fields, however, are in a sense quite different, and it is perhaps, therefore, not fair to compare them. It is a matter of very great satisfaction to be able to extend sincere congratulations to NATURE on the completion of its fiftieth year of extraordinarily useful service."

November 8. SOCIETÀ REALE DI NAPOLI: Accademia delle Scienze Fisiche e Matematiche: *Secretary, Senator G. De Lorenzo.*—"Although it is somewhat late, I am glad to express, on behalf of the academy, my sincere congratulations on the important scientific work which your esteemed journal has accomplished during its fifty years of existence, and trust it may have a prosperous future before it."

THE BRITISH ASSOCIATION AT BOURNEMOUTH.

SECTION K.

BOTANY.

OPENING ADDRESS (ABRIDGED) BY SIR DANIEL MORRIS, K.C.M.G., M.A., D.Sc., D.C.L., LL.D., F.L.S., PRESIDENT OF THE SECTION.

IT has been made abundantly clear that in botany, as in other applied sciences, we must rely in future less on chance individual effort and initiative. We must co-operate our efforts and organise them at every stage, bearing in mind that we shall always require the services of the worker in pure science to solve those larger problems of national importance which confront us. We must be armed by science, or we shall be placed at a disadvantage in the great struggle now before us. We are told that it is absolutely necessary for the prosperity and safety of the country that the development of the resources of the Empire and the production of our industries must be on a scale greatly in excess of anything we have hitherto achieved. As an Imperial people it is our duty to develop our resources to the fullest extent. Fortunately, a great change is taking place in the attitude of the Government and the State towards science, and it is noticeable also in the relations of science to industry and commerce. Since we last met we have lost a number of devoted workers in botany. Apart from those who have passed away in what may be called the course of nature, a sad aspect of the losses sustained in the war is the death of so many brave young men for whom it was anticipated that a bright and successful career was open in the domain of science. Their names are inscribed on the Roll of Honour, and we gratefully bear them in memory.

From the point of view of the scientific exploration of the resources of the Empire, it is satisfactory to note that the publications dealing with the floras of tropical and sub-tropical countries have been continued. These, involving, as they do, so much labour and forethought, are of more than passing interest from the fact that they serve to reveal the distribution of plants that may eventually prove of great economic value. A close investigation of tropical plants is necessary, as allied species or varieties of one and the same species sometimes differ appreciably as regards their economic value.

A new branch of botany has lately come into prominence as one of the results of the devotion to Nature-study and the contemplation of the characteristic features of vegetation as we find it distributed over the earth's surface. Ecology is capable of enormously extending the outlook of botany, and it has so largely added to the interest of field work that we may wonder that the phenomenon of vegetation so long displayed before our eyes had not suggested its sociological aspects long ago. Ecology has its society and journal, and bids fair to establish itself fully in the household of botany. It is hoped that it will mitigate some of the admitted drawbacks of purely laboratory work and revive the old natural history spirit of former days.

The remarkable spread of a comparatively new marsh grass (*Spartina Townsendii*) along certain portions of the southern coast deserves careful study. It is supposed to be a hybrid between *S. stricta* and *S. alternifolia*. It is claimed to be pre-eminent among halophytes on account of the extraordinary vigour with which it spreads over mud-flats, and eventually forms meadows to be measured by thousands of acres in Southampton Water and Poole Harbour. It is a question whether it may not develop into a serious menace to navigable waters. On the other hand, it may prove capable of being utilised in suitable localities as a reclaiming agent. Its economic value in providing material for paper-making or as food for cattle may also receive attention.

The critical study of British plants was supposed to be an exhausted field, but with the necessary insight and careful and critical observation there is much work still to be done. Exchange clubs are active, and additions to local floras are continually being made. New species, varieties, and hybrids are published from time to time. As an instance, *Potamogeton upsaliensis*, hitherto only known in Sweden, has recently been found in East Dorset. Hybrid orchids are being keenly studied, and the occurrence of hybrids in this and other classes of plants opens a wide and interesting field of investigation.

A much desired piece of work is a continuance of Starkie Gardner's interesting investigation of the fossil flora of the Bagshot beds so well shown in the Bournemouth and adjoining cliffs. Some of these have proved exceptionally rich in remains of tropical and sub-tropical plants. So far, in regard to these plant remains, we may say with La Place: "What we know is but little; what we do not know is immense."

My distinguished predecessor, whose work has been largely concerned with the systematic and philosophical side of botany, rightly expressed the general desire for a more cordial understanding between botany and its economic applications. "It is certain," he said, "that our outlook must be widely different after the war, and the changed environment must find us ready to respond in the interest of our country and mankind."

With your permission, and acting on a suggestion made to me, I propose to travel a little outside the usual scope of previous addresses and review the many efforts that have been, and are still being, made to promote the interests not only of the homeland, but also of the Empire as a whole. Before the war it was estimated there were about 3,000,000 square miles of British territory within the tropical zone. A portion of this area, including India, was already producing commodities of the estimated value of 230,000,000*l.* sterling. It is, therefore, in the national interest to keep closely in touch with the conditions and prospects of our tropical Possessions in order that we may render them still more capable of supplying the raw material so necessary to the maintenance of our commercial prosperity.

In recent times one of the most important steps taken in this connection was the establishment, on the recommendation of a Royal Commission appointed by Mr. Joseph Chamberlain, of an Imperial Department of Agriculture in the West Indies. The provision for the upkeep of the Department, approved by Parliament, was at the rate of 17,400*l.* per annum.

When fully organised the Department made grants for teaching science at colleges and secondary schools, and for the maintenance of agricultural schools, botanic gardens, and experiment stations. Special attention was devoted to research work in raising new varieties of sugar-canes and other plants, to the investigation of diseases affecting crops, and to the general amelioration of the conditions under which they were grown. At the end of ten years of strenuous effort it was noticeable that, owing to the expansion and improvement of old industries and the introduction of new, the general conditions in the West Indies were greatly improved. This may be illustrated by the fact that the public revenue of the Colonies had increased from 2,546,724*l.* in 1894 to 3,914,434*l.* in 1911, while the total trade during the same period had increased from 16,270,474*l.* to 26,949,086*l.* There was thus an increase of 65 per cent. in the total revenue and of 60·5 per cent. in the total trade. In reviewing the situation in the West Indies, as the result of the activities of the Imperial Department of Agriculture and those associated with it, the late Prime Minister said: "The work of the Department was universally and gratefully acknowledged by the planters to be largely responsible for the improved state of affairs in all branches of agriculture, and he believed—and he spoke with some experience—it would be difficult to find a case in which any analogous experiment made by the Home Government had attained such speedy and satisfactory results."

A gratifying proof of the appreciation of the work of the Imperial Department of Agriculture in the West Indies was the formation of several Departments on similar lines, first at Pusa in India in 1902, and afterwards in all the tropical Colonies in the New and Old World. Further, twenty competent officers trained in the West Indies are now in charge of the Departments of Agriculture in Ceylon, Mauritius, the Federated Malay States, and Fiji, and on the staffs of the Imperial Department of Agriculture in India and the several Colonies in East and West Africa. Another interesting feature of West Indian progress was the wider appreciation of improved methods of cultivation and of the value of science by members of the planting community. For instance, in 1898 the aggregate amount voted by the local legislatures for staffs, laboratories, and botanic and experiment stations was at the rate of 14,000*l.* per annum. Apart from the funds of the Imperial Department of Agriculture, it is probable that, directly or indirectly, the total amount contributed locally for scientific services is now not less than 60,000*l.* per annum.

There can be no doubt that not only in the West Indies, but also in all parts of the Empire, "enlightenment as to the objects, methods, and conditions of scientific research is proceeding at a rapid rate." Perhaps the most interesting feature of the progress made is in connection with the application of the laws of heredity to the improvement of such highly important crops as sugar, wheat, and cotton. The problems associated with these involve both scientific and economic considerations. As regards the scientific side, it is fortunate that with the beginning of the twentieth century came the rediscovery of Mendel's facts and the stimulating energy of the genetic school which has brought us an entirely new point of view in regard to the increased production of field crops.

Great importance is attached to the improvement of the sugar-cane, as the prosperity of many of our Possessions depends upon it. Further, the requirements of this country approach something like 2,000,000 tons per annum. The sugar-cane, although its origin is unknown, has been cultivated in tropical and sub-tropical countries from remote ages. Up to a recent date its propagation was purely vegetative, as it was supposed to have lost the power of producing mature seed.

Sugar-cane seedlings were observed at Barbados in 1858, but it was only in 1888 that Bovell and Harrison were in a position to utilise the discovery and obtain thousands of self-sown seedlings for experimental purposes. Similar seedlings were also available in Java about the same time. As about this period the standard canes in sugar-growing countries were showing signs of being severely attacked by disease, the discovery of seedlings was a fortunate circumstance. In fact, in some cases it may be regarded as having probably saved the industry. In British Guiana it is reported that in the crop of 1918 seedling canes occupied 83 per cent. of the total areas under canes. Similar results have been obtained at Barbados, where Bovell has continued since 1888 in raising canes of great merit.

In India there is probably a larger area under sugar-cane than in any other country. Its production of sugar is more than 2,000,000 tons. The larger proportion of this consists of a low-grade quality known as jaggery or "gur." Palm-sugar is also produced to the extent of 500,000 tons. Speaking generally, the sugar industry in India is not in a satisfactory condition. In spite of the enormous area under cultivation, India is obliged to increase its considerable imports of sugar from Java and other countries. To obviate this, urgent steps are being taken to improve the character of the canes and establish varieties adapted to local conditions and the circumstances of the sugar-growers.

In the considerable literature of sugar-cane breeding in India Barber has brought together a vast amount of information of singular interest and value. In the few years that have elapsed since he has been in charge of the Coimbatore Research Station he has laid the foundation of lines of inquiry that cannot fail to prove of great value in the permanent improvement of the sugar industry in India.

In his presidential address in 1898 Sir William Crookes stated that the prime factor in wheat production was a sufficient supply of nitrogen. As the supply was then showing signs of exhaustion, he warned wheat-growers of the peril awaiting them. Sir R. H. Rew has now shown that, thanks to the chemist, who came to the rescue, there is practically no limit to the resources of nitrogen. During recent years Biffen, by his successful investigations on Mendelian lines at the Plant-Breeding Institute at Cambridge, has shown that the characteristics distinguishing the numerous wheats can be traced, and the building up of a fresh combination of these characters was possible on practical lines. As the losses caused by disease were so serious, sometimes running to millions of quarters annually, Biffen devoted special attention to the possibility of breeding rust-resisting varieties. He found that the power of resisting the attacks of yellow rust, for instance, was an inheritable character. By crossing Gurka, a Russian disease-resisting wheat, with Square Head's Master, one of the most widely cultivated wheats in this country, Biffen eventually produced Little Joss, which, after trials extending over a period of several years, is said to yield four bushels per acre more than any other variety. Further, it possesses distinct disease-resisting qualities.

Another of Biffen's new wheats is Yeoman. This was raised in order to produce what are known as strong wheats. These are in great demand in this country, as they produce a flour which is much superior for baking purposes to the flour of English wheat. In pre-war days Canadian strong wheats commanded in the market 5*s.* more per quarter than

the best English wheat. Yeoman not only possesses the superior quality of Canadian wheat, but combines with it the high-yielding character of certain English wheats.

A well-authenticated report, supplemented with full details, of the value of Yeoman as a field crop was lately published (*Journ. Bd. Agric.*, vol. xxv., 1161). It was cultivated under normal conditions, but without artificial manure, on three fields on a large farm near Wye, Kent. The cropped area was a little more than twenty-seven acres. The total yield was 2072 bushels, or an average of about seventy-seven bushels per acre. One field, previously under beet, comprising three acres two rods and eight poles, yielded 340 bushels, or an average of eighty-six bushels per acre. These results may be compared with thirty-two bushels, the average yield of wheat in this country.

A most desirable improvement in wheat-growing in this country is to obtain a spring wheat combining early maturity with a yield approaching that of winter wheat. The establishment of a National Institute of Agricultural Botany for the further development of plant-breeding and the distribution of pure seed may be regarded as essential to the welfare and safety of the nation.

Wheat-growing is a very important industry in India. It was estimated in 1906–7 that 29,000,000 acres were under cultivation in wheat with a yield of nearly 9,000,000 tons. Of this 90 per cent. was consumed in India. A botanical survey of the Indian wheats was undertaken by the economic botanists at the Imperial Research Institute at Pusa in 1910. In the following years, by the application of modern methods of selection and hybridisation, high-grain qualities were successfully combined with high-yielding power, rust resistance, and stiff straw, so that wheats were produced which gave upwards of forty-one bushels per acre.

Among the best of the new varieties are Pusa 4 and Pusa 12. Owing to an organised system of distribution of seed, it is estimated that the area under Pusa 12 during the last wheat season (1918–19) was about 400,000 acres. The area under Pusa 4 was about 100,000 acres.

The important work carried on at Pusa by Howard and his accomplished wife has followed closely on the methods found so successful at Cambridge. It is interesting to note that in obtaining new kinds by hybridisation between Indian wheats and rust-resisting forms in Northern Europe a difficulty in regard to flowering at different periods was overcome by sending the Indian parents to Cambridge for spring sowing and by carrying out the actual crossing with Biffen's new hybrids in England. From the crosses thus obtained Howard reports that a wide range of wheats has been evolved likely to prove superior to Pusa 4 and Pusa 12.

The admirable work done by Biffen at Cambridge and the Howards in India clearly demonstrates the value of thorough acquaintance with pure botany as a qualification for grappling with questions of economic importance.

In reviewing the gain to Indian wheat-growers the director of the Agricultural Research Institute has recently stated that, in view of the favour with which the new wheats have been received and the cordial co-operation of provincial organisations, "it is a modest estimate to assume that in the course of a very few years the area under Pusa wheats will reach 5,000,000 acres. This means an increase in the near future in the value of the agricultural produce of India, in one crop only, of 75 lakhs of rupees or 5,000,000*l.* sterling." Another crop that has received attention is indigo. In regard to this a new method of growing the seed has been worked out, and the cause of the destructive wilt disease has been traced to the destruction of the fine roots and nodules during the monsoon rains. The remedy in this case is the selection of surface-rooted plants which are now in course of being generally grown.

As in wheat, so in cotton, this country is almost entirely dependent on foreign supplies. The uneasiness caused by the excessive dependence of the great Lancashire cotton industry, with exports of the annual value of more than 100,000,000*l.* sterling, on supplies from abroad, and the occasional shortage, have led to general action being taken to encourage the more extensive growth of cotton within the Empire. Next to the United States, which in some years has supplied seven-tenths of our imports, India comes second, but the East Indian cotton is not well suited to the requirements of the English spinner. Egypt, as the third producing country, supplies cotton of great strength and fineness.

The most valuable of all cottons is that known as Sea Island cotton, owing to its introduction and successful cultivation on the coastal areas in South Carolina, Georgia, and Florida. It is interesting to report that in recent years Sea Island cotton has been introduced back again to the West Indies, which was probably its original home. This was effected by the Imperial Department of Agriculture in the West Indies in 1902, when a pure strain of seed raised from plants immune to wilt disease was obtained in quantity from James Island. This ensured that the industry from the first was placed on a firm basis, and with the hearty co-operation of the planters an important West Indian cotton industry was successfully established. For some years the West Indian cotton has obtained a higher price than the corresponding grades of cotton from the Sea Islands themselves. The fine spinners in Lancashire are now practically independent for their supplies of this cotton from the United States. Further, it is not improbable that, owing to the serious attacks of the Mexican boll weevil on cotton plants in South Carolina and Georgia, the West Indies may become the only source of supply of fine Sea Island cotton. The results so far attained may be realised from the fact that the value of the exports of Sea Island cotton from the West Indies in recent years has reached a total of 2,000,000*l.* sterling. The general conditions in the West Indian islands, owing to their small size and comparative isolation, should enable them to maintain a high purity of cotton. Harland, whose services in the West Indies have been provided by a grant from the Imperial Department of Scientific and Industrial Research, has in hand important investigations with the view of placing the work of cotton selection and breeding on scientific lines. He has shown that the yield of lint per acre depends on a number of factors of a morphological and physiological character. In a general way it may be said that the yield is dependent on the climatic conditions, so an effort is being made to produce varieties which will interact with the environmental conditions to the best advantage. Although Harland's work so far is of a preliminary character, he is able to suggest the conclusion that, following certain lines of selection and breeding, and bearing in mind the relative importance of lint index and lint percentage, it is possible to isolate a strain of Sea Island cotton with a weight of lint per boll 31 per cent. greater than that of the ordinary sorts in cultivation.

As already mentioned, India is the second largest producer of cotton. In 1906–7 it was estimated that there were about 20,000,000 acres under cotton, with a production of nearly 5,000,000 bales. It is unfortunate that the quality of East Indian cotton is

not high, in spite of the considerable efforts made in recent years to improve it.

Leake's research work in the United Provinces, carried on for many years, is regarded as probably the most complete yet attempted with cotton in India. A variety known as K.22 has been widely distributed, and the produce in 1916 sold at 31 rupees per maund when local cotton was 25 rupees. Further, the ginning percentage has been raised from 33 to about 40, while the lint is of superior quality.

Leake has also been successful in raising an early-flowering form of cotton on Mendelian lines. The new form differed from ordinary cotton cultivated in the United Provinces in that it assumed a sympodial instead of a monopodial habit. It not only yielded cotton of high quality, but was found by its early-flowering habit to suit the special conditions of the United Provinces.

As Egyptian cotton comes next to Sea Island cotton in quality, it may be useful to refer to what has been done, or attempted to be done, on scientific lines to safeguard the industry. Its importance may be gathered from the fact that the area under cultivation is between 1,500,000 and 2,000,000 acres. Balls has fully reviewed the scientific and other problems that had to be solved in placing the industry on a satisfactory footing. According to Balls, the high-water mark of Egyptian cotton-growing was from 1895 to 1899. Since that time, although the actual area under cotton has been increased by 600,000 acres, the benefit measured in terms of cotton alone has been small. It is probable that the attacks of the pink boll-worm and other pests may have affected the results, but Balls and his colleagues drew the conclusion that "the falling off in yield was due to a rise in the level of the subsoil water or water-table of the country brought about by the extension of the irrigation system during the past decade." The roots of the cotton plant were thus adversely affected at a critical period of growth. This recalls what Howard discovered: that one of the causes of the wilt disease in indigo in India was the destruction of the fine roots and nodules during heavy monsoon rains.

Probably the most remarkable instance on record of the successful combination of science and enterprise in the tropics is the establishment of a cacao-growing industry in the Colony of the Gold Coast, West Africa. Thirty years ago no cacao of any kind was produced on the coast. Owing, however, to the foresight of the then Governor (Sir William Brandford Griffith), who sought the powerful aid of Kew, cacao-growing was started in a small way among the negro peasantry, with eventually extraordinary results. After selecting the locality for the experiments, seeds and plants were obtained through Kew, and a trained man was placed in charge (*Kew Bull.*, 1891, p. 169; 1895, p. 11). The first exports in 1891 amounted to a value of 4*l.* only. So rapid was the development of the industry that ten years later the exports reached a value of 43,000*l.* By this time both the people and the Government had begun to realise the possibilities of the situation, and systematic steps were taken to organise under scientific control a staff of travelling agricultural instructors to advise and assist the cultivators in dealing with fungoid and insect pests and improving the quality of the produce. In 1911 the exports had increased nearly fourfold and reached a total value of 1,613,000*l.*, while in 1916 what may possibly be regarded as the maximum exports were of the value of 3,847,720*l.*

It should be borne in mind that this Gold Coast cacao industry, now one of the largest in the world, has been called into being and developed entirely by the agency of unskilled negro labour, and on small plots from one to five or ten acres in extent. The controlling factors were, first, the selection of suitable land for cacao-growing; next, the selection and supply of seeds and plants of varieties adapted to local conditions; and, lastly, the advice and assistance of trained Europeans backed by the resources of science.

Coming nearer home, Henry, well known from his association with Elwes in the production of "The Trees of Great Britain and Ireland," by historical research and experiment has established the fact that many fast-growing trees in cultivation, such as the Lucombe Oak, Common Lime, Cricket-bat Willow, Black Italian Poplar, Huntingdon Elm, etc., are natural hybrids. It was of high scientific importance to discover the origin of these valuable trees. Further, by artificial pollination Henry has succeeded in raising new hybrids which display the extraordinary vigour characteristic of the first-generation cross. Perhaps the most notable so far is a new hybrid poplar (*Populus generosa*), which makes the strongest shoots of all poplars. It is claimed in the case of hybrid trees that "it is possible to produce much greater bulk of timber in a given time." The common belief that quickly grown timbers are of inferior quality is said not to hold good in respect of any quality in ash, oak, and walnut. In fact, according to Dawson, "with oak, ash, and walnut the quicker their growth the better their quality in every way. They are more durable, more elastic, and less difficult to work" ("Science and the Nation," p. 138). It is further claimed that by hybridising it may be possible to produce disease-resisting varieties and varieties carrying with them other desirable characteristics.

In the tropics breeding experiments in the case of india-rubber trees are likely to prove of great value. In the meantime, selection of seed from the best trees is being carefully carried out in the hope of increasing the general yield of the plantations. In Java the proportion of alkaloids in the bark of introduced cinchona trees (yielding quinine) has nearly doubled by careful selection on these lines.

Plant-breeding experiments with india-rubber trees have already been attempted, but they are not likely to be of much value if they are confined to empirical and haphazard lines. Work of this kind must be lengthy and complex, but it is absolutely essential to ensure the safety of an industry which is estimated to be of the annual value in the Middle East of about 50,000,000*l.* sterling. The Agricultural Department in Ceylon, which is fully alive to the fundamental importance of the selection and breeding of india-rubber trees, has already taken some action in the matter.

Another investigation in hand is to determine whether the latex-yielding quality of Hevea trees can be associated with any definite botanical characters and to what extent such characters are transmissible. Twenty trees of the same age growing in a four-acre block have been selected for differences in leaf and bark characters. These are all tapped on the same system, and the yield of rubber from each tree is recorded separately for each tapping (*Kew Bulletin*, 1917, p. 118).

The value of these and other experiments of a like nature may be realised when, according to Varnet, quoted by Johnson, the yield of rubber from different trees of Hevea growing under similar conditions in the same plantation may vary as regards volume of latex from 4 to 48, and in percentage of weight of dry rubber from 1·286 to 14·164 (*Journ. d'Agric. Tropicale*, 1907).

Bateson a few years ago expressed the opinion that nowhere is the need for wide views of our problems more evident than in the study of plant diseases. Biffen and others have shown that under certain

conditions the quality inherent in some varieties to resist disease may be utilised to great advantage. The national importance of such work is impressed upon us by the enormous losses sustained every year by rust in wheat, mould in hops, and the widespread disease of potatoes. One of the most striking instances in recent times was the destruction of the valuable coffee plantations in Ceylon. The industry, an exceptionally valuable one, was wiped out in a comparatively few years by the coffee-leaf disease (*Hemileia vastatrix*). In the light of our present knowledge it is not improbable that this disease may have been checked by seed selection or by raising an immune race of plants; or, more probably, as suggested by Armstrong, by regulating the use of essentially nitrogenous manures, which are known in some cases to intensify the attacks of fungoid pests, and substituting the use of phosphates. As illustrating the occurrence of an incidental result arising from a purely scientific investigation, mention may be made of the discovery of a remarkably tall strain of flax at the John Innes Institution. This, if capable of being established on pure lines, may prove of economic value. It is a hopeful sign that the appreciation of the work done at this institution, under the stimulating energy of Bateson, is increasing day by day. We may mention the great success which is attending the establishment of a school of technical education and research by the Royal Horticultural Society at Wisley. This is maintained by liberal funds, and by means of its well-equipped laboratories and extensive trial grounds it offers unique facilities for solving problems of great value as affecting the future of British horticulture. In sympathy with the work at Wisley, private firms are also setting up laboratories of their own and employing men of high standing so that a just balance may be maintained between science and practice. The progress made in the elucidation of problems in tropical plant pathology shows the necessity not only for well-trained and experienced mycologists and entomologists, but also for the correlation and combination of knowledge gained in their several lines of study. It is suggested that research work should be organised on the broadest possible lines, and combine the biological services of the whole Empire. We have a first step in this direction in the Imperial Bureau of Entomology, with its headquarters at the British Museum. Those acquainted with the efficient work done by this bureau and the excellent publications issued by it will very heartily welcome the establishment of the proposed Imperial Bureau of Mycology to carry on work on similar lines.

In this brief review I have endeavoured, however imperfectly, to place on record some of the activities that have taken place in the domain of botany in recent years. It has only been possible to select a few of the most striking incidents where progress has been made. This has been done in the hope of arousing wider interest in work of prime importance as affecting the interests of the home country and the Empire. Botany in its widest aspects affects so largely the welfare of the human race that it is impossible to slacken our efforts. Advance has necessarily been slow, but the creative impulse of science cannot fail to bring in a large harvest of results. This may be possible by encouraging individual efforts, by organising active co-operation, and by associating with us men who are practically grappling with difficulties that seem almost impossible to solve. I have attempted to show in what vast fields of enterprise botanical science has already rendered signal service. As regards the future, if we enlist the best intellects, imbued with the true spirit of progressive research, we shall ensure a continuance of discoveries that have proved so effectual. We must also call to our assistance some of that wonderful energy developed during the war and divert it to the great work before us.

Certainly one of the outstanding features that emerge from a record of botanical research during the last decade or two is the prominent position now occupied by plant-breeding on Mendelian lines. In proof of this we have the numerous well-equipped plant-breeding institutes established and maintained by Government and private funds. Plant-breeding is now in the forefront in relation to the improvement of crops, and the value of it is officially acknowledged as "a vital element in the national policy." According to the Secretary of the Board of Agriculture, what we want "are new races of plants adapted to intensive cultivation," and he adds: "It is my deliberate opinion that an increase in the production of our land is much more easily attainable in that direction than in any other."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—On Tuesday, December 2, in the hall of Trinity College, a lecture open to the University was given by Prof. Eddington on the theory of relativity. Apart from the interest of the lecture, which attempted sometimes lightly and sometimes almost dramatically—to present a popular account of the subject, the most striking thing about it was the enormous attendance. Fifteen minutes before the lecture began there was a queue half-way across the Great Court of men anxious to obtain admittance, and during the lecture the hall was entirely filled with dons and students listening breathlessly to hear an intelligible account, if one could be given, of the new theory. The keen interest was due, no doubt, largely to curiosity stimulated by the newspaper accounts of the subject, but also partly to the feeling, to which at last some hope of satisfaction can be given, that a further great unifying principle is needed in natural philosophy. Whatever be the reason, however, the size and appreciation of the audience were no less extraordinary than the subject of the lecture and the brilliance of its exposition.

Mrs. Osborn, the wife of the president of the American Museum of Natural History, has presented a striking portrait of her husband to the Sedgwick Museum. It is proposed to hang this portrait of an old student of Cambridge and an honorary doctor of science of the University amongst the fossil mammals, which have been the subject of his life's work, near the portraits of Darwin and Huxley. The portrait, which is recognised by friends in Cambridge as a remarkably good likeness, is inscribed as follows:—"Henry Fairfield Osborn, LL.D., Sc.D. Camb., a student at Cambridge in 1879, contributor to Comparative Anatomy, Palæontology, Biology, President of the American Museum of Natural History. By Orlando Rouland, New York, 1919."

LIVERPOOL.—The council has appointed Prof. E. R. Dewsnup, professor of railway administration in the University of Illinois, to the chair of commerce, recently endowed by the trustees of the late Mrs. A. W. Chaddock.

MR. A. CONNELL has been appointed to succeed Prof. S. White in the professorship of surgery in the University of Sheffield.

CAPT. L. L. BURCHNALL, scholar of Christ Church, Oxford, has been appointed lecturer in mathematics in the University of Durham.

DR. J. CRUICKSHANK, pathologist to the Crichton Royal Institution, Dumfries, has been appointed