum wherein he records that the prothallus, contrary to many text-book descriptions, is monoecious and that development is largely influenced by its freedom for growth.

28. Of work of an ecological nature reference may be made to Garland's examination of succession among the grasses of the Deccan trap dry mixed deciduous formation and its use in sub-classification.

29. A peculiarity of arrangement noticed by A. C. Joshi in the primary vascular strands of Heptaplurum venulosum, a north Indian

member of the Araliaceae, has been followed up by the author who now suggests that the abnormaUties traced have originated in response to physiologiqa needs.

. .30. The first volume of an important series on Forest Trees of the fetish Empire by Chalk and Burtt Davy has appeare i » . ». stains fully descriptive matter with morphological featuresid^» *** value of about a dozen species of African *angm-* « £> W * * .* to inokde Indian species-as it is to be hoped i t ^ J . ~ Avva most valuable addition to literature for the Forest Botanist.

31- Therateof process on Sir David Prain and Mr. BurkUTs,.ono- f Ph of the geni Dioscorea was resumed through t^e h ^ n f * * «• Trustees of the Bentham Moxon Fund, who, on ™^J™ Government gave a portion of the funds ^Tary for on, were prepared to supplement this to the extent that 32 botanical plates could be produced in the year. The voluminous text is in the Press: the year !934 should see the work finished so far as illustration is concerned, The Annals of the Garden are « J ^ in having secured a work of the magnitude and standard of this monograph.

a Industrial Section.-- During the year under report about 207 s ted in the Gallery. Most of them are specimens tea and coffee and the others represent fruits, oil seeds, fibres, coir, coir matting, etc.

H 2. No tour couW be undertaken by the Curator Jorwantof funds *• to retrenchment of - P - * * * ^ is strongly felt that if the specimens are to be kept in proper orc . replacement of those which due to age, the Curator will have to go out touring to collect ^e specimens required to replace and to add to the spe

t^ibits were thoroughly renewed and by procuring samples of tea through the courtesy of ing Agents of almost all the in f rtant Tea Gardens in India and Ceylon. Beside* the samples of tea, the Commissioner for India of the Indian Tea Cess Commi?tee, Calcutta, presented the Gallery »** • " » of 17 photographsdepictingviewsoof differ ent aspects of plantati on work and of the growth and manufacture oi » ea in These photograph3 mounted and framed form * **!*» ful and educative annexure «o the tea exhibits in the Public GaUerj.

, Messrs. D. G. Dutt & ^ - ^ alcutta presented a set of coir products manufactured in the South comprising beautiful specimens of door mats, ropes, mattings and fine fibres used in ion work which for.-n a very attractive and useful exhibit in the fibre bay of the Gallery.

5. Exhibits stowing Cinchona and its products have be en renewed.

6. About 2,000 labels for exhibits were replaced by P[rl]£ibited in 'w ones and, as usual, a number of herbarium specimens exn ^oW ^ Gallery were replaced by coloured drawings of plants w hich fruits and leaves in their natural bearings.

7. Information regarding the sources of supply of ^ ^ ^ fro* and their products was given to a number of correspondent; -lant India and abroad, and a considerable number of plants ana y ^ ducts were identified on behalf of Government Departtnen tal (Bai general public. The National Ayurvedic College and Hospi ecime ^ Shastra Pitha Parisad) of Calcutta applied for certain sp the drug plant material with a view to extend their Museum ana tution was helped with about 135 such specimens during tne y ear.

8. Information on materials of the following was suppnea ^ of applicants in different parts of the *orl<l -.-*Camellia theijer*, *Coffea arabka,* L.; *Psoralea corylifolia,* L.; *Bochmerta* D." Don.; *Artocarpns* ?p.; *Strophanthus y.*; *Ipomaea* Brassica campestric, Linn.; *Salvia aepyptiaca,* Linn.; *Law*** leana, Benth.; *Podophyllum Emodi,* Wall.; *Piper Betle, Un*- quinquefolivs, Linn.; *Brassica alba,* Hk. !. & T,; *Artemisia m* L.; *A. tulgaris,* L.; *Gossypium* sp.; *Cinchona* sp.; *B*assia* meria nivea, Hook. & Am.; *Primula* sp. ; *Eichornia* sp. ; garicum, Steph.; *Bamnytonia speciosa,* Forst.; *Terminalia* W. & A.; *Tuwtea* :iUora[f] Benn.; *Crataegus Oryacartha, tiw-* flora caloneura, Kurz.; *CopHs Teeta,* Wall.; *Derm* daria, Roscoe.; *Juncelhis inundatus,* Clark**; *Typha* Clinogyne dichotoma, Saasb.; *Morinda awymtijclia,* Roxb.; Curcus, Linn.; *Ricinus communis,* Linn.; *Bambusa* sp. r Eragrostis cynosuroides, Beanv.; *Brassica* sp. ; *Musa sapievdum* Aeschynomene aspera, Linn.; *Cyperus tegetum,* Roxb.; Chebula, ReU.; *Pongamia glabra,* Vent.; *Melia Azadirwhta,* Schleichera trijwja, Willd.; *Shorea robusta,* Gaertn.; *Aw* Linn.; *Lagerstroemia Flos Reginae,* Retz.; *Anthocephahs* tliq.; *Evgenia Jambolana,* Lam,; *Phocnir sylveslris,* Roxb.; *elephantina,* Roxb.; *Jatropha lamus* sp.; Linn.; *rminalia* Linn.; *Catechu, Cadamba, Borassus a,* Linn.; *Albizzia Lebbek,* Benth.; *Diospyros Embryopteris,* Fer*.; *Baccaurea savida.* Muell. : *Cannabis sativa.* Linn. : *Panaver somniferum,* L.; *butyracea,* Roxb.; Pre«a Zo6a^ Linn.; *Diospyros tomentosa,* Roxb.; *Withania somnifera,* Diinal.; *Cephaelis Ipecacuanha,* Rich.; *Tridax procumlena,* Linn.; *Aconitum ferox,* Wall.; 4. Aeter*phyllum,* Wall.; 4. *Napgttu**, Linn.; Coram Comi, Linn.; *Cocos nuri!***> Linn.; Acacia arabica, Willd.; yhrtooarpMs inma, Linn.; *Hydnocarpns W'9atus, no,* BL; P^aseoi its *aconitifolius,* Jacq.; P. *calcaratus,* Roxb.; P*[101]

K *• Mungo, L.; var. radiatus, Linn.; P. radiatus, P. vulgatis, Linn. and Apium graveolens, L.

III. ... from a ^ o ^ G o ? d Quinine--«^*.~Thcre was no bark imported during the year on Government account during the year. Bark harvests from the stock of «. ... ma Plantations amounted to 78,382 lbs. of ... H*,176 lbs. of bark was sent to the Bengal ^vested bark ... Factory at Mungpoo thus leaving the total quantity over to 1933-34. ... namely 78,382 lbs,, at the Plantations as a carry

2. ... ^a^barV ... baric carried over from the previous year total of 600,017 ... and Burma bark ... lbs ... was added 177 ... as opening balance for the year. To the stock from the ... lbs, (this is made up of 114,176 lbs. despatched from the ... Plantations during the year and 63,019 lbs. despatched ... during 1931-32 but reaching the Factory at Mungpoo ... year 1932-33). bringing in a total of 778,106-7 lb*. During the year 82,555 lbs. ... of bark (Java bark 58,833-3 lbs. and Burma bark ... lbs.) were worked leaving 345,639-4 lbs. of Java bark and 311,079-5 lbs. of Burma bark » a total closing balance of 656,718-9 lbs. as a carry over to 1933-34.

3. The total stock of India Government bark at the close of the year ... 6^,07 ... comprised of 78,382 lbs, at the Mergui plantations and 6^,718-9 lbs. at the Mungpoo Factory.

4. During the year 121,388-3 lbs. (Java bark 58,833-3 lbs. plus Burma 20<U 2>556 lbs,) were worked and 3,981 lbs. of Quinine Sulphate and ... lbs. of Cinchona Febrifuge were eytracted. Burma bark gave ... S'5 lbs. of Quinine Sulphate and Java bark gave 2,582-5 lbs.

5. Stock of Quinine.-At the close of the year the total Government of India stock of Quinine Sulphate purchased as such and extracted from Java and Burma bark amounted to 282,758-828 lbs. of which 62,634 lbs. lay at the Indian Museum, 215,513 lbs. at Mungpoo ** 4,611.828 lbs. at Naduvattam.

6. Stock of Cinchona Febrifuge.-The total stock of Cinchona Febrifuge at the close of the vear amounted to 22,965 lbs. of which roundly 12,390 lbs. *ere held at'Mungpoo, 10,462 lbs. at Naduvattam and 112 lbs. at the Jail.

7. Sale of Quinine. -During the year nndei report the sale of Quinine from the different stocks amounted to 11,368-11 oz. against 16,952 ... in the previous yea, The ... in the distribution ... J oz.; Rajputana ... oz.; North-West ... ; ... 3269 ... oz.; Baluchistan ... 92 lbs.; Central India 504* oz.; Delia 235 10* .

reduced sales of Quinine Sulphate are to be accounted for by the facts that Madras did not indent and by a shorter demand from the Punjab this year. Demand from the Medical Store Depot, Lahore, was less than what it was during the previous year. One pound jalap issued from the Mungpoo Stock is so far unaccounted for; this was forwarded as samples to the High Commissioner, London.

8. ***Sale of Oiwhona Febrifvge.-Until*** **it is used up the** Government of Bengal meet all indents for Cinchona Febrifuge from their own stock, so that the amount due to India on account of Febrifuge receipts ia not ascertainable till after the close of the year when the complete analytical results of the working at the Factory become known. During the year under report the quantity of Cinchona Febrifuge sold by Bengal on the Government of India account was 8,968'25 lbs. from the stock of Government of India Febrifuge at Mungpoo and the Presidency Jail, Alipore.

9. *Revenue by the* 8'* *of Quinine.—Dimng* 1932-33 the actual receipts amounted to Rs. 2,16,988-8 against Rs. 3,17,510 in the Previous year. Of the total receipts Rs. 1,00,391-1 were by cash and Rs- 1,1M 12 by credit sale and Rs. 102-11 by Bank Draft.

10. *PknWiovs.*—In pursuance of the policy of Government a policy dictated by the transference of Public Health as a subject to the provinces and in conformity with the recommendations of the *Tuv-fc* Accounts Committee to liquidate stocks and contract production-" no increase in the area of the plantations in Burma has been made. Contraction in the effort is going on as quickly as consideration *°r trees in bearing and about to give their quota of bark will allow. ™* younger areas are, however, still some way from giving the harvest of bark they could ghe if allowed to reach maturity, and it must, therefore, if these are to be made proper use of, be some years before reduction in supply can be effected. Tn the circumstances it is perhaps |*n- fortunate that the best area of the reserve so far utilised should be t&* which carries the youngest Cinchona, but one could not foresee the effects of constitutional development when a Cinchona programme was being framed and while present production is ahead of what is desirable it may be taken as certain that a time will come when the stocks produced will postpone the necessity of having again to depend on foreign supplies of the drug. The advent of Totaquina moreover Provides one means of utilising the Burma bark for it has a composition to* will help to balance other supplies as the united stocks of bark are put through the factory.

The older areas are being worked off as rapidly as practicable, the younger areas are standing well but there is and no longer can be an;

change in the Wllole is on!y experimental results so far evident. The reserve as a oUt Mother • ? oderately fitted to Cinchona. While it is being worked industr Clal Sease is • 7 that may weI1 prove t0 be worth while in the finan„ ?ent °o all S e Co∧rSe of deveIopment. After many years of experi- pec acuanha a Clncllona Plantations the best means of harvesting SUcl) success hS * nurseried plant tave become clear. There has been 011 ∧outh A e-re ∧ at **ere S∧OUW no longer be necessity for reliance IV American sources of this important drug plant.

Ss.i∧∧∧cial.∧The total budget allotment for the year was on ∧o∧jr u hkh Rs*38>000 fincludiDg Rs-1,000 for Enelish charees, ptoperinri ∧-g Commissioner>s Budget) was for the Botanical SuTver for Cinch gthe TndustriaI Section, Indian Museum, and Es.],25,000 al otnientp n Surrender ot Es. 1,765 was made from the total budget from the ,1>098 being from the Botanical Survey proper and Es. 667 appronria fio gKsl1 Charges on Stores, so that after surrender and re- (thiselciuT* the allotments for the year were reduced to Es. 1,61,233 Wa8 f0P ∧ s Provision of Es. 2 for loss by exchange) of which Es. 39,280 Us. i,21 *rtanioaI ,620 Survey proper, Es. 333 for English Charges and Was ga. 1,59 for Cinchona. The total actual expenditure for the year 8tore8 b t j591 namely Es. 39,083 (including English Charges on for BotanicU e3rcluding Es. 2 on account of Loss or Gain by Exchange) Under the ∧ Surver and Rs- h∧Ofiil for Cinchona. The net saving Cinch Botanical Survey of India proper was Es. 530 and under ment o?a T Rs, 779. Surrender of Es. 1,765 was reported to the Govern-

M ∧# *faff.--The writer held charge throughout the year as Director. out th N. Ba, Wa8 Orator, Industrial Section, Indian Museum, through- ber to Vo6ar excePting for a month and a half on leave, from 9th Novem- of h\a 7rd December 1932, when the Director himself took over charge Uls duties.

2. Mr. V, ∧ara7anaswami was the Systematic Assistant during the .Vear ber ∧*cePting for four months on leave from 13th July to 12th Novem- W 1 932, when Mr- T- D- Srinivasan, the now retrenched Systematic Assi8tant, acted for him.

3. 1Ir, ?, C, Pal was Assistant Pastor, Industrial Section, Indian MuSe ∧ tiI! the mh November 19i32» when as a measure of retrench- ment ∧ith h P?St WaS abolished with effect from the lst of December 1932, w ls retirement. He had rendered more than 35 years of meritorious ICein the Department,

4. Mr. S% B# Banerjee was the Head Clerk of the Department through- Ol*t the year.

5. On the Cbch0naPlanta ti°as> Mr. P. T. Kussell, was Superintendent, Cinchona ons, Burma, and throughout the y^ * . M g _ s i n e , O s e B e e r ,

6. All the members of the 8taff have ^rkęd conscientiously and well i[he difficult circumstances of increase ™rk due to development and to retrenchment of posts.

C. C. Cald«r,
Director, Botanical Survey 0//«*«»•

MGIPC—M—III-7-12—19-2-34—480.

Report of the Botanical Survey of India for 1933-34.

If Systematic ... very ... tte Way of tOUTin8 was PossiWe throu... the 8Wt the ... Case gener ii^** ^e ac*^^es °* ^e Survey were, as has been ^B and ... the SmCe re^renc lmien* was effected, confined to head- for outdoor w r..t * JIilseilIn_ No officer *oi* tie Survey was deputed material accru? > ail d apart from purely local collections all the new individ... to the herbarium came from sister departments and times li... rs fort y pd o fie ork t fortunate in ikp xiese ... unately placed for field work. It is fortunate in Botanic Qar a ... y * located m association with the Royal not found nS> *or ^ere are 8rown a ^aT6e number of plants that are living gpg . m tte ilm »ediate neighbourhood of Calcutta. Many of the can be r..de and this help... of the Gardens serve as stock from which distribution the deficienc... 3, though very inadequately, to make good work brings y. m material for exchange which the enforced lack of field But... te Surv^y m an official sense gets curtailed in the wider sense its progres... S *S ^^^ained by the product of the Indian Schools and ^olW... of ^or... wh*°k xe snlts shows how rapidly and efficiently the purely Indian ... is taking its rightful place among the Schools of Botany of the world. There are now but few divisions of the plant kingdom that have hot ^ ^e^ fc^an devotees, and the scope of India's contribution to th... kftowledge is ever enlarging. Although work connected with ^-ose ... divisions of Botany which are chiefly of economic importance, prc- j... Pcal botany, to mention two branches only, shows that the Indian e^°rt is not confined to those lines which most readily gain official recog- n... ifaon. Much of the work is obviously done for its own sake and for the interest the new generation of scientists have in it.

A. feature of these reports has been a brief review of the work done and published towards botanical study in India, no matter from what Source, but it is impossible in the space allowed here to do other than Nation a few of the outstanding lines of progress during the year. No claim to anything like completeness is made.

At headquarters identification for correspondents are on the increase, ^ttte 3,611 sheets were name^l. Many of these are, of course, common Plants that give little trouble to the herbarium worker; but the list contains its nonnal percentage of difficult species where dissection and comparison with description and figure and authenticated herbarium

record all have to be resorted to before determination can be made. A few uncommon specimens may and often do give more trouble to the sjstemat.st than many dozens that get recognised at a glance.

We the ft? U1 the iBAabm Comprised an examination of plants fr* the little explored area along the Baripada frontier tract, of the A* ilills, Assam. In these collections several new or likely to be new species have isol ^ AnKa W* others> G^osmis Boreana wami !r and a new member of the Cucurbitacea not yet named.

Mate 1 the genus Glycosmis from herb · ? tt ~een ^ ^ and ^ ^ along the SMDong and Dehra J»» tin™lte" nW T 1 6 8 Which ^ now b « ^ ^cognised as a result of tS revision yanaswe The ^ b M Science

Pl locust l * 1 " . 1 1 1 * m connection with the work now going on o» control have been reported on to the Research Entomologist *> the Impenal Council of Agricultural Research, whQe special attend ha. bee *lwSfT ^Amakm Flora nw ^der for publica SSfS ... Forest Serv. Smaller lote of ^ plants from Sik im, Dehra Dun and elsewhere are also recalled as forming part of the year's work.

Some 4,793 duplicates ^ distributed chiefly *» America, China, Japan, Hyderabad, Dehra Dun and Calcutta. Much of this material consisted of duplicates of ^^ plants ^ wMd. several sets were extracted from the herbarium 80me I™ ^. The Malayan Flora » relatively well represented ^ ^ herbarium and these * ^ therefore, f ... work has a S1U^le basiS fOT exchange during periods when *«** 1,000 of medi T f ^ DupUcate vi ^ the number of nearly of the Sc W T Pta ? * ™ gJwB to the Pharmacological Department herbarium ? ^r MedichlC in Calcutta to fonf the basis for of the species of medicmal plants it is proposed to build up there. Mater«J authorities tM ^ and Rhododen^on were on lol for work by * dinburgh respectively.

Several hundreds of sheets were received in exchange from the Continent and England, from America and from Singapore. A purchase of 200 valuable exsiccat© from Dr. Fr. Verdoorn added further to the accessions.

Mr. Biswas, Curator of the Herbarium, visited the Bhutan bordej* fro: ... osed revision known botanically and S+ . Ben«aI Plant«-' The area is not well of fresh material for'£&**?« ^ «*P towards the compilation of some 1,500 well p^Zf th<J Flora, He b™«ght back a collection orchids now growLg in 5 £Climen8including several bundles of living g a the Garden nursery. Ifo. Biswas also utilised

the opport
Bomb ay to ^f 11 ! had wlile attending the Indian Science Congress at
J ief c° mpoue t tne mau 8 rove area of the Salsette Islands. Here the
tolle aiu ^ , of tlle mangrove vegetation was found to be Ceriops
*Peci a ou t n kcl1 °edes importance as a predominant species to other
Work on ! i m ^ grovc c< >asts of Bengal and Burma.
of the 1 r F1 ora of MftdraB „ is bein 8 continued h Y m - Fischer,
er 0Us £r 0 u Porest Service. He has come to the difficult and
^Wishedfo+i* Oi tte S rassea > aiwl ft is natural therefore that his notes
froiri South I -» BuUetin under the title " New or little known plants
^^ of a .^ „ sllouI(1 chiefly relate to descriptions, with critical
tran8l ucens UC A S ? ecies as Aris»ina Wightii, Arisaema Barnesii, Arisaeina
vil los Uaj j^. ^^wma tylophorum, Arthraxon depressus, Arthraxon
tra Wor Gns Imeila bialata , Ischgemum Rangacharianum, Isch»mum
“ Pride of ! and Millliauiis forficulata.
^a of f? u g s t the floras of the year falls to Principal Fyson's
work uud er Nil 8 iris and Pulney Hilltops " a revised and elaborated
^ title „ Flora of the South Indian HiU Stations > Oota ca-
mund, Coon °Or> ^ot agiri, Kodaikanal, Yercand and the country round
these.” This ^8 luuc h more than a second edition of the original work
by th e s
of Coo u ame autllor - The area is extended by the inclusion of the floras
*^ritt e °01 ^ ^ ercail d. Many of the former descriptions have been
With it ^ ^ hule most °^ ^ fiQm ^ave ^eens h ortene<ifc0allow °*the v°lume
ti es of S nUttxerous additions being kept to a convenient size. The locali-
ty manv of the species cited have been extended, and new keys for
illustrat ge^ra a dd S rea % to the value of this edition. There are 611
T ions in the companion volume.
0{ ; he k ^te Rev. Father Blatter with McCann continued their revision
?ar f°°v e,8 „ Flora of the Bombay Presidency " by the publication of
S T XXI and XXI 1 EL tlie Journal oi the Bombav Natura l History
da let y. They have dealt with the Balsamineae, Rutaceas and Asclepia-
Milf* OlIe species Ceropegia panchganiensis is new. Blatter and
Ind e*d in the same journal continue their illustrated series of " Beautiful
andi au Trees." The plates of Saraca indica, Cochlospermum gossypium
prev Gardinia lucida now published should help, together with those
and unuly issued, to develop an interest in the botanically minded student
life ^ay lead more than one into a pursuit that may pave the way to a
time's study.
Tl *e " Flora of Afghanistan " has received little attention since 1887
w l *n Hcmsley and Aitchison published in the Transactions of the Lin-
ne a n Society the results of collections made during the Afghan Commis-
sion. Work by Bornmueller in the Botanische Jahobucher wherein
several new records arc made and new species recorded for the region'
hel i* to redeem the omissions while Father Blatter has also been at work
on plants from the same area. This author's descriptions of plants

from Waziristan in the Journal of the Bombay Natural History Society include the following new species:—Erodium nanum, Erodium adenophorium, Erodium heterosepalum, Trigonella lasia, Trigonella psilorhynchos, Astragalus mucilagineum, Astragalus Fernandezianus, Indigofera acanthinocarpa, Euphorbia helioscopioides, Euphorbia pauciradiata, Medicago pseudogranatensis and Medicago monantha.

Several new records for the " Flora of Assam " result from work during the year by Mr. C. E. C. Fischer while attention to the " Flora of Burma " has yielded Palaquium Sukoei, a new species. Mr. C. K. Parkinson has described a new monotypic genus in Dendrochloa distans, a bamboo from Burma. Taiwania cryptomerioides is an interesting occurrence of a Formosan Conifer in the Myitkyina district of Upper Burma. This Conifer was for long known only from Formosa where it was considered endemic. It was later discovered in the Salween Irrawaddy watershed of N. W. Yunnan well in the interior, and the present discovery much lower down illustrates the peculiar discontinuous distribution that certain species of plants display. The following new species have also come to light from Upper Burma :—Gaultheria sinensis, Jurinea Cooperi, Jurinea taraxacifolia, Saxifraga filicifolia and Agapetes corallina.

Mr. A. Das continued his writing of the " Flora of Assam/[1] working partly at Sibpur and partly at Shillong. The following new species *toi* the area were described by him, partly in collaboration with the stafi at Sibpur, and sent to the press :—Pachylarnax pleiocarpa, Eurya japonica var nitida, forma Kanjilali, Sterculia Khasiana, Gymnocladus assamicus, Lagerstroemia minuticarpa, Symplocos Pealii, Chirita niishmiensis and Strobilanthes furcatus. These appear described with illustrations in the Assam Forest Records.

Reference has been made above to Mr. Narayanaswami's work *on* Glycosmis. He has now finished the revision of the Indo Malay* species of the genus. Material from other herbaria was revised at the same time. Mr. Narayanaswami has critically revised the following species :—Glycosmis pentaphylla, Glycosmis arborea, Glycosmis cymosa, Glycosmis singuliflora, Glycosmis monticola, *Glycosmis pihsus*, Glycosmis puberula, Glycosmis Winitii, Glycosmis chlorosperma, Glycosmis macrocaipa, *Glycosmis Boreana, Glycosmis mansiana, Glycosmis paraphT Uianis*, Glycosmis macrophylla, *Glycosmis Parkeri*, Glycosmis Parkinsonii, Glycosmis sapindoides, *Glycosmis pseudosapindoides*, *Glycosmis perakensis*, Glycosmis lanceolata, Glycosmis crassifolia, Glycosmis angustifolia and Glycosmis bilocularis of which those in italics are new species validated by latin descriptions and plates still to be published.

The nomenclature of the species of Indian flowering plants has in recent years undergone considerable and drastic change in conforms with the latest rules of plant nomenclature, the object being precision priority and uniformity. The several Indian floras recently

preparation have, as far as possible, adopted the changes, but Hooker's "Flora of British India" remains the standard and unless it is revised simultaneously it will be difficult for systematists in India to adopt a universal system of nomenclature for the whole peninsula. To meet this end Mr. Narayanaswami has been compiling what is intended to be a comprehensive list of revised names culling the information from the available literature, besides revising certain names in the light of recent changes in the conception of Indian genera. His list is now in the form of card indices wherein the revised name appears alongside the name appearing in the "Flora of British India". He has also prepared a synoptical table of the families of Indian flowering plants of Hooker's Mora showing the changes they have undergone in recent years b$th hi nomenclature and in taxonomic position.

Of interest for the plant geographer is Mr. Orr's paper, Vol. XVIII of Notes from the Royal Botanic Garden, Edinburgh, on the distribution of Himalayan Conifers and their extension towards the East into the Burma Yunnan area, and a paper on the distribution of the Himalayan species of Ilex containing reference to a new species Ilex obtata from Upper Burma.

Indian Universities and Colleges have contributed their share of work which embraces an ever enlarging scope, to the study of Indian botany, especially in branches little touched on by official surveys. The study of the Cryptogams, anatomical, cytological and physiological studies, and ecology being in parts branches specially lending themselves to study by the student who may not always have wide collections or extensive literature at his disposal. The Cryptogams specially are studied, and several works of an ecological nature especially by forest officers may be cited as adding to our knowledge of the social in Indian Plant life.

Maclagan Gorrie deals with the ecology of the Sutlej Deodar. The ecology of the Himalayan spruce and Silver Fir is dealt with by Parmanand Suri and Pinus longifolia in Kangra and the Hoshiarpur Forest divisions forms the subject of an ecological paper by N. P. Mohan.

Several papers have been contributed by Mr. Biswas, Curator of the herbarium, during the year 1933-34. His paper on a "Comparative "tudy of Indian species of Avicennia" embodies Mr. Biswas' field observations in different parts of India, especially along the CLakaria Sundrians and the Arracan sea-coasts. This paper has been published with three plates in "Notes from the Royal Botanic Garden, Edinburgh." In his paper on "The vegetation of the neighbouring areas of the taniganj and Jharia Coalfields" published in the "Transactions of the Mining and Geological Institute of India," Mr. Biswas deals with the

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of Raniganj and Jharia. The paper " Living Conifers " formsa counter-part of Mr. Biswas' paper on the " Wild Distribution of Indian Conifers." In this paper about 106 species of wild and introduced conifers at present under cultivation in different parts of India and Burma Lave been recorded. He has also published " Observations on Algal collections from the Khasia and Jaintia Hills of Assam."

Along with the writer, Mr. Biswas is also engaged in the preparation of a descriptive and illustrated list of the commoner Indian water plants. While this is primarily intended for the use of the workers collaborating with the Malaria Survey of India, the ease with which many of the commoner water plants can be identified should render it a work useful for reference by a wide circle of Indian botanists having an interest in tin[1] group. It may be expected to furnish the basis for ecological studit* in the aquatic and marsh vegetation, rich in this country by reason of our generally abundant rainfall. The plates for this work which is being published by the aid of the Malaria Survey, have all been prepared and the text is nearing completion. Sir David Prain and Mr. Burkill's monograph of the genus Dioscorea is passing through the Press, the plates will be finished during 1934-35.

II. Industrial Section.—During the year under report about 85 gallery specimens were registered of which 63 were exhibited in the Public Gallery. Most of the specimens were food materials, others were fibres, medicinal plants, oil seeds, dye yielding plants and gums. Of the new exhibits the most noteworthy are the specimens of Tassar Silk Cocoons, waste silk yarns and pieces of cloths mostly coloured presented by the Industrial Institute, Bariii»:><l:i 'Vfayurbhanj, exhibited in the New Central case of the Fibre bay.

No tour could be undertaken by the Curator for reasons already stated in last year's Annual Report.

A comprehensive exhibit of edible fruits, abnormal fruits, rare fruits, important indigenous medicinal plants and Cinchona and its products, with photographs explaining the methods employed in the cultivation of Cinchona and details of manufacture of Quinine and other salts, was placed on view to the public in the Nature Study Exhibition held at Lady Ezra's Garden in December, 1933. The exhibit was most comply of its kind and the trouble taken was fully rewarded by the large number of interested visitors who spent time over it.

Exhibits of Cinchona and its products were placed on view wiw* explanatory notes for the All-India Pharmaceutical Conference held at the All-India Institute of Hygiene and Public TT.^lf-l. in January* 1934.

As usual a number of Herbarium specimens exhibited in the Gallery and in the Timber exhibit in the staircase were replaced by coloured drawings of plants.

Rearrangement and overhauling of specimens* continued during the year and about 2,500 labels for exhibits were replaced by printed or typed ones.

Information regarding sources of supply of Economic plants and their products was given to numerous correspondents, both from India and abroad ; a considerable number of plants and pkint products were identified on behalf of Government Departments and the general public.

Information on materials of the following was supplied to various applicants in different parts of the world :— Abrus precatorius, Linn., Acacia Catechu, Willd., Acacia leucophhea, Willd., Acalypha indica, Linn., Aeschynomene aspera, Linn., Aeschynomene indica, Linn., Agave fibre., Aleurites Fordii, Hesml., Alhagi maurorum, Desv., Alpinia Galanga, Wall., Amomum aromaticum, Roxb., Amomum subulatum, Roxb., Andrographis paniculata, Nees., Anodendron paniculatum, A. DC, Artemisia maritima, Linn., Artocarpus hirsuta, Lamk., Astragalus adscendens, Boiss and Haussk., Astragalus brachycalyx, Fisch., Astragalus gunnuifer, Labill., Astragalus kurdicus, Boiss., Astragalus Microcephalus, Willd., Astragalus Parnassi, Boiss., Astragalus pycnocladus, Boiss and Hussk., Astragalus stromatodes, Bunge., Astragalus verus, Olivier., Atropa Belladonna, Linn., Balanites Roxburghii, Planch., Bixa Orellana, linn., Bombax malabaricum, DC, Canarium commune, Linn., ^annabis sativa, Linn., Carthamus tinctorius, Linn., Cassia Fistula, I^nn., Cdastrus paniculatus, Willd., Cerbera Odollam, Gaertn., Cinchona I^dgeriana, Mcens., Cinchona officinalis, Linn., Cinchona succirubra, 1'av., Cinnamomum zeylanicum, Breyn., Citrullus Colocynthis, Schrad., Colocasia Antiquorum, Schott., Coptis Teeta, Wall., Cordia Myxa, Linn., Cordia obliqua, Willd., Coriandrum sativum, Linn., Corylus Colurna, linn., Crocus sativus, Linn., Curcuma longa, Linn., Cuttle fish., Cyanotis axillaris, R. and S., Cymbidum aloifolium, Sw., Delphinium denudatam Wall., Derris sp., Digitalis sp., Dioscorea Hamiltoni, Hk. f., Diospyros Lotus, Linn., Eclipta Alba, Hassk., Elaeocarpus Ganitrus, Roxb., Elettaria Cardamomum, Maton., Ephedra peduncularis, Boiss., Eugenia Jambolana, Lam., Euphorbia Tirucalli, Linn., Ferula fcetida, Regel., Ferula Narthex, Boiss., Fraxinus floribunda, Wall., Fumaria parviflora, Lam., Garuga pinnata, Roxb., Gentiana Kurroo, Royle., Geranium nepalense, Sweet., Clycine Soja, Seib and Zucc, Grewia sp., Guizotia ulijyssynica, Coss., Holarrhena antidysenterica. Wall., Holostemma ^heedei, Wall., Hydnocarpus venenata, Gaertn., Hydrocotyle asiatica, Linn., Hyoscymus niger, Linn., Isoptera sp., Lallemantia Royaleana, Benth., Lasiosiphon speciosus, Decne., Litsea polyantha, Fuss., Lespcdeza sP-> Melastoma malabathricum, Liim., Melia Azadirachta, Linn., Muehelenbeckia platyclados, Meissn., Nasturtium ofticinale, Br., Nymphea" Lotus, Linn., Oryza coarctata, Roxb., Oryza granulata, Nees and Am., Oryza sutiva, Linn., IVilln orinmides, Linn., Phyllanthua Kinblica,

Linn., Pinus longifolia, Roxb., Piper nigrum, Linn., Pistacia mutica, Fisch and Mey., Podphyllum Emocli, Wall., Pongamia glabra, Vent., Prosopis spicigera, Linn., Prunus Amygdalus, Baill, Psychotoria Ipecacuanha, Stokes., Pterocarpus santalinus, Linn, f., Quercus Ilex, Linn., Rubus fruticosus, Linn., Salvadora oleoides, Dene., Saussurea Lappa, Clarke., Sedum himalense, D. Don., Shorea sp., Sida rhombifolia, Linn., Smilax macrophylla, Roxb., Sterculea urens, Roxb., Strophanthus sp., Strychnus Nux-vomica, Linn., Suaeda maritinia, Dumort., Tamarix articulata, Vahl., Tamarix dioica, Roxb., Tumarix gallica, Linn., Terminalia Catappa, Lijin., Terminalia Chebula, Retz., Terminals tomentosa, Bedd., Tinospora cordifolia, Meirs., Trachelospermum fragrans, Hk. f., Ventilago calyculata, Tulasne., Vigna Catiang, Endl., Vitex peduncularis, Wall., Walsura Piscidia, Roxb., Wrightia tinctoria, Roth., ZephyTanthes rosea, Lindl., Zingiber officinale, Rose.

III. Cinchona and Quinine.—**Bark.**—There was no bark imported from abroad on Government account during the year. Bark harvests during the year on the Burma Plantations amounted to 54,878 lbs. Last year's stock together with a portion of the bark harvested during the year under report, was sent to the Bengal Government Quinine Factory at Mungpoo. This amounted to 111,3014 lbs.- leaving 21,9281 lbs. of bark at the Plantations as a carry-over to 1934-35.

Mungpoo stocks of bark carried over from the previous year were Java bark 345,639-4 lbs. and Burma bark 311,079-5, total of 656,718-9 lbs. as opening balance for the year. To the stock was added 111,301*5 lbs. despatched from the plantations, bringing in a total of 768,0204 lbs. During the year 167,631-5 lbs. of bark (Java bark 56,175 lbs. and Burma bark 111,456-5 lbs.) were worked leaving a total closing balance of 600,388-9 lbs. as a carry-over to 1934-35.

The total stock of India Government bark at the close of the year wag G22,317-4 lbs. comprised of 21,928-5 lbs. at the Mergiii Plantations and 600,388-9 lbs. at the Mungpoo Factory.

During the year 167,631-5 lbs. of bark were worked and 5,739-6 lbs. of Quinine sulphate and 3,394 lbs. of Cinchona febrifuge were extracted.

Stock of Quinine.—At the close of the year the total Government of India stock of Quinine sulphate purchased as such and extracted from Java and Burma bark including both purified and trade standard Quinine sulphate, amounted to 151,919-071 lbs. of which 54,036-09 lbs. lay at the Indian Museum, 97,271-153 lbs. at Mungpoo and 611-828 lbs. at Naduvattam. There was also 97,365-65 lbs. of crude Quinine ft* **Mungpoo Factory.**

***Stock of Cinchona febrifuge.~The* total stock of Cinchona febrifuge at the close of the year amounted to 21,146-25 lbs. of which 10,998-25 lbs. were hold at Mungpoo, 2,398 lbs. at Naduvattam, 112 lbs .«t**

Jail JLIH! 7,(>:i8 lbs. at tli<> Um-.l

Sale of Quinine.--During the year under report the sale of Quinine sulphate from the different stocks amounted to 12,955 lbs. 11 ozs. against 11,368 lbs. 11 ozs. in the previous year. The shares of the provinces in the distribution were United Provinces 1,917 lbs. 10] ozs., Punjab 8,929 lbs. \ oz., Rajput$na 621 lbs. 8 ozs., North West Frontier Provinces 549 lbs. 8 ozs., Baluchistan 247 lbs., Bushire 5 lbs., Madras 1 lb., Central India 468 lbs., Kashmir 45 lbs., Delhi 172 lbs.

A slightly increased sale of Quinine sulphate is to be accounted for by the facts that the Punjab and few other provinces had a slightly bigger demand this year.

Sale of Cinchona febrifuge.—During the year under report the quantity of Cinchona febrifuge sold on the Government of India account was 4,581 lbs. 12 ozs.

Revenue by the sale of Quinine.—During 1933-34 the actual receipts amounted to Rs. 2,88,862-10-6 against Rs. 2,16,988-8-0 in the previous year. Of the total receipts Rs. 1,08,539-1-0 were by cash and Rs. 1,80,323-9-6 by credit sale.

Plantations.— No extension of the plantations having been permitted Work here was confined to maintenance of the trees already out and to the filling up of vacancies in areas already under a good complement of Cinchona. The western area stands well, much better than any of the areas put out earlier in the history of Cinchona here and it should give a good harvest of bark. The usual difficulty of bringing plants through the dry period from November to March was experienced, but suitable shade planting has done much to prevent the effects that follow complete exposure of Cinchona to the sun, and as the Cinchona is harvested shade plants in the form of Rubber, Grevillia and Anthocephalus, especially the first and last, should leave the estate still worth something and worthy of attention. The development of an Ipecacuanha industry is going on rapidly alongside Cinchona. Many experiments on the cultural methods suitable for this plant have been made and the industry could now be developed to any extent necessary. There is a steady and growing demand for Emetine in India. This could be met completely by home production and certain of the larger European drug houses are also interested in the development.

IV. Financial.--The total Budget allotment for the year was fts. 1,«1,«H) of which Rs. 38,200 was for Botanical Survey proper and R.s. 1,25,100 was for Cinchona. After surrenders of Rs. 660 and Rs. 3,840 from Botanical Survey of India and Cinchona allotments the grants were reduced respectively to Rs. 37,540 and Rs. 1,22,560. Total actual **Pendi ture for the year was Rs. 1,55,615, *>., Rs. 37,494 for Botanical Survey and Rs. 1,18,121 for Cinchona, Rs. 4,500 was surrendered and

Rs. 2,000 was transferred to the High Commissioner's Budget. The net saving under Botanical Survey was Rs. 509 and under Cinchona Rs. 1,976.

V. Staff.—The writer held charge throughout the year as Director. Mr. S. N. Bal was Curator, Industrial Section, Indian Museum, throughout the year excepting 1 month 22 days on leave from 1st November to 22nd December, 1933, when the Director himself took over charge of his duties.

Mr. V. Narayanaswami was the Systematic Assistant throughout the year excepting for 1 month 6 days on leave from 8th January to 13th February, 1934.

Mr. S. B. Banerjee was the Head Clerk throughout the year.

On the Cinchona Plantations Mr. P. T. Russell was Superintendent. Cinchona Cultivation, Burma, and Maung Sine, Overseer, throughout the year.

All the members of the staff have worked well during the year.

C. C. CALDER,

Director, Botanical Survey of India.

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Report

of the

Botanical Survey of India

for

1934-35

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Report of the Botanical Survey of India for 1934-35.

I. **General.**—Botanical Survey work proper consists more of outdoor or field investigations and less of work indoors. Briefly stated, field work covers the study of plants in nature throughout India and Burma, with the object, firstly, of appraising the entire vegetable wealth of India and secondly of increasing our knowledge of those plants, in all possible aspects and finally making such a knoweldge available for the benefit of the people of the country which maintains the Survey. It includes among others (1) the collection, classification, naming and preservation of plant specimens and plant products in a dry state in a herbarium and a museum to serve not only as standards for future reference but also as an assemblage of the entire vegetable resources of the land in one easily accessible central spot and (2) collecting and acclimatising living plants in a botanic garden for the purpose of their multiplication and distribution when found useful to man. Ever since the organisation of the Survey in 1890, its activities have been directed towards floristic work mainly, as the extent of unexplored regions was great, but now and then problems of economic importance have also been successfully tackled as a reference to previous reports would disclose. But for some years past, **the** Survey had been passing through critical times both in finances and man power, which have conduced to the apparent inactivity in its own sphere of work. The year under review has been no exception and consequently attention has been directed to work near at hand, namely in the Herbarium, Boyal Botanic Gardens, and in the Museum, the results of which have to large extent compensated for the absence of work in the field. The Curator of the Industrial Section made a very short tour in Dacca and Mymensing and collected a few specimens, which were added io the Economic Herbarium attached to the Museum.

A feature that keeps the Survey alive is the constant flow oi specimens into the herbarium sent by officers more fortunately placed **than those of the Survey, who,** in return for **the** present of specimens made by them, are supplied with lists of identifications and economic information. Apart from depart mental work.

the large volume of botanical work, covering a wide range of subjects, both in pure and applied botany, which lias been done in the Indian Universities, the agricultural departments and elsewhere shows a considerable advance in the proper appreciation of the value of botanical studies in India. It has been a special feature of this report to record and review these products as well.

II. Systematic.—Some 2,434 species of plants have been identified in the herbarium for a large number of extra departmental correspondents, besides the critical examination of several sheets of the grass collections of the Herbarium. The major portion of these identifications represents the collections of Dr. N-L. Bor from the little known Balipara Frontier Tract along the Northern borders of Assam. Many interesting new records have been established for this region and something more than a passing reference is called for, because it gives the lie direct to the stock belief that the floristic Survey of Indian plants has long been completed and needs no attention any longer. Of the many interesting records noted, *Salvia japonica,* Thbg. var. *parvifolia* stands unique, because *S. japonica* is itself absent from India and much less this variety. *S. japonica* is a protean species occurring i& Japan and in the Chinese territories to the South-West of Japan, from Kiangsu to Szechuan. Its nearest Indian ally is *S. plectra*[1]** *ihoides* collected by Griffith from Funakah in Bhutan in the begin" ning of the last century. *S. japonica,* var. *parvifolia* was firs* collected by A. Henry in Hupeh and later on by Faber in Szechuan about the year 1885. Szechuan in Central China was the extreme Western limit of the species. Its occurrence in Balipara Frontier has now carried its distribution considerably South-West wards across the Chinese mountains and the Eastern Himalayas over more than 1,000 miles as the crow flies. This lends colour to and almost supports the theory held in the early fifties of the la[9]* century by Hooker and Thompson that there was a strong element of Chinese flora in the North-Eastern borders of India. This [lS] also another of the examples of distant discontinuous distribution of plants in the world, which was discussed in the last report when mention was made of the Formosan Conifer, Taiwan[1]* Cryptomerioides, occurring in Myitkyina district of Upper Bur^f" The causes of such irregular occurrences of the same plants [l11] widely separated localities are many, but the following are fore*[08]* aroonp them, namely, *(\)* imperfect knowledge of the flora of *[he] intervening country, (2) geological disturbances causing subsidence in one place and upheavals in another and (3) ethnological. [o t h c r] records from this nr«i nre *Juglans regia L.*. occurring[1] [r'/\ her]

«xieiiMvely according to Dr. Bor, *Quercus incana* Roxb., *Quercus polystachya* Wall., *Populus ciliata* Wall.', *Saluc longiflora* Anderss., *Habenaria urceolata* 01-, and *Cypripediuvi Fairieanum* Lindl. Of these *Q. incana* lloxb., occurs widely in the North-West Himalayas from Bushar to the borders of Western Nepal. It has also been collected from China Hills and the Shan States of Upper Burma. Its presence in the Aka hills, a locality almost midway between the two original centres of distribution, bridges the apparent discontinuity that had existed so long in its occurrence almost throughout the entire length of the Himalayas and as far as Burma. The occurrence of yet another Oak, *Quercus polystachya* Wall., till now recorded from Manipur and eastwards across Shan Hills as far as Tavoy in lower" Burma, leads one to the inference of the existence of an Indo-Burmese Flora running from the Himalayas across the Naga, Kachin and Shan Hills up to lower Burma. Such discoveries of valuable plants, even by casual workers, should draw our attention to the fact that our knowledge of several parts of India is far from perfect.

The herbarium collections wers enriched during the year by consignments of plants received in exchange from Washington, Canton and Singapore. Some 6,000 sheets have been put into the general collections.

2,354 sheets of the Herbarium material belonging to *Derris, Burmannicrceac, Avicennia* and *Gossypiuw* were on loan to Drs. Quisumbing of Manila, Pulle of Utrecht, Moldenke of Manila and Mr. Hutchison of Tndore respectively, in connection with research work on their hands.

Messrs. Parkinson, Kanjilal and Da* ‹i im- i [illegible] had several groups of plants placed at their disposal in the herbarium in connection with their floristic work. Dr. Sahni of Tjucknow has revised the sheets of *Marattia.*

1(53 sheets of *Evolvulus* were received back from Holland and the Madras sheets of the Sibpur Herbarium which were on loan to Kew in connēction with the preparation of the Flora of Madras V Gamble and Fischer were also received back from Kew.

General information on all kinds of subjects, botanical and economic, was supplied to a wide range of correspondents. Notes °n the genera Psilotum, Isoetes, Imperata, Andropogon and on the ˢl>ecies, *Cymbopogon Martini, Andropogon rersirolo,,* .1. *Rh œnanthus, Cassia renigera, Cassia auriculata, Brunfelsia latifolia* and *Asclepixu,* forming the materials relating to economic Problem*, were furnished.

The Curator of the Herbarium, Eoyal Botanic Gardens, accompanied by one of the herbarium assistants botanised on the Paresnath and the Tundi Hills of the Hazaribagh district of Bihar and Orissa and brought in a fair collection of plants. Another of the herbarium assistants, Haripodo Naskar, visited portions of Northern Bengal and secured a good collection of plants also.

Mr. V. Narayanaswami of the Survey department has completed a preliminary revision of the nomenclature of the Indian grasses, the most important group of economic plants, which not only consists of all the valuable cereals of India, namely, wheat, rice, oats, millets and maize, but also a large number of useful indigenous fodders, essential oil-yielding plants, sugar cane, raw materials for use in the manufacture of paper and bamboos, whose utility in the economy of India is too well known. In the preparation of this paper, much help was derived from the late Dr. Stapf's work on the grasses of Tropical Africa, the late Rev. Father Blotter's Revision of the Gramineae in Cooke's Flora of Bombay, Haine's Botany of Bihar and Orissa, Merrill's Enumeration of Philippine plants and from the herbarium sheets of the order at Sibpur. The shears have been rather very freely plied in this family and a number of Genera and species have been drastically split up and remodelled so as to fit in with the modern conceptions of the generic and specific limits, keeping always in mind that the earlier published name was the valid one to be retained for the species. These changes were already anticipated by Hooker in the Flora of British India, which was published in 1894. In that monumental work only 152 genera and 882 species were recognised as occurring in India, but under the new arrangement, there are 196 genera and 948 species which includes several new species described after 1894. *Andropogon,* almost the biggest genus of grasses in India, containing nearly 75 species according to Hooker, is now only about one-twentieth of its original shape, because most of the species placed therein have now been distributed to smaller genera like *Schizachyriuvi, Diectomis, Hypogyjiium, Andropogon, A inphilophis, Capillipediu m, Sorghum, Veti veria, Chrysopogon, Dichanthium, Heteropogon, Cymhopogon* and *Eulaliopsis.* Similarly it is the case with *Paspalum, Panicum, Axonopus, PennisetiW, Pollinia, Erianthus, Ischaunum* and *Itottbcellia.* He has also completed the revision of the nomenclature of Indian Flowering Plants, a work commented upon in the last report as having been started by Mm. The work is voluminous covering nearly 80 P*Pe8 of closely typed matter and includes all the families oUmlia" plants, wlmh it is hoped to be taken up for the records of the ✳ltanical

Survey of India, when the latter is free. It is a work that should prove very valuable to oue and all who may have something to do with the plants of India. These two papers along with those on *GlycosmiSy Dendrohium* and *Cassia nodosa* and *japonica* were read by him before the Calcutta Session of the Indian Science Congress held in January 1935. He lias also contributed to the same congress an interesting paper on the nature and the importance of a Herbarium.

Mr. Biswas, the Curator of the Herbarium, Botanic Gardens, Bengal, published four papers in Current Science and a fifth in the " Transactions of the Mining and the Geological Institute of India [M]. The first of them is on " Some foreign weeds and their distribution in India and Burma ". Herein he discusses the-wild occurrences over extensive areas of such noxious exotics like *Eupatorium odoratum, Croton s.parsiflorus, Lantana camara, Eichhornia speciosa (crassipes), AgeraUim conyzoides, Mikania scandens, Argemone Mexicana, Suoeda maritima* and *O/mntia Dillenii.* These weeds are only a very small fraction of the numerous exotics that have come to stay in India, not only to the detriment of the indigenous flora but also to the detriment of man. They have been spreading with undesirable freedom, destroying on their onward march extensive areas of valuable arable land and unless they are nipped in the bud they will prove certainly, in no very distant date, a serious source of loss to the agriculturist in the first instance and to the Government in the long run. The Oxalis and the Spergula pests in the potato fields of Ootacamund and the surrounding country on the Nilgiris, the menace of *Eupatorium adenaphorvm* to the Ooty hunt, the water-hyacinth *(Eichhornia crassipes)* curse hanging on large areas in Eastern Bengal and Assam, Burma and South India, the intolerable nuisance of the Khaki weed, *Alternanthera echinata,* to the pedestrians and the sportsman in Madras, Salem, Coimbatore, Mysore and elsewhere in South India are some of the weed problems that have been engaging most vitally the attention of the public and the Government alike at the present moment. Other papers by the same author are " Progress of Algological studies in India [f] \ " Observations on the systematic position of Ficus Erishnae growing at the Royal Botanic Gardens, Sibpur ", " Observations on [R]ome plant abnormalities in Bengal " and " The vegetation of Ti[n]d the neighbouring areas of the Hazaribagh district ".

III. Systematic- Regional.—Interest in South Indian Flora *is* rnntiiiiiml and Mr. C. K C. Fischer of the *Kew* Herbarium has Published ;>. *V.*.•* TTT. »f *hi** " "V™ or *Uitie* kiiown plants from

South India ", the following new species for the Madras province. They are *Sonerila tinnevelliensis, Ariscema convolutum, Coslachne Meeboldii, Tripogon pungcns, Impatiens Aliciae, I. eoelotropis,* 7. *platyadena, I. dendricola, 1. andavianica, Sonerila nematadensis, Oaj/tenanthera nigro-ciliata* var. *Hohenackeri.* But the most important contribution to the systematic botany of Madras is the publication of the penultimate part (Xo. X) of Gamble's Flora of Madras by C. E. C. Fischer, dealing with the difficult family of Gramineae. With this part, the systematic portion of the Flora of Madras is finished and with the final part (Part XI) which is reported to be already in the press, the Flora of Madras will be completed. The last part will contain the introduction, addenda and corrigenda and the index. This work was started by Gamble in 1914 under the authority of the Secretary of State for India in Council. Gamble, who had long been connected with the preparation of the " Materials for a Flora of the Malayan Peninsula " in collaboration with Sir George King, was finally chosen to undertake the compilation of this flora, on the termination of the Malayan work. The idea of the compilation of a Flora of Madras originated as early as 1909 and a series of correspondence passed between Lt.-Col. A. T. Gage, the then Director of the Botanical Survey *oi* India, and Dr. C. A. Barber, -then, the Government Botanist, Madras, who was also for some years, one of the *liaison* officers of the Botanical Survey, on the desirability of starting the compilation of a Flora for Madras with imperfect materials and when there were still several parts of Madras to be explored and collected and on the choice of the author suited to the task. Notwithstanding* Gamble, who was entrusted with the work, wrote to the head of Survey and impressed upon him the urgent need for the collection and forwardal to him of specimens, whenever possible, from the Agency Tracts of Ganjam and Vizagapatain districts, including Jeypore and the zamindari forests of those districts, the coastal ranges, especially the Mahendragiri Hills on the East Coast, parts of ceded districts during particular seasons, Wynad and the Higher ranges of Coorg, Mysore, Hyderabad, the Highway mountains of Madura district and portions of Travancore, especially central Tra\iancore lying between Peemadgjind^Shencottah, which were -considered by him^unexplwecT then.

Consignments of Madras sheets ui ihe .sili|mr IIIM-INH-IUIH forwarded to him from time to time. Some 2,300 sheets belonging to families of Portulacaceae to Connaraceae were unfortunately 1<** in the sea during the war and the Madras sheets of Ribpur up ta BuhiVeae were not consulted In· Oni.!.!.. .„* tl,n$_V$ v.».,..W Mm after

he had finished with those families with the mterials available at Kew. Collections of plants, made in the Rampa Agency and in the Central Travancore, while the work was in progress, were made available to him, and these have been helpful in establishing new records for those areas. Gamble completed the first seven parts between 1914 and 1925, but his unfortunate death in 1925 deprived him of the opportunity to see to the end of the work. However, it has been ably continued by Mr. C. E. C. Fischer, late of the Forest Department in Madras, who has now published the penultimate part. Fischer has not departed from Gamble's plan of treatment of the work and since the last part is still pending publication, it is too premature to review the work as a whole. The publication is a valuable contribution to a province which initiated the study of Indian plants as early as the seventeenth century and sent out eminent votaries of the Science like Roxburgh and Griffith to distant parts of India for creating other centres of botanical research. Citation of localities like Konkan, Deccan, Carnatic and the Corromandal coast under distribution are rather vague terms which require clear definition in the introduction. These were the broad geographico-botanical divisions which Hooker and Thompson used in their works as early as the fifties of the last ceutury. The notes on this part of the Flora, which Mr. Fischer has published in the Kew Bulletin should assist in clearing up certain doubtful points in the nomenclature of the Madras grasses.

Additional parts, numbers 23 to 25 of the " Revision of Cooke's Flora of Bombay " by Blatter and McCann, dealing with the Cypeiaceae of Bombay have appeared in the pages of the Journal of the Bombay Natural History Society. Further instalments of the popular illustrated account of " Some beautiful Indian trees of India " by Blatter and Mi Hard, containing the descriptions of *Jacaranda miwosaefoUa, Solanum wacranthnvi,* and *Bnuhinia variegatd* £ *purpvrca* wore also published in the same journal.

The interest in the " Flora of Waziristan " is evidenced by the publication of Part- III of that Flora dealing with *Cwsalpiniaceae* to *LmtihuJariaceae* by Blatter and Fernandez in the same journal. *n this connection, it is my most regretable duty to record the sad je«th of the senior author, Rev. K. Blatter, S.J., on 26th May 1934. *adia hns lost an eminent systematic botanist in him, who, by his enthusiasm and keen interest in the study of Indian plants, has contributed materially to the knowledge of Indian Plants from 19(W up to the date of his death. The ' Records of the Botanical Survey of Tndia ' is much indebted to him for his work* on the " Flora «f .\ch»n " and on " Fin™ Aniliirn ".

Ferns of Waziristan have been published by J. F. R. D'Almeida who in collaboration with Blatter has shown some interest to the Flora of this part of the North-West Frontier of India.

Mr. Mukat Behari Baizada of the Dehra Dun Herbarium had a paper in the ' Indian Forester ', Vol. LX, on " The new or little known plants from Kumaon ", based upon the collections of Mr. A. E. Osmaston from Eumaon. In this article he records the existence in Kumaon of nine species of plants, namely, *Clematis smilacifolia* Wall., *Sinomenium acutum* Rehder. & Wilson, *'Citrus hystrLv* D.C., *Natsiatuvi herj>elicum* Ham., *Fleming^ involucrata* Bth., *Mussmna frondosa* L., *Echinanthus attenuate Nees. Phlogacanthus Lambertii Sp. Nov., Loranthus odoratiis* Wall., *Viscum osmastoni Sp. Nov.,* which had escaped so long the notice of such eminent workers in Eumaon as Sir Edward Strachey and Winterbottom (1846-49), Duthie (1880), Major E. Madden (1848) and Osmaston (1927), who have all carefully gone over Eumaon and its flora rather minutely and published their results in their respective floras. Of these nine species, *Sinomenium acutum* Rehder. & Wilson, of the Menispermaceae, is an interesting occurrence of a Chinese plant, which had not so long been reported, outside China and Japan. *Phlogacanthus Lambertii* and *Viscum osmastoni* are two new species described for the area. This report of several fresh records for an area, long considered overworked, is an interesting illustration to prove that no area is an exhausted field for botanical discoveries.

Ecology, a subject of far-reaching importance and application in the agronomy of India and in the study of Indian plants, was in no way a neglected one. It goes hand in hand with that of floristic survey and each is so inextricably mixed up with the other that to separate one from the other would resemble the separation of the salt from the sauce. Mr. E. L. Aggarwal's paper on the " Soil Flora in Deodar Forests and its importance [f>] is an ecological paper dealing with the soil Flora in Deodar Forests and its relationship to the growth of tree crops. The author is struck by t^e wonderful occurrence of the same type of soil or surface cover of plants wherever Deodar Forests exist from Eulu, through Seraj and lower Bushar, to Hazara and concludes that a soil which contain most of the above species would certainly be most suitable for the introduction of Deodar. Frequency and the altitudinal range of the indicators are surer guides in the policy of regeneration of forests than mere stray occurrence of one or two species only. The nature or the habit of the soil flora «hould also be taken i«*> account before launching upon regeneration work of tree crop.

Works of such ecological nature are the desiderata in the right direction at the present moment and deserves greater application and encouragement than hitherto.

Mr. E. 0. Shebbeare, Conservator of Forests, Bengal, records the distribution of Conifers that occur naturally in Sikkim, namely ***Abies densa, Taarus baccata, Tsuga Brunoniana, Pinus excelsa, Larix Griffithii, Picea spinulosa*** **and** ***Juniperus pseudosabina,*** **and** discusses the causes underlying them. The cultivated conifers are also listed in the paper. *Cupressus Cashmeriana,* a conifer of dubious status is also discussed in a note by Sir Arthur Hill, who has reserved his final opinion pending the results of the cultivation in Eew of the suspected species.

To the Botany of Assam, a most useful service has been rendered by the publication of the First Part of Volume I of the " Flora of Assam " by the late Eai Bahadur U. N. Kanjilfcl and Messrs. P. C. Kanjilal and A. Das, dealing with Ranunculaceae to Elaeocarpaceae. This work is being published under the authority of the Government of Assam and it is hoped that the other volumes also will soon follow. According to the note on page iii by Mr. Das, this Flora of Assam strictly excludes the herbaceous plants of Assam and treats mostly about the plants of forest importance, namely, trees, shrubs and large climbers. But the title of the work appears to be rather inappropriate and should have been " Forest Flora of Assam ". The authors have not defined the limits of the flora and no map is appended for the help of the reader. At the beginning of the introduction, a short note is given about the collectors in Assam and about the beginnings of this flora. As the joint author has not said anything about the labours and the achievements of the Botanical Survey of India in connection wifli ilw» Flora of Assam, a few words on those points are essential.

Botanical work in Assam starts with Buchanan Hamilton, who in 1800, collected plant specimens from Goalpara while engaged on the Statistical Survey of Bengal. Nathaniel Wallich was the next botanist who in 1821 collected in Sylhet. In 1835 Wallich, accompanied by Griffith and McClelland, again visited Cherapunji, Myrung, the Khasya Hills, Gauhatti and Sadiya in quest of the tea plant. Griffith stayed behind and his botanical wurk in Khasya, Bhotan and the Mishmi mountains are described in Griffith's posthumous papers. J. W. Masters, under the garden employ, was deputed by Wallich in 1837 to work on the Napa Hills, whose flora he published in 1847. Tn 1850 Hooker and Thompson visited Portions of the Svlhet and the Khasya **Ilills.** Simons, Jenkins and

Peal come next who between 1850 and 1857, supervised and assisted the Indian collectors of the Botanical Garden in their districts, besides furnishing the collections of their own. *Coptis Teeta* of the Mislimi Hills was first forwarded by Jenkins to Wallich and it was later on collected by Gamniie and Burkill independently from the Mishmis. J. L. Lister, under Sir George King, worked on the Daphla Hills in 1874, who was followed subsequently by S. Kurz (1876) and G. Gallatly (1878), and G. Mann, the first Conservator of Forests of Assam (1883) who have all explored the Brahmaputra plains and the Khasia and the Jaintia Hills respectively. C. B. Clarke's endeavours between 1863 and 1886 were partly on the plains of Assam and partly on the Hills. Thereafter we pass on to the continuous botanical activities of the Botanical Survey of India under the successive directorships of Sir George King, Sir David Prain and Lt.-Col. A. T. Gage, who have each personally and by European artd Indian agencies carried out an unbroken chain of botanical explorations from 1890 to 1914. During this period Sir George Watt and Mr. I. H. Burkill of the Department of the Reporter on Economic products to the Government of India had also very materially enriched the collections of the Survey from places like the Manipur State and the Abor Hills, lying south and north of the Lakhimpur district of Assam. Botanical explorations in Assam and Burma were the main work of the Survey for nearly two decades from the beginning. The late Rai Bahadur U. N. Kanjilal came up on the scene in 1914, who bridged up several lacunae in the collections of the early veterans from 1914 onwards. The Botanical Survey thoroughly explored the entire province of Assam from one end to the other and accumulated a wonderful collection of Assam plants at Sibpur. But for this excellent collection and the help rendered by the Officers of the Survey, namely Ramaswami, Debbarman and Narayanaswami in identifying the Assam collections to the authors of this flora from 1912 onwards, it would not have been possible for the authors to have issued the work so soon as this. On the whole the book supplies a long-felt desideratum for the flora of the province of Assam.

Floras have so far come out or are in progress of i.vui' for Madras, Bombay, portions of the Punjab, the upper Gangetic Plain (incomplete). Kumaon, Gorakhpur, Bihar and Orissa, Bengal (old), Assam and Burma (very old and imperfect). There are still several parts of India, either unexplored or imperfectly explored for which no flora so far exists. These parts are (1) Mysore (partly included in Gamble's Madras Flora), (2) Hyderabad; (3) Central Provinces and Berar, (4) Central Tnclia. (5) Rajputaiui. ^ The

Punjab as a whole, (7) Kashmir, (8) Nepal, (9) Sikkini and Bhutan and (10) Burma.

Mandragora Shcbbeam, (J. *L.* (J. .Fischer and *Caret- monti-Everestii,* Kukenthal are two new species for Tibet that have been described in the Kew Bulletin.

The collections of that intrepid explorer and collector,. C'apt. Kingdom Ward, from Assam and Upper Burma, have been the source of the most important contribution to our knowledge of *Ayapetes* by Mr. H. K. Airy-shaw, in the Kew Bulletin. With the fuller materials of this genus placed at his disposal, he had been able not only to clear up many doubtful points concerning certain species of the genus already published by C. B. Clarke in the Flora of British India, but also to describe several new spec̈ies. The new species, that have come to light, are: —

.1. *pubiflora* (Upper Burma), *A. Sikkimensis* (Sikkim) new vars. *typica* Airy-shaw, var. *pseudo-verticiliata* Airy-shaw, Mir. *macrosepala* Airy-shaw, var. *acuminate.* Airy-shaw, and \ar. *parr iflora* (Kurz.) Airy-shaw of *A. set iff era* Wall.—all from Khasia—*A. neriifolia* (King, et Prain.) Airy-shaw, *A. pseudo-Griffith ii* Airy-shaw (Upper Burma), -4. *hyalo-cheilc.t* Airy-shaw (E. Bhutan), .4. *adevobotrys* Airy-shaw (Upper Burma), .1. *Kan j̈ Hal i* A. Das (Assam), *A. spissa* Airy-shaw (Assam), *A. brachypoda* Airy-shaw (Upper Burma),, and *A. pensillis* Airy-shaw (Upper Burma).

A fuller description of *Ayapetes 1 inearifolia,* Clark**, a rare species collected hundred years ago by Griffith, has been possible now from Kingdom Ward's fuller materials.

An account of a botanical tour made by Mr. C. E. Parkinson to the Mulayit peak in lower Burma has been presented by him to the pages of the Indian Forester. Mulayit peak is one of the three highest peaks in the chain of Hills known as the Tenasserim Tomas which form a continuation of the Shan Plateau and of Martaban, rising to a height of about 8,000 feet. A sketch of the vegetation of the Tenasserim Hill tops with an enumeration of the species collected therein is appended to the paper.

Of general systematic interest to India are the papers, (1) a key to the species of *Deutzin* mesodeutsia by Airy-shaw, (2) *Firmiana* and *Erythropsis* by II. N. Ridley, (3) An account of the genus *Meconopsis* by fx. Taylor and (4) A critical revision of certain Taxonomic groups of the Malvales by H. L. Edlin in the New Phytologist. Tn *(\)* above. *Deutzia Hookeriana (C.* K. Schneider)

Airy-shaw and Z>. *staurothria* Airy-shaw are two new Indian species closely related to *D. (orymbosa.*

The two genera of Sterculiaceae—*Firmiana,* Mars, and *Erythropsis,* Lindl.—along with *Scaphium, Pterygota,* and *Pterocymbium,* though separated by Robert Brown were united together under *Sterculia* by Bentham and Hooker in the [c] Genera Plantarum ' and by Masters in the ' Flora of British India '. Most of these genera have been separated by later botanists. *Firmiana* and *Erythropsis* are considered very distinct from each other, of which *Firmiana* does not occur in India, but the following belong to *Erythropsis,* viz.: —

> *Erythropsis colorata* (Roxb.) Burk. *(Sterculia colorata* Roxb.), *E. fulgens* (Mast.) Ridl. *(S. fulgens* Mast.), and *E. pallens* Ridl. nov. *(Sterculia pallens* Wall, et Voight. noinen.).

The discovery by Sprague and Fischer of Dr. W. Watson's •' Combination of Indian Grasses ' published in 1882 in Atkinson's " Gazeteer of the North Western Provinces of India ", accompanied by the corresponding number under *Andropogon* in Steudel's ' Synopsis Plantarum Glumacearum ' lias led to a joint note by them in the Kew Bulletin, styled " The validation of new combinations by indirect citation of synonyms concerned ". These combinations were long overlooked and were omitted from the KeW Index so long. Ignorant of Watson's earlier combinations, authors made their own combinations which are now reduced as synonyms in the light of these earlier names. Watson's combinations Hk[e] *Cymbopogon Martini* Wats, (the rusha or the geranium grass), *Cymbopogon flexuosus* (Steud.) Wats., and *Apocopis himalayensi** (Steud.) Wats., have now superseded *Cymbopogon Martini* Stapf-> *Cymbopogon flexuosu.s* Kfjijif . nmi *Apocopis Royiranus* Wes. respectively.

Hutchinson's " The families of flowering plants ", Part II, treating about the classification of Monocotyledons of the world has been published. The phylogeny of the monocotyledons proposed and discussed in this book are on a par with his work on the Dicotyledons and it is out of place to discuss the merits or otherwise of the work here. Suffice it to say that it is a valuable contribution to the taxonomy of Monocotyledons.

Of the wide range of subjects covered by the scientific productions of the Indian Universities and Colleges and the Agricultural Departments in India in the realm of Indian Botany, ungi, Pteridophyta, Cytology, Physiology, Morphology and Anatomy. the

Reproductive Organs and Agricultural Botany have all been dealt with. Anything more than a passing reference to some of them is out of question, but it is gratifying to realise the rapid advances that are being made in the study of such branches of Botany that **are** impossible for the Official Survey to take up. A certain ' Fusaria ' by A. Mitra, ' The Root-system of embryo-sac and the pollen-grain in Cassia tora ' by R. II. Datta, ' Origin of leafy 6porophytes in Ferns ' by G. P. Mazumdar, * A preliminary note on the study of Azolla pinnata ' by. S. R. Sud, ' A contribution to the anatomy, morphology and cytology of the flower of *Digera arvensis* ' by A. C. Joshi, ' A contribution to the life-history of *Vallisneria spiralis* ' and * The vascular anatomy of the flowers of four Nyctaginaceae ' are some of the botanical papers that were published in the Journal of Indian Botanical Society.

" The classification of the rices of Bihar and Orissa " by Kaslii Ram and Sarvayya Chetty, " The chromosome numbers in the genus Saccharum " by T. S. N. Singh, and " A Haploid plant in Rice " by E. Ramiah are some of the results obtained in the branch of agricultural botany and plant genetics. ' Physiological investigations on water-hyacinth (Eichhornia crassipes) with notes on some other aquatic weeds ' by Parija is **a** contribution to the subject of weeds and their eradication. In this paper the author discusses on experimental basis, the life-history of this pernicious weed and suggests certain remedies for its eradication, which are no more than the prevention of seed-formation at the proper time and removal of the weed by mechanical means. Chemical measures have proved a failure for the purpose.

Mention may be made here that the materials for the systematic portion of this report have been given to me by Mr. V. Narayanaswami, the Systematic Assistant of the Botanical Survey of India, working in the Herbarium at the Royal Botanic Gardens, Sibpur.

IV, Industrial Section.—During the year under report about 350 specimens were exhibited in the Public Gallery at the Indian Museum after registration. Drugs and the pharmaceutical preparations made from them, that were kindly presented by Messrs. Bengal Chemical and Pharmaceutical Works, Limited., deserve special mention and have been very attractively exhibited in a Central Case showing serially the various processes through which the raw materials pass through before they are finished products. These include, among others, the following:—

ITolarrhensi antidysenterica, Hydrastis. Strychnos Ńux-Tomica, Hyow·yamus, Scilla, Strophanthus, Psychotria Ipecacuanha, Atropa Belladona, Ephedra vulgaris, Aconites.

The Curator undertook a very short tour in the Mymensingb .and Dacca Districts for the collection of a number of medicinal plants. He also procured samples of basketry work, jute textiles and other miscellaneous cottage industries of Myniensingh and took this opportunity of collecting botanical specimens for the Economic Herbarium attached to the Industrial Section of the Indian Museum.

As usual a number of herbarium specimens exhibited in the Gallery and in the Timber exhibit in the Staircase were replaced by coloured drawiugs of the plants, giving a much better effect to the exhibits.

Numerous correspondents in India and abroad were furnished with information on the sources of supply of economic plants. Identifications of botanical specimens were also carried out as usual for several, the most important among them being the Excise Department, the Customs House and the Co-operative Societies.

There had been a considerable increase in the number of enquiries by commercial firms and the public in India, regarding the sources of the supply of raw materials and finished products relating to economic plants, which were all satisfactorily dealt with. A special, feature deserving mention is the large number of students of the local colleges and the University who visited the Gallery for their studies of the economic products and who were attended to.

Mounted specimens of wild rice including *Oryza sativa, L.* var. *plena,* Prain, collected from Bombay, Bengal, Madras, Central Provinces, United Provinces, Nepal borders, Assam and Burma, were supplied to the Kew Herbarium at their request.

Information on materials of the following was supplied to various applicants in different parts of the world: —

Croiaiaria junvea Linn., *Crotalaria retusa* Linn., *Sesbania aculeata* Pers., *Punica Gramitum* L., *Artemisia maritiwa* L.< *Raphanus sativa* L., *Cocos nucifera* L., *Mhnusops hevandra* ltoxb., *Broussonetia papyrif^ra* **Vent.,** *Cymbopogon Martini** Stapf., *Tinea rosea* L., *Tamar'uc dioica* Roxb., *Tamariv arti-•culata* Vahl., *Aexchynomcne aspera* L., *Derris elliptica* Benth., *Carum copticum* Benth., *Saussurea lappa* Clarke, *Ta.rus baccata* Linn., *Andropogon muricatvs* Betz., *Coryph& umbraculifera* Linn., *Metroxylon, sp., Smila*v sp., AconituM heterophyUum* **Wall.,** *Clematis Gouriana* **Hoxb.,** *Crocus sat hut* L., *Strychnos Nux-vomica* **Linn.,** *Acacia Catechu* Willd.* *Desmodiuw gyrans* D. C, *Alhagi vmurorum* Desv., *Eriodendron anfractvosum* D. C, *Cannabis sativa* Linn., *Papaver somniferum* Linn., *Ferula asa-foetida* Boiss., *Aleurit*r* Fordii* and *A. vwntana.*

V. Financial (Botanical Survey proper).—The original Budget allotment for the year was Us. 41,900 for the Botanical Survey proper including the Industrial Section, Indian Museum and a sum of I}?. 137 was reappropriated, bringing the Budget figure to Its. 41,763. A surrender of Its. 547 was made from the allotment. The actual expenditure was Rs. 41,026. The saving under this head was Us. 190 being distributed under several items.

"VI. **Staff.**—Mr. C. C. Calder held charge throughout the year as Director and Mr. S. N. Bal was the Curator, Industrial Section, Indian Museum, during the year under report.

Mr. V. Narayanaswami was the Systematic Assistant throughout the year excepting for 27 days on leave from 9th April to 5th May, 1934.

Mr. S. B. Banerjee was the Head Clerk till the 21st September 1934 and during his absence on leave, Mr. T. C. Mukherjee, Senior Upper Division Clerk, acted as the Head Clerk till the end of the year under report.

During the year Mr. M. N. Mukherjee, Upper Division Clerk, retired on superannuation after rendering over 25 years' meritorious service in the department.

All the members of the staff and clerical establishment have worked quite satisfactorily.

S. N. BAL,

Curator,

Industrial Section, Indian Museum.

CINCHONA AND QUININE.

Burma Plantations.—Operations were restricted to maintenance of the existing blocks in good condition. The plantations had a comparatively dry year, vainfall heing 18 inches short of the previous year's total. JJut through judicious stimulation of a green crop the effects of drought were minimised and cinchona did not suffer to any extent. The result of an interesting experiment is reported by the Superintendent—namely, that trees originally with (J to 9 stems which had been thinned to ^ or •{ steins at the beginning of the year showed a very rapid growth compared to trees left un thinned.

The harvest of bark obtained during the year was 04,42!) lbs. The Ipecacuanha beds continue to flourish and furnished 498 lbs., dry roots now stored at the Indian Museum. Of the shadr trees planted for the protection of young cinchona, rubber is doing well and seems to have already attracted the notice of the Government of Burma.

MungpOO Factory.—J'SG bark was received at the factory during the year under report but of the existing stock oi bark J01,015 lbs. were extracted yielding y,224 lbs. of Quinine Sulphate and 1,679 lbs. (including material in process) of cinchona febrifuge. There is now a total of 12,309 lbs. febrifuge at the factory all in unground condition and kept as a reserve against the day when the stock of Madras febrifuge will give out. All Quinine Sulphate extracted was in crude form as there are still large stocks of the purified product made in past years. In the process of extraction Jlurma bark and the purchased Java bark is blended in such proportion as would lead to economy in expenditure.

.Besides this 38,100 lbs.' net crude Quinine Sulphate us<* rcciystalised to yield 35,039 lbs. Trade Quinine of It. P. Standard and 204 lbs. ordinary Quinine Sulphate. The experience <:t the last two years have led to valuable results, the quinine now produced´being equal in colour to most brands on the market and better than most in chemical purity. The low bulk density which seems to be such a desirable characteristic in the Trade can also be produced if suitable plant could be put up for the purpose.

Indian Museum: Calcutta.—At the Museum, besides the usual distribution to Provincial Governments, arrangements have also been made for the production of quinine reinforced Cinchona febrifuge tablets for supply to the Director, Public Health, Assam. A total of 1,000 lbs. w:i* supplied dnrin«r <he \e;»r under review.

A note-woithy transaction was the supply of 8,000 ll»s. Quinine Sulphate powder and 2,000 lbs. tablets to the Government of Ceylon during the epidemic outbreak of malaria.

Total salt** wore as follows: —

	lbs.
Sulphate	211,942
Quinine Sulphate T»M«'ts	2,342
Cinchona febrifuge	1,920
Jteinforcecl C. F. Tablets	1.000

The total revenue realised from *:«lf»s i>«*iug Rs. 0,08,781-5-0.

Stocks.—In the course of the vein- the iotal stork of Quinine Sulphate diminished from »i7J»67 lbs. to 235.8UR lbs. The stocks of bark clumped from f>£2..'U7 lbs. to 585,131 lbs. and of Cinchona febrifuge from 21,147 llx. to 10,087 lbs. Detail* are given in the following stock accounts.

Stock Accounts.

Quinine Sulphate.

1)1·	lbs.		Cr. lbs.
K» NiiH-k on 1st April 1934	267,657	My salt's ;MK1 otlici issues	-- ·· 1
To manufacture niul returns	4-V,Jo'U	My stock on 1st April 1US5-	
		At Indian Museum	62,292
		At Minimum	172,962
		At Xacluvattam	612
	31X217		313,217

("mrhuiui *febrifuge.*

'Jo Mock on 1st April 1W*	21,147	is, ..,;, M 1 , i %tX\lvV ,.,,,,s	2 71-
To manufacture	1,258	My -stork «... |., April 19*5—	
		At MrniRpoo	12,369
		Jn Cnlcutta	7 318
	22,405		22,405

Hnrl.

To 121Kık on 1st V p'n l 1934	622,317	**>' »^lU4 tor extraction	101 ,«H5
'To quantity harv«>sii..l during thu^ yea,	1,129	BT stock on Kt April 1935—	
		At Mungpoo	
		At Mergu	80,358
	686,746		686,746

- I. \.

Botanical Survey of India.

MGIPC—I—III-7-11^ ^ I 1.35—454.

Report

of the

Botanical Survey of India

for

1935-36

CALCUTTA
GOVERNMENT OF TNDrA PRESS
1937

Report of the Botanical Survey of India for 1935-36.

I. Systematic—The officers of the Survey have had little opportunity for outdoor exploration since the advent of retrenchment. But, as has previously been the case, a large number of workers outside the Survey belonging to Universities, the Forest, Agricultural, and other Departments of Government availed themselves of the expert services of the officers at headquarters.

There has been a considerable increase in the number of specimens identified for various correspondents and workers, some 3,500 specimens having been named. That intrepid and veteran explorer, Capt. Kingdon Ward, His Excellency Sir John Anderson, Mr. N. L. Bor of the Forest Department, Assam, and Mrs. Townend are a few among those whose collections have come in for identification. Capt. Kingdon Ward and Mr. N. L. Bor collected in the Naga Hills, while His Excellency made a collection during his visit to Bhutan. A large number of specimens, however, are from Mrs. Townend who has been a very enthusiastic collector in the Sikkim Himalayas. All the above localities, judging from the collections, should yield very interesting facts of distribution, some new species, and not a few first records.

Besides the above, the Locust Research Entomologist, Karachi, Mr. C. E. Parkinson of the Forest Institute, Dehra Dun, Mr. Purkayastha, Forest Department, Assam, Mr. R. N. Tandon of the Allahabad University and several others had their specimens identified by the Department. A considerable number of sheets were received in exchange and presentation from the Lignan University, Canton, the Botanical Garden, AsiaB Mediae, Taschkent and the Singapore Gardens.

Some 421 sheets were on loan this year, comprising the genera *Psilotum, PleuToxpermum, Aganosma, Tarocarpus, Geniostoma, Monotropa,* and others, to Messrs. C. E. Parkinson, C. Norman of the British Museum of Natural History, T. Tsing of the Sun Tat sen University, Dr. S. P. Agharkar of the Calcutta University, and others. About 754 specimens, which were on loan, were received back from various workers, including J. B. Hutchinson, Dr. H. N. Moldenke of the New York Botanic Garden, The Forest

Botanist, Federated Malay States, and others, with necessary notes incorporated on the sheets.

Plants going out on exchange or presentation include 200 local species to Formosa, 30 specimens of *Phoenix* to America, and a collection of flower buds in special preserving fluid to Sweden. The National Herbarium, Manila and other institutions throughout the world also benefited.

General information on all kinds of subjects, botanical and economic, was supplied to a wide range of correspondents. Among others, information was given regarding *Medicago sativa,* Sabai grass, *Gleichenia* and *Schioea* species, Citrus, *Piper chabba*$_9$ *Taraktogenos Kurzii* and *Uydnocarpus Wightiana, Psychotria Ipecacuanha* and Fibre plants. Correct and up-to-date information regarding the herbarium was furnished to Dr. Verdoorn for incorporation in the next annual issue of " Chronica Botanica "-

Mr. Biswas, Curator of the Herbarium, botanised about Darjeeling up to Phalute *vid'* Sandakphu and brought to the herbarium about 500 valuable specimens and a good many " Alpine " seeds.

Among foreign visitors who worked in the herbarium, mention should be made of Prof. Tanaka who made a prolonged study of material and literature regarding Citrus. The Curator of the Herbarium has published a few papers, namely, " Jute and Allied Fibres ", " Our Garden Sanseverias ?', " Calcutta Filter Works and Organic Growth ", and " Notes on the Systematic Position of Sansevieria growing in India with special reference to *S. Laurentii* Willdem [f\

The year under review is of special importance as several important resolutions, suggestions, and tentative proposals specially affecting nomenclature and taxonomy have emanated from the Sixth International Botanical Congress held at Amsterdam. The proposed compilation of a new phytography representing the collections in the larger herbaria of the world and the scheme to photograph type specimens of all plants should go far ħm removing certain handicaps under which all workers, specially monographists, have been labouring. An International Dictionary of Botanical Terminology (though restricted to Phanerogams), translated and explained in English, French, and German, would, no doubt, prove of value in the standardisation of descriptions. Such' a wort is contemplated. It was also held to be highly desirable that the Linnean type specimens at the Linnean Society and at the British[1] Museum should be photographed, thus making copies available *tor*

distribution to workers in other herbaria. A number of modifications proposed in the international rules of nomenclature have been accepted by the Congress.

Part 10 of the Flora of the Madras Presidency completes the Flora proper. The final part will contain addenda, indices, etc.. Mr. Fischer has contributed further notes on Part X, which are calculated to clear many doubtful points. The South Indian grasses, 132 genera, are included in this part, Stapf's generic names being mainly adopted. Several genera of the Flora of British India, like *Panicum, Paspalum, Pollinia, Anthistiria, Andropogan,* etc., have been split up into smaller genera after Stapf.

Several new species end new combinations resulted from Prof. Barnes' collections in South India, worked out by Mr. Fischer. Amongst these is *Impatiens anaimudica* C. E. Gi Fischer, sp. nov., Travancore, Anaimudi Ridge, 8,000 ft., E. Barnes, allied to /. *travancorica* Bedd. *Arum ovatum* L. and *Lagenandra toxicaria* Dalz., formerly united under the latter name, have had to be separated again as the result of new material furnished by Prof. Barnes. Two species are recognised, *Lagenandra ovata* Thw. and *Lagcnan&ra toxicaria* Dalz.—both from Travancore. The vegetative parts of the two species are very similar, but all the parts are larger in *L. ovata.* A new Sonerila, *S. nemakadensis* C. E. C. Fisher, from Barnes[9] Travancore collection, is also recorded.

Collections made by Capt. Kingdon Ward and Mrs. N. E. Parry in Assam have resulted in the following new species, combinations and first records:—*Vernonia Talaumifolia* Hook. f. et T., var. *hirsutior* C. E. C. Fischer, Garo Hills, Mrs. N. E. Parry; *Veronica cana* Wall., Delei Valley, 6,000 ft., F. Kingdon Ward; *Veronica capitata* Benth., Delei Valley, 11,000 ft., F. Kinpdon Ward; *Pinguicula alpina* L., Delei Valley, 10,000 to 11,000 ft., F. Kingdon Ward; *Aeschynanthus deleiensis* C. E. C. Fischer, sp. nov., Delei Valley, F. Kingdon Ward; *Aeschynanthus linearifolia* C. E. C. Fischer, sp. nov., Delei Valley, F. Kinpdon Ward; *Elsholtzia Thompsoni* Hook., Garo Hills, 100 ft., Mrs. N. E. Parry; *Celt is sinensis* Per*., Delei Valley, 2,000 ft., F. Kinpdon Ward; *Lloydia Forrestii* Diels., Delei Valley, 12,000—13,000 ft., F. Kingdon Ward.

Mr. C. E. C. Fischer has commut-u Ins ruiiiribution to the Flora of Burma based on the collections of C. E. Parkinson', Kingdon Ward, C. W, D. Kermode, and others, of which the

following are new species:— *Goniothalamus burmanicus* C. E. C. Fischer, sp. nov. *(Anonaceoe),* North *Tonvgoo* District,, 0. E. Parkinson; *Scolopia Kermodei* C. E. C. Fischer, sp. nov. *(Flacourtiacece),* Baain District, C. W. D. Kermode; *Adhatoda oreophila* C. E. Fischer, Comb. nov. var. *magnet* C. E. C. Fischer, var. nov. *(Acanthacece),* Maymyo Plateau, Gokteik, C. E. Parkinson.

The first part of Volume I of the Flora of Assam has appeared. This is the result of the work of several authors, all Forest Service men. Although it suffers from some of the disadvantages that may be expected of work that has been done in the field and away from herbaria and libraries, it is welcomed as providing the firs* concise account of part of the Flora of the province. The volume is introduced by an ecological sketch, by a geological account, and by a note on the climatological factors influencing the vegetation. It is bound to serve as a useful work of reference and as a handy companion to all interested in the Flora of this part of India. Especially will it aid the Forest Officer and botanist.

The revision of the Flora of the Bombay Presidency (started by the late Father Blatter) is being continued in the pages of the Journal of the Bombay Natural History Society by Dr. C. McCann. The *Cyperacea* is being continued. In the same journal some beautiful Indian trees with coloured illustrations by the late E. Blatter and S. Millard, popular descriptions of *Tecomell* undulata, Kydia oalycim, Amherstia rwhilis, Dillenia indica,* and *Kleinhovia hospita* have appeared.

Volume VIII, No. 6, of the Records of the Botanical Survey brings to completion the Flora Arabica by the late Father Blatter. This volume contains the families Gnetace® to Gramine* and has a general index.

In the Journal of the Indian Botanical Society (XIV, No. 3, pp. 257-263) S. C. Dixit records some species of Chara and Nitella, chiefly from the Deccan, round about Poona, **& Kathiawar, of which one is a new species. In a paper published in the Journal of the Indian Botanical Society (XIV. No. *t*> pp. 339-348) Mr. Mukat Behari Raizada has described a number of recently introduced or otherwise imperfectly known plants from the Upper Gangetic Plain. This list may form a sort of supplement to Duthie's Flora of the Upper Gangetic Plain. It has been observed here that some plants indigenous to tropical America are becoming established and naturalised in the region of the Upper Gangetic Plain to an amazing extent. The discovery ‹ in conformity with observations made in the neighbourhood <*

Calcutta several years ago. He has also contributed a paper, " The Genus Psilotum in India ", Indian Forester, LXI, No. 10, p. 654, presenting an account of the genus and the distribution of one of the two species known under it. *P. triquatrum* alone occurs in India.

Mr. D. B. Mukerjee has contributed notes on a collection of plants from Mahendragiri in the Eastern Ghats, Agency area. Sixty species were collected at 600 ft. above sea level. A preponderance of South Indian Hill Flora over other hill floras was observed. The altitude is said to have its effect on the colour of the floral leaves, epidermal growth, etc. Dr. N. L. Bor made large collections in the botanically little known Balipara Frontier Tract and has given an account of the Conifers growing in this area together with brief notes on climate and geology. Mr. C. E. Parkinson has given an account of some Indian and Burmese Dillenias (Indian Forester, LXI, No. 7, pp. 447-453). E. G. Baker records a small bushy leguminous plant with yellow flowers from the Salween Gorge, Tibet, collected by Capt. Kingdon Ward. It is allied to *Sophora, Caragane,* and *Astragalus,* but differs in certain characteristics.

It is made into a new genus under the name *Saltoeenia Wardii* Baker.

Hedymrum citrinum from S. E. Tibet with racemes of pale lemon coloured flowers and pods with 3-4 flat glabrous articulations is a new species. *Hedysarum citrinum* sp. nov., S. E. Tibet, 13,500 ft., F. Ludlow and Sherriff. Two new species of *Styraceer* belonging to a new genus, *Huodendron,* are also reported from Tibet in the Journal of the Arnold Arboretum, XVI, p. 341 (1935). *Huodendron trbcticum* Alfred Itehder, Genus nov. sp. nov., extreme S. E. Tibet, Coll. C. E. Parkinson. *Huodendron hiaristatum.* Alfred Rehder, sp. nov., Upper Burma to West of Yunan, Coll. C. E. Parkinson. G. F. Kingdon Ward has given a very interesting account of his 12th expedition in Asia in quest of plants and their seeds. He explored S. E. Tibet, namely, the Ralween-Irrawady Divide, Shugdan Gompa, Dri Valley, Delei Valley, and part of the Mishmis. He has also contributed to the Journal of the Linnean Society, London, a sketch of the geography and botany of Tibet, being materials for a flora of that country. In the course of the paper he observes that re?»ent botanical exploration has shown that the affinity of the Eastern Himalayan Flora lies almost entirely with Western China across the Tibetan river porpe country. It does not lie with the southern ranges except iu a minor degree, although the mountain ranges appear

to be continuous in this direction. Both alpine flora and temperate forest extend east and west in continuous belts. Definite zonal vegetation according to altitude exists here beginning with temperate rain forest and ending with alpine flowers and dwarf shrubs in the higher zones. It is evident that the Flora of Tibet becomes progressive, richer, and more varied as one travels south-eastwards into the river gorge country, where many types of plant associations are met with. The river gorge country is one of the botanical treasure houses of the world.

Another paper giving a pointer to a modern trend in classification is given in the pages of the Journal of Botany (No. 873, Vol. 73, page 241) by Kingdon Ward, regarding Rhododendron seeds. Considered from an evolutionary standpoint it can be inferred that seeds are amongst the most stable parts of flowering plants. They do not easily change in response to a changed environment. The author supposes that a study of the seeds may give valuable data in determining the line of descent and so in recognising relationships. Applying the above principle to the classification of Rhododendrons he proposes an amendment to Bayley Balfour's system of classification of Rhododendrons, where seed characters receive greater attention than hitherto.

Mr. Bharadwaja has reported the occurrence of *Isoetes coromandelina* L. from near Benares where it is said to be extensively spread over a radius of 10 miles. No more than passing mention can be made in this report regarding the ever-increasing number of papers on a wide range of botanical subjects that have emanated from Indian Universities, Colleges, and Institutes. All branches of botany now have their students in this country and the class of work is high.

Mr. P. Maheswari has contributed a paper on the progress of work in India on the embryology of angiosperms wherein he stresses the value to taxonomic classification of a study of the embryology, the wood anatomy, and vascular supply to the floral organs.

Of special importance is the contributions of J. F. Caius in the Journal of the Bombay Natural History Society on the medicinal and poisonous palms of India, followed up by the medicinal and poisonous grasses of India and the medicinal and poisonous ferns.

Mr. J. D. Snowden has given an outline of the classification of cultivated Sorghums. This work was undertaken as a revision consequent on further collections from Africa and Asia at Kew

after Stapf's revision of the cultivated Sorghums of Tropical Africa. The present outline which gives new species, varieties, etc., is a preliminary to a complete revision of the Sorghums.

II. Industrial Section, Indian Museum.—During the year under report the Public Gallery has been enriched by the addition of 350 specimens, which consist mostly of medicinal plant products collected from East Bengal and South India.

The Curator undertook a long tour in the Madras Presidency and Travancore during the year, which resulted in collection of valuable specimens of medicinal plants and their products, fibres and their products, products of cottage industry, food materials, spices, and other miscellaneous articles. He also took this opportunity of collecting herbarium specimens for the Economic Herbarium attached to the Industrial Section, Indian Museum, which has also been enriched by the addition of about 50 sheets.

As usual, a number of herbarium specimens, exhibited in the Gallery, were replaced by coloured drawings of the plants, giving a much better effect to the exhibits.

During the year a number of students of some of the Colleges of Calcutta and the Post-Graduate students of the University of Calcutta visited the Gallery with a view to study the exhibits.

Numerous correspondents in India and abroad were furnished with information on the sources of supply of the Economic Plants and in various cases the plants were identified for them. The number of enquiries by commercial firms and the general public in India regarding the sources of supply of raw materials and finished products considerably increased and they were all satisfactorily dealt with. Further supply of botanical specimens of wild rice from various parts of India was continued for the Kew Herbarium at their request. Authentic specimens of roots of *Aconitum Jiete<roj)hyllum* were supplied to Prof. W. Rae Sherriffs of Southampton for research studies.

The work of general overhauling of the Gallery was continued, resulting in improvements in various directions.

Information on materials of the following was supplied to various correspondents both in India and abroad: —

Acacia arabica Willd.; *Aconitum heterophyllum* **Wall.;** *Aconitum* sp.; *AUtonia scholaris* Br.; *Amomum aromaticum* Roxb.; *Areca Catechu* L.; *Arenga saccharifera* Labill.; *Atropa Belladonna* L.; *Bambusa* sp.; *Berberis aristata* DC; *Bcehmeria* ***nivea*** Hook & **Am.;** *Brassica campcstris* L.; *Brassica* sp.;

Broussonetia papyrifera Vent.; *Butea frondoSa* Roxb.; *Carica Papaya* L.; *Carum Carui* L.; *Cassia* sp.; *Cinchona* sp.; *Citrullus Colocynthis* Schrad.; *Citrus Auramtium* L.; *Curcuma aramatica* Salisb.; *Datura fastuosa* L.; *Dendrocalamus strictus* Nees.; *Derris elliptica* Benth.; *Evibelia Ribes* Burm.; *Gardenia lucida* Roxb.; *Holarrhena antidysenterica* Wall.; *Hibiscus Sabdariffa* L.; *Hydrocotyle asiatica* L.; *Indigofera indica* Lamk.; *Mangifera indica* L.; *Nicotiana Tobacum* L.; *Ocimum Basilicum,* L.; *Oryza coarctata* Roxb.; *Oryza latifolia* Desv.; *Oryza sativa* L. var. *plena* Prain; *Oxytenanihera* sp.; *Papaver somniferum* L.; *Perilla ocimoides* L.; *Picrorhiza Kurrooa* Benth.; *Piper Betle* L.; *Plantago Psyllium* L.; *Podophyllum Emodi* Wall.; *Psychotria Ipecacuanha* Stokes; *Saccharum ciliare* Anders.; *Saussurea Lappa* Clarke; *Scopalia* sp.; *Sesamum indicum* DC.; *Swertia Chirata* Ham.; *Terminalia Chebula* Retz.; *Thevetia nereifolia* Juss.; *Tinospora cordifolia* Miers.; *Tritioum vulgar** Vill.; *Urginea Scilla* Steinh.; *Valeriana Wallichii* DC.

HI. Cinchona and Quinine.—*Burma Plantations.*—In the plantation rainfall was normal and there was no damage to Cinchona. No extension was allowed, but the existing blocks were maintained in good condition. Analysis at the Mungpoo Factory shows that age has enriched the Burma bark in quinine content and it compares now very favourably with Munsong bark. During the year under review the harvest of bark was 81,772 lbs., the corresponding figure for 1934-35 being 64,429 lbs. Bark sent to the Mungpoo Factory for extraction was 75,569 lbs. and the stock lying at the plantation at the end of the year was 92,511 lbs.

The shade trees are doing well. The accumulated Ipecacuanha roots are sent to Calcutta and stored at the Indian Museum. Revenue realised from the sale of these roots during the year under review was Rs. 1,760.

Mungpoo Factory.—The recrystallisation of crude quinine to Trade Quinine of B. P. Standard went on as before and the total produce was 17,230 lbs. Its growing popularity is evidenced from its continued sale.

During the year bark received at the Factory from the B;irma Plantation for extraction was 75,569 lbs. The total bark treated was 73,078 lbs. (Java 23,341 lbs. and Burma 49,737 lbs.), yielding 2,820 lbs. Quinine Sulphate and 1,379 lbs. Cinchona Febrifuge.

Since the supply of Cinchona Febrifuge from the Presidency Jail, Alipore, to the Government of India area was stopped under orders from the Government of Bengal, indents from the Indi*

area are being complied with from the Government of India stock of Cinchona Febrifuge at Mungpoo.

Indian Museum.—The most notable event of the year was the Government of India's decision to make a free distribution of 45,000 lbs. quinine to the various provinces and minor administrations except Bengal, in pursuance of their policy of liquidating the surplus stocks. This distribution was made from the stock at the Indian Museum. Owing to the loss of the water of crystallisation the Java Quinine became short weight but over-strength and this quinine was used in making the distribution. An invoice weight of 49,451 lbs. quinine was issued to the various provinces with the result that the total stock of quinine reached an amount of 157,870 lbs. at the end of the year, leaving an excess of only 7,870 lbs. over the reserve. This small quantity would inevitably prove inadequate to meet India's normal annual distributions.

Three kinds of tablets, *viz.*, Quinine Sulphate Tablets, Quinine Reinforced Cinchona Tablets, and Cinchona Febrifuge Tablets, are being prepared for supply to Assam and Upper India. These supplies are made direct from the Indian Museum. The supply to Assam increased from 1,000 lbs. in 1934-35 to 1,764 lbs. in 1935-36, and the Punjab began to indent for Cinchona Febrifuge Tablets towards the close of the year.

Besides the free distribution of 49,451 lbs. of quinine, the total net sales of all kinds of drug during the year were as follow:—

	Lbs.
Quinine Sulphate of all forms	30,148
Quinine Sulphate Tablets	1,222
Quinine Reinforced Cinchona Tablets	1,764
Cinchona Febrifuge Tablets	155
Cinchona Febrifuge Powder	4,533

The total revenue realised during 1935-36 was Rs. 5,53,354-4.

The following stock accounts will reveal the position of the different kinds of drugs:—

Quinine *Sulphate.*

Dr.	Lbs.		Cr. Lbs.
To Stork *on* 1st April 1935	235,866	By Sales and other issues	100,896
„ Manufacture and returns	22,900	„ Stork on 1st April 1936-	
		At Indian Museum	9,715
		At Mungpoo	147,543
		At Naduvattam	612
	258,766		258,766

Quinine Sulphate Tablets.

Dr.	Lbs.		Lbs.	Cr.
To Stock on 1st April 1935	899	By Sales and other issues	1,225	
„ Manufacture	1,194	„ stock on 1st April 1936—		
		At Indian Museum	868	
	2,093		2,093	

Quinine "Reinforced Cinchona Tablets.

To Stock on 1st April 1935	319	By Sales	1,764	
„ Manufacture	1,484	„ Stock on 1st April 1936—		
		At Indian Museum	39	
	1,803		1,803	

Cinchona Febrifuge Tablets.

To Stock on 1st April 1935	*Nil*	By Sales	155	
„ Manufacture	383	„ Stock on 1st April 1936—		
		At Indian Museum	228	
	383		383	

Cinchona Febrifuge.

To Stock on 1st April 1935	19,687	By Sales and other issues	6,250	
„ Manufacture and returns	1,800	Stock on 1st April 1936—		
		At Indian Museum	1,768	
		At Mungpoo	13,469	
	21,487		21,487	

Bark.

To Stock on 1st April 1935	685,231	By Issue for extraction	73,078	
„ Quantity harvested during the year	81,722	Stock on 1st April 1936—		
		At Mungpoo	501,364	
		At Mergui	92,511	
	666,953		66(5,953	

IV. Financial.—The total budget allotment for the year was **Efl.** 1,53,000, of which Rs. 41,800 was for Botanical Survey proper **and** Us. 1,11,200 was for Cinchona. **The** whole grant **was** spent,

leaving a small saving of about Es. 2,000 mainly due to modification by audit of the flat rate of extraction of quinine from bark.

V. Staff.—The writer held charge throughout the year as Director, except from 31st May, 1935, to 29th November, 1935, while on leave out of India. During his absence the post of the Director, Botanical Survey of India, was kept in abeyance. Mr. S. C. Sen, Quinologist to the Government of Bengal, who was then the Officiating Superintendent, Cinchona Cultivation in Bengal, discharged the Cinchona duties of the Director. Mr. S. N. Bal performed the duties of the Director at Indian Museum and was placed in immediate charge of the Quinine Stock at Museum under the general supervision of Mr. Sen. Mr. K. P. Biswas, Curator of the Herbarium, Royal Botanic Gardens, Sibpur, who was then officiating as the Superintendent, Royal Botanic Gardens, discharged the Director's duties at Sibpur. Mr. S. N. Bal was Curator of the Industrial Section, Indian Museum.

Mr. V. Narayanaswami, Systematic Assistant, acted as Curator of the Herbarium, Royal Botanic Gardens, Sibpur, under the Government of Bengal from 31st May to 29th November, 1935, and Mr. T. D. Srinivasan, a retrenched officer of this Department, worked in Mr. Narayanaswami's place from 13th August to 29th November, 1935.

Mr. T. C. Mukharjee acted as Head Clerk up to 13th May, 1935, when Mr. A. Banerjee was appointed to officiate in the post. Mr. S. B. Banerji, the Head Clerk, retired from Government service from 1st February, 1936.

On the Cinchona Plantation Mr. G. H. Fothergill acted as Superintendent throughout the year during Mr. P. T. Russell's leave preparatory to retirement. Mr. Mg. Sine was Overseer throughout the year except for a period of three months when Chandra Lai officiated in his place.

All the members of the staff worked well during the year.

C. C. CALDER,

Director,

Botanical Survey of India.

MGIPC—L—III-7-8—8-1-37—450*