and of acquiring knowledge at the same time. When, therefore, advocates of particular courses of instruction state that they do not pretend to teach science, but are concerned solely with method, they show unwise indifference to what is known about educational values. Locke's disciplinary theory—that the process of learning trains faculties for use in any fields, and that the nature of the subject is of little consequence—can no longer be entertained. It has now to be acknowledged that information obtained in the years of school life is as important as the process of obtaining it; that, in other words, subject matter as well as the doctrine of formal discipline must be taken into consideration in designing courses of scientific instruction which will conform to the best educational principles.

So long ago as 1867 the distinction between subject and method was clearly stated by a Committee of the British Association, which included among its members Prof. Huxley, Prof. Tyndall, and Canon Wilson. It was pointed out that general literary acquaintance with scientific things in actual life, and knowledge relating to common facts and phenomena of Nature, were as desirable as the habits of mind aimed at in scientific training through "experimental physics, elementary chemistry, and botany." The subjects which the Committee recommended for scientific information, as distinguished from training, comprehended "a general description of the solar system; of the form and physical geography of the earth, and such natural phenomena as tides, currents, winds, and the causes that influence climate; of the broad facts of geology; of elementary natural history with especial reference to the useful plants and animals; and of the rudiments of physiology." If we add to this outline a few suitable topics illustrating applications of science to everyday life, we have a course of instruction much more suitable for all pupils as a part of their general education than what is now commonly followed in secondary schools. It will be a course which will excite wonder and stimulate the imagination, will promote active interest in the beauty and order of Nature, and the extension of the Kingdom of Man, and provide guidance in the laws of healthy life.

The purpose of this kind of instruction is, of course, altogether different from that of practical experiment in the laboratory. One of the functions is to provide pupils with a knowledge of the nature of everyday phenomena and applications of science, and of the meaning of scientific words in common use. Instead of aiming at creating appreciation of scientific method by an intensive study of a narrow field, a wide range of subjects should be presented in order to give extensive views which cannot possibly be obtained through experimental work alone. The object is indeed almost as much literary as scientific, and the early lessons necessary for its attainment ought to be within the capacity of every qualified teacher of English. Without acquaintance with the common vocabulary of natural science a large and increasing body of current literature is unintelligible, and there are classical scientific works which are just as worthy of study in both style and substance as many of the English texts prescribed for use in schools. We all now accept the view that science students should be taught to express themselves in good English, but little is heard of the equal necessity for students of the English language to possess even an elementary knowledge of the ideas and terminology of everyday science, which are vital elements in the modern world, and it is the business of literature to present and interpret them.

It may be urged that knowledge obtained through descriptive lessons has no scientific reality unless it is derived from first-hand experience, and this is no doubt right in one sense; yet it is well to remember that science, like art, is long, while school life is short, and that though practical familiarity with scientific things must be limited, much pleasure and profit can be derived from becoming acquainted with what others have seen or thought. It is true that we learn from personal experience, but a wise man learns also from the experience of others, and one purpose of a descriptive science course should be to cultivate this capacity of understanding what others have described. As in art, or in music, or in literature, the intention of school teaching should be mainly to promote appreciation of what is best in them rather than to train artists, musicians, or men of letters, so in science the most appropriate instruction for a class as an entity must be that which expands the vision and creates a spirit of reverence for Nature and the power of man, and not that which aims solely at training scientific investigators.

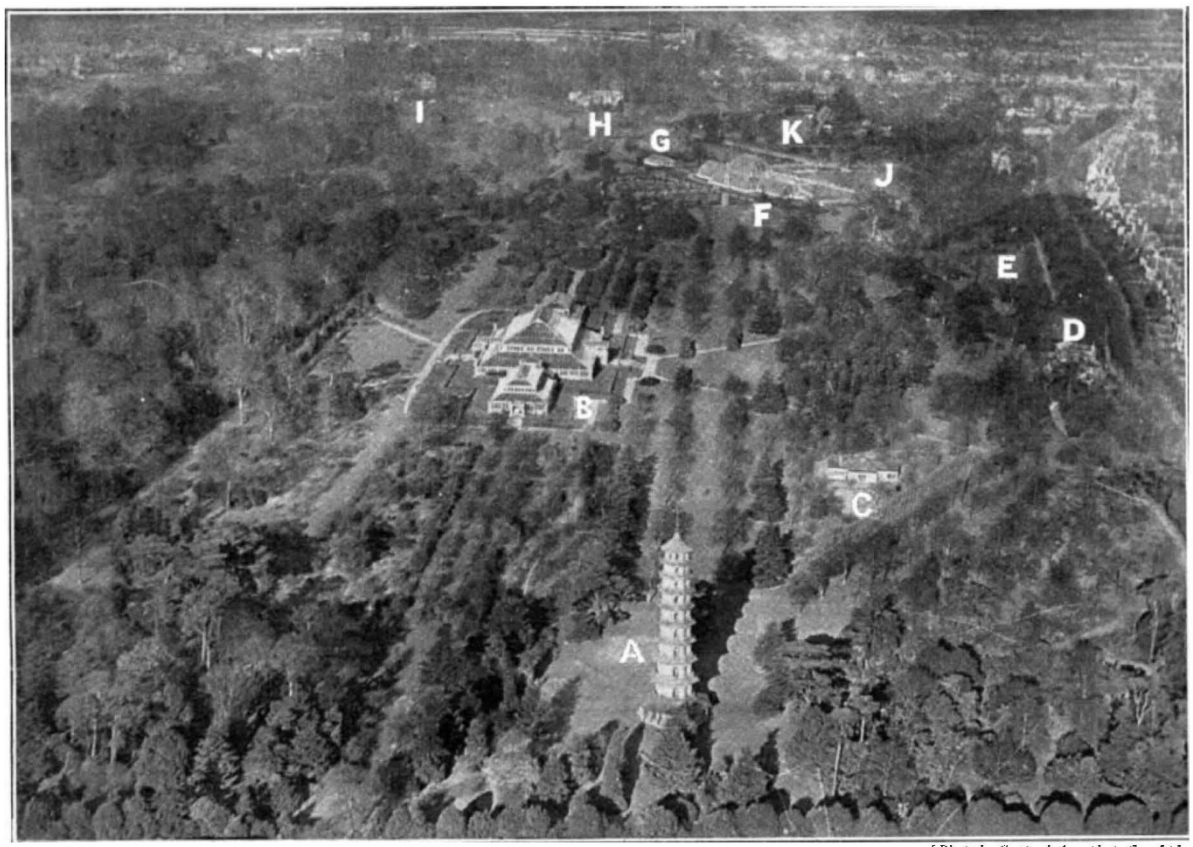
The Royal Botanic Gardens, Kew.

THE area occupied by the Royal Botanic Gardens of Kew, as we know them to-day, is mainly the result of the union of two demesnes, both of them famous in a horticultural sense long before they came to be associated in particular with the science of botany. These two demesnes were, first, the grounds originally attached to a house in the Old Deer Park of Richmond known as Ormonde Lodge, Richmond Lodge, and finally, when it came to be occupied by George II. (then Prince of Wales) about 1721, as Richmond Palace; secondly, the grounds belonging to Kew House or White House, a dwelling that stood near the present Kew Palace, and which, after being occupied by the families of Bennett, Capel, and Molyneux, came into the possession of Frederick, Prince of Wales, in 1730. On the death of George II. in 1760, both properties came under the ownership of his grandson, George III. At that time they were divided by an ancient bridle-path known as "Love Lane," which ran from Richmond Green to a horse-ferry over the Thames at Brentford. George III. obtained Parliamentary sanction to close Love Lane, with the obliteration of which, in 1802, Richmond Gardens and Kew Gardens became the larger Kew Gardens we know at the present time.

In the aero-photograph here reproduced we are looking almost due north, and most of the area shown belongs to the Kew Gardens of the eighteenth century. It is bounded on the east by the Kew Road, some of the villas of which are shown towards the top right-hand

corner of the picture. It is on this area that all the plant-houses, museums, and other buildings are situated. Richmond Gardens were bounded on the west by the Thames, and part of their site is the thickly wooded area shown towards the top left-hand corner of the photograph.

Under Queen Caroline, consort of George II., Richmond Gardens became famous for the costly and elaborate operations she carried out there. She built Merlin's Cave, the Hermitage, and various temples and other structures, all of which disappeared soon after George III. came to the throne. Even Richmond Lodge itself was razed to the ground in 1772.



[Photo by Central Aerophoto Co., Ltd.

THE ROYAL BOTANIC GARDENS, KEW.

A=PAGODA. B=TEMPERATE HOUSE. C=REFRESHMENT PAVILION. D=NORTH GALLERY. E=FLAGSTAFF. F=PALM HOUSE. G=WATER-LILY HOUSE. H=No. III. MUSEUM (ORANGERY). I=KEW PALACE. J=POND. K=CACTUS HOUSE.

The old Kew Gardens had a longer and more interesting history. John Evelyn made several references to them in his Diary. In August 1678 he records that the gardens had the "choicest fruit of any in England," and under the date February 24, 1688, he wrote, "we went to Kew to visit Sir Henry Capel's whose orangery and myrtetum are most perfectly kept." From the accounts of Evelyn and others it appears certain that, even 250 years ago, Kew was one of the best gardens in England.

Sir Henry Capel died in 1696, and the property descended to his grand-niece, the wife of Samuel Molyneux. Molyneux had a taste for astronomy and converted part of Kew House into an observatory. It was here that his friend Dr. Bradley, afterwards Astronomer Royal, made his two important discoveries, the aberration of light and the nutation of the earth's axis. Kew House was pulled down in 1802, but the site of the observatory and Bradley's discoveries is now marked by a sun-dial.

The foundation of the Botanic Garden at Kew has to be credited to Augusta, Princess of Wales and mother of George III. Under the superintendence of Lord Bute, about nine acres were laid out in 1760, the portion devoted to herbaceous plants, then called the Physic Garden, being arranged on the then newly devised Linnaean System. Willam Aiton, a pupil of Philip Miller of Chelsea and afterwards the author of the "Hortus Kewensis," was appointed head gardener, and Sir William Chambers, the architect of Somerset House, erected a number of temples and other buildings, of which several, including the Pagoda, are still conspicuous features of the place.

Between 1760 and 1841 Kew had a period of brilliant success and one of decadence. Princess Augusta died in 1772 and George III. substituted Sir Joseph Banks in place of Lord Bute as unofficial director of the Botanic Garden. Banks was largely interested in the fortunes of the garden until his death in 1820, and his association with it no doubt was the chief agency that ultimately gave it the premier position among

botanic gardens of the time. Plant collectors were despatched to various countries, the first being Francis Masson, who went to South Africa in 1772.

After the death of George III. as well as that of Banks in 1820, the gardens gradually declined in efficiency and repute, until at the accession of Queen Victoria there was a serious danger of their disappearance altogether as a botanic establishment. However, a committee of inquiry, headed by John Lindley, reported strongly in favour of their continuance and further development, and in 1840 their control was vested in the Commissioners of Woods and Forests. In 1841, Sir William Hooker was appointed director, and thus was inaugurated the second great period in the history of Kew.

During the last eighty years the area devoted to botany and horticulture has increased from about 15 acres to 288 acres. Its work as the botanical centre of the British Empire and for the distribution of economic plants to all our colonies and possessions is well known. To the public generally it is, of course, best known as a popular resort. Nor must its place as a training school in horticulture be forgotten, especially for curators of Colonial and Indian Botanic Gardens and superintendents of public parks at home. No better testimony of its value to the Empire can be adduced than that of Joseph Chamberlain, then Colonial Secretary, in the House of Commons on August 2, 1898: "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."

In pure botany its chief work has been the preparation and publication of Floras of British possessions—a botanical survey of the Empire. Bentham and Hooker prepared their "Genera Plantarum" at Kew, and the monumental "Index Kewensis" was compiled there. The Herbarium contains some 2,500,000 specimens and the library upwards of 24,000 volumes.

Turning to the more conspicuous objects in the accompanying illustration, the one that catches the eye first is the Pagoda (A). This was erected by Sir William Chambers in 1761–2; it has ten storeys and is 163 feet high. From its summit the Crystal Palace is usually visible and, with a favourable atmosphere, Windsor Castle. During the coal strike in the spring of last year all the more lofty buildings as far as St. Paul's could be seen.

The Temperate House (B) is a structure of three main compartments, the large central one, built in 1862, being devoted largely to the cultivation of Australian and New Zealand trees and shrubs, the smaller ones, built 1897–1899, to Himalayan and subtropical ones. The North Gallery (D) contains 848 paintings of flowers and tropical and subtropical vegetation by the late Marianne North; both the paintings and the buildings were presented by her to Kew in 1882. The Flagstaff (E), which appears merely as a dark streak in the illustration, was presented by British Columbia, and is 214 feet high, 2 feet 9 inches in diameter at the base, 1 foot in diameter at the summit; at the time of its erection in October 1919 it weighed 18 tons.

The Palm House (F), where tropical plants, such as palms, cycads, pandanads, bamboos, and bananas, are grown, is an iron structure built 1844–1848. It is 362 feet long and 66 feet high in the centre. The Orangery (H) is one of Chambers's buildings and was erected in 1761. The orange trees originally housed there were transferred to Kensington Palace in 1841, soon after Kew became public property. It is now known as Museum III. and contains exhibits of exotic timber and miscellaneous objects.

Kew Palace (I), once known as the Dutch House, is a red brick, Jacobean dwelling, built by Samuel Fortrey in 1631. By his grandson it was sold to Sir Richard Levett, who was Lord Mayor of London in 1700, and in 1781 it was purchased from the Levetts by George III., who used it as a dwelling for himself and his large family when the Court was at Kew. His sons, the Dukes of Clarence and of Kent, were married in one of the rooms, and his wife, Queen Charlotte, died there November 17, 1818. It is now open to the public who visit the Gardens, but is not attached in any scientific sense to the establishment, containing only mementoes of the Royal Family.

Obituary.

DR. R. H. CODRINGTON.

IN the fulness of years, at the age of ninety-two, Dr. R. H. Codrington, the apostle of Melanesia, has passed away. After a distinguished Oxford career he became Fellow of Wadham; soon after, he joined Bishop Patteson and afterwards lived with Bishop Selwyn at Norfolk Island. After thirty-two years' service in the Melanesian mission he returned to England and became vicar of Wadhurst and Prebendary of Chichester. A friend who knew him well describes him as "the soundest of scholars, kindliest of teachers, most practical of saints, most genial and tolerant of friends." He will be remembered as the first and greatest ethnologist and linguist who studied the people of Melanesia. His fame rests on two great books—"The Melanesian Languages," and "The Melanesians, their Anthropology and Folk-lore," published by the Oxford Press in 1855–1891. The former laid the foundation of the scientific knowledge of the speech of that region; the second is invaluable to the anthropologist as giving the first and fullest account of religious beliefs. Dr. Codrington was also the discoverer of the principle of Mana, which has played a leading part in the exploration of savage religion since he made it known to the world.

THE *Chemiker Zeitung* for September 5 announces the death on August 7 of Prof. Emilio Noelting, for many years Director of the Chemical School at Mülhausen. Prof. Noelting was an authority on dye-stuffs; he was born on June 8, 1851, at Porta Plata, San Domingo, and after study at Zürich he took up his position at Mülhausen in 1880. In the issue for September 9 of the same journal the death is announced of Prof. E. Bergmann, director of the Chemisch-Technische Reichsanstalt, Berlin.