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Work and Influence of the Royal Botanic Gardens, Kew.

COAL, oil, iron and steel enter so largely into the working of the complicated civilisation of the present that it is apt to be overlooked that they are but the tools for collecting, distributing, elaborating, protecting and too often destroying the organic products on which the life of man, his culture and most of his comforts depend. Directly or indirectly, these products are the gift of the living green mantle of the earth. The spread of population that has taken place concurrently with the evolution of modern industry has brought about great, and is likely to bring about still greater, changes in the earth's vegetation. Some of those transformations, such as the displacement of the native flora of prairie lands by cereals and other crops, are inevitable and, from the human point of view, beneficial; others, like the reckless destruction of forests in many parts of the world, have wasted the present and heavily mortgaged the future. The sooner the problem of ensuring a rational utilisation of the vegetation of the earth is faced in more organised fashion than at present the better.

It is of peculiar importance to the British Empire, for no other power holds such vast estates, with every variety of physiographical and other conditions, and almost boundless potentialities of production. These potentialities can be developed to the best advantage only on a foundation of exact knowledge of all the conditions, and one of the most important elements of this foundation is a thorough scientific survey of the vegetation of the Empire. Although the desire for increase of knowledge of plants was stimulated by the travels and voyages of discoveries from the fifteenth century onwards, and their resulting introductions of new plants and products into Europe, a scientific survey was impossible until a rational system of nomenclature was devised by Linnæus, about the middle of the eighteenth century. Thereafter the botanical survey of the Empire began and has been in progress ever since.

In British colonies and tropical possessions the benefits expected from the introduction of foreign, and the improvement of native, plants, and the need of centres where such plants could be experimentally cultivated, led to the foundation of botanic gardens in the West Indies, India, Australia, the Straits Settlements and Ceylon. These and other overseas gardens have played a very useful part in the botanical survey of the Empire, but it may be doubted if the practical importance of these institutions is appreciated as it should be, for in too many cases their history is one of cramped finances, under-staffing and scanty equipment.

Still, in founding them at all the governments concerned showed more enlightenment than was evident in the home government for many a year afterwards, for while this activity was being shown abroad the home government remained indifferent. Fortunately, this official neglect was counterbalanced by the interest in botany shared by Royal personages and men of position and wealth, and it is to such interest that the British Empire owes the foundation of the Botanic Garden that more than all the others has contributed to our knowledge of the Empire's vegetation.

The small Physic Garden, which Princess Augusta, with the advice of the Earl of Bute, formed at Kew in 1760, was greatly enlarged after her death in 1772 by her son, George III., and Joseph Banks—not long returned from his famous voyage with Cook—placed in advisory charge. For almost half a century thereafter, the king royally supported Banks in his schemes for the enrichment of the Royal Botanic Garden—as it had now become—and the botanical exploration of the lands beyond Europe. In addition to the support of the king, the interest, wealth, and influence in scientific circles of Sir Joseph Banks, the impersonal advantages of its geographical position contributed to the early pre-eminence of Kew. In tropical gardens the difficulties in controlling temperature restrict the introduction of plants to those of similar climates, while in the investigation of the vegetation of the territories they serve, most of them were and are embarrassed by a wealth of material far beyond their means to work out unaided. Here Kew was—and is—of signal service, for it could introduce plants from and to all parts, while the comparative poverty of the British flora left the Garden all the more free to extend its interests and help beyond the British Isles.

Natural advantages, however, avail not without personality and means, as Kew discovered with the passing of the king and Sir Joseph Banks in 1820. For the next twenty years the Royal Gardens declined almost to extinction, from which they were rescued only by the interest of the young Queen Victoria and an agitation against their proposed abandonment that led to a committee being appointed to advise on the future of the Gardens. The committee—which included Lindley and Paxton—commented rather severely on the lack of unity of purpose and of system in the control of the overseas gardens and advocated the placing of them all under the control of a central National Botanic Garden as the best means of co-ordinating the investigation of the vegetation of the Empire and of applying such investigation to medicine, commerce, agriculture, horticulture and industry. Although the wisdom or even the feasibility of placing all the gardens of the outer lands under the official control of

a central garden may be doubted, there can be no question of the advantages of co-operation and co-ordination, and there is still a vast field for cultivating both.

Although the Report of the Committee did not result in the establishment of an Imperial Botanical Survey, it brought about the transformation of Kew from a private Royal Garden into a public one, and the appointment of the elder Hooker as its first director. Since then Kew has, thanks in no small degree to the personality of its directors, proved a most valuable asset to the British Empire. On the purely scientific side, and considering only the Empire lands, Kew can point to the published floras of Australia, New Zealand, Hongkong, the Malayan Peninsula, Ceylon, India and most of its Provinces, Mauritius, the Cape, tropical Africa and the West Indies as amongst the fine fruits of its botanical leadership. On the applied side its influence on horticulture and on the introduction and cultivation of economic plants has been far-reaching and profound. Of the latter the vast growth of the rubber industry is a notable instance. It may be doubted, however, if the great practical importance to the Empire of the scientific activities of Kew and the scope for extending these are sufficiently appreciated.

Possibly one reason for this is the unobtrusive way in which the work has been carried on and the reticence practised in publishing information as to the Gardens' activities. It is, therefore, a move in the right direction that the old practice—obsolete for so many years—of publishing a review of the year's work, has been recommenced. This review, which appears under the guise of Appendix II., 1925, of the *Bulletin of Miscellaneous Information*, gives within 31 pages a concentrated account of the work of the Gardens during 1924. Almost every page mirrors the world-wide range of Kew, for whether it be the Gardens proper, the Museums, the Jodrell Laboratory or the Herbarium and Library, there is scarcely a land between the poles that does not give or take.

The offerings, in fact, have been for so many years in excess of the means of dealing with them that Kew has suffered from chronic indigestion. While it is good to learn that some relief has been given to this condition by a temporary addition to the Herbarium staff, it is as well to recognise that this is merely palliative. Proper treatment of the condition involves a strengthening of the whole organisation for botanical survey work—in the widest sense—throughout the Empire. The wider aspect of the problem which forced itself upon the attention of the Committee of 1838, was again examined by the Imperial Botanical Conference of 1924, whereat many excellent suggestions were advanced.

The extent to which these suggestions are likely to bear fruit will depend largely on the realisation by the home and overseas governments of the great practical importance of the Survey and on the recognition by those who have made and are making fortunes in jute, tea, cotton and other textiles, soap and such-like products, of what they owe to botanical investigations. As Dr. Burt Davy pointed out at the Conference, the home government has good reason to give generous aid to the Survey, as England depends so much on the overseas parts of the Empire for raw products and foodstuffs. Yet the total annual expenditure on Kew is little more than equal to the interest on the proposed government guarantee for the British Empire Exhibition. If England can find such a guarantee for an Exhibition so largely concerned with the organic products of the Empire, it should surely be possible to allow a more liberal endowment than is at present available for the investigation of the ultimate source of all such products. The support of the Survey should appeal no less to the overseas governments as a fruitful aid in the development of their vegetative resources and so of their populations and products. Yet at Kew, the botanical centre of the Empire, only India and the combined West African colonies are represented on the scientific staff by a single botanist each.

The fact that most of the botanical gardens of the Empire are government institutions is not an unmixed advantage, for government financial departments are apt to judge them rather too much by the irrelevant test of direct revenue and to treat them as mere luxuries to be reduced when opportunity offers, while the public scarcely thinks of them as requiring financial aid like universities, medical schools and hospitals. Governments may reasonably be expected to provide for an increase in staff and equipment and the institution—where it is not already in existence—of some system of study leave, such as the Indian scientific services enjoy, to enable members of the scientific and horticultural staffs to enlarge their experience and increase their usefulness.

But beyond such provision as any government within the Empire is likely to give, there remains abundant scope for private aid in the endowment of travelling fellowships, of exploration of the less known parts of the Empire, of lectureships on various aspects of the vegetation of the Empire, of libraries, of museums, of laboratories and of publications. For the exercise of such public-spirited liberality the Royal Botanic Gardens, Kew, which owe their enlarged foundation to the enlightened munificence of an English king, stand as a splendid stimulus and example.

### Egyptian Mathematics.

*The Rhind Mathematical Papyrus: British Museum 10057 and 10058.* Introduction, Transcription, Translation, and Commentary by Prof. T. Eric Peet. Pp. iv+136+24 plates. (Liverpool: University Press of Liverpool, Ltd.; London: Hodder and Stoughton, Ltd., 1923.) 63s. net.

#### I.

PROF. PEET'S beautiful book is written for the Egyptologist and the mathematician, but not only for them. It is also for the man in the street—in such a street as runs through any university town; for the Rhind papyrus is one of the ancient monuments of learning. The famous scroll was bought in Luxor in 1858 by a Scottish lawyer and antiquary, from whose keeping it passed into that of the British Museum. There, in 1867, Lenormant examined it and referred it to the XIIth dynasty; Birch, and Brugsch the lexicographer, again examined and in part described it; and Eisenlohr (a colleague of Moritz Cantor's in Heidelberg) published a full and useful description,<sup>1</sup> based on facsimiles lent by the Museum—"a courtesy which he repaid by publishing a tracing of them without authority." The Museum issued an almost perfect facsimile in 1898, with an introduction by Sir E. A. W. Budge (cf. NATURE, vol. 59, p. 73); and at various times the papyrus has been studied by many scholars, by Hultsch, Cantor, and Lepsius, Griffiths and Rodet, Favaro, Gino Loria and others. Prof. Peet is a born Egyptologist; he has made himself a mathematician; he has "combined his information." His labours crown the exhaustive investigation of the papyrus, and he gives us its whole story in the most attractive and most readable form; he might have given us, perhaps, a fuller bibliography.

As it lies in the British Museum the papyrus is in two parts with a gap between; some one (Prof. Peet does not tell us who) had the good fortune and the insight to discover that the gap was in part filled up by certain fragments in the possession of the New York Historical Society, once the property of Edwin Smith, and probably obtained by him together with a famous medical papyrus which bears his name. These New York fragments help to complete a table of fractions of which we shall speak directly, a table which is of cardinal importance for the understanding of the whole work.

The Rhind papyrus was written under a certain Hyksos king who reigned somewhere between 1788 and 1580 B.C., but the scribe states that he copied an

<sup>1</sup> "Ein mathematische Handbuch der alten Ägypten," 1877.