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FLOWERING TREES IN INDIA

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**INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI**

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FOREWORD

WHAT with the greed of man and what with the wrath of nature in turn, our countryside in India is dry and denuded of vegetation which was our tropical heritage in the remote past. No wonder, erosion rules in place of green foliage and desert threatens where green fields prevailed. The Community Development Programme has been designed to be the garden for man, animal and vegetation, including the microbe integrated again for the fundamental law of life—'live and let live'.

We have been doing a lot for increased food production and better amenities of life such as communications, public health, education, social education and activities in diverse other allied fields. But beauty is the birthright of man living in nature, and this can be provided in the countryside by nature's pheasantry and vegetation alone. We have been looking for long for a publication on this subject which could inspire and help make a beginning in this direction. Mr. M. S. Randhawa's 'Flowering Trees in India' fills this void.

Professionally, Mr. Randhawa is an administrator. An administrator, according to the normal pattern acceptable in this country till now, is a person who has been so drilled in the system in which he functions as to be totally cured of feelings or emotions or all that man, the 'chosen' in nature, was to be heir to. Mr. Randhawa has behind him an outstanding career to his credit. He holds now a key responsibility in the most vital field of development affecting India that lives in the five hundred and fifty thousand dull and drab villages. In this fresh publication of his he has proved, if proof was needed at all, that 'art' and 'administration' are not necessarily in conflict with each other; that these can be blended to the enrichment of life instead of its stultification. I offer him my hearty congratulations.

The Ministry of Community Development is grateful to Dr. Randhawa for the contribution he has made, and looks forward to its repetition by others in the field. May the colour and the pattern in the pages that follow find expression in the life, the fields and the horizon beyond.

New Delhi
October 5, 1956

S. K. Dey
Minister for Community Development

PREFACE

THIS is a saga of the Tree Beautiful. It is the result of a decade of observation and worship of the beautiful trees of India. It recalls many joyful hours spent in the forest, the countryside and the garden feasting my eyes on the beauty of mauve Bauhineas and flaming scarlet blossoms of *palas*. In my quest for the Beautiful Tree, I wandered all over the face of India—from the Himalayas to Cape Comorin. I was thrilled by the beauty of the graceful coconut palms with their plume-like leaves swaying gracefully in the scented breeze of Kerala, the Land of the Coconut Palm. I enjoyed the beauty of Plumerias, their waxen leaves and white branches glistening in the tropical sun of the countryside of Travancore. The graceful bamboo forests at the foot of the Nilgiris, the blue mountains of South India, appeared indescribably beautiful in the early monsoons. The teak forests of Central India kept me company for days, and I enjoyed the rustling of their broad leaves and the sight of their pale yellow blossoms. In the submontane Uttar Pradesh, I enjoyed the sight of *sal* trees, and the dark village women clinging to the flower-laden branches of *sal* reminded me of the mother of the Buddha. The Himalayas in spring time, when the plum and the wild pear burst into a white universe of flowers, made a deep impression on me.

The flowering of the forest trees is the spontaneous expression of the mystery of life. Contemplating the beauty of the trees, one experiences the joy of the Impersonal, when the inner self of man and the outer self of nature unite. In the union of the soul and nature one experiences ecstatic joy and forgets one's little self. Thrilled by the beauty of the blossoms of the forest trees, the sailing clouds, the golden sunsets and the splendour of the snow peaks, one feels elevated, and a rain of beauty seems to drizzle.

In these pages a sensitive reader will enjoy the beauty of the gardens, the forests and the countryside of India. As one thinks of the forest, images of great strength and beauty swim before one's eyes. And these images are more clear if one has had a chance to visit a forest in one's younger days when the mind is more receptive and impressions are more vivid. Forest trees provide an appropriate background to our emotions, for they remind us of our primaeval ancestors who often read their own moods in nature. The forest-lore of India provides a vast fund of primitive imagination and feeling which may well be ranked with real poetry. As I delved into the tree-lore of ancient India, I reconstructed forest scenes among which lived our *rishis* and forest maids in association with the trees which they loved and looked after. The ancient garden-lore gave me great happiness.

The dwellers in the forest who are more familiar with trees in their surroundings have spun numerous yarns about trees and tree gods and goddesses. In folk-songs

PREFACE

of the forest tribes one finds numerous references to trees. In these folk-songs and folk-tales one enjoys great panoramas of poetic delicacy and flashes of colour effects.

Now that tree planting has been adopted as a national policy and emphasis has been given to the planting of the denuded forests, strips of land along the canals and rivers, roadside avenues and village plantations, it is necessary that love and reverence for trees are evoked among the people.

Under the Community Projects and the National Extension Scheme, great emphasis has been laid on the planting of fruit and timber trees in villages. It was on a suggestion received from Mr. S. K. Dey, Minister, Community Development, that this book was written. This book sums up a lifetime interest in trees, gardens, forests and the countryside of India. An attempt has been made to understand the character and personality of the beautiful trees of India, and to convey to others the joy I have experienced in watching the pageant of colour which marches through the countryside of the Subcontinent through the twelve months.

I acknowledge with thanks the help which I received in preparing this book from various quarters. I am particularly grateful to Mr. M.G. Kamath, Editor, Indian Council of Agricultural Research, for carefully revising the text. Mr. N. S. Bisht, Art Director, Indian Council of Agricultural Research, prepared the line-sketches. Mr. G.S. Baweja, Extension Officer, Extension and Training Directorate, was of considerable assistance in compiling the list of ornamental trees. Mr. D. B. Krishna Rao, Librarian, Indian Council of Agricultural Research, compiled the index and bibliography. Mr. Devindar Satyarthi, the famous collector of folk-songs, provided a collection of folk-songs relating to the tree theme. I am grateful to all these persons for their willing co-operation. I am also grateful to Mr. P. L. Verma, Chief Engineer (Capital), Chandigarh, Mr. M. Corbusier, Mr. Bhanu Mathur and Mr. R. Prabhawalker, Architects, for providing such useful material relating to landscaping of Chandigarh as will be of interest to all town planners. I also received co-operation from a number of artists who have provided their paintings to serve as illustrations to the text. I am grateful to Shrimati Indira Gandhi for the loan of the painting entitled "Autumn" by the late Mrs. Sass Brunner. I am also grateful to Mr. Yodh Raj for the loan of the painting entitled "Spring" by Madame Sass Brunner which adorns this book as frontispiece; Mr. Dan Singh Bisht of Nainital for the loan of the painting "Kachnar in Bloom"; Thakur Ganga Singh, Mr. Madhava Menon, Mr. Sudhir Khastgir, Mr. N. S. Bisht, Shrimati Anandi Bisht, Dr. B. P. Pal and Miss Elizabeth Brunner for their valuable paintings; Dr. L. A. Ramdas, Deputy Director General of Observatories, Meteorological Department, Poona, for valuable information on phenological observations on the flowering of trees like the mango, *nim*, *babul* and tamarind. I also acknowledge with thanks the co-operation so willingly given by Dr. S. Sinha, Director, Publications Division, Ministry of Information and Broadcasting, Government of India, particularly for the loan

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of five blocks of paintings which were published in the "March of India". I am also thankful to Messrs George Allen and Unwin Ltd., London, for allowing the use of quotations from Mr. W. C. Archer's book 'The Blue Grove'. I am deeply grateful to Shri Ajit Prasad Jain, Minister for Food and Agriculture, Government of India, for the encouragement he has given me. By constituting the Floriculture Committee under the Indian Council of Agricultural Research, he has given due recognition to the neglected subject of ornamental gardening. I am also grateful to Dr. Punjabrao Deshmukh, Minister for Agriculture, Government of India, for the encouragement he gave me in this task. In fact, his love for trees and arboriculture was a source of inspiration to me, and stimulated me to complete this task. This book, it is hoped, will be useful to all those who are interested in trees and tree-lore, garden aesthetics as well as town and country planning.

New Delhi
October 5, 1956

M. S. Randhawa

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CHAPTER I

QUEST OF THE BEAUTIFUL TREE

“**B**UTEA FRONDOSA is one of the most showy flowering trees and is also called the Flame of the Forest. The petals yield a yellow dye commonly used in the Holi festival.” From an otherwise prosaic textbook of Botany this was the spark which, when I was sixteen, fired my imagination and kindled in me the love for beautiful flowering trees. Having been brought up in the rather drab countryside of the Punjab where the only common trees are the *shisham*, *kikar* and *phulahi*, like most up-countrymen I was not aware of the wealth of colour in the vegetation of the sunny South. My posting to Fyzabad in Uttar Pradesh introduced me to the glamorous yellow *amaltas* and the orange blossoms of *gul mohur*. At Lucknow, I made my first acquaintance with the sober blue tints of the jacaranda and the purple and mauve shades of *Lagerstroemia thorelli*. In this city of parks and pleasantries, I saw for the first time the pink cassia tree robed in delicate pink. I was enchanted by its beauty. It was like falling in love at first sight, and the pink cassia, which appeared like a gigantic bouquet of roses, has remained my favourite tree.

When out on tour, I used to wander in the *dhak* forests which were a blaze of fire in the month of March and provided the most picturesque background to the fields of golden wheat. The Flame of the Forest, with its naked branches turned into flaming torches, was a never-to-be-forgotten sight. Wandering in the forest every morning and evening, I spent hours admiring the beauty of its flowers which lent glamour to patches of salt-infested land on which nothing else would grow. White egrets roosting on some of the taller trees or following droves of buffaloes added an attractive note to the scene. The oppressive stillness of the forest was intermittently relieved by the organ-like notes of the *sarus* cranes who raised their graceful necks, turned their scarlet heads, suspiciously watched the intruders into their sanctuary with their beady eyes, flapped their slate-coloured wings and glided off. In the quiet of Rae Bareilly, which was more or less an overgrown village, I had the opportunity of making a closer and more intimate acquaintance with many flowering trees planted by tree-loving Englishmen in the compounds of bungalows, relics of the early post-Mutiny Anglo-Indian period, now looking decrepit and forlorn. I watched the pink, mauve and white varieties of *kachnar* laden with orchid-like flowers which brightened up the compounds of many houses. I also saw the white *champak*, *Plumeria alba*, prodigally scenting the air with its fragrance in obscure corners of the grounds of many bungalows. Scattered in the Civil Lines were many *frangipanis*, conspicuous on account of their gaunt limbs which in the month of April were clothed in clusters of giant leaves and capped with the most delicately scented

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pale yellow flowers. In a corner of a Deputy Collector's house was a *Kleinhovia*, its branches crowned with delicate pink flowers and covered with heart-shaped leaves. At the entrance of my house was a clump of Easter trees which in the month of April appeared most attractive, their fragrant white flowers contrasting with their dark branches. Captivated by their beauty, I felt annoyed with the person who gave them the horrid name of *Holarrhena anti-dysenterica*.

The indifference of my countrymen to the beauty of flowering trees was no small cause of annoyance to me. Why were they oblivious of the beauty of our *dhak*, *kachnar* and *semal* trees ? While there are plenty of people who would plant trees for fruit or timber, there are very few who would bother to plant an ornamental flowering tree. So I realized that while the fruit trees could take care of themselves, emphasis must be laid on the planting of beautiful flowering trees in places where they should be planted. While ornamental trees have no place on our national or state highways and canal plantations, they must be given their due place in our homes, public parks, public buildings and town roads. On account of the prevailing lack of aesthetic taste among our countrymen, this crusade for the beautiful tree was necessary, even at the risk of overemphasis. Our ancestors of the Asokan and Gupta periods were people of the highest aesthetic perception, while we are surprisingly deficient in aesthetic consciousness. I thought the planting of beautiful trees in homes and public places in towns would provide a healthy corrective and would lead to a genuine improvement in taste, particularly among the educated classes who profess to be cultured. I decided that the beauty of these trees must be multiplied for the benefit of those who had shut their eyes and persistently refused to see it. It should be conspicuously brought to their notice by planting these colourful trees on platforms of railway stations and in the form of avenues along streets and roads in their towns, and brought to their very doors by encouraging the planting of such trees in their gardens. I made arrangements for planting these beautiful trees in the compounds of district courts, *tahsils*, schools as well as in the houses of the well-to-do along the roadsides. Though I never saw these trees grow up, I knew that some day they would flower and convey my message of love for the beauty of nature at least to the coming generation.

My purchase of a residential site in Allahabad brought me in touch with the problem of beautiful trees in association with buildings. The type of trees that should be grown to provide a feast of colour from month to month brought me face to face with a host of problems which I tried to solve. I felt there must be scores of people who were anxious to build homes and who would like to know what trees they should plant to beautify their residences. While thrashing out this problem, I came in contact with M. D. Chaturvedi, at that time a Conservator of Forests in Uttar Pradesh. Chaturvedi is an original thinker whose contribution to bioaesthetics is significant. It was with his collaboration that I started the pleasurable pursuit of

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celebrating tree-planting weeks in Uttar Pradesh, which under the inspiring lead of K. M. Munshi, became a national festival, now celebrated with so much enthusiasm in all parts of the country.

After familiarizing myself with the beautiful trees of the present, I adventured into the past. V. S. Agarwal, Curator of the Lucknow Museum, introduced the graceful Kushan sculptures to me. These sculptures unlocked the secrets of ancient Buddhist temple gardens to me and also provided a clue to the climate of that period. The Kushan Yakshinis sporting with flowers of *asoka*, *kadamba* and *champak* revealed the love for beautiful trees which our ancestors had, and also gave an indication of the climate of Vrindaban, the land of Krishna and the Gopis, about 2,000 years ago, and how desiccation had affected the country in which the *asoka* and *kadamba* forests once flourished.

“The Woman and Tree” motif in the Bharhut and Mathura sculptures with its surprisingly accurate delineation of the *asoka* and *kadamba* stimulated my curiosity to see these trees in flower. The true *asoka* tree—*Saraca indica*—is very rare in North India and is usually confused with another tree *Polyalthia longifolia*—also called *asoka*—which has a mast-like crown and pale green flowers, and is commonly grown in gardens and compounds of houses in Uttar Pradesh. The real *asoka* tree, the red-flowered *asoka* of Kalidasa and the Kushan sculptors, is known to very few people indeed. There is a solitary specimen in the Ram Bagh, Amritsar, and a few trees can be seen in the city of Lucknow. When the *asoka* tree is not flowering it resembles the litchi tree, and the similarity in the shape of their leaves is so great that a superficial observer can easily confuse one with the other. However, when the *asoka* is flowering, there is no scope for any confusion, for it is hard to find another tree with such beautiful flowers. When I saw a clump of *asoka* trees laden with bunches of crimson red flowers in a house in Lucknow, I greatly enjoyed the thrill of discovery. The coral red bunches of flowers bursting out of the branches of the *asoka* and peeping through the dark green mango-like leaves gave me great happiness. I then realized why the ancient Hindus adored this tree which was an ornament of their temple gardens and provided romantic themes to their poets and sculptors.

The *kadamba* tree proved elusive and it was after a great deal of search that I located a beautiful specimen in the compound of the house of a *talukdar* in Rae Bareilly district. It was a graceful *kadamba* with its spreading crown bearing a rich crop of ball-like flowers amongst a garniture of shiny broad leaves. The *kadamba* flowers resemble *laddus*, a sweet associated with Krishna. There were vast forests of *kadamba* trees in the region of Vrindaban about which we read in the Mahabharata, and now only a few specimens can be seen between Mathura and Bharatpur—remnants of a luxuriant forest which covered this area about 2,000 years ago.

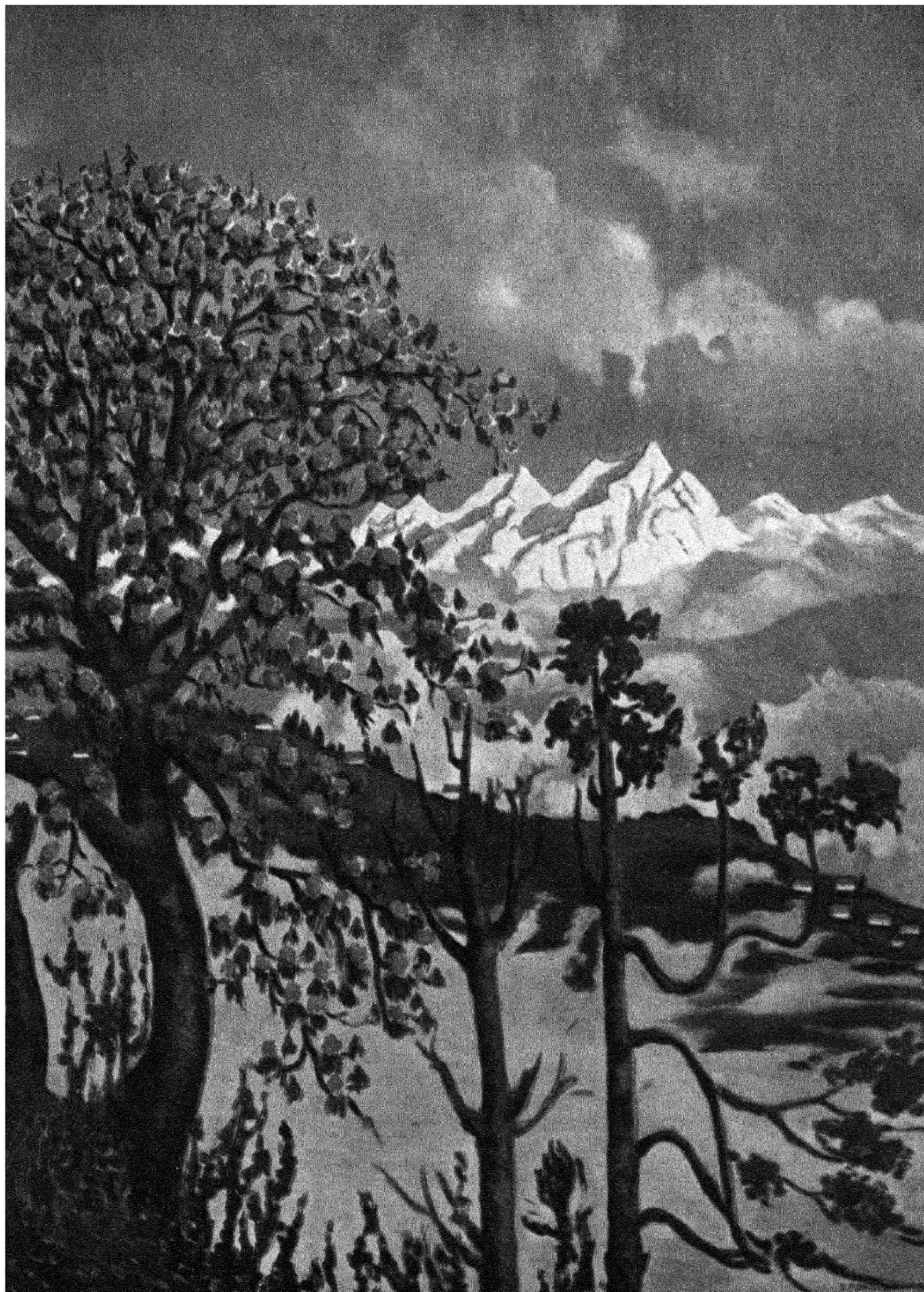
The *pipal* is the “Bodhi tree”, the tree of enlightenment under whose cool shade Gautama became the Buddha. The Bharhut sculptures date from the time of Asoka

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and we find that the person of the Buddha was not yet worshipped by the Buddhists. As E. B. Havell observes, "Everything is Buddhist, but it is Buddhism without the Buddha. He nowhere appears either as a heavenly person to be worshipped or even as an ascetic. The objects which attract the reverent homage of both men and beasts are the symbols of the faith: the sacred footprints, the Bodhi tree in which the Presence dwelt, but not the Presence itself." In these sculptures, we find groups of devotees worshipping the *pipal* tree, which is garlanded by *apsaras*. Surrounding the *pipal* are branches of the mango, bearing large clusters of fruits, and the inevitable corymbs of the *asoka* tree with tassels of leaves below. The halo of sanctity which the *pipal* acquired so early in the history of India continues even in this modern age, and the sanctity of the tree was a prolific cause of riots prior to August, 1947.

"Why did the Hindus regard the *pipal* tree as so sacred?" I often wondered. A *pipal* tree beside the village pond is the village club where the villagers assemble for an afternoon chat. Under its hospitable shade the wayfarer seeks refuge from the heat of the sun in summer, the elders gather for gossip and the boys watch the buffaloes enjoying their afternoon bath. It was in the month of April that I stayed in a bungalow in Bharwain in the Siwaliks of Hoshiarpur. The full moon of the *Purna-mashi* had spread a mantle of silver over the Suan valley. Against one corner of the bungalow was a tree with leaves shining like golden lamps. These were the young coppery leaves of the *pipal* which were transformed by the moonlight into myriads of fairy lamps. In the morning, the blazing sun of April came out from behind the *pipal* tree, turning their copper into molten gold. Thus I realized that the ancient Hindu poet was not exaggerating when he said that in the roots of the *pipal* is Brahma and in its stem Vishnu, and on every leaf sits a god.

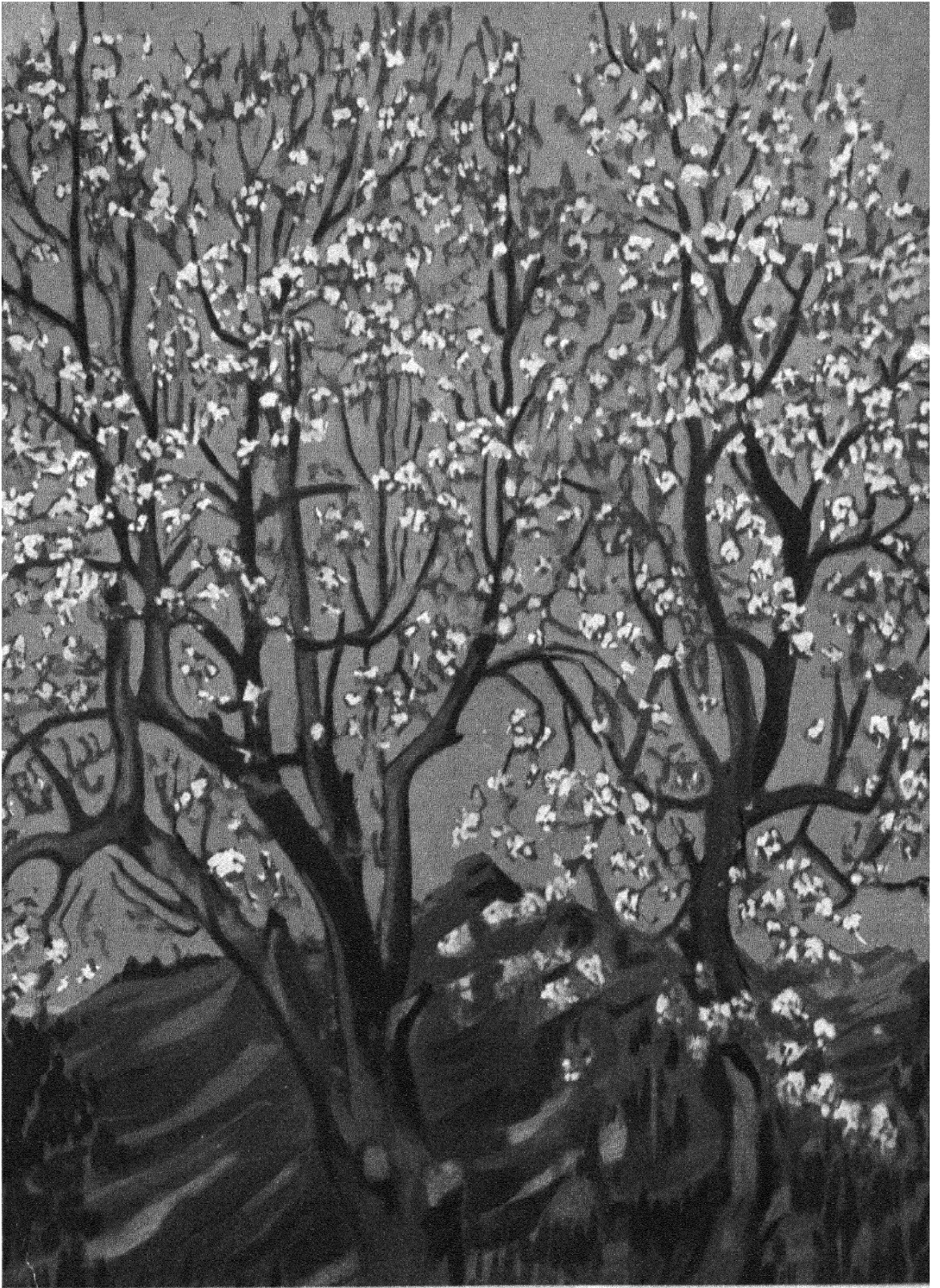
The beauty of the sculptures from Bharhut, Sanchi and Mathura stimulated my interest in the ancient Hindu and Buddhist gardens, and thus I became acquainted with the works of Kalidasa and Ashvaghosha and Vatsyayana's *Kamasutra*. The number of trees with which Kalidasa was familiar amazed me. Kalidasa must have been an ardent lover of nature watching trees in all their moods. He must have roamed the forests along the banks of the Narbada in Central India to the birthplace of the Ganges in the Himalayas where he must have seen the forests of pine and deodar. The study of the Hindu classics with particular reference to the beautiful flowering trees and of ancient tree-lore enabled me to reconstruct forest scenes among which lived our *rishis* and forest maids in close association with the trees they loved and looked after. When I contrast Kalidasa's knowledge with the ignorance of our present generation to whom every tree is a "tree", every bird a "*chirya*" and every herb a "*bootee*", I sometimes wonder whether we do not in some ways at least show retrogression. I remember a classmate of mine, a townie from Lahore, who could hardly distinguish a *pipal* tree from a *beri* though he was a graduate in Botany. He reminded me of another like him who was called up for



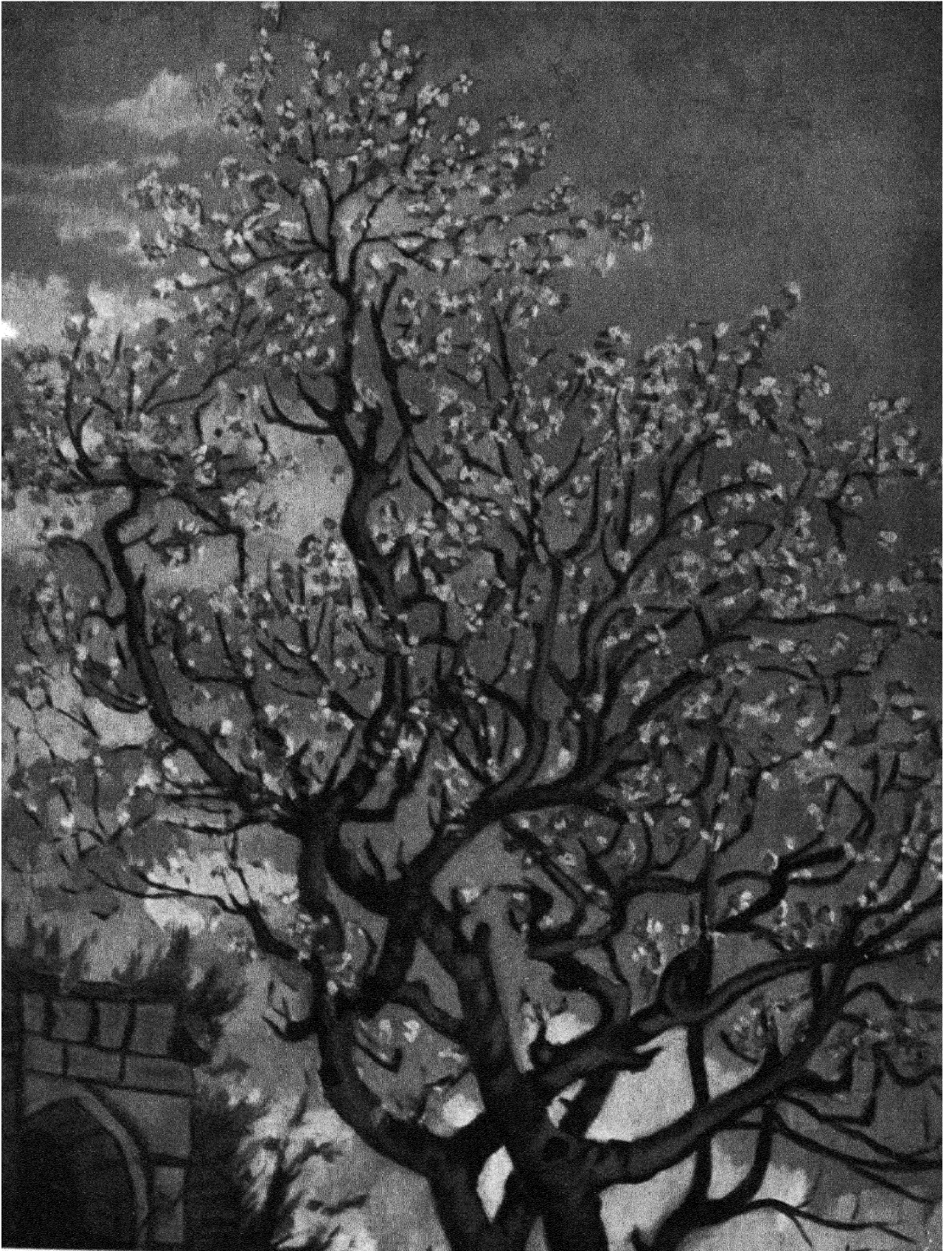
2. *Rhododendron arboreum* IN BLOOM IN THE HIMALAYAS



3. "THE WILD PEAR BURSTS INTO A WHITE UNIVERSE OF FLOWERS"



4. WHITE BAUHINEA



5. *Kancher* LADEN WITH ORCHID-LIKE MAUVE FLOWERS

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an interview for a job and when questioned whether he had ever seen a wheat plant, could not tell whether wheat grew on a herb, shrub or tree, and was not surprised when told that the beams of the roof under which they were sitting were made of wheat trees.

The artistic impulse which gave India the beautiful sculptures of Bharhut, Sanchi and Mathura, the mural paintings of Ajanta, the temple gardens of Nalanda and Taxila and the literature of Ashvaghosha and Kalidasa spent itself by the end of the seventh century A.D., and after that we do hear no more about the *asoka* trees and their lovely maidens. Nor do we see that inspiring art which has won the admiration of lovers of beauty the world over.

The quest of the beautiful tree ultimately became the quest of the beautiful in life—the Life Beautiful. I began to study the interiors of homes of people, the houses of cultured Englishmen as well as of Indians of all classes. The sober taste of the cultured Englishman, his selection of furniture and objects for interior decoration and their orderly arrangement were worth emulating. On the other hand, the lack of taste and absence of aesthetic values in an average middle class Indian home nauseated me. Then I was in the quest of the Home Beautiful. Was there a home in India which combined the aesthetic principles of decoration with indigenous materials? On a visit to Shantiniketan, I found such a synthesis in the home of Rabindranath Tagore, so tastefully decorated by his son Rathindranath who is himself a keen gardener and an aesthete. His small garden-house opening on to a beautiful garden where I could see almost every colourful tree of India, appealed to me greatly. Here was a place where one could contemplate beauty in an atmosphere of peace, the beauty of trees and the beauty of landscape, the beauty of the monsoon showers and the beauty of humanity arising from the serenity of mind, the hallmark of true culture, which comes from the contact of the human mind with nature.

I also found beauty in the mud houses of some of the villagers with their carefully plastered walls decorated with abstract figures of men, women and animals which have provided inspiration to some of our modern artists who have wandered in villages in search of folk art. I found real beauty in the mud houses of farmers in the Kangra Valley. Here were clusters of houses which seemed to grow from the earth and, like the *kainth* trees of the valley, are the true children of Mother Earth.

Ultimately, the pleasing discovery dawned upon me that the fundamental principles of the art of gardening, architecture, interior decoration and music are the same—rhythm, harmony and balance. Possibly these are also the basic principles of religion, which is the art of the inner life. Harmony must be in one's environment—the garden and the home are conducive to the harmony of the mind which one acquires by leading a life with truth for beacon light, by ignoring the pinpricks of life and making light of small annoyances, by emphasizing the essentials and by

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wood and bathe in the water of the river.' So they made their abode there, and on their return to Ayodhya, the name of the place was changed to Sitabani, or the 'Grove of Sita.' Sita did not forget the charm of the forest trees and pleasures of the bath in the river. Surrounded by the palace luxuries of Ayodhya on return from exile, she still pined for the jungle. Says she to Rama, "I long once more to wander through the shades of the brown woods, and plunge amidst the waves of Bhagirathi's cool translucent stream."

The *asoka* tree is so much associated with the name of Sita, who is supposed to have taken shelter in a grove of these trees when pursued by the lustful demon Ravana while she was in his captivity in Lanka, that it is befitting to call this tree *Sita asoka*. This will also avoid its confusion with another tree, also called *asoka* (*Polyalthia longifolia*), which has dull green flowers and does not compare with *Sita asoka*. Red is the colour of passion, love and devotion. It is also the colour of blood and liberty. In Eastern countries, the red colour has an erotic significance. That is why this colour is used in the *Holi* festival by young men for smearing the faces of young women. The red flowers of *asoka* are also associated with Kama Deva, the Hindu god of love. Red is also the colour of the sun, the source of all life, and of Brahma the Creator. In ancient Buddhist books it is related that the father of King Harsha daily offered a bunch of red lotuses to the sun-god as scores of people even now do in India.

If the degree of development of a culture is judged by the aesthetic level which the people reach, then we can safely say that the Hindu culture reached its heyday in the period 100 to 500 A.D., from the reign of Kanishka to the close of the Gupta rule. During this period flourished a number of outstanding personalities who added lustre to the annals of India. Of the poets and authors of this period, Ashvaghosha and Kalidasa deserve particular mention. Ashvaghosha, the spiritual preceptor of Kanishka, mentions a number of beautiful trees in his *Sundara Nanda* in which he describes the love story of Nanda, brother of the Buddha. He compares the broken-hearted Nanda trying to conciliate his mistress to a "*naga* tree (*Mesua ferrea*) broken down by the wind from its excessive burden of flowers." Describing the apathetic mood of Nanda pining for his beloved, he writes, "The *naga* trees there, though studded with flowers with yellow interiors as if with gold-fitted caskets of ivory, no more drew the eyes of Nanda in his sorrow." In his description of a jungle in the sub-Himalayas, he describes waving *kadamba* trees, and the *parijat* tree "shining with all the qualities of majesty, and playing the king over the *mandara* trees and other trees laden with the bloom of the day, water-lilies and red lotuses." Ashvaghosha compares Nanda's mistress to a lotus pond, "with her laughter for the swans, her eyes for the bees, and her swelling breasts for the uprising lotus buds."

However, it was in the fifth century A.D., when Kalidasa and Vatsyayana

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flourished, that the Hindu mind was fully in touch with nature, the beautiful trees and flowers and graceful *sarus* cranes with the countryside resonant with their melodious voices. Kalidasa describes the *asoka* tree in most of his plays, and in his *Ritusamhara* he gives charming descriptions of most of our indigenous beautiful trees which flower from month to month. In his description of spring he describes the mango tree bent with clusters of coppery red leaves, and their branches covered with light yellow fragrant blossoms shaken by the March breezes, which kindle the flame of love in the hearts of women. He describes the *asoka* trees with their graceful drooping young leaves hanging like tassels of silk, covered with coral red blossoms which make the hearts of young women *sasoka* (sorrowful). He describes jungles of *dhak* (*kimsuka*) resembling a blazing fire waving in the wind, making the earth appear like a newly-wedded bride with red garments. How aptly he compares the scarlet flowers of *dhak* with the bright red beaks of parrots! In his description of women's toilet he mentions that they paint their bodies with the fragrant paste of white sandal and cover their breasts with garlands of snow-white jasmines, and perfume their beautiful heads with *champak* blossoms. In the rainy season, women decorate their heads with garlands of *kadamba*, *kesara*, *kakubha* and *ketak* flowers. It is thus that Kalidasa describes the toilet of Shakuntala :

The *siris* blossom, fastened o'er her ear
Whose stamens brush her cheek;
The lotus-chain like autumn moonlight soft
Upon her bosom meek.

After the Guptas we notice the decay of Hindu culture. The Hindu mind got so tarnished that it became completely oblivious of the beauty of *buteas*, *erythrinas* and *bauhineas*. Hindu poetry became stereotyped, completely lost the erotic charm of Kalidasa and degenerated into *bhajans*, the so-called devotional songs, which were colourless, pessimistic and insipid, and showed much concern for the next world for which the devotee was supposed to be preparing by fasting and prayers.

Our ancestors were much beauty-conscious. It is a shame that we, their successors, who claim to be more civilized are aesthetically so dull. For most of us, our *amaltas* trees decked in the golden glory of their graceful, pendulous racemes of yellow flowers have been flowering in vain. This also explains why our *kachnars* with their March mantle of mauve-purple flowers have been languishing in obscure corners of our public gardens, and our *Lagerstroemias* laden with pinkish red flowers have been lying neglected in our parks and gardens. This has been the fate of the indigenous trees, and as regards the exotics like *Browneas*, *Colvilleas*, *Peltophorums* and *Milletias*, they are known only to the curious few.

Most of our good things are discovered by foreigners, while we, who live surrounded by them are oblivious of their beauty or merit. Unless a certificate

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of merit is obtained from a foreigner, a poet, a painter, an author, a dancer, or even a tree has very little value in our eyes. Tagore became known in his own country when the English translations of his poems reached Europe and won appreciation. Uday Shanker's worth was recognized in India only when his dances were extolled in Europe and America. We are grateful to appreciative Englishmen who have helped us in rediscovering our country and its culture. Havell rediscovered the virtues of Indian art; Roerich, Smythe and many others the grandeur of the Himalayas; Blatter the beauty of our trees. It is time the knowledge of beautiful ornamental trees was disseminated among all people, particularly among the younger people, so that their environment may become more cheerful and colourful and they may develop an aesthetic sense.

Talking about popularizing art, Roerich says that pictures should find a place not only in art galleries and museums, but also in hospitals and even in jails. When art invades jails, they will cease to be jails, for a man who can appreciate a good picture will no longer remain a criminal. Similarly, a human being who can admire beautiful flowers ceases to be materialistic and his mind rises to a higher plane. So in the cultural development of a community or a nation, a bioaesthetic plan has a very important function.

Our poets have plenty of indigenous material for their poems in our beautiful trees, and yet how blind they are to the splendour of *kachnar* blossoms and even to the golden glamour of *amaltas* ! We should introduce themes on beautiful Indian trees in *mushairas* and *kavi sammelans*, and ask our poets to give us descriptions of *kachnar*, *amaltas*, *champak* and *jacarandas* in their poems, so that we may gladden our hearts and revel in the beauty of their blossoms when their flowers are dead and gone. These poetical symposiums will also afford us an opportunity of giving suitable names to exotic trees which have found a home in our country.

CHAPTER III

THE PAGEANT OF THE SEASONS

THE pageant of the seasons in Northern India is truly exciting. The Hindu year is divided into six seasons, each season consisting of two months. *Vasant*, the spring, comprises the months of *Phagun* and *Cheter*. Summer scorches the countryside in the months of *Jyesth* and *Asarh*. Then follow the rains from *Sawan* to *Bhadon*. When the skies have cleared in the month of *Asuj*, autumn, with its beautiful cloud-effects and golden sunsets begins, and in the month of *Kartika* the nights sparkle with moonlight. From *Mangsar* to early *Poh* is the early winter, the *Hemant*, when the climate becomes cool and bracing. From the latter half of *Poh* to early *Magh* is the winter, *sishir*, when there is biting cold, fields are covered with frost and snow falls in the Himalayas. According to prevailing temperatures, the year can be divided into four seasons—spring, summer, autumn and winter, which can be compared to the four parts of the day—the dawn, noon, sunset and the night. Spring corresponds to the dawn, summer to the noon, autumn to the sunset and winter to the night.

Vasant, the Indian spring, is heralded by the cooing of doves and the yellow flowers of *sarson*, which in the first week of February wave like a sea of gold. The *shisham* trees get covered with pale green silk-like leaves. Men and women wear saffron clothes and harmonize with nature. The merriest festival in ancient India was the *Suvasantaka*, the spring festival, celebrated in honour of Kama Deva, the god of love. Dancing, singing and merry-making were organized in every village, and both men and women participated.

The *kachnar* trees, which in February appeared so unattractive with their dark, leafless branches, produce a rich harvest of pink, white and purple-mauve blossoms, and for full one month they add colour and charm to the landscape. The delicate blossoms of *kachnar* trees fill one's heart with bliss and soothe the eyes. *Kachnars* are followed by *semal*, the giant silk-cotton trees, so common in the Kangra Valley. The gaunt limbs of the *semal* are decorated with cup-like scarlet flowers, and the tree reminds one of the goddess Lakshmi, with numerous arms, holding scarlet lamps on the palms of her outstretched hands. The sombre mango groves suddenly begin to pulsate with life and produce pale yellow blossoms in profusion. Attracted by the fragrance of the mango blossoms, *koels* come to the mango gardens, which are filled with the pleasant echoes of their calls. By the middle of March, spring is in its prime.

The twisted *dhak* trees, unworthy of notice in winter, shed their trifoliate leaves, and their twisted limbs get covered with dark brown buds. As if touched by a magic

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wand, the buds open suddenly, and the trees are ablaze with flame-like orange-scarlet blossoms. Clad in the dazzling scarlet robe of *dhak* flowers, the earth looks like a young bride.

In the Kangra Valley, the fields and hedges are dotted with snow-white blossoms of *kainth*, the wild pear. A small unsightly bushy tree a few days ago, the wild pear flowers before the leaves unfurl in the last week of February, and becomes a dome of white blossoms. "I am the white song of creation," says the *kainth*. By the middle of March the young leaves open, fledging every tree with pale green silk, and provide garniture for clusters of silver-white blossoms. In hedge-rows, the yellow blossoms of *Basant* are seen in profusion, and their pouting corollas are strangely significant of the spring season. Along the watercourses, thousands of gentians with turquoise-blue flowers provide a delightful frame to the fields of green wheat. In some of the fields, blue flowers of linseed are mixed with yellow blossoms of *sarson*, providing a delightful colour contrast.

There is warmth in the air and lovers feel drowsy with amorous languor. Even days and nights have partaken of the colourfulness of *Phagun*. *Phagun* is the season of love, and the lovers long for *Phagun* as the dark night longs for the full moon.

Swings are put up among the blossom-covered branches of trees in which bees are humming, enjoying the fragrance of the flowers. The spring is in full bloom and great are love and joy. Jasmines open their buds and fill the air with their perfume. The sky is clear blue like the Mansarover lake, and the sun and the moon are its giant blossoms.

The spring slowly ripens into summer. By the first week of April it starts getting warm. Most of the trees produce new leaves, and the umbrella-like *pakurs* get covered with coppery leaves and appear most charming. When the slanting rays of the evening sun strike the young leaves of *pakur*, they appear like a cloud of fire. In damp places, myriads of fire-flies are seen twinkling like stars, and "weaving aerial dances in fragile rhythms of flickering gold." Dry leaves of trees fly about, and weird bonfires are seen under *mahua* trees. The air is heavy with the fragrance of *nim* and *sirisha* flowers, and the quiet of the night is disturbed by the rattling noise of *sirisha* pods. The rust-red young leaves of *mahuas* are tipped with gold in the rays of the morning sun. *Gul mohurs* are flushing into vivid scarlet, and it is getting warm.

Hot winds blow and scorch the vegetation. Dust devils are seen whirling into brown spirals, linking the earth with the heaven and sucking leaves and dust into their bodies. The fierce rays of the sun beat mercilessly on the coppery earth, and the atmosphere is filled with stifling dust. All men and beasts seek shelter in shade. Peacocks sit like statues amidst the trees and pray for rain. They are oblivious of the presence of peahens, who follow them in the shade of the trees. The hot, dry wind blowing over sand dunes produces mirages of rivers and lakes and attracts herds of

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deer for miles. Even tigers are fatigued and lie languidly in their caves. The whole firmament is aglow with the dazzling radiation of the sun. The lakes, which were filled with pink and white lotuses a month ago, are drying. Thirsty buffaloes are wallowing in the mud with their tongues protruding. Forest fires cause havoc among birds and beasts, the denizens of the forest. Elephants, oppressed by the heat, rend the air with their trumpeting. Cobras leave their holes. Wayfarers seek the hospitable shade of mango groves, and quench their thirst from the *piayo*.

After the parching heat of *Jyesth* and *Asarh*, clouds, the white elephants of Indra, appear in the sky, and provide joy to the farmers anxiously waiting for the rain, as well as to lovers in search of coolness. On sighting the purple clouds and hearing the thunder, peacocks shout with joy and spread their rainbow coloured tail-feathers into gorgeous fans. The *kadambas* are covered with yellow ball-like flowers.

Rain-clouds drench the earth with the water of life, and the thirsty brown earth suddenly gets covered with a carpet of green grass. Velvet insects, the scarlet *birbahauties*—the brides of the heroes, make the earth look like a pretty woman decked with sparkling gems. The rain patters on the leaves of the mangoes and exquisite music flows from the crowns of the mango trees. Crowds of women and children wander in the mango groves in search of ripe, golden mangoes filled with nectar-like juice, which drop from the branches. The raindrops give birth to iridescent bubbles on the placid waters of the village pond, which, after their momentary glamour, merge into the water of the pond.

The clouds have parted, and through the thin spray of falling rain we have a glimpse of the sun. A rainbow appears in the sky and it seems as if the earth and heaven meet on a seven-coloured swing. On the village common, buffaloes and cows are grazing the lush green grass, which the generous rain clouds have provided. In the branches of the mangoes and the light green *shishams*, green parrots are flying. On the white flowers of the grass, saffron-coloured butterflies are beating their wings.

The moist air of *Sawan* is drenched with the fragrance of jasmynes, and the Queen of the Night and *mehndee* exhale delicate fragrance. The white flowers of gardenia are studded over the hedges like stars in the dark blue sky. "The golden-glowing *champak* buds are blowing by the swiftly flowing streams."

Describing the toilet of women of his age, Kalidasa observes: "The women of Alakapuri rub the dust of *lodhra* flowers on their cheeks, *maghya* flowers decorate their temples, *kuruwaka* flowers hang from the knots of their hair and *sirisha* flowers decorate their ears. In the monsoon, *kadamba* flowers glorify the heads of these charming women and they carry pink lotuses in their hands." Even now the women of Maharashtra decorate their tress-knots with the white *champak*, "the moon hanging by the mountain", and wear bracelets of jasmine round their wrists. Garlands of

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jasmine and *bela* are popular all over India during summer, for we have always had a sensitive appreciation for the fragrance of flowers. While the Europeans feasted their eyes on colour and developed beautifully-coloured flowering annuals, Indians packed their gardens with sweet-smelling flowering creepers, shrubs and trees.

Rivers are swollen with turbid water, in whose mighty current large trees uprooted from the banks are tossed about like straw. Clouds rumble ceaselessly, and in the dark night, water drips continuously from the leaves of trees and creepers shaken by the powerful wind. The bees have forgotten all about honey and the fragrance of flowers, and are hiding themselves in heaps.

Sawan is the month of lovers, amorous and passionate. In the cool and fragrant breeze of *Sawan*, lovers who are parted feel unhappy and long for each other. Brides away from their husbands feel sad. Lovers who are united watch the dark, rolling clouds and the flashes of lightning. Cleaving the dark clouds with their golden legs are flights of white cranes, who provide a thrill to the lovers drunk with the joy of the rainy season.

The rains have ended. The atmosphere is free from dust particles and haze, the sky is deep blue and the air cool. In the autumn, glorious sunsets are seen. The earth is covered with silver grass tipped with white blossoms like Yak's tails, which wave gracefully in the air along the banks of rivers. In the blue sky float pure white rainless cumulus clouds, like cotton-wool scattered by the bow of a wool carder. The autumn-flowering *kachnars*, the *kovidara* trees, are laden with thousands of pink-purple flowers which invite myriads of bees.

In the Kangra Valley, the *padam*, the carmine cherry, is a never-to-be-forgotten sight. The *padam* with its carmine blossoms dangling in clusters, seen against the blue Himalayan sky lighted by the rays of the setting sun, appears like a cloud of fire. "I am the rose-cloud of pleasure floating in the dream of the autumn," says the *padam*. The leaves of the oaks are rich brown, and the maples and chestnuts with their golden brown leaves stand out conspicuously among the other trees of the forest.

On the banks of the rivers, *sarus* cranes amble gracefully, and flights of ducks can be seen gliding from the mountains to the *jhils* in the plains. Farmers are harvesting paddy and the roofs of their houses are covered with amber cobs of maize. The moonbeams dance on the white panicles of silver grass, transforming them into magic pillars. The night is filled with silvery radiance, and the sand in the dried beds of mountain ravines sparkles like diamonds.

The month of *Magha* announces the arrival of winter. The days have shortened and the nights have lengthened. The sky is dark blue with not a patch of cloud. A cold wind blows from the mountains and men and cattle seek warmth in the nooks of houses. *Kachnar* trees have shed their leaves, and their bare branches appear

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“like the naked swarthy *gopikas* of Vrindavanam, whose clothes and jewels the cloud-god has stolen in a divine mischief.”

As the sun rises, life quickens and the villagers draped in blankets sit in sheltered sunny nooks of the courtyards of their houses and on roof-tops. The air is like champagne, bracing and invigorating.

CHAPTER IV

TREES IN MODERN INDIAN ART

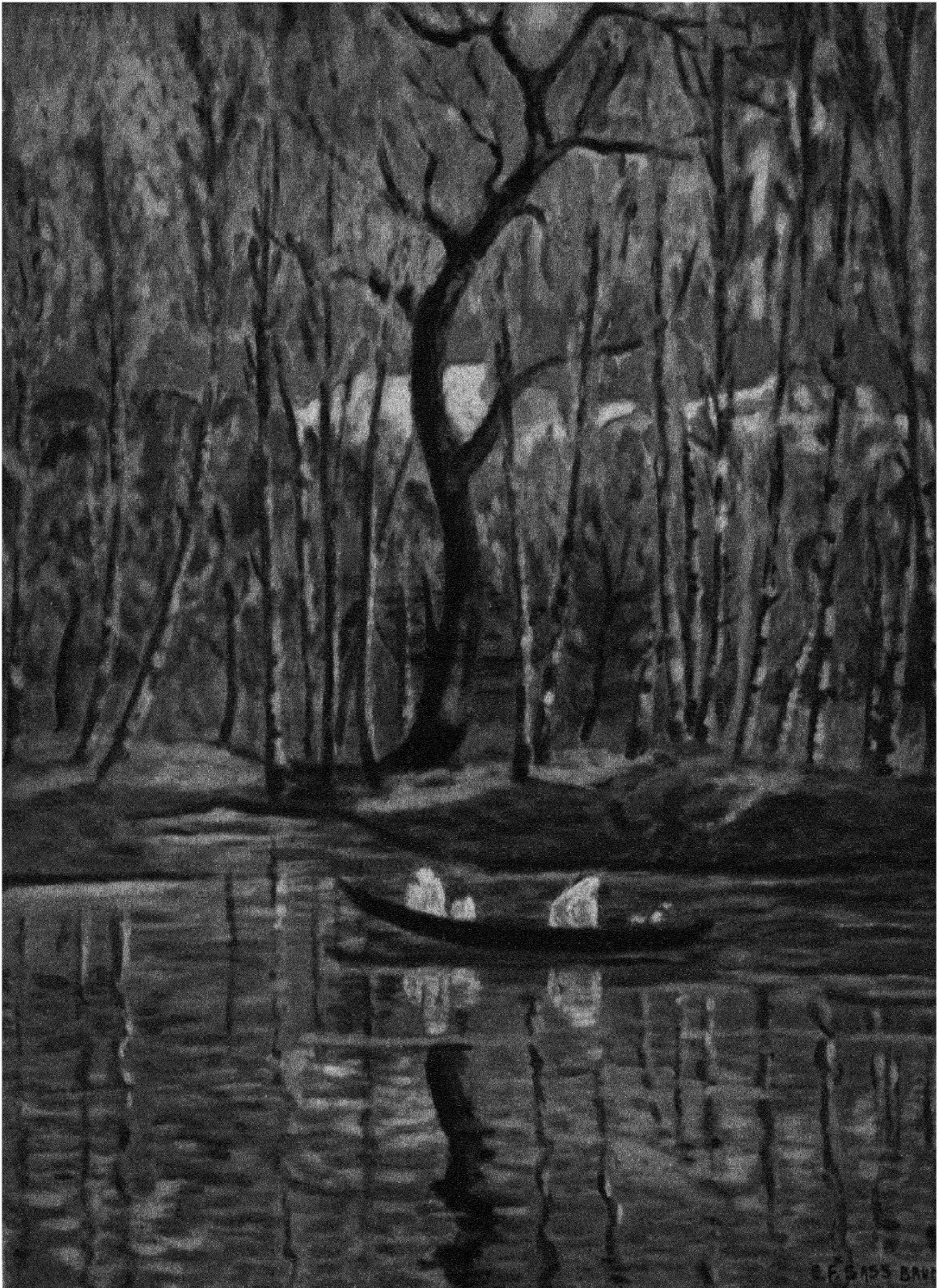
AFTER discovering the beauty of our trees in the present and the past, I felt how inadequately our trees had been painted by our artists. A tree laden with flowers is a great joy to the beholder, but its glory is all too brief. These fleeting moments of joy can be perpetuated only in the form of paintings. Mere words, I realized, could not adequately convey the beauty of the baubineas and the buteas. To my amazement I found that most of our modern artists were blind to the beauty of our trees. Our forests contain a wealth of trees, only a few of which, I found, had attracted the attention of our contemporary artists.

The Himalayan forest trees have a personality of their own. The smooth-leaved *kharsu* oaks with their drooping branches laden with festoons of lichens look like Himalayan hermits with matted locks and convey the impression of age and wisdom. The stately firs appear like well-groomed soldiers guarding the sanctuary of Shiva, the god of the Himalayan snows. The twisted *banj* oaks with the dark ugly knotted stem draped in a coat of moss and epiphytic ferns, give a sombre appearance to the Himalayan forests, toning down the sparkling red blaze of the rhododendrons.

The stately deodars with their smoke-like planes and spire-like crowns are really the monarchs of the forests. They are, in fact, aristocrats of the Himalayan forests, nurtured by the golden breasts of the daughter of Himachal. That is why they hold their heads high, and stand upright, looking so distinguished among all the forest trees. The forest of Manali in the Kulu Valley, with the deodar trees growing on a plateau interspersed with moss-covered boulders, reminds one of a scene from Shakespeare's 'A Midsummer Night's Dream'. The deodar forest along the bank of the Khajair lake near Dalhousie on the way to Chamba is unrivalled in stateliness and grandeur.

The search for the Tree Beautiful on canvas thus led me to artists like Bireshwar Sen. I knocked at the door of the Art School at Lucknow and met this amazing little man, and was able to divert his attention from the Himalayas to flowering trees, and he and his pupil Lakshmi prepared a number of sketches of flowering trees. Their sketches of moulmein rosewood showing the purple-mauve flowers of the tree against the background of tamarind are beautiful. Sen has also painted the colville's glory, the purple baubinea and the pink cassia.

Lakshmi's painting of *asoka dohada* in which he has illustrated the theme of the awakening of the *asoka* flowers by a beautiful maiden, is a landmark in the tree art of India. The *asoka* covered with drooping tassels of light green leaves and bunches

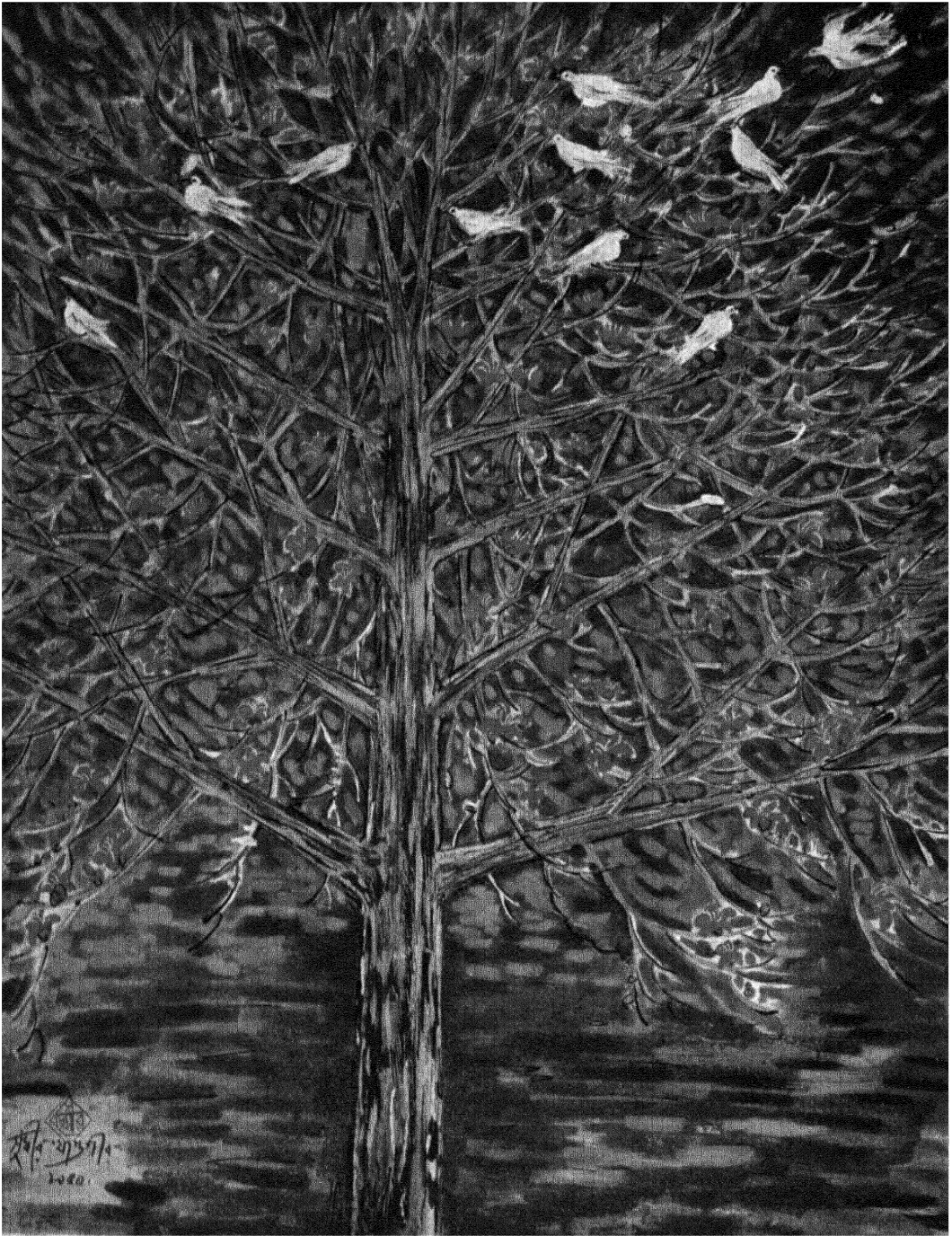


6. AUTUMN



7. *Kachnar* BLOSSOMS





9 THE SILK COTTON TREE DECORATED WITH SCARLET FLOWERS

of orange-scarlet flowers has been painted in exquisite colours and the young maiden in her gaily coloured drapery, in a joyous mood, greatly enhances the beauty of the tree.

Then I came across Serbjeet Singh and Ganga Singh. It was left to young Serbjeet to paint the forests of deodars. His picture of a hill dance near the Khajair lake effectively conveys the sombre atmosphere of a deodar forest. Serbjeet Singh has also painted the alder glades of the Kulu Valley. A group of Kulu men and women in colourful costumes standing on a bridge with clumps of alders on all sides is a picture of great beauty and artistic merit.

Ganga Singh's paintings of flowering branches of beautiful trees of India faithfully depict the shape and colour of flowers, leaves and branches. For their accuracy and freshness of colour, his paintings stand unrivalled.

Ganga Singh, who was attached to the Forest Research Institute, Dehra Dun, as its official artist, is admittedly one of the best plant artists of the world. He was mainly patronized by British officers and their wives. Lady Willingdon acquired a collection of his paintings which decorate her home in England. In Delhi, a small but representative collection of his sketches of flowering trees, shrubs and creepers can be seen in the Botany Division of the Indian Agricultural Research Institute.

A larger collection of his paintings can be seen in the Forest Research Institute, Dehra Dun. It is said that some of these paintings are so life-like that they even attract bees and butterflies. Most of the plant sketches of Ganga Singh are botanical in character and are painted in water colours. Recently, he has adopted the oil medium and has painted flowering branches of *asoka* trees and red flowers of *Rhododendron arboreum*. The Flame of the Forest, which has provided themes to so many plant artists, has been painted by Ganga Singh so vividly that one actually feels the presence of a living tree.

It was in Delhi that I met the garrulous Anil Roy Choudhry, who attracted my attention by his very beautiful paintings "Santhal Girls" and the "Flame of the Forest". He is one of our few Indian artists who have painted some of our flowering trees. His "Santhal Girls" is a picture of outstanding merit. Against a background of orange-scarlet *dhak* flowers the pair of swarthy Santhal girls decked in coloured beads and trinkets appears rather attractive. The flame-like beauty of *butea* lends glamour to the girls who reflect the glory of the *butea* blossoms and provide a pleasant contrast.

In their treatment of the tree theme, Gopal Ghose and Manishi Dey are a class by themselves. Their rendering of the "Tree" is novel and original. In his "Coral Tree", Gopal Ghose has drawn the tree, which is common in Bengal, in an impressionistic style. By a few strokes of the brush he has successfully portrayed the character of the coral tree. This painting seems to be an essence of the tree world,

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expressing the nature, and not merely the likeness, of a coral tree. Manishi Dey's sketch of *amaltas*, the Indian laburnum, is also unique. By an exaggerated treatment of the racemes of yellow flowers of the *amaltas*, Manishi has been able to convey, in a remarkable manner, the character of the tree while in bloom.

Down in the South, I met Madhava Menon, the artist of Kerala, who has painted trees and animals of South India with extraordinary sensitiveness and feeling. His paintings of bamboos and frangipanis are extremely beautiful and compare with the work of old Japanese masters in delicacy and simplicity. In Madhava Menon, the white-stemmed *Plumeria* of Travancore-Cochin has found her most sympathetic interpreter, and one almost feels the presence of this glorious tree which adorns many parks and gardens in Trivandrum.

The credit for painting the colourful flora of Sikkim goes to a frail young woman artist, Devyani Kanwal Krishna, who has the unique experience of extensive travel in the forests of the Eastern Himalayas. She has painted the coral trees, rhododendrons and orchids of Sikkim with great feeling. Seeing her paintings of the Himalayan trees, shrubs and climbers is a rare treat; one feels as if one is wandering in the mountains and valleys of Sikkim clothed with extraordinary variety of purple, mauve and crimson rhododendrons, while from the trunks of stately trees, pink, mauve and pale yellow orchids sway gracefully in the cool breeze of the Eastern Himalayas.

Sudhir Khastgir, who has been impressed for years by the graceful rhythm of the female dancing figure, has recently turned his attention to beautiful trees. *Amaltas* and *palas*, the trees of the forest, have attracted him and he has interpreted these colourful trees in paintings of extraordinary power and passion. His painting of *amaltas*, with the tree bending under the load of golden flowers swaying gracefully on a group of village girls returning from the well in the forest carrying red earthen pitchers, is beautiful. The limpid tropical earth, hot and aroused, seems to be blossoming with the joy of creation. He has shown the *palas* in the full blaze of its spring glory, and the white doves in the sky look as if they are escaping from the scorching flames of the tree.

Francis Brunell, a French artist and diplomat who lived in Delhi for many years, was also attracted by the beautiful trees of India. His paintings of Indian trees have a character of their own and are unrivalled for the freshness and delicacy of colour. A collection of his tree paintings can be seen in the Public Library at Mehrauli near the Qutab Minar, Delhi. *Amaltas* is his favourite tree. His "Forest of Gold", showing a clump of *amaltas* trees laden with yellow flowers against the blue sky of May with a yellow haze in the horizon, is thrilling. His paintings of flowering branches of *amaltas* showing its golden yellow flowers against a light blue background are exquisitely beautiful. Brunell has also painted the flamboyant, and has successfully depicted the flame-like beauty of its scarlet flowers. His paint-

ings of apple and peach trees of Kashmir are characterized by softness of colour, and show a charming contrast of blue and white.

It was, however, a Hungarian artist who really captured the beauty of the jungle trees of India. My acquaintance with Madame Sass Brunner and her daughter Elizabeth was made through their book "Mystic India" which contains a selection of reproductions of their paintings. These tree paintings aroused my interest in the work of the Brunners, and I undertook a journey to Naini Tal and met them in a house called "St. Cloud". There I was shown a wonderful array of tree paintings depicting the graceful palm trees on lotus lakes, venerable banyan trees meditating on the banks of the Ganges and flaming *gul mohurs* against the blue sky of May.

Madame Brunner is one of the most sympathetic interpreters of Indian trees. Among her numerous studies of India's famous trees, the Flame of the Forest features in a good many. When the tree sheds its leaves and is clothed in scarlet blossoms, it fills the forest with its radiance. Against the background of a blue sky, the scarlet flowers of the Flame of the Forest stand in glowing contrast. Madame Brunner's paintings of this tree are remarkable for their accuracy, depth and brilliance of colour. She has faithfully delineated the form of the tree, and has been able to convey the atmosphere of the *dhak* forest in natural colour.

Having spent a considerable part of her life in the Himalayas, Madame Brunner has studied the mood of trees in different seasons. For instance, her painting of poplars in a leafless condition in winter reflected in the waters of the Jhelum is a charming study in lines. She has also Painted the saffron terraces and the *chenar* trees of Kashmir. The yellow autumn tints of the *chenar* contrasting with the sombre green of the pine forest and the blue sky with cumulus clouds in the background, remind one of autumn in the Himalayas. In another painting, she has shown the same tree in a leafless condition in winter, covered with snow. A group of ravens sitting on its branches in a mournful manner provides an interesting contrast, and is symbolic of winter. The same tree covered with green leaves with a carpet of yellow flowers below, reminds one of the spring season in the mountains.

The wild cherry tree with its pink blossoms is one of the most beautiful trees in our mountains and is a favourite theme of a number of Madame Brunner's paintings. She has painted this tree in various forms : with its black, gnarled stem and branches covered with pink blossoms against the blue sky and the white Himalayan snows in the background. The mountain ebony, or the white bauhinia, which flowers in March, is one of the most beautiful trees which grow in the plains as well as in the mountains. Its white flowers are a symbol of youth and purity and nobody has painted them more beautifully than Madame Brunner.

The rhododendrons with their scarlet bunches of flowers and the *banj* oak tree with its twisted branches covered with festoons of lichens, enliven the Himalayan landscape in April. Madame Brunner has painted the oak in all its moods. She has

FLOWERING TREES IN INDIA

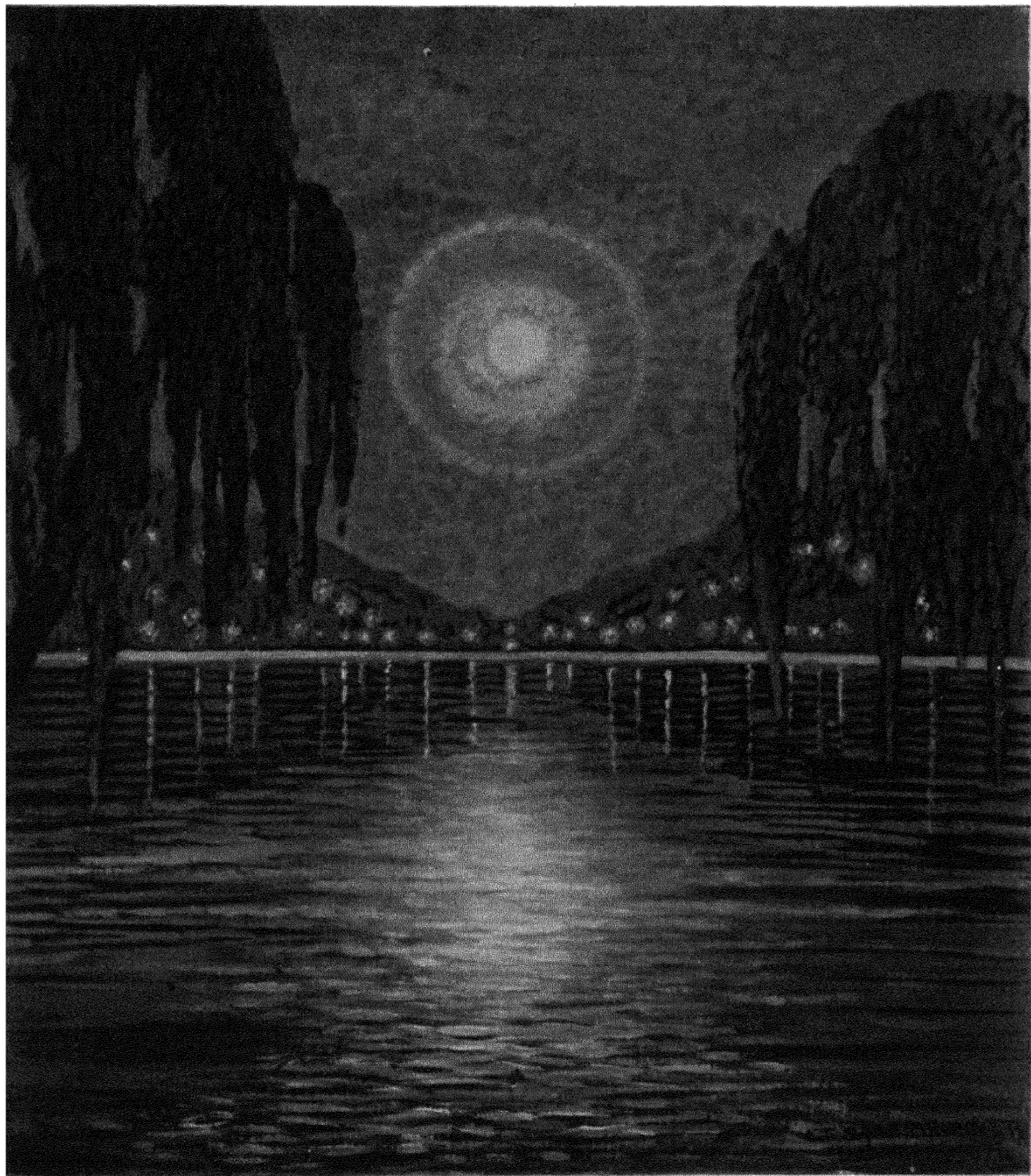
painted the *banj* oak in winter when it is leafless and its gaunt crooked branches are covered with dark brown lichens, and in summer when it is draped in dark green leaves. Her rhododendrons truly depict the spirit of the spring in the Himalayas. The weeping willows of Naini Tal with their graceful pendulous branches waving in the mountain breeze, and ivy creepers clinging to oaks and alders also find a place in some of her paintings. Even jacarandas with their purple-mauve flowers, which almost defy pictorial description, have been successfully painted by her.

The banyan tree, a symbol of wisdom and of tropical luxuriance, is a favourite with the villagers and the folk-loreists in India. Madame Brunner's paintings of the banyan present great artistic merit. Her painting which illustrates a procession of women in colourful clothes carrying pitchers of water, and long, rope-like aerial roots of the banyan dangling in the humid air, depicts a familiar scene in the rural life of South India. No doubt, Madame Brunner's paintings will be loved and admired by all lovers of trees.

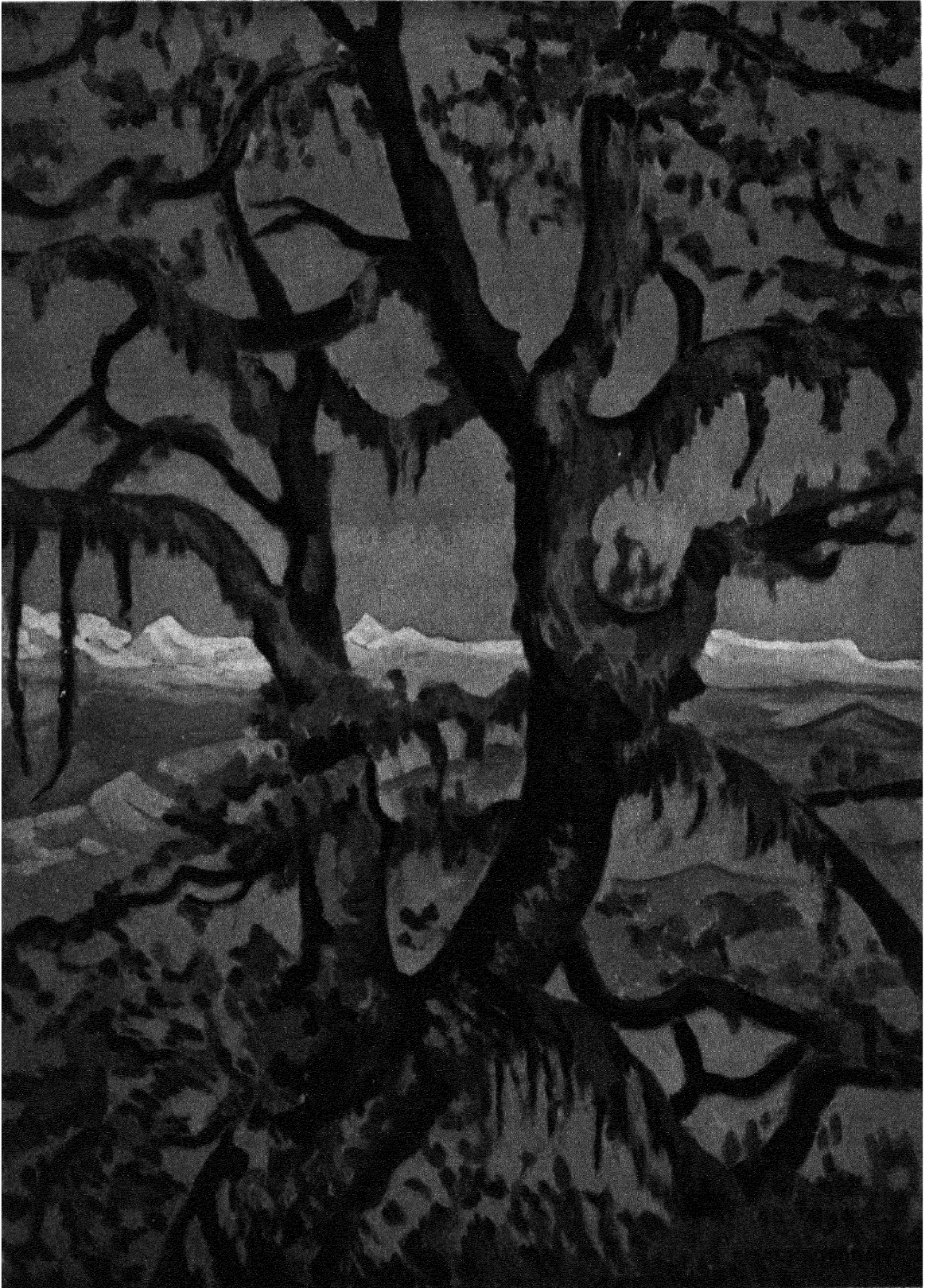
But besides these artists and a few more, there is a great void in India regarding the flowering trees in art. One reason for this neglect of the tree in the art world is the ignorance of the artists who come from urban middle class families, and never stir out of their classrooms or studios to study nature at first hand.

It is time the curse of conventionalism was lifted from Indian art and the spell of Ajanta which has stifled all originality broken. It is not implied that the frescoes of the Ajanta caves are not beautiful and lack the merit which is commonly attributed to them. The pictures which the Ajanta artists have left us are undoubtedly beautiful creations. They have an appeal to aesthetes, for they faithfully represent the everyday life of the people of that age, apart from the excellence of their technique. The artists of Ajanta undoubtedly painted pictures of great merit, but their greatness should not become an Old Man of the Sea on the shoulders of our present-day artists. We who live in the twentieth century, the most eventful era in human history, sometimes become victims of escapism, and out of sheer cowardice seek relief from the painful reality which is life by imagining a Golden Age, a *Satyayuga* of the past, and peopling it with mythical heroes. We see the sad spectacle of Indian artists who are blind to the beauty of snow peaks and flower-filled valleys and colourful trees. Our artists should live in the present and observe their surroundings with eyes wide open.

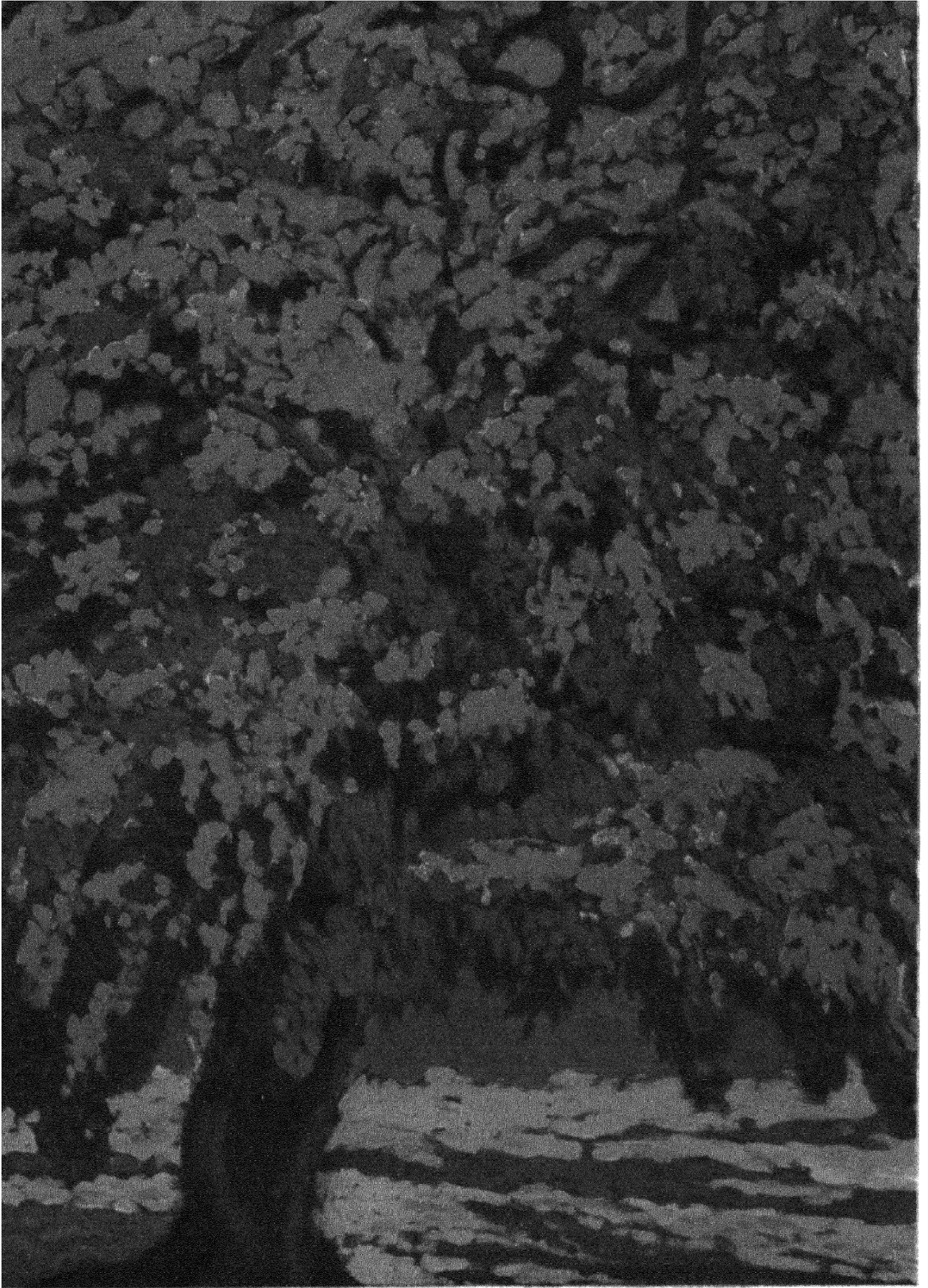
Let them open their eyes to the beauty of their mountains, rivers and trees. What a wealth of colour is sprayed in our countryside from month to month !



10. WILLOWS OVER NAINI TAL LAKE



11. THE OAK IN THE HIMALAYAS. (H. J. WOODS)





13. THE GOLDEN YELLOW BLOSSOMS OF *amaltas* BRIGHTEN UP THE FOREST

CHAPTER V

TREES IN INDIAN FOLK-SONGS

“**O** *SHISHAM* tree of my village, at least you remember me!” exclaimed an old man as he affectionately embraced the tree. “You are still standing by the roadside where I left you twenty years ago!” He had returned from Shanghai to the village of his birth in the Punjab. Nobody had come to receive him at the railway station, nor could he recognize any of the persons who were present there. He hurriedly left the platform and rushed to the tall, shady tree by the roadside. His attitude symbolized man’s time-honoured love for trees.

In India, planting of trees has always been regarded as an act of piety. The hospitable shade of a *nim*, a banyan or a *pipal* comes as a boon to the weary traveller who has to undergo the ordeal of walking on a dusty, shadeless village road in the countryside. These trees have been sanctified in folk-lore and religion. It was under the shade of a *pipal* that the Buddha obtained the Inner Light, and many generations of Buddhists have worshipped it as the sacred Bodhi tree.

To the aborigines of India’s jungles, trees mean a good deal more. The words for tree and house are practically the same among some of the aboriginal tribes of India and Ceylon. The Veddas of Ceylon, who still live in the forest, use the Sinhalese word *rukula* for a hollow tree as well as a house, and thus remind us of the primeval times when the ancestors of mankind lived in hollow trees and caves. But as the society passed on from the hunting to the agricultural stage, the tribe continued to hold the ancestral trees in reverence. Though the jungles were cleared for cultivation, groves were invariably left in the clearings. The village grove was also the refuge of the dispossessed spirits. Every tree possesses a spirit, as the tribal lore emphasizes, and even today the tribesman formally seeks the permission of the spirit of the tree before applying his axe to it. Certain tribes attributed intellect and consciousness to sacred trees; rarely, a tree was even endowed with the power of speech which could be heard in the rustling of its leaves. A tree may suffer from the evil eye. A slight offence may annoy the spirit of a tree; an elephant, it is said, once ate a leaf of a banyan, and died within three days. Sacrifices are offered to sacred trees, and votive offerings are hung on their branches.

At the birth of a Lama, as the Tibetan legend emphasizes, all the withered trees surrounding the birthplace put forth green leaves to show that a holy child is born. Every country has thus celebrated the tree theme. In Sweden, for instance, a popular ballad describes how, when a young nymph danced, the leaves of a tree accompanied her harmoniously. Similarly, in India again, the legend of the girl who was killed by her brothers and was transformed into a tree has many versions;

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it has perhaps travelled to every country of the world. The youngest brother of the girl who was innocent, came to the tree to pluck flowers; the tree spoke in human voice and revealed the tragedy. In another version, the girl was murdered by her step-mother, who openly repented for her evil act when a minstrel sang at her door; it was merely by chance that the minstrel cut a branch from the tree that grew out of the blood of the girl, and with this branch he made the bow for his *sarangi* that produced a most heart-rending lament.

A group of tree legends centres round the magical qualities of certain trees. For instance, it is said that a tree grows over the tomb of Tansen, the famous musician of Akbar's durbar : anyone who would chew its leaves would attain an exceptional sweetness in his throat. The attendant ladies of Lalla Rookh aptly assert that the poet, who sang love songs to the princess, must have chewed the leaves of the tree that stood over the tomb of the great musician.

In aboriginal India, the bride and the bridegroom are asked to walk several times round a tree before the marriage takes place : the bride smears the *mahua* tree with vermilion and embraces it. The bridegroom, on the other hand, performs a similar ceremony with the mango tree.

The legend of the origin of the mango tree shows the poetic flight of the Indian folk mind. The daughter of the sun god threw herself into a pool to escape the persecutions of an enchantress, and changed herself into a lotus. A king saw the lotus flower and desired to possess it. But the enchantress burned it and from the ashes of the lotus arose the mango. The king saw the flower and fruit of the mango, and he decided to keep the ripe fruit of the mango with him : as the fruit fell on earth, from it came out the daughter of the sun god who was recognized by the king as having been his former wife.

Perhaps, at every birth in the village, the mango tree sends forth green leaves. Thus even today, as the Hindu tradition maintains it, new mango leaves are brought and hung over the door of the house where the housewife has given birth to a son.

An attempt to discover the tree theme in the vast panorama of India's folk-songs must take into account the great funds of legend and religious belief from the five thousand year-old Mohenjo-Daro period down to recent times.

As one surveys the tree theme that has directly or indirectly touched the mind of the folk singers, one finds scenes from the daily life of the past depicting a society of lovers of trees coming back to life. To plant a *pipal* or a banyan near the village temple or by the roadside has been recognized for ages as a great social act.

In almost all Indian languages, trees form the subject of many folk-songs. Sometimes they are used as mere pegs to hang human emotions on, and they become symbols of man's joy or grief. Occasionally, they are personified and they express their own feelings as in the following song :

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The *semal* tree meditates :

Why are my flowers red ?

Why are not my flowers offered to gods and goddesses ?

Why doesn't the *mali* make garlands of them ?

In the *Song of the Trees* translated from Kashmiri, the trees are again personified to give expression to their sorrows.

I, the gardener's daughter, longed for a mate,
Slowly, slowly, the new spring came.

The apricot tree made a request to God :
I am named 'the late comer';
So early though I blossom;
I shall be useful to the peasant at wedding time.
Slowly, slowly, the new spring came.

The *phrastan* tree made a request to God :
I am named 'the auspicious one';
Why bear I no fruit ?
The peasant stands awaiting my fall,
So that he may use me as a beam for his house roof,
Slowly, slowly, the new spring came.

The *chenar* tree made a request to God :
I am named 'the goddess';
Why bear I no fruit ?
Though my cool shade pleases the whole world.
Slowly, slowly, the new spring came.

The willow made a request to God :
I am named 'the hero';
Why bear I no fruit ?
Alas ! in my youth my body becomes hollow.
Slowly, slowly, the new spring came.

The pear tree said before God :
I am named pear and fruit I bear;
I give cool shade as well,
It pleases the Bahavakhar,
Slowly, slowly, the new spring came.

This song has assumed different versions in different villages, yet the central theme has never altered.

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“Father, never cut this *nim* tree,” is the beautiful opening of a song from Uttar Pradesh. Translated from Awadhi, it is classified as *hindole ka geet* or swing song. When sung in chorus collectively by young girls on swings, it gives an unusual thrill :

Father, never cut this *nim* tree,
The *nim* offers rest to sparrows.
Father, never trouble your daughters,
Daughters are like the sparrows.
All the sparrows will fly away,
The *nim* will feel so lonely.
For their fathers-in-law's will all the daughters leave.
Mother will feel so lonely.

The *nim* symbolizes the mother to whom daughters are like sparrows; when they leave it for their new homes, the tree feels lonely like the mother whose daughters leave her one by one, as they get married.

A fragment from a mystic song of Kashmir brings the deodar into bold relief. Thus sings the mystic in the mood of a lover :

In the forest I stood as a strong deodar,
To lay me low there came to me the invincible angel of death;
Such was my fate,
I lost my houri while yet I was young.

A marriage song, translated from Marathi, also deals with the tree motif. It is sung while the people are busy erecting the *mandap* or the marriage marquee :

The mango tree talks to the *jambul* tree,
Let us go and invite the *umbar* tree,
I had sown the *umbar* seed.
Thirty-three crores of gods witnessed it;
Let every tree be an *umbar*, O *umbar* tree.
Your branches have spread everywhere,
The other has gone to the underworld,
The third has come to the *mandap* of Ramraj.

The following song from the Punjab is an epitome of the vicissitudes through which a sapling has to pass before it grows into a tree :

Tree, O tree, said the parrot,
Firstly, your soil is bad,
Secondly, your stem is old.
Neither my soil is so bad,

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Nor my stem so old.
Firstly, the Nabob Sahib's she-camels have eaten me,
Secondly, the carpenters cut away the beams,
May the mourners in batches visit the carpenters' houses,
May the Nabob's she-camels all expire,
And may the wise old Nabob himself too expire.

Another song from the Punjab provides a peep into Indian village life. It is sung by a girl whose soldier husband is away at a distant cantonment and does not care to write to her :

O *pipal* of my birthplace,
Your shade is cool;
Water in our pond is dirty,
The leaf-powder from its surface I set aside.
Lachhi and Banto have gone to their husbands,
And whom shall I tell my story ?

Often the tree has its tale of woe to tell, as in the following song from the Simla Hills :

O cruel woodcutter,
Cut merely my lower branches;
Do not stretch out your axe towards the top,
O leave it for the birds' nests.

In aboriginal India, songs are wedded to dance. The song given below is sung in chorus by the Maria Gonds of Bastar in praise of their land :

In our land, O girl,
Oh, in our land, dear girl,
Stretching our hands we can pluck the mangoes, dear girl.
Oh, stretching our hands we can pluck the mangoes, dear girl,
Never a scarcity of mangoes, dear girl,
Oh, never a scarcity of mangoes, O girl,
If you drink toddy, O girl,
Oh, if you would drink toddy, dear girl,
You would drink to your heart's content, O girl,
Oh, you would drink to your heart's content, dear girl.
Gods with their own hands, O girl,
Oh, gods with their own hands, dear girl,
Have planted the palm tree, O girl,
Oh, they have planted the palm tree, dear girl.

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Verrier Elwin has a *karam* song from Rewa ; the Gonds follow the method of direct statement :

Plant the mango, plant the tamarind and plantain :
Clusters of fruits will weigh their boughs.
Plant ten *kachnar* trees for flowers;
In a garden set the *tulsi*.
Water them unweariedly, but they will always wither.
But the trees in the forest,
Which depend on God alone,
Never wither and die.
The forest trees grow always.

Trees can always add colour to life. Tribal poetry everywhere gained in power and charm whenever it touched the tree motif.

The *jangalies* of the Punjab sing scores of *dhola* songs with a common opening address—“*Butt vanota !*” *Vanota* is the *peelu* tree (*Salvadora persica*) which is known as *jal* in the West Punjab. *Vanota* is from Sanskrit *vana* or forest. It means that *peelu* is the lord of the forest. *Butt* means body or “living personality”. Thus, *Butt vanota* may be translated as “O living *peelu* tree !” Here is a popular *dhola* song that opens with the symbolic address :

O living *peelu* tree !
Your roots are gone deep into the soil,
Well-shaped is your stem since your birth,
Over it your branches have added colour.
My neighbours are all ready for the journey,
Drums have announced the news.
Undoing my hair, I have turned an ascetic woman.
I have put on the sacred thread of *mala*;
Following your path, I searched for you in streets and lanes.
In what town should I search for you now ?
I enquire from astrologers and Brahmins,
No prediction has so far told me the path you followed indeed.
Across the river I stand—I, a woman who cannot swim,
Bundle of clothes in hand;
Bring your boat here, O boatman,
How can I stand here waiting and waiting ?
Lo ! I fall on the earth, seek my death,
Turn but once your she-camel homeward,
Once at least you can bring life to a poor soul like me.

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This is the method of the *jangali* folk-songs; the woman represents the human soul, and the never-ending search of the soul for God is the theme of the *dhola* songs. Again and again, the *peelu* tree is addressed in the opening line of the *dhola* song as if it understood the human voice, and, when the search for God seems to bear no fruit, the singer looks towards the old forest tree for advice.

The tree motif is dear to the village mystic; in varying forms it usually adds to the vitality and depth of feeling of the singer as seen in the following pieces from the Punjab.

i

O dry *pipal* leaf, why are you rustling ?
Fall now, old leaf,
Lo ! the season of new leaves has come.

ii

Listening to the songs of trees
My heart is illumined.

iii

[The *pipal* sings; the banyan sings,
And the green mulberry, too :
Stop, traveller, and listen,
Your soul will be set right.

iv

Under the banyan tree
I happened to see God Almighty.

v

[Tell me, O *pipal* tree,
Which is the path to Heaven.

vi

[O silent *pipal* tree,
Do open the knot of my soul.

vii

The banyan knows the secrets;
No good telling a lie in its presence.

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But the mystic appeal cannot be shared equally by all. Generally speaking, it is the life of the people that provides a fertile soil for the tree motif. Here are, for instance, few Bhojpuri *birha* songs :

i

The bamboo-grove where I played with friends,
O it never fades from my mind;
A lute shall I make of bamboo from the same forest
The *birha* shall I sing from door to door in the village.

ii

Our goddess feels hungry, brother,
She asks for milk to drink.
Shall I milk the banyan or the *barohi* tree ?
My *raina* cow has gone a long way off.

iii

Rama and Lakshmana left for the forest,
And Sita accompanied them;
Rama and Lakshmana felt thirsty,
Sita gave them nectar mixed with water.

iv

In one forest an ant wanders,
In one forest a cow wanders;
In one forest wanders the daughter of the Ahir mother
With bells fastened on her breasts.

v

The east wind blows and I just yawn;
While standing, my body is filled with lassitude;
Who is the dandy whose gaze fell upon me ?
The home and the forest, O neither of them would please me.

vi

No more looking after the cows,
No more bathing in the Ganges,
No more friends' company under the *nim* tree,
These three things God Almighty took away from me.

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vii

On the branches of the mango, a bunch of mangoes looks lovely,
In the forest, the *palas* trees are blossoming;
In the lap of the fair bride the child looks lovely,
As though the moon appeared on the sky.

viii

On the branch of the mango the *koel* sings,
In the forest the peacock dances;
On the river bank I sing my *birha*,
It pierces the heart.

Again and again one wonders how much the Indian folk-songs owe to the tree that adds colour to the local landscape. The villager, as he takes to the oldest songs, conjures up the past. One may say that even a mere reference to a tree is a reminder of the past, for it reminds the singer of his ancestors who lived in the forest in the olden days.

W. G. Archer, poet, scholar and administrator, spent many years among the Uraons of Chotanagpur. This lovable Englishman has provided us with a remarkable collection of Uraon folk-songs translated into English, conveying as much as possible their beauty in his book entitled "The Blue Grove". *Phagua* and *Sarhul* are the main festivals of the Uraons, celebrated in the months of March and April when the mango groves in the outskirts of Uraon villages resound with dance and music. Describing these festivals Archer writes :

"The *Phagua* festival occurs in March and is the Uraon equivalent of New Year's Eve—seeing out the old year and bringing in the new. It marks the end of the marriage season and the period of relaxation after the harvest.

The ritual consists in setting up some branches of the silk cotton tree, wrapping them in straw and offering some country bread and incense to them. The branches are then burnt and the Festival ends in dancing and drinking.

The *Sarhul* festival comes a month later, and has a double significance. In one aspect, it is a "vegetation" ceremony—an act of rejoicing in the jungle which has already come into flower. In the other, it is a "fecundity" ceremony—a marriage of the earth with the sun on the assumption that the soil is ready to be quickened. The fertility of the jungle is used, as it were, to stimulate the fertility of the fields. From one point of view, therefore, the appearance of blossom on the *sal* trees is an indispensable prerequisite of the Festival.

Over the *sal* trees the children of the moon are dancing
The drum is of gold
The drum is of silver
The sticks of copper sound in the noon.

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From the other, an indispensable preliminary is that the ploughed fields should be left bare to the sun for a month prior to the Festival. Finally, the element of rejoicing involves drinking and dancing, while the fecundity aspect is seen in the mimic marriage of the earth and the sun.

“The ritual commences with ceremonial baths by the men and women and the stacking of some selected rice in winnowing baskets. A grindstone is then put in the courtyard of the house of the *pahan* or village priest and on it are placed three bundles of straw and a yoke. The *pahan* and his wife sit on the yoke while the *pahan's* assistant, the *pujari*, sits to their right with his wife. A mimic marriage is then gone through—the *pahan* representing the sun and his wife the earth, while the *mahto* or village headman officiates by putting oil and scarlet powder on their heads. Rice beer is then offered by the headman to the village ancestors, and later, some of the stacked rice is sanctified by the priest and put aside for use at sowing. There is then a procession to the village *sarna* or sacred grove, where fowls are sacrificed to the village ghosts and to the sun god. The sun god is asked to bless the *Sarhul* and make it merry and to grant prosperity to the village in the coming year. The *pahan* then returns to his house for a ceremonial drenching, and after that there is a men's feast in the grove composed of rice and the sacrificial fowls. This is followed by a women's feast in the *pahan's* house, and the night passes in general drinking and dancing.

The Festival has for the Uraons the gladness of Easter Day—an exultation in the brilliant weather and the flowering trees, and the sense of sprouting life.”

There are many references to trees in Uraon folk-songs. *Plumeria acutifolia*, also called the life-and-death tree, is usually planted by the shrines dedicated to Mother Earth, *Devi Mai*, in almost every Uraon village. The creamy white blossoms of this tree are very popular with the Uraon girls.

“The life-and-death tree blossoms

Slowly swinging

In the morning and the sun

Slowly swinging.”

“Near the spring is a life-and-death tree.

Throw stones, *juri*, and I will catch the flowers.

If you throw stones and get me the flowers

I will let you dance the *bheja* with me.”

Hérons and egrets sitting on the tall *pipal* trees growing on the sides of the village ponds is a common sight in the villages of Chotanagpur. Under the *pipal* trees, cows and buffaloes have their afternoon siesta. Says the Uraon folk-singer :

“Under the *pipal* tree the black cows are sitting

A heron sits on the *pipal* tree.

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Who was the girl who broke a branch
And sent the sitting heron flying from the tree.”

“*Hare*, this is my lot
The pipal tree
O girl, two pipal trees
How sweet
Unripe how bitter
Ripe how sweet
O girl half ripe
Sweet as honey.”

The fig tree laden with a bumper crop of figs is a symbol of fertility. A young girl ripe for marriage has been likened to a fig tree :

“Walking, walking on the path, mother, I saw
The fig tree blooming, I saw the fig’s blossom
A hundred blooms were smelling, mother, spreading for twenty miles
Over forty miles the blooms were smelling.”

Again the ripe girl has been symbolized by the blossom-covered *munga* tree :

“You planted a *munga* tree, father
The *munga* has spread its branches
The *munga* is in blossom
The bees hum and fly
They come to suck the honey.”

In the month of August, another festival is celebrated by the Uraons known as the *Karam* festival. It is thus that Archer describes this interesting festival :

“The centre of the ritual consists in cutting three branches of a *karam* tree and their installation in the dancing ground. The branches are called the “*Karam Raja*”. The entry of the branches into the village is accompanied by dancing, and after the installation, *Karam* dancers revolve round the Raja through the night. The following morning the branches are garlanded and the *karam* legend is recited. Flowers are then thrown over the Raja and offerings of curds and rice are made. Red *karam* baskets full of grain are also put before the branches, and some ceremonially nurtured barley seedlings are distributed among the boys and girls who put the yellow blades in their hair. The blessing of the *Karam Raja* is then sought and the branches are taken up and carried by women through the villages. A halt is made at the houses of the village *pahan* and *mahto*, the Uraon religious and secular heads, and at each house the branches are anointed with the oil and scarlet powder which are

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part of the apparatus of a marriage. The branches are then thrown into a stream."

"It is considered both meritorious and exciting," says Verrier Elwin, "to plant trees. The Gond or Pordhan who does this generally has a great desire to perpetuate his name, and look forward to a prosperous old age."

We may mark this phase of aboriginal life in the light of the following Gond folk-song :

How young I was
When I planted the mango
And still the leaves are full of life
But there is none in my old body.

Verrier Elwin rightly says that "The old man who planted mango and tamarind trees in his youth finds himself jealous of the vigour of their fresh green leaves and contrasts it with the lack of strength in his own limbs."

Here is a Bhil song translated by D. P. Khanapurkar. It seems to bring out the *pipal* tree as a symbol of grace and character in view of the names of the chiefs of the Dangi Bhils which are mentioned in the song :

"Oh, King Somansing,
Your throne is of gold
Oh, it is of gold
Your speech is silvery
Oh, it is silvery
Oh, *pipal* tree,
Your leaves appear golden.
Oh, King Chandarsing,
Your throne is of gold
Oh, it is of gold
Your speech is silvery
Oh, it is silvery,
Oh, *pipal* tree,
Your leaves appear golden.
Oh, King Sahebu,
Your throne is golden
Oh, it is golden
Your speech is silvery
Oh, it is silvery
Oh, *pipal* tree,
Your leaves appear golden.

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✓ Oh, King Anandrao, .
Your throne is of gold
Oh, it is of gold
Your speech is silvery
Oh, it is silvery
Oh, *pipal*, your leaves are golden.”

The image of the elder brother's wife persists in many hill songs, as also in another Garhwali song that centres round the willow (*majnu*) tree :

Who you are, O man, sitting in the shade of the tree ?
Besides water stands *majnu* tree.
Sitting in the shade, do not break its branches.
Who you are, O man, sitting in the shade of the tree ?
Besides water stands *majnu* tree,
My uncle built its stone enclosure,
My aunt brought stones and clay.
Who you are, O man, sitting in the shade of the tree ?
Besides water stands *majnu* tree.
My brother got it fenced,
Steadily did my sister-in-law nurture it.
Who you are, O man, sitting in the shade of the tree ?
Besides water stands *majnu* tree.
It stands erect, full of pride,
And reminds me of my dear ones.
Who you are, O man, sitting in the shade of the tree ?
Besides water stands *majnu* tree.
Sitting in the shade, do not break its branches.
It grieves my heart
To see it assailed.
Who you are, O man, sitting in the shade of the tree ?

Most hill songs are built round trees and are sung at village rituals. The following songs from Himachal Pradesh are good examples of this type :

i

The cones are growing on the pine trees,
The deodar trees have borne *koka* cones;
O I saw men, many men,
But your glances are unique.

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ii

O green *koomshi* plant of the valley, you are green, ever green
O I'll win the man of my heart, else I shall die.
The young man left me stealthily,
Kindling the fire of love in me—a branch of a tree.

The following love song from the Khondhs of Orissa projects the image of the *jaru* tree, along with a *mahua* and a mango :

On the hill-top stands a *jaru* tree
Flowers blossom on the *jaru* tree;
One flower for you, darling,
One flower for me.

On the hill-top stands a mango tree,
The pollen appears on the mango tree;
One blossom for you, my boy,
One blossom for me.

On the hill-top stands the *mahua* tree,
Flowers blossom on the *mahua* tree;
One flower for you, darling,
One flower for me.

Here are the opening lines of a beautiful Malyalam folk-song :

Says the landlord, "Trees are green but you are withered."
I say, "I will die to be born a tree on earth !"
Blow, blow, O sea breeze, tell your tale,
The landlord never hears our wail,
O Earth, O Sun, I see no justice.

The tree motif, either forming the background or the theme itself, is also seen in the following South Indian folk-songs, translated from Kannada :

i

It is cool under the *nim* in summer,
The Beemrati river, too, is cool, mother,
You are cool at my birthplace.

ii

The bird of the sandal forest flies swiftly,
He must be knowing the secrets of the trees, mother,
He loves the fragrant breeze.

TREES IN INDIAN FOLK-SONGS

iii

The fig tree stands at the door of the barren woman,
Parrots sit on every branch and say :
'O barren woman, your life is for others.'

iv

Better be mud than a barren woman,
For on the mud will grow a tree
Giving shelter from the sun to the sons of man.

v

The road to the weekly market is lined with trees,
At the weekly market I left my boy,
The trees kept away their flowers with grief.

vi

Safe are the sandal trees; we are planted by the gods;
We love the land where the peacocks dance,
And the sandal trees are our companions.

Some Punjabi songs mention the sandal tree as in the *Song of Lachhi*.

Aha, where Lachhi washes her face,
There a sandal grows—where Lachhi washes her face.

Another Punjabi song brings in the *shisham* and mulberry trees :

Where shall I plant the *shisham* trees—
All full of leaves ?
O my youth with a slim body,
Where shall I plant the mulberries ?
Oh, the old fool would not follow me.
In the garden shall I plant the *shisham* trees—
All full of leaves.
O my youth with a slim body,
At the door of the house shall I plant the mulberries.
Oh, the old fool would not follow me.
Full one span have grown *shisham* trees—
All full of leaves,
O my youth with a slim body,
Full one span have grown the mulberries.
Oh, the old fool would not follow me.

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The old fool is the husband who would not help the young bride in planting the tree, and it seems, at every step she is thinking of leaving him for good.

In its earliest forms, the Indian folk-song was inseparable from the tree motif, as the community lived close to the forests and was never cut off from the real roots of inspiration.

Man has always taken pride in his relationship with trees. Since the early dawn of culture, he has learnt to call every tree by name. An urge to discover something new in the image of the tree may be seen in the poetry of every tribe.

“There is a dumb bird that sits on a beautiful *sal* tree. Shake the tree, and the bird awakes and sings.” This is a Gond riddle. The answer is “the anklets on the feet of a girl who goes to the dance.” Like folk-songs, even riddles and proverbs of the people in India have been enriched by frequent reference to the tree motif. And even folk-tales have celebrated the importance and beauty of trees in India.

Trees have provided inspiration to humanity for thousands of years. While human beings enjoy youth which is only transient, trees remain youthful for many years. Every year they produce new leaves and new flowers which bring joy to us. The annual rejuvenation of trees like *kachnar* and pink cassia and their magic mantle of mauve and pink flowers gladden the heart of the lover of nature. Planting of beautiful trees, which has lately become increasingly popular in India, will provide richer themes for our folk-songs and will beautify our country.

CHAPTER VI

WANDERINGS OF PLANTS

SINCE the time primitive man began to gather seeds from plants growing wild in the fields and to improve them by slow and crude methods, he has been enriching his diet by adding new varieties of food crops and fruit trees. After he conquered the barriers of land by domesticating the ox and the horse, and of water by inventing the canoe, an extensive exchange of plants has been going on between the continents of Eurasia and Africa. However, the Americas for a long time remained isolated from the Old World. If we examine our crops and trees, we will find that a large number of them have been introduced from foreign countries. Potatoes which furnish food to millions came to this country from South America via Europe only in the seventeenth century. Quinine was unknown in the East and cinchona plants were introduced from South America into Java and other Eastern countries not very long ago. Soyabean was introduced from Manchuria into America and Europe and Para Rubber from South America into Java, Malaya and India.

The black mulberry came from Iran. The peanut was introduced by the Portuguese into India and Africa from Peru. Papaya (*Carica papaya*), whose fruit is a valuable source of papain—a digestive enzyme resembling animal pepsin and particularly useful to meat-eaters—is a native of Central America and the West Indies. A few high-yielding varieties like *Washington*, *Giant Hawaii*, *Ceylon Long*, *Ranchi Mammoth* and *Calcutta* have been selected as suitable for India, and there is no doubt that there are others in their home countries which may repay introduction. Who can imagine Kashmir without its *chenars*, poplars and willows? Yet these *chenars* and willows are exotics, introduced by the Moghuls from Central Asia, while the Lombardy poplar is a recent introduction. We may also mention that until recently the strawberry was practically unknown in the plains of Northern India. It was introduced into Kapurthala from France by D. R. Sethi in 1918, and now it is commonly grown in the villages of Jullundur district of the Punjab.

Most of our ornamental flowering trees and garden plants have been introduced by garden-loving British travellers, explorers and government officers from foreign countries like South America, Madagascar, Malaya, Java, the West Indies and Burma. *Poinciana regia* and *Colvillea racemosa* were brought from Madagascar, *Jacaranda mimosaeifolia* and the ramie tree from Brazil, *Brownea ariza* and *Bauhinia purpurea* from the West Indies, *Cassia javanica* and *Peltophorum ferrugineum* from Malaya, *Spathodea campanulata* from Tropical Africa and the double-flowering peach from Japan. The dogwood tree (*Cornus florida*) with its beautiful white flowers of the United

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States of America deserves to be introduced into our hilly areas. The pink *Bombax* (*Bombax ellipticum*) of Hawaii is another desirable ornamental tree.

The seedless *Washington Navel* orange originated as a bud sport of a Portuguese variety of orange in Brazil and was introduced into California in 1878. This variety is also a recent introduction into India and is becoming popular. The summer orange *Valencia* which ripens from February to April, is an introduction from the Azores, a group of Portuguese islands in the Atlantic.

One of the recent introductions is the teasel plant (*Dipsacus fullonum*) by Jai Chand Luthra who got a few seeds of this plant from the Botanical Garden at Duisberg in Germany in 1931, and successfully cultivated it in Kulu and Palampur in Kangra district of the Punjab. The heads of this plant are used for raising floss on the surface of woollen goods, and a few years' cultivation of teasel has made India independent of foreign imports.

In the United States of America, the Plant Introduction Service was organized by the State Department of Agriculture as long ago as 1903. David Fairchild, who has done a great service to his country by organizing this Service, also introduced some of our best Indian mangoes into Florida. The United States Plant Exploration and Introduction Service sent capable botanists like Walter T. Swingle and William E. Whitehouse to the unexplored regions of North Africa and Asia, and these explorers have amply served their country by introducing a large number of economic plants. It is perhaps not commonly realized that excepting the persimmon, avocado, grapes, berries and a few plums, America had no important fruit trees, and the only known food plants were maize, potatoes, sweet potatoes and tomatoes. Most of the green vegetables grown in America have been introduced from outside.

In the state of South Dakota, Carleton and N. E. Hansen introduced a white-seeded variety of prosoa, a paniced millet from Semipalatinsk in Siberia. It is a catch crop, maturing in 60 days and found suitable for a dry climate with an annual precipitation of eight inches, and may repay introduction into dry areas like those of Rajasthan.

Two most valuable introductions into the U.S.A. are the Smyrna fig and the date-palm. Along with the Smyrna fig, *Blastophaga*, a tiny pollinating wasp which carries pollen from the male tree (the Capri fig) was also introduced. The date-palm produces a more well-mineralized, high-flavoured and healthy human food per acre than any other crop excepting the banana.

Swingle introduced into the U.S.A. a number of varieties of date-palms from Morocco, Tripoli, Egypt, Arabia, Iraq, Iran and the southern states of America. He brought the remarkable *Medjhool* from the Tafilat region of Southern Morocco and *Deglet Noor* variety from Southern Tunisia. On account of these introductions, more than a 1,000 choice varieties have been tested in the date gardens of Southern

California and Arizona, and the total annual production of dates in the United States of America exceeds 13,000,000 pounds, which is one-quarter of her total consumption. In spite of its marked xerophytic character, the date-palm requires plenty of irrigation. The Arabs rightly say that the date-palm must have its feet in running water and its head in the fires of heaven. These conditions are met with in an ideal state in the canal-irrigated areas of the Punjab and Rajasthan. In spite of such favourable circumstances, we have introduced only a few varieties of the date-palm into India. Choice varieties of dates should be introduced on a large scale into the canal-irrigated areas and grown along the banks of canals and watercourses. The date-palm is a tall tree and does not cast much shade, and as such is not harmful to other crops.

With the coming of quicker means of transportation, particularly of the steamship and the railway, world exchange of plants has been going on at a quicker pace and on a much vaster scale. However, the possibilities of plant introduction, particularly from the point of view of plant breeding, are still far from exhausted. The cassava (*Manihot utilissima*) has been tried in South India. The starch-palm (*Bactris utilis*) which is so popular in South America, may prove to be of considerable value in tropical India. The tung-oil tree (*Aleurites fordii*) is being tried by the Forest Research Institute at Dehra Dun. With the diversity of climate which India possesses, there is no doubt that our stock of economic and ornamental plants can greatly be increased.

In India, we are fortunate in having a variety of soils and climates, and plants from all regions of the world—from the arctic to the tropics—can find a congenial home here. A. C. Joshi has drawn our attention to the vast potentialities of our country from the point of view of plant introduction on account of its favourable geographical situation. Of the six “primary centres” of origin of cultivated plants recognized by Vavilov and other Soviet scientists, three, viz., Central Asia, the mountains of Eastern China and the Indo-Malayan region, border on India. These are the homes of most Old World fruit trees. B. P. Pal summarizes the information about the various centres of origin of cultivated plants and possible causes of production of new varieties thus :

“In their respective centres of origin, cultivated plants display a wealth of varietal diversity which is not to be found elsewhere. A characteristic feature is that these primary centres frequently include a large number of genetically dominant characters.

“The researches of Vavilov and his co-workers have shown that the region of north-western India and south-eastern Afghanistan is the place of origin of the soft and club wheats and also of many other field and garden crops such as rye, pea, lentil, beans, flax and carrot. The 28-chromosome group

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of wheats has had an entirely separate centre of origin in Abyssinia. The Eastern Asiatic region has probably seen the origin of rice, soyabean, and some of the millets. In the New World, the rather restricted territory of Central America (including Southern Mexico) is the home of such plants as maize, teosinte, the common bean, annual pepper, agave, anona, sapota and papaya. Tobacco probably originated in South America. It is also probable that the potato plant had more than one centre of origin. While the island of Chiloe and the neighbouring islands of the coast of Chile are probably the centre in which the common cultivated potato originated, many cultivated and wild species have originated in the Peru-Bolivian tableland."

It will be apparent that many of the important centres of origin are associated with the tropics or subtropics and the presence of mountains. This may, perhaps, be connected with the fact that in such regions an optimum of moisture, heat, light and substratum have afforded favourable conditions for the origin and accumulation of varietal diversity. Mountainous areas tend to act as isolators and thus may have played a part in the differentiation and divergence of species and varieties. An interesting speculation that cosmic rays might be responsible for the greater diversity and density of species near the mountain tops has been advanced by Dixon, Hurst and more recently, by Hamshaw Thomas. The cosmic rays are particles of very great energy which are constantly reaching the earth in very great numbers and closely resemble the X-rays in their properties and effects. As X-rays are used for the artificial production of mutations, it appears possible that cosmic radiations may have been a factor in the production of varieties by direct action on the germ plasm. It is interesting to note that the centres of origin of cultivated plants are often near the centres of ancient civilization.

We can hope to achieve considerable improvement of our fruit trees if we explore these regions systematically. Apart from exploring the Himalayas and the mountainous regions of South India, we should send expeditions to China, Java, Malaya, Australia, Afghanistan, Iran, Iraq, Africa and Central and South Americas to search and bring new fruit and ornamental trees and shrubs as well as the wild ancestors of crop plants. For orchard fruit and nut trees like apricots, peaches, plums, almonds, pistachio and walnut, Afghanistan, Iran, Iraq and Western Turkey should be explored. The Hindukush is regarded as the home of a number of important cultivated crops, and will repay exploration from the point of view of disease and frost-resistance in crops.

China can also furnish us with a great variety of vegetables such as radish and beans. B. P. Pal brought seeds of a number of Chinese vegetables to India. On account of the periodical ravages of floods and famines, the Chinese have

investigated the food value of a number of edible weeds. *Momordica grosvenori* Swingle, the rare seasoning weed *lohan kuo*, is grown in the mountains of Kwangsi Province and is prized as a condiment as well as a remedy for throat and intestinal disturbances. Rhubarb is also of Chinese origin. *Ephedra sinica*, a valuable source of ephedrin and a well-known alkaloid used for throat and nose troubles, was introduced into California from China by Swingle in 1926. He spent a number of years in China exploring the interior of the country, and reported that there were a 1,000 distinct varieties of citrus cultivated in the provinces south of the Yangtze river. Some of these are hardy and disease-resistant and some are valued for their flavour. Some varieties grown in California have their home in China. However, it may be mentioned that even with their efficient Plant Exploration and Introduction Service, the Americans have not tested more than 10 per cent of the Chinese varieties. South China, the home of the orange, deserves close exploration, and it is necessary that we too should introduce some of the best Chinese varieties into India.

In most countries excepting the U.S.A. and the Soviet Union, the work of introduction of new plant material and its use in hybridization with local varieties has been carried out on a limited scale. In the Soviet Union, Vavilov and his co-workers have collected plant-breeding material from many countries. Numerous wild species of wheat and barley have been collected from Abyssinia, Turkey and Afghanistan and many species of peas, beans, tomatoes, onions, melons, pears, peaches, apples and grapes from countries the world over. As a result, cold-resisting and early-maturing varieties of wheat have been propagated in Siberia which served as the Soviet bread-basket when Ukraine was occupied by the Nazi armies in the Second World War.

Considering the variety of plant material at the disposal of the Soviet plant-breeders, endless possibilities of origin of new plants arise. How this has affected the outlook regarding the future plant-breeding work can be well judged from the following remarks of Vavilov himself: "Our ideas about such plants as the potato have been entirely revised. The whole work of breeding and genetics had been formerly based on one Linnean species, *Solanum tuberosum*, whereas the expedition to South America has disclosed the existence amongst the cultivated potatoes at its original home of no less than thirteen well-defined Linnean species, many of which are of great practical interest. These species differ from one another in the chromosome number, morphological and physiological characters and area of distribution. They contain species and forms which are extremely resistant to disease and frost. The potatoes formerly known to geneticists and breeders were only fragments of one species, collected at random by the first travellers, and on these the whole of the breeding and genetic work of the nineteenth century and the beginning of the twentieth century has been based."

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Besides the cultivated plants, we must also take into account the wild plants. There was a time when wild plants were considered to be of interest to the taxonomist only. It is now admitted that greater possibilities in breeding can be realized by making use of the wild relatives of our cultivated plants. By virtue of their persistence and habitat under arduous conditions of climate and soil, the wild plants possess some useful economic characters such as resistance to cold, drought and disease. Many instances may be quoted of the successful utilization of wild forms in the solution of economic problems in plant breeding. The Java sugar industry, which was at one time threatened with collapse on account of serious losses caused by the serah disease, was saved by the timely introduction by Kobus of a wild variety of cane from India known as *Chunnee*. The famous series of canes developed at Coimbatore has been the result of crossing with the wild species *Saccharum spontaneum*. The production of perennial hardy varieties of wheat by Tzitzin in Russia by making use of the wild grass *Agropyron* is another outstanding example. These wheats are considered very promising for new tracts with highly unfavourable weather conditions. Harland has reported interesting results in cotton. The hybrid of the wild Hawaiian species *Gossypium tomentosum* with *Sea Island* has produced a beautiful khaki lint of Egyptian quality, and is completely immune to attacks of leaf-sucking insects. Potato-breeding work has been revolutionized by the discovery of wild tuber-bearing species *Solanum demissum*, *S. acaule*, *S. commersonii*, etc., some of which are resistant to frost and others to late blight caused by *Phytophthora infestans*.

Though the contribution made by explorers and travellers of the nineteenth century is very valuable, the time has come when we must recognize that a work of such importance cannot be left to the whims and fancies and the comparatively poor resources of private individuals. A systematic, organized and planned effort is needed to place the plant exploration and introduction work on a sound national footing.

CHAPTER VII

A BIOAESTHETIC PLAN

WE are indebted to Professor Lancelot Hogben for the term “bioaesthetic planning” which may be defined as conscious planning of the flora and fauna with the object of beautifying the country.

For a healthy and balanced development of a nation, wealth in the form of material goods is, no doubt, necessary, but a beautiful environment is just as essential. Colourful trees and flowers play a great part in making the environment beautiful and refining the minds of the inhabitants. Here is a plan for planting flowering trees on a mass scale in the inhabited areas of this country.

Bioaesthetic planning embraces both the animal and plant sciences, Botany and Zoology, and may be further defined as planned ecology of living beings from the artistic and aesthetic points of view. It includes the plantation of ornamental flowering trees along city roads, in parks, public places and compounds of houses both in towns and villages, and development of national parks for the preservation of beautiful, non-carnivorous animals, and the creation of bird sanctuaries. The object of a bioaesthetic plan for India is the encouragement of the planting of selected ornamental flowering trees in our towns and villages, protection of beautiful, harmless birds like wild ducks, egrets, geese and *sarus* cranes by legal declaration of our big *jhils* as bird sanctuaries, and preservation of graceful animals such as black bucks, blue bulls, *sambhars* and spotted deer, which are being ruthlessly exterminated in national parks and zoological gardens in the vicinity of our big towns.

Bioaesthetic planning, of course, embraces landscape gardening as well, but it is a much wider term. The whole country is susceptible of bioaesthetic planning, provided a consistent policy is followed and a persistent effort made over a long period. The bioaesthetic planner is a master artist whose canvas is the entire country and whose pigments are the beautiful flowering trees. He paints the canvas of the countryside in rich colours—blue, yellow, orange, scarlet, red and pink. The blue jacarandas, yellow *amaltas*, orange-scarlet *gul mohurs*, scarlet colvilleas, red erythras and pink lagerstroemias are with what he paints the side-walks of roads, the platforms of railway stations, the canal banks and the compounds of houses and public buildings. His objective is to lay them out in a pleasing pattern so that an attractive picture results.

With the success of our First Five Year Plan, people in India have become plan-conscious, and, in fact, planning has become the rage of our epoch. All thinking people realize the danger and wastefulness of ‘go-as-you-please and devil-take-the-hindmost’ competitive unplanned economy which we have inherited. The

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world over, people have begun thinking of the future needs of the community and have realized the value of planning. The idea of planning appeals to the imagination of people who appreciate clear thinking, for it is scientific. It is also the quickest method of developing the resources of a backward country, and hence its appeal to the people of China and India. The idea of planning is not novel to the biologist who deals with the classification of plants and animals and their orderly arrangement in phyla, classes, families, genera and species, thus creating order out of chaos. In fact, Carl Linnaeus was a very great planner indeed, for he cleared so much confusion and created an orderly Biology.

Bioaesthetic planning is the projection of the systematizing and planning mentality of the biologist into the field of everyday life. The planning of our cultural and aesthetic life is a necessary concomitant of the planning of our social and economic life. While we are planning our industries and agriculture we can hardly ignore the environment of the human beings.

Though a beautiful pattern may result by chance out of haphazard efforts of individuals, it cannot be called planning for beauty. Planning has been described by Professor Abercrombie as "a conscious exercise of the powers of combination and design, and not a question of unconcerned growth, even though the latter may produce fortuitously happy results."

About 150 years ago in Europe and about 50 years ago in this country, the common man was afraid of the wild country, mountains, lakes and forests, and regarded mountains and forests with a feeling of horror. It is only in the nineteenth century that educated people began to admire the beauty of the mountains and forests. In India, the educated classes are under a heavy debt to Wordsworth for inculcating in them the love of nature. Since then the pendulum has swung to the other extreme. There is in some of us an indiscriminating and irrational adoration of nature. People who have never grown a herbaceous border of annual flowers in their own house, burst out in panegyrics on seeing a clump of anemones or potentillas in the hills. It is far from my intention to decry the beauty of alpine flowers in the Himalayan meadows as compared with the annual flowering plants in our gardens in the plains. On the other hand, I hold that in the magnificent setting of the Himalayan snows a planned alpine garden will look much better than anything nature has ever produced. Untamed nature is disorderly, chaotic and wayward. Man has been constantly fighting his environment. He battles with nature to produce a semblance of order. He clears the jungles, breaks virgin soil for cultivation, diverts the courses of rivers, makes canals and embankments for irrigation and converts waste land into parks and gardens. While in some cases he has produced ugliness by his haphazard, uncontrolled and misdirected actions, in other cases he has been able to improve upon nature. Who can deny the beauty of the poplar-lined roads of France, the vineyards of the Rhine, the tulip fields of Holland, the saffron

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terraces of Kashmir and the hedge rows of the English countryside? Those who admire the beauty of the English countryside forget that it is the result of hard work of many generations. Describing the evolution of the English countryside, Lancelot Hogben writes, "What generally gains admiration for the beauties of the English countryside is not nature as such. Untouched nature is generally monotonous. English park lands and hedge rows, and many of our woodlands are the result of human interference, sometimes by the deliberate action of enthusiastic pioneers of bioaesthetic planning like John Evelyn, and sometimes as relics of past cultivation." Similarly, the wonderful landscape gardens of Japan are the result of a toil of generations.

However, broadly speaking, man's battle with nature and environment has been haphazard and there has been no conscious planning and direction of his efforts. The explanation is simple. Individuals who set about consciously changing and planning their environment are rare. On the other hand, the large majority of people are content with their mode of living and their everyday environment. Moreover, it is by a rare chance that the odd individuals who change things are in a position of power where they can execute their plans. This is more true of India than of any other country in the world. Excepting the Moghuls who came from the arid region of Central Asia and were more garden-conscious than Indians and left behind wonderful terraced gardens and planted grand avenues of *chenar* (*Platanus orientalis*) along the banks of the Jhelum in Kashmir, our country has been practically untouched, so far as bioaesthetic planning is concerned. Maybe, our comparative neglect of gardening is due to the luxuriant jungle vegetation which surrounds our villages. But, now, this should be a help rather than a hindrance in the planned planting of flowering trees.

Town planning and bioaesthetic planning should go hand in hand. Orderly and planned planting of ornamental trees can be seen to its best effect in new towns with wide roads, flanked by shady foot-paths, well laid-out public parks and squares, rather than in congested old towns with narrow, crooked streets. Our old towns offer little scope for bioaesthetic planting. Firstly, they contain no open places suitable for plantation, and secondly, their streets and roads are too narrow. Planting of flowering trees in an old town appears like draping an old, haggard and ugly woman in a brilliantly coloured new *sari*, which merely throws her ugliness into greater contrast. Beautiful new clothes are displayed to their best advantage on a good-looking young woman, and bioaesthetic planting too can be seen at its best in new residential quarters which are growing up on the outskirts of old towns.

Town planning is a precondition for bioaesthetic planting. We have allowed our towns to develop like mushrooms on a dung heap without any plan or order. In our country, *laissez faire* has really run amuck and the results have been most unfortunate. Ugly, ill-ventilated houses joined together in monstrous piles along

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narrow, crooked lanes—that is how our ancient towns like Amritsar, Lucknow and Banaras appear to an outsider whose eyes are accustomed to western orderliness. An aerial view reveals them as pieces of a jigsaw puzzle, mixed up in a crazy pile ; and not a patch of green in these prison-like piles of masonry ! These houses may have been suitable in insecure times of the middle ages when security rather than ventilation was the guiding principle in our domestic architecture, but in the present social context they appear anachronisms and fossils of a social and economic order which disappeared long ago. In these old towns, we see a reflection of our disorderly and indisciplined social and economic life. They may appear romantic to foreigners who come to our country in search of oriental mysticism and magic, but are certainly unfit for the healthy growth of a nation. It is time we realized that we have had enough of these stinking streets. The younger generation must be educated in a new mode of living. We must improve the environment in our towns.

A very pertinent question arises about the future of these old towns. What should be done with these ancient insanitary slums ? Some would recommend wholesale demolition. But that is an extreme view, idealistic rather than practical. We should try to improve them as far as practicable. These old towns are in need of drastic surgery. We must decongest old residential areas by compulsory acquisition of suitable central housing areas, and after demolishing the ugly houses thus acquired, we should develop parks and open spaces in the sites thus vacated. Improvement Trusts have done useful work in Kanpur, Lucknow and Delhi, but the pace of progress is snail-like and painfully slow, considering the rapid urbanization and an alarming increase in the population of our cities. In the parks thus made, swimming pools should be constructed for the recreation of citizens in hot weather, and incidentally, for irrigating the trees and lawns.

The garden suburb should be our ideal in this warm country, for vertical development is unsuitable, considering the summer heat; and flats are positively uncomfortable in summer. Moreover, the development of motor transport has greatly facilitated horizontal and peripheral development of towns. As far as possible, the growth of these garden suburbia should be planned in a concentric manner, as this will mean economy in fuel consumption for motor vehicles. With the evisceration of slummy quarters, development of parks and tanks in the decongested areas and controlled development in the suburban areas, we can make our old towns also fairly attractive.

Towns developing along the lines of communications serve as production or distribution centres. Our old towns developed along the banks of rivers which were the main channels of communication in the past and served as distribution centres where the villagers exchanged their agricultural produce with handmade articles manufactured by the artisans of towns. These towns were built around forts in which the kings lived surrounded by their nobles and soldiers. They were surrounded

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by stone or brick walls for the sake of protection. The ancient walled towns packed with buildings raised without much of planning appeared like disorderly piles. The narrow streets were designed for the needs of pedestrians, pack animals like mules and donkeys, and country bullock-carts, whose speed may be taken as three miles per hour. With the increase in population and changes in the technique of warfare as well as transport, the walled city became an anachronism. The ancient town packed with buildings and people ultimately bursts, and garden suburbia in the shape of so-called civil stations and model towns are created.

So the problem arises: what should be our ideal in this new town development? The Garden City should be our ideal. The Welwyn Garden City in England and Chandigarh in the Punjab provide examples which may profitably be followed in the development of new population centres.

With electrification which will come in the wake of the hydro-electric schemes, trolley-buses will be the most suitable for transporting people to their places of work from their homes in garden suburbs. For our city of the future, the Le Corbusier model with many-storeyed offices and factories linked with the garden suburbs by means of bioaesthetically planted roads will be very suitable. People will work in the production hub of the city during daytime and will disperse again in the garden suburbs in the evening, enjoying life in healthy, quiet, noise-free and dust and smoke-free surroundings.

CHAPTER VIII

PLACES SUSCEPTIBLE OF BIOAESTHETIC PLANNING

PUBLIC places which belong to the community as a whole rather than individuals should have priority in bioaesthetic planning. A larger number of persons, especially those who are unable to afford private gardens of their own, will thus be able to enjoy the sight of beautiful flowers. Public parks and squares, public roads, platforms of railway stations, compounds of hospitals, universities, colleges and schools, ancient historical buildings under the supervision of the Archaeological Department, compounds of courts, office buildings of Municipalities and District Boards and dak bungalows of the Public Works Department, the Canal Department and the District Boards are the places in towns which are susceptible of bioaesthetic planning and should claim preference in our programme of beautifying our towns and cities. Proprietors of hotels and banks and owners of new bungalows should also be encouraged and given all assistance in the planting of ornamental trees.

A railway station is the entrance gate of a town. An outsider coming to a town for the first time receives his first impression of the place from the railway station. An unfavourable first impression requires a good deal of correction later on. A traveller on a long journey forms his opinion about a town, which he is too busy to see, from the architecture of the railway station and the appearance of its platforms. He may condemn a town merely because he passed through a ghastly railway station. A railway station with a grim exterior will be unworthy of any beautiful town. Platforms can also be sometimes frightfully drab. Avenues of *amaltas*, Persian lilac, peltophorum and lagerstroemias will give them a touch of colour, relieving them of their monotony. A platform without trees will add to the discomfiture of passengers who often have to wait for long on it for their trains. Shade is always welcome in summer. The necessity of planting the platforms and approaches of railway stations with beautiful flowering trees is yet to be fully appreciated. We have still to plan the planting of platforms of thousands of railway stations.

There is another reason why we should make the platforms of our railway stations gay with flowering trees. Millions of persons daily pass through railway stations in the course of business. Platforms of railway stations are more noticed by the people than any other public place. Only a few go to gardens to acquaint themselves with flowering trees, while they all have to see the platforms and approaches of railway stations. By planting flowering trees on platforms of stations, we will not only be beautifying them, but will also be educating the citizen in bioaesthetics. The railways will thus be making a genuine contribution to the cultural life of the country. The Indian railways should grow their own nurseries for supply of

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seedlings to station-masters for planting on platforms. It is necessary, however, that the station-masters develop a sense of appreciation for flowers and trees. This they will if they are given lectures on bioaesthetics in the course of their training.

We are living in a shrinking world, which is rapidly becoming one. India is no longer an isolated country and no longer a vast jungle full of snakes, tigers and elephants. The aeroplane has annihilated distance, and the size of the earth has shrunk to a fifteenth of what it was before the Second World War in terms of the time dimension. This will mean greater contacts among the peoples of different countries, and a tremendous increase in tourist traffic in India. So far, we have been having cold-weather tourists only from Europe and America, but in future we will have tourists from all parts of the world in the spring and summer and autumn months too, when the Himalayas are at their best and most of our ornamental flowering trees are in bloom. Moreover, electric fans, air-conditioned railway trains, motor buses, houses and hotels will reduce the discomfort of living in a hot country to a great extent, and the plains of India will no longer remain unbearably hot and uncomfortable as at present. The Himalayan meadows carpeted with brilliant alpine flowers, the snow-covered peaks of the Himalayas with their pine-scented forests and the brilliantly coloured rocky trans-Himalayas will draw lovers of natural beauty like a magnet from all parts of the world. What will they see in the plains on their way to the Himalayas? If we transform the land into a colourful place by planned planting of flowering trees, the visitors will carry back happier impressions. Just as the Japanese invite foreigners when cherries blossom in their country, we can also call them when the baubineas are covered with a mantle of purple and mauve flowers in the month of March, and when our roads become a blaze of colour with flowers of *gul mohur*, *amaltas* and *peltophorum* in the month of May.

Gate-keepers who live in neat little houses along the railway lines near the gates at railway and road crossings should also be asked to plant a couple of flowering trees near their houses. How beautiful these places will appear! Not only railway passengers, but people passing through these places in cars and other conveyances will also be able to feast their eyes on the beauty of the blossoms of the pink cassias, *kachnars*, *amaltases* and *lagerstroemias*. Those who have to wait at railway crossings when the gates are closed, will have something more beautiful to contemplate than the railway signals and the complaint book.

Ancient buildings and ruins under the supervision of the Archaeological Department afford endless opportunities for bioaesthetic planting. Those who are in charge of this Department have already shown imagination and foresight in this type of work. The deer park in Akbar's tomb at Sikandra in Agra district is an instance. However, the planting of flowering trees needs be pushed on further. The bare hills around Fatchpur Sikri should be planted with *amaltas*, which is highly drought-resistant with the additional advantage of not being eaten

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by goats. Besides *amaltas*, *dhak*, *erythrina*, *barna*, yellow silk cotton tree and *semal* may also be planted in pure formations on different hillocks. Hills swathed in yellow, deep yellow, scarlet, and red colours of the flowers of these trees will look fascinating from the Hawa Mahal. The ruins and temples at Sarnath, near Banaras, the Taj Mahal, Itmad-ud-Daulah, Akbar's Tomb at Sikandra, the ancient temples at Bateshwar in Agra district, the Purana Qila, Qutab Minar and Humayun's Tomb at Delhi and the Mandu Fort in Madhya Pradesh all provide scope for planned planting of ornamental flowering trees.

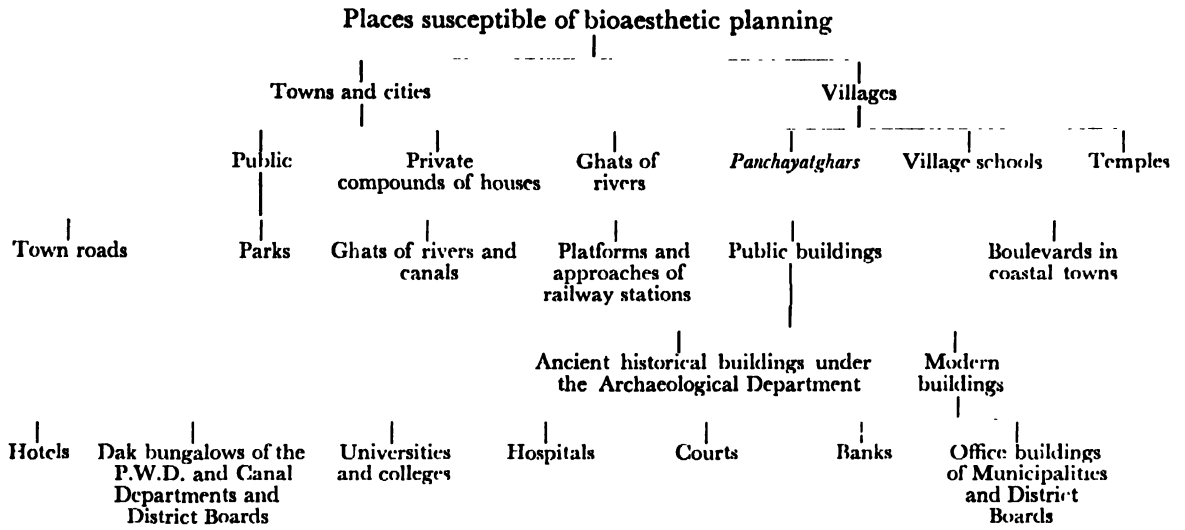
Towns which have canals and small rivers are particularly suited to bioaesthetic planting. The banks of the canal at Kanpur and the banks of the Gomti river at Lucknow should be planted with *Lagerstroemia flos-reginae*, *L. thorelli* and other moisture-loving trees. It would be desirable to encourage canal irrigation in the other towns as well, for it will provide an incentive for the growing of gardens and also for planned planting of ornamental trees. Headworks of canals can also be developed into pleasure resorts with a little effort.

In India, rivers like the Ganges and the Jumna are regarded as particularly sacred, and along their banks we see scores of temples and ghats. Such temples and ghats may be planted with *kadam* and *asoka*, the sacred trees of Krishna and Sita. Avenues of *asoka* and *kadam* at Hardwar and Banaras will not only enhance the sanctity of the ghats but will also add colour and charm to these places.

Hotels and dak bungalows which are usually fenced and have well-protected compounds, and some of which have irrigation facilities as well, come within the scope of the tree-planting programme. The boulevards of coastal towns like Bombay and Madras can be made into a symphony of colour by planned planting of suitable flowering trees.

We also should not neglect the villages, where village schools, *panchayatghars* and temples can be planted with ornamental trees. In the Punjab, the villagers plant *bakain* (Persian lilac) around the bullock-runs of wells fitted with Persian wheels. These clumps not only provide shade for bullocks and men, but also appear very beautiful in March when they are covered with sweet-scented, lilac-coloured flowers. Village community houses (*panchayatghars*) which are jointly owned by the village and are usually under the supervision of rural development organizers and *panches* (the elected representatives of the village), provide ample scope for planting of ornamental trees. Small nurseries of flowering trees can be raised in the compounds of village schools and *panchayatghars* and can serve as foci of tree-planting activities.

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CHAPTER IX

NATURE CONSERVATION AND NATIONAL PARKS

EXCESSIVE urbanization created by the nineteenth century industrialism has torn away a large number of persons from the environment of trees and open fields. Thousands of townlings seldom see the morning sun and the starry sky except through a haze of dust and smoke. In sprawling cities like Calcutta and London, people get conditioned to a mode of life, a life which rolls along tarred roads to the tune of a world of noises. In such surroundings, one feels stifled, and one's soul begins to wither. After a year's stay in London I felt a strong urge for a touch of the soil. When after a long time, I handled clods of earth in Hampstead Heath, I felt revived. It was my peasant soul craving for contact with mother earth and longing for the solitude which the countryside alone can provide, that was finding satisfaction in an environment which was the nearest approach to a village in London. In England, under the spell of urbanism, they allowed their agriculture to decay, and only lately realization has come to the British people that agriculture is something more than a mere industry. We should guard against the decay of our rural life, and must not lose sight of the fact which has been realized by G. M. Trevelyan that "agriculture is not an industry among many, but is a way of life, unique and irreplaceable in its human and spiritual values."

The soul of urbanized man is becoming more and more warped. A large number of men and women in our urban areas live maimed and thwarted lives. Living in an artificial environment they become physically and mentally more and more flabby. As Professor C. E. M. Joad observes,

|| "Nature is the mother of our race; we have evolved as part of a natural process and our ancestors lived for millennia in natural conditions. As a result, there lies deep-seated within us a natural love of country sights and sounds and smell and an instinctive need for occasional moments of quiet alone with nature. The smell of fallen leaves or new-mown hay, the tang of a mountain brook, the feel of lush meadow grass against the face, the texture of the bole of an oak, or the sight of its first young leaves showing yellow-green against the April sky, these things touch in us an ancestral chord that stretches back to our savage, perhaps to our subhuman past."

One of the surest remedies for curing the sickness of the soul is reviving contact with nature. While urbanized man tries to satisfy his appetites in a world of eating-houses, movies and radios, he forgets that he has a mind and a soul which,

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cut off from nature, the fount of all life, is slowly withering. The spirit of God manifests itself in the grandeur of the mountains, and their flower-filled valleys, in the needle-like Himalayan firs and deodars pointing their green fingers towards the sky, in the gushing torrents and roaring rivers pounding their way to the plains, in the forests blazing with blossoms of flowering trees, in the great banyan trees with spreading crowns standing and contemplating the spectacle of life, and in skeins of ducks and wild geese flapping their wings over *jhils* lit up by the rays of the morning sun. Our trees, our mountains and our wild birds make India what she is. So the preservation of our fauna and flora in national parks, nature reserves and sanctuaries is one of the conditions necessary for our development as complete human beings with minds and spirits as well as bodies and appetites.

The concept of nature conservation embraces several distinct purposes such as conservation of plant and animal life, the scientific aspect which includes biological research, field research and experiment, the amenity aspect which deals with the aesthetic and recreational side, and the educational aspect. The aesthetic and recreational approach places the main emphasis upon preserving the characteristic beauty of the landscape and upon providing ample access to and facilities for open air recreation and for the enjoyment of beauty in those areas. The major features of the park are made easily accessible by providing roads, tracks and bridges, and living accommodation in the form of hostels, etc. The scientific approach which in no way underestimates aesthetic values, was primarily directed to the advancement of knowledge and its application to human welfare. "The educational aspect", as the Special Committee on Wild Life Conservation in the U.K. observes, "is in many ways complementary to each and all of the others. True appreciation of scenery rests in part upon, and is certainly enhanced by, some understanding of the rocks and the variety of landscape which they induce, the shape of the valleys and summits, the flow of the streams, the cliffs and the dunes and flats of the coast, and all the rich verdure with which they are clothed, are things which can invigorate and refresh the mind and upon which a deep culture can be based. The more widely this appreciation can be diffused, the sounder will be the mental and physical health of the nation."

The types of areas which are in need of conservation can be classified under the following categories :

I—*National Parks and Nature Reserves* : National Parks may be defined as extensive areas of beautiful and relatively wild country with characteristic landscape beauty, which are also wild life sanctuaries for the preservation of big game, or other mammals and birds, where access and facilities for open air enjoyment are also provided, so that the people may be able to observe wild life of all kinds in its natural surroundings at close quarters. There is also a need for

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nature reserves in the national parks which act as breeding reservoirs for shy animals, which it is desired to encourage and which are not accessible to visitors.

II—*Geological Monuments and other areas of outstanding value* : These include rocks, exposures or sections which, because of their great geological interest, should be preserved as geological monuments, and which should be given the same protection as archaeological buildings and monuments. These should be protected from mining, excavation, prospecting and drilling or similar operations.

II—*Local Educational Reserves* : These include small areas of local country containing representative local flora, which are reserved for educational purposes for the benefit of schools and colleges.

An uncontrolled destruction of wild life has been going on in many countries of the world, and as a result, natural fauna has dwindled and many species have become extinct. In West Europe and countries like England, the process of death and destruction has reached such limits that the sight of a wild bird or animal is regarded as an event of such importance as to inspire many lovers of nature to write letters for publication in the *Times*, saying that they heard a cuckoo at such and such a place. With the modern means of rapid transport such as the motor car, jeep and aeroplane, the whole world is becoming so speedily opened up to travellers, tourists and traders, and with the increasing population so much uncultivated land is coming under the settler's plough, that the need for the preservation of fauna in national parks and reserves is being increasingly felt.

Credit goes to the United States of America for giving a lead to the world in establishing national parks and reserves. The first great national park, the Yellowstone in the United States, dates from 1872. In 1916, the National Park Service of America was instituted to look after those areas of scenic beauty set aside by Congress to conserve the scenery and the natural and historic objects and the wild life therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. These parks are also wild life sanctuaries which provide shelter to animals like the bear, bison, deer, elk, moose, antelope and the mountain sheep.

Forests in national parks are preserved for their beauty and scientific value. In the Sequoia National Park in California are groves of the world's oldest and biggest trees, Sequoias, which are 3,000 to 4,000 years old with trunks up to 17 feet in diameter. In the Mt. McKinley National Park in Alaska, there are extraordinary areas for the study of glacial action. In the Grand Canyon National Park of Arizona can be seen the most interesting examples of water erosion. Here the Colorado River has cut 19 canyons, of which the Grand Canyon is a mile deep, and is flanked by

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intricately carved and most gorgeously coloured rocks. In the Saguaro National Park in Arizona can be seen segments of the oldest desert of the world with desert animal life and a large variety of cacti and other xerophytic plants. In the petrified forest of Arizona are well preserved fossil tree trunks, sometimes five feet in diameter and fifty feet in length. These petrified logs are so well preserved that even the texture of the wood can be clearly seen.

In 1940, the U. S. Bureau of Biological Survey was fused with the U. S. Fish and Wild Life Service, which concentrates mainly on vertebrates including game and fur-bearing animals. The refuges of these animals are of immense size and are habitats artificially controlled or improved to accommodate or attract particular birds and mammals.

The lead given by the U. S. A. has been followed by other countries such as Canada, Australia, New Zealand and the Union of South Africa. In Canada, the first national park was established in 1885. South Africa has several long-standing national parks. Her Sabi Game Reserve was founded in 1898 and renamed as Kruger National Park in 1926. The Albert National Park in Belgian Congo was created mainly due to the efforts of the American naturalist Carl Akeley. Due to the creation of this sanctuary for wild animals, the gorilla has been saved from extinction. New Zealand has one huge park, "Fjordland", 3,500 square miles in area. Europe, Sweden, Poland, Holland, Italy and Switzerland have established national parks and reserves.

In India, the necessity of creating national parks has met with tardy recognition. Bainsi Prasad has thus summarized information about national parks in India :

"In 1934, a very great advance was made in Uttar Pradesh through the great personal interest taken by the enlightened Governor of the State, Sir Malcolm Hailey, as a result of which the National Parks Act of 1934 was passed. This Act provided for the establishment of national parks and for the preservation of wild animal life or other objects of scientific interest and for incidental matters provided therein. As a result, the Hailey Park was demarcated as a national park in the famous Patli Doon and the hill forests to the south of it, consisting roughly of an area of 99.97 square miles. Under the Act, the word 'animal' was defined as 'mammal, reptile, or bird', and it was an offence to kill, injure or disturb any animal or to take or destroy any eggs or nests of any bird from the park. The conditions under which the people were allowed to enter or reside in the park were laid down in the Act and to be enforced by the forest department. In Assam, certain areas had already been demarcated as game sanctuaries and more stringent action was being taken to preserve the wild life, which according to some reports had been reduced by almost 75 per cent within recent years. Reference may also

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be made here to the Chamrajanagar Sanctuary of the Mysore State Forests which had been established with a view to offering complete immunity to animals, particularly wild elephants, thereby making it possible for them to thrive without interference. Introduction of other animals not found in the area was to be attempted, and the Sanctuary was to provide facilities for the scientific study of the life-histories of different indigenous species of game”.

Since then, other states have also fallen in line and have enacted legislation for the preservation of wild life by declaring certain areas with well-defined boundaries as national parks or game sanctuaries or reserves. Some of them, as in Mysore and Kerala are well stocked with natural fauna in an undisturbed forest.

One of the most beautiful wild life sanctuaries in India, the Periyar Wild Life Sanctuary, is in Kerala State. Covering about 300 square miles, the Sanctuary is situated at an average elevation of 3,000 feet. Inside it is the famed Periyar Lake covering an area of 10 square miles and surrounded by grassy hills and valleys with forest groves along its borders. It is well stocked with elephants, bisons, samburs, wild bears, jungle sheep, tigers, and panthers. In summer, when the springs in the hills dry up, the wild animals are attracted to the Lake, and romp about on its long stretches of green grass, or rest in the welcome shade of the forest trees. Tourists boating on the Lake get a close view of the animals resting in the open. The long range of hills and valleys covered with colourful flowering trees presents an enchanting sight to the spectator. An additional attraction is the ancient Sabarimala Temple situated within the Sanctuary which draws thousands of pilgrims every year. The Sanctuary area is permanently closed to all shooting, hunting, cutting down of timber, grazing of cattle and collection of minor forest produce.

Another sanctuary that deserves mention is the Mudumalai Wild Life Sanctuary situated in the Nilgiris in Madras State. Covering an area of 120 square miles, it is 42 miles from Ootacamund along the Ooty-Mysore Road which commands magnificent views of hills and valleys. Hunting, shooting or snaring of animals is not permitted within the Sanctuary, which has a large population of elephants, bisons, spotted deer, tigers, panthers, bears, wild pigs, barking deer, hyaenas, four-horned antelopes, samburs, Nilgiri tahrs, Grey langurs, the Nilgiri langurs, Malabar squirrels, mouse deer, civet cats, red mongoose, flying squirrels, wild dogs, grey jungle fowls, spur fowls, quails, partridges, green pigeons, Malabar trogons, black-headed orioles and wood pigeons. A few trained elephants are maintained for taking the visitors round.

The Kanha National Park and Game Reserve, 34 miles south-west of Mandla in Madhya Pradesh, is one of those rare spots where undisturbed nature can be seen in her glorious splendour. The Reserve occupies an area of about 97 square miles and has such animals as the tiger, panther, cheetal, sambur, *barasingha*,

black buck and barking deer. The main part of the Game Reserve is a plateau nearly 3,000 feet above the sea level, and includes the catchment area of the Banjar River. It has green grass even during the months of May and June when elsewhere pastures dry up. The Park area has been famous for its fauna and flora and was, till recently, an excellent shikar haunt for big and small game. It attracted many sportsmen even from far off countries, who were enchanted by the beautiful *sal* forests of the Kanha Valley. Captain Forsyth in his "High land of Central India" describes these forests as follows :

"The valleys themselves are generally open and free from all underwood, dotted here and there by belts and islands of the noble *sal* trees, and altogether possessing much of the character ascribed to the American Prairies. And in many places springs of clear, cold water bubble up, clothing the country with belts of perpetual verdure, and conferring on it an aspect of freshness very remarkable in a country of such comparative small elevation in the centre of India. Everything combines to deprive this region of the sterile and inhospitable appearance worn by even most upland tracts during the hot season. Throughout the summer, the glossy dark-green foliage of *sal* reflects the light in a thousand tints, and first when all other vegetation is at its worst, a few weeks before the gates of heaven are opened in the annual monsoon, the *sal* selects its opportunity of bursting into a fresh garment of the brightest and softest green. But for the bamboo thickets on the higher hills whose light feathery foliage beautifully supplements the heavier masses of the *sal* that clings to their skirts, the scene would present nothing peculiar to the landscape of a tropical country."

The evergreen *sal* and the year-round fresh pasture in this Reserve are responsible for the abundance and variety of game. The cool summers invite swarms of birds to nest in the forest, and the Reserve has been the famous haunt of many species of birds such as the pea-fowl, jungle fowl, sand grouse, quail, green pigeon, blue rock pigeon, snipe duck, common teal and the *brahmi* duck. A winding network of roads touches all the salient points in the Park. Facilities have been provided for observing wild animals such as tigers, panthers, bears, samburs, spotted deer, four-horned antelopes and a variety of birds, in their natural habitat. A well-equipped booth with electric installations has been set up for studying the habits of tigers, and for photography. Three beautiful lakes provide an added attraction.

There is a clear need for establishing nature reserves within national parks. The principal purposes of such nature reserves, as given by the Wild Life Conservation Special Committee of England and Wales and which are applicable to India as well, are as follows :

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“To conserve and manage, for the enjoyment and interest of visitors, and for the use of naturalists, students and teachers, sites of biological, physiographical and geological importance and characteristic stretches of the natural vegetation. Similar considerations would apply in a less degree to other areas which, though not so valuable on strictly scientific grounds, have just as much importance because of their general charm or because they contain objects of marked beauty—whether rocks, trees, or flowering plants.

“To establish breeding reserves for scientifically encouraging particular species or communities of species the preservation or wider spread of which within the park it is desired to promote. In such reserves public access would have to be more or less restricted.

“To set aside areas so managed as to attract rare, interesting and beautiful species not at present living in the park or its surroundings.”

The authorities responsible for the management of the reserves should keep in close touch with the university and educational centres, as well as local natural societies. A need would also arise for providing small handbooks on nature reserves, explaining with the aid of maps, photographs and sketches the scientific significance of the reserve.

Lack of field training for teachers as well as students is one of the most serious deficiencies in the current biological education in India. Without field training or facilities for nature study, the teaching of Botany or Zoology tends to become lifeless and warped. Thus, there is need for local educational reserves for all colleges where biological sciences are taught. The local educational reserve is the counterpart of the college museum and the laboratory. These reserves would open a vast and stimulating field of knowledge in a discipline which trains such mental attributes as acute power of observation, patience, concentration, detailed ordering of thought, and the appreciation of form and colour. Visits to these reserves under proper guidance would provide a liberal education to the students in one of the most stimulating and formative fields of thought. These are gains which cannot be quantified in terms of money. A beginning in this direction has been made in Delhi State, where the local government has placed an area of 20 acres on the ‘Ridge’ at the disposal of the Department of Botany, University of Delhi. This piece of land will be enclosed with barbed wire, representative trees and shrubs will be labelled and efforts made to introduce other local plants also which can grow under these conditions.

With the liquidation of the feudal order and the merger of states into unions, the problem of wild life preservation has acquired a new significance. It must be said to the credit of the princes and rajahs that they preserved the wild animals and forests of their states rather well. With the demand of cultivators that their crops be saved from wild animals, there is need for the formulation of a clear policy on

wild life preservation. There is immediate need for an initial survey of all proposed national park areas. While there is a necessity of maintaining a good vegetational balance and preserving the rich flora and fauna in national park areas, the general wild life policy must be such as will not prejudice the use of developed agricultural land. The interests of the cultivator and the lover of nature must be harmonized. The apprehensions of farmers that national parks and nature reserves will develop into uncontrolled sanctuaries where pests and weeds will be allowed to flourish and which will spread into surrounding agricultural lands must be allayed. Biologists must give lists of harmful and useful birds and animals. While such of them as are friends of the cultivator are encouraged in the national parks, the enemies must be exterminated. The Biologists should also give advice on whether campaigns should be started for the destruction of wild boars, porcupines, monkeys, bats and parrots which cause enormous damage to crops and gardens. Before any such campaign is started, it should be ascertained whether wholesale destruction of certain birds or animals will have harmful repercussions elsewhere by upsetting the balance of power between the various organisms. An action which *prima facie* may appear sensible and desirable may have far-reaching and most unpleasant and unforeseen consequences fifty years hence. As the authors of the report on "The Wild Life Conservation" observe, "A conservation policy directed to maintaining any particular biological equilibrium entails constant vigilance and a fine-scale 'management' of a kind comparable to the most highly developed farming." The Special Committee further recommends the establishment of a National Biological Service, which should include not only systematists but also others. As the Committee further observes, "Though the ability to recognize and name an organism is the first essential stage, it is by no means the last. The ecologist, the plant or animal physiologist, the geneticist, the student of behaviour, the soil scientist, the climatologist and the statistician, each has his prominent place in the picture. But standing level with the biological sciences, though too often neglected in the context of nature preservation, are the geological and physiographical sciences; for it is from the nature and distribution of the rocks and from the configuration of the earth's crust that the natural beauty of scenery and its living carpet are derived."

In January 1935, the Government of India convened at Delhi an All-India Conference for the preservation of wild life with a view to reviewing the position of the fauna and flora as it existed at the time and considering generally the problem of protection of animals peculiar to India. The Conference prepared two lists of species: first, of animals that were to be protected as completely as possible, and second, of those which could only be hunted, killed or captured under a licence, in some cases subject to a bag limit. The Conference further laid stress on the establishment of wild life sanctuaries. It was also recommended that the duty of preserving the

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fauna should be assigned to the forest departments in the areas under their charge, and the necessity of co-operation of the police and magistracy was also urged.

A comprehensive protective legislation was enacted in 1933 in the Punjab Wild Birds and Wild Animals Protection Act. Wild birds and animals were classified into three categories :

- (1) Wild birds and animals which are excluded from protection,
- (2) wild birds and animals which may be killed and captured without a licence during a specified period, and
- (3) wild birds and animals which may be killed or captured under a licence, subject to a bag limit in some cases, during certain seasons. Shooting of these is prohibited during the breeding season, which is the close season.

To administer the Act, a Game Warden was appointed for the states of the Punjab and Delhi. A Game Inspector was appointed in each district with a number of Game Watchers. In addition, District Fauna Committees with the Deputy Commissioner as chairman were established in each district for advising generally about the protection of fauna in their respective districts, and for educating the public mind on the necessity of preserving wild life. The District Fauna Committee of Delhi has done exceedingly useful work. Pictorial charts showing the close season and the bird and animal friends and foes of the cultivator were published for wide circulation in schools, *panchayatghars* and police stations.

The Wild Life Preservation Act at present in force in many of our states should be made more comprehensive, and cognizance should be taken of the plant world, too. Plants which are rare or striking, beautiful or odd should be scheduled for protection in areas where this is necessary. Rare plants like species of *Lycopodium*, *Ophioglossum* and *Osmunda*, and beautiful plants like orchids, *Rhododendrons* and *Meconopsis*, which are liable to excessive collection by botanists, and which are widely plundered and uprooted by 'pleasure'-pickers should also be given protection, and their collection should be permitted only under proper control.

There are a number of giant trees scattered all over the country, which are known only locally, barring a few like the well known banyan tree of Sibpore Botanical Gardens which covers acres of land. In almost every district, there is a tree of mythical age, which attracts the curiosity of people, and is often worshipped. Where religion has sanctified them, or superstition has invested them with magical powers, these trees are protected by the people. The *pipal* (*Ficus religiosa*) and banyan (*Ficus bengalensis*) are regarded as sacred, and only in the direst extremities of a famine will their leaves be cut for cattle. The *jand* (*Prosopis spicigera*) is revered in the arid districts of the Punjab and is commonly selected to mark the abode of a saint or a deity, and

rags are tied to its branches as offerings. There was a general sentiment against cutting of trees among Hindus, which has given them effective protection so far. In most villages, sacred groves are found from which no one may cut wood or pick fruit. The Bishnois of Hissar and Rajasthan object to cutting a tree growing by a pond. The reverence for tree life has gone to such extremes that wood-cutting and kiln-burning are regarded as unlucky occupations as both of them involve the destruction of living trees and of insects in the earth in the burning of bricks. That is why woodcutters and kiln-burners are said to be shortlived.

Where religion has given protection to certain ancient trees, little more is required. The sorrow-removing *ber* tree (*Zizyphus jujuba*) of the Golden Temple at Amritsar and the sacred *garna* (*Carissa spinosa*) of village Bodal in Hoshiarpur district are trees of great antiquity, and are held in great reverence by the Sikhs. Besides these there are many trees which are in need of special protection. There is a giant *arjan* tree near Agra which deserves such protection. The biggest mango tree in the world is growing in an obscure village named Burail in *tahsil* Kharar, District Ambala, and only came to public notice during the anti-capital agitation, as this village happened to be included in the proposed site for the new capital of The Punjab. It has been given the name of "Chhappar" or thatched house, probably because it gives protection to a number of wayfarers from the heat of the sun and rain. The circumference of its stem is 32 feet. It has nine main branches trailing close to the ground, 5 to 12 feet in circumference, and 70 to 80 feet in length. Each of these branches looks like a giant tree. The total area occupied by the crown of the tree is 2,700 square yards. The average yield of the tree is reported to be 450 maunds. It is said that when 20 cartloads of mangoes plucked from this tree reached Patiala a few years ago, people asked whether a whole orchard had been plucked. It is desirable that such trees should be given legal protection as national monuments.

Some of the Himalayan valleys are in grave danger of losing their character on account of excessive grazing and growth of rumex. Apart from other vegetation, the sheep and ponies which are taken to alpine meadows above the tree-line by graziers in the months of April and May graze mainly on rumex. A symbiotic relationship has developed between the sheep and rumex. While the sheep feed on rumex, in their turn they manure the pasture land with their droppings, which, in turn, further promotes an extensive growth of rumex. The result has been that more attractive, but less edible alpine plants are driven out by rumex, which now covers big areas in the alpine valleys of the Himalayas like that of the Pindari glacier. In the interest of the tourist industry, it is very necessary that some of the beautiful alpine valleys of the Himalayas are declared as plant sanctuaries; and not only the collection of beautiful and rare plants controlled, but the grazing of sheep and cattle also prohibited. This is necessary in the interest of the tourist industry and botanical studies, as much as for checking soil erosion.

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Nature conservation and conservation of soil, forests, grassland and water are intimately interconnected. Most changes in nature are slow, insidious, and not readily detectable. A change in the balance of power between small organisms in the soil, a slowly dropping water-table—these are potent factors in the destruction of a countryside. What has to be done to conserve the soil and water resources so as to maintain or establish a series of varied and most delicately balanced conditions ? This question is just as fundamental to agriculture, horticulture, forestry, game preservation and fisheries, as it is to the management of national parks.

Soil erosion occurs as a result of the removal of the plant cover on account of deforestation by man or by the uncontrolled grazing of cattle and goats or the utilization of grasslands for agriculture. To understand the disastrous results of soil erosion it is necessary to know what soil is.

Soil is more than a mere disorganized rock material. It has been aptly described as a living organism. Apart from the soil particles, there are numerous bacteria, protozoa, diatoms and other soil microorganisms along with the decayed remains of plants which compose the soil. Leaves of trees, bushes and herbs form a protective cover which acts as a sponge, absorbing the run-off water. This water percolates through the humus layers to the minerals of the soil and accumulates in underground storage reservoirs, which give birth to numerous fresh-water streams. With the plant cover removed by the action of man and animals, the run-off discharge of water increases at an alarming rate. Gorrie has made observations on the run-off data in the Pabbi Range, Jhelum District, and has found that in an area which is fairly covered with trees the maximum run-off is less than 100 cusecs per square mile, while in the land where persistent cattle- and buffalo-grazing has destroyed the plant cover, the run-off rises to 1,600 cusecs. Moreover, silt-laden water has a sealing effect on the pores of the soil and the amount of seepage is considerably reduced. The silt-laden water has also a sand-papering action on the floor and sides of the channel. Valuable salts containing potassium, phosphorus, calcium and nitrogen as well as microorganisms, which play an important part in the proper development and functioning of the roots, are lost.

When more surface soil is washed away, clefts appear and gullies are formed. During monsoons, the rain water rapidly flows away, flooding the countryside. Thus water conservation becomes a serious problem ; the water level falls and the country, in general, becomes dry and barren. The land becomes useless for agriculture and does not even produce enough grass. The repercussions of all these changes on wild life are serious. With the disappearance of grasslands, forests and fresh water streams, wild life also begins to disappear. The erosion problem of the Siwaliks is a case in instance.

Records, which are available, show that in the middle of the nineteenth century, these ranges were covered with thick vegetation, which harboured a number of wild

animals. These forests were protected by the feudal landlords and rajahs for shikar. In the conditions which prevailed in the last phases of the Sikh rule and the early days of British occupation of the Punjab, the hillmen further encroached upon the forests. Grazing of goats and cattle and the cutting of trees continued unchecked for a long time. In the early nineteenth century, the *chos*, which are now torrential monsoon rivers, were perennial fresh water streams which furnished valuable irrigation in the submontane area of Hoshiarpur. With the disappearance of the plant cover, these perennial fresh water streams became torrential monsoon rivers, which now wash away large quantities of soil and have covered fields, which were once fertile, with sand. The forest-covered Siwaliks have degenerated into bare hillocks which are not capable of producing enough even for the starving population of human beings, goats and cattle, much less of providing food and shelter to wild life.

What remedies should be adopted to check soil erosion? Closure to grazing and its substitution by grass-cutting and stall-feeding, and replacement of goats by sheep which are less destructive, have been suggested. Agricultural practices in areas in the Himalayas and submontane areas also need to be modified. Terracing, bunding, contour ridging, contour furrowing, crop rotation and strip cropping also require attention. However, the sovereign remedy is reforestation, and 'PLANT MORE TREES' should be our slogan for the next decade.

CHAPTER X

PLANTING TREES IN VILLAGES

GREAT opportunities exist in the villages of India for planting fruit, timber and fuel trees for the use of villagers. Fuel and timber trees can be grown in village pasture lands and near cattle-sheds, and fruit and ornamental trees in the compounds of houses, village schools, mosques, temples and *Gurdwaras*, and along boundaries of fields and on the bullock runs of wells. To push forward a programme of tree planting, there is need for nurseries for supplying plants to the villagers. Needless to say that facilities in the form of readily available plants from nurseries raised for the purpose at district and block headquarters and *panchayatghars* in villages are far more important than mere propaganda.

A comprehensive tree plantation programme for villages would include renovation of existing orchards, planting of new orchards, individual planting of fruit trees like mangoes, lemons, sweet limes, guavas, papayas, *kathal* and bananas in the compounds of houses of farmers or in the form of shelter-belts in farms where the fields are consolidated into blocks. It would also include raising of fuel plantations on waste lands which are commonly used for pasturing cattle.

Consolidation of scattered and fragmented holdings will greatly help in pushing forward tree plantation programmes in villages. When scattered fields are brought together, homesteads similar to those in Europe can easily develop. The farmer with his family and livestock will live on the land and the problems of insanitary villages and inefficient cultivation will also vanish.

The pattern of farming which may suit the needs of the teeming peasant population of the Indo-Gangetic alluvial plains of India may be described as mixed farming, practised on an individual basis by farmers on consolidated blocks of land. Mixed farming may be described as commensalism, in which man, animal, tree and soil are linked together to their mutual advantage. An irrigated soil provides crops and trees for the benefit of man and animal, and they, in their turn, fertilize the soil by providing manure. Under such a pattern of farming, each family keeps a couple of buffaloes or cows and some poultry, and grows a patch of vegetables, crops and fruit trees along the boundary of the farm for use as well as for sale. In wet areas, fish culture may also be practised in a small tank in the farm.

For a homestead in moderately wet areas, an ideal plantation scheme would be like this :

A shelter-belt of timber trees like *shisham* and *babul* at the back with fruit trees like grafted mangoes, papaya, guava, lemons and sweet limes on the

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remaining boundaries. A couple of *kathals*, which provide the farmer's family with a delicious vegetable, may also be grown. It may be mentioned that all the trees which we have listed are dwarf trees which cast little shade, and hence are not injurious to crops. There are two trees which were very popular with the ancient Hindus, and in their house-planting schemes they always recommended their planting in certain specified directions. These are the *bael* (*Aegle marmelos*) whose fruit is useful in digestive ailments, particularly diarrhoea and dysentery, and *amla* (*Phyllanthus emblica*) whose fruit has been found to be particularly rich in vitamin C and is used for making chutneys and pickles.

Farmers in the Punjab and Rajasthan usually own fair-sized cattle-sheds. Shade is an urgent necessity in cattle-sheds for protecting cattle, particularly buffaloes, from the heat of the sun. Quick-growing trees like *bakain* (*Melia azedarach*) should be planted in clumps in the compounds of cattle-sheds interspersed with mulberry trees. These trees would require protection only in the first three years. Mulberry twigs are commonly used for making baskets for use in the cattle-shed and the house in the Punjab, while *bakain* yields valuable insect-proof timber.

The creation of fuel plantations has an important bearing on agriculture. It is due to lack of fuel that the cultivator is forced to burn nearly one-half of his cattle dung. Chaturvedi has estimated that the fuel value of a ton of fresh dung is equal to about $\frac{1}{5}$ ton of firewood, which is worth about four rupees. The manurial value of a ton of fresh dung is approximately nine rupees. Thus, the loss involved in utilizing 50 million tons of manure as fuel in Uttar Pradesh alone at rupees five per ton amounts to 250 million rupees. If fuel plantations are raised, cow-dung will be utilized for manurial purposes, and such plantations will also arrest wind and water erosion of soil.

Village *shamilat*, the common land which is used for pasturing cattle, is ideal for village plantations. Old fallow land which has been out of cultivation for a long time can also be planted with trees. The question is whether these plantations should be raised and managed by individual farmers or by the village *panchayats*. Plantations under the supervision of the *panchayat* and common ownership of the trees are an ideal solution, but the difficulty lies in the lack of corporate sense in many villages. Usually, we find that everyone's responsibility is no one's responsibility, and trees planted with great effort are grazed off by cattle. So we have to adopt both: In a village where a *panchayat* is functioning successfully the plantation should be raised by the *panchayat*, which can also appoint village youngmen as guards for protecting the trees in the first two years.

In some villages, it would be more feasible to partition the village waste land into allotments. These allotments should be enclosed by *kutchha* walls to give protec-

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tion to young trees. Where the water-table is fairly high, a *kutch* well may also be dug in the plot. Near the boundary wall, thorny fuel trees like *babul* or mesquite, and in the middle area, fruit trees like *desi* mango and *kathal* may be planted. The fruit trees may occupy 25 per cent of the area ; the rest should be covered by fuel and timber trees.

For an ideal village plantation, we require trees which provide fuel and fruit as well as small timber for agricultural implements. So the species selected must be fast-growing, easily grown and good coppicers. The following species are recommended :

For fuel and timber. *Babul* can grow almost anywhere in dry, waterless tracts, eroded ravines and on marshy banks of *jhils*. It yields excellent fuel as well as fine timber for agricultural implements and wheels of bullock-carts, and its bark is used for tanning leather. *Shisham* yields excellent fuel and timber and is a fast grower. It has been extensively used for covering sand-covered fields along the banks of *chos* in Hoshiarpur district and is a good coppicer. *Bakain* is a very fast-growing tree and yields insect-proof timber for ploughs. Mesquite can easily grow in sandy and rocky soil. *Dhak* will grow on the worst soil and can even tolerate mild *usar*. It is a good coppicer. Bamboos can easily be planted near ponds. Bamboo has many uses in the farm. In the case of mulberry, only *desi toot* should be encouraged.

“*Desi*” fruit trees. Good varieties of *desi* mangoes with thin juice and good flavour and stones of grafted varieties like *Safeda*, *Dussehri* and *Langra* should be selected and grown. In areas with a rainfall of over 30 inches, *kathal* trees should be encouraged. *Mahua* is a popular tree in Oudh and is valued for its fruit as well as wood. It can grow on mild *usar*. The *jamun* variety with a big-sized fruit, known as *Ra-jamun*, should be encouraged. This is one of the few trees which stand water-logging and can be grown on areas liable to be flooded. Tamarind yields edible fruit as well as excellent coal for producer-gas engines.

Fodder trees provide valuable cattle feed in the winter months when grasses are not available. As compared to grasses, some leaf fodders, particularly those of *kachnar* and *toot*, are exceptionally rich in essential nutrients such as crude fat and protein, lime and nitrogen-free extractives. The best leaf fodder species are *kachnar*, *toot*, *nim* and *babul*. Fodder trees also deserve to be grown in village plantations.

The Forest Tree Relation Department of the TVA has developed an unusual line of research which concerns the development of tree crops. Elaborate experiments were conducted to discover suitable trees and shrubs that yield crops of fruits or

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nuts which are either directly available for human consumption or can be fed to pigs or other livestock. Incidentally, with more trees the bird population also multiplies. Black walnut, filberts and sumachs have proved a success. A very large experimental arboretum as well as several hundred demonstration farms are maintained for work of this nature.

In India, the subject of tree crops deserves more attention at the hands of the Forest Departments. Tree crops can be encouraged in Government forests as well as in private village forests. Wild fruit trees like *ber* (*Zizyphus jujuba*) and *toot* (*Morus alba*) can be propagated on waste lands and in forests on a big scale. *Ber* provides a delicious fruit of many varieties which is eaten both in the fresh and dried condition. It is also an excellent fodder tree and its leaves are fed to goats and buffaloes. It is an extremely hardy tree which can stand drought as well as frost, and is ideal for barren districts with comparatively poor rainfall. *Ber* also provides a valuable famine food. By selection and hybridization, the fruit can be improved in size as well as in taste.

CHAPTER XI

PLANNING YOUR HOME GARDEN

GARDENING, like music, is one of the most sensitive of fine arts. A landscape designer should be an artist, an aesthete, a botanist, a gardener and an architect. As an artist he should have an eye for colour and form, and as an aesthete, love for nature and beautiful plants. He should also know the anatomy, physiology and ecology of plants, as well as the principles of sculpture, architecture and engineering to appreciate the relationship between plant form and architecture. He should not only be able to select plants which are suitable for the soil, but also possess a highly trained aesthetic sense so that he is able to appreciate the principles of balance, rhythm and accent in the planting of trees.

Beauty and utility should be harmoniously combined, and we must give up the idea that to be useful a thing must be ugly, and an object is useless because it is beautiful. Beauty and utility were at opposite poles a century ago when expensiveness and ornamentation were the chief canons of beauty, and it was thought necessary that a chair or a table must be expensively carved to be beautiful. Now we appreciate that a piece of furniture or crockery can be simple in design and yet be beautiful. The ideals of utility and beauty have coincided. Now we realize that whatever is to be designed must perform its function easily, thoroughly and gracefully. In fact, all true beauty is functional. The body of a well developed woman is beautiful because it expresses its function of procreation and maintenance of the species so well. A teapot is beautiful when it can hold a sufficient amount of hot water and pour it out in a steady stream. A teapot from which the hot water trickles out drop by drop or in a torrent cannot be called beautiful. Similarly, a garden in which trees of all varieties are jumbled together without regard to the colour of flowers, the shape of crowns and the height of plants cannot be called beautiful. A garden is a place for repose and quiet contemplation of beauty, and if its design is such that one experiences a sense of irritation, it is badly designed.

In a garden design one has to see that a tree is placed properly and that the right tree is selected. If a cheap oleograph of Ravi Varma showing Shiva with serpents coiled around his neck is placed in a sitting room, it will make no difference against which window it is hung, because it will look equally hideous in all shades of light. If one possesses a Himalayan landscape of Bireswar Sen, Brewster or Roerich showing the steel grey Himalayan snows after sunset, or inimitable lonely mystical figures in the mellow starlight, one has to be careful where it is placed. If it is hung in a heavily curtained dark sitting room, or opposite a door where light reflects from the glass of the frame, it is decidedly out of place. So you have to select

your picture as well as a place in your house to display it. Similarly, you have to select your tree, and also a good site for it. If a dwarf *kachnar* is placed behind a tall *colvillea*, it is a bad design. Design thus deals as much with the placing of the object as with the object itself.

Roote and Kelly have defined landscape design as the “satisfactory and consequently beautiful composition of natural areas—shape of earth, trees, and sky—in three dimensions”. The tree form shows a remarkable adaptation to topography. We usually find that the shapes of the crowns of trees which grow in a particular locality are adapted to the landscape. Thus the twisted *cryptomerias* of Japan grow on irregular volcanic rocks, the elongated conifers like the pine, deodar, cypress and fir with columnar stems and elongated globose crowns harmonize with the pyramidal mountains of the Himalayas, and the semi-globose oaks, chestnuts, maples and apples go so well with the rolling downs and small hillocks of England and France. On the other hand, umbrella-like *acacias* and *gul mohurs* and semi-umbrella-like *nims*, *mahuas*, mangoes, banyans and *pipals* of the alluvial plains of North India are admirably suited to the flat nature of the country. Contrast these with the grotesquely twisted trees of the Vindhya which grow on inhospitable rocks. The modification of the tree shape and crown is possibly related to light. I have seen columnar pine-like *pipal* trees in congested gardens. A tree with an umbrella or a semi-umbrella-like crown assumes its natural shape when plenty of space is available for the spreading of its branches. The linear habit of the conifers is so well adapted to crowding on a hillside. Possibly, it originated as a mutation and the resemblance of pyramidal or linear crowns of the conifers to pyramidal mountains is fortuitous. That this peculiar habit is chromosomal in origin is proved by the fact that these trees retain their linear shape even in the plains where there is no crowding in growth and no struggle for light is imposed.

It has been found that a tree from one particular habitat when grown in a different habitat serves as an accent material. Thus a cypress, a pine, a deodar, or a Lombardy poplar when grown in the plains serves as a most striking accent.

Accent. According to Roote and Kelly, “accent is attained by the use of a plant the distinguishing characteristics of which are quite noticeably different from those of the plants which form its setting.” Thus, accent may be secured by planting trees and shrubs of a different scale and form than those growing in the locality. A solitary date-palm, a polyalthia, a poplar, a millingtonia, a pine, a cypress, a deodar, or an araucaria growing in the corner of a lawn serves as an accent material when the other trees and shrubs are low and rounded. Accent may also be produced by using trees with unusual foliage or brilliantly coloured flowers. Thus a solitary *colvillea* or *gul mohur* serves as an accent material. Accent material should be used sparingly; a mass of tall and unusual trees all clamouring for attention produces confusion and loss of unity.

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If a person is asked as to what type of planting scheme he would prefer for his house—formal or informal—you will find that if he is progressive-minded, he will invariably go in for an informal design. It is here that a word of caution is necessary. The words “formal” and “informal” when used in relation to planting, should be taken out of their social or political context.

Informal planting is suitable for flat as well as uneven ground and formal planting for flat ground only. As Roote and Kelly have defined, “Informal design may be called a study of space relations, and formal design a study of lines. Informal planting consists of irregular forms irregularly placed, and formal planting consists always of regular forms regularly placed. In a formal scheme, straight lines and angles are emphasized on account of their greater precision, while the informal type lays larger emphasis upon curves and rounded masses. In the formal type little is left to the imagination, few unexpected arrangements occur, and the whole scheme is visible from one point, instead of unfolding gradually to the view.”

Formal planting is based on geometrical balance, and informal planting on occult or unsymmetrical balance. A formal arrangement is usually based on bilateral symmetry and use of trees with regular and symmetrical crowns. The Moghul gardens with their rows of cypresses are a typical example of formal planting. Formal planting is always used in connection with architecture. It is the architectural element which predominates, and the trees used repeat the character of the lines of the building. Mark the resemblance of the cypress trees grown in the Taj Mahal to the four columnar towers. Formal planting is particularly suitable for buildings in cities. In cities, lines are straight or rectangular and their primness and unnaturalness must be repeated in the garden of the house by a symmetrical arrangement of the trees and shrubs, and the use of trees and shrubs with regular shape. In some cases, where the crowns of trees and shrubs are not naturally regular, the desired result can be achieved by clipping and pruning. In the formal type of design, the walks, hedges, walls or bedding are considered as line-divisions. The line being the dominant factor in the disposition of the area, more attention is paid to the arrangement of the material than to its character.

Informal planting is very suitable for houses in our Himalayan belt and in some parts of the Deccan plateau. In this type of planting, the balance is asymmetrical and is a matter of gradual appreciation. In fact, an informal type of planting combines a number of independent balances which form a unity. Its beauties and subtleties are gradually unfolded and not thrust all of a sudden before the gaze of the onlooker. The Japanese garden is a typical instance of informal planting. The horticultural element preponderates in this type of planting. Free use is made of shrubs which are placed at unequal distances individually or in groups. Trees are selected for their individual value—beauty of the colour of flowers, their fragrance or the charm of their foliage or the twisted shape of their branches.

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If planting of ornamental trees in the compounds of private houses is properly planned, their cumulative effect will be very striking, and thus private individuals can create an artistic environment for their families and also add to the beauty of the town which has claims on them as its citizens. Unfortunately, ornamental trees find a very unimportant place in our house-building schemes. Few people realize that ugly-knotted *nim* trees, dark mango and *siris* trees with noisy rattling pods produce a very ugly effect and mar the beauty of even the most modern-looking building. Compounds of houses with a crowded growth of mangoes, guavas and jack-fruits look gloomy, dark, depressing and dismal.

When you are building a new house, the first step you should take is to cut all existing *siris*, *mahua*, *babul* and other trees, most of which are self-grown. This may appear painful especially when mature trees are concerned, but it is a necessity, for no planning is possible unless the existing confusion is cleared. In any case, if shade is a problem, the existing self-grown trees should be gradually removed. After this preliminary surgery is over, start the new plantation. The best plan for a house of an average size (on a plot of two acres and less) is as follows: plant ornamental flowering trees of medium size at the sides, dwarf ornamental trees or shrubs in front and fruit trees at the back of the house where they are not visible from the main entrance.

In the case of small and medium-sized houses with small compounds, ornamental trees should be planted *only on the outer boundaries*. It is no use planting avenues on the inner roads in a small compound, for such avenues produce a stifling effect and the compound appears narrower still. If you have about two acres of land, then have a double row of trees at the sides; the outer row should be of evergreen shade trees with ornamental foliage like *Acacia auriculiformis*, *Polyalthia longifolia*, *Putranjiva roxburghii* or *Phyllanthus emblica*. Have a row of one species on one side and of another on the other. The first three of these have a compact linear crown and beautiful foliage. Planted at a distance of 15 feet, they produce a beautiful screen which also serves as a background for the flowers of ornamental flowering trees which should be put in the second inner row at a distance of about eight feet from the outer row. Only dwarf flowering trees which are listed separately should be grown, for it is no use putting big trees with spreading umbrella-like crowns like the *gul mohurs* in compounds of small houses where adequate space is not available for their full growth.

There are also a number of trees and shrubs which emit fragrance at night time, especially during rains, such as *Gardenia lucida*, *G. florida*, *G. latifolia* and *Cestrum nocturnum*. These can be planted to their best advantage opposite windows and doors of bedrooms, so that one may enjoy their fragrance in the evenings, particularly in the summer months.

While planning your ideal home, do not forget to pay proportionate attention to the layout of your compound. The house and the garden should be designed as a

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unit, and one should consider how the garden will look from the house, and how the house will appear from the garden. The garden provides a background and setting to the house, as a frame to a picture. The view of the garden from the house is very important and there should be something pleasant and colourful to look at from every door, window and verandah. Facing the verandah beyond the open lawn, one may plant pink cassia, *amaltas*, *peltophorum*, jacarandas or bauhinias which all flower from March to June, the hot months in which we sit in the verandahs of our houses. However, do not smother the house with trees. The trees should be restricted to the boundary wall and corners of the plot, and have a level, quiet and restful lawn in front of the house. In a small plot of land, a feeling of spaciousness is given by a foreground of lawn, and if trees are planted too near the house, the result is stifling confusion and a narrowing of the compound.

As regards a design for your garden, a sound advice for a person building a modern house is to choose a simple design harmonizing with the plain architecture of the house. Intricate flower-beds with borders, unnecessary hedges, meaningless paths, useless pergolas, sun-dials, fountains, statues and unnecessary green-houses should be avoided. Star-shaped and polygonal flower-beds are difficult and more costly to maintain and appear irritating, as compared with simple rectangular, round or oval plots which are not only easier to maintain, but are also restful. If there is an uneven piece of land, make use of it by making terraces for the growth of annuals. Annuals grown on four to five terraced plots give a fine display. The flower-beds should be at least six to ten feet broad, for the annual herbaceous border with tall annuals at the back, medium-sized plants in the middle and dwarf annuals in front cannot be displayed to its best effect in narrow strips of land.

So far as verandahs are concerned, it is better to keep them free of crotons, ferns and such other plants. Too many flower-pots in verandahs, the relic of early Anglo-Indian gardening, create untidiness and are also favourite haunts of snakes, scorpions and spiders. Fern-houses also go ill with modern houses. On the other hand, cacti with their peculiar globular, cylindrical and snake-like shapes fit in admirably well with modern architecture, and a rock garden with an assorted collection of cacti is an asset to a modern house. *Lantanas*, *hazara orange*, *petraea* and *bougainvilleas* grown in standards also add a good deal of charm to a compound. Do not have too many of these. A few plants judiciously placed at appropriate places produce a far more pleasing effect than a jumble of plants. Simplicity of treatment and design is the keynote of the modern garden.

Hedges form an important component of the garden in the compound of a house. Here, too, one must discard formalism. Place a hedge where it is necessary and where it can serve some purpose. Hedges can be used for separating the kitchen garden from the flowering garden of annuals, or for screening a portion of the garden where one can recline in comfort in the sun during winter. A variety of cypress called

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mor pankhi forms an excellent hedge, and on account of its evergreen nature and dark green colour is to be preferred to common dodoneas and durantas. Hedges are used for marking the boundaries of the compound, and for screening servants' quarters, garages and other unsightly features of the house.

Where the land available is small, do not have the building in the centre. This will result in the creation of ribbons of land on the sides, which cannot be of much use. Place the building on one side, thus leaving a fairly ample space for a lawn in front and on one side in the shape of an L, the sides of which can be planted with dwarf ornamental trees. In planting, one should also overcome the craving for symmetry, and not plant exactly similar trees on both sides. In the art of decoration, a balancing effect is more desirable than dead geometrical symmetry. Two groups of trees of two different sizes on the sides create an artistic balancing effect. In modern decoration, the tendency is to break the symmetry in such a way that a balance results.

There are some who would rather have plants which produce flowers all the year round, than annuals which flower for only a couple of months. Where space is limited, there is much to be said in favour of this view. Canna beds, ornamental shrubs like *Myenia erecta*, red, yellow and orange varieties of ixora, blue plumbago and *zinnia linearis*, a perennial dwarf zinnia with orange-coloured flowers, provide a good substitute for annual flowers. Canna beds can be laid out opposite bathrooms, as their broad leaves have a quick rate of transpiration and provide an easy solution for the drainage problem.

Vegetable gardening has its artistic side as well. Neat rows of cauliflowers, egg-shaped white brinjals and scarlet tomatoes look attractive. Bottle gourds and snake gourds, when grown over a scaffolding of tree trunks supporting a roof of twigs, appear very charming in the month of November. Beans, *pethas*, and pumpkins may also be grown on such supports where they are safe from monkeys and other pests.

DWARF ORNAMENTAL TREES SUITABLE FOR SMALL COMPOUNDS

Flowering trees

<i>Acacia auriculiformis</i>	<i>Jacaranda mimosaeifolia</i>
<i>Alangium lamarckii</i>	<i>Brownea coccinea</i>
<i>Bauhinia purpurea</i>	<i>B. ariza</i>
<i>B. variegata</i>	<i>Kleinhovia hospita</i>
<i>Butea frondosa</i>	<i>Lagerstroemia thorelli</i>
<i>Cassia fistula</i>	<i>Mesua ferrea</i>
<i>C. javanica</i>	<i>Milletia auriculata</i>
<i>C. marginata</i>	<i>Pongamia glabra</i>
<i>Cochlospermum gossypium</i>	<i>Plumeria rubra</i> and <i>P. a'ba</i>
<i>Cordia sebestina</i>	<i>Saraca indica</i>
<i>Crataeva religiosa</i>	<i>Solanum wrightii</i>
<i>Erythrina blakeii</i> , <i>E. crista-galli</i>	<i>Spathodea nilotica</i>

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<i>Guaiacum officinale</i>	<i>Sterculia colorata</i>
<i>Gliricidia maculata</i>	<i>Teomella undulata</i>
<i>Holarrhena antidysenterica</i>	<i>Thespesia populnea</i>

Fragrant trees and shrubs

<i>Alstonia scholaris</i>	<i>Ixora parviflora</i>
<i>Anthocephalus indicus</i>	<i>Lawsonia alba</i>
<i>Artabotrys odoratissimus</i>	<i>Magnolia grandiflora</i>
<i>Gardenia lucida</i>	<i>Michelia champaca</i>
<i>G. latifolia</i>	<i>Murraya exotica</i>
<i>G. florida</i>	<i>Nyctanthes arborescens</i>
<i>Hiptage madagascariensis</i>	<i>Schinus molle</i>

Trees with ornamental foliage

<i>Averrhoa carambola</i>	<i>Citharexylum subserratum</i>
<i>Callistemon lanceolatus</i>	<i>Polyalthia longifolia</i>

Trees with ornamental fruit

Hazara orange

It is not intended, however, that fruit trees are to be totally banished from the compounds of private houses. From the aesthetic point of view, they should on no account be grown in the front part of the compound of the house because of their unattractive appearance. They should be relegated to that part of the compound behind the house where they will not be visible from the entrance. The governing principle should be aesthetic planting in the foreground and economic planting in the back yard of the house. Economic planting should be unobtrusive enough to escape notice and should attract the least attention.

Another nuisance which results from the planting of mangoes and guavas is that of flying foxes and parrots. While flying foxes produce eerie noises at night time, the parrots play havoc with the fruit during daytime. As M. D. Chaturvedi observes, "On no account should a residential compound be permitted to degenerate into a fruit garden with the necessary accompaniment of contractors, *malis* and beating of kerosene tins and other weird noises devised to scare away birds and animals."

Even for the back part of the house, one should be careful in the selection of fruit trees. Citrus plants like grapefruit, oranges, sweet lime and lemons are particularly desirable on account of the sweet smell of their flowers ; their fruit is rich in vitamin content, and is a welcome addition to the table. *Carissa carandas* has scented flowers, and its fruit is ornamental and is used for pickling. Other trees which may be planted are figs (*Black Ischia* and *Black Turkey*), dwarf-grafted mango varieties like *Dussehri*, *Sufeda* and *Banarasi Langra*, papaya, *bael* and grafted *amla*. Papaya fruit contains pepsin, an enzyme which digests proteins and is very helpful for meat eaters.

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The *amla* fruit contains a very high percentage of vitamin C. Figs are a laxative, and are beneficial to dyspeptics.

Where a big area is available, say, five acres or more, one can make use of tall trees like Eucalyptus, trees with spreading crowns like *gul mohurs* and pink cassia. In such compounds, one can also have avenues along the inner roads. For avenues, trees with long, linear and symmetrical crowns are suitable, for they appear graceful when grown in a line, and also do not obscure the view of the house.

An avenue of *Polyalthia pendula* appears very attractive along an ascending road. There is a beautiful avenue of this pendulous variety of *asokan* in "Kamla Retreat," the house of Padampat Singhania at Kanpur. Other trees suitable for avenues of approach roads are *Polyalthia longifolia*, *Acacia auriculi-formis*, *Callistemon lanceolatus*, Eucalyptus, *Sterculia alata*, and *Averrhoa carambola*.

Only trees with regular and shapely crowns, and preferably those with pyramidal, linear, or spire-like tapering ones, are suitable for planting in the form of avenues. Other requisites are a straight stem, preferably tall, and a rich evergreen foliage. In big compounds with long drives, avenues are desirable. However, the choice should be restricted to one species only, as the beauty of an avenue lies in the uniformity of the crowns of trees and their growth. There are some trees, like the Royal Palm (*Oreodoxa regia*), which appear attractive when grown in the form of avenues in public parks only. In compounds of houses they appear unsuitable. They impose a mechanical regularity on an avenue which may appear attractive along a broad public road, but turn out to be irritating in the compound of a house.

Three to four rows of Eucalyptus trees grown at the back of a big house provide a grand background. Eucalyptus is a gregarious tree, looking attractive only when grown in a clump. A single row of Eucalyptuses on the sides of a house looks ugly as well as awkward. If it is desired to have Eucalyptus at the back, plant three to four alternating rows close together. Colvilleas, which also grow very tall, look very majestic when grown at the corners in the back row.

A large compound also provides scope for planting dwarf ornamental flowering trees in clumps, and in alternating rows. Even if big trees are grown, overcrowding should be avoided and the temptation of planting too many trees should be resisted. Better confine your choice to a few select trees rather than aim at the creation of a botanical garden.

Asokan can be effectively used for screening off the compound of a big house from a public road. The *asokan* avenue along the compound wall of the Government House at Lucknow is an admirable example of this type, and a thick, close-growing *asokan* row forms a tall hedge, not only ensuring privacy, but also acting as a filter for dust.

While the symmetrical placing of trees may not be desirable in a small compound, it is necessary in a big compound with a building of a large size. Such a

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building should be placed in the centre of the plot. In front, one may have a circular or semi-circular lawn as the space permits, fringed by a road. In the centre of the lawn one may plant a solitary tree with a spreading crown like the *gul mohur* or pink cassia. If one's predilection is towards water plants, one may place a pool in the centre with red lotuses, and white and blue-purple lilies. Small larvicidal fishes can also be reared in such pools to keep them clear of mosquitoes. The amazing assortment of white and blue purple lilies which Rai Bajrang Bahadur Singh of Bhaduri in Partabgarh district of Uttar Pradesh has been able to collect is a good illustration of the beauty of aquatic gardening which can be enjoyed by the owners of big houses and large compounds with irrigation facilities. Even if a pool for the culture of aquatic plants is not regarded as desirable, it is advantageous to have a small swimming pool at the back of the house built sufficiently high with its waste water discharging into the lawn and the garden.

LIST OF ORNAMENTAL TREES SUITABLE FOR BIG COMPOUNDS ONLY

Beautiful flowering trees

<i>Anthocephalus indicus</i>	<i>Lagerstroemia flos-reginae</i>
<i>Bombax malabaricum</i>	<i>Millingtonia hortensis</i>
<i>Cassia nodosa</i> and <i>C. grandis</i>	<i>Peltophorum ferrugineum</i>
<i>Chorisia speciosa</i>	<i>Poinciana regia</i>
<i>Colrillea racemosa</i>	<i>Sterculia colorata</i>

Fragrant trees

<i>Dillenia indica</i>	<i>Pterospermum acerifolium</i>
<i>Mimusops elengi</i>	

Trees with ornamental foliage

<i>Eucalyptus</i> (all species)	<i>Putranjiva roxburghii</i>
<i>Phyllanthus emblica</i>	<i>Terminalia arjuna</i>

Shade trees

<i>Diospyros embryopteris</i>	<i>Kigelia pinnata</i>
<i>Ficus retusa</i>	<i>Tamarindus indica</i>
<i>F. infectoria</i>	

CHAPTER XII

AVENUES FOR NATIONAL AND STATE HIGHWAYS

THE planting of a tree to provide shade to wayfarers and cattle was regarded as an act of piety in ancient India. Emperor Asoka was one of the earliest Indian monarchs who planted shady trees on the roads and in public places. The Moghuls, too, realized the necessity of shade on the roads which they constructed. But there was no conscious planning ; and the *pipal*, banyan and *pakur* trees were indiscriminately mixed with *nims*, tamarinds and *mahuas*. It was only in Kashmir that they showed some preference for planning and planted magnificent avenues of *chenar* along the banks of the river Jhelum, which can be seen at their best at Gandharbal and Matan on the way to Pahalgam. Conscious planning of avenues in Europe dates from the sixteenth century when Francis I of France adopted a scheme of planting Lombardy poplars along the main roads of France. The beautiful French roads with their grand avenues of spire-like poplars are the result of his effort, and his successors carried on his policy over a long period. The early French emigrants carried the Lombardy poplar to Canada, and we find the graceful tree extensively planted along roadsides in the province of Quebec.

A plantation plan for our national, state and district highways is urgently needed. In such a plan, the climate of a place, its temperature, rainfall, soil and water level should be carefully considered and suitable species selected. At present, our roads are planted by P. W. D. engineers who are ignorant about trees. Ultimately, planting of trees and replacement of dead trees is left to *malis* who may plant any tree which comes handy. The result has been unfortunate and our roadside avenues have become a mixture of odd trees, presenting a patchy appearance.

M. D. Chaturvedi pleaded for a national policy for roadside avenues in 1937. His valuable pamphlet *Roadside Avenues* reveals an imaginative approach to this problem of supreme national importance. Some of his ideas were followed by D. I. Sah who drew a "Working Plan" for avenues of P. W. D. roads in Kanpur district in 1939. This is a pioneer attempt to develop a certain mileage according to a plan. However, considering the total mileage of our roads, it is merely a drop in a bucket. What is desired is a plantation plan for the roads of the country as a whole.

On account of indiscriminate plantings and thoughtless replacements, our roadside avenues have become very much mixed. Due to the difference in the shape of their crowns and the rate of their growth, they have a patchy appearance, and from a distance present a jagged skyline. On the other hand, if we plant *pure* avenues with one species only for a number of miles, they will look harmonious and pleasing, and

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the skyline will be regular and wave-like. *It is, therefore, very essential that mixtures of different species are avoided and pure avenues of a single species planted over long stretches of road.* This will not only improve their appearance, but will also render management more economical and replantation easier, and will rationalize their exploitation for commercial purposes. If *mahuas* and *nims* are grown in pure avenues for miles, an oil-crushing industry can easily be started in such districts. Growing such trees in compact areas will effect a saving in transport. Similarly, the furniture-making industry can be encouraged in the sub-Himalayan districts which specialize in *shisham*, *sal* and *teak*. The tamarind fruit which now only serves as a staple diet of monkeys can be profitably exported to the Punjab and West Pakistan. *Mahua* flowers can be used in the manufacture of power alcohol.

The main function of a roadside avenue is shade. Hence, trees which are quick-growing and provide dense shade should be selected. The trees selected should provide shade not only on the sides, but also in the centre of the road. From this point of view, trees with an umbrella or sub-umbrella crown like *nim*, *mahua*, *imli* and mango are more suitable than trees with a linear elongated crown like *teak*, *Eucalyptus* and *Millingtonia*. If the trees selected provide shade and also yield valuable timber or fruit, they are all the more desirable. The trees should be planted 40 feet apart so that their crowns may develop freely. Where the road is more than 100 feet wide, a double avenue of trees with the outer avenue near the boundary line should be grown. A section of the Lucknow-Rae Bareli road has such a double avenue, and the road is very shady and cool.

Trees for roads should be selected with due regard to rainfall, soil, temperature and water level. *Only those trees should be grown along roads which provide thick shade and are also valuable from the economic point of view.* The following trees which are also shady and yield products of economic value are recommended.

Nim (Melia azedarach). Its leaves and bark are used for medicinal purposes and its seeds yield valuable oil. It can grow on alkaline *usar* soil.

Mahua (Bassia latifolia). Its fruit is edible and the seed yields oil. It is also ornamental and its coppery leaves appear beautiful in the months of March and April. Suitable for clayey soil, it can also stand semi-alkaline soil.

Imli (Tamarindus indica), a beautiful tree which stands the dust of roads very well; its fruit and timber are also valuable. Suitable for dry areas.

Shisham (Dalbergia sissoo) yields excellent timber. Suitable for sub-Himalayan districts with rainfall over 40 inches.

Mango (*Mangifera indica*) yields valuable fruit and dense shade. Suitable for clayey or mixed soil with the water level at 30 feet or less.

Albizia procera (sufed siris). A quick-growing beautiful tree. Grows easily on sandy soil. On account of the light yellow colour of the trunk, it reflects even weak light. An excellent roadside tree.

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Pithecolobium saman (rain tree). Suitable for moist districts with a rainfall of over 40 inches.

TREES UNSUITABLE FOR ROADSIDE AVENUES

On no account should the following trees be planted along the roadside.

Brittle Trees

Eucalyptus. All species

Millingtonia hortensis

Eugenia jambolana

Albizia lebbek

Cassia siamea

Ficus glomerata

All these trees have very weak wood, and consequently break easily in a wind-storm. The result is that after a heavy storm roads become blocked and traffic is stopped for considerable lengths of time, and during a storm these trees are a positive menace to the lives of unfortunate travellers who happen to be on the road. Besides, *Eucalyptus* and *nim chambeli* have linear elongated crowns which provide poor shade.

Thorny Trees

Acacia arabica

Acacia modesta

Zizyphus injuba

These are thorny trees and their thorns are a nuisance for the pneumatic tyres of small cars, cycles and motor cycles.

CHAPTER XIII

AVENUES FOR TOWN ROADS

IN India, we have the largest number of flowering trees in the world, indigenous as well as exotic, which we can utilize for beautifying our towns. On account of the diversity of climate and soil, we can grow almost any tree from the temperate rhododendrons and double-flowering cherries to the tropical amherstias and browneas. Compared with our opportunities, our achievements are, however, puny. Barring a few cities like New Delhi, Lucknow, Patna, Chandigarh and Bangalore, we have made little use of the tree-material available in our country.

Even in countries in the temperate zone, where modern western civilization has made comparatively greater progress, it is only recently that attention has been drawn to the use of trees for beautifying towns. Barring France and Italy, where Lombardy poplars are extensively grown, we find little beauty in the town roads of Europe. With the intensive house-building activity which followed World War I, people in England awakened to the necessity of planting their town roads with beautiful trees. The outer streets of Birmingham show careful planning with liberal use of trees and grass. In Liverpool, grass is grown even between tram-lines with flanking hedges.

The French immigrants introduced the Lombardy poplar in Canada, and it is commonly grown as a roadside tree in the cities of Quebec and Montreal. Maple, which is the national tree of Canada as oak is of Germany, is extensively grown as a roadside tree in Canada and the eastern U. S. A. Of all the cities in the temperate regions, the City of Washington is, perhaps, the most aesthetically planted. The amber, yellow and coppery tints of maples, oaks and chestnuts in the Rock Creek harmonizing with the yellow colour of buildings in the autumn months of October and November, leave an indelible impression on one's mind. Japanese double-flowering cherries and peaches, dogwood trees with white and pink flowers, and fragrant magnolias lend grace to the state buildings and monuments of this beautiful American city.

However, as compared with tropical and subtropical countries, the tree-material available to the inhabitants of temperate countries is comparatively prosaic. Trees with brilliant flowers and birds with gay plumage occur only in the tropics and subtropics. Temperate countries of Europe and America have hardly anything to match the blazing *gul mohur* avenues of Kandy, the brilliant blue jacaranda avenues of Johannesburg and the graceful palm avenues of North African towns.

Considerable attention has been paid to the layout of avenues in Cairo. Along the long road leading from Gizeh to the pyramids, we find a beautiful avenue of

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alternating *gul mohur* and Eucalyptus. Jacarandas are planted extensively along roadsides, and also date-palms mixed with clipped box-like trees. Clumps of date-palms are grown in the back yards of houses. In Morocco, the French colonials have planned the roadside avenues of their towns in an artistic manner. In the main thoroughfare of Rabat, a dwarf variety of date-palm is grown in the form of avenues with grass and beds of annuals at the sides. Triangular plots in the town are planted with Persian lilac and *Schinus terebenthifolius* which bears red berries in profusion in the month of November. The compounds of private houses are enlivened by orange flowers of *Bignonia venusta*, magenta-coloured bougainvilleas, and bright-blue shrubs of *Plumbago capensis*.

The broad aims of town planning are that the towns must be made more efficient, more healthy and more beautiful. For making them healthy and beautiful, we require not only spacious well planned streets designed as a unit, but, also well planned roads and parks with a planned plantation of ornamental trees. What is desired is *order*, which is not the same thing as uniformity. Dead uniformity with the same stamp placed on all the houses and trees in the whole town will be as undesirable as our present confusion with everyone following his own sweet will and spreading ugliness. What is desired is an orderly variety with not only houses in a street following a particular design, but trees as well, planted and replaced from time to time according to a plan.

For our towns, we are not only in need of a "Road Plan" for traffic but also a "Plantation Plan". *For every town of importance a "Plantation Plan" should be drawn up and rigidly adhered to.* For new roads, it is comparatively easy to plan a plantation of unfamiliar flowering trees, but it is the old roads which present a problem. The wholesale cutting of existing trees will render them shadeless. Hence, the only practical approach is *replacement of dead, decaying and old trees according to a plan*, and removal of young trees planted within two to three years. Once a plan is made, it should be rigidly followed not only in new plantations but also in replacements. Some imaginative person planned beautiful avenues of flowering trees for the Banaras Hindu University, which have disappeared or have become patchy on account of the absence of a plantation plan and lack of aesthetic taste in those who, later on managed them. Everyone cannot appreciate colour and beauty. While we call to our aid painters and artists for furnishing and decorating our houses, we should also take the help of aesthetically gifted arboriculturists. Arboriculturists who have an eye for colour and beauty should be selected and given training in art schools in garden designing and theories of colour harmony and colour contrast. The artist should be introduced to the garden, and the arboriculturist should be initiated into the arcana of the art school. Both will be gainers from the experience. While the fresh breeze of the garden and the glamour of erythras, colvilleas and *amaltas* will invade the studio, freshening up the minds of the artists, the garden will also gain from the impact

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of imaginative and sensitive minds, who will be able to convey their experience to the common man in the form of beautiful pictures. Thus, the blaze of *gul mohurs*, the glory of *colvilleas* and the splendour of *kachnars* will brighten up our homes throughout the year, even when other flowers are dead and gone. On the other hand, we will be spared the pitiable spectacle of arboriculturists who plant *pipal* and *shisham* trees on our roads in the towns.

While shade and economic utility should be the criteria for selecting trees for national, state and district roads passing through the country, different types of trees are required for town roads. *For roadside avenues in towns and cities, shade and beauty are the sole criteria* which we should consider while selecting trees. Unfortunately, as the large majority of our flowering trees are deciduous, there are very few trees which combine shade with beauty of flowers. Where the space available is limited and only one row of trees can be grown on each side of the road, flowering trees like *gul mohur*, *amaltas*, *jacaranda*, *erythrina* and *spathodea* may be grown alternating with shade trees like *Eugenia operculata*. The choice should be restricted to one species only for each street. Very tall trees like *Eucalyptus* and *millingtonia* and trees with spreading crowns like *banyan* are unsuitable for town roads, because they interfere with electric wires. Medium-sized trees like *Eugenia operculata*, and *pakur* (*Ficus infectoria*), which are extensively grown in New Delhi, are ideal for shade, while for beauty we have a large number of trees to choose from.

Double avenues of trees are a necessity in big cities where wide roads are available. In an ideal road for a traffic centre of the metropolis, provision should be made for fast-moving traffic such as motor cars and lorries and slow-moving traffic such as horse-drawn vehicles, bullock-carts and bicycles. A road divided into four sections for slow and fast traffic on each side, separated by islands planted with grass and shrubs in the middle and flanked by footpaths for pedestrians should be our ideal. *I recommend double avenues of trees on the outer sides of the footpaths : an outer row of shade trees and an inner row of ornamental flowering trees.* The outer row should be composed of evergreen shade trees with dense foliage such as *tamarind*, *Polyalthia longifolia*, *Eugenia operculata*, *Putranjiva roxburghii*, *moulsari* (*Mimusops elengi*), *Ficus retusa*, *nim* (*Melia azedarach*) and *pakur* (*Ficus infectoria*). The function of the outer row is of shade only. These trees *should be planted in pure avenues and not in mixed patches.* Growth in pure avenues provides a beautiful skyline and a pleasing effect due to uniform size and shape of the crowns of the trees of the same species, while a mixture creates an ugly confusion with a jagged skyline. The inner rows should be of ornamental flowering trees only. The outer rows of shade trees will provide shade for pedestrians on the footpaths, and at the same time will furnish a green background for the pink, red, crimson and yellow flowers of the flowering trees. The trees in both the rows should be planted at a distance of 30 feet from each other with the trees in opposite rows alternating.

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In modern towns constructed in the form of blocks, numbering of streets is desirable, as it is the easiest guide for a newcomer. In old towns, we usually find the roads and streets named after historical personages, officials, and lately after municipal commissioners who regard the naming of roads after them as the royal road to fame and immortality. The result has been encrusting of the road crossings with clumsy signboards, particularly when the seeker after cheap popularity insists upon retaining all customary titles. This involves waste of time and energy in correspondence, and those who have to send telegrams should be justified in sending a bill to the immortality-hunting gentry who, while perpetuating their own memory, cause so much of inconvenience to others.

Bioaesthetic planning will also simplify the problem of naming roads and streets. Streets can be named after the flowering trees which are grown on the road, such as Amaltas Avenue, Kachnar Avenue, Gul Mohur Avenue and Asoka Avenue. Not only the roads will be readily recognizable, but this device will also enable the citizens to familiarize themselves with our common flowering trees. Some imaginative pioneer has actually named a road in Lucknow as Millingtonia Avenue after *Millingtonia hortensis*.

In every big town, we find triangular pieces of land at the junction of roads. To safeguard against traffic accidents, these plots are not leased for building purposes. There are many such triangular plots in the Civil Lines of Allahabad. At present, they are lying neglected, covered with ugly self-grown jungle trees. How beautiful they can be, particularly the sunken ones, if they are planted with flowering trees! Only one species of trees should be planted in each triangle. Covered with spathodeas, lagerstroemias, jacarandas and *kachnars*, these triangular plots will appear very beautiful, serving as nodal points of beauty, affording a welcome shade to pedestrians and a refuge for young lovers.

Beautiful roads and well planned parks and squares will bring the beauty of nature within the reach of the common man in our towns and cities. The dwellers of slums will also appreciate the beauty and splendour of flowering trees, or at least their children will, who will have the opportunity of growing up in a new environment. Those who have lived in filthy surroundings for generations cannot be suddenly transformed, in a few years, into lovers of beauty. But the attempt is certainly worth making and results will be tangible after some time.

While most of the flowering trees look beautiful when planted in pure avenues, there are some species which flower at the same time; the colour of their flowers also harmonizes, and hence they appear more effective when planted side by side. Some of the flowering trees which flower in the same season are grouped below in schemes with due regard to colour harmony and are recommended for planting along our town roads :

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SCHEME No. 1



This is a very striking colour scheme, the rich yellow colour of *amaltas* flowers contrasting with the scarlet-orange colour of *gul mohur* flowers in the month of May when both the trees are flowering.

SCHEME No. 2



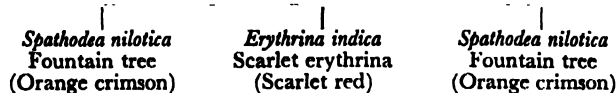
This colour scheme is very effective in October when both these trees are flowering, and a colour effect similar to that in scheme No. 1 is produced.

SCHEME No. 3



Both these trees flower together in April and a beautiful colour effect, which is soothing in the glare of April sunshine, is produced.

SCHEME No. 4



Both these trees flower in March when they are a blaze of colour.

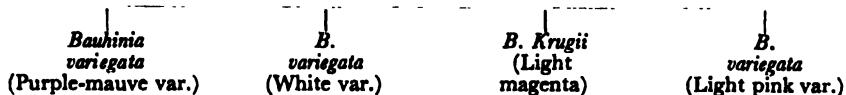
SCHEME No. 5



Both these trees flower in May and June when a very mellow colour scheme of pink and red is obtained.

SCHEME No. 6

Bauhinia Scheme



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This colour scheme which is composed of three varieties of *Bauhinia variegata*, pink, white and purple-mauve, and light magenta (*B. Krugii*) is recommended for dust-free roads of residential areas. All these bauhinias blossom in a leafless condition from the middle of February to the middle of March when they look like huge bouquets of pink, white, purple and light magenta flowers. This is a very pleasing colour scheme and is highly recommended.

ORNAMENTAL TREES SUITABLE FOR TOWN ROADS

Foliage trees for outer avenue	Flowering trees for inner avenue
<i>Averrhoa carambola</i>	<i>Cassia fistula</i>
<i>Callistemon lanceolatum</i>	<i>Bauhinia purpurea</i> ; <i>B. variegata</i>
<i>Anthocephalus cadamba</i>	<i>Colvillea racemosa</i>
<i>Eugenia operculata</i>	<i>Peltophorum ferrugineum</i>
<i>Polyalthia longifolia</i>	<i>Spathodea nilotica</i>
<i>Putranjiva roxburghii</i>	<i>Jacaranda mimosaeifolia</i>
<i>Sterculia alata</i>	<i>Poinciana regia</i>
<i>Pithecolobium saman</i>	<i>Lagerstroemia flos-reginae</i> and <i>L. thorelli</i>
<i>Melia azadirachta</i>	<i>Grevillea robusta</i>
<i>Tamarindus indica</i>	<i>Gliricidia maculata</i>

CHAPTER XIV

THE TREE-PLANTING PLAN OF NEW DELHI

WHEN Sir Edwin Lutyens came to New Delhi, he asked for a list of trees which could grow there. Griessen of the Horticultural Department prepared a list of trees and shrubs that might be made use of in the planting scheme of the new capital at Delhi. Griessen planted the laid out roads, but on account of unsatisfactory water supply, most of the roads had to be replanted several times. Griessen retired in 1920 and was followed by Mustow, who established the nursery at Jor Bagh opposite the Safdar Jung tomb. Thenceforward, most tree-planting, and much that grows in New Delhi, owe their existence to Mustow. He afforested the ridge. He introduced the mesquite from Mexico, and thus gave India a hardy tree which may even help to make Rajasthan green. Generally, road avenues were inter-planted; quick growers between the permanent and slow growers. Most of that inter-planting has been cut out.

The tree-planting plan of the modern city of New Delhi can serve as a model for many of our towns which have irrigation facilities. Extensive use has been made of many of our flowering trees for brightening up the housing areas, squares and circuses. For avenues, *Eugenia operculata* with its light green leaves has been found to be the most suitable in New Delhi. It sheds its leaves in late February and renews them in early March, after remaining leafless for only a few days. It has a compact semi-globose crown and its light green leaves are very soothing to the eyes. Avenues of this beautiful evergreen species adorn the parks on both sides of the Kingsway, and are also planted on many roads. Other successful roadside trees are *Kigelia pinnata*, *Pongamia glabra*, *Ficus retusa*, *Ficus infectoria*, *Celtis australis*, *Sterculia alata*, *Cassia fistula*, *Anthocephalus indicus*, *Hardwickia binata* and *Melia azedarach*.

The Secretariat and the Government House are the nucleus of the layout of New Delhi, and a number of roads radiate from them. The clipped bushes of *Diospyros cordifolia* in the lawns in front of the Government of India buildings look very attractive. The trees annually receive a light pruning treatment, the branches being cut at a certain height above the ground. This leaves space for pedestrians to wander about below, and the Pathan-type of hair-cut which the trees receive gives them a smart appearance. The clumps of Jacarandas on the corners of the two Secretariat buildings are a beautiful sight in the month of April.

Most of the circuses in the centre of road junctions are enlivened with clumps of flowering trees like Jacarandas, *amaltas*, *gul mohur* and *kachnar*. Where space available is narrow, use has been made of shrubby climbers like the various species of *Bougainvillaea* and *Petraea volubilis*.

THE TREE-PLANTING PLAN OF NEW DELHI

The squares in housing areas have been planted with all types of flowering trees. The *semals* in Hastings Square with their flaming red flowers are a sight in the months of March and April. Purple and mauve *kachnars* lend grace to many squares, though they have a rough time at the hands of clerks and the members of their families who pillage their buds ruthlessly for curry.

Flowering trees have also been planted at the edges in the compounds of bungalows which are maintained under the supervision of the Public Works Department. At the gateways, bottle-brush trees with pendulous branches are commonly grown. We also find trees of *Jacaranda mimosaeifolia*, *Bauhinia variegata*, *B. purpurea*, *Erythrina indica*, *Grevillea robusta* and *Ochna squarrosa*. In the foreground, extensive use has been made of ornamental shrubs, and pink oleanders lend a gay note to many bungalows in the Capital. Scented shrubs like *Murraya exotica* and *Cestrum nocturnum* exhale their perfume in many bungalows. However, no attempt has been made to vary the planting scheme, and as a result, all bungalows look alike. By adopting different combinations of trees and by planting some of the flowering trees in pure avenues, New Delhi could have been made more colourful. Another defect from which the plantation schemes for compounds of New Delhi bungalows suffer is that fruit trees have been totally ignored, and too much emphasis has been laid on mere ornamentals. The tree-planting scheme of New Delhi can be very much improved, if fruit trees like grafted mangoes, citrus, figs, and papayas are also planted in the back yards, thus achieving a happy compromise between beauty and utility.

CHAPTER XV

LANDSCAPING CHANDIGARH

THE partition of India in August 1947 led to a large scale movement of population. By the end of September 1947, the Indian segment of the Punjab was flooded with lakhs of homeless refugees from West Pakistan. While the refugees from the rural areas were settled in evacuee villages under the Land Settlement Scheme, homes had also to be found for the urban refugees. Some of the existing towns of the Indian Punjab were expanded by building so-called model towns, a type of garden suburbia, to accommodate the refugees who could not find accommodation in the houses left behind by Muslim evacuees. Many still were left homeless and shelterless. Even the State Government had no centralized location. This led to the search for a new site for the capital, and thus Chandigarh was born.

At that juncture, the Punjab was fortunate in having a man of vision in the person of P. N. Thapar as the administrative head of the Capital Scheme. The site was selected by a Committee headed by P. L. Varma, Chief Engineer. It comprises an area of 15 square miles on a plateau, 1,300 feet above sea level with the Sivalik and the blue Kasauli hills in the background. After the acquisition of the site, the first problem was the resettlement of villagers from the villages which had been acquired. Thapar resolved the problem of resettlement of the oustees from the Chandigarh site with great wisdom, tact and sympathy, and found new homes for them in the villages in the periphery of the new City. Apart from this, he set about planning the new capital with resolute energy against heavy odds. He collected talented engineers and eminent town-planners and architects from France, England and India. The initial town plan was prepared by Albert Meyer, an American. Corbusier, assisted by Pierre Jeanneret, E. Maxwell Fry and Jane B. Drew, improved upon it, and ultimately produced the famous Chandigarh Plan. The City was planned for a population of 1,50,000 persons to start with, but eventually, it was to accommodate a population of half a million. Work started on the site in 1951. By April 1952, when Jawaharlal Nehru, the Prime Minister of India, visited the site, the outlines of the City had become visible. On October 7, 1953, the Capital was formally inaugurated by the President of India. Within a period of three years, a new city had grown up upon an empty site.

Corbusier sums up the ideals of town planning thus: "The sun, space and verdure are the ancient influences which have fashioned our body and our spirit. Isolated from their natural environment, all organisms perish, some slowly and some quickly, and man is no exception to this general rule. Our towns have snatched men from essential conditions, molested them, starved them, falsified them,

embittered them, crushed them, even sterilised them; the third generation to live in great cities tends to sterility. Fashioned throughout millennia by the conditions of nature, man cannot with impunity disrupt the natural order. Shut up in masonry walls and conditioned to the smell of petrol fumes, men in large towns lead a cramped and unhappy life, deprived of the essential joys of life—sun, space and verdure. Unless the conditions of nature are re-established in man's life, he cannot be healthy in body and spirit.

“The fundamental elements are: accord with the laws of nature; harmony of actions in the recurrent cycle of the solar day of 24 hours; experience of the ‘essential joys’; an intensity in consecrated work and in consecrated leisure; definition of the metier of the contractor; exploitation of the architectural revolution accomplished in the laboratory by the 19th and 20th centuries; the idea of unity regulating the doctrine of the ‘built domain’ and its necessary overhauls; the intervention of the ‘law-giver’ reuniting again nature with the built work, in the land, in the province, in the region, in the town, determining the scales and types of built volumes and tracing new routes; the whole in conformity with the lay of the land.”

In search of the sun, space and verdure, man drifts from the ancient town and establishes himself in garden suburbia. Ultimately, the so-called garden towns also develop and expand, reducing the outskirts of the towns to miserable shabbiness. Nature melts under the invasion of roads and houses. Horizontal garden towns in the grip of the tentacles of the ancient city are ultimately re-absorbed and the promised seclusion becomes a crowded settlement.

According to Corbusier, the real solution lies in the Vertical Garden City in which the superimposed buildings rise above the park which contains amenities such as sports grounds, creches, primary schools and clubs. The housewife is also liberated from domestic work. By the concentration of a large number of dwellings in one building, a considerable area of open ground is liberated, the site effectively enlarging and merging with the surrounding countryside. The dwelling unit allows the organization of common services such as water supply, electricity, air-conditioning, medical services, sports and education. The corridor street lined with houses on both sides is abolished, and in the place of confusion, architectural amplitude of simple splendour results. The town is no longer a senseless pile of stone and masonry but becomes a park, and man and nature are harmonized. Avenues of trees, sometimes three to five rows thick, provide green walls, and grouping of trees in the form of rectangles, squares and circles creates green rooms.

These are the ideals of town planning as propounded by Corbusier, and it is necessary to understand them if one would like to appreciate the basic concepts which underlie town planning in Chandigarh. In a country with hot summers, multi-storeyed residential flats, unless they are air-conditioned, are a positive dis-

comfort. Hence in Chandigarh, the ideal of the vertical garden city has been partially accepted, in the sense that residential buildings are double-storeyed while the office buildings are multi-storeyed. Thus Chandigarh represents a compromise between the ideals of the vertical and the horizontal garden cities.

Towns are biological phenomena, according to Corbusier, and they have the brain, heart, lungs and feet like human beings. It is on this conception that the city of Chandigarh has been planned. The "Capitol" group of buildings comprising the Secretariat, High Court, Legislative Assembly and Governor's House constitutes the head. Spacious parks and green belts which run through the city provide the lungs. The network of roads for vehicular traffic and footpaths for pedestrians constitute the circulatory system. The city centre with commercial buildings and shops represents the heart. The industrial area in the east with its population of factory workers and educational institutions on the west represent the limbs.

The entire residential area is partitioned into 30 rectangular habitation units called Sectors, covering roughly an area of 240 acres and with capacity to house 15,000 people. A Sector is practically a self-contained unit with common services such as a High School, a Health Centre, a Club and a Shopping Centre. The residential area occupies the best sites within the area with respect to topography, climatic conditions, sanitation, sun and available green space. Compare this with the discomfort of New Delhi where the only shopping centre is Connaught Place for a large, spread-out inhabited area.

Now let us examine the special features of the housing at Chandigarh. In North India with its severe winters and hot summers, there is need of warmth in winter and protection from the hot sun in summer. The general plan of the houses in Chandigarh has been evolved by orientating the houses in such a way that the hot summer sun is kept out, while the winter sun comes right into the rooms. Various elements like sun-breakers and brick *jallies* have been introduced, which have given a character to the buildings of Chandigarh. The sun-breakers have been devised to intercept the sun, and to insulate the interior of the house from heat. Large glass windows admit into the house the warmth of the sun in winter. Moreover, by the use of these glass windows, the interior of the house is brought effectively in touch with the surrounding landscape. Seen through the glass, the hills, the trees and parks become a permanent extension of the home, and man enjoys the essential joys of life—the sun, space and verdure. Sunlight is most essential for health. As Corbusier says, "From the physical point of view, the human being is nothing other than a 'transformer of solar energy', and, of the numerous forms taken by this energy, it is light, from infra-red to ultra-violet, that constitutes its most indispensable nutriment. For man directly absorbs it through his skin by means of a million papillae tuned to the luminous vibrations like tiny resonators of precision. Furthermore, man absorbs it indirectly through his food, vegetable or animal, a

veritable store of light. Darkness and the sickly light of towns, broken by smoke and dust, are potential causes of tuberculosis, rickets and nervous breakdowns."

"The 24-hour cycle and the radiance of the sun alone can teach us how to build. Behind them, the entire cosmos reveals itself, approaches man and is ready to clasp him to its bosom, like a prodigal son who is to be restored to his rights."

The site of the young city was practically bare with the exception of a few clumps of mango trees which have been preserved. Chandigarh, like a new-born baby, was waiting to be clothed in a mantle of vegetation. The urgency of planting the Capital was realized by the State Government, and a Landscape Committee, with the present author as Chairman, and Engineers and Architects of the Chandigarh Project as members, was set up to guide the work.

Corbusier, who was one of the members of the Committee, suggested the preparation of a chart showing shapes of trees and colour of flowers. This simple chart presented a classification of selected, beautiful, ornamental flowering and foliage trees of India which may be called the aristocrats of the plant kingdom, and provided the basis of all tree-planting in Chandigarh.

Let us analyse and classify the elements which constitute the problem of landscaping and tree-planting in Chandigarh. These resolve themselves into three: firstly, the urbanistic elements which require tree-planting; secondly, the selection of trees and their classification according to the shape of the crown and colour of flowers; thirdly, the manner and arrangement of trees, i.e. the architectural disposition of the elements of tree-planting.

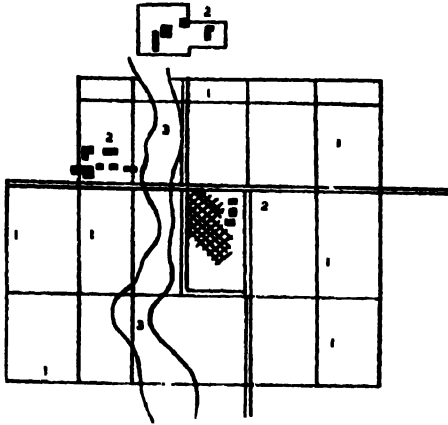
Urban elements affected by tree-planting are the roads, urban spaces with elements of architecture such as the Capitol, University and commercial centres and free urban spaces.

Along the roads trees are planted in single rows, in double rows or in multiple rows. In the green belts and other free urban spaces, the trees are planted singly, in homogeneous groups, in heterogeneous groups or in large forest plantations.

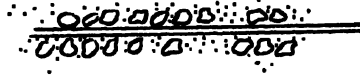
The keys of town planning are in the four functions—Living, Working, Recreation and Circulation. The base of the City Plan is a rectangular grid of heavy traffic roads enclosing the self-contained neighbourhoods or Sectors. The road-and-Sector system almost completely separates vehicular and pedestrian traffic. The Sectors are interconnected by the shopping street running across, and by park belts, lengthwise. The pedestrian can thus traverse the city in both directions without walking on the major traffic streets. The fast-moving traffic is restricted to the rectangular grid of heavy traffic roads which are designated V2 and V3. These roads are at the outer sides of the Sectors. Inside the Sectors, protected from fast traffic, are the V4, V5, V6 and V7 which provide access to the houses, shopping centre, schools, hospitals, etc.

The avenue of the Capitol consists of a heavy traffic automobile highway of a

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4 URBANISTIC ELEMENTS AFFECTED BY TREE PLANTING



1. THE V ?



2 URBAN SPACES WITH ELEMENTS OF ARCHITECTURE CAPITOL, UNIVERSITY, COMMERCIAL CENTRE ETC.



3. FREE URBAN SPACES.

1. ARCHITECTURAL CONCEPT OF THE ELEMENTS OF THE TREE PLANTING.



1 TREES ARRANGED SIMPLY IN ROWS.



2 TREES IN DOUBLE ROWS



3 TREES IN MULTIPLE ROWS



4 ISOLATED.



5 IN HOMOGENOUS GROUPS

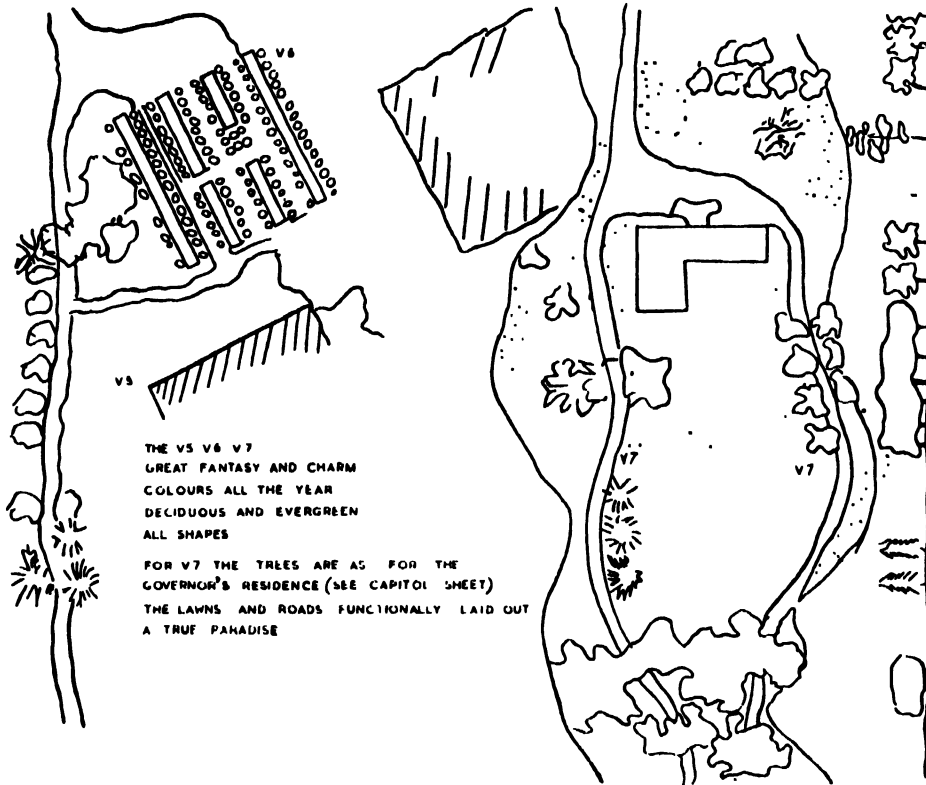


6. IN HETEROGENOUS GROUPS.



7. FOREST.

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parallel band of parking, a large pavement on each side with shops and arcades and high buildings. Also outside this and parallel to it is the eroded valley. This road has been planted with green grass and ornamental shrubs like the bougainvillea. Footpaths which are provided at the sides for pedestrians are shaded by four to five rows of trees.

On the one hand, it seems useful to demarcate the automobile highway by a border of high trees, and on the other, to unite with one glance the entire width of the avenue in question, the shops, pedestrians, parking cars and the localized contacts with the eroded valley and the leisure space. It is equally necessary to cover the pedestrian promenade with shade along the shops.

For the car route, a single or double row of trees with high foliage will permit the eye to travel across. This will be with light and evergreen foliage to avoid the need for sweeping.

For pedestrians, a multiple row of trees with very heavy deciduous foliage is required so that the sun's rays may pass through in winter. There must also be some evergreen trees with dark and glistening foliage.

This arrangement will contrast the height, the thickness, the colours and the permanency of the foliage, and will explain the various functions of this essential artery of the City.

FLOWERING TREES IN INDIA

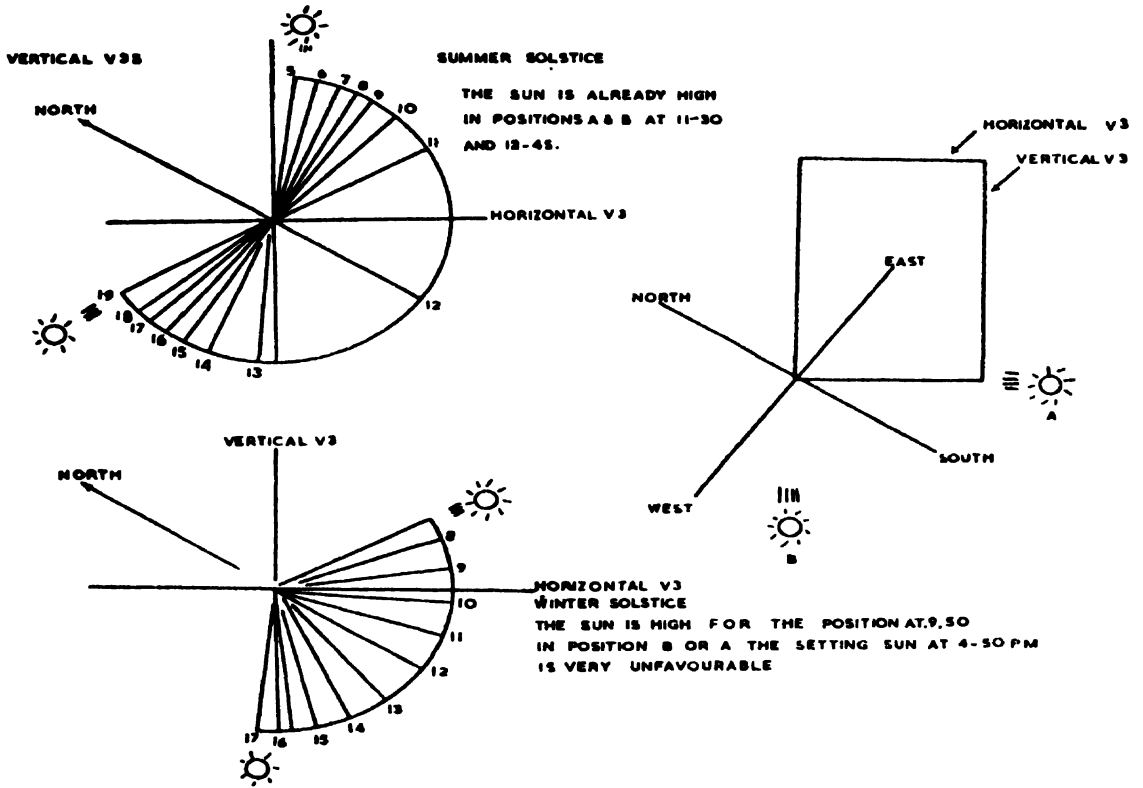
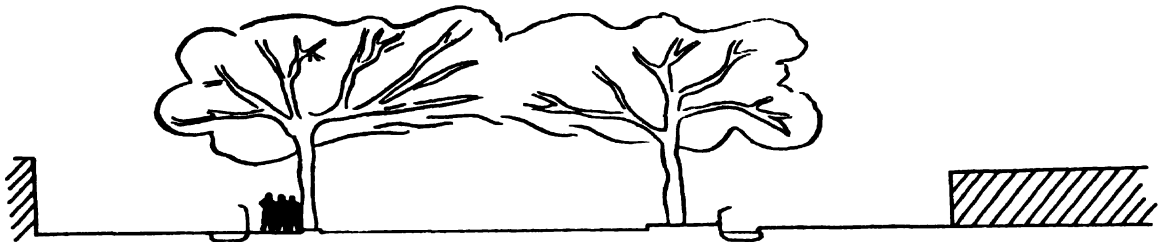
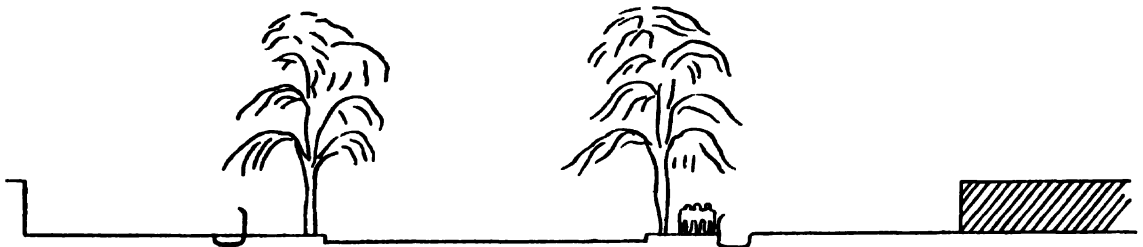


FIGURE 1



VERTICAL V3

EVERGREEN FOLIAGE (TO AVOID UPKEEP FROM SWEEPING).
 FORM: SHAPE 2 DEVELOPMENT OF HORIZONTAL BRANCHES IN ORDER TO ENABLE TRIMMING TO FORM A TUNNEL.
 ARRANGEMENT: ROW EACH SIDE , REGULAR SPACING . (AN AVENUE OF FIGUS INFECTORIA)



HORIZONTAL V3.

EVERGREEN TREES (TO AVOID UPKEEP FROM SWEEPING).
 FORM: SHAPE 6.
 ARRANGEMENT: REGULAR SPACING , ONE ROW EACH SIDE

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V3 receives only high speed traffic. Choice and planting of trees should be studied to give the best conditions, especially in relation to the glare of the sun. There are two directions of the V3s. Horizontal V3s parallel to the Station Avenue, and vertical V3s which are parallel to the Avenue of the Capitol.

In Fig. 1, *a* & *b* indicate two positions unfavourable to drivers in relation to the sun. The situation in *a* for the horizontal V3 is not serious because the sun in summer is almost at its zenith at this time. On the other hand, in *b*, the vertical V3 will be in a bad way in winter when the sun is low on the horizon, and its rays are in the same direction as the vertical V3. That is why the trees must be chosen and planted differently. On some of the roads, evergreen trees with large umbrella-like crowns like *Ficus infectoria* have been planted, and in course of time their crowns would meet, forming a green tunnel. For horizontal V3s, the trees should have light foliage (Shape 6).

It should be noted that the difference in the tree-planting of the horizontal and the vertical V3s will at once make it clear to the users in which direction they are travelling.

The V4 is the place where the most intense activity of the urban life of the sector is assembled. The V4 will be the street which will give its own character to each Sector. Consequently, such a V4 will be different from the others and finished with special characteristics, because it is indispensable to create a great variety across the city, and to furnish elements of classification to the inhabitants. All the possibilities of nature at our disposal are to give to each V4 a personality which will maintain itself in the whole width of the town and thus tie up five or six Sectors traversed by a V4.

To specialize the character, each V4 has been planted with trees having different colours of flowers. For example, one V4 is yellow, another red, and yet another blue.

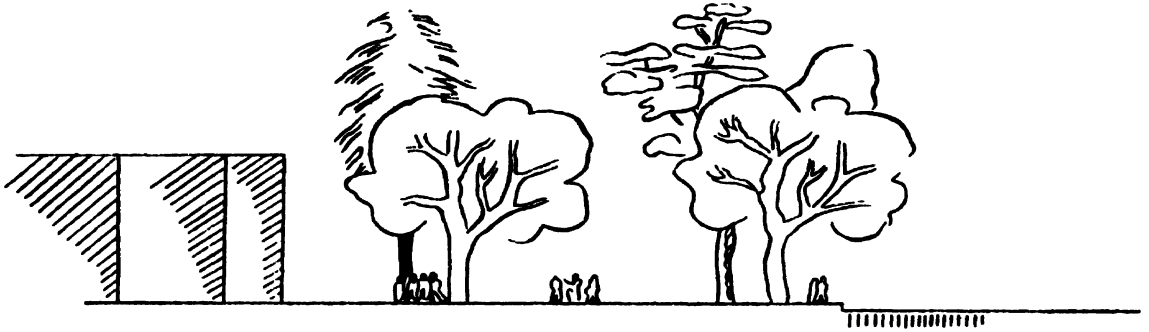
The V4 should be lively. Consequently, unlike V3s it can have several different types of trees as well as different types of shapes and mixtures of foliage, deciduous as well as evergreen.

For roadside avenues along V4 roads, trees which provide shade and are also beautiful have been selected. Trees with a regular shape such as cypresses, Lombardy Poplar, *asoka*, and *chorisia* are suitable for formal planting schemes. On interior roads where the shape of the crown is not so important, trees with beautiful flowers and foliage such as *kachnar*, *jacaranda*, coral tree, *amaltas*, *gul mohur*, pink cassia, silver oak, and Pride of India have been planted.

The countryside with these trees will be interesting and pleasant in all the months of the year.

In summer, the trees would provide shade and in winter sunshine, as the deciduous trees will permit the sun's rays to pass.

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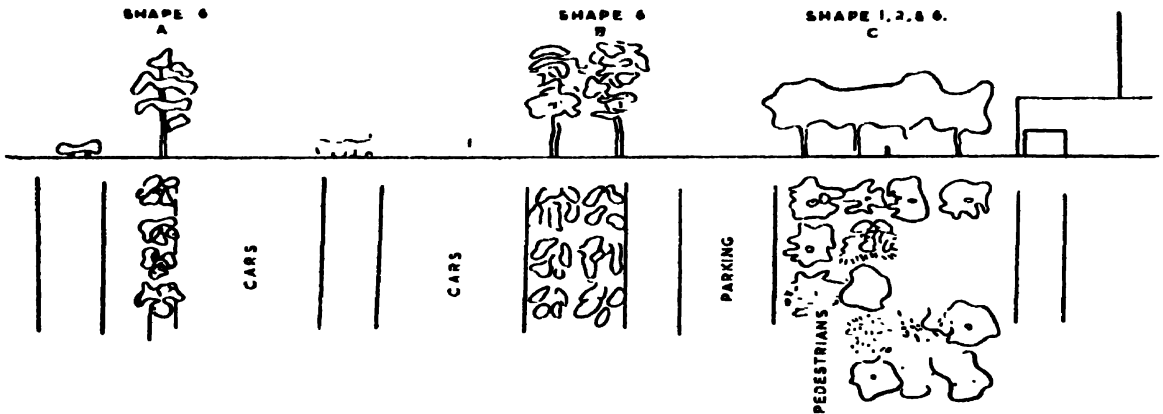


V 4. (A) AN EFFECTIVE MIXTURE OF DECIDUOUS FOLIAGE TO ALLOW SHADE IN SUMMER AND SUNSHINE IN WINTER.

(B) SOME PERMANENT EVERGREEN FOLIAGE TO PROVIDE SCENERY FOR WINTER.

ARRANGEMENT:

SIMPLE ROWS DOUBLE OR MULTIPLE OR IN ANY OTHER WAY.



A EVERGREEN FOLIAGE FOR A & B GOING AWAY WITH NEED FOR SWEEPING.

B. DECIDUOUS TREES WITH SOME EVERGREENS FOR C.

SHAPE: 6 FOR A & B.

1,2,3,6 FOR C.

ARRANGEMENT: REGULAR SPACING FOR A & B.

IRREGULAR SPACING AND VARIED FOR C.

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Ample areas have been provided for parks in the master plan of the Capital. For these parks informal planting has been adopted. Interior belts with their continuous flow combine with the outer green belts to give a verdant feeling to the whole City. They also give a sense of direction and dramatically culminate in the Capitol. Facing the parks are building groups such as the Public Library, Art Gallery, the Museum and the Girls' College. There are narrow greenways connecting major parks, and an area of 75 acres has been allowed for a zoological garden, and 100 acres for the botanical gardens.

Though a large number of trees, both exotic as well as indigenous, have been planted, the old trees, particularly mangoes, whether growing singly or in groups, clumps of date-palm and groves of the Flame of the Forest have been retained in the green belts, thus creating an illusion of great age. A Tree Preservation Order was passed which prohibited the cutting down, lopping or wilful destruction of trees. On account of the promulgation of this Order, a large number of venerable mango trees have been saved from destruction.

Apart from preservation of old trees, beautiful effects have been created by planting trees in groups. Trees have been planted in the form of squares and circles, and the rest have been planted in clumps in such a manner that the tallest trees are in the middle and the smaller trees are at the periphery, thus creating pyramids of greenery. Groups of ougeinia, pink cassia, jacaranda, callistemon, *amaltas*, Pagoda tree, *asoka*, lagerstroemia, double flowering peach and cherry have been planted in this manner. Bamboos are particularly suitable for this type of planting. Bamboos are of various types—giant bamboos, dwarf bamboos, thick bamboos, thin bamboos and green, yellow and striped bamboos. Clumps of various varieties of bamboo in due course will lend a great charm to the parks and open places of Chandigarh.

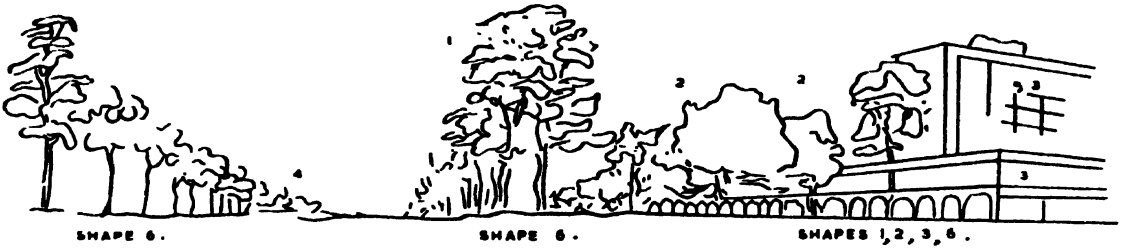
At the bottom of man's heart reigns his boundless yearning for the primordial forest. In the forest, man is brought in contact with his ancestral environment. The deep shade and silence of the forest provide an opportunity for introspection and meditation, and one forgets the worries of life. Trees realize their personality, and perform their duty only when they are planted in numbers. This is particularly true of trees like Eucalyptus, *kadamba*, chir pine and the yellow *sisis*. A row of Eucalyptus trees appears miserable, and one gets a feeling that something is missing and the planting is incomplete. Plant them in large numbers, and see what a beautiful effect they create! Then, at once, everything is transformed, sky and light recover their first deep meaning, and an oasis of coolness, silence and shade is created. Some of the parks in Chandigarh were planted exclusively with forests of the chir pine, Eucalyptus, *kadamba* and the yellow *sisis* (*Albizia procera*). These are all giant trees which are gregarious and when grown in large numbers create a beautiful effect.

The cathedral-like alignment of the shafts of chir pines shooting towards the sky, smooth, pure and inflexible, with their round and plump crowns, is a reminder

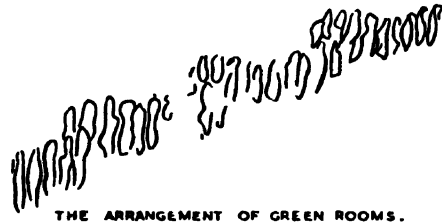
FLOWERING TREES IN INDIA



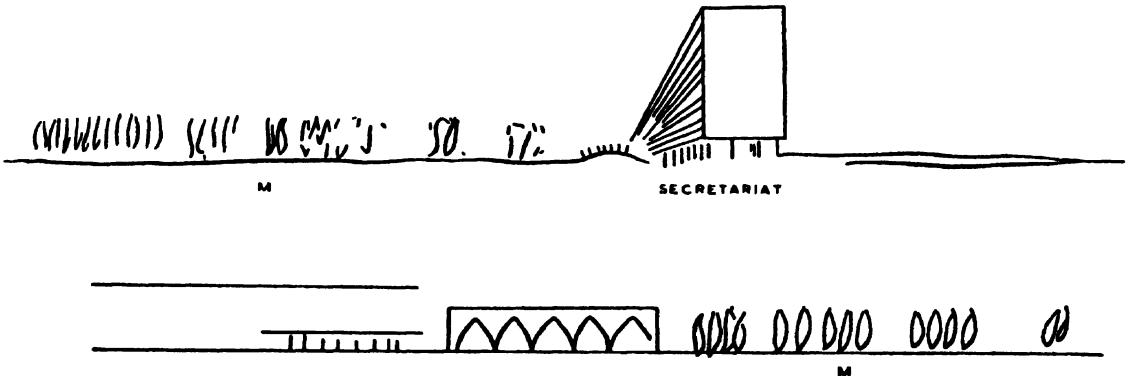
1. TREES WITH HIGH TRUNKS .
LIGHT FOLIAGE AND EVERGREEN .
2. TREES WITH HIGH TRUNKS
THICK FOLIAGE-DECIDUOUS .
3. TWO-STOURED BUILDINGS .
4. BAND SEPARATING TWO ROADWAYS (ANTI-HEADLIGHTS)



4. IN CERTAIN PARTS OF THE
CAPITOL THE HORIZON WILL
BE SHUT OFF BY GREEN WALLS
(TREE WALLS) M, AND GREEN ROOMS
WILL BE CREATED.



THE ARRANGEMENT OF GREEN ROOMS.



LANDSCAPING CHANDIGARH

CHANDIGARH CAPITOL

TREE PLANTING

AT THE CAPITOL MANY FORMS OF TREES

ARE CONTEMPLATED

1. EXISTING ELEMENTS AT SITE. ISOLATED TREES (MANGOES OR OTHERS) OR IN GROUPS FIG.1.

2. THE PRIVATE GARDENS OF THE GOVERNOR.

AN ORTHOGONAL DRAWING OF THE PATHS

CONTAINS A GARDEN WITH TREES OF ALL

TYPES COLOURS SHAPES AND HEIGHTS AND

PICTURESQUE ARRANGEMENTS FIG.2.

ALL THE VARIETIES (BEAUTIFUL)

ALL COLOURS

ALL SEASONS

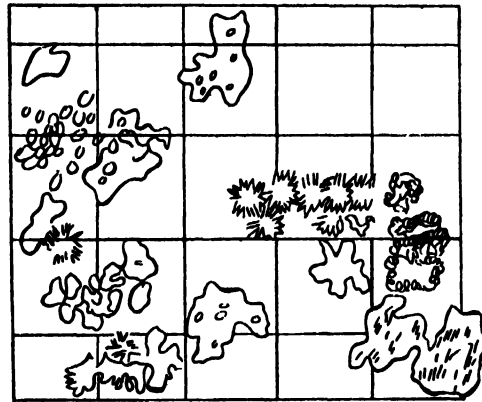


FIG. 1.



FIG. 2.

of the Himalayan forests with their peace and silence. *Kadamba* groves with their silence and perfume remind us of the happy forests of Vrindavan where Krishna roamed with the milkmaids, and no doubt they will provide the gladness and freshness of the rainy season to the citizens of Chandigarh. Forests of yellow *siris* with their smooth, light yellow and barkless boles emit a strange golden light ; there is a warm and russet glow at their base, and a blue ethereal mist covers their top.

The Capitol group of buildings which consists of the Governor's House, the High Court, the Legislative Assembly and the Secretariat is spread out in a 250-acre enclave at the foot of the Sivalik Hills. Located at the head of the site which is gently sloping, it carries an air of detachment and dignity. For planting on the Capitol site, many forms of trees are contemplated. The existing trees, mostly mangoes, whether isolated or in groups, have been maintained. The Governor's private garden would contain a garden with trees of all types, colours, shapes and heights which would be arranged in a picturesque manner. All the varieties which have been selected are beautiful, and there would be colour in all the seasons. With the earth removed from the excavated ground from the Capitol site, artificial mountains will be created. These hillocks will create a play of forms with the buildings of the Capitol, and will be covered with evergreen trees of different types. In certain parts of the Capitol, the horizon will be shut off by green walls of trees, and green rooms would be created by planting trees in the form of circles, squares, and rectangles.

Bioaesthetic planning is closely connected with town planning. Before the towns arose, there were groves of trees, meadows, moving horizons, hills, mountains,

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3 ARTIFICIAL MOUNTAINS HAVE BEEN CREATED WITH EARTH REMOVED FROM EXCAVATED GROUND FOR PARKING AND CAR ROUTES. THESE HILLS WILL CREATE A PLAY OF FORMS WITH THE BUILDINGS OF THE CAPITOL AND WILL BE COVERED WITH EVERGREEN TREES OF DIFFERENT TYPES.



ARTIFICIAL MOUNTAINS



THE SECRETARIAT



THE ASSEMBLY

NOTE: THE ARTIFICIAL HILLS SHOULD BE STEEPER—35°OR 45°.



rivers and lakes. By building disorderly piles of houses, many beautiful views have been obscured. This has been avoided in Chandigarh by staggering the siting of houses in such a manner that the mountain view is not obscured even at the ground level. Trees have been carefully chosen with due regard to colour of flowers, beauty of foliage and shape of crown. In addition to utilitarian and aesthetic aspects, trees in city areas constitute an effective buffer against dust and noise, and also act as wind-breaks. Moreover, when planted properly they link up individual masses of buildings in a harmonious whole, and enhance their architectural appeal by presenting a foil of texture, colour and form by way of contrasts.

Chandigarh is one of the most carefully planted cities of the world. When the trees grow up, the residential areas will be brightened up by masses of blossoms. In the hot months of summer, heavy masses of dark green leaves will provide a refreshing shade. Under the shadow of the blue mountains of the Kasauli range, the great blocks of buildings stand shaded by the green walls of trees, the true friends of man. From the top of the buildings the vast horizon is seen providing a play of colours throughout the seasons. In the monsoon, which is the most pleasant season in Chandigarh, clouds appear in all directions ; they are raining in the east, their dark masses are visible in the south, and the scarlet of the setting sun is tinging the horizon in the west. The green domes of *pipal* and mango trees which have been retained provide a touch of the country. Thus, we find in Chandigarh that the town and the country are blended, the marriage of the tree and the building has taken place; the result is harmony, and the link between nature and man is established.

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Classification of ornamental trees according to size, indicating height, spread of crown, rate of growth, foliage and spread of root system

S. No.	Name of the tree	Height	Spread	Growth (slow or quick)	Foliage (thick or light)	Character of leaves	Root structure
A—Deciduous trees							
I—Large-sized trees							
1.	<i>Ailanthus excelsa</i>	40'-50'	Tall	Quick	Light	Long leaves 3' long	Large
2.	<i>Bombax malabaricum</i>	40'-60'	"	"	"	Palmate, broad	"
3.	<i>Chorisia speciosa</i>	30'-45'	Medium spread	"	"	Long-stalked leaves, leaflets acute	"
4.	<i>Ficus infectoria</i>	35'-50'	Wide spread	"	Thick	Glabrous, coppery, shining	"
5.	<i>Millingtonia hortensis</i>	50'-60'	Tall and small spread	"	Light	Long leaves	"
6.	<i>Albizia procera</i>	60'-80'	Tall and good spread	"	"		Medium
II—Medium-sized trees							
1.	<i>Bassia latifolia</i>	30'-40'	Compact	Very slow	Thick	Leaves appear in whorls	Medium
2.	<i>Bignonia crispa</i>	25'-30'			Light	Compound leaves	"
3.	<i>Cassia javanica</i>	25'-30'	Spreading crown	Slow	"	Feathery leaves	"
4.	<i>Cassia nodosa</i>	20'-30'	"	"	"	Leaves compound, with 6-12 pairs of leaflets	"
5.	<i>Delonix regia</i>	25'-35'	Large spread	Quick	"	Long, bipinnate, feathery	"
6.	<i>Erythrina indica</i>	25'-35'	Medium	"	"	Large, composed of three broad leaflets	"
7.	<i>Lagerstroemia flos-reginae</i>	20'-30'	"	"	"		"
8.	<i>Peltophorum inerme</i>	20'-35'	Spreading crown	"	Thick	Large, bipinnate	"
9.	<i>Schleichera trijuga</i>	30'-40'	"	"	"	Paripinnate, leaflets opposite, very handsome	"
III—Small-sized trees							
1.	<i>Bauhinia acuminata</i>	20'-30'	Medium	Quick	Light	Leaves have cleft at the apex	Small
2.	<i>Bauhinia variegata</i>	20'-30'	"	"	"	Leaves have cleft at the tip, alternate	"
3.	<i>Bauhinia triandra</i>	20'-30'	"	"	"		"
4.	<i>Butea monosperma</i>	20'-35'	Irregular	Slow	Thick	Large, trifoliate	"
5.	<i>Cassia renigera</i>	15'-20'	Medium	Quick	Light	Long leaves, 8-20 pairs of leaflets	"
6.	<i>Cassia fistula</i>	25'-35'	"	"	"	Large, compound	"
7.	<i>Crataeva religiosa</i>	25'-30'	Small	Slow	"	Leaves clustered	"
8.	<i>Erythrina suberosa</i>	40'-50'	"	Quick	"	Leaves glabrous	"
9.	<i>Jacaranda mimosaeifolia</i>	25'-35'	Medium	"	"	Fine feathery foliage	"
10.	<i>Milletia ovalifolia</i>	20'-20'	Small	Slow	"		"
11.	<i>Spathodea campanulata</i>	25'-35'	"	Quick	"	Large, 4-9 pairs of leaflets	"

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S. No.	Name of the tree	Height	Spread	Growth (slow or quick)	Foliage (thick or light)	Character of leaves	Root structure
B—Evergreen trees							
I—Large-sized trees							
1.	<i>Colvillea racemosa</i>	40'-50'	Spreading crown	Quick	Light	Leaves alternate, 3' long	Large
2.	<i>Enterolobium saman</i>	60'-80'	"	"	"	Feathery foliage, pinnate	"
3.	<i>Ficus religiosa</i>	50'-60'	"	Slow	Thick	Elliptic or obovate apex	"
4.	<i>Polyalthia longifolia</i>	40'-50'	Tall with downward branches	Quick	Light	Lance-shaped, bright and wavy	"
5.	<i>Pterospermum acerifolium</i>	40'-50'	Tall with spreading branches	Slow	"	Large, obovate	"
6.	<i>Sterculia alata</i>	30'-45'	Medium	Quick	"		Small
II—Medium-sized trees							
1.	<i>Azadirachta indica</i>	30'-40'	Medium	Quick	Light	Long, pendent, serrated	Medium
2.	<i>Casuarina equisetifolia</i>	35'-45'	Oval crown like conifer	"	Feathery foliage	Cord-like	"
3.	<i>Cedrela toona</i>	40'-50'	Medium	"	Light	Glabrous, 5-10 pairs of leaflets	"
4.	<i>Eugenia jambolana</i>	30'-40'	Dense crown	"	Thick	Large, smooth oval	"
5.	<i>E. fruticosa</i>	30'-40'	"	"	"		"
6.	<i>Grevillea robusta</i>	30'-80'	Columnar	Slow	"	6"-4", pinnate	"
7.	<i>Kigelia pinnata</i>	5'-45'	Medium	"	"	Leathery	"
8.	<i>Tamarindus indica</i>	35'-40'	Spreading crown	Very slow	Light	Compound, with 10-12 pairs of leaflets	"
III—Small trees							
1.	<i>Acacia auriculiformis</i>	30'-40'	Columnar	Medium	Light	Phyllodes glabrous	Small
2.	<i>Acacia moniliformis</i>	20'-30'	"	Very slow	"		"
3.	<i>Calophyllum inophyllum</i>	20'-25'	"	"	"	Elliptic	"
4.	<i>Cassia siamea</i>	25'-35'	Medium	"	Thick	6"-12" long, pinnate, glabrous, shining, oblong	"
5.	<i>Diospyros embryopteris</i>	25'-30'	Spreading	"	"		"
6.	<i>Dillenia indica</i>	30'-40'	"	"	"		"
7.	<i>Guaicum officinale</i>	30'-40'	Rounded crown	Slow	"	Dark green with 2-3 pairs of leaflets	"
8.	<i>Lagerstroemia thorelli</i>	20'-25'	Medium	Quick	Light	Alternate leaves, bright green	"
9.	<i>Mesua ferrea</i>	20'-25'	"	"	"	2"-6" long, upper side shining	"
10.	<i>Putranjiva roxburghii</i>	25'-30'	Columnar, slightly spreading	Slow	Thick	Bright green	"
11.	<i>Plumeria alba</i>	20'	Low spread	"	"	Dark green, shining	"
12.	<i>Plumeria acutifolia</i>	20'	"	"	"	Smooth and narrow	"
13.	<i>Phyllanthus emblica</i>	25'-30'	Medium	Quick	"	Deep, but not spreading	"

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S. No.	Name of the tree	Height	Spread	Growth (slow or quick)	Foliage (thick or light)	Character of leaves	Root structure
14.	<i>Thespesia populnea</i>	25'-30'	Umbrella-like	Quick	Thick	Heart-shaped	Small
C—Palms							
1.	<i>Borassus flabellifer</i>	40'-60'	Erect unbranched	Slow		Large, fan-shaped	„
2.	<i>Cocos nucifera</i>	80'	„	„		Large, pinnate	„
3.	<i>Livistona chinensis</i>	6'	„	„		Kidney-shaped 5 across	„
4.	<i>Oreodoxa regia</i>	50'	„	„		Long, arched, with long leaflets	„
5.	<i>Phoenix dactylifera</i>	30'-40'	„	„		Long, arched	„

CHAPTER XVI

THE WORLD FESTIVAL OF TREES

IT has long been a tradition in many countries to celebrate annually a Tree or Forest Festival, the enthusiasm with which it is celebrated depending upon the degree of awareness of the people's need for forest resources, and where such resources are adequate, of the necessity of their protection and maintenance by a public whose sense of responsibility has not yet been fully awakened. In recent years, more nations have been joining the list of those celebrating tree festivals because of their growing awareness of the situation resulting from the destruction of their tree resources by irresponsible actions of the people and their eagerness to instil in the people the aesthetic, physical and economic value of trees.

Countries which have long recognized that their main wealth is timber, and their very existence is dependent upon the maintenance of a protective forest cover, have not felt the same need as others for observing such celebrations. In Sweden, for example, where forests play such an important part in national economy, specific activities are confined to a 'Week of the Forest'. But in other countries, the 'Festival of Trees' is a much-planned celebration, in which a large section of the populace actively participates and such activities lead to the large-scale planting of saplings.

The Governments of the States of the Commonwealth of Australia, have, for many years, recognized the value of a regular annual function aimed at inculcating in the minds of the young people a tree-consciousness and a sense of importance of trees and forests to the general life of the community. To this end, celebrations known as the Arbor Day have been organized by the State Departments of Education in the form of a tree-planting function at which, in the larger centres, leading citizens present relevant subjects to school children who are responsible for the planting of the trees and shrubs. Plantings are carried out in school plots or other areas especially set aside for the purpose, and, in some instances, the planting of trees alongside roads in the community is arranged, suitable trees and shrubs generally being made available by the State Forest Service. Owing to a vast divergence of climate and other conditions obtaining in various states and districts, the annual ceremony is held on different dates, the form of ceremony depending upon the size of the centre and the school, and other local aspects. In some States, various organizations and associations arrange tree-planting functions on similar lines, assisted by the Forest Services, which provide the needed publicity.

Victoria has been observing an Arbor Day in her schools for the last forty years, and many beautifully planted school grounds throughout the State bear witness to its success. Each year the Education Department draws the attention of school

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committees, teachers and pupils to the necessity of planting of and caring for trees. An official instruction to head teachers is published in the Education Gazette for April and May, and suitable articles, stories and poems are published in school magazines and educational periodicals.

The usual programme followed in each school is that the morning session is devoted to special lessons relating to the beauty and importance of trees and forests, while the afternoon is given to actual planting activities. In many schools, the Day is a special social occasion when parents and friends of the school take part. Where the school grounds are fully planted, schools frequently participate in community planting projects sponsored by municipal authorities or such bodies as the Country Women's Association, or the Natural Resources Conservation League. In addition to the encouragement it gives to school ground and roadside ornamental planting, the Education Department has fostered a scheme of school endowment plantations by which schools are encouraged to establish their own community forests. These small forest plots, approximately 400 in number, vary in size from one acre to seventy acres. Many of these plantations are beginning to make an appreciable contribution to the timber resources of the State, but their principal value lies in the stimulation of pupil interest, and the provision of opportunities for community service, coupled with healthy and pleasant outdoor activity.

In Western Australia, apart from the Arbor Day, the Annual Wild Life and Flower Show has found popular support. This has now become one of the most popular annual floral events in Perth. Organized by the Perth Naturalists' Club, it is supported by several public bodies, including the Forests Department. The Show is held in September when most of the native wild flowers, shrubs and trees are in flower. Since the last few years, a Festival of Flowers is also being celebrated with great success. Organized by the Silver Chain Nursing Association, the Festival is celebrated by decorating every building and statues etc. in Perth proper with flowers. The display of native flowering shrubs and Eucalyptus does much to stimulate the demand for trees and plants of many species. As a practical guide to farmers, arboreta have been established in the South-west as well as in the Wheat Belt, and the establishment of more of these at intervals throughout the country districts is contemplated to add to the interest of farmers in tree-planting.

In Canada, several provincial governments sponsor Arbor Days which are chiefly celebrated by way of tree-planting by school children, often on school property, and, in addition, a nation-wide Forest Conservation Week is observed. During the Week, the importance of better management of farm woodlots and of the protection of forests against fire is particularly stressed.

The 'Festival of the Tree' is celebrated along with national 'Festival of the Race' in Colombia. The 'Festival of the Tree' is organized by the Forestry Service in collaboration with, among others, the Ministry of Agriculture, the Ministry of

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National Education, the departmental authorities, the Society of the Friends of the Tree and the militia units. Special features of the Festival include the flood-lighting of the 'Tree of Peace' and the singing of tree hymns by school children. The Festival was celebrated in 1951 not only by symbolical means in most of the provincial and departmental capitals, but by the planting of half a million trees around schools, colleges and barracks and in parks and avenues.

Heralded by press publicity and radio broadcasts, the German Federal Republic celebrated a national festival of trees for the first time in 1952. The occasion was organized by the *Schutzgemeinschaft deutscher Wald* in collaboration with the forest administration, schools and local organizations. Groups of trees were planted in all communities by local authorities and by school children, and lectures were delivered by foresters and nature lovers.

Haiti has been celebrating the 'Festival of the Tree' since 1938. The celebration has aroused such enthusiasm throughout the land and is carried out in such an agreeable atmosphere that during the last five years a 'Week of the Tree' has been organized for school children. During the five days before the date set for the Tree Festival, a series of conferences and talks is given in all the schools, at the end of which a symbolic tree is planted. A typical ceremony consists in the school children and their teachers assembling at the site chosen for reforestation. Usually, this locality is a bare hill in the neighbourhood, a public square insufficiently set with shade trees, a recreation ground of an important educational institution or any other place suitably close to the commune. The seedlings to be planted and the tools necessary, especially the spades, are placed in the centre of the area selected. When the invitees have arrived, the children sing the Haiti National Anthem, and raising their right hand shoulder-high, take the Oath of the Tree. The parish priest is then invited to bless the trees, and especially the finest specimen which will have been selected as the symbolic 'tree of the year' to be planted by the highest authority present. Then follow the school children under the guidance of their teachers and the students from the National School of Agriculture, who complete the planting to be done. Throughout the ceremony, a commentary is broadcast through loudspeakers explaining the importance and the extent of the ceremony, and sometimes school bands play selected tunes. The active participation of the children attending primary and secondary schools of the communes in the planting operations is assured through legislation.

In Israel, the Jewish calendar has set aside the fifteenth day of the month of *Shevat* (falling approximately in the second half of January) as the Festival of Trees since time immemorial. Traditionally, the Festival is called 'the New Year's Day of the Trees' and in the popular tradition it is assumed on this day that the sap begins to rise, then beginning the annual cycle of vitality. For many centuries the day was kept primarily as a minor religious festival, but with the beginning of the Zionist

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movement, the character of the Festival was modified to include the character of the Arbor Day.

The earlier Jewish settlers in Israel recognized the great necessity of tree-planting in the bare country they came to, as well as the need to implant in the public mind the importance of forests and their preservation as a most valuable national asset. In the present form of the festival, the Day is celebrated in schools and throughout the country as well as in the youth movements by devoting the Day to explanations of the significance of trees and forests. Songs and poems relating to the subject are taught and appropriate popular legends are retold. The actual tree-planting ceremony is the climax of the celebration. Classes of school children go into the countryside to sites reserved for afforestation. Each child is ceremoniously handed a sapling; the saplings are then planted by all children at the same time, and the actual planting is followed by a general celebration. Similar planting ceremonies are organized by various organizations and groups of adults who wish to commemorate some event or person, or generally to associate themselves with afforestation. Such groups are very often constituted not only by people in Israel, but also by Jewish communities throughout the world who wish to express their attachment to Israel this way. Forests or groves are named either for the sponsoring group or for a personality or event they wish to commemorate. The actual planting ceremony is attended by some prominent personality who inaugurates the forest by planting the first tree. The celebration of the Festival of Trees is organized by the Jewish National Fund, a public body responsible, *inter alia*, for a great deal of the afforestation work being done in Israel.

In Japan, the national tree festival is celebrated annually for a week in April, known as the 'Greening Week', corresponding to the Arbor Day observed in the U.S.A. and South Australia. The 'Greening' campaign in Japan is sponsored by the National Land Greening Promotion Committee, composed of the Speaker of the House and of the Representatives (Chairman) and some members of the same House and the House of Councillors and representatives of various other organizations. The 'Greening Week' comprises the Street Greening Day, the Homestead Greening Day, the Mountain Greening Day, the Traffic Greening Day, the Schools Greening Day and the Green Tree Protection Day. In 1952, the Emperor and Empress planted trees in person on the Day observed in Tokyo. A National 'land greening' mass meeting was held on the occasion of the national tree festival, at which the formal official commendation of persons who had rendered distinguished services in the 'greening' programme, prize-winning posters, children's songs and popular songs in the contest held under the auspices of the Committee. Special trains were run to the places where the Tree Festival was celebrated for the convenience of the large attendance. National 'land greening' campaign posters made by the pupils of schools throughout the country were placed on public exhibition. A campaign for

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'Green Feather' contributions was pushed forward throughout the country under the auspices of the respective 'perfectural greening' promotion committees, obtaining an active co-operation from the pupils of schools as well as volunteers. The contributions thus collected were allocated to the creation of the school forest, river-head forest, street forest and 'school site greening' as well as to the dissemination of the ideas of the aesthetic, physical and economic value of the trees. In commemoration of the coming into force of the Japanese Peace Treaty, the creation of public forests, school forests, and the youth club forests was encouraged, and programmes were pushed forward for 'greening' the forest lands, cities, school sites, workshops, homesteads and transport sites. A new brand of cigarettes was put on sale in commemoration of the 'greening' campaign. Posters for the 'greening' campaign were widely circulated and gramophone records of popular children's songs about the campaign were issued.

Since the 'Greening Week' was inaugurated in Japan in 1948, land covering 10,000 hectares has been reinforced every year by school pupils. A total of a million school children took part in the 'greening' campaign. To encourage the campaign, the Minister of Agriculture and Forestry and the Minister of Education awarded prizes to the best schools in the school forest contest.

Sweden as a country has been well aware for so long a time of the importance of forestry and of the wood product industries to the country. Yet, it celebrates a 'The Week of the Forest' in Stockholm every year, when a great number of associations in the field of forestry have their annual meetings and discussions. The Press gives good publicity to these meetings, so that the people are kept reminded of their obligations to the tree forest. Swedish schools make an important effort in this respect by way of education and by the planting of trees.

In the United States of America, the observance of Arbor Day has become established in one form or another in all the States. It was first observed in Nebraska in 1857, and grew out of conditions peculiar to the Great Plains. Tree planting on the Day is largely done by school children, in which is combined pleasure, utility and instruction. Great emphasis is laid on educating the young people in the conservation of trees and forests, and the observance of the Day encompasses such diverse objectives as the establishment of memorial trees or groves, the enlargement of community forests, the beautification of streets and highways, and even the growing of Christmas trees. Arbor Days have contributed a great deal to the goal of mass consciousness of the aesthetic, physical and economic value of trees.

CHAPTER XVII

THE FESTIVAL OF TREES IN INDIA

IT is not the lack of aesthetic sense and respect for trees on the part of the people alone that have led to the thinning of our forests and degradation of our woodlands. A growing population gave rise to land hunger, and man, his plough and the cow and goat invariably had their incursions into the natural tree wealth. Even marginal lands and community wood and grazing lots were not spared, even if it was only for clearing such lands of the trees, taking up an unprofitable agriculture on them for a short time and abandoning them soon to their fate. An undecided and halting national forest policy aided the degeneration of national and state forests further, and the inevitable followed.

Soil erosion, for decades confined to patches here and there, assumed dangerous proportions. With the denudation of village forests, villagers were soon in search of alternative sources of fuel for the homes, and began using cow-dung at the cost of impoverishment of their soils and consequent lower yields. This led to further incursions into the tree reserves. Nature's balance had been disturbed, and a costly lesson was being learnt.

The rural landscape in many states became increasingly treeless and barren. It looked as if the great drama of the disappearance of the fertile red soil of China would be enacted in this country. What was required was a national awakening to the necessity of planting trees, and attempts at tree rehabilitation on a national scale.

The beginning came in July 1947, when a very successful Tree Planting Week was celebrated in Delhi State. The Week was heralded by the planting of *kachnar* saplings by the stalwarts of the Nation, led by the Prime Minister, Jawaharlal Nehru, at a picturesque ceremony in the historic Purana Quila. Addressing the people, Nehru said, "I think there should be a law about cutting down trees. A person who cuts down an aged tree should be required to plant another, and thus compensate the loss." "A growing tree," he exclaimed, "is the living symbol of a progressive nation."

Commenting on the Delhi Tree Planting Week in one of his post-prayer speeches, Mahatma Gandhi said, "The official who originated the idea of tree-planting did not do it for fancy, nor was it meant for the moneyed men. It began with them so that others would copy them and thus add to the wealth and rainfall of India."

The main objective of celebrating the Tree Planting Week was to focus the attention of the people on the national importance of planting trees and to make them

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tree-conscious. This objective was fulfilled to a great extent. There was a scramble for seedlings at the nurseries, and in many states the Week was celebrated on an organized basis.

But to K. M. Munshi goes the credit for raising the tree to the level of importance it should have in our national economy. As Minister of Food and Agriculture of the Indian Union, he stressed the need for including the principle of sustained and regulated yield in the forest policy of new India. At the same time, he took up the work of tree-planting on a national scale by initiating a national tree-planting movement. He reminded the people of what our great ancestors thought and said about forests and trees. "Trees," he said, "have a rightful place in the general economy of every country. The forest is not a handmaid of agriculture. Our forests are inexhaustible reserves for providing subsistence to our growing millions; for, trees mean water, water means bread and bread is life."

Under his inspiring guidance the first National Festival of Trees or *Vana Mahotsava* was observed in 1950. Never before was such a festival held on so vast a scale. In July that year and in the following months, lakhs of seeds and seedlings were planted all over the country. Apart from the results achieved, what was much more important was that the people of India became tree-conscious, and the realization came to them that even trees had a place in the life and economy of the country.

The Festival is not confined to cities and towns alone, where everyone knows what need there is for trees to help reduce the monotony of the drab brick and cement. It has seeped into the villages, bringing home to the villagers that trees mean better crops, better living conditions, better cattle and more beautiful villages.

The *Vana Mahotsava* has achieved much during the years the Festival has been observed. Yet, some more efforts have to go in before the gains are consolidated and further progress achieved. The public mind needs to be further educated on what stands behind the mere ritual of planting trees.

The *Vana Mahotsava* is not a festival, as other religious festivals are, lasting for a day or two and thereafter developing into a rite devoid of meaning or importance. It is a symbol of an unending movement towards verdure. The planting of a tree is merely the starting point of a tacit undertaking to do all that is necessary to provide it with appropriate living conditions and protect it against damage or destruction by man or beast.

There are very many still to appreciate the true significance of the Tree Planting Festival. Every effective method should be made use of for disseminating information on the Festival to the general public. It must be told of the sacred significance of the one-time forests that clothed the land and cradled the Aryan civilization. It must be told of how the law of diminishing returns is operating in the field and the meadow because of an ill-planned and ill-balanced rural economy that has

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allowed cultivation to engulf grazing ground and tree land. It must be told of the value of the forest and the tree in national economy, and their importance in controlling erosion and mitigating floods, and in providing shade and shelter against the tropical sun and desiccating winds. It must be told of the need for the 'village beautiful'.

Then again, the ceremonial should be given a practical turn. Large-scale nurseries should spring up to provide a variety of planting material and sufficient quantity of it to meet a large demand. All available resources should be canalized towards this end, and all those who want to plant should easily and with very little cost get what they need to plant.

People should be properly guided on the technique of planting and after-care of trees, including protection against adverse elements. The guidance will have to be sustained, especially in the initial stages. In fact, this aspect of forestry Extension can ably be tackled by our Community Development Projects and the National Extension Service, in addition to the other voluntary social services.

Incentives are already provided through awards of shields, cups, *sanads* and certificates. These are for achievements on a national scale, but the institution of more of these on a state and smaller unit basis will help foster a greater spirit of healthy competition in the field.

Everyone can help, including women and children. Active participation of children in tree-planting festivities will help build a future generation of tree-lovers. For this reason, a special course on planting of trees should be instituted in the curriculum in all schools. Teachers and students should plant trees with their own hand, thus instilling in all minds the dignity of labour. Spades and hoes, and where necessary, irrigation appliances should be provided free of cost to all schools. Special prizes should be awarded for good work done.

In villages, rural communities should be persuaded to plant not occasional individual trees, but compact blocks of them wherever land is available. Our villages need windbreaks and shelter-belts. Such work deserves to be initiated during the Festival.

The tree-planting plan needs to be flexible enough to accommodate the tree-needs of the community. The plan need not be confined to the planting of flowering trees alone, though this should form an integral part of it. Planting of timber trees like tamarind, *nim*, *bakain*, *shisham*, casuarina and *babul* on waste land and fruit trees like lemons, sweet lemons, papaya, *amlas*, *kathal*, mangoes and bananas in gardens and house compounds and back yards, should also form a part of the programme.

Griessen mentions the existence of a 'Society of the Friends of the Trees' in Tunis in North Africa, whose function is to bring together all people who love trees and are interested in encouraging their planting. He states that packets of seeds of

selected trees are supplied each year to the students of schools in Tunis, which are sown during a selected week. We need to organize such a society, so that all those interested in the propagation of beautiful trees are brought together. Such a society ought to be organized under the auspices of the National Extension Service, and can play a big part in popularizing tree culture and developing a love for trees throughout the country.

The Tree Planting Festival is now being celebrated on a progressively bigger scale each year. If public enthusiasm in this direction is kept up, every nook and corner of the country before long will brighten up with clear strong gold and scarlet, the rich purple and blue and waxen white of numerous flowering trees, so that they may tell the younger generation the message of a minor nineteenth century poet :

“He that planteth a tree is the servant of God
He provideth a kindness for many generations
And faces that he hath not seen shall bless him.”

The Festival of trees is being at present celebrated in different countries under diverse names. The name is immaterial, so long as its aims are fulfilled. The stage is also now passed when the festival, instead of being confined to individual countries, is made an international occasion in which the tree as a symbol of enduring peace is the central theme of the celebrations. It is befitting that the younger generation in every country learns to foster an international feeling of friendship and world peace. The exchange of indigenous tree seeds between the school children of one country and another, the establishment of forests or ‘Groves of Nations’ would not only be of high educational value, but would be of some considerable community interest and an effective means of promoting goodwill among nations. Many nations have adopted trees, shrubs and flowers as national emblems. The supply of seeds of such plants to schools in other countries would provide for a symbolic manifestation of friendship and co-operation. Sponsoring such programmes as International Friendship Groves, suggesting friendship and co-operation among nations in planting trees for public purposes, will have a definite impact on the adult mind, since forest problems are not confined to the boundaries of one country but are spread over a larger region consisting of a number of countries. The international nature of the Festival will provide a common platform for exchange of forestry knowledge, thus bringing about a better understanding between one nation and another.

CHAPTER XVIII

TREES AND THEIR HABITAT

BIOAESTHETIC planting of ornamental trees has close relationship with plant ecology, and the study of ecology is essential for the bioaesthetic planner. The texture of the soil, amount of rainfall, presence of rivers, canals and tanks, and the temperature play an important role in the growth of trees. Plants must be placed in habitats which approximate to their natural surroundings. There are certain trees which flourish only in moist districts with a rainfall of over 40 inches, or along the banks of rivers, canals and tanks. In districts with a lesser rainfall, these trees can grow with artificial irrigation, but they never acquire the same stature as in moist areas. This does not mean that such trees should not be grown in dry areas at all. If means of irrigation are available, these may be grown. A dwarfing in size takes place when trees which are inhabitants of moist districts are grown in dry areas, and this is an advantage when considered from the point of view of the owner of a house with a small compound. *Lagerstroemia flos-reginae*, which is a big tree in Bengal, is a medium-sized tree in the Punjab and Uttar Pradesh. Trees suitable for growing under various conditions are given below.

ORNAMENTAL FLOWERING TREES SUITED TO MOIST LOCALITIES

Name of Tree	Country of origin	Time of flowering	Colour of flowers
<i>Amherstia nobilis</i>	Burma	March	Salmon pink
<i>Bauhinia variegata</i>	India	March-April	White, pink or mauve
<i>B. purpurea</i>	West Indies	February-March	Red
<i>Brownea coccinea</i>	do.	do.	do.
<i>B. ariza</i>	do.	do.	Rose pink
<i>Cassia marginata</i>	Ceylon	May-June	Terra cotta red
<i>C. javanica</i>	Java	do.	Rose pink
<i>C. nodosa</i>	India & Malaya	do.	Bright pink
<i>Colvillea racemosa</i>	Madagascar	October-November	Scarlet orange
<i>Guaicum officinale</i>	West Indies	March-April	Blue
<i>Lagerstroemia flos-reginae</i>	India	April-May and July-September	Mauve purple
<i>L. thorelli</i>	do.	do.	White mauve
<i>Milletia auriculata</i>	Burma	March	Purple mauve
<i>Poinciana regia</i>	Madagascar	April-June	Scarlet orange
<i>Peltophorum ferrugineum</i>	Malaya	October	Golden yellow
<i>Pithecolobium saman</i>	Brazil	March and September	Pale pink
<i>Saraca indica</i>	India	February-March	Scarlet orange
<i>Solanum wrightii</i>	Brazil	All the year round; particularly in October	White and purple blue
<i>Spathodea campanulata</i>	Tropical Africa	February-March	Orange red
<i>Sterculia colorata</i>	India	April-May	do.

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ORNAMENTAL FLOWERING TREES SUITED TO DRY LOCALITIES

Name of Tree	Country of origin	Time of flowering	Colour of flowers
<i>Acacia auriculiformis</i>	Australia	October-November	Yellow
<i>Butea frondosa</i>	India	March	Vermilion
<i>Cassia fistula</i>	India	April-May	Yellow
<i>Cordia sebestena</i>	India	All the year round; particularly January to March	Scarlet orange
<i>Cochlospermum gossypium</i>	India	March	Yellow
<i>Erythrina indica</i>	India	February-March	Scarlet red
<i>E. Blackeii</i>	India	April	Cinnamon red
<i>Jacaranda mimosaeifolia</i>	Brazil	March-April	Violet blue
<i>Melia azadirachta</i>	India	April	Lilac
<i>Plumeria alba</i>	South America	March-April, July-October	White
<i>Pongamia glabra</i>	India	May	Mauve
<i>Spathodea nilotica</i>	Tropical Africa	February-March	Orange crimson
<i>Tecomella undulata</i>	India	March-April	Orange yellow
<i>Thespesia populnea</i>	India	All the year round; particularly in October and November	Yellow and purple reddish

DROUGHT-RESISTANT TREES SUITABLE FOR ARID REGIONS

<i>Albizia lebbek</i>	<i>Siris</i> . A deciduous, spreading, fast growing tree, 40 to 60 feet high. Thrives in the Punjab, Rajasthan and South Iran. Moderately drought-resistant.
<i>Butea frondosa</i>	<i>Dhak or palas</i> . A medium-sized deciduous tree, gets covered in March with scarlet flowers. Extremely resistant to drought.
<i>Cassia fistula</i>	<i>Amaltas</i> . A medium-sized deciduous tree, 30 to 40 feet high. Gets covered with golden yellow flowers in May.
<i>Casuarina equisetifolia</i>	Beef-wood tree. A tall evergreen tree; 50 to 60 feet high, with long needle-like leaves; native of Australia, grows well on dry sandy soil. Thrives in the Punjab.
<i>Eucalyptus citriodora</i>	<i>Safeda</i> . A tall evergreen tree; thrives in the Punjab and Iraq.
<i>Melia azedarach</i>	Persian lilac, dake, <i>bakain</i> . Deciduous tree, 20 to 40 feet high; purple panicles in March; flourishes in the Punjab.
<i>Morus indica</i>	Mulberry, <i>toot</i> . Thrives in the Punjab, Syria and South Iran.
<i>Phoenix dactylifera</i>	Date-palm, <i>khajoor</i> . Flourishes in West Pakistan, Iran and Iraq.
<i>Prosopis juliflora</i>	Mesquite bean. A deciduous tree, medium sized, graceful feathery foliage; quick-growing, extremely drought-resistant, a native of Mexico.
<i>Salvadora persica</i>	<i>Pilu</i> , Mustard Tree of Scripture. A small evergreen tree with small oval-fleshy leaves; extremely drought-resistant; flourishes in West Pakistan and Iran.

SALT-RESISTANT TREES

<i>Butea frondosa</i>	<i>Dhak, palas</i> . Extremely salt-resistant; in fact, the only tree which grows successfully on saline, <i>usar</i> and <i>kalar</i> soils.
<i>Bassia latifolia</i>	<i>Mahua</i> . Moderately salt-resistant, can grow on slightly saline soil; yields good timber and edible fruit which can be fermented into liquor.
<i>Eucalyptus citriodora</i>	Moderately salt-resistant. Grows even in Iraq.
<i>Azadirachta indica</i>	<i>Nim</i> . Moderately salt-resistant.
<i>Phoenix dactylifera</i>	Date-palm, <i>khajoor</i> . Flourishes in brackish soil.
<i>Phyllanthus emblica</i>	<i>Amla</i> . Flourishes in slightly saline soil.
<i>Psidium guava</i>	Guava. Can easily grow in mild <i>usar</i> .
<i>Tamarix articulata</i>	<i>Farash</i> . Thrives in arid saline soil.
<i>Thespesia populnea</i>	<i>Bhendi</i> . Thrives in the back-waters of Kerala.

TREES AND THEIR HABITAT

TREES FOR SWAMPS AND MARSHY AREAS

<i>Eucalyptus rostrata</i>	Has a high rate of transpiration and is useful for draining marshy areas.
<i>Salix tetrasperma</i>	Willow. Ideal for waterside planting.
<i>S. babylonica</i>	Like the willow, highly suited to waterside planting.
<i>Tamarix</i> sp.	<i>Farash</i> . Can stand water-logging.
Plantains	<i>Kela</i> . Its broad leaves have a high rate of transpiration.

NECTAR-YIELDING TREES

Bauhinia purpurea
Bottle brush (*Callistemon lanceolatum*)
Horse chestnut (*Aesculus indica*)
Jaman (*Eugenia jambolana*)
Kachnar (*Bauhinia variegata*)
Nim (*Azadirachta indica*)
Shisham (*Dalbergia sissoo*)
Soapnut (*Sapindus*)
Tun (*Cedrela tuna*)
Barna (*Crataeva religiosa*)

It is seen from the above that the majority of the trees listed as suited to moist areas are natives of tropical countries with heavy rainfall and high humidity. On the other hand, among those shown suitable for dry areas are trees which can stand shortage of water. These are trees with special structural modifications which enable them to cope up with dry conditions, heat and shortage of water. Some of these are indigenous to India, and thus are ideally suited to our dry tracts where irrigation facilities are poor and hot dry winds blow. They can tolerate arid conditions, but it does not mean that they love drought and heat. They can as well grow in the moist districts and thrive very well indeed.

However, on the banks of a canal, a river or a tank, such moisture-loving trees as *Lagerstroemia flos-reginae*, *Salix tetrasperma* (willow) and *Sapium sebiferum* (*makhan*) should be planted. The last one, which is also known as the Chinese Tallow Tree, is a medium-sized deciduous tree whose leaves display lovely autumn tints and is used for stream training in Kangra district of the Punjab.

Very few trees can grow in marshy water-logged areas. *Eucalyptus rostrata* has proved a success in water-logged areas near the Upper Jhelum canal in West Pakistan. Willows and tamarix are also suitable for such areas. Where adequate protection against animals is available, the banana may also be tried. These trees can also be used for draining puddles which form near wells in our villages. These puddles should be enclosed with brick-walls to protect the young trees from cattle, and planted with the trees mentioned above. Where soakage pits have failed to drain the water, these trees may succeed.

The soil plays a very important role in the life of trees. A high and well-drained soil of mixed sand and clay is ideal for the growth of trees. Water-logged, low-lying

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areas produce stunted growth. There are certain trees which can flourish in poor sandy soils. These are mostly members of the family *Leguminosae* whose roots harbour nitrifying bacteria in tubercles which fix atmospheric nitrogen and make it available to the tree. Then there are trees which can cope with alkaline soil, such as *Butea frondosa*, the common *dhak*. In fact, trees serve as a valuable index of the type of soil on which they grow. Further, there are trees which can grow on dry rocky areas with minimum of soil, such as *Cochlospermum gossypium*, *Cassia fistula*, *Prosopis juliflora* and *Plumerias*. These trees are ideal for covering arid hills such as those found in Central India and Rajasthan.

Animals, particularly goats, are the chief enemies of young trees. Some trees like *Cassia fistula* contain chemicals deterrent to animals in their sap. Goats, cows and buffaloes will not touch the leaves of *amaltas*, which have a purgative action on their digestive organs. Hence *amaltas* is well-suited for planting waste land which cannot be protected from grazing animals.

The Frost Line, described as an imaginary line which passes through the districts below which frosts never occur, extends roughly from the sub-Himalayan districts of Uttar Pradesh to the eastern districts of the Punjab. The significance of this line lies in the fact that majority of the denizens of the equatorial and monsoon forests are unable to flourish in the areas above this line. Given sufficient protection in winter, they may grow in the area, but they *will not be able to reproduce themselves* in areas where frost occurs. This explains why *Colvillea racemosa* produces so few seeds even in Uttar Pradesh. Of the trees listed as suitable for moist localities, there are 12 trees which are natives of tropical countries like Africa, Madagascar, Java, West Indies, Malaya and Burma. These trees cannot be satisfactorily grown in the Punjab, Kashmir and the Himalayan zone. In this matter, Uttar Pradesh, Bihar, Bengal, Madras and Bombay are more fortunate, inasmuch as the choice of trees available for planting is larger as compared with the northern area above the Frost Line. In these areas only indigenous trees which are adapted to our climate are indicated.

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A list of palatable fodder trees with the chemical analysis of their leaves indicating composition, percentage of mineral constituents and nutritive value

S. No.	Indian name	Botanical name	Chemical composition				Mineral constituents			Nutritive value			Remarks
			% Crude fibre	% Crude Protein	% Fat	% Nitrogen-free extract	% Calcium as CaO	% Phosphorus as P ₂ O ₅	% Total Digestible Nutrients	% Starch Equivalent	% Digestible Crude Protein	Consumption per 100 lbs. body weight in lbs.	
1.	Siris	<i>Albizia lebbek</i>	31.52	16.81	3.97	36.16	3.60	0.35	49.30	30.23	11.59	2.76	
2.	Jharberi	<i>Zizyphus nummularia</i>	33.82	11.63	1.59	46.76	2.66	0.70	57.10	37.00	5.45	3.28	
3.	Bel	<i>Aegle marmelos</i>	16.45	15.13	1.54	52.83	5.93	0.69	56.65	46.13	10.76	3.92	
4.	Tut	<i>Morus alba</i>	15.27	15.00	7.43	47.98	3.38	0.56	59.59	50.46	10.68	3.44	
5.	Khair	<i>Acacia catechu</i>	22.55	13.02	4.55	50.96	3.84	0.395	46.33	32.16	2.90	2.46	
6.	Maroffali	<i>Helicteres isora</i>	19.80	13.25	3.04	53.02	3.15	0.69	58.32	46.03	9.68	2.53	
7.	Bans	<i>Dendrocalamus strictus</i>	27.64	14.19	1.73	44.46	1.57	0.59	48.91	32.12	9.34	2.51	
8.	Kachnar	<i>Bauhinia variegata</i>	31.80	15.80	1.95	41.20	3.78	0.50	55.54	36.27	9.16	4.00	
9.	Gular	<i>Ficus glomerata</i>	12.27	11.16	2.43	59.00	3.75	0.71	53.82	47.28	6.69	5.00	
10.	Pula	<i>Kydia calycina</i>	23.71	12.17	3.31	46.10	4.29	0.80	54.41	39.63	7.88	2.3	

Crude fibre—This comprises the cell walls and woody fibre of all plants—the least digestible part of a feed.

Crude protein—This includes true protein, containing a number of amino acids, and non-protein nitrogenous compounds such as amides.

Nitrogen-free extract—These are soluble carbohydrates. They produce heat or energy and fat in the body.

Total digestible nutrients—This unit is used in the U.S.A. to represent the energy value of a cattle feed. It is expressed as a percentage of the total weight of the feed.

Starch equivalent—This is used in U.K. and certain European countries to represent the available energy in a feeding stuff. This is also expressed as a percentage of the total feed.

Digestible crude protein—The percentage of the total crude protein in a feed which is utilized by the animal.

CHAPTER XIX

PLANTING TREES AND THEIR CARE

IN North India, we have a typical woodland climate which is favourable to the growth of trees. In wet districts with rainfall over 40 inches per annum and in the comparatively drier districts where irrigation facilities in the form of canals are available, a sapling grows into a fairly big tree in about six years. Most ornamental flowering trees produce flowers after a growth of four to five years. There is advantage in planting saplings one to two years old rather than raising trees from seed, especially in bare places where shade is quickly desired and a gain of one or two years' growth is of great value. Saplings over two years old are undesirable, as they take a long time to recover, especially when they are pot-grown with cramped roots.

Sites for pits should be planned and located beforehand, preferably three to four months before planting. There is a tendency to plant too many trees, as from the size of saplings people often fail to realize their eventual growth and the space they will occupy when mature. Dwarf trees should be grown 15 to 20 feet apart, and larger trees when planted in an avenue or a clump should be at least 30 feet apart. Pits at least four feet deep and four feet in diameter should be dug at the sites selected in the month of March. The soil should be exposed to the sun during April and May, and in early June mixed thoroughly with old farmyard manure or compost in the ratio of 5 : 1. The pit should be filled up with the mixture to the ground level. Fresh or raw manure is not desirable as it is a standing invitation to white ants. Where the soil is unsuitable for the growth of plants as in *usar* and *bhur* areas, it should be discarded and good soil from some other locality used for filling the pits. When the soil in the pits has subsided after the first two or three showers the pits are ready for receiving the saplings.

The best time for planting trees is in January and February and in the monsoon months from July to September. Where irrigation facilities are available, winter is the best time for planting deciduous trees. During winter, they are in a dormant condition and are less likely to suffer damage when dug up. For evergreen and semi-deciduous trees, the rainy season is the best time for planting. Where irrigation facilities are available, it is preferable to plant trees in the last week of February, as the trees thus planted will be benefited by the spring growth and will be securely established by the time the rains come. In places where there are no irrigation facilities or the water supply is inadequate, planting should be done towards the end of July. If trees are planted in the month of February, the best time for planting is in the evenings. During monsoons, the planting should be done on a rainy or cloudy day.

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When removing the plant from the pot, the ball of earth round the roots should not be removed or broken. The roots should be loosened and straightened. Injured portions of the roots and branches should be cut off. The root-collar should be just under ground level and care should be taken to secure the same position for the sapling in the pit. It is injurious to plant too deep by burying the stem under ground. Make a hole in the pit sufficiently deep to receive the roots of the sapling. Place the plant in an erect position in the hole thus made and pack the soil tight round the plant. After planting, give it a thorough drenching. These precautions are necessary for the successful growth of the saplings, and where these are not observed, the transplants mostly die or remain stunted.

The practice of planting more than one sapling in a single hole in the hope that at least one of them will strike root is wasteful and undesirable. Saplings of one to two years' growth get established in the pits in a few days. If there are any casualties, they should be replaced without much delay.

Grass has a very harmful effect, particularly on young trees and the deciduous species suffer more than the evergreens. Fruit trees are practically suffocated by the growth of grass and their fruits become small and hard. During the monsoon rains, the volume of carbon dioxide in the spaces of soil under grass increases about five-fold as compared with the soil air of cultivated land. Carbon dioxide dissolves in the water film and the formation of humus, nitrification and mycorrhizal relationship are all affected. As compared with fruit trees like guava, litchi and loquat, forest trees like *dhak*, tamarind and *jarul* are able to compete with grasses and weeds on account of the fact that their deep root system admits of growth during the dry season when the grass is dormant and the active roots of the surface system are resistant to a poor soil aeration and can successfully compete with grass for oxygen and minerals. Nevertheless, for a healthy growth of the plants, a thorough weeding and hoeing are of much greater importance than irrigation. As soon as the soil is dry, the pits should be dug up with a hoe. Aeration of the roots stimulates growth and the removal of weeds, which rob the transplants of nutritive material, will naturally be beneficial. The entire diameter of the pits should be kept free from weeds. Do not dig wet soil. It is more likely to prove harmful and the churning of pasty liquid mud does not serve any useful purpose.

Most of our trees have two growing periods, the spring months of March and April and again the monsoon months of July to September. Where irrigation facilities are available, it is desirable to plant trees in February after the end of the cold weather. Young plants should be watered continuously from March onwards, and particularly in the dry months of April, May and June, there should be at least five to six waterings a month. Each watering should be copious, so that water may reach the roots. Instead of watering with a water can, the trees should be irrigated by flow through a channel and the pits should be filled to the brim. Grindal recom-

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mends the vertical insertion of earthenware flower-pots in the pits and pouring of water in these. Where watering is done by hand, this is a good method and ensures against superficial watering by the gardeners. Light surface sprinkling, even if repeated every alternate day, is actually harmful to the trees, for such superficial waterings tend to keep the roots of the tree nearabout the soil surface, and since the water cannot reach the subsoil, it results in slow and weak growth. On the other hand, if the watering is more thorough, the roots burrow deep down, thus resulting in a healthy growth of the tree. In the period between the waterings, the soil in the pits should be thoroughly hoed. The working of soil not only provides oxygen for the respiration of the roots, but also conserves moisture.

Where irrigation facilities are not available or are inadequate, the trees should not be irrigated in the month of March. Irrigation promotes the growth of new leaves and the rate of transpiration increases. If irrigation facilities are not available later on, the saplings are damaged by excessive transpiration. In such circumstances, it is best not to irrigate the plants, but leave them to their own resources.

In the second year, if the plant develops two or more shoots, it is better to retain only one healthy shoot and to remove the subsidiary ones. Pruning should be done with a pruning knife or saw, and to prevent infection, the open wounds should be tarred. As the tree grows, the lower branches should be cut out and inter-lacing branches in the crown should be removed to keep the frame clear. Staking in the early stages is also necessary, as it helps the tree to develop a straight trunk. Straight and stout branches of trees or bamboo poles can be used as stakes. The sapling should be tied with plantain-fibre with the stake, and it is desirable to insert a small pad of old cloth between the plant and the stake. Strings or wire should on no account be used, as they injure the bark. Nails also should not be driven into the stem, as in some cases they even kill the tree and provide an open door for the attack of fungi. When the stakes have served their purpose, they should be removed.

The protection of young trees in the compound of a house is no great problem. But, in public parks and on the roadside it is a serious task. The main enemies of young trees are goats, cattle, monkeys and mischievous boys. The best solution is to provide tree-guards of bricks limed or cemented at the top, so that the bricks are not stolen. Tree-guards of bricks are suitable for public parks, town roads and platforms of railway stations. Along the roads in the countryside, however, tree-guards of bricks are expensive and are a standing temptation to villagers and cartmen who remove bricks for making *chulahs* for cooking their meals. In such cases, a mud structure affords the cheapest and best protection. A ditch around a mud structure serves as a useful barrier against cows and buffaloes but it is also necessary to place thorns on the mud-walls to ward off monkeys, boys and goats.

The pruning of some fruit trees is essential to keep their crowns in good shape, especially in the compounds of houses where the space available for the expansion

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of their crowns is limited. However, pruning should not be indulged in for its own sake. Every tree has its natural crown which is usually symmetrical and the necessity of pruning ornamental trees very rarely arises. But pruning is a necessity in apples, pears, and other deciduous fruit trees. Many of the trees like *amaltas*, *nim*, and *putranjiva* can stand quite drastic pruning, and in some cases large growing trees can be headed back at 15 to 20 feet. In the case of quick-growing trees like *jacarandas* and *gul mohurs* it is more desirable to remove the tree altogether after 20 years and to plant afresh. Dead or diseased branches should always be sawn off.

Training of trees is also essential from the age of two to three years. By properly bending and tying young trees, beautiful structures result, and gloriettas and gateways of *amaltas* can be made and bottle brush trees can be bent over tanks like weeping willows. Even trees with crooked branches like *Cassia nodosa* can be compelled to form a straight stem in a house with a limited space, if at the commencement the branches are thinned out, and the main stem is staked.

The development of an adequate number of nurseries is an essential preliminary step in the planning of the growing of ornamental, fruit and shade trees. At present the number of nurseries is very inadequate, and a big programme of expansion with more staff should be undertaken and definite quotas should be fixed for each nursery so that sloth and indifference on the part of individuals may not stand in the way. There are nurseries at Delhi, Saharanpur, Lucknow, Allahabad and Agra connected with the Government gardens where a certain number of saplings of ornamental trees is grown. Considering the huge number required to meet the national needs, these nurseries are too small. The superintendents of these gardens complain that there is very little demand for ornamental trees, and hence their small nurseries. At present this is understandable, for very few people have knowledge of the wealth of ornamental trees which we possess in this country, and we see the pitiable spectacle of *jamuns*, *mahua* and *chilbil* plantations in the compounds of houses in bungalows maintained by the Public Works Department and other public places. Demand will be created by properly organized propaganda, and by diffusing knowledge about the selected ornamental trees in schools and colleges. When the average man is in need of a tree for planting, usually he gets hold of the nearest available, irrespective of the fact whether it is a *nim* or *gul mohur*. If he is advised as to what he should plant and at the same time is provided with the plants at a moderate price, he will certainly show discrimination.

There is need for expansion of nurseries in our State Capitals, and at the same time nurseries should also be developed at the headquarter towns of all districts in gardens owned by the Municipal and District Boards, and in the compounds of bungalows belonging to the Public Works and Canal Departments. The nurseries of District Board and Municipal Board gardens should specialize in ornamental and fruit trees and those of the Public Works Department and canal bungalows in

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ornamental, shade and fruit trees—ornamental trees for the compounds of bungalows, shade trees for roadside avenues, and fruit trees for canal roads.

M. D. Chaturvedi, who may be regarded as one of the pioneers of bioaesthetic planning in this country has given very helpful hints about raising nurseries in his pamphlet *Roadside Avenues*. It is very necessary that the inspecting officers should also know how to raise a successful nursery, so that this important work is not left to the whims of gardeners. I cannot do better than reproduce Chaturvedi's very helpful instructions on the planting of avenue trees from his pamphlet.

Site for Nursery. Nurseries should be raised on the best available soil. Well-drained deep sandy loams are best suited for plant growth. Heavy clays should be avoided as far as possible. Posts for the erection of shades to protect young seedlings from frost and desiccating sun should be permanently fixed around nursery beds.

Manuring. Thorough soil-working and an occasional dose of organic manure like cow-dung and vegetable litter will result in good sturdy plants capable of standing transplanting shock with a minimum wastage. Nursery beds should be about five feet wide permitting the gardener to reach the middle from either side, and of any convenient length. A convenient size is 5 feet by 25 feet to hold 500 plants, six inches apart. The long side of beds should run east-west for convenience of shading, if necessary.

Sowing of seeds. Seeds should be sown six inches apart and just covered with fine soil. Nurseries should be dead level, otherwise seeds sown will tend to wash out on the lower end. Beds are to be carefully irrigated in the mornings in preference to evenings, because photosynthetic activity is at its highest at noon. The soil should be lightly worked after each irrigation.

Weeding. Nursery beds should be kept scrupulously clean of weeds, and the soil well worked up. It is not sufficiently realized that good weeding and soil aeration are as important as irrigation. The tendency to stress the importance of irrigation at the expense of weeding and soil-working results in more weeds than plants.

Season. It is both convenient and cheaper to sow seeds in nursery beds at the break of the monsoon.

Transplanting. The seedlings may be retained in the original seed-beds till the following February when they should be dug out with a ball of earth and planted two feet apart in another bed. These transplants should be irrigated right through the summer. At the break of the following monsoon, they should be shifted again and put out three feet apart. Seedlings picked out twice under nursery conditions get accustomed to transplanting shock, and their root system is prevented from getting unwieldy. At the break of the

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third monsoon when the plants are two years old, they are ready for their roadside homes.

Transplants should be carefully dug out and, as far as possible, any injury to the root system avoided. An irrigation or two just before picking out makes the soil soft and easy to work. Injured roots are best cut clean with a sharp knife. The ball of earth around each plant can be kept in place by a piece of gunny bag or straw tied round by a piece of string, and stitched where the lead is long. The gunny bag is to be kept moist during transit.

It is advisable to cut down transpiration during the transplanting period by reducing the leaf surface. With the exception of the leaves on the leading shoots all leaves may be nipped off with a sharp pair of scissors and not plucked anyhow.

Plants put out at the break of the rains take a fortnight to three weeks to get established. A delay of two to three weeks may make all the difference between success and failure. Most plants stop growth by the end of October, and irrigation, where possible, must begin at the beginning of the following March to take full advantage of the growth in spring.

Protection against frost. The rigours of excessively frosty weather are very much reduced by a protective cover, irrigation and loosening of soil. Big and sturdy transplants usually manage to send in roots deep enough during the very first monsoon to bridge them over the following summer, rendering irrigation unnecessary where not available.

CHAPTER XX

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

STRICTLY speaking, all trees which are not cone bearing are flowering trees. In some trees the flowers are brightly coloured as in *gul mohur* and *Spathodea*, and in others they are small, inconspicuous and green as in *Asokan*. Trees which have showy flowers deserve to be classified as "Ornamental Flowering Trees" to distinguish them from trees with inconspicuous flowers which are otherwise desirable on account of their beautiful foliage and have been classified as "Ornamental Foliage Trees". While most of the ornamental flowering trees are deciduous, and a few are evergreen, nearly all the ornamental foliage trees are evergreen. Some of the ornamental foliage trees are particularly suitable for planting as shade trees along roads and in parks on account of their thick spreading crowns.

A scrutiny of the lists of ornamental flowering trees shows that only a few are indigenous, and the majority are exotics introduced from foreign countries like Madagascar, South Africa, Tropical and South America, Java, Malaya, Burma and China. While some of these trees like *gul mohur* and *gul-i-chin* have become fairly popular, there are a number of others which are still unknown to the layman, as no effort has been made to popularize them by propaganda. Boys and girls in schools should be taught the names of these beautiful trees and parties of school girls and boys should be taken to public gardens to show these trees to them when they are in flower. The average man has an aversion for complicated Latin names. Latin botanical names have their merit, particularly on account of their international use and accuracy. On the other hand, popular names are often vague and have been indifferently used by various persons. If mental laziness is overcome, one should have no difficulty in mastering botanical names. Even illiterate *malis* learn to pronounce difficult English and botanical names in a comparatively short time; so there is no valid reason why educated persons should find much difficulty with them.

Though Latin names are to be preferred on account of their accuracy and international usage, there is no harm in having popular names in simple Hindustani as well. Most of our indigenous flowering trees have Indian names and these require only to be popularized. On the other hand, there are a number of foreign trees which have no Hindustani names. For these the present author has coined new names, and these can be easily popularized in schools, universities and gardening institutions. Name plates with both Latin and Hindustani names should be fixed on selected specimen trees in all our public parks and gardens, so that the common man too may learn to identify them rather than stand and gape in wonder at indecipherable Latin names.

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The flowering of trees and crops is intimately connected with temperature, and it occurs later and later in the season as one moves from the South to the North ; the delay in flowering being of the order of four days for every degree variation in latitude northwards. For example, mango flowers in Travancore-Cochin about the first week of December, in Hyderabad-Deccan, about the first week of January, in Gujarat and Central India, about the first week of February, and in the Punjab about the first week of March. *Nim* flowers on the first of January in Malabar, on the first of February in Mysore, in the first week of March in Central India, in the first week of April in Northern India and the Punjab area, and in the first week of May in the sub-Himalayan area. Similar variations are found in the flowering of tamarind and *babul*. Under an All-India Phenological Scheme, four trees—mango, *nim*, tamarind and *babul*—were selected for the study of the data of the flowering period. These trees grow in all the states, from Cape Comorin to the Himalayas, and can truly be called Indian trees, as they have an all-India spread. Phenological observations were made on important phytophases like the flowering, fruit setting, and maturity of the fruit in respect of these trees, and isochrones for each phytophase were drawn on maps. Isochrones for the earliest dates of flowering of the four trees under observation during the year 1954-55 are shown in figures 1 to 4. It will be seen that in the case of all the four trees, flowering takes place earliest in the southern parts of the country, and later towards the North.

Further, the variations in the time of flowering of the mango tree from the extreme South (about latitude 8°N) to the extreme North (about latitude 30°N) is roughly from first December to first March (90 days). In other words, the flowering of the mango tree appears to be delayed by nearly four days for every degree of latitudinal variation northwards. It is interesting to note that this is in agreement with the Bioclimatic Law formulated by Hopkins for North America. What is true of the flowering of these four trees is also true of most of the other flowering trees as well, and these maps can be taken as approximate guides for ascertaining the flowering period of other trees as well.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

ORNAMENTAL FLOWERING TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
I- 1.	Apocyanaceae	<i>Plumeria P. acutifolia</i> Poir.	Pagoda tree; Hindi : <i>chameli gul-i-chin</i> ; Bengali : <i>dalana-phula</i> ; Kannada : <i>kadusampage</i> ; Gujarati : <i>dolochampo</i> ; Malayalam : <i>arali</i> ; Marathi : <i>khairchampa</i> ; Tamil : <i>ilattalari</i> ; Telugu : <i>arhataganneru</i> ; Oriya : <i>golochi</i>	White March-April and July to October	A small tree, 10 to 12 feet high; bare stem; crooked branches bearing terminal clusters of broad lanceolate leaves, capped with large corymbs of fragrant flowers. Native of Mexico and Guatemala	Easily propagated by cuttings in July and August. Allow the cuttings to wilt before planting. Can thrive in sandy and stony soil with a rainfall of 25 inches or upwards. There is a variety with white stem and branches which appear to be lime washed ; common in Travancore.
2.	do.	<i>P. rubra</i> Linn	Frangipani; Hindi : <i>lal champa</i>	Red March-April and July to October	Has red flowers.	
3.	do.	<i>P. alba</i> Linn.	White Frangipani ; Tamil : <i>peru</i> ; Telugu : <i>veyyivarahalu</i>	White March-April & July to October	A dwarf tree bearing clusters of dark-green ovate leaves. It is the prettiest tree of the <i>Plumeria</i> genus and is almost evergreen. Native of India, is seen in ancient Kushana Sculptures.	Propagated by cuttings. There are a number of hybrid plumerias designated by such names as 'tuberculata magnifica' 'lutea,' 'Rene', etc., available at the Royal Agricultural Society's Garden at Calcutta. I have seen a few of them in flower, and some are very fine, with flowers distinctly larger than in the commonly grown varieties.
4.	do.	<i>Wrightia tinctoria</i> R. Br.	<i>Dudhi</i>	Red May	A small tree with an ivory white stem which bears numerous red flowers scattered among leaves in the month of May.	
II-5.	Bignoniaceae	<i>Bignonia crispa</i> Buch-Ham.	<i>Padiri</i>	White May-June	A very handsome tree with drooping boughs, glossy leaves and funnel-shaped delicately fragrant flowers.	A South Indian tree, also grows in Bengal. Suitable for moist districts only.

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
6.	Bignoniaceae	<i>Jacaranda mimosae-folia</i> D. Don.	Jacaranda, <i>nili gul mohur</i> R.	Violet blue March-April	A small tree, 15 to 30 feet high with fern-like bipinnate leaves, and loose pyramidal panicles of 40 to 100 blue flowers. A native of Brazil.	Propagated by seed. Suitable for dry areas. Stands pruning well. Starts flowering at the age of five years and after 20 years becomes ugly and should be headed off. Quite common in the compounds of houses, particularly those of Secretariat bungalows at Lucknow, at Forest College, Dehra Dun and at New Delhi.
7.	do.	<i>Spathodea I.S.campanulata</i> Beauv.	The Fountain tree or Scarlet Bell tree or Tulip tree; Kannada : <i>nirukavi</i> ; Telugu : <i>patadi</i>	Orange crimson February-March	A tall tree growing to a height of 70 feet, large odd pinnate leaves; gorgeous terminal panicles of erect orange-crimson flowers. A native of Tropical Africa. One of the finest trees for scenic planting.	Appears very attractive when grown in clumps or avenues. Can be seen at its best at the Willingdon Sports Club, Bombay. Suited to districts with 20 to 40 inches of rainfall. Easily propagated from root-suckers or from cuttings. Also raised from seed. Demands rich, well-drained soil. Widely planted in Hyderabad (Andhra).
.	do.	<i>S.milotica</i> Seem	do.	do.	Smaller tree with bright flowers. More beautiful than <i>S. campanulata</i> .	There are five or six trees behind Victoria's statue, in Alfred Park, Allahabad, which are a glorious sight in March.
.	do.	<i>Tecomella undulata</i> Seem. <i>Tecoma undulata</i> G. Don.	Wavy Leafed Tecomella; Hindi : <i>rugtrora</i> ; Marathi : <i>rakhtreora</i> ; Punjabi : <i>lahura</i>	Orange yellow March-April	A small tree; leaves greyish green with wavy edges; flowers large, orange yellow, in bunches of 5 to 10 at the ends of small lateral branches, very handsome when in full bloom.	Easily propagated from seed or cuttings. Flourishes in dry districts. Common in desert areas of the Punjab, Rajasthan and Gujarat.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
10.	Bignoniaceae	<i>Millingtonia hortensis</i> Linn.	Cork tree or tree jasmine; Hindi : <i>akas nim, nim chaneli</i> ; Bengali : <i>akas nim</i> ; Tamil : <i>karkku, kat malli</i> ; Telugu : <i>kavuki</i>	Silvery white flowers appear in April-June and November-December. The flowers are delightfully fragrant.	It is a tall, straight, very ornamental tree.	Cultivated all over India both in gardens and avenues.
III-11.	Bixaceae	<i>Cochlospermum gossypium</i> D. C.	Yellow Silk Cotton tree; Hindi : <i>gooloc, galgal</i> ; Bengali : <i>golgol</i> ; Kannada : <i>anasinaburaga, bettataware</i> ; Gujarati : <i>kadachogund</i> ; Malayalam : <i>appakutakka, chempanni</i> ; Marathi : <i>galgal, ganer</i> ; Punjabi : <i>kumbi</i> ; Tamil : <i>kannigaram, kattilavu</i> ; Telugu : <i>adaviburaga, akshotamu</i> ; Oriya : <i>beniyamrydami, ganiari</i> .	Deep yellow February-March	A small tree 8 to 18 feet high. Golden yellow flowers appear when the tree is leafless.	Being a xerophytic plant flourishes in dry areas.
IV-12.	Boraginaceae	<i>Cordia sebestena</i> Linn.	Scarlet Cordia; Hindi : <i>lal lasora</i> R.; Kannada : <i>challekendala</i> ; Tamil : <i>aachinaruvihli</i> ; Telugu : <i>virigi</i>	Orange-red or scarlet January-March or throughout the year	A small tree of dwarf habit and compact growth, rarely more than 15 feet high; wrinkled leaves; flowers orange-red in large open clusters at the ends of branches. Imported from Cuba and Tropical America.	Propagated by seed or by layers.
V-13.	Combretaceae	<i>Terminalia arjuna</i> Bedd.	The Arjun; Tamil : <i>vellamarda, kulamaruthu</i> ; Telugu : <i>yermaddi</i> ;	Creamy flowers of cup shape which resemble those of myrobalan March-June	It is a tall evergreen tree with a smooth grey bark. Leaves are oblong and opposite.	It is found throughout India, Burma and Ceylon, usually on the banks of rivers and streams.

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
VI-14.	Capparid- aceae	<i>Crataeva religiosa</i> Forst F. (<i>C.nuroala</i>)	Caper tree; Hindi : <i>barna</i> ; Bengali : <i>barun</i> ; Kannada : <i>bilpatri</i> ; Gujarati : <i>varno</i> ; Malayalam : <i>kili</i> ; Marathi : <i>haravarna</i> ; Punjabi : <i>barna</i> ; Tamil : <i>adicharanam</i> ; Telugu : <i>viloaram</i> ; Oriya : <i>barun</i>	White April	A small tree 10 to 12 feet high, crooked branches; becomes laden with pale yellowish flowers in the last week of April. It flowers in leafless condition and is very pretty indeed. Is suitable for planting in triangular plots in towns.	It is a very hardy and drought-resistant tree. Raised from seed in the monsoons. Common in Uttar Pradesh. Can be seen at Lucknow. Frost-tender and slow-growing.
VII-15.	Dilleni- aceae	<i>Dillenia indica</i> Linn.	Hindi : <i>chalta</i> ; Bengali : <i>chalita</i> ; Kannada : <i>bettadakanagal</i> ; Gujarati : <i>karmbal</i> ; Malayalam : <i>Chalita</i> ; Marathi : <i>karmbel</i> ; Tamil : <i>akku</i> ; Telugu : <i>kalinga</i> ; Oriya : <i>chalota</i>	White July	An erect evergreen tree, 30 to 40 feet high, rounded crown; leaves broad, pointed, with toothed margin. Flowers large, white and fragrant, borne singly at the ends of branches in July. Common in Bengal and Bihar.	Propagated from seed sown in monsoons. Suitable for moist localities. Frost-tender.
VIII-16.	Lyth- raceae	<i>Lagerstroemia</i> <i>l. L. flos-reginae</i> R-tz.	Queen's Flower or Pride of India; Hindi : <i>arjuna</i> ; Bengali : <i>jarul</i> ; Kannada : <i>challa</i> <i>holedachalla</i> ; Malayalam : <i>atambu</i> ; Marathi : <i>bondara</i> ; Tamil : <i>kadali</i> ; Telugu : <i>varagogu</i> ; Oriya : <i>ary</i>	Mauve purple or Mauve pink April-May July-August	A small-sized evergreen tree with light grey smooth bark. In moist districts it is a large tree but in dry districts it is seldom 15 to 20 feet high; flowers when only shrubby in size; mauve purple or pinkish flowers in terminal panicles one foot to two feet high.	Grown from seed; a moisture-loving tree, does well on river banks. Commonly cultivated in Gorakhpur district. There are some nice specimens of this tree in Sikandar Bagh, Lucknow. Transplant when one year old; flowers three to five years after planting. Heavy pruning of side-branches is necessary.
17.	do.	2. <i>L.thorellii</i> Gagnep	Queen's Flower or Pride of India; Hindi : <i>bari</i> <i>sanwani</i> R.	White and mauve July- September	A dwarf bushy tree with mottled mauve flowers.	Easily grown from seed. Can be seen in Sikandar Bagh, Lucknow.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
IX-18.	Leguminosae	<i>Amherstia nobilis</i> Wall.	Noble Amherstia	Salmon-pink with golden yellow spots on petals. November & April	A medium-sized tree with drooping leaves with sprays of salmon pink flowers tipped with golden yellow spots.	Considered by some to be the most beautiful of all the flowering trees. Native of Burma. Flourishes in Bengal and other humid localities. Dies in North India on account of hot dry winds and frost.
do		<i>Enterolobium saman</i> or <i>Pithecolobium saman</i> .	The Rain tree; Hindi and Bengali: <i>belaiti siris</i> ; Tamil: <i>amaivagai</i> ; Malayalam: <i>plavu</i>	Pink and white flowers; March to May and again in Nov. and December	It is a large, handsome, spreading, evergreen tree. It is grown either in groups or in avenues. It is a very quick growing tree and is of great value for fuel.	Originally brought from Central America; came to India through Ceylon.
do		<i>Peltophorum inerme</i> or <i>caesalpinia inermis</i> Naves.	The Rusty Shield-bearer or Copper Pod; Tamil: <i>iyavakai</i> ; Telugu: <i>konda-chinta</i>	Yellow. Flowering period is long and variable. April is the full bloom season.	It is a tall tree about 80 feet high. Very dense and dark when in full foliage.	Tree is native of Ceylon and the Andamans; propagated by seed.
19.	Leguminosae Papilionaceae	<i>Butea frondosa</i> Roxb. <i>B. monosperma</i> (Lam) Kuntze.	Flame of the Forest; Hindi: <i>dhak, palas</i> ; Bengali: <i>kinaka</i> ; Kannada: <i>brahma vriksha</i> ; Gujarati: <i>kakria</i> ; Malayalam: <i>brahmavriksham</i> ; Marathi: <i>kakracha</i> ; Punjabi: <i>chachra</i> ; Tamil: <i>kattumurukku</i> ; Telugu: <i>kimsukamu</i> ; Oriya: <i>kinjuko</i>	Scarlet orange February-March	A common jungle tree, which covers acres of waste land. In the months of February and March, it flowers in leafless condition, and becomes covered with flaming scarlet-orange flowers with black calyces. Varieties with canary yellow and apricot colour flowers have been recorded.	Propagated from fresh seed, which germinates easily.

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
20.	Caesalpinioideae	<i>Bauhinia 1. B. purpurea</i> Linn.	Mountain Ebony, Purple Bauhinia; Hindi : <i>gulabi kachnar</i> R; Bengali : <i>bevakanchan</i> ; Kannada : <i>basavanapadu</i> ; Malayalam : <i>suvannamandaram</i> ; Marathi : <i>atamtti</i> ; Punjabi : <i>karalli</i> ; Tamil : <i>kalavilaichi</i> ; Telugu : <i>bodanta</i> ; Oriya : <i>boroda</i>	Purple to lilac or red November	A medium-sized evergreen tree. A very beautiful tree which deserves greater popularity. The only defect is top drying of branches.	Flourishes in high well-drained soil. Easily affected by low temperatures. Sow the seeds in lines in the beginning of the monsoons. Transplant from nursery in the first year. Cut off branches which lean out.
21.	do.	<i>2. B. tomentosa</i> Linn.	<i>Kachnar</i>	Pale yellow	An evergreen shrubby tree bearing numerous pale yellow flowers during rainy months.	
22.	do.	<i>3. B. triandra</i> Roxb.	Pink Bauhinia; Hindi : <i>lal kachnar</i> R.	Pink October & November	A small bushy tree with pinkish flowers.	
23.	do.	<i>4. B. variegata</i> Linn.	Variegated Bauhinia; Hindi : <i>kachnar (baisakhi)</i> ; Bengali : <i>bidul, kovidara</i> ; Kannada : <i>arisanantigi</i> ; Malayalam : <i>kovidaiam</i> ; Marathi : <i>kanchan</i> ; Tamil : <i>mandarai</i> ; Telugu : <i>bodanta</i> ; Oriya : <i>boroda</i>	Pink, white and purple varieties February-March	Flowers white with light yellow spots or pink with red spots or purplish, appearing when the tree is leafless.	It is a very beautiful tree and an avenue of these three varieties along with <i>B. Krugii</i> is lovely.
24.	do.	<i>5. B. acuminata</i> Linn.	<i>Sufaid kachnar</i>	White All the year round	A small tree about 10 feet high, nearly always in blossom with numerous white flowers.	Grown in Sikandar Bagh, Lucknow.
25.	do.	<i>6. B. corymbosa</i> Roxb.	<i>Sufaid kachnar</i>	Rosy white April	A scandent shrub with small leaves.	

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
26.	Cacsalpinioidae	<i>7. B. alba</i> Buch-Ham.	<i>Sufaid kachnar</i>	White April	A dwarf, round-headed tree.	
27.	do.	<i>Brownea</i> <i>1. B. coccinia</i> Loefl. ex Griseb.	West Indian Mountain Rose	Scarlet red March	A small tree 8 to 10 feet high; of handsome compact growth, with dazzling heads of scarlet flowers. There is no mass flowering, however.	Propagated by layers; does well in moist climate. There is a handsome specimen in Sikandar Bagh, Lucknow. Unsuitable for northern India as it is killed by <i>loo</i> —can only be grown in sheltered spots.
28.	do.	<i>2. B. ariza</i> Benth.	West Indian Mountain Rose	Rose red March	A small spreading tree with beautiful foliage. Leaves droop in heat.	
29.	do.	<i>3. B. grandiceps</i> Jacq.	Rose of Venezuela	Bright red March	Native of West Indies. A large-headed variety; mottled foliage.	Should be grown in a sheltered shady place.
30.	do.	<i>Cassia</i> <i>1. C. fistula</i> Linn.	Indian Laburnum or Golden Shower; Hindi : <i>amaltas</i> ; Bengali : <i>amultas</i> , <i>bandarlati</i> ; Kannada : <i>aragina</i> ; Malayalam : <i>konna</i> ; <i>kritamalam</i> ; Marathi : <i>bahava</i> ; Punjabi : <i>alash</i> ; Tamil : <i>appai</i> ; Telugu : <i>aragvadhamu</i> ; Oriya : <i>sandari</i>	Yellow April-May	A small hardy tree, sheds its leaves in March, and produces pendulous racemes of large bright yellow flowers in April and May. Young leaves coppery red.	A very common tree found wild at the foot of the hills of Uttar Pradesh and Assam. Can be seen to best advantage in Lucknow. Makes a beautiful avenue. Hardy, xerophytic, not eaten by goats. Boil the seeds for five minutes before sowing to soften the hard coat. Transfer the seedlings to baskets in first rains. Will grow in poor soil. Suitable for dry or moderately wet districts.
31.	do.	<i>2. C. javanica</i> Linn.	The Java cassia; Hindi : <i>java-kirani</i> R.	Pink May-June	A native of Malay Islands, bears clusters of pink flowers.	

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
32.	Caesalpi- nioideae	<i>C. nodosa</i> Ham.	The Pink <i>mohur</i>	Pink May-June	A tree with a spreading crown. Flowers in big pink clusters appearing like bunches of roses on long branches. When the tree is in flower it appears like a huge bouquet of roses. It is the most beautiful of all flowering trees, flowers in the leafless condition and leaves appear in the lower branches first. It is at its best in the month of June. A native of Burma and Malaya.	Stake the young trees as they have a tendency to lean over. There is a beautiful specimen in front of the Taj Mahal at Agra and one in front of the Superintendent's Office in Sikandar Bagh, Lucknow. Suitable for moist localities. Can also be grown in dry districts in sheltered spots where the tree can be saved from hot winds.
33.	do.	<i>C. renigera</i> Wall.	The Burmese pink cassia	Pink May-June	Medium-sized, 18 to 20 feet. Introduced from Burma.	Common in Bombay City. Prefers a moist climate.
34.	do.	<i>Colvillea racemosa</i> Bojer	Colville's Glory; Hindi : <i>kilbli</i>	Orange to red July-August to October	Pinnate leaves and umbrella-habit as in <i>gul mohur</i> ; flowers orange to red in colour, in large drooping clusters. A native of Madagascar.	Propagated from seed, suited to moist or moderately dry low country. There are three trees in Alfred Park, Allahabad, which flower in October. Flowers appear in a scarlet fringe on the top of the crown and are a glorious sight.
35.	Legumi- nosae 2. Papilio- naceae	<i>Erythrina</i> <i>1. E. indica</i> Lam. var. <i>parcelli</i>	The Indian Coral tree	Scarlet red February- March	A small quick-growing tree with variegated leaves. Racemes of scarlet flowers appear in clusters at the ends of branchlets before the leaves.	Propagated from cuttings three feet long, three inches across. There is one plant in Alfred Park, Allahabad. Common in Bihar and Bengal.
36.	do.	<i>2. E. Blakei</i> Hort.		Cinnamon red April	A small tree with brilliant scarlet flowers. It is the most beautiful tree of the genus.	There is a nice shrubby tree of <i>E. blakei</i> in Sikandar Bagh, Lucknow, in front of the Superintendent's Office.
		<i>3. E. crista-galli</i> Linn.	Cockspur, Coral Bean	Deep red April	A dwarf tree bearing a profusion of deep red flowers. It is a very attractive tree. A native of Brazil.	Government Nursery, New Delhi.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
37.	Papilionaceae	<i>Gliricidia maculata</i> H.B.K.	The spotted Gliricidia or Madre tree	Pale pink February-March	A small quick-growing tree, long feathery leaves, leaf-fall in February, followed by sprays of pale pink flowers, which resemble those of wistaria.	Easily raised from seed or cuttings five to six feet long. Wood is brittle, the tree should be pollarded from time to time to keep it dwarf. A native of Tropical America. Quite common in Bombay and South India.
38.	do.	<i>Milletia ovalifolia</i> Kurz.	Moulmein Rosewood	Lilac March	A small tree with beautiful lilac-coloured flowers appearing in leafless condition and entirely covering the tree. Its mauve and lilac pendulous racemes are a glorious sight.	It grows in Sikandar Bagh, Lucknow, and Khusru Bagh, Allahabad. Raised from seed.
39.	do.	<i>Enterolobium saman</i> Prain.	The Rain tree	Pale pink March-September	A large tree with pinnate leaves, grows very rapidly; flowers appear in pale pink clusters.	Suitable for planting in exposed places; a wind-resisting plant; provides quick shade; suitable for avenue planting. Propagated by seed sown in rains.
40.	do.	<i>Peltophorum</i> ; <i>P. ferrugineum</i> Benth. <i>P. inerme</i> Llanos.	The Rusty Shield-bearer; Tamil: <i>ivalvagai</i> , <i>perungondrai</i> ; Telugu: <i>kondachinta</i>	Bright yellow March to May and September to November	A big tree 40 to 80 feet high with feathery-pinnate leaves; leaf-fall in January. Young leaves grow in February when the tree becomes covered with profusion of yellow flowers; it flowers twice in the year. A native of Ceylon.	A highly ornamental tree, very effective when planted alternating with <i>gul mohur</i> , its bright yellow crowns contrasting with scarlet heads of <i>gul mohur</i> . Easily propagated from seed. There are some trees in Alfred Park, Allahabad, which appear highly ornamental with golden yellow flowers in October. Common in Bihar, Bengal and the Western Ghats.
41.	Caesalpinioideae	<i>Saraca indica</i> Linn. <i>Jonesia asoka</i> Roxb.	The Asoka tree: Hindi: <i>ashok</i> , <i>sita asoka</i> R; Kannada: <i>achenga</i> ; Gujarati: <i>ashopalava</i> ; Malayalam: <i>asoka</i> , <i>hemapushpam</i> ; Marathi: <i>ashoka</i> , <i>jasundi</i> ; Tamil: <i>asogam</i> ; Telugu: <i>asokamu</i> ; Oriya: <i>osoko</i> .	Orange-red February-March	An evergreen tree with branches spreading in all directions; flowers in large compact clusters. On opening they are orange coloured then turn red contrasting with the deep green foliage. Hindus regard it as sacred, being dedicated to Kama Deva, God of Love.	A very handsome tree with a thick shade. On account of its spreading habit it should be grown in a clump in an open space. Grown from seed. Some people regard it as the prettiest Indian tree. There is a handsome specimen in Khusru Bagh, Allahabad. Fairly common in Bengal.

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
42.	Cacalpi- nioideae	<i>Poinciana regia</i> Bojer (<i>Delonix regia</i>) Raf.	<i>Gul mohur</i> flamboyant; Kannada : <i>dodda-ratnagandhi</i> ; Malayalam : <i>alasippu</i> ; Marathi : <i>gulmohr</i> ; Tamil : <i>mayirkondrai</i> ; Telugu : <i>ettaturavi</i>	Scarlet orange-red April-June	A spreading umbrella-like tree, pinnate feather-like leaves; leafless in March; in April a brilliant mass of scarlet flowers. A native of Madagascar.	A very common tree, especially at Lucknow. Seeds should be soaked in hot water for eight minutes before sowing. A tree grown from cuttings. A beautiful avenue tree, especially when grown alternating with <i>amaltas</i> .
43.	do.	<i>Poinciana elata</i> Linn.	White <i>Gul mohur</i> Hindi : <i>sankesar</i> ; Kannada : <i>kempukenjiga</i> ; Gujarati : <i>sandesra</i> ; Marathi : <i>sandesra, sankasura</i> ; Tamil : <i>padenarayan</i> ; Telugu : <i>chilikesarapu</i> ; Oriya : <i>simamondaro</i> .	Yellow white February- March	A short and stumpy tree with umbrella-like crown. Gets laden with yellow-white flowers in February-March, which provide a pleasant contrast with its bright green feathery leaves. Commonly grown in Madhya Pradesh. Introduced into India by the Arabs from Abyssinia.	
44.	Papilio- naceae	<i>Pongamia glabra</i> Vent.	<i>Karanj</i>	Mauve April-May	A dwarf deciduous tree, with trifoliate shiny <i>Shisham</i> -like leaves; flowers in leafless condition in the last week of April when it is laden with lilac or mauve flowers which resemble those of <i>Milletia</i> . Appears very pretty when flowering. Provides excellent shade. Suitable for platforms of railway stations.	Is raised from seed in rains. A sight to see in May when laden with flowers; fast growing.
45.	do.	<i>Pterocarpus indicus</i> Wild.	Padauk tree; Hindi : <i>padauk</i> ; Kannada : <i>honne</i> ; Tamil : <i>vengai</i> ; Telugu : <i>ettavagisa, simagandamriga-punethuru</i> .	Golden yellow May-July	A tall tree 40 to 50 feet high, bears racemes of orange-yellow flowers in early rains. Flowers are very short-lived.	A native of Burma and Malaya. Suitable for moist sea-side districts of South and East India. Propagated from seed.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
46.	Papilionaceae	<i>Sesbania grandiflora</i> Poir.	<i>Agastya</i>	Cream or pink December	A small quick-growing tree; pinnate leaves; two varieties: one with salmon pink flowers and the other with cream-coloured flowers of comparatively large size, borne singly. Flowers eaten in the form of <i>pakor</i> s. Pods long and unsightly and should be plucked off.	Raised from seed in rains. Yields a nice hedge in a year and flowers the same year.
X-47.	Malvaceae	<i>Hibiscus collinus</i> Roxb.		Rose-pink with dark purple-coloured eye Nov.-Dec.	A small tree with spreading branches and trilobed heart-shaped leaves.	A very ornamental tree which looks very pretty on a lawn. There is one tree in Gulabbari Park, Fyzabad.
48.	do.	<i>Kydia calycina</i> Roxb.	Roxburg's Kydia; Hindi: <i>baranga</i> , <i>choupullea</i> ; Kannada: <i>belagu</i> , <i>belluka</i> ; Gujarati: <i>mhotihirvani</i> ; Malayalam: <i>Velukku</i> ; Marathi: <i>bhendi</i> ; Punjabi: <i>pola</i> , <i>pula</i> ; Tamil: <i>vendai</i> ; Telugu: <i>kondapotari</i> , <i>pachadotuka</i> ; Oriya: <i>bankopasia</i> .	White September- October	A small tree with large irregularly heart-shaped leaves, bearing panicles of white or pinkish flowers.	Propagated from seed—in nursery. Transplant seedlings when two to three inches high. Quick-growing tree.
49.	do.	<i>Chorisia speciosa</i> St. Hill.	Mexican Silk Cotton tree.	Light yellow October	A beautiful tree with bottle-shaped green trunk. It bears numerous light yellow flowers in leafless condition in the month of October. Commonly grown in Lucknow and Dehra Dun.	It is a fast-growing tree which begins flowering in about five years. Raised from seed. Sown in rains.

FLOWERING TREES IN INDIA

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
50.	Papilionaceae	<i>Thespesia populnea</i> Soland ex Correa.	Portia tree, <i>Bhendi</i> tree, Tulip Tree; Hindi : <i>bhendi</i> , <i>pipal</i> ; Bengali : <i>dumlagajashundi</i> ; Kannada : <i>arasi</i> , <i>huvarsi</i> ; Gujarati : <i>bendi</i> , <i>parasapipto</i> ; Malayalam : <i>chandamaram</i> ; Marathi : <i>bendi</i> , <i>ranbhendi</i> ; Punjabi : <i>pahari</i> <i>pipal</i> ; Tamil : <i>kallat</i> ; Telugu : <i>galgaiavi</i> ; Oriya : <i>gunjausto</i> .	Yellow & cinnamon red All the year round	A large, evergreen tree with glossy dark green poplar-like leaves, flowers appear singly off and on throughout the year. Grows to a height of 30 to 40 feet. Is extremely salt resistant.	Easily raised from seed or cuttings. It has a crooked stem and is suitable for medium-sized gardens. Prefers a light porous soil. There are many trees opposite Municipal Museum, Allahabad, which flower profusely in October. Very common in Madras, Cochin and Travancore.
XI-51.	Ochnaceae	<i>Ochna squarrosa</i> Linn.	<i>Khambar</i>	Bright yellow, blue; May	A small tree bearing bright yellow flowers in early May. Fairly pretty.	Raised from seed and cuttings in monsoons.
XII-52.	Moraceae	<i>Ficus bengalensis</i>	Banyan tree; Hindi : <i>bargat</i> , <i>bor</i> , <i>ber</i> ; Telugu : <i>ala</i> ; Malayalam : <i>peral</i> ; Telugu : <i>mari</i> , <i>peddamari</i> ; Marathi : <i>war</i>	Flowers are concealed in fleshy figs. These figs grow in pairs like red cherries	It is epiphytic. The leaves are large and leathery and dark green. The tree is huge in size and is worshipped by Hindus. It is an excellent shade tree.	
XIII-53.	Moringaceae	<i>Moringa oleifera</i> or <i>M. Pterygosperma</i> Lam. & Gaertn.	Drumstick tree or Horse radish tree; Hindi and Bengali : <i>soanjana</i> , <i>suhunjna</i> ; Tamil : <i>morunga</i> ; Telugu : <i>munga</i> ; Malayalam : <i>sakhta</i> .	Creamy white flowers appearing in large clusters; February to April	It is a pretty tree. The leaves are divided and subdivided. Fruit edible. Oil and fibre are also extracted.	Very common, particularly in Bombay State. Grows wild in the Western Himalayas.
XIV-54.	Rubiaceae	<i>Mussaenda glabrata</i> or <i>M. Frondosa</i> Linn.	Paperchase tree or Dhobi tree; Hindi : <i>lanchnut</i> , <i>sarvad</i> ; Tamil : <i>vellaiyilai</i> ; Marathi : <i>bhutkesh</i> ; Malayalam : <i>vellila</i> .	Small orange flowers July-October	It is an erect shrub or a small tree with a tendency to climb. Stems and veins are red. Used for medicinal purposes.	

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
XV-55.	Sapotaceae	<i>Madhuka latifolia</i> or <i>Bassia latifolia</i>	The <i>Mohwa</i> or Indian Butter tree; Hindi, Bengali and Marathi: <i>mohwa</i> ; Tamil: <i>kat-illipi</i> , <i>illupai</i> ; Telugu: <i>ippa</i> ; Malayalam: <i>illupa</i>	Calyx plum coloured, corolla creamy white Feb-April	Very important Indian forest tree. It has nutritious flowers. Deciduous. The tree blooms at night and flowers fall to the ground at dawn. Its different parts are put to a variety of uses.	
XVI-56.	Solanaceae	<i>Solanum grandiflorum</i> Ruiz & Pavon.	Large flowered Night Shade or Potato tree	Bluish violet All the year round	It is a shrub or small tree 30 to 40 feet high. Leaves large, 10 to 15 inches long. Cultivated in gardens for large showy flowers and ornamental foliage.	Native of South America. Propagated from seed or cuttings and thrives best in sheltered places.
XVII-57.	Sterculiaceae	<i>Sterculia foetida</i> Linn.	Wild Almond or Poon tree, Hindi and Bengali: <i>jungli badam</i> ; Tamil: <i>pinari</i> , <i>illawa</i> ; Malayalam: <i>pinari</i>	Crimson Feb.-March	It is a tall, straight tree with horizontal branches.	It is originally found in East Africa and North Australia. Very common in Burma and Ceylon.
XVIII-58.	Zygo-phyllaceae	<i>Guaiacum officinale</i> Linn.	Lignum Vitae Tree or Tree of Life	Bright blue March & November	A shrubby tree with small dark-green leaves. It bears clusters of bright blue flowers in great profusion in the months of March and November. The colour of the flower fades from deep blue to light blue, the variegated pattern of colours producing a beautiful contrast with the dark-green leaves. Introduced from West Indies.	Raised from seed. A good specimen can be seen near the Ajanta Museum in Hyderabad.

N.B.—The dates of flowering given above relate to Northern India only. The same tree would flower 2½ to 3 months earlier in Southern India and about a month earlier in Central India.

FLOWERING TREES IN INDIA

UNCOMMON FLOWERING TREES WHICH DESERVE GREATER POPULARITY

Serial No.	Natural order	Botanical name	English & Indian names	Colour of flowers & period of flowering	Description	Gardening notes
I- 1.	Araliacae	<i>Brassaia actinophylla</i> F. Muell.		Crimson July	A small tree with large radially-divided leaves, with a terminal inflorescence of several radiating spikes three to four feet long.	A native of Queensland in Australia; suitable for moist districts.
II- 2.	Bignoniaceae	<i>Tabebuia</i> i. <i>T. rosea</i> D.C.		Pale mauve June	A small erect tree, palmately five-leaved, producing beautiful pale mauve flowers.	A native of Mexico suited to moist localities. Grown from seed in the monsoon.
3.		ii. <i>T. spectabilis</i> Nichols.	<i>Basant Rani</i> R.	Yellow March-April	A small tree, gets covered with bright yellow bell-shaped flowers when leafless in spring. Flowers drop in the morning forming a bright yellow carpet below the tree.	A native of Venezuela. Suited to moist localities. Grown from seed in rains.
III- 4.	Bixaceae	<i>Oncoba spinosa</i> Forsk.	Bride of the Desert <i>Arbi Dulhan</i>	White April-May	A small bushy tree with light green ovate leaves. Bears large white, solitary, sweet-scented flowers.	Native of Arabia, suited to dry areas.
IV- 5.	Guttiferae	<i>Mesua ferrea</i> Linn.	Ceylon Iron-wood tree <i>Naka, Nagkesar</i>	do.	A medium-sized tree, produces large white flowers with a central bunch of yellow stamens. Young leaves are deep crimson above and silvery below.	Grown in Ceylon near Buddhist temples. Suited to hot and moist areas. Common in Assam.
V- 6.	Leguminosae	<i>Boul-santhus speciosus</i> Harms.	Rhodesian wistaria <i>Gul-i-Nilam</i>	Deep blue	A beautiful slow-growing tree with glossy dark green pinnate leaves. It bears drooping wistaria-like racemes of most beautiful deep blue, sweet-scented flowers.	A native of Rhodesia, South Africa. Propagated by seed in rains.
7.	do.	<i>Lysidice rhodostegia</i>	Rose of China <i>Hance</i>	Rose purple January-February	A large, handsome tree with pinnate leaves, bearing erect loose panicles of rose purple flowers with pink scaly bracts which persist after the flowers are shed.	A native of South China, thrives in moist localities.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

Serial No.	Natural order	Botanical name	English and Indian names	Colour of flowers & period of flowering	Description	Gardening notes
8.	Leguminosae	<i>Pterocarpus echinatus</i> Pers.		Orange yellow April-May	A medium-sized tree with large clusters of pale orange yellow flowers which look very pretty.	A native of the Philippines, also grows in Ceylon.
9.	do.	<i>Pterocarpus indicus</i> Willd.	<i>Padauk</i> or <i>Senna Padauk</i>	Yellow March-April	A tall and handsome tree with a round spreading crown, long drooping branches and pinnate leaves. Yields fine timber.	A native of the Andamans, suitable for big compounds or parks. Suitable for moist districts.
10.	do.	<i>Saraca declinata</i> Miq.	Kannada : <i>Honne</i> ; Tamil : <i>Vingai</i> ; Telugu : <i>Ettavisisa</i>	Orange yellow February-March	A small tree with large heads of bright orange yellow flowers borne on the stem and main branches.	A native of Sumatra. Very striking when in flower. Thrives in shady and sheltered situations. Suitable for moist districts.
11.	do.	<i>Schizolobium excelsum</i> Vog.	<i>Basanti R.</i>	Bright yellow February-March	A large quick-growing tree with feathery bipinnate leaves. Flowers borne on large erect sprays when the tree is bare.	A native of Brazil, suited to moist localities.
VI-12.	Proteaceae	<i>Stenocarpus sinuatus</i> Endl.	'Tulip tree of Queensland	Scarlet May-June	A tall erect tree, bearing clusters of showy scarlet flowers.	A native of Australia, suited to moderately moist places.

TREES WITH ORNAMENTAL FOLIAGE

Serial No.	Natural order	Botanical name	English and Indian names	Description	Gardening notes
I- 1.	Annonaceae	<i>Polyalthia longifolia</i> Benth. and Hook f.	The Mast tree <i>Asokan</i> <i>Deodar</i> (Hind.) <i>Debdaru</i> (Beng.)	Tall evergreen tree with a symmetrical pyramidal crown; beautiful glossy light green leaves in great profusion, translucent when young, flowers greenish, inconspicuous in March; fruits July. Native of Ceylon and Bengal.	This tree is very graceful and is suitable for planting in avenues. Grown 15 feet apart on the southern side of the compound wall they afford a very good protection from the heat of the sun, and act as windbreak. A very common tree in Oudh and Allahabad. Seeds sown in July. Sow in flower pots. Plant out when of suitable size. Can be easily headed off.

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Serial No.	Natural order	Botanical name	English and Indian names	Description	Gardening notes
II- 2.	Burscraceae	<i>Filicium decipiens</i> Thw.	Fern tree	An evergreen tree of medium size, with ornamental fern-like leaves; crown compact and globular.	An exceptionally good tree for grouping or small avenues. Propagated by seed.
III- 3.	Combretaceae	<i>Anogeissus pendula</i> Edgew.	<i>Dhao</i>	A very ornamental medium-sized tree with drooping branches and small leaves. Stem white.	Suitable for avenues. Obtainable from Govt. Gardens, Saharanpur.
IV- 4.	Euphorbiaceae	<i>Phyllanthus emblica</i> Linn.	<i>Amla</i>	A very handsome medium-sized tree with beautiful feathery leaves, and mottled stem. Fruit is pickled and has high vitamin C value.	The grafted variety from Banaras is exceedingly handsome. Suitable for planting in avenues and groves.
5.	do.	<i>Putranjiva roxburghii</i> Wall.	The Child Life tree <i>Putranjiva</i> or <i>Jiva puta</i> or <i>patju</i>	A very handsome large evergreen tree with a semi-globular crown; dense glossy foliage on semi-pendulous branches; resembles <i>Polyalthia</i> in habit. Flowers inconspicuous, March-May.	Suitable for planting in avenues. Easily transplanted from nursery stock. Common in Lucknow. Can be easily headed off.
6.	do.	<i>Sapium sebiferum</i> Roxb.	Chinese Tallow tree <i>Vilayati shisham</i>	A medium sized deciduous tree with leaves resembling those of <i>shisham</i> . In autumn leaves turn bright scarlet and present a beautiful sight. The tree is extremely frost-resistant and commonly grows in Kangra district. Introduced from China.	The seeds are coated with white wax and germinate easily.
V-7.	Leguminosae	<i>Tamarindus indica</i> Linn.	<i>Imli</i>	A big evergreen tree with small leaflets, 30 to 50 feet high and a large spreading crown. Flowers April-June; fruits November-December.	Grows well in all localities free from sharp frosts. Grown from seed in March-April, transplanted in monsoons, but of slow growth. Fine specimens of <i>imli</i> trees can be seen in Guptar Park, Fyzabad, where they have attained a huge size. An excellent tree for roadside avenues.
8.	Leguminosae Mimosoidae	<i>Acacia auriculiformis</i> A cunn. ex. Benth.	Australian phyllode acacia or Australian wattle	A very handsome evergreen tree with pendulous branches, and leaf-like phyllodes.	Planted in a clump at the back of the house, it provides a very shady corner suitable for study. Also makes a fine avenue. There are some fine specimens in Alfred Park, Allahabad.

ORNAMENTAL, FLOWERING, FOLIAGE AND SHADE TREES

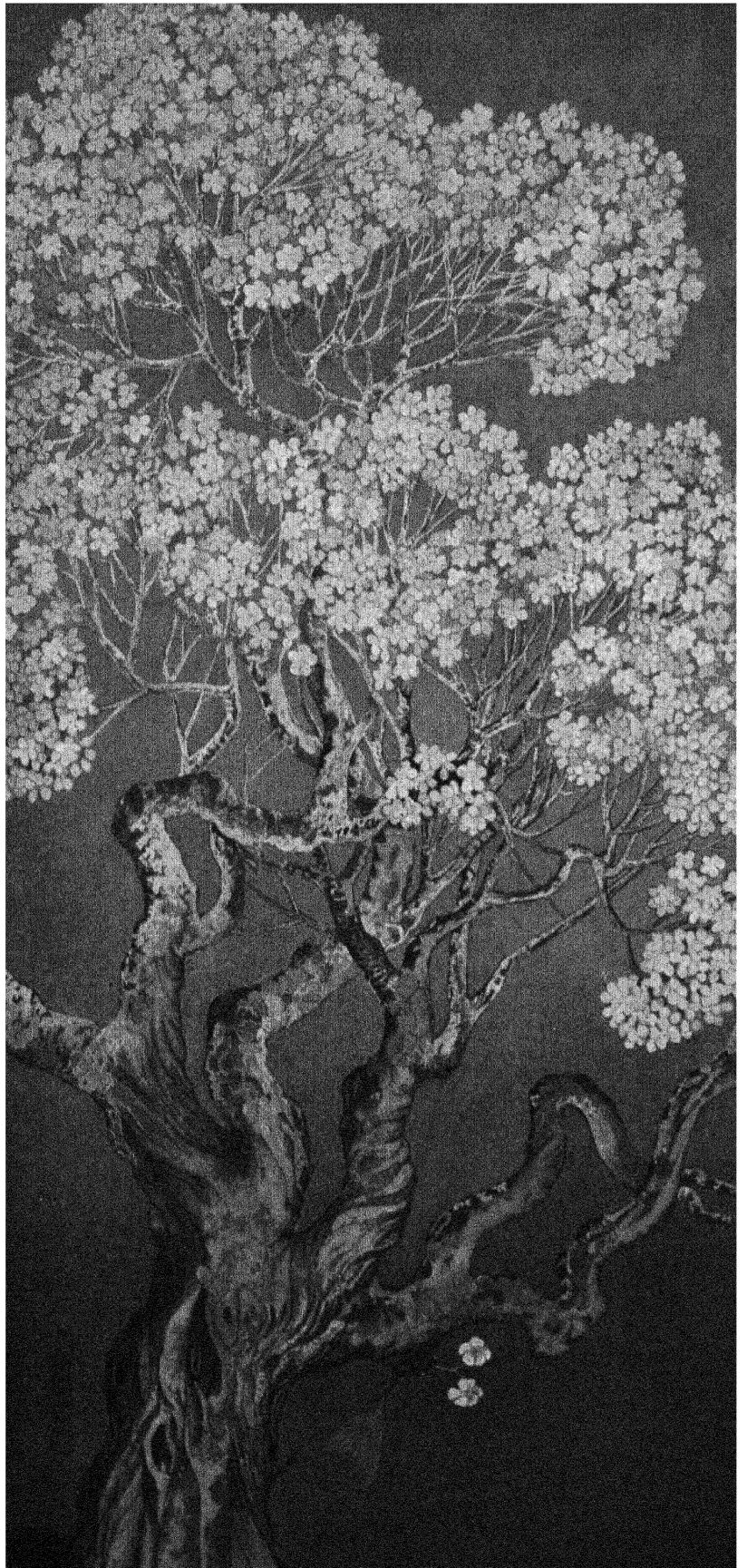
Serial No.	Natural order	Botanical name	English and Indian names	Description	Gardening notes
9.	Meliacca	<i>Melia indica</i> Linn. or <i>Azadirachta indica</i>	<i>Nim</i>	<p>Common tree, about 20 to 30 feet high. It is a hardy tree and stands pollarding well. If a tree grows too big, cut off the crown from the top of the stem in December or January. New shoots will sprout in March.</p> <p>It sheds its old leaves in March and produces glossy young leaves and fragrant white flowers in the first week of April. The flowers and fruit stink badly after a shower. It is a very shady tree which grows successfully in saline soil even in extreme drought. On account of its large number of leaves, the leaf-area is big and rate of photosynthesis is also high. Consequently, gives more oxygen during day-time as compared with other trees. Hence its reputation as purifier of air is not unjustified.</p>	Seed of <i>nim</i> does not keep. It should be sown soon after collection.
10.	do.	<i>Melia azedarach</i> Linn.	<i>Dake, bakain</i> (Persian lilac)	<p>A very fast-growing middle-sized tree, 15 to 25 feet high with smooth bark and beautiful leaves; soft lavender-coloured flowers in March-April; fruits November-December.</p>	Grown from seed in rains. Not attacked by rats or white ants on account of its bitter bark. Rather shortlived. It is common in the Punjab especially around wells fitted with Persian wheels and deserves popularity in Uttar Pradesh also.
VI-11.	Moringaceae	<i>Moringa pterygosperma</i> Gaertn.	Horse Radish tree <i>Sainjan</i>	<p>A handsome quick-growing tree with pinnate fern-like leaves.</p> <p>Bears white or cream-coloured flowers from the end of January to middle of February. Pods cooked as vegetable.</p>	Sow the seed in July. This tree stands pollarding very well and new shoots appear very quickly.
VII-12.	Myrtaceae	<i>Callistemon lanceolatus</i> Sweet.	Scarlet Bottle Brush tree <i>Lal botal bursh</i>	<p>A very handsome evergreen tree with pendulous branches as of the weeping willow with clusters of small leaves.</p> <p>Scarlet flowers in March in bottle brush-like tufts. It again flowers in October.</p>	Its graceful 'weeping habit' makes it suitable for avenue planting. Propagated by seed. A common garden tree in the Punjab and Uttar Pradesh.

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Serial No.	Natural order	Botanical name	English and Indian names	Description	Gardening notes
13.	Myrtaceae	<i>Eucalyptus citriodora</i> Hook	Blue Gum tree <i>Sufeda</i>	Slender trunk, smooth, clean, few branches, lemon-scented leaves, evergreen. Flowers May - June. A native of Australia.	Grows rapidly, has a gregarious habit and should be planted in clumps or avenues.
14.	do.	<i>Eucalyptus filicifolius</i> F. Muell		A very ornamental eucalyptus with a profusion of crimson flowers.	Suitable for avenues.

SHADE TREES

I- 1.	Ebenaceae	<i>Diospyros embryopteris</i> Pers.	<i>Gab</i>	An evergreen tree with a spreading habit, about 25 to 30 feet high with smooth shining leaves covering its spreading branches. Sexes separate. Introduced from China.	There is a fine specimen in Govt. Gardens, Saharanpur. Children use the low spreading branches as see-saws. Suitable for public parks.
II- 2.	Myrtaceae	<i>Eugenia cuspidata</i> Berg.	<i>Jamoah</i>	A medium-sized evergreen tree with shady crown of bright green leaves and light yellow stem. The tree renews its leaves imperceptibly in the month of March, and the new leaves have an attractive light green colour. A very desirable avenue tree for town roads and is particularly effective when grown alternating with deciduous flowering trees like <i>kachnar</i> , <i>amaltas</i> and <i>jacaranda</i> . Fruit is sour and small in size.	Grown from seed. This tree has been extensively grown as a road-side avenue tree in New Delhi. Alternated with various varieties of <i>Bauhinia variegata</i> , it looks very pretty.
3.	do.	<i>Eugenia jambolana</i> Lam.	<i>Jamun</i>	Is a bigger tree with dark stem and edible fruit.	Grown from seed.
III- 4.	Urticaceae	<i>Ficus</i> 1. <i>F. infectoria</i> Roxb.	<i>Pakur</i>	A large shady tree 35 to 40 feet high with aerial roots and well-formed deep but low crown providing a thick shade. In April it is covered with delicately-tinted copper-coloured foliage.	Propagated from seed sown in nursery stock or propagated by stumps. Branch cuttings produce trees with a low spreading crown, and ugly stem. Can be seen to its best advantage in Bareilly district, especially along Bareilly-Nainital Road. Suitable for most districts.
5.	do.	2. <i>F. retusa</i> Linn.	<i>Chilkan R.</i>	A very shady, spreading tree with glossy dark green leaves. It is evergreen and the best shade tree available in this country. It is 30 to 35 feet high and is as large as a banyan tree.	Common in New Delhi.





17. BANYAN AVENUE IN POONA

CHAPTER XXI

SOME ODD AND UNUSUAL TREES

IN this age of planning and standardization, the craving for individuality can easily be appreciated. Every individual desires to have some odd tree in his garden to excite the wonder and curiosity of neighbours and visitors. There are some trees, indigenous as well as exotic, which appeal to this trait of human character.

Of these odd and unusual trees, cycas and ginkgo have special historical and botanical interest. Cycas or the so-called sago-palm is a comparatively common garden tree and is usually mistaken for a palm. It is as much related to a palm as a sea-horse is to a horse or a shark to a whale. The sea-horse and the shark are fishes and the horse and the whale are mammals. Cycas is nearer to ferns than to palms. Like ferns, the powder-like pollen in male cones produces living motile sperms. The trees that we commonly notice in our gardens are female plants with woolly female cones bearing scarlet-red ovules. In the Jurassic period when birds were evolving from reptiles, there were big forests of cycas and tree-like cycads. At present the cycas is a living fossil, survivor of an ancient race of plants which dominated the surface of the earth millions of years ago. Similarly, ginkgo or the maidenhair tree which has been saved from extinction by Chinese priests who gave it shelter in their temples, is a living fossil. In this tree too we find that motile sperms which actively swim about in drops of water are produced as in animals. While cycas is easy to propagate by means of bulbils, ginkgo, which is grown from seed, is a difficult tree. In Dehra Dun it has attained a reasonable size.

We may as well mention Araucaria which is a distinctive tree and when successfully grown arouses considerable interest among visitors. A native of tropical regions, it is grown in pots in cool verandahs. Ornamental bamboos which are so popular in China, particularly the striped gold-with-green varieties are very attractive and the soil around them can serve as a base for rockeries.

Some of the parks in Lucknow are studded with an odd-looking giant tree with a swollen trunk. This is the baobab tree also called *gorakh imli* on account of its association with Gorakh Nath, guru of the *kanphata yogis*. The *yogis* use the shell of the gourd-like fruit of baobab as a water pot. This tree is an introduction from Central Africa and thrives in dry areas. With its spreading horizontal branches and swollen hollow trunk tapering suddenly, the baobab tree appears grotesque and is one of nature's odd creations. It is suitable for planting in spacious parks as well as in the countryside.

There are some trees with unusual type of fruits. The cannon-ball tree has ball-like fruits studded over the main stem while the candle tree has candle-like fruits

FLOWERING TREES IN INDIA

protruding from the stem. The sausage tree has sausage-like fruits dangling from its branches.

There are some trees which have odd and unusual leaves. *Ravenala*, the Traveller's Tree from Madagascar, has been grown with success in some private gardens in the moist districts of east Uttar Pradesh, in Bombay and in Bihar. It has banana-like leaves arranged in the form of a Japanese lady's hand fan. One of the most peculiar trees is Krishna's Ficus with leaves joined at the base, giving them a conc-like appearance. The legend is that Krishna used the leaves of this tree for storing stolen butter.

UNUSUAL TREES FOR THE GARDENS OF THE CURIOUS

1. ANGIOSPERMS

Serial No.	Natural order	Botanical name	English name	Indian name	Description	Gardening notes
I.	Araliaceae	<i>Trevesia moluccana</i>			A small tree with very large palmate spreading leaves surrounding clusters of dark purple berries.	It is a tropical tree, a native of Moluccas and is suitable for Bengal and tropical South India only.
II.	Bignoniaceae	<i>Kigelia pinnata</i>	Sausage tree	<i>Jhar fanoos</i>	A medium-sized spreading tree bearing long pendulous racemes of mottled dark purplish red flowers which appear like candelabra. Its fruits are long and sausage-like in appearance with long, cord-like stalks.	A native of tropical West Africa which is equally at home even in the cold climate of the Punjab. Propagated by seed.
		<i>Parmentiera cerefera</i>	Candle tree	<i>Mom batti R.</i>	A small tree with light green leaves. Its cylindrical candle-like yellow fruits are borne on the stem and branches in large numbers twice a year.	A native of Tropical America. Propagated by seed.
III.	Malvaceae	<i>Adansonia digitata</i>	Monkey bread tree	<i>Gorakh imli</i> Baobab tree; Hindi : <i>gorakh imli</i> , <i>goram lichora</i> ; Gujarati : <i>gorak chinch</i> ; Tamil : <i>paparapulia</i> , <i>perauka</i>	It is a giant tree with thick smooth trunk with broad base and tapering stem. During the hot weather it is leafless, when its much divided crown appears gaunt and grotesque. Introduced into India by the Arabs from Africa.	Raised from seed. Planted singly in parks. Good specimens can be seen at Aurangabad and near Madras.

SOME ODD AND UNUSUAL TREES

Serial No.	Natural order	Botanical name	English name	Indian name	Description	Gardening notes
IV.	Myrtaceae	<i>Couroupita guianensis</i>	Cannon-ball tree	<i>Tope gola R.</i>	A remarkable tree with large pink and white fleshy flowers borne on the main stem. Its brown fruits are globular, about the size of a man's head, resembling a cannon ball.	A native of tropical South America, also found in Ceylon. It flourishes only in a moist tropical climate; propagated by seed. An excellent specimen of this can be seen in Victoria Garden, Bombay.
		<i>Careya arborea</i>		<i>Kumbhi</i>	A common forest tree in Madhya Pradesh. Its copper-red leaves appear very pretty in the month of October. Fruit is pitcher-shaped; hence the name <i>kumbhi</i> . Flowers pink white, appear with new leaves in April-May.	Raised from seed. Planted singly in parks.
V.	Scitamineae	<i>Ravenala madagascariensis</i>	Travellers' tree	<i>Khajur pankhi R.</i>	A remarkable tree which appears like a gigantic ladies' hand-fan. Its banana-like leaves are borne in two rows. Grows to a height of 30 to 40 feet. Its sheathing leaf-stalks form receptacles in which water is stored.	Requires a hot and humid climate, being a native of Madagascar though in U.P. it can grow in shaded and sheltered situations. Good specimens of this tree can be seen in parks in Bombay and Cochin.
VI.	Urticaceae	<i>Ficus krishnae</i>	Krishna's butter cup	<i>Makhan katori R.</i>	A small tree with folded leaves joined at the base which appears like containers of ice-cream (<i>kulphis</i>).	Grows easily in North India.

2. GYMNOSPERMS

VII.	Cycadales	<i>Cycas revoluta</i>			A remarkable tree which produces a crown of palm-like leaves every year. The sexes are separate. The pollen of male cones produces living motile sperms as in ferns and animals. A living fossil.	Propagated by bulbils.
VIII.	Ginkgoales	<i>Ginkgo biloba</i>	Maiden-hair tree	<i>Bal kunwari</i>	Beautiful foliage and has motile sperms. A living fossil.	A native of China; propagated by seed.

FRAGRANT SHRUBS AND TREES

raat-ki-rani (*Cestrum nocturnum*), *papra* (*Gardenia latifolia*) and *laung mushk* fill the air with delightful fragrance and are very desirable in the hot and rainy months. I cannot forget a joyful evening in a bungalow at Dewaldhar in Almora district in the month of May where the white flowers of *laung mushk* were studded all over a dwarf hedge. At sunset the verandah was filled with the delicate scent of this species of *Gardenia* and coupled with the warmth of the air it induced a feeling of relaxation and happiness which the legendary lotus-eaters might well envy. *Champa* and *laung mushk* are great favourites with the people of Kangra Valley, and in gardens in Dharamasala and Palampur the air is filled with the heavy scent of these flowers at night time. With the background of snow-covered Dhaula Dhar which glistens like a lump of silver in the full moon, and the gurgling sound of numerous streams and rivulets, Kangra Valley appears like a fairy land. Perhaps it was an evening in this part of India that Sarojini Naidu described as :

Where the golden, glowing
Champak-buds are blowing,
By the swiftly-flowing streams,
Now, when day is dying,
There are fairies flying
Scattering a cloud of dreams.

Some of the dwarf trees like *Acacia farnesiana*, *Murraya exotica*, *Gardenia lucida*, *Franciscea hopeana*, *Ixora parviflora* and *Lawsonia alba*, can also be utilized for making fragrant hedges. However, some of them require severe pruning to keep them in check.

Madhavi lata (*Hiptage madablota*) was a favourite creeper of the ancient Hindus. In Hindu flower symbolism, the *madhavi* creeper is likened to a frail young woman clinging on for support to her lord and master, symbolized by the mango tree. The marriage of the *madhavi* creeper and the mango tree used to be performed by ancient Hindu hermits. Says Kanva, the hermit, to Shakuntala after she had met her lover Dushyanta :

My child, you found the lover who
Had long been sought by me ;
I'll give the *madhavi* creeper a lover true
This handsome mango tree.

Mehndi (*Lawsonia alba*) has an important function in the toilet of women in the East. Women stain the palms and soles as well as their nails with crushed *mehndi* leaves. It is also used for dyeing hair, and flame-coloured beards of *mullahs* owe their rich coppery tints to *mehndi*. *Mehndi* is the Camphire of Palestine and Henna of Iran, and Pliny called it the Cypress of Egypt. It is commonly grown in India, Afghanistan and Iran, and is valued as much for the red dye of its leaves, as for the delicate fragrance which its flowers exhale at evening time in the months of June and July.

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A *har singhar* tree planted in the eastern part of the compound of a house opposite the verandah used for sleeping can be a source of great pleasure during the months of September and October. After dark, the fragrance of the night-opening flowers of *har singhar* fills the atmosphere. A small cemented pool may be constructed below the tree for collecting the flowers. Every morning in the autumn months you will see myriads of flowers with their orange-coloured corolla tubes resting on the surface of water on their spoke-like snow-white petals.

The *champak* tree was very popular with the ancient Hindus and we find it sculptured in Kushan Mathura about 2,000 years ago. Even now *champak* flowers are used by the women of Bengal in their coiffure, and the delicate fragrance of their amber petals adds to their subtle charm.

To plant a hedge, make a trench, two to three feet deep. A shallow trench inhibits growth of deep roots, while a deep trench induces perpendicular deep root action. Place a layer of decomposed farmyard manure at the bottom of the trench, and refill it. Irrigate the trench, and when the soil has settled, sow the seed or cuttings in three or four lines. The seed may be soaked 6 to 24 hours before sowing to hasten germination. The trench should be kept moist till the seeds germinate or the cuttings sprout. A thin topdressing of charcoal ash, compost and sand helps to retain moisture.

An occasional hoeing with a *khurpa* encourages the growth of the hedge plants, and should be followed by application of compost. Soft-wooded hedges can be pruned at any time, but hard-wooded species should be pruned when the season's wood has matured. When the plants have matured their wood, watering should be partially suspended. According to Griessen, overwatering of hedge plants induces shallow root action.

Apart from the fragrant flowering plants already mentioned, the following flowering trees and shrubs may also be used for making colourful hedges.

- | | |
|-------------------------------------|---|
| 1. <i>Erythrina indica</i> Lam. | Scarlet |
| 2. <i>Hibiscus</i> —all varieties | Shades of red |
| 3. <i>Plumbago capensis</i> Thumb. | Blue |
| 4. <i>Meyenia erecta</i> Benth. | Blue |
| 5. <i>Strobilanthes</i> | Blue |
| 6. <i>Bauhinia acuminata</i> Linn. | White |
| 7. <i>Bougainvillea</i> | Shades of
magenta, orange
and red |
| 8. <i>Sesbania aegyptiaca</i> Pers. | Light yellow and
salmon pink |
| 9. <i>Tecoma stans</i> H. B. K. | Yellow |

FRAGRANT SHRUBS AND TREES

SHRUBS AND TREES WITH FRAGRANT FLOWERS

Serial No.	Natural order	Botanical name	Common Indian and English names	Description	Gardening notes
I.	Annonaceae	<i>Artabotrys odoratissimus</i>	<i>Harī champa</i>	A large scandent shrub, leaves broad, lanceolate, glossy; inconspicuous green flowers, usually hidden in leaves emitting delicate perfume, like those of overripe apples. Flowers in July and August.	Propagated by seed or cuttings in rains.
II.	Apocyanaceae	<i>Tabernaemontana coronaria</i>	<i>Chandni</i> or moonbeam	A shrub four to six feet high with broad shining leaves and large double, dazzling white flowers which appear very pretty in moonlit nights in rainy months. Only slightly fragrant.	To improve the size of flowers, thin off the leaves when flower buds begin to form at the ends of branches. Propagated by layers or cuttings.
III.	Lythraceae	<i>Lawsonia alba</i> Lam	<i>Camphire hennah</i> or Egyptian privet; Hindi : <i>mehndi</i> ; Bengali : <i>medhi</i> ; Tamil : <i>marudani</i> ; Telugu : <i>gorinta</i> ;	Long spires of creamy flowers. Has clinging fragrance. Blooms throughout the year but is at its best during the hot weather and rains.	It is a common Indian shrub known in many parts of the world. When young, it is a smooth twiggy bush with straight branches which later on become thorny.
		<i>Carissa carandas</i>	<i>Karonda</i>	A small scandent thorny shrub with ovate dark shining leaves, bears highly fragrant flowers in February and white pink and scarlet berries in July-August. Buds open in the evening and emit a delicious fragrance.	Propagated by seed in rains. Excellent for hedges.
IV.	Magnoliaceae	<i>Magnolia grandiflora</i>	<i>Bara champa</i>	A small tree 10 to 15 feet high, laurel-like leaves; big white fragrant flowers in April and May.	Propagated by <i>gootes</i> but with difficulty.
		<i>Michelia champaca</i>	<i>Champa</i> or <i>champak</i>	A small handsome evergreen tree, 15 to 20 feet high, fine foliage, flowers emit a delicious fragrance in April. Flowers yellow, solitary in axils of leaves.	Propagated by seed.
V.	Malpighiaceae	<i>Hiptage madablota</i>	<i>Madhavilata</i>	A rampant shrub with horse chestnut-like fragrant flowers in March.	Propagated by seed.

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Serial No.	Natural order	Botanical name	Common Indian and English names	Description	Gardening notes
VI.	Oleaceae	<i>Jasminum sambac</i>	Jasmine, <i>mugra</i>		Propagated by cuttings or division of roots.
		<i>Nyctanthes arbortristis</i>	<i>Har singhar</i>	A tree about 10 feet high, bears a profusion of star-like, white flowers with orange centre at night time, which are shed in early morning. Flowers in September-October. A common tree in Oudh.	Propagated by seed sown in rains. Plants should be renewed every third year. It is quick growing; its long woody shoots should be pruned after flowering.
VII.	Rubiaceae	<i>Gardenia florida</i>	Cape jasmine <i>Gandha raj</i>	A delightful shrub, with glossy obovate leaves; bears large double white fragrant flowers in March and April. A native of China. A large-flowered variety with leaves four inches in diameter is available.	Grows to a height of six to eight feet. Propagated by cuttings in rains.
		<i>G. lucida</i>		A small tree 8 to 10 feet high; bears solitary fragrant white flowers in April and in July.	Propagated in rains by cuttings. Can be kept in a dwarf condition by pruning.
		<i>G. latifolia</i>	<i>Papra</i>	A small tree with leaves 15 inches long, six inches wide; large fragrant white flowers in April. Flowers turn yellow in the evening.	Propagated in rains by cuttings.
		<i>Ixora parviflora</i>	<i>Rookminee</i>	A shrub six to eight feet high, with handsome lanceolate leaves three to eight inches long; large corymbs of white fragrant flowers in April-May. A very beautiful plant. Is a native of China.	Propagated by layers or cuttings.
do.		<i>Gardenia resinifera</i> Roth.	The brilliant <i>Gardenia</i> ; Hindi : <i>dekamali</i> , <i>dekamari</i> , <i>dikamali</i> ; Marathi : <i>dekamari</i> , <i>dikamali</i> ; Tamil : <i>kambil</i> , <i>kumbai</i> ; Canarese : <i>bikke</i> , <i>dikkamalli</i> ; Telugu : <i>bikki</i> , <i>erubikki</i> ; Sanskrit : <i>hingu</i> , <i>hingunadika</i> , <i>jantuka</i>	Flowers large, pure white on opening, turning yellow later on. Flowers open in the evening and die soon after.	Large shrub or small tree, 20×25 feet high. Leaves 2½ to 8 inches long. Fragrant flowers used for medicinal purposes. Grows wild in Burma and South India. Propagated by seed and seedlings. Does best in partial shade.

FRAGRANT SHRUBS AND TREES

Serial No.	Natural order	Botanical name	Common Indian and English names	Description	Gardening notes
		<i>Anthocephalus indicus</i>	<i>Kadamb</i>	Ovate-oblong glossy leaves, golden-yellow flowers solitary at the end of branchlets. Associated with Krishna. Flowers in great profusion in August.	Propagated by seed in rains. Good specimens of <i>Kadam</i> can be seen near Bharatpur.
VIII.	Sapotaceae	<i>Minusops elengi</i>	<i>Maulsari</i> or <i>vakula</i>	A beautiful tree with a thick spreading crown, dark-green glossy leaves; pale-green fragrant flowers in March. A very nice shade tree.	Propagated by cuttings in rains.
XI	Rutaceae	<i>Murraya exotica</i>	Chinese box <i>Kamni</i>	An evergreen shrub, globular crown; sweet-scented pure white flowers.	Propagated by seed in rains.
		<i>Citrus aurantium</i>	<i>Khatta</i>	A spring shrub useful as a protective hedge.	Propagated by seed in rains.
X.	Solanaceae	<i>Cestrum nocturnum</i>	Lady of the Night, night blooming jasmine, <i>raat-ki-rani</i>	A shrub with pale-green inconspicuous flowers which emit a strong fragrance at night.	Propagated by cuttings in rains.

FLOWERING TREES IN INDIA

ORNAMENTAL FLOWERING TREES, SHRUBS AND CLIMBERS SUITABLE FOR MOONLIGHT GARDENS

A garden filled with trees, shrubs and climbers with white flowers can be very delightful on a moonlit night. The snow-white colour of the flowers stands out against the background of a dark green foliage. An admixture of fragrant plants can further enhance the charm of such a garden. It is fortunate that many of the plants with white flowers are also fragrant. A scheme for such a garden is given below.

A. TREES

- | | |
|--------------------------------------|---|
| 1. <i>Bauhinia alba</i> | 2. <i>Citharexylum subserratum</i> |
| 3. <i>Crataeva religiosa</i> | 4. <i>Delonix elata</i> |
| 5. <i>Dillenia indica</i> | 6. <i>Erythrina variegata</i> |
| 7. <i>Gardenia resinifera</i> | 8. <i>Gliricidia alba</i> |
| 9. <i>Holarrhena antidysenterica</i> | 10. <i>Lagerstroemia indica (white)</i> |
| 11. <i>Millingtonia hortensis</i> | 12. <i>Mimusops elengi</i> |
| 13. <i>Mimusops hexandra</i> | 14. <i>Plumeria acutifolia</i> |
| 15. <i>Plumeria alba</i> | 16. <i>Prunus domestica</i> |
| 17. <i>Wrightia tinctoria</i> | |

B. SHRUBS

- | | |
|---------------------------------------|--|
| 1. <i>Acocanthera spectabilis</i> | 2. <i>Barleria alba</i> |
| 3. <i>Bauhinia acuminata</i> | 4. <i>Brunfelsia undulata</i> |
| 5. <i>Bougainvillea (Mary Palmer)</i> | 6. Bush rose |
| 7. <i>Caryopteris</i> | 8. <i>Cestrum diurnum</i> |
| 9. <i>Cestrum nocturnum</i> | 10. <i>Chonemorpha macrophylla</i> |
| 11. <i>Coffea bengalensis</i> | 12. <i>Datura suaveolens</i> |
| 13. <i>Duranta ellisii</i> | 14. <i>Gardenia florida</i> |
| 15. <i>Hamiltonia suaveolens</i> | 16. <i>Hibiscus syriacus</i> |
| 17. <i>Ixora parviflora</i> | 18. <i>Ixora undulata</i> |
| 19. <i>Jasminum sambac</i> | 20. <i>Jasminum pubescens</i> |
| 21. <i>Jasminum officinale</i> | 22. <i>Jasminum grandiflorum</i> |
| 23. <i>Lagerstroemia alba</i> | 24. <i>Lawsonia alba</i> |
| 25. <i>Magnolia grandiflora</i> | 26. <i>Melodinus monogynus</i> |
| 27. <i>Meyenia alba</i> | 28. <i>Murraya exotica</i> |
| 29. <i>Nerium odoratum</i> | 30. <i>Nyctanthes arbor-tristis</i> |
| 31. <i>Plumbago zeylanica</i> | 32. <i>Solanum pseudocapsicum</i> |
| 33. <i>Spiraea corymbosa</i> | 34. <i>Tabernaemontana coronaria</i> |
| 35. <i>Tecoma jasminoides</i> | 36. <i>Trachelospermum jasminoides</i> |

C. CLIMBERS

- | | |
|---------------------------------|---------------------------------------|
| 1. <i>Baumontia grandiflora</i> | 2. <i>Clematis paniculata</i> |
| 3. <i>Echites caryophyllata</i> | 4. <i>Hiptage madhoblata</i> |
| 5. <i>Ipomoea sinata</i> | 6. <i>Ipomoea bananox</i> |
| 7. <i>Jasminum auriculatum</i> | 8. <i>Lonicera japonica</i> |
| 9. <i>Porana Paniculata</i> | 10. <i>Rhynchospermum jasminoides</i> |
| 11. <i>Solanum jasminoides</i> | 12. <i>Thunbergia fragrans</i> |
| 13. <i>Vallaris heyneii</i> | |

FRAGRANT SHRUBS AND TREES

Select list of ornamental trees from Sanskrit literature

Sanskrit name	Botanical name
<i>Arjuna</i>	<i>Terminalia arjuna</i>
<i>Asoka</i>	<i>Saraca indica</i>
<i>Champaka</i>	<i>Michelia Champaka</i>
<i>Chuta</i>	<i>Mangifera indica</i>
<i>Devadaru</i>	<i>Cedrus deodara</i>
<i>Gandharaja</i>	<i>Gardenia florida</i>
<i>Kadamba</i>	<i>Anthocephalus Cadamba</i>
<i>Karnikara</i>	<i>Pterospermum acerifolium</i>
<i>Ketaki</i>	<i>Pandanus odoratissimus</i>
<i>Kimsuka</i>	<i>Butea frondosa</i>
<i>Kovidara</i>	<i>Bauhinia purpurea</i>
<i>Kunda</i>	<i>Jasminum pubescens</i>
<i>Kuravaka</i>	<i>Lawsonia alba</i>
<i>Lodhra</i>	<i>Symplocos racemosa</i>
<i>Mandara</i>	<i>Erythrina indica</i>
<i>Naga Kesara</i>	<i>Mesua ferrea</i>
<i>Nari Kela</i>	<i>Cocos nucifera</i>
<i>Parijataka</i>	<i>Nyctanthes arbor-tristis</i>
<i>Punnaga</i>	<i>Callophyllum inophyllum</i>
<i>Sala</i>	<i>Shorea robusta</i>
<i>Krishna Sirish</i>	<i>Albizia amara</i>
<i>Pit Sirish</i>	<i>Albizia lebbek</i>
<i>Tala</i>	<i>Borassus flabelliformis</i>
<i>Vakula</i>	<i>Mimusops elengi</i>

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