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OPENING ADDRESS

Anniversaries such as we are now celebrating are occasions for congratulation, reminiscence and reflection—occasions when we look back to the beginnings of an institution to discover the intentions of its founders, and to consider how far those intentions have been respected, amplified, amended or achieved by succeeding generations. Institutions are, in a sense, living things, and are subject to the same inflexible processes of change that govern all living things. Like cultivated plants, they germinate, grow, branch out, flourish and bear fruit only if sown in the right sense, in the environment, and given their proper share of attention. Otherwise they fail and are soon forgotten. Indeed one might carry the analogy further and say that some institutions are like summer annuals, quick to blossom, and sensational for a while, but soon out of flower and then discarded; others, like forest trees, start from small beginnings, take a long time to develop, and then remain grand and majestic for many years, spreading wider as they mature, and venerated even in their old age.

I cannot pay the Conservatoire and Jardin botaniques de Genève a more handsome compliment than to liken it to a mature and noble oak, first planted by Augustin-Pyramus de Candolle and the worthy citizens of Geneva, tended by a succession of distinguished curators, directors and benefactors, and now, at 150 years of age, in the prime of life, well rooted in the best traditions of botany, verdant, vigorous and richly furnished with a wealth of botanical treasures.

The history of the botanic garden at Geneva, as outlined by Dr. Stafleu in his thoughtful appreciation of the late Dr. Baehni¹, would appear to have been one of steady, uninterrupted progress, from small beginnings to its present international eminence. The Royal Gardens at Kew, of which I am proud to be Director, have had a longer, but more chequered career. First a rapid rise to fame when Princess Augusta of Wales and her son, King George III, were our patrons, and Sir Joseph Banks their very able adviser; when public enthusiasm for Linnaeus and the Linnaean system of classification put botany, for a spell, to the forefront of the sciences, and when the exploration of South Africa and Australasia opened European eyes to the astonishing wealth, diversity and magnificence of the vegetable world.

Then, about the time when de Candolle and his collaborators were founding their historic garden in Geneva, the fortunes of Kew passed into a rapid but temporary decline. King George III and Sir Joseph Banks both died in 1820; the Linnaean tradition began to be displaced by the natural system of classification, and the public, surfeited perhaps with plant novelties and perplexed by the abstruse complexities of vegetable affinities, turned its attention from botany to chemistry, physics and other sciences. Indeed so rapid was the decline of Kew as a botanic

¹ *Boissiera* 11: IX-XXXIX. 1965.

garden that by the 1830's some of the most influential voices in the Kingdom were calling for its dismemberment; and John Lindley, commissioned to report on the state of the gardens, could, in honesty, only say that it was "little better than a waste of money to maintain it in its present state, if it fulfils no intelligible purpose, except that of sheltering a large quantity of rare and valuable plants".

Fortunately for science, the decline was halted, and, in capable hands, Kew entered upon a new era of prosperity and expansion. But it was a near escape—and a cautionary episode for those who imagine that an institution can survive for long solely on a tradition of former greatness. The fact that Kew enjoyed more than sixty years of prosperity, and that it had contributed in full measure to the glories of Linnaean scholarship, were not in themselves enough to save the gardens from destruction, for, as Dr. Stafleu puts it, a tradition, however great, remains alive only "through continuous renewal and testing of the old against the new". This being so, it is not merely significant, but indeed of vital importance, that, at this symposium, we should turn our thoughts inwards, and consider, in the light of modern science, which amongst the many functions of a modern botanic garden are most likely to contribute to the future well-being of botanic gardens, and which, surviving as outmoded traditions, are best discarded.

At this point we may pause to consider what functions de Candolle and Lindley had in mind when they appealed for the foundation of a botanic garden at Geneva, and for the restoration of a botanic garden at Kew. The two botanists were, of course, working against very different backgrounds: Britain, at the beginning of Queen Victoria's reign, had already acquired an extensive and somewhat heterogeneous array of colonies, and was actively acquiring more, while Switzerland was without colonies or colonial ambitions. Lindley, working at the hub of the empire, envisaged Kew as a centre around which colonial botanic gardens should be arranged, and as an institution which could advise the government upon points connected with the establishment of new colonies. It was, indeed, on the basis of these recommended functions that Sir William Hooker initiated a series of large-scale Floras—of India, Africa, Australia and North America—the preparation of which was to engage the attention of the scientific staff at Kew for another century. Indeed, even now, when the colonial empire has almost vanished, and when colonialism is out of fashion, the botanists at Kew still devote much of their energy and ingenuity to similar though rather more sophisticated enterprises in the department of floristics.

Apart, however, from what may be called colonial functions, Lindley and de Candolle were very much of a mind. Both were strenuous advocates of public education, and both showed an earnest, though rather vague belief in the value of botanic gardens and botanical studies as a means to this end. Lindley waxed eloquent on the subject, declaring that a national botanic garden "would undoubtedly become an efficient instrument in refining the taste, increasing the knowledge, and augmenting the amount of national pleasures of that important class of society, to provide the instruction of which has become so great and wise an object with the present enlightened administration".

This sounds an over-enthusiastic claim for botanic gardens, for much as I like to think that at least some of the many thousands who pass through the gates of Kew each year derive some increase in their "rational pleasures" from the

visit, I rather question if modern educationalists would attach such importance to the influence of a botanic garden in moulding and refining public taste. Lindley and de Candolle, it must be remembered, spoke for an age when education, for those who were lucky enough to get any, was still very largely restricted to a study of classical authors; when the possession of books of any sort was assumed to indicate a certain degree of affluence, and when travel was out of the question except for a minute section of the community. In such circumstances a visit to Kew must have been something of an eye-opener and an education. Nowadays, with education almost everywhere an obligation rather than a privilege, with newspapers, magazines, paperbacks, radio, television, films and cheap conducted tours all offering the public advice, instruction, information and entertainment, it may be asked if botanic gardens can possibly compete as rival attractions, or if it would not be wiser to shut our gates to the general public and cater only for the tastes of the much smaller world of botanists and scientific gardeners.

At least one recent writer, Professor W. F. Robertson¹, has publicly asserted that to do so would be a cardinal error, maintaining that botanic gardens have an increasing, rather than a decreasing "part to play in the education of the public, of the professional botanist, and in university teaching, and that there is a case for the establishment of more botanic gardens". It is certainly possible that a better educated public, with at least some knowledge of the natural sciences, may be better qualified than the public of a century ago to understand and take advantage of the information a botanic garden dispenses. It is also possible that the relative peace of a garden may prove increasingly more attractive than the noisier and more blatant forms of mass-communication. No doubt this symposium will be considering how best a modern botanic garden can fulfil its role as a teacher. From the public's viewpoint it is certain that at least two aspects of our education function—instruction and recreation—must exist together, and in this respect the attitudes of the public and the professional botanist are not always congruent.

Another traditional function of a botanic garden, utilitarian rather than educational, was to maintain collections of plant materials of value in medicine, commerce, agriculture and horticulture. It is significant that no less than 42 pages of an official report on the gardens at Geneva, published in 1819—a year after its foundation—are devoted to cataloguing the numerous varieties of peaches, almonds, apricots, plums, cherries, pears, medlars, apples, goose-berries and vines already added to the collections. The early reports of Sir William Hooker on the progress of Kew under new management likewise lay particular stress on the importance of economic botany and of the economic functions of a botanic garden in acquiring, maintaining and propagating stocks of useful plants for distribution to other parts of the world.

Indeed we, at Kew, are still justifiably proud of our record in the exercise of this particular function, and of our accomplishments in extending the cultivation of quinine, rubber, coffee and other valuable crops and medicinal plants. The fact that this economic function has greatly declined in importance does not reflect upon the competence of present-day botanic gardens, but upon the common-

¹ *Nature* 194: 11-13. 1962.

sense of governments and commercial growers in establishing or sponsoring national or international research stations for specialist work on the breeding and management of a particular crop or group of crops. Most botanic gardens still exhibit collections of useful plants as part of their educational function, but, in the modern world, it is unlikely that they will again be expected to operate on an extensive scale in providing plants for agriculture, industry or medicine.

This is not to say that botanic gardens should necessarily exclude plant-breeding of plant-trials from the ambit of their activities, or that they should turn a blind eye to economic needs, but rather that they should not attempt to compete in fields where specialized research is already being carried out with a view to meeting these particular needs. Botanic gardens can still perform a very useful function as centres for the introduction, propagation and distribution of novelties or rarities, particularly as regards plants of interest to horticulturists.

Under pressure of economic circumstances more and more nurserymen are restricting the range of their stocks to a limited number of popular and profitable subjects, while fewer and fewer are prepared to devote time, money and labour to experimenting with new introductions or maintaining collections of unusual species for which there is little public demand. In such circumstances the botanic garden is likely to become increasingly important as a sanctuary for useful and ornamental plants which would otherwise be lost to horticulture—and indeed, in this respect, our scope need not necessarily be restricted to natural species and varieties, for we have ample evidence of periodic resurgences in the popularity of outmoded cultivars—for old roses, fuchsias, camellias and rhododendrons—to mention only some of the groups where current enthusiasm has led to an increased public demand for the neglected favourites of an earlier era. Such collections of almost-forgotten cultivars may in addition serve an educational function in illustrating the history and evolution of cultivated plants.

The botanic garden should also take the initiative in drawing attention to new introductions which, after trial, have proved themselves valuable additions to the general run of well-tried and well-known cultivated plants. Of the huge number of potentially valuable garden plants, it is surprising how few have found their way into general cultivation, and how many, once or twice introduced, have subsequently been lost to cultivation after inadequate trial. Indeed there may be some justification for the complaint that botanic gardens have done too little to encourage initiative and enterprise amongst gardeners, that we have been too reticent, and that we have a positive duty to publicize good plants in every possible way, to demonstrate their qualities and to make sure that they are available to every interested and competent grower.

We may also have a positive duty to ensure that certain plants, already rare and diminishing, are not allowed to become extinct. This means that we should not only encourage nature conservation and press for the creation of more nature reserves, but that we should give more immediate protection to threatened rarities by sheltering them in our gardens, just as some animals, threatened with extinction, have found a measure of protection in zoological gardens. To this end there is an urgent need for more botanic gardens in tropical and sub-tropical regions, for with the best will in the world the riches of tropical forests and savannas, or any other plants too tender to be grown outdoors in temperate regions, can be afforded only very limited and unsatisfactory accommodation in our stoves and glass-houses.

So far I have dwelt on what may be called the external relations of a botanic garden, on questions involving the general public and public education, on our relations with commerce, medicine, agriculture and horticulture, and our responsibilities as regards the protection and conservation of rare plants. But our most important function, implicit in the very name "botanic garden", is to serve the interests of botany and botanists.

Most of the older botanic gardens were established, in the latter years of the Renaissance, primarily as places where students of medicine could learn something about herbs, their uses and classification, at a time when plant-lore was an essential part of a medical education. Then with the advent of scientific taxonomy and the decline of herbalism, such gardens became living illustrations of philosophical concepts of classification, with neat order-beds to demonstrate the genius of Linnaeus or de Jussieu.

A few gardens have not advanced beyond this stage, and a great many, including Kew, still maintain order-beds more, I suspect, out of deference to tradition, than in the belief that they render a necessary service to botany or medicine. Indeed, in gardens otherwise well planned and planted it is by no means unusual to find these drab souvenirs of the past discreetly tucked away from the general gaze in overshadowed or neglected corners, furnished with a sparse representation of commonplace, undernourished and mislabelled herbage. Those members of the uninitiated public who trespass upon such relics have their worst suspicions of botany confirmed and pass quickly to more inviting scenes. The botanical purist alone gleans some satisfaction from the vista, dismissing the more voluptuous features of the garden as "no better than a public park" and wishing that the whole site could be carved into systematic rectangles, with no concessions to the pleasure-seekers.

I like to think that a successful botanic garden manages to cater for both tastes, and that it can be organized to combine aesthetic enjoyment (or "rational pleasure") with instruction. Surely edification and ugliness are not necessarily synonyms? And surely a wide range of interesting and well-documented plants can be represented without turning what might be a pleasant garden into that dreariest of all objects—a collection? I see no reason why colourful and decorative plants should be less instructive to students than dowdy ones—indeed the reverse is more likely to be true, and I am certain that too rigorous an adherence to taxonomic arrangements in planting can be as calamitous for the plants as it is frustrating for the gardeners, whose techniques are tied to ecology rather than to taxonomy.

There are, however, certain difficulties which sooner or later force themselves upon the attention of every conscientious garden director, especially upon those who, like myself, direct large gardens, financed by the state, and open all the year round to all sections of the tax-paying public. We are, first of all, expected to excel in all directions at the same time, and will at once become the butt of criticism if a student, say, of lilies finds that our collection is less extensive or less well grown than his own; and while we are expending time and staff in making good this defect, a student of poplars or poppies finds that his department of botany is being shamefully neglected. All the time those visitors who take a pride in their botanical innocence are declaiming loudly on the disgraceful state of the lawns, or the comparative failure of the summer bedding! We know that it is impossible to please everyone, but, nonetheless, a great part of an official career may be spent in attempting this very impossibility; and in the effort to humour everyone it is easy to satisfy no-one, and to lose our sense of direction.

Greater specialization might well provide a partial remedy; instead of attempting to grow everything, and devoting an excess of attention to plants which are difficult to grow, it might be wiser for each garden to maintain a useful, but limited general collection, and to concentrate its efforts on the cultivation of those plants which respond favourably to local conditions of soil and climate, diverting enquiries elsewhere if they concern plants for which local conditions are uncongenial. In this way one garden might excel in its representation of moisture-loving, lime-hating species, while another would display an outstanding range of calciphilous xerophytes; one might concentrate on alpine, another on bulbous and tuberous plants, and so forth. At present I rather suspect that too many gardens are endeavouring to maintain very extensive, and extensively duplicated, collections.

The provision of one particular kind of specialized collection is, however, likely to become an increasingly important function of botanic gardens in the near future, and one which will present problems of a special order to management and gardenstaff alike. I am thinking of the detailed and elaborate collections required by cytologists, geneticists and all those who collaborate in what is loosely known as experimental taxonomy.

It is relatively easy for botanic gardens to maintain useful and varied collections of plants of interest to the general public and to non-specialist students of botany. Most gardens try to exhibit a reasonable array of plants, which, for one reason or another, are not readily available for inspection elsewhere, and which cannot adequately be studied from dried and pressed herbarium specimens. Extensive collections of orchids and tropical plants, ferns, cacti and succulents have been acquired and are maintained with such ends in view, and might almost be regarded as traditional features of the botanic garden.

Useful though such collections may be for general instruction in biology or for work on plant morphology and physiology, they are not designed to meet the requirements of advanced taxonomy, at a time when conventional systems of classification are being everywhere subjected to critical re-appraisal by means of techniques which can operate effectively only if abundant living material is available. The experimental taxonomist requires, above all else, precisely localized and fully documented specimens; he may require a very large range of specimens, even of a single species; he must be assured that this material has not been contaminated by hybridization in the course of cultivation and propagation, and that every care has been taken to ensure that stock plants have not become mixed or mislabelled.

If every experimentalist were his own gardener, then perhaps he would appreciate more fully just how much work a specialist collection of this sort involves, and the amount of time, space, care, patience and money required for its upkeep. It is easy to envisage such collections: it is also easy to place an impossible burden of responsibility upon the shoulders of those who are called upon to maintain them. And then, supposing the joint efforts of gardener and experimentalist have been carried on to a successful conclusion, there remains the problem of knowing what to do with a vast assemblage of plants, got together by dint of much effort, valuable as the voucher material of the completed researches, and yet, in all likelihood, of very little interest to the general public, or to botanists other than those who have been pursuing or who indeed to pursue similar studies. For living plants, unlike herbarium specimens or books, cannot be filed away in a convenient repository until such times as they are wanted for re-examination.

This is a twentieth century problem. I feel that a botanic garden should pay more than lip service to the progress of advanced taxonomy, and I am well aware that there are many, amongst our critics, who feel that we attach too much importance to our function as a public amenity, and too little to the demands of science. No doubt there is room for improvement, for better records and documentation, for a wider range of plants of known wild origin, and for more efficient safeguards against chance hybridization. But it is easier to create an ideal garden in one's dreams, than to translate those dreams into practical, viable projects. Nor does it follow that one man's ideal will be approved by his neighbour: the botanic garden has to discharge many functions and try to strike a balance between many diverse, and sometimes conflicting interests.

An opening address can do no more than sketch the broad outlines of a topic. I have not attempted to catalogue all the functions of a modern botanic garden, nor do I intend to offer constructive suggestions for the solution of all the problems implicit on these functions. A symposium is a banquet, and the guests at a banquet are not invited to lecture or to teach, but rather to enjoy themselves, to talk, to listen and to learn. In the coming days, at working sessions, at receptions and on conducted tours of parks and gardens, we shall have ample opportunity to do all these things.

History tells us that Geneva has been a great nursery—indeed sometimes a hot-bed—of revolutionary ideas and noble ideals. Invigorated by such a favourable environment, comforted by the kind and considerate attentions of our hosts, and all the time watched over by the benign shades of illustrious botanists, I am sure this symposium will be the best of feasts, and a noteworthy commemoration of 150 glorious years of botanical endeavour.

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