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All communications for the Society should be addressed to the Secretary, John Street, Adelphi, W.C. (2)

NOTICES.

NEXT WEEK.

WEDNESDAY, JANUARY 2nd, at 3 p.m. (Mann Juvenile Lecture.) DR. WILLIAM ARTHUR BONE, F.R.S., Professor of Chemical Technology, Imperial College of Science and Technology, "Fire and Explosions." (Lecture I.) The lecture will be fully illustrated with experiments.

Special tickets are required for this course and for the Mann Juvenile Lecture by MRS. JULIA W. HENSHAW, F.R.G.S., Croix de Guerre, entitled "Among the Selkirk Mountains of Canada (with ice-axe and camera)," to be delivered on Wednesday, January 16th, at 3 p.m. A few tickets for both courses are still left, and these will be issued to Fellows who apply for them at once.

COMPETITION OF INDUSTRIAL DESIGNS.

Particulars of the Competition of Industrial Designs to be held at the Victoria and Albert Museum in June, 1924, can now be obtained on application to the Secretary, Royal Society of Arts. Over £1,000 will be offered in Travelling Scholarships and Money Prizes in the various sections, and the Society's Diploma will be conferred on any candidate whose work reaches a very high standard of artistic ability and shows practical knowledge of the materials and processes of his trade.

PROCEEDINGS OF THE SOCIETY.

FIFTH ORDINARY MEETING.

WEDNESDAY, DECEMBER 5TH, 1923.

PROFESSOR C. A. SEWARD, Sc.D., F.R.S., Pres.G.S., F.L.S., Professor of Botany in the University of Cambridge, in the Chair.

THE CHAIRMAN said that it was his great privilege to introduce to the Society the Director of Kew, who would speak about the many activities of the Royal

Gardens. Dr. Hill had not presided for many years over the destinies of Kew as Director, but he had been associated with the Gardens for a long time past in another capacity. Before he went to Kew he was at Cambridge, and there the speaker had had the opportunity of being with him in the same Departments of that University. He left a School mostly concerned with pure science for an institution which was concerned with both pure and applied science—with pure science to the greater degree, although, of course, it was difficult to draw the line between the two. He had pleasure in calling upon Dr. Hill to read his paper.

The paper read was :—

THE WORK OF THE ROYAL BOTANIC GARDENS, KEW.

By ARTHUR WILLIAM HILL, M.A., Sc.D., F.R.S., F.L.S.,

Director, Royal Botanic Gardens, Kew.

Before attempting to give you some account of the work of the Royal Botanic Gardens, Kew, I feel it is essential to a proper understanding of the functions of Kew to consider for a few minutes the early history of the Gardens, how they came into being, and how their development as the Headquarters of Botanical Enterprise for the British Empire gradually materialised.

As with so many of our National Institutions, Kew, as we know it to-day, was not evolved in any deliberate manner, or as the result of some carefully conceived plan in the brain of any far-seeing Empire builder. Its origin was due to the interest in horticulture of that eminent lady, Princess Augusta of Saxe-Gotha, widow of Frederick, Prince of Wales, who in 1760, under the guidance of the Earl of Bute, started a Botanic Garden of some nine acres in the vicinity of Kew House. Frederick himself would appear to have been interested in gardening pursuits, for after his acquisition of Kew House on a long lease from the Capel family in 1730, he commenced a fresh arrangement of the pleasure grounds, and made additional plantations under the direction of the celebrated Kent.

It was after Frederick's death in 1751 that Princess Augusta gave to Kew Gardens

the definitely scientific character they have ever since maintained.

The date 1760 may be accepted as the commencement of the Botanic Garden, as it was towards the close of the year 1759 that William Aiton, who had been a pupil of the famous Philip Miller at the Chelsea Physic Garden, was engaged by the Dowager Princess of Wales to establish at Kew a Botanic, or, as it was then termed, a Physic garden.

Princess Augusta died in 1772, but during the last twelve years of her life she was assisted in her botanical pursuits by John Stuart, third Earl of Bute, who was keenly interested in botany. This science, apart from his brief political career, was the principal occupation of his life, and his interest in botany has scarcely received the appreciation it deserved. It should, however, be borne in grateful remembrance that he took a very active part in developing the botanical side of Kew. Some of the trees planted under his direction still exist, notably the fine Maidenhair tree (*Ginkgo*) and a *Diospyros* near the site of the Temple of the Sun, which among others were probably brought from the garden of the Duke of Argyle near Hounslow in 1762.

That the collection of plants at Kew in these early days was a remarkable one is shown by Sir John Hill's *Hortus Kewensis*, published in the year 1758, which was an octavo volume of 458 pages forming a catalogue of the plants cultivated in the garden of Her Royal Highness the Dowager Princess of Wales at Kew. This catalogue enumerates 3,400 species, 488 being hardy trees and shrubs and 200 tender shrubby plants; while in 1770 Sir John speaks of Kew as "that garden where every tree that has been seen in Europe is at hand."

After the death of Princess Augusta, George III. purchased the freehold of Kew House and grounds from the Dowager Countess of Essex, and amalgamated them with the gardens of Richmond Palace, which had been the residence of George II. and Queen Caroline. Love Lane, which separated the two properties, was the old roadway from Richmond to Brentford Ferry, and the present Kew Road is its successor. The original Love Lane is still preserved in the Holly Walk in the Gardens, but though George III. was empowered to close the lane in 1765, it seems doubtful whether the two Royal Gardens were really united until about the year 1802. Many

of the trees still at Kew, in the part which was formerly Richmond Gardens, were planted under the direction of Queen Caroline.

With the acquisition by George III. of the two Royal Gardens and the appointment of Sir Joseph Banks as Botanical Adviser, or in effect "Director" of the Royal Gardens, in place of Lord Bute, the "Golden Age" of Kew may well be said to have commenced.

The King maintained the botanical character of Kew with even greater energy than did his Mother, and supported with keen interest the various botanical activities initiated by Sir Joseph Banks, which have resulted in Kew occupying the position it holds to-day in relation to botanical enterprise throughout the Empire.

To Sir Joseph was due that practice, which has yielded such fruitful results, of sending out collectors to various parts of the British Empire and to other countries, which, after lapsing and being revived by Sir William Hooker, has in recent times been continued by the leading nurserymen and by private enterprise.

In the year 1772, Sir Joseph Banks, being then President of the Royal Society, addressed a memorandum to the King with reference to sending Francis Masson, an under-gardener at Kew, to collect seeds and living plants at the Cape of Good Hope "for the Royal Botanical Garden at Kew."

Masson made remarkably fine collections, and sent home over 400 species of living plants. At least one of his plants, the interesting Cycad *Encephalartos longifolius*, still exists in the Palm House, while among others were *Cineraria cruenta*, the parent of our garden Cinerarias, and the wild Cape Pelargoniums, from which have been evolved our garden "Geraniums." From the long list of Kew Collectors one or two names deserve special mention. Among them, that of David Nelson, who was Assistant Botanist on Captain Cook's third voyage, and subsequently accompanied Captain Bligh on the ill-fated voyage of the "Bounty." The genus *Eucalyptus* was founded by L'Heritier—the French Botanist who came to England 1786-87, and studied the Kew collections—on a species (*E. obliqua*), which was found by Nelson in Tasmania. Then there is Archibald Menzies, who accompanied Captain Vancouver (1791-95), and brought home seeds of the Chilean Monkey Puzzle (*Araucaria imbricata*), which Sir Joseph

Banks planted, some at his own place at Spring Grove, Isleworth, and the others at Kew. It is a pity that Sir Joseph's name is not still commemorated by the retention of the early name "Sir Joseph Banks' Pine," by which it was first known. Menzies also discovered *Sequoia sempervirens*, the Californian Red Wood. I must also refer to Christopher Smith, who went with Bligh on his second successful voyage to convey the Bread fruit to the West Indies, and afterwards collected in India; Peter Good, who was in Calcutta and Australia; George Caley, who was appointed by Sir Joseph as botanical collector in New South Wales; William Ker, who was sent to collect in China; Alan Cunningham, who travelled as a collector for Kew, in Brazil, The Cape and Australia, and David Lockhart, who was the only survivor of the scientific staff of Captain Tuckey's Congo Expedition of 1816. These are some of the most famous of the earliest of the Kew Collectors.

Three of these same men also deserve further mention, namely, William Ker, who in 1812 was appointed Superintendent of the Royal Botanic Garden, Ceylon, founded in 1810; George Caley, who was Superintendent of the Botanic Garden, St. Vincent, from 1816 to 1822—the earliest of our Tropical Gardens founded in 1765—and David Lockhart, who was apparently the first Superintendent of the Botanic Garden in Trinidad, where a Garden was founded in 1817. Thus began that long and valuable connection, which still happily exists, between the Royal Botanic Gardens, Kew, and the daughter Botanic Gardens which have gradually been established in practically every British Colony and Dominion.

A glance at the *Kew Bulletin* appendices giving the List of Staffs of the Botanical Departments at home, in India and the Colonies during the last 35 years, will show that gardeners trained at Kew are at the present time, or have been until quite recently, in places so remote as the Falkland Islands, the Fiji Islands, the Seychelles, Rodriguez, Central Africa, Hong Kong, Port Darwin, Australia, New Zealand, and, in fact, throughout the British Empire.

One of Sir Joseph Banks' schemes was to found a Herbarium and Library at Kew.

The present Herbarium and Library occupies the house originally known as Hunter House (the property of Mr. Robert Hunter), which it is believed was purchased for the King in 1818, at the instigation of

Sir Joseph Banks, for the purpose to which it is now dedicated. A room on the ground floor was fitted with bookshelves, and no doubt the botanical collections brought home by the Kew Collectors were deposited in the building.

Unfortunately, the King and Sir Joseph both died in 1820, and Kew suffered greatly in consequence. Sir Joseph's Library and Herbarium, including the botanical specimens brought home by the Kew Collectors, were bequeathed to the British Museum, and became the foundation of its Botanical Department, so that Kew, unfortunately, does not now possess the fruits of the labours of her earliest sons.

George IV. at first took a good deal of interest in Kew, and adhered to the plan of adapting Hunter House to its present purpose. He also added considerably to the amenities of the Gardens on the Kew Green side, but in 1823 he sold Hunter House to the Nation. Notwithstanding this, however, William IV., about 1830, granted its use to the Duchess of Cumberland for her life, and, on the Duke's accession to the throne of Hanover, it became generally known as Hanover House. Here the King of Hanover sometimes resided, but after his death in 1851, it remained unoccupied, and in 1852 its use for Herbarium purposes once more commenced, thanks to the action of Sir William Hooker.

The house itself now serves as our Library, while the Herbarium occupies two extensive wings which have been added to the north and to the west of the original house. The Herbarium contains a remarkable series of specimens of dried plants from every part of the world, representing especially the floras of the various parts of the British Empire. Between 3,000,000 and 4,000,000 specimens and comprehensive collections of plant portraits, fruits and seeds are preserved in the Herbarium, while the Library, which is probably the finest botanical library in existence, contains some 30,000 volumes. The annual additions of pressed specimens to the Herbarium amount to about 30,000 sheets.

The death of Sir Joseph Banks, in 1820, was a serious blow to Kew, and though the activities which he initiated, and which received such warm support from George III., were continued to some extent after his death, there was no real progress in the development of the Gardens, but rather they suffered a steady decline.

George IV. soon abandoned Kew for Windsor and Sir Everard Home appears to have assumed the task of directing the affairs of Kew, and used to meet at the house of Francis Bauer "the eminent men of the day for purposes connected with Botany and other branches of Natural Philosophy."

Francis Bauer, F.R.S., it should be mentioned, was an Austrian who came to England in 1788 and in 1790 was, through Sir Joseph Banks' liberality and with the King's sanction, attached as Draughtsman to the Botanic Garden. He occupied the position for fifty years, until his death in 1840. This most essential post in connection with a Botanical Institution such as Kew has recently been properly recognised by Government, and a Botanical Artist is now one of the established officers on the scientific staff of the Royal Botanic Gardens.

Sir Everard Home died in 1832, two years after the death of George IV., and, though William IV. took a warm interest in Kew, the Gardens and all that Sir Joseph Banks had laboured to achieve, languished, and their scientific importance was so lost sight of that the scientific botanists of the day appear almost entirely to have got out of touch with Kew.

Collecting activities fortunately did not entirely cease, and some valuable additions were made, but the Gardens were still a private establishment. Visitors, however, had free access on certain days, thanks largely to Mr. W. T. Aiton (son of the first Curator, W. Aiton), who was Director-General not only of Kew but of other Royal Pleasure Gardens in addition.

It was after the death of William IV., in 1837, that the position of the Royal Gardens became precarious, and their abandonment was seriously considered, so much so, that the Treasury in January, 1838, appointed a Committee "to inquire into the management, etc., of the Royal Gardens." This committee consisted of Dr. Lindley and two practical gardeners, one of whom was the future Sir Joseph Paxton. Without going into the full details of their inquiry, and narrating all that took place when Dr. Lindley's Report was presented to Parliament in 1840—though he reported in 1838—it will suffice to record that after the discussion in the House of Lords, the charge of Kew was removed from the control of the Board of Green Cloth, and transferred to the Department of Woods and Works on March 11th, 1840.*

On the dissociation of the Department of Woods from the Office of Works, Kew, like the Royal Botanic Gardens, Edinburgh, came under the control of H.M. Office of Works, but though the Edinburgh Gardens are still in the domain of the First Commissioner of H.M. Works, Kew was transferred in 1903 to the care of the Board (now the Ministry) of Agriculture and Fisheries, as far as its general administration is concerned.

When this transfer took place, it was laid down "that the privilege enjoyed by the Foreign Office, Colonial Office and India Office of corresponding directly with the Director will be preserved to those Departments," and I need hardly point out, that from the nature of the work performed at Kew, this very important privilege is highly valued by the Director of Kew.

The outcome of Dr. Lindley's Report was the renaissance of the Royal Gardens, which dates from the year 1841, when, on April 1st, Sir William Hooker, F.R.S., Regius Professor of Botany in the University of Glasgow, was appointed Director of the Botanic Gardens.

In the year 1841, W. T. Aiton resigned his position of Superintendent of the Botanic Garden—a post he had held for fifty years—and John Smith, previously Foreman, was appointed Curator, and was the first Curator of Kew as a Public Establishment.

The continuance of the existence of Kew in these evil days seems to have been due rather to the interest of Her Majesty Queen Victoria, than to the popular agitation that

*The following is the principal part of Dr. Lindley's Report presented to Parliament in 1840.

"The importance of Botanic Gardens has for centuries been recognised by the governments of civilised states, and at this time there is no European nation without such an establishment except England. The wealthiest and most civilised country in Europe offers the only European example of the want of one of the first proofs of wealth and civilisation. There are many gardens in the British Colonies and Dependencies, as Calcutta, Bombay, Saharunpore, the Mauritius, Sydney and Trinidad, costing many thousands a year; their utility is much diminished by the want of some system under which they can all be regulated and controlled. There is no unity of purpose among them; their objects are unsettled, their powers wasted from not receiving a proper direction; they afford no aid to each other, and, it is to be feared, but little to the countries where they are established; and yet they are capable of conferring very important benefits on commerce, and of conducing essentially to colonial prosperity. . . . A National Botanic Garden would be the centre around which all these lesser establishments should be arranged; they should all be placed under the control of the chief of that garden, acting with him and through him with each other, recording constantly their proceedings, explaining their wants, receiving supplies, and aiding the mother country in everything useful in the vegetable kingdom; medicine, commerce, agriculture, horticulture, and many branches of manufacture would derive considerable advantage from the establishment of such a system. . . . From a garden of this kind Government could always obtain authentic and official information upon points connected with the establishment of new colonies."

its proposed abandonment aroused. The following extract from a letter to John Smith by Mr. Aylmer Bourke Lambert, a private gentleman keenly interested in botany, who seems to have succeeded to the role of Sir Joseph Banks in the affairs of Kew, is of interest in showing the part played by the Sovereign in the preservation of Kew.

March 9th, 1840. "You will not be a little surprised, and I think not less grateful when I tell you that your letter that you wrote me giving particulars of the origin of Kew Gardens, and the interest taken by the Princess of Saxe-Gotha, that said letter went to the throne, and (was) read by Her Majesty and Prince Albert, they were much interested in it. There is no doubt that was the reason Lord Ilchester came to Kew, as he is one of Her Majesty's household."

Sir William's charge, when he assumed office, comprised only 15 acres, yet his appointment inaugurated that new era in the history of Kew, which, though perhaps in some directions not so eventful as in the days of Sir Joseph Banks, has been a period of uninterrupted progress and notable achievement.

These, then, were the traditions of Kew, and such were the labours of other men into which Sir William Hooker, in 1841, was called upon to enter. In that year, Kew was not, alas, the inspiring place created by Sir Joseph Banks, but a moribund and decadent institution waiting to be restored to its former eminence, a task for which Sir William was peculiarly fitted. It is no doubt his son and successor in office, Sir Joseph Hooker, who is generally thought of as the Director who re-established the prestige of Kew and succeeded in making it the centre of botanical enterprise for the Empire, but it must not be forgotten that practically every one of the proposals and schemes for the development of the work of Kew on the lines which are still followed, were conceived with remarkable foresight and set in motion by Sir William Hooker.

In 1843 Sir William Hooker, as I have stated, reverted to the plan initiated by Sir Joseph Banks, of sending collectors to distant countries for the purpose of transmitting plants and seeds to the Royal Gardens. Among Sir William's Collectors should be mentioned W. Purdie, who was sent to New Granada; G. Mann, who went

to the Cameroons, Gaboon River and Fernando Po; W. B. Baikie and C. Barter, who went to the Niger; John (later Sir John) Kirk, to the Zambesi with Livingstone; Sir Joseph Hooker to the Himalaya; Edmonstone, followed by B. C. Seemann, to Western and Arctic America in H.M.S. Herald, and the latter to the Fiji Islands with Col. Smythe's mission, and also R. Spruce who was sent to Ecuador for Cinchona seeds.

It would be a long story were I to attempt to give in detail the history of the many activities of Kew, even with regard to India and our overseas Dominions and Colonies during the Directorships of the two Hookers, of Sir William Thiselton-Dyer and of Sir David Prain; for the Director of Kew is also Botanical Adviser to the Secretary of State for the Colonies, and is consulted on Indian botanical matters by the Secretary of State for India. Thus the shelves of the Director's office are filled with folios dealing with questions concerning the introduction of useful plants to our Colonies and India from other regions, and with every sort of enquiry as to the world's economic products so far as they relate to the vegetable kingdom.

The work of the Royal Botanic Gardens, Kew, is divided up into four main divisions, only one of which, however, is generally known about and appreciated by the people of this country. This, I need hardly say, is the garden proper. To most people the name Kew Gardens, or as they should properly be called, the Royal Botanic Gardens, Kew, represents a beautiful garden of herbaceous plants, trees and shrubs, and many greenhouses, some of which they find uncomfortably hot. To a select few, who, one is glad to say, are ever an increasing number, the Gardens are recognised as the place where the attempt is made to cultivate every variety of plant "that is pleasant to the sight and good for food," under the best conditions that Kew can provide, and they, together with those botanists who are also lovers of plants, fully appreciate the scientific order of the collections. These have been so skilfully arranged, thanks largely to the keen instinct for landscape effect possessed by Sir William Thiselton-Dyer and by the Curators of the Gardens, that the general public are scarcely aware that the garden lay out is governed by any scientific principles at all.

One is tempted to believe that among our many student visitors there are some

who have realised that the "Tree of Knowledge" also is to be found at Kew.

The next department which commands a fair share of public interest, and also, one hopes, serves as a means of liberal education, is that of the Museums.

Four Museum buildings now house the varied and extensive economic collections, which comprise examples of the economic products of the plants of the world. The Museum collections, though brought together with the definite purpose of illustrating the uses to which plants may be put, are really complementary and ancillary to the collections in the Herbarium and in the Garden, and one collection without the other would lose very much of its importance and value. The housing of the collections in four separate buildings, is an unfortunate arrangement as far as economical working of the Department is concerned, and also somewhat unsatisfactory since three of the buildings have been adapted to serve their present purpose and are not as well suited for the exhibition of specimens as they might be.

The original museum collection, which was the first of its kind brought together for the purpose of exhibiting in systematic order the economic products derived from plants, was due to the foresight of Sir William Hooker. In 1847, owing to Sir William's representations, the fruit storehouse belonging to the Royal Family, now Museum No. II., was, by Her Majesty's command, added to the Botanic Garden and Sir William's own private collection, which he presented to the Nation, formed the nucleus around which our present extensive collections have been built up.

The objects exhibited could not be shown either by the living plants in the Garden or by the specimens preserved in the Herbarium, and the value of these collections has become increasingly evident in the course of years, so that now practically every vegetable product from any part of the globe can be accurately determined.

As soon as the establishment and aim of the Museum was generally made known, contributions poured in from all quarters of the world, and the original building became so crowded that application had to be made to Parliament for a new building for the proper accommodation of the specimens.

In 1857, to meet this need, the present No. 1 Museum was opened. Here the

economic products derived from the Dicotyledonous plants (including such well-known objects as cocoa, coffee, cinchona, rubber, tea, etc.), are displayed, while the products derived from the Monocotyledons, such as palms, bamboos, grasses, the various food grains and articles, such as mats, hats, vegetable ivory, etc., are exhibited in the original museum, now called Museum No. II. Thus it may now, I believe, be said with full truth that it is almost impossible to point out any Colonial product, however insignificant, which is not adequately represented in the Kew Museums.

No. III Museum, the home of Tropical Timbers in particular, was formerly the Orangery of the original Royal Gardens; while No. IV. Museum, our most recent acquisition, which contains a remarkable collection of British-grown timber, and the articles made therefrom, as well as a complete series of the fungus and insect pests to which trees are subject in this country, has been housed in Cambridge Cottage. This building was formerly the private residence of His Royal Highness, the late Duke of Cambridge, and was after his death graciously made over to Kew by the Crown, and opened to the public in 1910.

Three of our Museum Buildings, as I have mentioned, are none too well suited for their purpose, since they were not built for the display of museum specimens, still, they serve their function very fairly well. No. I. Museum was enlarged in the year 1881, and both it and No. II., which is the least suitable for a museum, are now inconveniently crowded. It is to be hoped that before long a further enlargement of No. I. Museum may be sanctioned on such a scale that not only the crowded out products derived from the Dicotyledonous plants can be included, but also the Monocotyledon exhibits now displayed in No. II. Museum. If this should ever be sanctioned, then the whole range of vegetable products, exclusive of the timbers of the world, could be studied under one roof, in proper systematic sequence.

What, it may be asked, is the purpose of these collections, and in what way are they connected with the work of Kew? Their chief object is to show the practical applications of botanical science, and to enable students and those engaged in commercial pursuits both at home and from overseas, to appreciate the general relations of the vegetable world to man, and in

particular to exhibit the vast resources of the Empire. We learn from them the sources of the innumerable products furnished by plants for our use and convenience, whether as articles of food, of construction and application in the arts, of medicine or curiosity. They also show us the points where we need further information, more especially as to the origin of many valuable timbers, fibres and drugs.

In short, not only do these collections tell us how much we have already discovered, but also how little we still know of the extent to which herbs, shrubs and trees contribute to our necessities, comforts and our numberless requirements.

Closely associated with the Museums, as it is also with the garden proper and the work of the Herbarium, the Jodrell Laboratory must now be mentioned. Here, thanks to the munificence of Mr. T. J. Phillips Jodrell, who built and equipped the Laboratory at his own expense in 1876, we have a department where work can be undertaken to determine the structure, functions and properties of obscure vegetable products, and it is seldom that it is not possible by means of careful research, to solve the problems which are constantly being presented to us by our correspondents both at home and abroad. Without the wealth of material in the Museums and the Herbarium for comparison and examination, the many valuable results which have been achieved in this laboratory would not have been possible.

The Laboratory is also fitted for physiological and mycological investigations, and some famous researches by distinguished botanists have been carried out within its walls. Research students are welcomed here, and are able to study, as nowhere else, the problems presented by the vegetation of the globe illustrated, as it is, by the collections of living and preserved plants in the Royal Botanic Gardens.

The North Gallery, built and presented by Miss Marianne North, in 1885, is also an appanage of the Museums, and, as is well-known, in this remarkable botanical picture gallery plants from all over the world may be seen painted in oils by her master hand. The pictures are renowned for their botanical accuracy as well as for their artistic skill, and these qualities render them of infinite value in a scientific establishment like Kew where an attempt is made to grow, portray, preserve and study as fully as

possible the wonders of the vegetable kingdom.

A smaller collection of pictures by Miss M. H. Mason, of South African plants, in Museum No. IV., may also be referred to here, since they enable us to appreciate very clearly the special characteristics of the vegetation of South Africa.

This brings me to the fourth department, the Herbarium. The present Herbarium collections, as I have stated, owe their origin to Sir William Hooker, since those earlier and famous collections made by Sir Joseph Banks and the Kew Collectors, are now at South Kensington.

When Sir William came to Kew, he brought with him his own large collection of dried plants, and in 1854 this was greatly augmented by the collections of the distinguished botanist, Mr. George Bentham, who presented his fine private Herbarium and Library to the Nation. This nucleus has been continually added to by official contributions, by exchanges and by the judicious expenditure of our small annual parliamentary grant voted for the purpose, so that now the Kew Herbarium contains between three and four million specimens.

In the Herbarium, which is the largest and most completely organised in the world, in addition to the collection of dried specimens, we possess a magnificent collection of coloured botanical drawings of plants, so that not only can a large number of the plants of the globe be studied in the living condition, and as pressed specimens, but they can be examined as delineated by botanical artists, both as they have flowered at home, and also in many cases (Miss North's pictures) as they grow and flower in their native countries.

Such botanical studies are of very great assistance to the work performed at Kew in connection with the Floras of the different parts of the world.

The work carried out in the Herbarium is one of the most important of the functions of Kew. What exactly that work is may be gathered from a perusal of the pages of the *Kew Bulletin* for the year 1905, compiled by Sir William Thiselton-Dyer. In addition to the attempt that is being made to complete a botanical survey of the Empire, detailed researches are being undertaken in connection with the floras of the world, and particular attention is always being paid to the determination of plants which may prove to be of economic

importance, whether as food or for use in the arts, and which might be introduced with advantage to one or other of our overseas possessions.

Unless a plant, which may possess definite economic possibilities, has been identified botanically, it is quite useless to attempt its introduction to cultivation without incurring the grave risk of bringing in a worthless plant. The more we get to know about plants, and the more we discover how considerable a range of variation they exhibit, both as regards form and in their constitution, the more we understand the importance of arriving at an exact determination of the particular species or of some special varietal form which it may be desirable to introduce in order that it may be a commercial success.

Had it been appreciated earlier that species show fundamental physiological variations, which are often only rendered apparent by experiment in the laboratory, as well as the more easily discernible morphological variations, much labour and money might have been saved.

I may instance two examples which affect the British Empire, with both of which Kew has been intimately concerned.

In the one case, that of Camphor, the product derived from *Cinnamomum Camphora*, Nees, native of Formosa and Japan, Kew must plead ignorance. In the other, that of Para Rubber *Hevea brasiliensis*, Muell. Arg. the blame must be attached to the rubber growers. They failed to appreciate the fact that science could help them in selecting the best trees to cultivate in their plantations and thought that from the seeds of any tree of *Hevea brasiliensis* they would obtain the plants they required. Scientific research, however, has shown that the percentage of latex yielded by individual trees varies very greatly in amount, for while some trees yield only 2% of latex, others yield as much as 40%. Had the warning note which was sounded by Kew and by others been regarded, which was, that seed from untested trees should not be sown promiscuously, rubber plantations to-day might have been furnished with a larger proportion of the best latex-yielding trees than is now the case.

With regard to Camphor, it is only recently that it has become known in the West that there are two varietal forms of the Camphor tree, both so alike in their external botanical characters that they can

hardly be separated. One of these yields the valuable solid camphor on distillation, the other camphor oil, a product of little commercial use. Since Camphor can be cultivated in several British Colonies, seed was obtained through Kew for growing in Mauritius, the West Indies and other Colonies. Unhappily, however, the seed which was procured emanated from the oil-producing trees, which were well-known to the senders, so that, except in a few isolated cases, there are scarcely any true Camphor trees in the British Colonies.

Problems of this nature abound in the realms of economic botany, as for instance, the exact determination of the best type of Willow for making cricket bats which was worked out at Kew, or in the domain of textiles such as the finding of the best strains of Cotton, New Zealand flax, Sisal or other fibre plants, which from time to time are temptingly brought to the notice of the prospective investor.

Several forms are known, both of Agave and Ananas, as members of this society are well aware, which are of little value for fibre production, and such are clearly recognisable by their botanical characters. It is in questions such as these that a botanical institution like Kew, with all its resources, can afford so much assistance to industry if only those concerned in commerce will seek our aid.

The principal work of the Kew Herbarium, however, is, as I have said, the systematic investigation and description of the floras of the world, and in particular, those of the British Empire. Owing to our close connection with India and the Colonies, vast collections of plants have poured in from every quarter, and it is the work of the Herbarium staff to name, preserve and arrange them so that they may be available for reference and study.

It is a matter of regret and a serious handicap to the full measure of our usefulness, that, despite additions to our staff, the influx of new material has ever been greater than could be absorbed, even with the most unremitting energy.

Both the Home and Colonial Governments and the Government of India have been generous in affording financial assistance to enable us to tell them of the wealth and potentialities of their floras. But you will, I feel sure, agree that far more help is required if Kew is to maintain its proud position as the premier botanical

establishment of the world, when I tell you that in our stores we still have accumulations of preserved material, largely from the Empire, amounting to some 200,000 specimens. This position, which it must be our earnest endeavour to uphold, when British interests are so immense both in the domains of pure and applied botany, can perhaps best be maintained by the generosity of private benefactors, and should there by any happy chance be such an one among my audience, I can assure him that assistance of this nature would benefit humanity at large to no small degree. I may mention here that the great American Institution, the New York Botanical Garden at Bronx Park, has received very large sums in the way of private benefactions, the number and magnitude of which fill me with envy.

Science never likes to beg, but should there be anyone anxious to help forward a great task, I would commend to their notice the work which, thanks to the generosity of Charles Darwin, has been undertaken at Kew. I allude to the *Index Kewensis*, that great register of all the species of plants, giving their habitats and references to the place and date of publication, of which five supplements have now been published in addition to the four original volumes produced at Darwin's expense. I may mention here that we estimate that the VIth quinquennial supplement of the *Index* will contain some 35,000 entries of new species, while in the Vth supplement, published in 1921, 37,000 new names were registered. These figures, to-

gether with those I have given of the number of our herbarium specimens, will perhaps indicate something of the magnitude of the work that is being undertaken in the Herbarium, and in particular of the heavy tax on our resources that the preparation of the *Index* entails; a work that is indispensable to botanists and horticulturists throughout the world.

I must not omit to mention, however, that Kew does receive some valuable help from the Bentham Trustees, who administer the legacy of that illustrious botanist, Mr. George Bentham, who left a sum of money for the purchase of books and specimens for Kew.

What, however, has been achieved at the Herbarium in addition to the labours I have already sketched? I can best answer by pointing to the long rows of the Colonial and Indian floras, and such ancillary works as "The Dictionary of Economic Products of India," and "The Useful Plants of Nigeria," all of which have been prepared at Kew.

The proposal that a series of Colonial floras should be compiled at Kew was made by Sir William Hooker as long ago as 1863, and it is of interest to compare his proposals which were made public in the *Annals of Botany* for 1902 (p. lxxxiii) with the results that have so far been accomplished.*

*"The Life of Sir William Jackson Hooker," by Sir Joseph Dalton Hooker, in the *Annals of Botany*, Vol. XVI, Nl. LXIV., Dec., 1902, which gives a vivid account of Sir William Hooker's work at Kew. See also *Kew Bulletin*, 1905, p. 20.

COLONIAL AND INDIAN FLORAS.			
Sir W. Hooker's proposals.	Volumes.	Present position.	Volumes.
1. Australian Colonies including Tasmania.	8.	Flora Australiensis.	7.
2. South African Colonies.	10.	Flora Capensis.	10.
3. British North America, Pacific to Atlantic.	2.	(Not prepared).	
4. West Indian Colonies.	2.	Flora of the British West Indian Islands. (A new work is now needed.)	1.
5. New Zealand.	1.	Handbook of the New Zealand Flora.	1.
6. Ceylon.	3.	Handbook of the Flora of Ceylon.	5 and 1 quarto volume of plates.
7. Hongkong.	1.	Flora Hongkongensis.	1.
8. Mauritius and the Seychelles.	1.	Flora of Mauritius and the Sey- chelles. (A new work is now needed.)	1.
9. British Guiana.	2.	(Not yet commenced).	
10. Honduras.	1.	(Not yet commenced).	
11. West African Colonies.	2.	Flora of Tropical Africa.	2.
12. British India.	10.	Flora of British India.	7.

In addition to these the following Floras have already appeared, or are in course of preparation, and have been prepared wholly or mainly at Kew :—

1. Materials for the Flora of the Malay Peninsula. 6 volumes.
2. Flora of the Malay Peninsula. 5 volumes.
(in preparation, 2 vols. issued)
3. Flora of the Upper Gangetic Plain. (1 volume to complete) 3 volumes.
4. Flora of the Presidency of Madras. 5 parts
(under continuation).
5. Flora of the Presidency of Bombay. 2 volumes.
6. Index Florae Sinensis. 3 volumes.
7. The Commercial Products of India. 1 volume.
8. The Useful Plants of Nigeria. 4 parts.
9. The Flora of West Africa (in preparation).
10. Floras of Bermuda, St. Helena, Ascension, Tristan da Cunha were published in the Scientific results of the Challenger Expedition.
- 11 Sketch of the Forestry of West Africa (Moloney) 1 volume.

A proposal to prepare a Flora of Trinidad has been under consideration for some time, but it has not yet been found possible to undertake this very desirable piece of work.

In place of Sir William Hooker's proposed "Flora of the West African Colonies," "The Flora of Tropical Africa" has resulted, and is now nearly complete, comprising eleven volumes. So greatly has our knowledge extended, of the flora of our West African Colonies, that it has been found necessary to ask the Governments of our four West African Colonies, The Gambia, Sierra Leone, The Gold Coast and Nigeria, to subsidise the preparation of a "Flora of West Africa." This proposal, I am happy to say, has received the approval of the Secretary of State for the Colonies, and of the Colonial Governments, and work was commenced in September last on this new undertaking. When this new compact Flora is published, it will, I believe, be possible, not only for the botanist but for all interested in the vegetation and vast botanical resources of West Africa, to determine the plants they meet with, and learn something of their economic possibilities.

The floras of Trinidad, and the splendid vegetation of British Guiana and British Honduras, and, strange as it may seem, the flora of Canada, still await attention; and, as might be expected, the earlier volumes of the Flora Capensis published

between 1859 and 1865, require to be almost entirely re-written, so greatly has our knowledge grown of the vegetation of South Africa in recent years. Similar remarks apply to the Floras of Mauritius and of the West Indies.

Thus, though much has been accomplished, even more remains to be done, and, as in every other branch of science, it is not possible to foresee any termination to our activities, but rather each accession of new knowledge opens up long vistas and enlarged spheres of useful and necessary work.

Not only do we deal in the Herbarium with the flowering plants and ferns, but with the mosses, lichens, seaweeds and fungi of the world as well, and such matters as the serious Panama disease of bananas, the coffee leaf disease (*Hemileia*), which devastated the flourishing coffee plantations in Ceylon, and other noxious or less harmful plant diseases from time to time demand investigation on the part of our scientific assistants.

Every post brings some enquiry of interest, and frequently one which necessitates careful and laborious research, or, on the other hand, it may open out some possibility of utilising a new economic product for the benefit of one of our distant Colonies.

We are prepared to report upon and obtain advice with regard to new vegetable industries, though it may relate to so small a matter as the supply of West African palm kernels for carving into coat buttons, or as to the value of a pithy stem as a material for a razor strop, on which—before the days of safety razors, I need hardly say—Kew reported to a West Indian Government, or even, quite recently, as to the botanical identity of the wood of a walking stick, about which its owner, as we discovered later, had made a bet!

I must, however, return to the garden side of Kew in order to illustrate more fully our close connection with the Colonies and India.

It was through Kew, as I think it is now well-known, that the Para rubber industry of the East was founded, and that the cultivation of Cinchona in India, Ceylon and Jamaica came about. This latter enterprise had been urged by Sir Joseph Banks more than half a century before.

These two remarkable introductions of South American economic plants were made

possible through the assistance given by Kew to the two enterprises, for the seeds of both plants were despatched to Kew from their native countries (*Hevea* in 1876, *Cinchona* in 1861), and the young plants which were raised in our greenhouses were despatched in Warden cases to the East, where they now flourish. In the one case, the successful achievement has brought very large financial returns, and in the other, the possibility of sound health in the tropics to a vast number of people.

I might give an account of many other projects that Kew has undertaken did time permit, such as the introduction of the very useful Teff grass from Abyssinia to South Africa; the annual sending of Mahogany seeds from the West Indies to India, and the building up there of Mahogany forests; the advice and help which Kew has afforded to the experiment in afforesting the barren tree-less Falkland Islands, and the sending of seeds and cases of useful plants to the Islands of Ascension and St. Helena with the result that Ascension is now furnished with useful thickets of trees. Kew has also rendered assistance which has been of value in setting up the lucrative Onion-growing enterprise in Antigua, and in connection with the making of paper from the "Ginger Lily," *Hedychium coronarium*. Then, again, reference must be made to the sending of Cacao plants to the Gold Coast since the success of the Cocoa plantations there is largely due to the assistance and advice afforded by the Royal Botanic Gardens.

Interesting stories about many other economic plants, valuable for their fibre, for paper making, spices or drugs, or for their food value, with which Kew has been intimately concerned, could also be related. I must, however, pass on to the consideration of a further sphere of usefulness to which we attach great importance, and which has been attended with far-reaching results; that is, the work of completing the botanical and horticultural training of the young men who come to Kew for a period of two or three years as Student Gardeners.

In this respect Kew may be regarded as a University of Horticulture, and perhaps more particularly of Tropical Horticulture, since so many of her sons go out to every part of the Empire to carry on the science and practice of Horticulture in the Botanic Gardens and Agricultural Stations in the Tropics.

That this should be the case is only natural since in no other Institution in this country can so much be learned about the vegetation of the Tropics, and the proper method of cultivation of tropical economic and other plants. Men trained in botany and agriculture in our Universities are no doubt well equipped in the scientific principles underlying their subject, but they are perforce sadly handicapped, owing to their lack of practical knowledge of the plants which they will meet with in our Colonies in connection with their work.

With the growing and legitimate demand for men who have passed through a University on the part of the Colonial Governments, the men trained at Kew are often placed in a difficult and unfavourable position, but I venture to say that the best of our students will be found, in the long run, with their practical knowledge added to the theoretical instruction provided for them at Kew, to be able to hold their own in comparison with the men who have had better opportunities in the way of a course at a University or at an Agricultural College.

Neither class of men, I would submit, are entirely satisfactory for sending out straight from home to some distant Colony where they will be confronted with problems with which they are, to a great extent, unfamiliar, but now that the Imperial College of Tropical Agriculture has been so successfully established in Trinidad, I am convinced that at last we have the opportunity of completing the education necessary both for the University candidate and for the man trained at Kew, so that they may become efficient scientific officers qualified to serve in whichever of our Tropical Colonies or Dominions their services may be required.

I have recently had occasion to bring this aspect of the training of scientific officers for colonial posts to the notice of the Secretary of State for the Colonies, and I hope that my proposals may meet with His Grace's approval, and that they may also be favourably considered by the Governors and Directors of Agriculture of our Colonies.

The important part that Kew has played in the past, and I am glad to say is still maintaining, in sending out her sons to distant lands in Government service, is, as I have indicated earlier, in direct continuity with the policy initiated by Sir Joseph Banks over a century ago, when Kew men were sent to take charge of the Botanic Gardens in Ceylon, St. Vincent and Trinidad.

The connection between the Royal Botanic Gardens, Kew, and the many daughter Botanic Gardens and Stations overseas—which have now very generally become the centres of flourishing Agricultural Departments—has been of inestimable benefit both to the Home and to the Colonial Institutions, and has served to weld that link of union and mutual help and sympathy which it is so essential to preserve.

Before leaving this portion of my subject, I may perhaps be allowed to mention that at the present time among the higher posts held by Kew men in the Colonies, one of our former student gardeners is Director of Agriculture in the Gambia and another is Commissioner of Lands and Forests, Sierra Leone. Another is Superintendent of the Botanic and Forestry Department, Hongkong, and the Economic Botanist, Trinidad, also received his early training at Kew, while the Superintendents and Curators of almost every one of our Tropical Agricultural Stations and Botanic Gardens have passed through Kew. In the United States of America it is of interest to note that Kew-trained men are held in high esteem. One is now Assistant Director of the famous Arnold Arboretum, and several others hold important horticultural appointments in that country. The value of the Kew training is further emphasised by the fact that several of our Scientific Assistants received their early training in the Gardens, including the present Assistant Director, who, before returning to Kew last year, held important posts in the Gold Coast as Assistant and Deputy Conservator of Forests and in Singapore as Assistant Director of the Botanic Gardens.

I cannot close this account of the work of the Royal Botanic Gardens without a brief reference to the building where all the various activities are centred, namely, the Director's Office; a small and unpretentious building of great interest from its historical associations. I believe the Director of Kew has been compared to a spider at the centre of his web, and the comparison is not altogether inept, since he has to keep in intimate touch with all the threads of the work in progress in each of the separate departments, and with all the important matters raised by correspondents at home and abroad. It is also his duty, and it is a very pleasant and interesting side of the Kew work, to keep himself informed as to the progress of

botanical and agricultural affairs in India, the Dominions and the Colonies, and to do whatever may lie in his power to help forward their various enterprises.

The crowded shelves on the walls of the Director's room afford some evidence of the nature of the work, as any visitor to his office can see, for every folio bears in large letters on its back the name of some dependency of the Crown or of a subdivision of India, or of a Dominion. In fact, a stranger might well think that he had inadvertently entered the office of the President of the Royal Geographical Society or the room of the Secretary of State for the Colonies in mistake for the Director's Office at Kew.

The average daily post bag also reflects very clearly the Imperial nature of the work of Kew. Letters and parcels come from every part of the world, and may relate to such varied subjects as the possibility of introducing the mulberry tree to British Honduras; the Panama disease of bananas; the suitability of Newfoundland lichens for reindeer food; the precautions that should be taken to prevent undue destruction of the oil palm in West Africa; the identity of the seeds in a mixture of chicken food, a query possibly involving some legal action; or as to the botanical identity of a tropical plant about which all information is withheld by the senders, who we subsequently find are interested in the promotion of a company for its exploitation. In the latter case, I think the enquirers would be a little disturbed did they know how much we had been able to discover about their plant, bearing some camouflaged name, both as to its country of origin, chances of success under cultivation and so on.

There is also the extensive and more purely scientific correspondence to be attended to with botanical establishments on the Continent and in America, Java and the East as well as with our colleagues in our home universities and colleges.

Visitors, too, are sometimes almost as numerous and varied as the letters, for like them they come from every part of the world, and serve as a pleasant reminder that the work of Kew is appreciated throughout the Empire, and their visits to Kew help to strengthen that tie of mutual sympathy and intercourse the value of which we fully realise. That several members of the staff have personal acquaintance with most parts of the world enables Kew to give more useful

advice and criticism than might otherwise be possible.

I hope I may have been able to give you some small idea of what the work of Kew really is, and that though this work is pre-eminently scientific, Kew is, nevertheless, keenly alive to the interests that make countries prosperous and wealthy. In the words of Sir William Thiselton-Dyer—which are, I believe, as true now as when they were written over forty years ago—Kew “has itself grown and flourished under its past and present Chiefs . . . not so much from its dependence upon their merits, but rather because the principles of its administration have been essentially British and practical.

“It has steadily set itself to do every kind of public work which is connected with botanical science.

“It was never launched with a theoretically complete equipment and constitution, but it has slowly earned every advantage that has been conceded to it, and, as its labours have been enlarged, so its capacity for their performance has been increased.”

The following testimony, extracted from a speech by Mr. Joseph Chamberlain in the House of Commons on August 2nd, 1898, will show how much, in the opinion of the most famous of Colonial Secretaries, the Colonies owe to Kew: “I do not think it is too much to say that at the present time there are several of our important Colonies which owe whatever prosperity they possess to the knowledge and experience of, and the assistance given by, the authorities at Kew Gardens. Thousands of letters pass every year between the authorities at Kew and the Colonies, and they are able to place at the services of those Colonies not only the best advice and experience, but seeds and samples of economic plants capable of cultivation in the Colonies.”

I have attempted to show how much of what Kew has become is due to the initiative and foresight of Sir Joseph Banks and Sir William Hooker, and I think if it were desired to place an inscription beneath a monument to either of these great men, relating to their work at Kew, the following verses from the Book of Ecclesiasticus, which refer to “Wisdom,” might very fittingly be selected:—

“I came out as a brook from a river, and as a conduit into a garden.

“I said, I will water my best garden and will water abundantly my garden bed ;

and lo, my brook became a river, and my river became a sea.”

DISCUSSION.

THE CHAIRMAN said that they had listened to an exceedingly interesting and very complete account of a famous Institution. He supposed that Kew and perhaps the waxworks in Marylebone Road were the two best-known places in London, not only to the provincial, but to the foreigner. He had often been surprised, while talking to foreigners in different places, by their knowledge of Kew, which was the one place that they wanted to come to England to see. It was no little privilege to be associated with a Garden such as Kew, and he entertained a certain envy of the lecturer. Dr. Hill had told them something of the history of Kew during the last 150 years. In seeing Kew to-day one was sometimes apt to forget the wonderful services which had been rendered to the Garden in time past by the pioneers, especially the two Hookers, father and son; and there were many other botanists that one might mention whose names came to mind. He remembered Sir Joseph Hooker in one or several of his letters complaining that the young botanists of his day did not know their plants, and the speaker was afraid that this was still true of some of the older botanists. Many botanical students, while having an intimate acquaintance with the insides of plants, had only the slenderest knowledge of their outsides. He himself had been more or less brought up in that sort of school. He was not going to complain of his teachers, because he felt nothing but gratitude towards most of them; but it was the fact that at that time—and he was afraid that the schools were yet not quite free from the reproach—one learned a good deal of the microscopic characters of plants without knowing what the plants themselves looked like. Students could improve their education at Kew in that respect. One thing that always struck him about Kew was that it appealed to every sort of person, not only botanists, but all men who had any aesthetic sense (and most people had some). The botanist himself approached Kew with a sense of awe, while the ordinary non-botanical person who went there, probably walked about as if the place belonged to him. He himself remembered going to the Director's office—long before the time of the present Director—in fear and trembling, though he found when he got into his presence that the Director was a human being, and indeed his experience had always been that the Directors of Kew were essentially human. So long as that state of affairs continued, the fortunes of Kew might safely be left in their hands. A great deal had been heard that evening about the work which Kew had done and was doing—its variety and utility. But he thought that Kew might even do a little more than it was doing, and he hoped that in future it would develop along new lines of activity. There was still room for expansion at Kew on the experimental side, and the best wish one could express for its future was that it might go on developing in the

future with the same rapidity as in the past. They had been told that evening that science never liked to beg. As a matter of fact, he thought that the lecturer had begged very nicely, and he would be very glad—he did not wish to appear as a rival beggar—if an additional endowment could be obtained for that wonderful book, the *Index Kewensis*. That was a work to which every botanist owed a great deal, and to which he turned very frequently for information, and he would like to support the appeal which had been so delicately made that evening by the Director of Kew.

PROFESSOR F. W. OLIVER, F.R.S., said that the Chairman had called upon him to speak probably because he knew that the first half of his life was spent in the Gardens as the son of an official, and that he could speak quite freely. He had always been an admirer of Kew, as well as its critic. His criticisms, however, he reserved for private consumption. Nor was he going to indulge in reminiscences of those early days when he lived in the Gardens, except to say that his recollections of fifty years ago were extraordinarily vivid because Kew to him then was naturally the centre of his world, as well as the centre of the botanical world. In the sixties and seventies of the last century the dominant element in botany was the systematists. They occupied all the principal positions in the botanical world, and with them resided the power of conferring appointments upon others. If at that time a botanical post was desired one naturally made friends with the Hookers or their successors. That state of affairs had gone and could never return on account of the enormous subdivision and development of the branches of botanical science. But in those days the whole botanical world used to come to Kew and reside for a week or a month or more on Kew Green, especially in the Long Vacation. Dozens of the most eminent botanists, British and foreign, were to be seen there. All this left an indelible impression on his mind, the more so because they used to talk quite freely to him, and say what they thought of Kew. They agreed that it was a most wonderful place, and then they held up their hands and said, "But, you know, the whole thing is simply wasted. Not more than one per cent. of the resources and material at Kew is utilised in any way whatever in the advancement of knowledge." What they meant was that all the plants that could be grown in the world were being grown at Kew, but that was all; the harvest was rich, but the reapers were few. The other point he remembered was this, that he and others would utilise Kew in an illegitimate way—bird-nesting, for example. Kew had an extraordinary range of birds and bird-nests, and he learned most of his ornithology in Kew Gardens. Occasionally he would use a gun for shooting game birds, sometimes even out of season! But one felt that Kew at that time sadly lacked the element of youth. This systematic aspect of botany got a little bit upon one's nerves. One of the most happy episodes in the development of Kew was the foundation of the

Jodrell Laboratory, to which Dr. Hill alluded, and particularly the association with it of Dr. Scott. When the history of botany at the end of last century and the beginning of the present century came to be written the work done in the Jodrell Laboratory connected with Dr. Scott would receive full justice. His was a most extraordinary output from one man, and the number of young people he interested in the subject of botany as a whole was quite remarkable. Almost every botanist for the last forty years had passed under the influence of Dr. Scott, and lasting and extraordinary benefits had resulted to all of them. The speaker's last point was to suggest that something in the nature of an *entente* might come about between Kew Gardens and, if not a university, a sort of department of botany or botanical institute, which would have the privilege of using Kew and advancing the knowledge of the subject. He was not implying any blame to anybody, but it was perfectly impossible for the officials of a Garden to succeed in the double duty of administration and of advancing to the full the knowledge of the subject. At one time he was almost thinking of getting up a syndicate to carry out this idea—in other words, to acquire Gloucester House close by and convert it under a syndicate into a botanical institute; but that never came to anything, and the building was taken over as a college for the training of miners and other working-men who became leaders of labour. Any such development might not come within the next twenty or thirty years, but he felt sure that at some time or other an educational side would develop in connection with Kew, in the most friendly relations with the Gardens, and yet not under their authority. Kew was a Government institution, and it was out of the question to have an educational body under the orders of a Government office, although too often one found that such was the relationship. The name of Sir Joseph Banks had been mentioned that evening. Banks was not merely a botanist, he moved in the great world and knew everybody. Those who had read the *Farington Diaries*, lately published in the *Morning Post*, would have noted with pleasure the frequent appearance of Sir Joseph Banks, not only in social engagements, but on his travels, in his illnesses, and at his eatings and wine-drinkings. The *Diaries* showed that Banks was very human, in which respect he resembled the Directors of later times. Those must have been great days, when men were still in touch with the tradition of Linnaeus, who made the subject of botany more popular, he supposed, than it had ever been before, and certainly than it had ever been since. Linnaeus made certain aspects of botany at once accessible to common men. There was no more fashionable pursuit 160 years ago than the study of botany. Whether those days would ever come back again or not it was impossible to say; probably they would not.

DR. J. A. VOELCKER said that he could not claim, like the last speaker, to have spent his early days

at Kew. He had to speak rather from the point of view of the ordinary visitor, and as such he would like to be the medium of expressing the great indebtedness of the public to those who directed such a place as Kew. He did not know what others thought, but he had often remarked, on his periodical visits, that he always came away feeling that he had got something for the payment of his imperial taxes! Whether people simply walked round and enjoyed the sight of the plants and the museums and ended up with tea at the Pagoda, or whether they went with more serious intentions, they must always feel, he thought, that they had got something for being citizens of the Empire. But for those who knew the subject more closely there was a much wider sphere of interest at Kew, and it was very instructive to have heard from the Director himself an account of the history and of the present activities embraced under the name of Kew. If he might be allowed as a layman to speak from his own experience, he would like to acknowledge the courtesy and the readiness to help which resulted from addressing inquiries to Kew. In his own agricultural work he had had from time to time to refer questions to Kew, and it was almost unnecessary for him to say that the officials there were willing to go to endless trouble in satisfying the requests of those who applied to them. The British public did not fully know of this; they did not realise that institutions such as Kew were there for the purpose of affording information to inquirers, and the number of questions which the obliging officials there were able to answer was remarkable. We needed to be reminded that Kew was a national possession. It was one of the places to which we had a right to go, and if the public did not use the stores of information available, the fault was that of the public and not of Kew. At all events, he could say for the Directors of Kew Gardens, and now for the present Director, that they were always willing and ready to afford information to those who inquired. He could bear out from his own experience what Dr. Hill had said with regard to the influence of Kew in other parts of the Empire. It had been his lot to travel about in India, and wherever he went he found a number of people in constant touch with Kew. The Gardens at Calcutta, Saharanpur, and elsewhere were in regular correspondence with Kew. The same thing obtained in the West Indies and elsewhere. All this formed part of a vast system for the gathering together of information which was for the benefit of science, and which also served commercial interests. There were a large number of cases in which the accumulated knowledge of Kew, from purely scientific sources, had been devoted to the expansion of commercial interests. Science was not valued purely for its own sake, but for the extent also to which it could be used in the general service. He had been interested to hear of the different changes that Kew had gone through in its time, how the original plan was conceived and carried out, and how it then underwent a period of decadence, when another institution, the British Museum, came

up and secured the early records of Kew. He did not know that that was altogether a bad move; it was not always a mistake to have two institutions, one keeping the other up to the mark. At all events, the old plan had been reverted to, and the system of having collectors and correspondents all over the world had been retained, and all who had listened to the lecture that evening would wish good success to that work.

MR. E. SHINE said that in the Ministry of Agriculture he had the pleasure of working with the Director of Kew. The Director had rather slurred over, in his paper, the connection with the Ministry of Agriculture, and he for his part only wished that the Ministry of Agriculture had the same interesting dealings with Kew that, he understood, the Foreign Office, the Colonial Office, and other departments of Government had. The Ministry of Agriculture's concern at Kew often related to such dull questions as to whether perambulators should be permitted to go into the Gardens, and whether the entrance fee should be a penny, twopence, or nothing at all. The Ministry of Agriculture was very glad to be connected with a department like Kew Gardens, which, he thought, was always in favour with the general public. At the Ministry they were so accustomed to people finding fault with them on such questions as rabies, foot and mouth disease, and so on, that it was quite pleasant to hear everybody exclaim that everything in the garden was lovely! So far as the officials at the Ministry were concerned, their relations with the Director and officials were always most harmonious, and they welcomed at the Ministry the privilege of being associated with them.

THE SECRETARY said that there was one small point to which he would like to draw attention. The Director of Kew had referred at the beginning of his paper to the introduction of the bread-fruit tree to the West Indies. The speaker merely wished to point out, as a sort of foot-note to the paper, that the whole question of the conveyance of that bread-fruit tree to the West Indies was due to the work of the Society. Sir Henry Trueman Wood, in his History of the Society, related how Sir Joseph Banks, who was a member, took a great interest in this question, and it was on his suggestion that a prize was offered with this particular object. As a result of that prize, Captain Bligh undertook his expedition on the "Bounty." He failed the first time, but on his second expedition, in 1793, he succeeded. On his return he sent in a full report of the whole affair to the Society, and as a result of that he was awarded the Gold Medal.

THE CHAIRMAN felt sure that the audience would wish to express its hearty thanks to the Director of Kew. He could only say for himself that although he had been more or less familiar with Kew for some time, he had been somewhat ignorant of its past history, and had not realised the full extent of its activities until that evening. It would be

a great advantage to many to have this paper in a form in which it could be readily referred to, and he was very glad that it was going to be printed in the *Journal*. It would be a most valuable paper for reference.

A vote of thanks was passed unanimously.

DR. HILL briefly acknowledged the compliment, and the meeting terminated.

NOTES ON BOOKS.

LIFE OF SIR WILLIAM WHITE, K.C.B., F.R.S., LL.D., D.Sc. By Frederick Manning, with an introduction by The Rt. Hon. Lord George Hamilton, G.C.S.I., LL.D., D.C.L. London: John Murray. 1923.

Sir William White died in 1913 at the age of 68, so that it is time for his life to be written, if it is to be read by any of his contemporaries. Not very many of them can still survive, and the list is rapidly diminishing. One of them, Lord George Hamilton, fortunately is still alive and contributes, as an introduction to this volume, a warm and generous appreciation of Sir William's character and public service. Lord George and Sir William White were born in the same year. One was First Lord of the Admiralty when the other was appointed Director of Naval construction, and the mutual liking and admiration conceived by each for the other continued till Sir William's death.

Sir William White's life just synchronised with the era of change brought about by the introduction of steam as a motive power, and the substitution of iron for wood in the construction of war-ships. The first work on which he was employed as a dockyard apprentice was the conversion of a sailing ship into a screw-propelled steamer. When he resigned his post at the Admiralty, British war-ships had become the huge swift engines of destruction which saved the country from invasion in the great war which began a year after his death.

From the time of Elizabeth till the day of Trafalgar, there had been no great change in our ships, and in the half-century which followed Trafalgar the improvement had been but small. Now, a single modern line-of-battleship (given, of course, a sufficient supply of ammunition) could send to the bottom, herself uninjured, the great Armada and the English ships which drove it to destruction, or the combined fleets which fought at Trafalgar.

It is not, of course, suggested that these great changes were in any sense due to Sir William White. Things would have taken the same course had he never lived, and even when they were modified by individual direction, he was only one of many whose influence affected the direction of change and its character; but he took his full share of the work. To call him "the greatest naval architect this world has ever seen," is to make rather a strong statement, but certainly

among his contemporaries he had few, if any, equals, and certainly no superior.

He started in life as a dockyard apprentice, after a discussion, it would appear, between some of his friends as to whether he should not be trained for the Baptist Ministry. Fortunately, alike for the boy and for the public service, the wiser counsel prevailed and he entered the Royal dockyard at Devonport in 1859. Not very long after his apprenticeship (in 1869), the School of Naval Architecture was founded at South Kensington and White was one of the candidates selected from the various dockyards. He passed at the head of the list in the competitive examination and remained at the school till he entered the construction department of the Admiralty in 1870. In the same year the School was merged in the Royal Naval College at Greenwich, and White, who had become Instructor of Naval Architecture at the school, became one of the Lecturers at the College.

At the Admiralty he remained till 1883 holding various appointments, the highest being that of Chief Constructor. In that year he received an offer from Sir William Armstrong which led to his employment by the great Elswick firm. With them he remained till 1885, when, on the resignation of Sir Nathaniel Barnaby, he was recalled to the Admiralty as Director of Naval Construction. White's acceptance of this post was a distinctly patriotic act, for in spite of its high distinction, its emoluments were less than he was receiving, and would have received at Elswick. If he had remained at Armstrongs he would certainly have died a much richer, and probably a happier man. The service of a great commercial firm is free from many of the drawbacks of service under superiors whose actions and decisions must of necessity be influenced very largely by political considerations; and besides discharging the duties of a difficult post, he had to meet the parliamentary criticism of a former holder of the same office, neither an easy nor an agreeable task.

The policy of the Admiralty, and the work of its construction department were the subject of vigorous, even violent, controversy, alike Parliamentary and professional. The Director of Naval construction was not only permitted, but expected to take his part in it. This White did with much effect, both at the professional associations, such as the Institutions of Naval Architects and of Civil Engineers, and before more popular audiences in his lectures and addresses at the Society of Arts, and the British Association.

He held his office till 1902, when he resigned. His resignation, partly due to failing health, was precipitated by a blunder made in the construction of a Royal Yacht, for which he was nominally though not actually, responsible. The work which he carried out during his 17 years' tenure of office is described in full detail by Mr. Manning, and the record is a long and honourable one.

When he left the Admiralty he was disposed to retire entirely from further work, but the advice and solicitations of several warm friends induced him as his health recovered, to resume. He became