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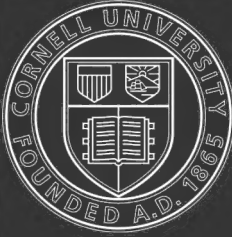
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THE ROMANCE OF
OUR TREES

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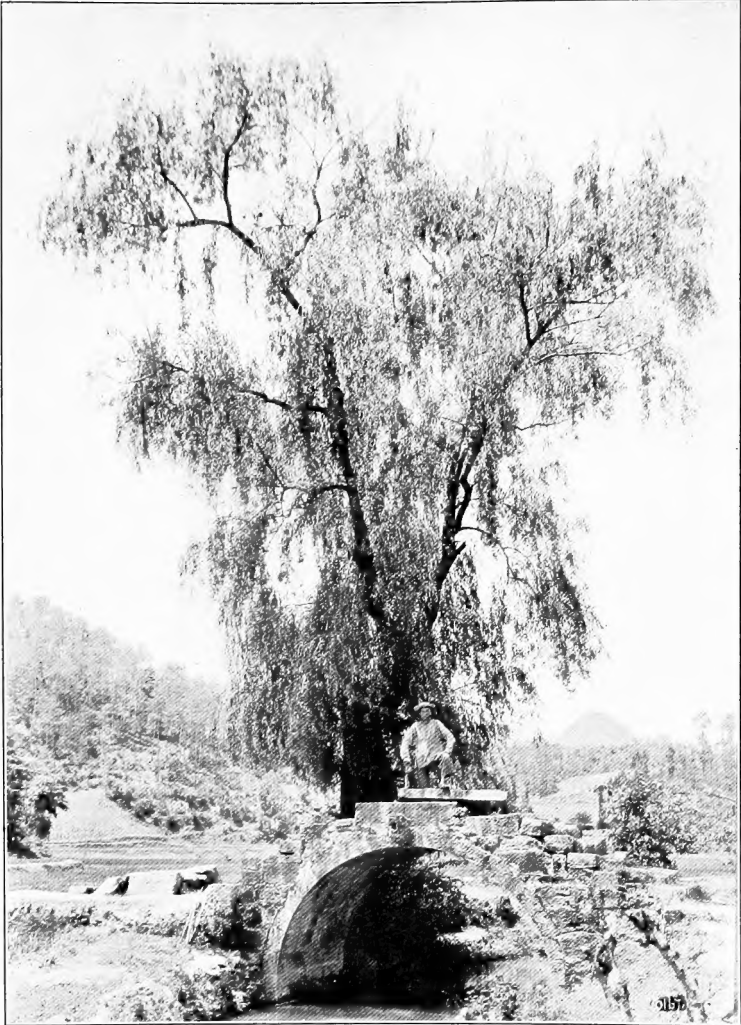
—

ARISTOCRATS OF THE
GARDEN

CONIFERS AND TAXADS
OF JAPAN

CHERRIES OF JAPAN

A NATURALIST
IN WESTERN CHINA



WILLOW OF BABYLON IN WESTERN CHINA

THIS TREE IS A NATIVE OF CHINA AND IS NOT THE TREE REFERRED TO IN PSALM CXXXVII, V. 1, 2 WHICH WAS IN FACT A POPLAR. THERE ARE MANY "WEEPING" OR PENDANT BRANCHED WILLOWS, SOME OF WHICH ARE MORE HARDY THAN THE "BABYLON" WILLOW, AND ARE VERY COMMONLY ACCEPTED FOR IT

(*Salix babylonica*)

THE ROMANCE OF OUR TREES

BY
ERNEST H. WILSON, M.A., V.M.H.
ASSISTANT DIRECTOR ARNOLD ARBORETUM
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ILLUSTRATED
FROM
PHOTOGRAPHS

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1920

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TO
CHARLES SPRAGUE SARGENT, LL. D.
PROFESSOR OF ARBORICULTURE, FOUNDER AND DIRECTOR
OF THE ARNOLD ARBORETUM, HARVARD UNIVERSITY
AUTHOR OF THE
“SYLVA OF NORTH AMERICA”
WHOSE LIFE HAS BEEN DEVOTED TO THE STUDY OF
TREES
AND WHO, MORE THAN ANY OTHER MAN IN AMERICA,
HAS AWAKENED INTEREST AND PROMOTED KNOWLEDGE
IN THE TREES OF THE NORTHERN HEMISPHERE
AS A TOKEN OF THE AUTHOR’S ADMIRATION
AND ESTEEM
THIS WORK IS DEDICATED

P R E F A C E

IN THE following pages an effort is made to tell of the intimate association of trees and mankind from the earliest times. Simplicity combined with accuracy has been the aim, and technical language has been avoided. The opening chapters treat of trees in general and serve to illustrate the mutual dependence of the animal and vegetable kingdoms. The records of geology bear witness to the continuous and progressive change in character of the tree types, of the complete disappearance of many, and of the persistence of a few from Coal-measure times down to the present. The protective influence of religion of many creeds is emphasized by the history of the Ginkgo and of the Cedar of Lebanon. The immense value of the Yew-tree to the warriors of the Middle Ages and influence of war-like migrations and wars of invasion in the distribution of fruit trees is told. As a corollary to the development of the civilizations of the Orient and Occident two parallel groups of fruit trees have

been developed, and the blending of these two groups by hybridizing may result in future fruits superior in quality to any we now enjoy. The romance, the more interesting folk-lore and mythology that have gathered round certain trees like the Apple and Yew give an insight into the early life of our forebears.

The types selected represent the patriarchs, the giants, the pygmies, and the curiosities of tree growth, and their importance in the embellishment of gardens, parks, and pleasure grounds is emphasized. The beauty of trees at all seasons, of their bark, their flowers, and their autumn foliage finds expression, and the cardinal idea permeating the whole work is to increase interest and love for trees and gardens. Trees are much more than sticks bearing leaves and useful as fuel and as a source of timber for construction purposes. They are, indeed, the most vigorous expression of life and its most enduring form this planet boasts, and a nation's trees should be esteemed as national treasures. A measure of a country's culture may be very accurately taken by an analysis of the position gardens hold in the people's esteem. In history books too much is told of man's destructive quarrels and too little about his constructive work in developing the arts of peace. Truly, if we delve into such mundane affairs as the development of

the fruits, the vegetables, the grains, and the common flowers of our gardens we may learn more concerning the real progressive development of the human race than is possible from the history books.

The preparation of these essays has been largely a recreation, and in sending them forth in collective form it is hoped that readers may find in the romance of our trees not only interest but inspiration. A résumé of twelve chapters has appeared in *The Garden Magazine* for 1919-20; that on the autumn tints is reprinted from my "Aristocrats of the Garden." To the esteemed editor of *The Garden Magazine* I am indebted for helpful criticism; to the publishers, Messrs. Doubleday, Page & Co., my thanks are extended for the courteous manner in which they have met all suggestions.

E. H. WILSON.

Arnold Arboretum,
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CHAPTER I
THEIR ANCIENT LINEAGE

THE ROMANCE OF OUR TREES

CHAPTER I

THEIR ANCIENT LINEAGE

FROM the earliest glimpses preserved to us of the development of the human race we find that trees have exercised a beneficent influence on man's character and uplift. They figure prominently in the records, written and oral, of all religious systems in all parts of the world. Indeed, the connection of trees with religion is as old as the conception of the deity itself. North and south, east and west, we find the same idea. In the most universally prized of all the books, the Bible, trees are oftentimes mentioned. In Genesis, chap. II, v. 9, "And out of the ground made the Lord God to grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of knowledge of good and evil." All are familiar with the biblical story of man's fall and banishment from the Garden of Eden through disobeying God's commands in reference to these trees.

THE ROMANCE OF OUR TREES

Those who have studied the folk-lore of primitive man tell us that the legend of good and evil trees is almost universal, and that they are intimately connected with man's own story of his development. As man congregated, built homes of mud, brick, and stone, his energies became more and more absorbed in gaining wealth, and this has repeatedly led to his own destruction and that of his kindred. The same thing obtains to-day. The happy and contented among us are those whose thoughts are not wholly engrossed in laying up treasure in gold, silver, and precious stones but who take an intelligent interest in Nature's treasures, preserve them, and prize them at their true worth.

When looking at a tree—any tree—say in summer, what do we see? A stout stem or trunk firmly fixed in the earth and bearing aloft many branches, great and small, each more or less crowded with green leaves; occasionally flowers are conspicuous. Contemplating a wood or a forest we note the fact that trees are not all alike. They differ in size and form and in shades of colour, and, looking closer, we see that the stem may be white, gray, or nearly black, and that its surface may be smooth or rough; also that the outer covering of the stem may be loose and scale off in patches, thin or thick, in papery rolls, or, it may be firm and deeply fissured. In the autumn

THEIR ANCIENT LINEAGE

we note that on many trees the leaves change from green to beautiful hues of purple, crimson, orange, yellow, and leather-brown; in the winter that many trees are entirely leafless, look stark and dead, others bear brownish leaves which rustle in the wind but are obviously lifeless. Other trees, on the contrary, are clothed with small dark green or gray-green leaves even as they were in spring, summer, and autumn. Those of an inquiring turn of mind are quick to perceive other points of difference and soon realize that among the group of life-forms we designate as trees variety is infinite. Scarcely two are identical in outline and detail, and although some sort of classification is obviously possible, almost every tree has an individuality of its own. The beauty of trees—their form, foliage, flowers, and the tracery of their branches—appeals to the artistic instinct of man; their cool, shade-giving qualities in the heat of summer are appreciated by man and animals alike, and so also are the edible fruits which many kinds of trees produce in the autumn. But alas! the utilitarian spirit so dominates the world in general, and modern civilization in particular, that comparatively few people see anything in the trees which form our woods and forests except a source of fuel, of lumber, of pulp for paper-making or of some other product useful for manufacturing purposes. Too often even their very use-

THE ROMANCE OF OUR TREES

fulness in the arts and crafts of man is ignored and trees are regarded as mere useless encumbrances of the ground to be ruthlessly felled to make room for houses, fields, and highways.

Since our earliest days we have been familiar with trees as things that are: what they are, and why they are, interest but very few. A trip across the dreary deserts and treeless plains of the western part of this country brings many to an appreciation of trees and green things generally. Would that more of us could realize the truth so admirably expressed in the splendid tribute to "Trees" by Joyce Kilmer who was killed in the trenches of battle-scarred northern France:

I think that I shall never see
A poem as lovely as a tree;
A tree whose hungry mouth is prest
Against the earth's sweet-flowing breast;
A tree that looks at God all day
And lifts her leafy arms to pray;
A tree that may in summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

Rightly considered trees are the noblest product of the earth. Look how they rear themselves against gravity for from 50 to 100, aye to 400 feet; how

ERRATUM

The name of the tree shown in the illustration facing page 6, should read:

(*Sequoia gigantea*)



THE OLDEST LIVING THING IN THE WORLD
—A TREE! .

GENERAL SHERMAN BIG TREE IN SEQUOIA NATIONAL PARK, CALIFORNIA, 2,000 YEARS OLD WHEN JESUS OF NAZARETH WAS BORN. IT IS NOW 279 FT. HIGH; $36\frac{1}{2}$ FT. IN DIAMETER (*Sequoia sempervirens*)



THE GREATEST MEMORIAL AVENUE IN THE WORLD

PLANTED ALONG 24 MILES OF HIGHWAY AT NIKKO, JAPAN, LEADING TO THE TOMB OF IEYASU, FATHER OF THE SECOND SHOGUN OF THE TOKUGAWA DYNASTY. BEGUN IN 1651 AND COMPLETED IN 20 YEARS. THERE NOW STAND 18,308 TREES
(Cryptomeria japonica)

THEIR ANCIENT LINEAGE

they resist the storms of every season, the winter's cold, the summer's heat. They are a most wonderful expression of life, year by year adding to their dimensions—often through centuries—flourish whilst generations of mankind come and go, reach their optimum, produce seeds to perpetuate their kind, and finally obey the law inevitable: die, and give place to others. Their structure built of myriads of minute cells piled on and around each other and differentiated into tissues of varying thicknesses and forms as best adapted to the work each has to perform in the life economy of the whole organism.

The big roots firmly anchor the tree to the earth and give off tiny rootlets that absorb water and various food salts in solution which are carried upward through special tissues to the leaves. The leaves—the lungs and chemical laboratories of the tree—breathe in from the air during daylight a gas deleterious to man (carbon dioxide), break it up, exhale a part as pure oxygen essential for the life of the animal kingdom, and combine the remaining carbon and oxygen with the water and food salts supplied by the rootlets into simple forms of sugar, in which manner they are immediately available as food to nourish the tree's growth in all its complicated parts. So much of these sugars not at the moment wanted is converted into forms of starch and stored away for

THE ROMANCE OF OUR TREES

the tree's future needs. No chemical factory in the world built by man and fitted with all the wonderful appliances of modern science is half so marvellous as the leaf of any one kind of tree; no system of collection and transportation devised by human ingenuity and skill so perfect as that which serves each and every tree.

All who keep gold fish in a bowl or in an aquarium know that green weeds of some sort must be kept in the water or the fish will die. Why? Because the fish inhale all the free oxygen in the water and poison themselves with carbon dioxide, which they exhale unless plants are present to take up this gas and in exchange give back free oxygen and thus maintain the balance in nature. So on the grander scale. But for the presence of vegetation this earth would be uninhabitable for the animal kingdom in all its forms, man included.

The two kingdoms—vegetable and animal—are interdependent, but the vegetable kingdom is the more ancient of the two. Men of great minds, both of the past and of the present, who have studied deeply the problems concerning the origin of the world of life are of the opinion that the present state of development of the animal kingdom—the living types of to-day including man the complex—has been made possible by the steady change in the

THEIR ANCIENT LINEAGE

development of the vegetable kingdom. The fossil remains of plants and animals imbedded in the rocks of the different geological epochs of the world's history tell the story of the progressive changes that have taken place during the earth's history, from its youth and adolescence to its present age. Indeed this progressive development of organic life through successive geological periods is the theory on which the modern teaching of the science of natural history is based, and it must be confessed that it goes far toward rendering intelligible natural phenomena as they exist to-day.

Trees by no means represent the oldest type of life-forms in the history of the vegetable kingdom; on the contrary, they are fairly modern. Geologists tell us that in the earliest phases of the world's history of which organic remains exist, the vegetable kingdom was represented by simple, aquatic, or semi-aquatic plants, and the animal kingdom by sponges, worms, centipedes, and spiders. In succeeding ages land plants were developed. During the period represented by our coal measures (the Carboniferous period) and the lengthy epoch preceding it, the whole earth became more or less forest-clad with a low type of vegetation mostly allied to our Ferns, Horsetails, Lycopods, and ancestral forms of the Cycad and Ginkgo families.

THE ROMANCE OF OUR TREES

This earliest luxuriant land vegetation—that which formed the great coal-fields of the earth—was probably adapted to the physical environment alone and was almost uninfluenced by the scanty animal life of the period. Reptiles and mammals were then differentiated, but the former, being better fitted to live upon the vegetation and to survive in the heavily carbonated atmosphere, increased more rapidly. This increase continued through the next two geological epochs and culminated in the next, the Jurassic period, which has been fitly termed the “Age of Reptiles.” Rocks of this age are prevalent in the states of Wyoming, the Dakotas, Kansas, and Texas, and from them have been excavated, and sent to museums for preservation, remains more or less complete of the largest, the ugliest, and the most extraordinary forms of animal life the world has known.

The development of vegetation reacting on the climate and on the animal kingdom, and each on the other, induced constant change. In due course reptiles gave place to mammals, birds were differentiated and likewise insects in variety; Cycads, Araucarias, Ginkgos, Yews, Cedars, and other conifers came into being and, later, broadleaf and coniferous trees similar to those of to-day. It is not my purpose to trace this progressive change in further detail but the fact I do wish to emphasize is that isolated types

THEIR ANCIENT LINEAGE

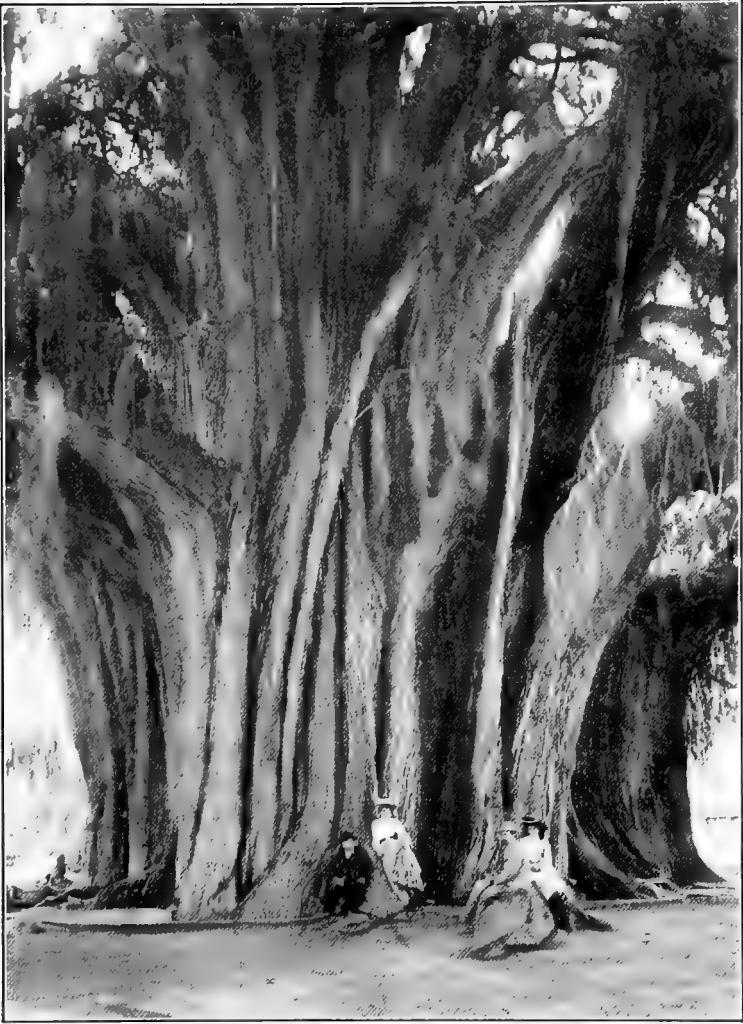
of the archaic forms of trees have persisted down through remote ages to the present day. Of such may be instanced the Araucarias, now confined to South America and Australasia. A familiar example of these trees is the Norfolk Island Pine (*Araucaria excelsa*), so much in request for indoor decorative purposes in the colder parts of this country, and quite hardy in California. Other examples are the Cycads, which are found scattered through the Southern Hemisphere and northward to the Tropic of Cancer, the Cedars of Lebanon, of Cyprus, of the Atlas Mountains and of the western Himalayas; also the Ginkgo of China, Korea, and Japan.

CHAPTER II
THEIR PRESENT-DAY
DISTRIBUTION



THE FAMOUS BURNHAM BEECHES

POLLARDED REMNANTS OF A FOREST ONCE EXTENDING ACROSS ENGLAND AND POSSIBLY
A THOUSAND YEARS OLD AT THE TIME OF THE NORMAN CONQUEST



CYPRESS OF MONTEZUMA

AT TULE, MEXICO, 160 FT. HIGH, 146 GIRTH. ESTIMATED TO BE
MUCH OLDER THAN 2,000 YEARS

(*Taxodium mucronatum*)

CHAPTER II
THEIR PRESENT-DAY
DISTRIBUTION

MANY persons take it for granted that the types of trees with which they are familiar are found all the world over; others more discerning know that every tree has but a limited distribution covering at most a limited range of degrees of latitude and longitude. They know that the Oaks, Elms, Maples, Pines, and Firs are different on the east and west seaboard of this country; also that both differ from those of Europe on the one hand and of eastern Asia on the other. If one looks into the subject all sorts of curious facts are unearthed. For instance, the Tulip-tree and the Kentucky Coffee-tree are each represented by two species only, one of each in the eastern United States and another of each in central China. Of Douglas Firs, two species grow on the mountains of the Pacific Slope and two species in eastern Asia. The Honey-locusts grow in eastern North America, in eastern Asia, and in the Caucasus region. One species of Incense Cedar is

THE ROMANCE OF OUR TREES

native of the mountains of California, another of the mountains of Formosa and southern China, while several species are indigenous to South America and New Zealand. Some groups of trees are represented by many species, others by one or two species. And so as study follows interest it is clearly seen that some groups are in the heyday of their youth, others in their prime, others on the wane—not as individuals but as groups. Reasoning on these facts the conclusion is naturally reached that in the progressive development of types of trees this is the natural sequence. It has been the same through the world's history. Types have arisen and disappeared, some completely, while others, altered and modified to meet the climatic and other changes, have persisted through very long periods of time, and are, as it were, living fossils.

With three of these ancient types of trees I shall deal at length in succeeding chapters, but, as an explanatory introduction, it is necessary to enter a little into the subject of plant distribution in general. A popular book is hardly the place for a full discussion of these matters, yet they are of such interest and importance that a few salient points cannot fail to be of use in understanding present phenomena of tree distribution. Savants have written much to explain particular cases, and as knowledge increases

PRESENT-DAY DISTRIBUTION

the whole question becomes more simple. The geological records, even of the Northern Hemisphere, are notoriously imperfect but as investigations proceed many links are forged and abysmal chasms bridged. The human mind, collectively or individually, will never achieve the infinite but it may learn enough to explain much intelligently.

If we are in the least degree to understand the present-day distribution of plants, and especially the isolation of groups of trees like for instance the Honey-locust (*Gleditsia*), and Sweet-gum (*Liquidambar*), which occur in Asia Minor, China, Japan, and eastern North America and each separated by thousands of miles of land and sea, it is necessary that we try and picture some of the changes time has wrought in the climate of the Northern Hemisphere. Geologists are pretty well agreed that the two great oceans, Atlantic and Pacific, have not changed much in the æons of time since this earth began to cool. Seas, plains, mountain ranges, and large areas of land have, however, changed vastly though probably the depressions and elevations have maintained a fairly stable equilibrium—a sort of compensation balance.

The Tertiary period, that is the geological era immediately preceding the present, was one of great disturbances and the folding of the earth's crust, due to internal cooling and consequent contraction, made

THE ROMANCE OF OUR TREES

vast changes in the earth's surface. Its close was marked by a period of great cold which wrought havoc among vegetation, and to-day much land that in Tertiary times was forested is hidden under enormous ice-fields. In Tertiary times most of the present Arctic Zone was probably free of ice, at any rate Spitzbergen, Greenland, Iceland, the extreme north of the mainland of America and Asia enjoyed a climate at least as mild as New England does to-day. Vast forests circled the whole of to-day's Arctic regions, for the land connection was complete. In those times the types of tree vegetation were similar throughout the whole Northern Hemisphere. Doubtless, then as now, species had a limited distribution, but the genera then, much more so than to-day, were widespread. Tulip-trees, Magnolias, Sweet-gums, Ginkgos, Sassafras, Sequoias, and, indeed, countless others grew in Europe, in America, and in Asia.

As the period of great cold came on so the vegetation was forced to migrate down the mountains and southward to escape destruction. As the ice crept southward so it destroyed the vegetation. The trees of Greenland, Spitzbergen, Iceland, of the regions separating North America and eastern Asia, were all destroyed. In this country they were forced south of Philadelphia (Lat. 40° N.) and where there was no continuous land connection they were oblit-

PRESENT-DAY DISTRIBUTION

erated. In Europe they were swept almost to the very fringe of the Mediterranean and virtually all destroyed. In Europe to-day, only about three dozen genera of trees are found and even the species are very limited in number.

We are not concerned with the theories as to what particular astronomical change induced the Ice Age, but it is important to realize that the ice did not descend to equal latitudes all round the Northern Hemisphere. Japan and China escaped glaciation and, though the temperature must have been lowered, the vegetation suffered little harm. Of course there was a migration toward the south and a reverse one at the close of the glacial epoch. The net result is that the existing flora of the Chinese Empire and of central Japan southward, is really a miniature of the whole flora of the Northern Hemisphere in pre-glacial times. In China and in the parts of Japan indicated grow to-day many peculiar types, and all the principal genera of trees known from the other parts of the Northern Hemisphere except Robinia, Laburnum, Platanus, true Cedars (*Cedrus*), Sequoia and *Taxodium*; and of the latter two there are such very closely allied trees as *Taiwania* and *Glyptostrobus*. Fossils of many types which grow in the Orient to-day occur in Europe, and recent dredgings off the Dutch-English coast have added much to prove that the

THE ROMANCE OF OUR TREES

ancient flora of Europe was similar to that now flourishing in the Far East. I do not mean that they were specifically identical but that the generic types were similar. If we picture to ourselves the onward, inevitable creeping southward of the ice we can easily understand how trees and other forms of vegetation were destroyed in its path, and only those which were able to reach places of sufficient warmth to maintain life survived. The greater the land extension toward the south the greater chances had the vegetation, and where the country was broken by mountain ranges advantageous regions were more easily found.

The ice on its path ground off the tops of mountains and scoured out valleys to a great depth, and when it retreated the face of much of the Northern Hemisphere was changed. It disappeared from sea-level valleys earlier than from mountain ranges and so isolated groups of vegetation. If we picture this, and remember that before the period of great cold set in the vegetation of the North was everywhere very similar, we can understand how to-day are found here and there groups of trees isolated by thousands of miles from their kindred. This explains the separation of the Cedars of Lebanon, of the Taurus, of Cyprus, of the Atlas Mountains and of the western Himalayas; also the isolation of the Nettle-trees, Honeylocusts, Sweet-gums, Walnuts, and others in the

PRESENT-DAY DISTRIBUTION

Caucasus region, in eastern North America and in the Orient. What were temperate regions in the north in Tertiary times are even now the frozen North, and the land of this region capable of growing forests is infinitely less than it was then. Deserts, seas, lakes, high plateaux, and mountain ranges influence climates, which strongly affect plant distribution. Birds, animals, air- and water-currents are all agencies in plant dispersal, and so to understand why this tree is here and not yonder involves the study of a number of cognate branches of natural history. Complex is the problem, but however little it is studied the marvels of the world we live in become more and more apparent.

Brief and fragmentary as this sketch is it would be more so did we omit mention of the influence of man. At what period in the world's history man first appeared is much disputed, but certain it is that, as soon as he became a sentient being, hunger caused him to investigate the vegetation and taught him to appreciate what was wholesome as food; providing himself with clothes, shelter, and weapons for protection followed. As he migrated so he carried with him plants that were of service to his needs, and, later, such as were a delight to his higher being. We know so little of the early peregrinations of the human race, or of where it had its cradle, that

THE ROMANCE OF OUR TREES

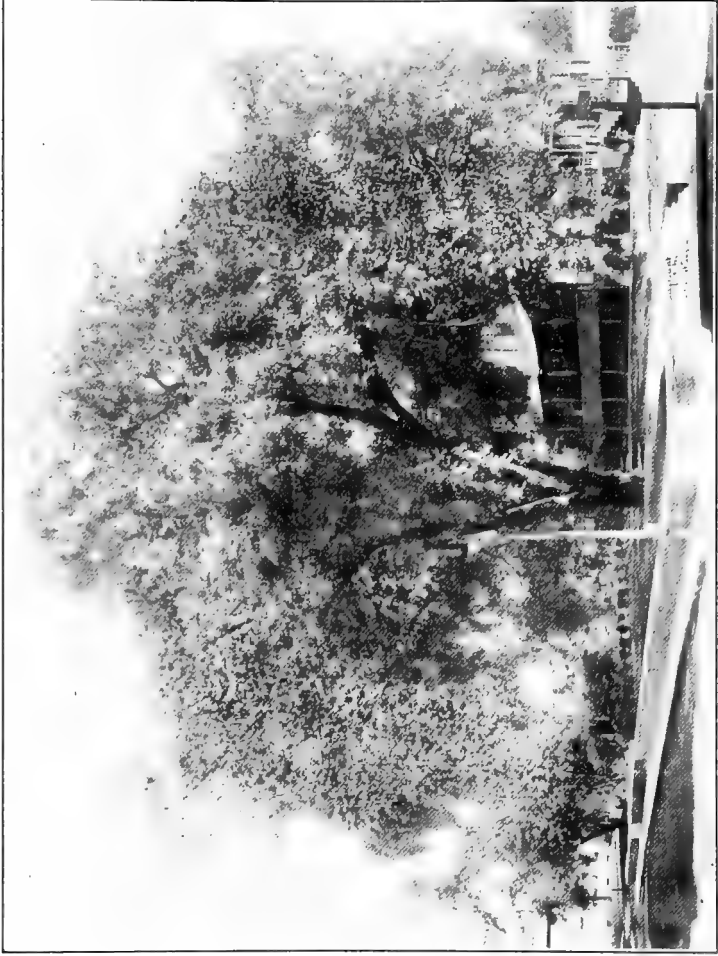
we can say nothing of that remote and most interesting period. In the mythology, folk-lore, and sacred writings of all races of which we have knowledge frequent mention of trees is made. Invading armies devastated countries and carried off useful plants, including fruit trees and the like, as spoils of war. Alexander the Great is but a name in history in spite of his great conquests, and of his work the only beneficial result to mankind remaining is the Orange-tree which his soldiers are said to have carried back from India to the shores of the Mediterranean.

Of the mighty migrations across Asia we know very little though it is certain that for centuries the great highways of commerce of the Old World were across central Asia. That the peach, orange, and certain of its relatives, were carried from China to Persia and that neighbourhood is certain, and that the walnut and grapevine were brought back is equally true. From the rich and famed China of old, plants useful and ornamental were also carried to Korea and Japan; even as the apple, the pear, the cherry, wheat, and barley were carried here from Europe and later the peach, apricot, almond, date, vine, and the like. From this country the potato, tobacco, and maize were taken to Europe and to China. In later times ornamental trees, shrubs, and herbs have been carried far from their original homes.



ANCIENT ENGLISH OAK AT BLENHEIM, ENGLAND

(*Quercus robur*)



THE AMERICAN ELM

APPROPRIATELY ASSOCIATED WITH THE HOMES OF NEW ENGLAND AS A SHADE TREE
(*Ulmus americana*)

PRESENT-DAY DISTRIBUTION

In all this beneficent work man has been the organizing power, and could a thousand and one of the common plants around us tell their story it would fascinate the least attentive. This pen is indifferently equipped, but the purpose of this work is to show the intimate connection, the bond of companionship, as it were, between ourselves—mankind in general—and certain groups of plants. Animal life, in all its higher forms at any rate, is dependent for its very existence on the vegetable kingdom. Man draws much of his bodily sustenance from the products of plant life, and trees will yield, to all who heed their beauty and study them, mental enjoyment and healthful recreation.

CHAPTER III
THEIR RUGGED TRUNKS



SCOTCH ELM
(*Ulmus glabra*)



ENGLISH OAK
(*Quercus robur*)



A COMPARISON OF TREE-BARK CHARACTERS—1
FALSE ACACIA
(*Robinia pseudacacia*)



THE REDWOOD
(*Sequoia sempervirens*)



ENGLISH YEWS
(*Taxus baccata*)



(THE HORNBEAM)
(*Carpinus Betulus*)

A COMPARISON OF TREE-BARK CHARACTERS—II

CHAPTER III

THEIR RUGGED TRUNKS

MUCH of the beauty of any region is due to the trees which clothe the mountain slopes and river valleys or line roadsides and hedgerows. This statement is commonplace, yet those who have crossed the treeless areas in this and other lands can best appreciate its full significance. In the summer time, when clothed with leafage, all deciduous trees may look very much alike to a casual observer. In the fall, when the change of colour in the leaves takes place, variety becomes apparent, but it is in the winter when the trees are naked that they best display their peculiar characteristics. A very brief study will enable any one in winter to pick out the Elm, Oak, Sugar Maple, Beech, Hickory, and Silver Birch. The general aspect, position of main branches, thickness of shoots, character of the bark, and often of the buds, each or several, afford easy clues to identity. Those who are born and live in the country readily recognize by intuition their neighbouring trees. Townsfolk have not the same opportunities

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and must learn by study what countryfolk acquire
through association.

Of the many attractive features of trees not the least is their bark, and in winter this feature is not only very pronounced but is often characteristic. The various organs of a tree, like those of the human body, have each their function, and that of the bark is protection. It protects the vital tissues, which lie near the periphery, from the heat of the sun's direct rays and from the intense cold of winter. We are not concerned with a scientific treatise on the origin of bark but a few simple facts are instructive since they enable us to understand how the various forms of the bark arise. When transplanting trees it is well known that care must be taken not to injure the bark, especially when it is smooth, and that in certain trees, the Holly for example, even moderate injury is fatal. In the Holly (*Ilex*), in *Acer striatum*, and other striped-barked Maples, and in a few other trees, the original cells of the outer surface keep pace by growth with the formation of new tissue in the interior. In this case no proper bark is formed, and any considerable injury to the skin, as it may be termed, of the trunk is fatal, since it cannot heal over. Such trees grow naturally in the shade of others and are thereby much protected. Most commonly, however, it is the layer of cells immediately within the

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outer surface which becomes active and forms bark and continues to do so during the life of the individual. In some trees, like the Birch, as new layers are formed the older ones are partially or completely thrown off. In others, like the Beech, the growth is such that the bark firmly coheres and remains smooth on the outside. In the Oak, Elm, and Chestnut successive formations are amassed and the bark, though firmly coherent, becomes fissured and with age deeply and ruggedly so. In some trees the bark-forming cells, after a time, cease to function and fresh layers arise successively deeper and deeper within the tissues. When this happens, as in Sequoia, the bark is made up of different tissues and is known as fibrous. In most cases the bark is either thin and papery, firm and smooth, or fissured, but in some—Cork Oak, Cork Elm, and other trees—it is thick and corky.

Without entering further into the origin of bark, our purpose is served if it be remembered that the character of the bark depends largely upon its seat of origin and the nature of the tissues of which it is composed; that its appearance depends mainly upon degrees of coherence and upon the stress and strain it is submitted to as growth continues year after year. It is the tree itself that fashions the bark in all its varied forms and not external elements, though wind,

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heat, and cold assist in the removal of loosely coherent barks.

In different groups of trees the bark varies enormously in thickness. We have stated that in the Holly no true bark is formed; in the Beech it is firm and smooth, and on trees several hundreds of years old it is scarcely more than one half an inch thick; in the Chestnut it is thicker, but in none of our common trees is the bark of any great thickness. In the Big Trees of California it attains its maximum development, being in adult trees often as much as thirty inches thick!

But mere thickness has no bearing on the ornamental character of bark. The White or Paper Birch, often felicitously called "My Lady of the Woods," is known to all by its smooth white bark which peels off in thin layers. No other tree has such pure white bark though many Poplars have pale, yellowish-gray bark, smooth except on the lower and older parts. In the River Birch the papery gray-brown bark clings in loose masses of irregular shape. The Beech has smooth, grayish-white bark and in the American species in particular the effect from a distance is like white mist. The Hornbeam also has a pale gray bark like the Beech, but rather darker, and on old trees it becomes shallowly fissured. The Red, Silver, and Sugar Maples have smooth, pale



TYPICAL SMOOTH BARK OF THE
BEECH



ABNORMAL CHANNLED AND FISSURED BARK OF BEECH-
TREE GROWING ON A DRY SOIL

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gray bark which becomes darker and on old trees fissured.

The deciduous Oaks according to their bark fall into two groups. Many of the White Oaks (*Quercus alba*, *Q. macrocarpa*, *Q. bicolor*, *Q. stellata*) have light gray bark which becomes fissured with age. Others like the European Oak (*Quercus robur*), and the Red, Black, and Chestnut Oaks of America have dark gray bark, varying from nearly smooth to deeply fissured according to the species. The Chestnut also has dark gray, deeply fissured bark. In the Sweet Birch the bark is smooth and almost black, and in the Cherries lustrous, chestnut-brown, and peeling. In the Plane and certain Hickories the bark flakes off in plates or strips leaving smooth white or pale brown scars; in *Stuartia* and the Crêpe Myrtle (*Lagerstroemia*) this is carried to the extreme and the trunks become smooth and polished. The Robinia has a grayish, deeply fissured, fibrous bark, and that of the Elm, Linden, and many other common trees, is dark and irregularly fissured. In the American Honey-locust (*Gleditsia triacanthos*) the bark is almost black, cracked and fissured, whereas that of its Chinese relative (*G. macracantha*) is quite smooth and pale gray. A similar difference obtains between the Kentucky Coffee-tree and its Chinese congener. In the former the bark is dark,

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fissured, and rugged, in the latter perfectly smooth and gray-green. Many are familiar with the dark, fissured bark of the valuable Black Walnut but fewer, perhaps, with that of the American Persimmon (*Diospyros virginiana*). In this tree the bark is almost black and is deeply fissured, both longitudinally and transversely, in such manner that the trunk is studded with close-set rectangular knobs which form a perfect mosaic. Among trees I know of only one other, the Korean Cornel (*Cornus coreana*), that has this peculiar and striking kind of bark. In conclusion it may be said that nearly every kind of tree has its own peculiar form of bark, differing slightly or conspicuously from that of its neighbours. Quite often the bark is remarkable for its colour or form, and in winter it is especially attractive and beautiful.

CHAPTER IV
THEIR AUTUMN GLORY

CHAPTER IV

THEIR AUTUMN GLORY

IN SEPTEMBER, when the beauty of the Aster displaces that of the Goldenrod, when blue and purple transcend the yellow in field and border, the deep green mantle of foliage draping hill and dale, mountain and ravine, streamside and roadside commences to show portentous signs of change. The Pines, Hemlocks, and their kin look even darker as the contrast with their deciduous-leaved neighbours becomes stronger. In the swamps, about the last week of August and at the first whiff of autumn in the air, the Red Maple begins to assume a purplish tint and its example is soon followed by other kinds of trees. To all of us the season of the year becomes apparent, warning signs of stern winter's approach increase rapidly, and soon the whole country puts on its gayest mantle of colour. The peoples of the tropics, where monsoon rains are followed by burning heat and where the young unfolding leaves of many forest trees are brightly coloured, never enjoy the wonderful feast of colour displayed in the forests

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and countrysides of this and other northern continental areas. They have other things for which we may envy them but the autumn tints of leaves are peculiarly our own. The brightly coloured *Codiaeums* of the tropics and of our hothouses, beautiful as they are, do not equal the Red Maple, Sugar Maple; *Sassafras*, and *Tulip-tree* in the fall. No scene in nature is more delightful than the woods of eastern North America in the fulness of their autumn splendour.

It is a weakness of humans to crave most those things beyond their immediate reach, but the wise among us are content to enjoy those which fall within the sphere of every-day life. To revel in the splendid riot of autumn colour no long journey has to be undertaken. It is at our very door. From the St. Lawrence Valley and the Canadian lakes southward to the Alleghany Mountains there is displayed each autumn a scene of entrancing beauty not surpassed the world over. Central Europe, Japan, China, and other parts of eastern Asia have their own season of autumn colour and each area has an individuality of its own but, if they rival, they cannot surpass the forest scenes of eastern North America.

But wherefore and why all this gay autumnal apparel? Is it the handiwork of the charming fairies and wood-nymphs of our childhood beliefs and nursery days? Surely some guiding hand, some

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beneficent agency, some lover of mankind must have prepared the scene as the final tableau of the seasons! Of a truth the talent of the Master Artist is unveiled, and the picture surpasses the dreams of those who live in less-favoured areas of the world.

Those skilled in the mysteries of organic chemistry and plant physiology tell us that autumn tints are due to chemical changes associated with the storing away of food material and the discharge of certain waste products. This explanation, though matter of fact and disturbing to our youthful belief in fairies and wood-nymphs, opens up a field of inquiry which must tend to enlarge our viewpoint and increase our appreciation of Nature's wonderful methods. We find that all is governed by laws which act and react in such manner as to insure the end and object desired.

Briefly the autumn metamorphosis is effected as follows:

At the approach of winter leaves which cannot withstand frost cease to function as food factories and the residue food substances are conveyed from the leaf-blade into the woody branches or subterranean rootstock and there stored, chiefly in the form of starch, until the season of growth recommences the following spring. The leaves from which everything useful has been transported form nothing more than a

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mere framework of cell-chambers containing merely waste products such as crystals of calcium-oxalate which are thrown off with the leaves and help to enrich the soil. But while the process of food evacuation is going on other changes take place. In many plants a chemical substance, known technically as anthocyanin, is produced in the leaves and often to such an extent as to become plainly visible on the exterior. It appears red in the presence of free acids in the cell-sap, blue when no acids are present, and violet when the quantity of acids is small. In a great many leaves the bodies which contain the green colouring matter become changed to yellow granules while the evacuation of food substances is in process. Sometimes these granules are very few and anthocyanin is absent, then the leaf exhibits little outward change except losing its freshness before it falls. In others the yellow granules are abundantly developed, and if anthocyanin is absent or nearly so the whole leaf assumes a clear yellow hue. If there is an abundance of yellow granules together with free acids and anthocyanin the leaf assumes an orange colour. Thus the leaf at the period of autumnal change by the presence of these substances in a greater or lesser degree loses its green hue and becomes brown or yellow, crimson or orange, purple or red. The play of colour is greater

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according to the number of species and individuals associated together in a particular spot. But the greatest display of colour is seen when the neighbourhood is sprinkled with trees having evergreen foliage, when it often happens that a relatively small area of woodland appears decked in all the colours of the rainbow.

The most casual observer knows that all trees do not assume tinted foliage in autumn. Some, like the Alder, the Locust (*Robinia*), the Elder, and most Willows exhibit little or no change save, perhaps, a number of yellow leaves scattered through the green before the fall. But this group is relatively small and only adds additional contrast to the landscape. Again, plants whose leaves are covered with silky or woolly hairs or with a felted mat of hairs never present any autumn colouring, and in those in which the green colour disappears the change is to pale gray and white.

In a rather large group of trees which includes the Walnut, Butternut, Catalpa, Elm, Hickory, Chestnut, Horsechestnut, Linden, Button-tree, White Birch, and others, the tints are a general mixture of rusty green and yellow and, occasionally, pure yellow under favourable circumstances. In the Poplar, Tulip-tree, Honey-locust (*Gleditsia*), Mulberry, Maidenhair-tree or Ginkgo, Beech, and most of the

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Birches, the leaves change to pure yellow of different shades. In none of the above-mentioned groups is purple or red of any shade developed.

In favourable years the American or White Ash (*Fraxinus americana*) is unique in its tints passing through all shades from a dark chocolate to violet, clear brown, and salmon but it has no reds.

The Peach, Plum, Pear, Apple, Quince, Cherry, Mountain-ash, Hawthorn, and the Silver Maple, have a predominance of green with a slight or considerable admixture of purple, red, and yellow, and individuals are frequently strikingly brilliant. In another group purple, crimson, and scarlet, with only a slight admixture of yellow if any, obtain. Here are the Tupelo, Scarlet Oak, White Oak, Sumach, Viburnum, Sorrel-tree, Cornel, and many other trees. A final group—to which belong the Red, Sugar, Striped, and Mountain Maples, the Smoke-tree (*Cotinus*), Poison Dogwood, Sassafras and the Shadbush or Snowy Mespilus—has variegated tints comprising all shades of purple, crimson, scarlet, orange, and yellow on the same or different individuals of the same species. Often the leaves are tinted and sometimes figured like the wings of a butterfly.

Careful observers will note that the gradations of autumn tints in all cases are in order of those of sunrise: from darker to lighter hues, and never the re-

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verse. The brown leaves which long persist on some trees (Beech, Chestnut, and certain Oaks), though darker than the yellow or orange from which they often turn, are no exception, since these leaves are dead and the brown colour is only assumed after vitality has vanished.

Some species are perfectly uniform in their colours; others, on the contrary, display a very wide range of colour. For example the Maidenhair-tree, the Tulip-tree, and Birch are invariably yellow; the Tupelo, Sumach, and White Oak chiefly red, while Maples are of as many colours as if they were of different species. But each individual tree shows nearly the same tints every year even as an Apple-tree bears fruit of the same tints from year to year.

The Red Maple (*Acer rubrum*), so abundant in swamp and wood, roadside, and on dry hilltop, is the crowning glory of a New England autumn. By the last week of August it commences to assume a purplish hue; sometimes a solitary branch is tinted, frequently the colouring process begins at the top of the tree and the purple crown of autumn is placed on the green brow of summer. Trees growing side by side are seldom alike, and in a group may be seen almost as many shades of colour as there are trees. Some are entirely yellow, others scarlet, some crimson, purple, or orange, others variegated with several

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of these colours. Indeed on different individuals in the Red Maple may be seen all the hues that are ever displayed in the autumn woods. The Sugar Maple (*Acer saccharum*), though more brilliant, has a narrower range of colour and is more uniform in its tints, which range from yellow and orange to scarlet.

The common Tupelo (*Nyssa sylvatica*) more invariably shows a mass of unmixed crimson than any other New England tree. The foliage first assumes shades of purple which changes into crimson or scarlet before it falls.

The Oaks, the noblest group of trees in eastern North America, assume their autumn tints very late and are not at their zenith until after those of the Maples have past. In the Scarlet, Red, and White Oaks the tints are ruddy, varying from reddish purple and crimson to pale red, and when at their best, after the middle of October, these trees are the most beautiful of the forests and pastures. The Black and Swamp Oaks develop imperfect shades of orange to leather-coloured tints.

In the White Oak, the Beech, the Chestnut, and the Red Oak when young, the leaves as they die become russet-brown, and, remaining on the trees through the winter, give a sensation of warmth to the woods and landscape in the coldest days of winter. The period of retention varies greatly in

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different individuals, often the leaves are retained on the lower branches when the upper parts of the tree are bare.

In Great Britain the native trees, with few exceptions, such as the wild Cherries and Beech, assume no autumn tints comparable with those of their American relatives. Indeed, in England the most varied and brightly coloured tints are found not on the indigenous trees but on the Brambles (*Rubus*). Long ago many English trees were planted in eastern North America and some, like the Elm, Linden, and Oak, have grown to a large or moderately large size. In autumn such trees stand out very clearly with their mantle of green foliage when the native trees around are of all tints or have shed their leaves. These English colonists preserve their green hues until late into October when finally the leaves become mottled, yellowish or brownish, and fall.

The Asiatic trees in cultivation assume their wonted tints, and so also do those of central Europe. The trees of Japan and China colour with us rather later than the native trees and lengthen the season of colour fully two weeks.

In Japan, where an intense love of nature is innate among all classes, there prevails a custom which might well be adopted in other lands. The beauty spots in that country are many and are justly

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celebrated in poetry and song: august Fuji-san with its perfect cone and snowy mantle; the Pine-clad islets of Matsushima; the Inland Sea with its hundreds of islands clad with verdure to the water's edge; the Nikko region with its mountains and lakes, its waterfalls and woods, and hundreds of other places more or less famous. In October, when the woods assume their autumn splendour, children from primary and secondary schools, high schools and colleges with their teachers and professors make excursions of three or four days' duration to noted places and revel in the feast of colour. The railways offer cheap fares and from all the large towns and cities children, youths, and maidens journey to the mountain woods. In the autumn in the Nikko region I have seen thousands of scholars, boys and girls varying from eight to twenty years of age (and a happy, orderly throng they were), enjoying to the full the scenery, breathing in the freshest of mountain air, and building up healthy minds and bodies. Their joyousness was wholesomely infectious and it was good to mingle with them. As I look back on the many pleasant experiences I have enjoyed in that pretty land none gives me greater pleasure than the memories of those throngs of happy scholars in the woods and woodland paths of Nikko, Chuzenji, and Yumoto.

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Autumn tints is a subject that belongs more to the sphere of the artist than to that of the scientist; the poet can sing their song more easily than a writer of prose can describe their beauty; yet, equally with all, ordinary folk can enjoy their splendour. Let us then in autumn time lay aside for a brief moment the cares of life; let us break away from engrossing tasks of every kind and linger for a while among the trees and shrubs of the roadside and woodland, drink in cool draughts of fresh air, and revel in the galaxy of colour that beneficent Nature so lavishly displays on every side.

CHAPTER V
THE STORY OF THE GINKGO

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THE oldest existing type of tree, a veritable "living fossil," is the Ginkgo or Maidenhair-tree. It is the sole survivor of a family, rich in species, which was distributed over the temperate regions of both the Northern and Southern hemispheres during the periods when the Terrible Lizards (*Deinosaurus* and *Iguanodon*), the Winged Lizards (*Pterodactylus*—possible ancestors of our birds), and the Paddle-bearing Lizards (*Plesiosaurus*) roamed the earth, and whose fossil remains, so plentiful in the rocks of Wyoming, North and South Dakota, Kansas, Texas, and elsewhere, alone remain to tell of their existence. The fossil evidence is insufficient to prove the existence of members of the Ginkgo family in the age of the coal measures (Carboniferous period), but there is a strong suspicion of their presence in the next (Permian), as fossils from Virginia show. From the Triassic rocks (the oldest group of Secondary period) several species of Ginkgo have been described from Australia, and it seems

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fairly certain that during this epoch the tree flourished in the Southern Hemisphere. In the strata of the next era—the Jurassic or Reptile Age—the Ginkgo is abundantly present in America, Asia, and Europe. From rocks of this age in Canada, China, Japan, northern Germany, and England northward to Greenland, Siberia, and Franz-Joseph-Land many fossil species have been described. In some of them the leaves are quite indistinguishable from those of the existing species. From the rocks of the Chalk Age (Cretaceous) of North America, Greenland, and Vancouver Island, fossil species have been named which are probably identical with that living to-day. From the Tertiary period, fossils of several species have been described from widely separated parts of the Northern Hemisphere, and it may be concluded with approximate certainty that the living *Ginkgo biloba* flourished at that period; also that it was a common tree in the present temperate and circumpolar regions of the whole Northern Hemisphere.

The close of the Tertiary period was marked by a glacial epoch which, in Europe and North America in particular, destroyed much of the vegetation. In eastern North America the ice-cap extended as far south as Philadelphia (Lat. 40° N.) as the scarred rocks, erratic boulders, and detritus amply testify. This ice-cap did not reach any part of China, Korea,



MATURE HABIT OF AGE (BOSTON PUBLIC GARDENS)

TWO FORMS
OF THE
GINKGO



THE UPRIGHT TYPE GROWING AT
FAIRMOUNT PARK, PHILADELPHIA



GINKGO AT KOYENGI TEMPLE, JAPAN

THIS HAS A GIRTH OF 28 FT. AND FITTINGLY EXHIBITS THE RELIGIOUS ASSOCIATION OF THIS TREE, THROUGH WHICH ALONE IT HAS BEEN PRESERVED TO THIS AGE

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or Japan, though, of course, the climate there was very considerably modified by its influence. The glaciation of North America, Greenland, Europe, and western Siberia probably caused the extinction of the Ginkgo in those lands, whereas in the Orient, thanks to the milder climate that obtained, it survived. But be the explanation what it may, the record of the rocks demonstrates both the antiquity and wide geographical range of the Ginkgo-tree down to the Tertiary glacial epoch. To-day, the Ginkgo, statements to the contrary notwithstanding, no longer exists in a wild state, and there is no authentic record of its having ever been seen growing spontaneously. Travellers of repute of many nationalities have searched for it far and wide in Japan, Korea, Manchuria, and China but none has succeeded in solving the secret of its home. Once or twice the statement has been made that it "was seen wild" in northern Japan, in western or eastern China, or in Korea, but subsequent visits by those competent to judge have shown the authors of such statements at fault in their identification of the tree, or misled and hasty in their findings. It is known in Japan, Korea, southern Manchuria, and in China proper as a planted tree only, and usually in association with religious buildings, palaces, tombs, and old historical or geomantic sites. Whilst excessive cold may reasonably

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explain its disappearance from much of the Northern Hemisphere it does not account for its absence in a wild state in the Orient, where fossil evidence proves its presence in epochs coeval with those in America and Europe. Having successfully withstood varying conditions throughout an inconceivable period of time, as proved by the geological record, it seems passing strange that it should so comparatively recently have disappeared. What caused its disappearance we shall never know, but the same has happened to billions upon billions of organic forms since first progressive organic development began. More marvellous is the fact that this extraordinary type of vegetation should have persisted through the æons to the present.

The earliest known mention of the Ginkgo in books is in a Chinese work on agriculture which dates from the 8th century of our era. At the beginning of 1000 A.D. the fruit was taken as tribute by the newly established Sung Dynasty being known as "Ya-chio-tzu," which signifies "Silver-apricot," from its resemblance to the kernel of an apricot. In the great Chinese *Herbal*, issued in 1578, the author calls it the "Ya-chio-tzu," which means "the tree with leaves like a duck's foot" and is quite descriptive. These old names may be in use in parts of China today, but I never heard them used; the names in

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general use in those parts of the Flowery Land I travelled through are "Yin-kuo-tsu" (Silver nut-tree) and "Pai-kuo-tzu" (White nut-tree). In Korea it is known as the "Eun Haing-namou" which is simply the Korean rendering of the Chinese name. In Japan the tree is known as the I-cho, and the fruit as Gin-nan, which again is a translation of its Chinese name. The tree reached Japan with Buddhism in the 6th century of the Christian Era, and "Ginkgo" is simply the Japanese rendering of the Chinese name "Yin-kou." In this connection it must be remembered that the Chinese ideograph and Chinese literature were adopted by the Japanese long, long ago. The best authorities claim that the first Chinese books were brought to Japan in 285 A.D.; that Buddhism was introduced from China via Korea in 552, and that the Chinese calendar was introduced in 602. It is, of course, possible that the Ginkgo in those early days existed as a wild tree in the forests of Japan, but it may be assumed with almost absolute certainty that in any case it was brought to Japan by Korean and Chinese Buddhist monks and planted by them in the earliest days of their proselytizing. Many of the magnificent old Ginkgo-trees in Japan are claimed to be more than a thousand years old and there is no valid reason for disputing the statement.

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We of the West owe our first knowledge of the Ginkgo-tree to Engelbert Kaempfer, who, as a surgeon in the service of the old Dutch East-India Company, visited Japan in September, 1692, and during the time made an overland journey from Nagasaki to Tokyo. He returned to Europe in 1694, and published a book in 1712 in which he gives a good figure of the Ginkgo. An Englishman named Gordon, in 1771, sent a plant of it to the great Linnaeus who adopted Kaempfer's name for the generic title of the tree, calling it *Ginkgo biloba*. In 1796, an English botanist, one Smith, renamed it *Salisburia adiantifolia* on the grounds that Linnaeus's name was "equally uncouth and barbarous." This act of pedantry was very properly objected to at the time and later Smith's name was abandoned for the older and legitimate one given by Linnaeus.

The Ginkgo-tree was first introduced into Europe by the Dutch sometime between 1727 and 1737, and planted in the Botanic Garden at Utrecht, but the date is uncertain. It came to England between 1752 and 1754, presumably by seeds brought direct from Japan. The first tree to flower in Europe was in Kew Gardens in 1795 and proved to be male. The famous Jacquin planted a tree in Vienna about 1768, and this tree when it flowered, proved to be a male also. Of its first introduction to France the following

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interesting story is on record as related by M. André Thouin, when delivering his annual Cours d'Agriculture Pratique in the Jardin des Plantes, Paris. In 1780 a Parisian amateur named M. Petigny voyaged to London in order to see the principal gardens there. Among those he visited was that of a nurseryman who possessed five young Ginkgo plants, all in one pot, raised from seeds received from Japan. The plants were very rare and the nurseryman valued them highly but after abundant hospitality, in which wine was not omitted, he parted with them for twenty-five guineas which the Frenchman promptly paid, and lost no time in taking away his valuable acquisition. Next morning the Englishman's generosity of spirit induced by the wine was replaced by a keen sense of business acumen and he bewailed his loss of the five Ginkgo plants. He sought out M. Petigny and tried to buy them back, finally offering for a single one the twenty-five guineas he had received for the five. The Frenchman refused and carried the plants to France. His story of outwitting a native of "perfidious Albion" was much enjoyed in Paris, and, as each plant had cost him but about 120 francs or 40 crowns, the tree was christened "Arbre aux quarante écus!" Most of the older trees in France are said to have been derived from the above five, but Sir Joseph Banks, in 1788, gave to

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Broussonet, who was then in London, a Ginkgo plant and he sent it to Professor Gouan of the Montpellier Botanic Garden where it was planted. In 1790, an English amateur named Blake, sent a Ginkgo plant to M. Gaussen de Chapeau-rouge who had a garden at Bourdigny, a village two leagues from Geneva, Switzerland, where he cultivated many rare trees. This tree is historical. It proved to be a female, the discovery being made by Auguste Pyramus De Candolle in 1814. Scions from this tree were distributed over Europe by its discoverer and grafted on the male trees including those at Vienna and Montpellier. In fact, all the fruiting trees in Europe up to 1882 are believed to have originated by grafting from the tree near Geneva. As a result the tree at Montpellier produced perfect fruit for the first time in Europe, in 1835. The original female tree at Bourdigny was cut down before 1866 by order of a new proprietor of the grounds who cared nothing for trees.

The introduction of the Maidenhair-tree to America is said to be due to William Hamilton who obtained it from England in 1784 and planted it in his garden at Woodlands, near Philadelphia, where it grows to-day though the garden itself has become a cemetery. In the first years of the 19th century it was planted by Doctor Hosack at Hyde Park on

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the banks of the Hudson River. On the north side of Boston Common grows a historic Ginkgo which is possibly older than the tree at Woodlands and probably came direct from China. It is said to have been a tree of "full size when Mr. Gardiner Greene purchased the garden in 1798." The site of the garden is now occupied by the Court House in Pemberton Square. After Mr. Greene's death in 1832, the grounds were sold and the tree moved to its present position in 1838. The city paid a portion of the cost and each of Mr. Greene's children contributed one hundred dollars. The tree when moved was 40 ft. tall and 4 ft. in girth of trunk. Those were times of great financial stringency, and there was some opposition to the spending of public money on moving a tree. The talk was considerable and the famous physician, Dr. Jacob Bigelow, a friend of Gardiner Greene, and himself mainly responsible for saving the tree, wrote a lengthy and amusing poem on the incident, beginning:

Thou queer, outlandish, fan-leaved tree,
Whose grandfather came o'er the sea
A pilgrim of the ocean,
Didst thou expect to gather gear
By selling out thy chopsticks here?

In China the Ginkgo as a planted tree is associated with Chinese civilization almost throughout the

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length and breadth of the kingdom. I am not sure that it grows in the hotter parts of southern China, and where I have seen it most abundantly is in the western province of Szechuan (the province of the four streams). There I met with the most perfect specimen of a Ginkgo-tree I have ever seen. It grows a few miles above the city of Kiating, but on the left bank of the Min River, and in 1908 was about 100 ft. tall, had a symmetrical, narrow-oval crown with branches almost sweeping the ground, and a trunk 24 ft. in girth. It is a male. I have seen others in China with rather larger trunks but never one quite so tall or so lovely in form. In the grounds of the Yellow Dragon Temple at Kuling, a summer resort in the Lushan Mountains behind Kiukiang on the Yangtsze River, grows a famous old Ginkgo not especially tall (about 70 ft.) but with a trunk 25 ft. in girth. In and around Shanghai are many fine specimens of this tree. A little to the west of Shanghai in a district unfrequented by foreigners the late Frank N. Meyer, plant explorer in China for the United States Department of Agriculture, found the Ginkgo to be common and used for fuel, and he suggested that it might be truly wild there. Meyer's opinion is more worthy of respect than those of many other travellers who have made similar ascertions but I am an unconvinced sceptic. A Russian

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botanist of German extraction, Dr. Alexander von Bunge, who accompanied the 11th Ecclesiastical Mission sent by the Russian Government to Peking in 1830 where he stayed for nearly eight months, tells of seeing a Ginkgo-tree near Peking "of prodigious height and 40 ft. in circumference." No subsequent traveller has seen a tree of such huge dimensions and the probability is that Bunge exaggerated.

In southern Manchuria and in Korea grow fine specimens of the Ginkgo, especially in Keijyo, the capital city of Korea, where trees from 80 to 90 ft. tall and from 18 to 20 ft. in girth of trunk are fairly common. In the courtyard of Choanji temple in the Diamond Mountains, a Buddhist sanctuary and one of the loveliest spots on earth, there is a fine old specimen some 80 ft. tall and 14 ft. in girth of trunk and with abundant sprouts. The most northerly place in which I saw the Ginkgo growing in Korea was about 40 miles east of Gensan. In Korea the people claim that one may sit down on the ground beneath the shade of a Ginkgo-tree and not be pestered with ants, but my experience does not support this claim.

It is in Japan and in the city of Tokyo, however, that I have seen the finest average trees and the greatest in size of trunk. Every park, temple ground, and palace yard has its Ginkgo-tree which is usually of great size. There are handsome specimens in Hibya

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and Shiba parks, but the finest I saw grows in Koy-enji temple grounds and is about 85 ft. tall and 28 ft. in girth of trunk. In the grounds of the Zankuji Temple in Azabu, Tokyo, there is a grand old tree with a trunk 30 ft. in girth but the top has been broken off by a storm. In the Imperial Botanic Gardens in Koishikawa, Tokyo, grows the Ginkgo-tree on which Professor S. Hirase carried out the experiments in 1896 which led to his remarkable discovery of the motile male sperms. At the Hachiman shrine in Kamakura there is a Ginkgo said to be more than a thousand years old, about 20 feet in girth of trunk. In the old capitol of Kyoto the tree is common, and in the courtyard of the Nishi-Hongwanji there is an old tree, much broken by storms and some 15 feet in girth of trunk, which is supposed to protect the temple against fire by discharging showers of water whenever a conflagration in the vicinity threatens danger! In the old 8th century-capital, Nara, and quite near the hotel, there is an extraordinary Ginkgo out of which is growing a Keaki tree (*Zelkova serrata*) with a trunk 8 feet in girth. It evidently originated from a seed planted in a fissure of the Ginkgo-tree by the wind or by a bird. The trees are about equal height (75 feet) and the composite trunk is 15 feet in girth. It is entitled to rank among the marvels of Japan for it looks as if two

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trees had been grafted together. Of course no organic union between two trees representing almost the poles of the vegetable kingdom is possible, but they thrive together harmoniously.

On the massive lower branches of old Ginkgo-trees thick, peg-like structures develop which grow downward and on reaching the ground develop true roots from their apex and give off branches above. The growths are often very numerous and are sometimes as much as from 12 to 16 feet long and one foot in diameter. This phenomenon is rare in China and Korea, but is common in Japan where the growths are styled "chi-chi": that is, teats or nipples. Their true character is not properly understood but evidently they serve to prolong the life of the tree by developing new stems and branches.

From the trunks of old trees many sprouts develop which sometimes form a veritable thicket of ascending stems. If the top of the tree be broken, as frequently happens in the long life of the tree, new shoots arise, grow upward, and make a new crown. The vitality of the tree is marvellous and Mother Nature seems to have endowed it with a thousand and one means of maintaining its existence. I never saw a dead Ginkgo during the twenty years I have travelled in the Far East.

Japanese gardeners raise many seedlings in a pot

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or pan and use them for table decorations, but as a dwarfed tree the Ginkgo is not much in request in Japan.

As far as authentic records go the oldest Ginkgo-trees in this country are the two in Woodlands Cemetery, Philadelphia, which were planted by William Hamilton in 1784. The largest, a male, measures 7 feet 7 inches in girth of trunk, the other is female and measures 6 feet 6 inches in girth. Both are fully 75 feet tall and in vigorous health. Professor Harshberger, to whom I am indebted for the above measurements, thinks the Ginkgo in the old Bartram Garden in West Philadelphia is the oldest and the first planted in America, basing his opinion on the facts that this garden is older than that founded by Hamilton and that the tree is larger, being 9 feet 3 inches in girth. I have told of the old tree on Boston Common, and in the Public Gardens of Boston there are a number of fine trees, the best being 60 feet tall and 7 feet in girth of trunk. In Mount Auburn Cemetery, Cambridge, Mass., there is a handsome specimen, probably planted under the direction of Dr. Jacob Bigelow soon after the cemetery was started, which the Assistant Superintendent, Mr. John Peterson, kindly informs me is about 88 feet high and 7 feet 11 inches in girth at five feet from the ground. Unfortunately the symmetry of the

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tree was spoiled by a storm two years ago which broke off one of the principal branches. In the Missouri Botanic Garden, St. Louis, grows a fine Ginkgo-tree which is about 65 feet tall and 7 feet in girth. Probably the largest and best Ginkgo in this country is at Hyde Park, on the Hudson, New York, which as before stated was planted very early in the 19th century by Doctor Hosack. In a letter, the present owner, F. W. Vanderbilt, Esq., courteously informs me "that it measures 11 feet 2 inches around the trunk two feet from the ground just where the branches begin to spread, 11 feet 1 inch at six inches from the ground, 70 feet spread from tips of branches, and the height from 80 to 85 feet. This tree is in splendid condition and vigorously healthy. It is always perfectly clean and has never had a dead branch on it of even the smallest size and the tree has never required spraying during the 24 years I have been here."

Perhaps the best-known Maidenhair-trees in America are those forming the avenue in the Department of Agriculture grounds, Washington, D. C. There are some ninety trees in the avenue and on the curves of the drive which lead into the avenue. The trees were all planted at the same time but vary greatly in size. The tallest is about 52 feet and a good many of them are about 48 feet in height,

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the average being about 40 feet tall; in girth they vary from $2\frac{1}{2}$ feet to $7\frac{1}{2}$ feet. In the parks of Minneapolis, Minn., the Superintendent, Mr. Theodore Wirth, tells me that the Ginkgo is hardy but that so far they have not found a satisfactory place for it. As to its behaviour in Canada, Mr. W. T. Macoun, Dominion Horticulturist, obligingly informs me that he has "seen very few specimens of this tree in Canada, but we have been growing it here for twenty-five years and there are a few specimens on the grounds of about that age. They are from 25 to 30 feet high, and, although rather slow in growth, may be considered, I think, perfectly hardy although occasionally the tips kill back. So far as I know they are not grown in any colder part of Canada. The winter of 1917-18 was the most trying on both fruit trees and ornamental trees that we have experienced in thirty years, but the Ginkgo was not injured. During that winter it was below zero on fifty-seven days, the lowest temperature being thirty-one below zero, Fahr. We have tested the Ginkgo in our Prairie provinces but it has not proved hardy there." On the Pacific seaboard I do not remember any remarkable trees, and a friend in Oregon to whom I wrote tells me that they do not seem happy in the neighbourhood of Portland.

The first tree to fruit in this country was probably one in the grounds of the Kentucky Military Insti-

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tution, in 1878, and seeds from this tree were sent to the Arnold Arboretum. Trees in Central Park, New York City, have fruited for a number of years past. So, too, have those in Washington, D. C., and others in various parts of the country.

In England the tallest Maidenhair-tree is said to grow at Melbury, Dorchester, which in 1904 was more than 80 feet tall, but the best known example is that in Kew Gardens a male tree, 64 feet 9 inches tall and 10 feet 7 inches in girth of trunk. At Frogmore, one of the gardens belonging to England's King, there is a Ginkgo-tree which in 1904 measured 74 feet in height and 9 feet 3 inches in girth of trunk. At Blaize Castle, near Bristol, there is a tree 68 feet tall and 9 feet 3 inches in girth of trunk in 1906; it is graceful in habit and said to have come from Japan on the same ship with the one at Kew and another in the Bishop's garden at Wells, Somersetshire. In Wales the finest example known is at Morgan Park, Glamorganshire, which in 1904 was about 70 feet tall and 6 feet in girth of trunk.

On the continent of Europe, where the climate is apparently more to the tree's liking, many magnificent Ginkgos may be seen. In the Botanic Gardens at Milan there are handsome specimens; growing in the old botanical garden at Geneva are a male and a female tree planted in 1815; in 1905 the male meas-

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ured 86 feet high and 4 feet 10 inches in girth of trunk and is straight and upright in habit; the female, which bears good seed, is much smaller. It is claimed that the Ginkgo in Europe will live outdoors as far north as Viborg in Finland (Lat. 60° 45' N.) and that it thrives in Riga (Lat. 56° 57' N.). In Norway, in the Botanic Gardens at Christiania, it has grown outdoors on a wall facing east since 1839. In southern Sweden, in Skaone, and on Gothland, it grows well, and in Denmark it thrives in many gardens.

Apart from the typical tree there is a form (*pendula*) with pendent branchlets; another (*fastigiata*) with upright growing branches; a third (*variegata*) has leaves blotched and streaked with pale yellow, and a fourth (*macrophylla*) is characterized by its larger, more deeply cut leaves. The pendulous and upright forms are worth cultivating, but the other two have nothing to recommend them except that they are curious.

This sole survivor of an extensive family in prehistoric periods of the earth's history is quite unique among existing trees. It boasts a whole catalogue of peculiarities and is not closely related to any living family or group in the whole vegetable kingdom. Its leaves resemble the pinnae of the common Maidenhair Fern; its plum-like fruit is not a fruit in the



FIRST (MALE) GINKGO INTRODUCED TO ENGLAND, AT KEW GARDENS

THE GINKGO IS A
LINK WITH THE
LIMITLESS PAST



THE TERRIBLE LIZARD WAS AN INHABITANT OF
THE EARTH IN THE AGE WHERE THE GINKGO
"ELONGS



GINKGO AVENUE AT WASHINGTON, D. C.
ON THE DEPARTMENT OF AGRICULTURE GROUNDS

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true botanical sense of the term but is a naked seed somewhat resembling that of the Californian Nutmeg (*Torreya californica*) or that of the Cycads; it is fertilized by a motile sperm like the Cycads, Ferns, and Club Mosses; its shoots are of two forms like those of the Larches and like them it loses its leaves in autumn. But whilst it possesses these points of similarity it is closely related to none of them nor to anything else, and constitutes a family of its own which forms an obscure connecting link between the Yew family, the Cycads, the Ferns, and their allies. It is hardy in New England as far north as Hanover, New Hampshire, is unaffected by summer drought, and thrives under city conditions as well as in the pure air of the country; it is not known to be attacked by any pest, insect or fungoid, and lives to a great age. It transplants readily when of large size, as the tree on Boston Common testifies. The Japanese think nothing of moving trees 40 feet tall and more than a foot in diameter of trunk. An avenue of Ginkgo-trees of this size was planted in 1914 on the boulevard leading from the terminal station in Tokyo and not one died. However, in this connection it must be remembered that Japan enjoys a more generous summer rainfall than North America does.

At maturity the Ginkgo is a stately tree 100 feet

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or more tall, with a cylindric, slightly tapering trunk sometimes 30 feet in girth at breast height above the ground. Young free-growing trees commonly have their primary branches radiating in clusters (false whorls) from the stem, tier above tier, and the outline of the tree is distinctly spirelike. Very rarely does this habit obtain at ripe old age. Most usually the crown is made up of several massive, ascending and ascending-spreading branches and innumerable irregularly disposed, but more or less horizontally spreading, often semi-pendent branchlets. In such trees the habit is from loosely pyramidal to more or less conical. Round-headed trees are not uncommon but a flat-headed one I have never seen. The branches are rigid and when clothed with leaves decidedly plumose in appearance. The bark on the trunk is from pale to dark gray, somewhat corky, and fissured into ridges of irregular shape. The wood is white or yellowish white and is not differentiated into heartwood and sapwood; it is fine grained, something like that of a Maple, is easily worked but is of no great value. In Japan it is used as a groundwork for lacquer-ware and for making chess-boards and chessmen.

The leaves are quite unlike those of any other tree or shrub and are unique in their fan-like shape; they are stalked, have no midrib but many forked

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veins and no cross veinlets; the apex is irregularly crenate or cut and is usually cleft, more or less deeply, into two or more lobes. In bud the leaves are folded together not rolled up crozier-like as in the Ferns, they are scattered on the long free-shoots and crowded at the apex of the short, spur-like branches. In size they vary from 2 to 3 inches in width on the spurs, but on the free-shoots, and especially those which freely develop from the base of the trunks of old trees, they are sometimes from 6 to 8 inches broad, and are bright, grass-green when young, and dull, rich green at maturity. They are leathery in texture, and in the autumn assume an unvarying tint of clear yellow before they fall. In China the leaves are sometimes placed in books as a preservative against insects. In the Orient the lovely yellow autumn foliage renders the trees most conspicuous, and after the fall of the leaf they are easily recognized by their rather stiff and decidedly stately appearance.

The trees bear either male or female flowers but the two sexes are never found on one and the same individual unless deliberately grafted together. In some books it is claimed that the "male trees are pyramidal and upright in habit, the ascending branches of free and vigorous growth"; that the "female trees are more compact in habit, more

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richly branched below and the branches sometimes becoming even pendent." Personally I have not found it possible to determine the sex of the tree by its habit and the many Japanese, Koreans, and Chinese whom I have questioned on this point assert that it is utterly impossible to do so. Could some reliable means of distinguishing the male from the female trees be found it would be of considerable value, for as an avenue tree the female, on account of the evil smell of its ripe seed, is not desirable, as the people of Washington, D. C., will testify. The flowers are developed from among the leaves at the apex of the spur-like shoots and appear at the end of April or beginning of May; the males in arching catkins, superficially not unlike those of the Oak but rather stouter and less pendent; the females in pairs on the apex of slender footstalks, each flower consisting of a minute, globose little body tipped by a short point and subtended at the base by a cup-shaped swelling. Indeed they are very like the flowers of some Oaks (*Quercus glauca*, a Japanese species, for example). The pollen is scattered by the wind and settles on the tip of the female flower, after which the cup grows up and encloses the globose body. Fecundation takes place early in September, being preceded by many changes within the growing nut-like body which culminate in the development of a

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motile male sperm from the pollen and an egg cell in the female flower. Their union consummates fecundation. The development of the embryo takes place early in November when the seed is full grown, yellow in colour, and ready to fall. Often, indeed, the development of the embryo does not take place until the seed has actually fallen to the ground. If you ask why this essential is so long delayed no answer is forthcoming. Two or three embryos are sometimes developed in one seed. The seeds germinate in the following spring and the manner is very like that of the Oak, the thick, fleshy cotyledons (seed leaves) with their food stores for the developing young plant remain under or on the ground; the primary leaf scales are 3-seriate.

But we are getting ahead of our story for we have omitted to describe the plum-like fruit which, as stated before, is not a true fruit but is a naked seed. It is round, bright orange-yellow, about an inch in diameter, and consists of a thin, outer fleshy layer, like a plum, covering a pointed oval nut from one half to three quarters of an inch long, keeled lengthwise on both sides and having a smooth, fragile white shell enclosing a soft kernel. On or soon after falling to the ground the fleshy covering splits and emits a most offensive, nay, abominable, odour. If the ripe seeds are handled or touch one's clothing

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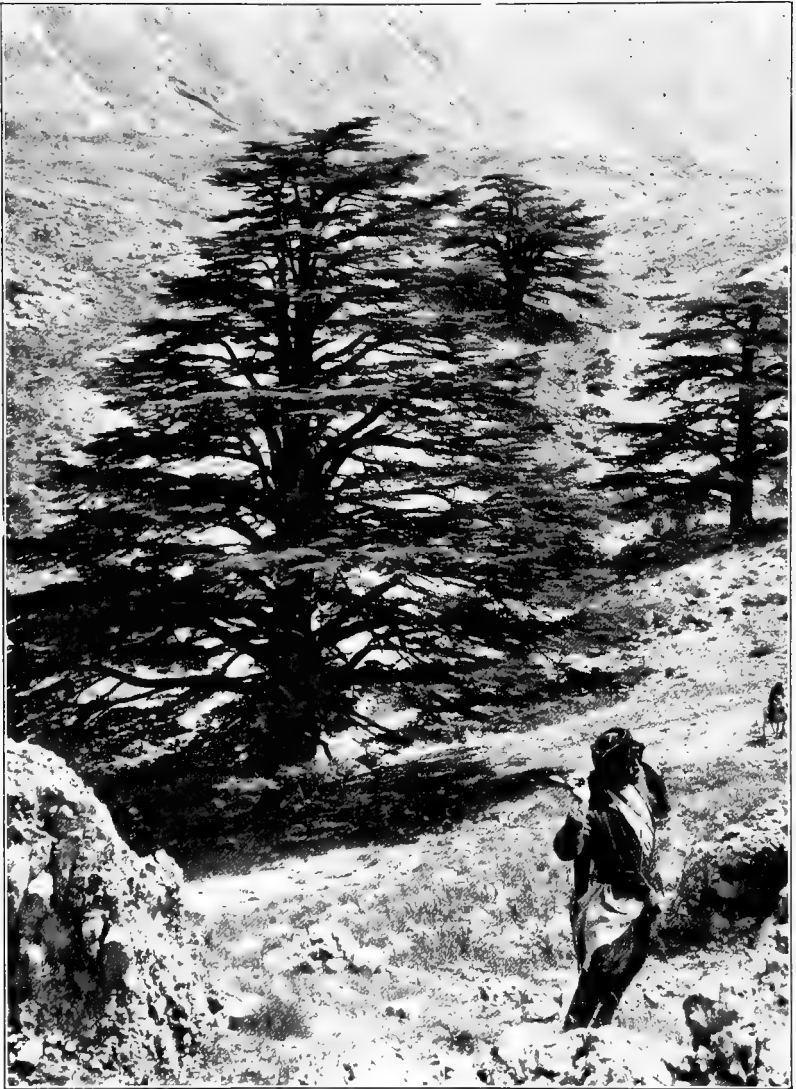
the odour is not eradicated for a day or more. This penetrating offensive smell is due to a peculiar crystallizable, fatty acid, akin to butyric acid, which was first extracted about 1830 and named ginkgoic acid. When extracted it forms tufts of acicular crystals, brownish yellow in colour. It is easily soluble in alcohol or ether and in either case exhibits a strong acid reaction; when heated with a solution of potash it forms a soap-like compound. I do not know if any attempt to use this ginkgoic acid in the arts and sciences has been made.

The nuts, denuded of their offensive pulp and washed, are pure white, and are on sale in most of the market towns in China and Japan and in a less degree in those of Manchuria and Korea. They are known in China as "Pai-kuo" or "Yin-kuo" (white or silver nuts) and, after roasting, are eaten at banquets, weddings, and convivial gatherings generally, being supposed to promote digestion and to diminish the effects of wine. There is told a story of their being introduced, on one occasion at least, by Chinese to a mining camp in north Australia, rubbed with some bad scent to imitate Tonquin beans and sold as such. Their avowed virtue was to destroy moths but for such purpose they and also the true Tonquin Bean (the seed of *Dipteryx odorata*, a tree native of Guiana and belonging to the Pea family) are equally

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worthless. In the Orient these ginkgo nuts are still an important commodity, but formerly they were even more so. Pallas, a famous Prussian botanist, visited the market town of Mai-mai-cheng, opposite Kiakhta in Mongolia, in 1772 and saw there the nuts on sale. They had been brought from Peking.

That the Ginkgo has been closely identified with Buddhist institutions from early times, and by adherents and missionaries of this religion planted wherever they have obtained a stronghold in the Orient, is beyond question. It may not be too much to say that its very existence to-day is due to the adherents of this faith. Very probably they found it in some way associated with Taoism and other forms of nature worship which were current in China when first they established their faith there, and with the tolerant catholicism which characterized the early fathers of this religion, adopted it as their own. But whatever the actual motive which induced the Buddhists and other religious sects to protect and preserve by wide planting the Ginkgo-tree it may safely be inferred that its edible nuts played no unimportant part. The Ginkgo is, in fact, the oldest cultivated nut tree.



A PRESENT DAY REMNANT OF MOUNT LEBANON'S ANCIENT FORESTS

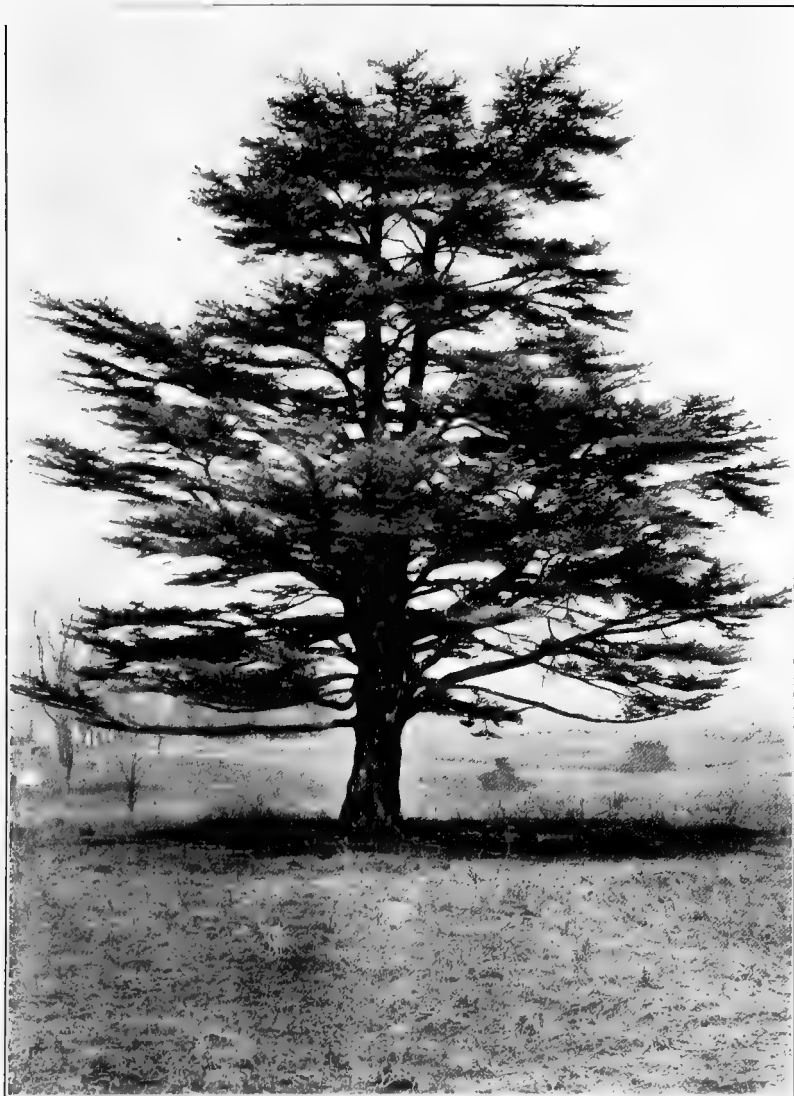


ITS FRUIT OR CONE

"AND SOLOMON DETERMINED TO BUILD AN HOUSE
FOR THE NAME OF THE LORD, AND AN HOUSE
FOR HIS KINGDOM.

"AND SOLOMON SENT TO HURAM THE KING OF TYRE,
SAYING, . . .

"SEND ME ALSO CEDAR-TREES OUT OF LEBANON."



ONE OF THE FEW SPECIMENS IN THE NEW WORLD, AT FLUSHING, N. Y.

"THEN HURAM THE KING OF TYRE ANSWERED IN WRITING, . . .

"AND WE WILL CUT WOOD OUT OF LEBANON, AS MUCH AS THOU SHALT NEED; AND WE WILL BRING IT TO THEE IN FLOTES BY SEA TO JOPPA; AND THOU SHALT CARRY IT UP TO JERUSALEM."

II CHRONICLES, II, I, 3, 8, 11, 16



YOUNG HARDY TREE GROWN FROM CILICIAN TAURUS SEED AT BOSTON, MASS

THE CEDAR OF
LEBANON

CHAPTER VI
THE STORY OF THE CEDAR OF
LEBANON

CHAPTER VI

THE STORY OF THE CEDAR OF LEBANON

“The righteous shall flourish like the palm tree: he shall grow like a cedar in Lebanon.”—PSALM XCII:12.

THE Holy Land has undergone many changes and vicissitudes from early biblical times down to its deliverance from the Turks by General Allenby in October, 1918. The very aspect of the country has changed enormously in the few thousand years of its record as set forth in Holy Scripture. It is true that the “physiognomy” of every country is based primarily on its geological structure, that is on the character and arrangement of its rock masses, but the clothing of its stony skeleton and its numberless modifications of external form and colour are due to its vegetable life.

More than skies and clouds, more than villages or hills, more than sentient creatures of high or low degree, the trees, shrubs, and herbs of a land give character to its scenery; impressing the mind by their grandeur, or charming it by their beauty. De-

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nuded of its vegetable growth the very skeleton of a country changes and decays; even the skies and clouds are altered. How great the changes that have taken place in Palestine we can but faintly imagine, but many of the trees mentioned in the Bible still grow there if in much reduced numbers. On Lebanon grow the Cedars in all their pristine majesty, but vastly fewer in numbers than in the days when Balaam compared the far-stretching encampments of the Israelite tribes in the Jordan valley to "cedar trees beside the waters" (Numbers, chap. XXIV, v. 6).

Whether the word "cedar" in the Old Testament connotes one or many kinds of tree may be left to the biblical critics and Hebraists, but there is ample and unmistakable proof that the Cedar of Lebanon was well known to the Prophets and other teachers of the old Hebrews. By their poets, as every Bible reader knows, the forests of Lebanon Cedars were regarded with sacred awe. They were the type of power and majesty, of grandeur and beauty, of strength and permanence; as "trees of Jehovah planted by His right hand crowning the 'great mountains'"; masterpieces in lofty stature, wide-spreading shade, perpetual verdure, refreshing perfume, and unending fruitfulness. Some of the finest imagery in Old Testament song is drawn from this

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oft-frequented source. The mighty conquerors of olden days, the despots of Assyria, the Pharaohs of Egypt, the proud and idolatrous monarchs of Judah, the Hebrew Commonwealth itself, the warlike Amorites of patriarchal times, and the moral majesty of the Messianic Age, are all compared to the towering Cedar in its regal loftiness and supremacy. Its huge trunk, massive branches, great height, wide-spreading, tabular, densely umbrageous crown, dark green at all seasons, are so well known that they have been condensed into the phrase "cedar-like," in common use to-day by writers who wish to portray the general aspect of certain trees. Further, the colour, character, and peculiar fragrance of the wood frequently mentioned by Old Testament writers lead, both in ancient and modern times, to the name "cedar" being given wide application. To-day it is applied to a variety of trees, some closely and others very remotely related to the true Cedars. In fact, nowadays its use is far too ambiguous and connotes little besides character of wood and perhaps fragrance. It is, however, an unconscious tribute to the reputation of the Cedar of Lebanon so deeply established in the minds of mankind and, perhaps, the most renowned and most venerated natural monument in the world.

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In modern times many distinguished travellers and men of science have visited the Cedar of Lebanon in its home and their story, old yet ever new, has been written over and over again. A Frenchman, Pierre Belon, author of "*De Arboribus Coniferis*," published in 1553, and the first treatise on Conifers ever written, ascended Mt. Lebanon in 1550 and visited the Monastery of the Virgin Mary, situated in a valley below a grove of Cedar-trees where the festival of the Transfiguration was held. Then as now this and other groves belonged to the Patriarch of the Maronites—a Christian sect inhabiting Mt. Lebanon. Belon states that after celebrating High Mass upon an altar erected under one of the largest trees, said to have been planted by King Solomon, the Patriarch threatened with ecclesiastical censure those who presumed to hurt or diminish the Cedars then remaining. Since Belon's time many travellers have visited the Cedars on Mt. Lebanon the most experienced of all being the late Sir Joseph Hooker, the eminent English botanist, who was there in the autumn of 1860. Sir Joseph's visit was for the special purpose of examining the Cedar groves, and in the *Natural History Review*, January, 1862, he published a most interesting account of them.

The elevation of Mt. Lebanon was found to be 10,200 feet and that of the Kedisha Valley where

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the trees are growing 6,200 feet. The whole of this area of Mt. Lebanon is, to quote the article, "a confused mass of ancient moraines which have been deposited by glaciers that, under very different conditions of climate, once filled the basin above them and communicated with perpetual snow which then covered the whole summit. The rills from the surrounding heights collect to form one stream and the Cedars grow on that portion of the moraine which immediately borders the stream, and nowhere else. They form one group about four hundred yards in diameter with an outstanding tree or two not far from the rest, and appear as a black speck in the great area of the corry and its moraines which contain no other arboreous vegetation. The number of trees is about four hundred, and they are disposed in nine groups, corresponding with as many hummocks of the range of moraines. The trees are of various sizes, from about 18 inches to upward of 40 feet in girth; but the most remarkable and significant fact connected with their size and consequently with the age of the grove is that there is no tree of less than 18 inches in girth, that we found no young trees, bushes, nor even seedlings of a second year's growth." Sir Joseph Hooker found only fifteen trees above 15 feet in girth and these all grow in two of the nine clumps. He estimated the age of the youngest

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at about 100 years, and the oldest at 2,500 years, but with no degree of surety.

To-day some five groves of *Cedrus libani* are known on Lebanon, the one containing the oldest trees being on the northern slopes above Bsharri. The largest tree, but not one of the very oldest, is 48 feet in girth, in full growth and vigorous health. In one grove, that of Baruk and the largest, are many young trees in all stages of growth. Several travellers have noted that seedlings spring up readily but are browsed off by goats. With proper protection against these animals, and the forbidding of the people cutting them, these Cedar groves would increase in size and in time become forests, as in the days of King Solomon.

The Cedar of Lebanon is not confined to the mountain of that name but grows also on the Taurus and Anti-Taurus ranges in Asia Minor, from the province of Caria in the west to near the frontier of Armenia in the east. On these mountains it forms a considerable portion of the coniferous forest between 4,000 and 7,000 feet but appears to attain its maximum development on the Cilician Taurus, where the climate is a severe one, the snow lying several feet deep on the ground for fully five months of the year. At least such is the statement of Walther Siehe.

The Director of the Arnold Arboretum heard of this discovery on the Cilician Taurus and commis-

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sioned Siehe, who used to collect bulbs for that grand old gardener, Max Leichtlin, to secure seeds of the Cedar of Lebanon from this cold region. On February 4, 1902, ripe cones were received at the Arnold Arboretum and the seeds sown. They germinated freely and many plants were raised. These Cedars have grown more rapidly in the Arnold Arboretum than any other Conifer has ever done. In fourteen years the tallest was 22 feet high. They passed the winters unscathed until the dreadful winters of 1917-18 and 1919-20 which badly scorched the leaves. This retarded their growth though none died, and now they are again well-furnished with foliage and are growing well. The leaders of many have suffered from the Pine-needle borer but new ones take their place. The experiment is most promising, and certain it is that if the gardens of New England ever enjoy Cedars of Lebanon as hardy trees it will be through the far-sightedness of the Director of the Arnold Arboretum. Under cultivation several varieties of the Cedar of Lebanon have appeared, and the more important are distinguished by such names as *argentea nana*, *pendula*, *stricta*, *tortuosa*, and *viridis*.

The grandest of all forms of vegetation known to the Hebrews, the Cedar of Lebanon has rightly found favour in many lands. It loves a warm, deep, well-drained soil, and it thrives in southern California.

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In England no other exotic tree, perhaps, has been more generally planted for ornamental purposes during the past two and three quarter centuries. Thousands of noble, wide-spreading old specimens are scattered from one end of the country to the other, and they are among the most impressive objects in many stately parks and pleasure grounds. Visitors from this and other lands are familiar with the majestic Cedars on many estates in England. Many specimens have been written about, measured, and photographed, and we can do no more than incidentally mention one or two. Just when the Lebanon Cedar was introduced into England is not clearly known and probably never will be. The evidence available points to that at Childrey Rectory, near Wantage, as the oldest in England. It is claimed that it was planted by Dr. Edward Pocock, who was chaplain to the Turkey Company at Aleppo in 1629 and afterward to the Embassy at Constantinople. Returning home in 1641, Pocock was appointed to the living of Childrey in 1642. In 1903 his Cedar was a handsome tree still growing vigorously, and measured 25 feet in girth five feet from the ground and its spread of branches covered an area of 1,600 square yards.

Wilton House near Salisbury is famed for its Cedars. In 1874 a specimen 36 feet in girth was cut

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down and its annual rings, carefully counted, numbered two hundred and thirty-six. According to this the tree must have been a seedling in 1638, and very probably it is of the same origin as the one at Childrey Rectory. Loudon thought the Cedars in the old Physic Garden at Chelsea, planted in 1683, but now dead, and those at Chiswick House, which are still flourishing, were the oldest in England. One at Enfield is known to have been planted by Dr. Robert Uvedale, Master of Enfield Grammar School, between 1662 and 1670, another, also still living, at Bretby Park, Derbyshire, was planted in 1676.

Among the many noble specimens in England it is difficult to state which is the largest but that at Pain's Hill, near Cobham, figured by Elwes and Henry in their great work "*The Trees of Great Britain and Ireland*" and by them measured in 1904 and found to be from 115 feet to 120 feet tall and 26 feet 5 inches in girth of trunk with a wide-spreading crown and in perfect health, must be counted among them. Another in Goodwood Park, the seat of the Duke of Richmond, was measured in 1906 and found to be about 96 feet tall and 26½ feet in girth of trunk. Goodwood is probably more celebrated for its Cedar trees than any other place in England. There is a record of Peter Collinson in 1761 supervising the planting of a thousand Cedars for the then Duke of

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Richmond. The tallest tree in England is perhaps that on the grounds of Petworth Park which was measured in 1905 and found to be about 125 feet tall and 149 feet in girth of trunk. Another in the Royal domain at Windsor is fully 115 feet tall. The finest avenue of Cedars is that at Dropmore, planted in 1844, but there is some question as to whether they are Lebanon or Atlas Cedars.

In Scotland there are many fine Cedars of Lebanon and some are scarcely inferior to the best in England. Perhaps the finest is that at Hopetoun, the seat of the Marquis of Linlithgow, which in 1904 measured 80 feet in height and 23 feet 8 inches in girth of trunk. In Wales and Ireland the Cedar of Lebanon has not been so much planted and these are very few notable specimens. One at Maesleugh Castle in Wales is said to be about 100 feet tall, $16\frac{1}{2}$ feet in girth, and one at Carton, Ireland, in 1903 was 93 feet high and 14 feet 9 inches in girth and is said to have been the first planted in the country.

On the continent of Europe the Cedar of Lebanon is much less plentiful than in England owing largely to a less congenial climate. The tallest is said to be on the grounds of Madame Chauvet at Beaulieu, near Geneva. It is about 102 feet by 16 feet with a spread of 102 feet. Many incorrect statements have been made as to the date of the Cedar's intro-

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duction to France but it is now pretty well accepted that it was in 1735, by seed carried from England by Bernard de Jussieu, and that the historic tree in the Jardin des Plantes, Paris, is of this origin and was planted in 1736. From this seed was also derived the tree at Beaulieu, and another at Montigny which is considered to be the finest in all France and about $26\frac{1}{2}$ feet in girth of trunk 6 feet from the ground.

In this country, except in California, the Cedar of Lebanon is rarely seen, and no specimens exist comparable with those in England. In the New England States the typical form is not hardy and the winter of 1917-18 played havoc with the odd trees which have existed with a struggle for a number of years. For that matter it did the same with the Atlas Cedar which is the more hardy of the two. In the most interesting "*Memorials of John Bartram and Humphry Marshall*" by William Darlington, published in 1849, on page 67 is printed a letter to John Bartram from Peter Collinson, dated from London on February 12, 1735, in which the following statement occurs: "The Lebanon cone, with a knife carefully pick out the seeds; sow in a box, put large holes in the bottom and cover with shells, in sandy light mould. Let it only have the morning sun." Whether Bartram succeeded in raising plants and if so what

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became of them is not ascertainable. In reports of his historic garden no mention is made of the Cedar of Lebanon.

Some 1,400 miles from the Cedar forests of Asia Minor and separated by the whole breadth of the Mediterranean Sea grows the Atlas Cedar (*Cedrus atlantica*). This forms the prevalent arboreous vegetation throughout the eastern province of Constantine which borders on Tunis. It also abounds on the eastern Atlas ranges according to Hooker. Henry, a more recent visitor, states that "in Algeria this Cedar forms a considerable number of isolated forests, none of them of great extent, at altitudes between 4,000 and 6,900 feet." Likewise it grows on the mountains in Morocco, but its distribution there is still not properly known though it was in this country that this Atlas Cedar was first discovered. Philip Barker Webb visited Tangiers and Tetuan in the spring of 1827, and from a native obtained branches of a Cedar which had been collected on the impenetrable mountains of the province of El Rif where there were said to be vast forests. Webb's specimens are preserved in the museum of the city of Florence, Italy.

The Atlas Cedar differs from that of Lebanon in having a perfectly erect, rigid leader, straight stiff ends to the branches, all which in the Lebanon Cedar droop more or less, shorter leaves and a smaller

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cone. It is also more easy to transplant, and endures exposure and bad soil better than the Lebanon. In this country it is generally considered to be the hardiest of the true Cedars. The Atlas Cedar also grows faster than the Lebanon. The date of its introduction into England is not precisely known, but the oldest recorded tree is one at Eastnor Castle and was raised in 1845 from cones gathered by Lord Somers at Teniet-el-Gaad. In 1906 this tree was 77 feet tall and 8 feet 1 inch in girth of trunk. At Linton Park, Kent, there is a tree 80 feet tall (in 1902) and very glaucous. In Ireland are even taller trees; one at Fota, also of the glaucous variety and planted in 1850, was 83 feet tall and 7 feet 7 inches in girth in 1904. At Carton, the seat of the Duke of Lienster, is a reputed Atlas Cedar which in 1903 was 80 feet high by 9 feet in girth of trunk. In the south of France and northern Italy the Atlas Cedar grows faster than in England. In the public garden at Aix au Savoie there is a grove, planted in 1862, with trees from 90 to 95 feet tall. There are varieties such as *glauca*, *pyramidalis*, *columnaris*, and *fastigiata* which are sufficiently described by the names they bear.

On the principal watershed of the southern ranges in the island of Cyprus grows a third species of Cedar (*C. brevifolia*). This was discovered in 1879, by Sir

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Samuel Baker. Since then it has been found by other travellers in Cyprus and, to-day, it is known to occupy about 500 acres of forest mixed with Pines and broad-leaf evergreen trees. All the Cyprus Cedars discovered are comparatively young and small, the largest measured being about 60 feet tall and 11 feet 6 inches in girth of trunk. This Cedar has a slightly drooping leading-shoot and the ends of the branches are pendent as in the Cedar of Lebanon but the leaves are quite short and the cones are smaller than those of the Atlas Cedar. Seeds were sent to Kew from Cyprus in 1881, but the trees have grown slowly. It is unknown in this country but in all probability would thrive in parts of California.

Eastward from Mt. Lebanon some 1,400 miles are the Deodar Cedar forests of Afghanistan which extend continuously eastward on the Himalayas almost to the confines of Nepal. This Cedar (*C. deodara*) is in India exclusively a western tree; it begins where the influence of the monsoon is much diminished, that is where the climate begins to approximate that of the Levant. Its altitudinal range is between 3,500 and 10,000 feet and from 6,000 to 8,000 feet, and though it grows gregariously it never forms pure forests. The leading-shoots and the ends of the branches are more pendu-

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lous and the leaves longer than those of the Cedar of Lebanon; the cones are the same size, but the cone-scales and seeds are of the same form as those of the Atlas Cedar.

Seeds of the Deodar were first sent to Great Britain by the Hon. Leslie Melville in 1831, and sown at Melville in Fifeshire, at Dropmore, and elsewhere. In 1841 it was introduced in quantity. The finest trees recorded are at Bicton where one in 1902 measured 80 feet tall and 11 feet 8 inches in girth and another 90 feet tall and 9 feet 1 inch in girth of trunk. There are many others in England more than 80 feet tall. In Ireland are specimens approximately as fine; but in Scotland, where it is only hardy in the warmer parts of the country, the tallest recorded are less than 60 feet. There are varieties known by such descriptive names as *albo-spica*, *crassifolia*, *fastigiata*, *nivea*, *robusta*, *verticillata*, and *viridis*.

These four Cedars, differing but slightly one from another yet occupying five distinct geographical areas, present a most interesting problem in plant distribution. Northern Syria and Asia Minor form one botanical province so that the Lebanon groves, though so widely disconnected from the Taurus forests, can be regarded in no other light than as outlying members of the latter. Sir Joseph Hooker in the paper already referred to suggests that in pre-

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historic times the Cedar forests occupied much lower levels and were continuous. He adduces geological evidence to prove that vast changes took place in the Mediterranean basin during Tertiary times, and shows that in the warm period which followed the glacial epoch the vegetation of the lower levels was forced to seek colder situations and so migrated northward and up the mountains. This would bring about the geographical isolations of the Cedar and the differences now apparent between the four species are mere variations fixed and accentuated through time.

Now the Cedars though not so ancient as the Ginkgo are an old type of tree-life. Fossil remains of the ancestors of the present race have been found in the Lower Greensand of England around Maidstone and Folkestone in Kent, and at Shanklin in the Isle of Wight. This Lower Greensand underlies Chalk and belongs to the Cretaceous or Chalk Age, a geological era remarkably prolific in animal life. In this period birds very probably first appeared, the Terrible Lizards of the Reptilian Age disappeared, but a race of extraordinary, serpent-like Reptiles (*Mosasaurus*) flourished. These were long, snake-like animals with pointed teeth, and were furnished with swimming paddles and a long and powerful tail. One species of these astonishing creatures of which

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fossil remains have been unearthed in this country is estimated to have been from 75 to 80 feet in length! The mammals of this epoch were apparently Marsupials like those of Australia to-day. But the important fact from the viewpoint of the Cedars is that Cretaceous rocks agreeing in their lithological and palæontological facies occur in all the Alpine ranges from Provence to Dalmatia, in the Atlas Mountains, in Syria, Palestine, Arabia, Persia, the Caucasus, and the western Himalayas. The Libyan Desert of northern Africa is also floored by Cretaceous rocks though of a different lithological character but apparently of the same age.

In the Tertiary period which succeeded the Cretaceous epoch, Cedar forests composed of one species were doubtless more or less continuous on the mountain ranges throughout the Mediterranean basin and Asia Minor to the western Himalayas. Owing to the tremendous depressions and elevations for which this epoch is remarkable the continuity was broken. During the era of glaciation which ushered in the close of the Tertiary Age the Cedars and all other vegetation were forced to lower levels. When perpetual snows covered the great axis of Lebanon and fed glaciers which rolled 4,000 feet down its valleys the climate of Syria must have been many degrees colder than now; the position of the Cedars

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fully 4,000 feet lower, and the atmosphere much more humid. At the close of the Glacial period the increased temperatures forced the Cedars and other cool-temperate vegetation to seek colder localities and so they migrated up the mountain slopes and northward. Those that failed to do so would be killed, and this would lead to their present-day occupation of isolated sites. On the mountains of Cyprus and on Lebanon, and to a less extent also on the Atlas Mountains of northern Africa and on the Taurus ranges of Asia Minor, the Cedar groves and forests are merely surviving remnants of prehistoric forests of enormous magnitude.

In closing this sketch of the Cedars, their history and geographical distribution, a few brief remarks on the character and usefulness of their wood seem appropriate. It is fragrant, easily worked, and of lasting quality. That of the Deodar is the most important of any timber in northwestern India. It is used in quantity for railway-ties, for bridge-building, for general construction work; also for roofing shingles. That of the Atlas Cedar also is valuable and especially in the ground. The Cedar of Lebanon in England grows rapidly and its wood is of poor quality, but that of the trees on Lebanon is excellent. The subject has been much debated, but the consensus of opinion now is that the wood used in building

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Solomon's temple and by Nebuchadnezzar was in all probability that of the Cedar of Lebanon. It is a known fact that the character and quality of timber are strangely influenced by soil and climate. The Old Testament references afford some idea of the enormous consumption of these noble forest trees. If to these, and the like demands by the Tyrians and others, we add the wanton destruction by invading armies we need not wonder at the diminished glories of Lebanon but rather be surprised that any trees remain.

CHAPTER VII
THE STORY OF THE COMMON YEW

CHAPTER VII

THE STORY OF THE COMMON YEW

THE discovery of gunpowder with the resultant development of arms of precision may at first sight appear to have little to do with the planting of trees in general and with the Yew in particular. As a matter of fact the connection is close. For centuries long prior to the introduction and general use of gunpowder the peoples of the world used bows and arrows, and in temperate regions where grows the Yew the best bows were made of the wood of this tree. Certain simple people like the Ainos of Hokkaido and Saghalien still use the bow in the chase but in general archery is now regarded as a pastime. It is beloved by the Japanese, Koreans, and Chinese; in the West associations and clubs have been founded to preserve this ancient sport and in Great Britain it is a favourite with women.

But if archery be now regarded as merely a healthy pastime its rôle in the grim affairs of human history has been among the greatest. With the story of William Tell every schoolboy of the West is familiar,

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and the appreciation of the skill of this Swiss archer has lost nothing through lapse of time, for, whether fact or fiction, William Tell typifies sturdy patriotism's stand against tyranny and aggression. The long-bow and the cross-bow are famous in history. Were not the battles of Crecy, Poitiers, and Agincourt won by the English mainly with the long-bow in the hands of archers of wondrous skill? Three English kings met their deaths from the yew-bow, and it was the most popular weapon through the internecine Wars of the Roses.

Indeed, in both warfare and the chase the bow was held in exalted estimation long after the invention of gunpowder had paved the way to a complete change in the arms of warfare. In the early days of English history there were in force special enactments for the planting and protection of the Yew-trees. As far back as the 13th century every person not having a greater revenue than one hundred pence was obligated to have in his possession a bow and arrows, and all such as had no possessions but could afford to purchase arms were commanded to have a bow with sharp arrows if they dwelt without the royal forests. Since bows were of so great value in warfare it is not strange that English kings should have made strenuous efforts to plant and protect Yew trees, and to encourage the use of bows by various

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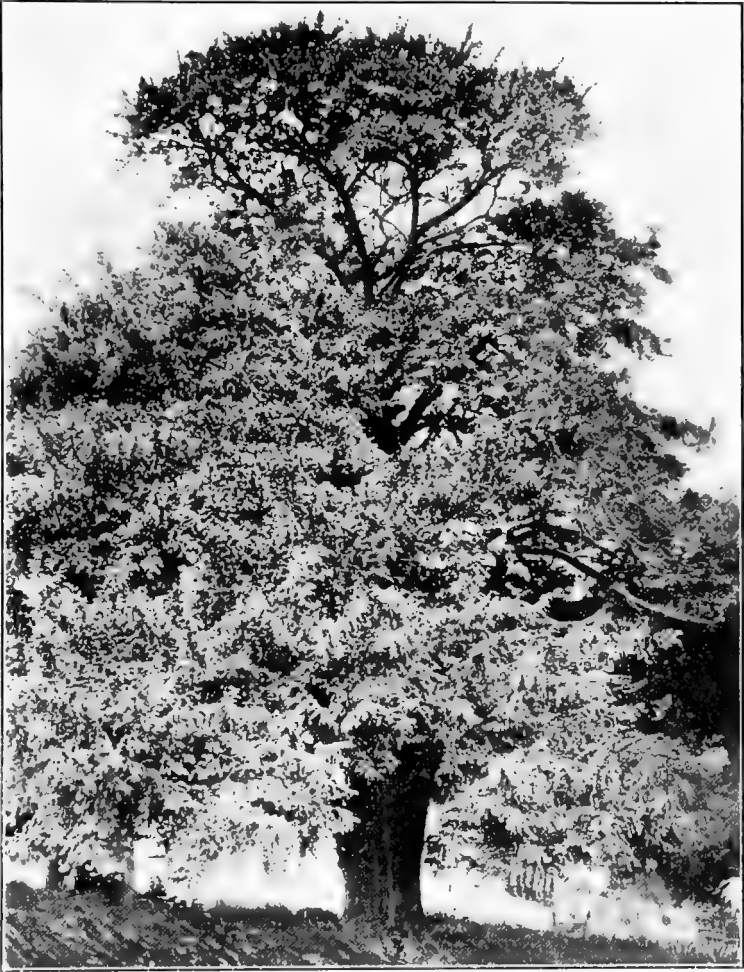
edicts and Acts of Parliament which also regulated their price, making provision for their importation and forbidding their exportation. From the time of Edward IV to quite a late period in the reign of Elizabeth, these Acts continued in force, being renewed by each successive sovereign, and it was not until the latter reign, when firearms came into more general use, that less consideration was paid to the long-bow. A petition from the Commons to Edward IV states that "such bow-staffes as be brought within this Realm, be set now to outrageous prises," and prays that "every tun-tight of merchandise as shall be conveyed in every Carik, Calec, or shipp, iiii bowestaffes be brought, upon pain of forfeiture to your Highness, for lacke of bringing every such bowestaff vi-s. viii-d." The last statute issued with regard to the use of bows is the 13th Elizabeth (cap. XIV) which orders that bow-staves shall be imported into England from the Hanse towns and other places. Through Saxon-Norman-Plantagenet to late Tudor times the yew-bow played a famous part in the national history of England, and no English tree has gathered around itself so much historic, poetic, and legendary lore as the Yew.

The association of the Yew-tree with early English history is varied and important. Venerable trees

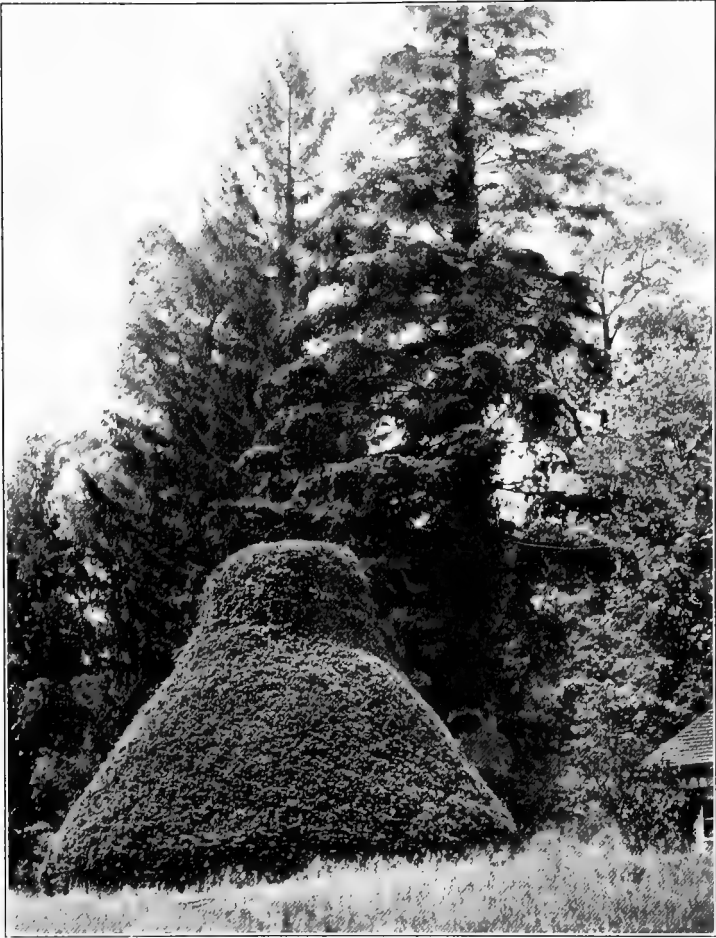
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still mark the spots where great events have taken place, and many are associated with the names of historic personages. The Ankerwyke Yew at Staines witnessed the conference between King John and the English Barons in 1215, and in sight of this tree the Magna Charta was signed. This Yew is $30\frac{3}{4}$ feet in girth of trunk at three feet from the ground and is probably more than a thousand years old. Under the Loudon Yew in Ayrshire it is said that Bruce bestowed the ancient castle and estate on the Loudon family, and on the same spot some centuries afterward John, Earl of Loudon, signed the Act of Union between England and Scotland.

Up and down the length of England are ancient churchyards famed for their magnificent old Yew trees. The reason for the association of the Yew with churchyards has been much debated, and in all probability it is several-fold. It is by no means confined to England but is a custom common in Ireland, and also in Normandy, Germany, and elsewhere on the continent of Europe. That it is a very old one is proved by a statement of Giraldus Cambrensis, who visited Ireland in 1184, and observed the tree in cemeteries and holy places. It has been stated that "the Yew was a funeral tree, the companion of the grave, among the Celtic tribes," but there is no reliable evidence of the abo-



TYPICAL ENGLISH YEW
GROWING AT ASHHURST, KENT, ENGLAND



CLIPPED ENGLISH YEW IN AN AMERICAN GARDEN
AN UNUSUAL PIECE OF TOPIARY, AT CATONSVILLE, NEAR BALTI-
MORE, MD.

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original tribes or the Druids holding the Yew in any esteem. On the other hand, it has been surmised, and with some show of truth, that it was used by the early Roman invaders of Britain in their funeral rites in lieu of their accustomed Cypress and Pine, and it was thus associated with the passage of the soul to its new abode. Certain it is that from very early times it has been used at funerals for the practice is mentioned by many early English writers. Evelyn in his "*Sylva*" says "The best reason that can be given why the Yew was planted in churchyards is that branches of it were often carried in procession on Palm Sunday instead of Palms." As a confirmation of this it is said that the Yew trees in the churchyards of Kent are to this day called Palms, as also in Ireland, where it is still the custom for the peasantry to wear in their hats or buttonholes from Palm Sunday until Easter-day sprigs of yew, and where the branches are carried over the dead by mourners and thrown beneath the coffin into the grave. The Yew being evergreen was in old times considered typical of the immortality of man. Having in mind primitive man's reverence for trees there is good reason to believe that the Yew tree had a part in the Pagan religion of our remote ancestors and that Christian monks later engrafted it on Christianity. While admitting this and other probable causes, a more

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cogent reason for planting Yew trees in churchyards was the necessity for providing a supply of bow-staves for bow-men.

In English history we find many enactments both for planting and protecting Yew trees. Thus there was ordered in the reign of Richard III, 1483, a general planting of these trees for the use of archers. And in the reign of Queen Elizabeth it was enjoined that Yew trees should be planted to insure their cultivation and protection and partly to secure their leaves from doing injury to cattle. With all the efforts the supply was not equal to the wants of the villagers, and there was an enactment put in force providing for a certain number of bow-staves to be imported with every butt of wine from Venice and elsewhere. In Italy, Normandy, and Picardy and other parts of Europe similar laws were in force. Without pursuing this further, certain it is that, no matter what caused their planting, venerable Yew trees are the pride and glory of many old churchyards in western Europe.

In ornamental gardening the English Yew was employed as early as the Tudor times to form hedges, and was pleached and clipped into the forms of grotesque beasts, birds, cones, pyramids, and other fantastic shapes. During the 17th century the taste for this kind of art increased and in the time of Wil-

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liam and Mary reached its highest point. Even to-day in Europe there are many old places and in this country at least one, the Hunnewell garden, Wellesley, Mass., famous for this topiary art, but in general it has rightly fallen into disrepute. Evelyn claims the credit of introducing the Yew into fashion for this work. Quite early topiary had its opponents. Lord Bacon in the 17th century condemned the practice. "I for my part," he says in his *Essays*, "do not like images cut out in Junipers and other garden stuff; they be for children." But it was mainly due to the ridicule thrown upon the practice by Addison and Pope in the 18th century that it fell into disuse. Pope, deriding the fashion, says: "An eminent town gardener has arrived at such perfection that he cuts family pieces of men, women, or children in trees. Adam and Eve in Yew; Adam a little shattered by the fall of the Tree of Knowledge in the great storm; Eve and the serpent very flourishing. St. George in Box, his arm scarce long enough but will be in a condition to stick the dragon by next April; a green dragon of the same with a tail of Ground-ivy for the present. (N. B.—These two not to be sold separately.) Divers eminent modern poets in Bays somewhat blighted to be disposed of a pennyworth. A quickset hog, shot up into a porcupine by its being forgot a week in rainy weather."

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Very many Yew hedges and clipped trees were swept away in the middle of the 18th century by the celebrated landscape gardener, "Capability" Brown. He dealt ruthlessly with all clipped hedges and topiary work, but there appears to have been a natural rebound in the public mind with regard to Yew hedges after the attacks of Addison and Pope and the wholesale manner in which they were swept away to make room for Brown's new style of landscape gardening. The Yew is indeed one of the very best hedge plants in temperate lands. It has been much used for this purpose in England where many famous Yew hedges from 10 to 20 feet high and 9 to 12 feet through may be seen. A Yew hedge is indeed an ornamental adjunct to the flower garden and pleasure grounds for which it not only forms an efficient screen but often produces a picturesque effect.

Though its geological antiquity does not compare with that of the Ginkgo it is probably as ancient as the Cedars. In early Tertiary times, when the elephant and rhinoceros roamed through Britain, Greenland, and the now Arctic regions of this continent, the Yew formed a common ingredient of the forests of those lands. To-day the Yew is found widespread in the temperate regions of the Northern Hemisphere. The family likeness everywhere is very strong, so strong in fact that many botanists con-

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sider all to belong to one species. Under cultivation, however, they behave differently, especially in degrees of hardiness, and there are other and more subtle points of difference which merit recognition. The Arnold Arboretum recognizes eight species with many varieties and forms and, from the garden viewpoint at any rate, this classification is the most satisfactory.

In this continent are found four species—the Canadian Yew (*Taxus canadensis*) which is common in swampy woods and thickets from Newfoundland and Nova Scotia, through Canada to the northern shores of Lake Superior and to Lake Winnipeg, and southward to Minnesota in the west and to New Jersey in the east; the Western Yew (*T. brevifolia*) is widespread, but not common, from the Rocky Mountains in Montana to the Pacific, from Queen Charlotte's Island in the north to the Bay of Monterey in California, but is abundant on the Selkirk Mountains in British Columbia up to 4,000 feet altitude, and on the western slopes of the Sierra Nevada up to 8,000 feet altitude; the Mexican Yew (*T. globosa*), a little-known species which grows on the mountains of south Mexico; and the Florida Yew (*T. floridana*), native of a restricted area extending some thirty miles along the eastern bank of the Apalachicola River in western Florida. In Asia grow four species—the Japanese

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Yew (*T. cuspidata*), which is found from Japanese Saghalien southward through Hokkaido, Hondo, and Shikoku of Japan proper, and on the mainland from the Amur Valley south to the extreme limit of Korea; the Chinese Yew (*T. chinensis*) is scattered through central and western China and also on the mountains of Formosa; the Himalayan Yew (*T. Wallichiana*), which is found between 6,000 and 11,000 feet on the Himalayas from Afghanistan and Kashmir to Assam, on the Khasia Hills, and through Upper Burmah and Malaya to Sumatra and the Philippine Islands; the European Yew (*T. baccata*), which grows on the Cilician Taurus in Asia Minor, in Armenia, the Caucasus, and northern Persia. In Europe this species is more or less common in all mountainous and hilly districts from Lat. 63° 10' N. in Sweden and Norway, in Esthonia, and through Great Britain from Aberdeen in Scotland south, and from Donegal in Ireland south to the Mediterranean; also it grows in northern Africa, and on the Atlas Mountains in Algeria.

The Mexican and Florida Yews have never been introduced into cultivation, and as far as I can discover this is also true of the Himalayan Yew. The Canadian Yew is grown to some extent in New England gardens but, in the open, browns badly in winter, and except as a ground cover in shady, moist places

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has little value. It is said to have been introduced into England in 1800 but has never obtained a place in English gardens. The Western Yew is not cultivated in eastern North America and I do not know that it is on the Pacific Slope. It was sent to England by William Lobb in 1854, but is still a very rare plant in gardens. The Chinese Yew was introduced by myself to the Arnold Arboretum in 1908, and has been distributed, but in New England it is tender and of no value for gardens. In California it will probably thrive and be a useful ornamental tree. The same remark holds good for favoured areas in the British Isles. At its best it is a fine tree 50 feet tall and 15 feet in girth of trunk, with large spreading branches.

In Great Britain and Ireland only the Common Yew and its numerous varieties are grown but in this country both these and the Japanese Yew are available, and for gardens north of Washington, D. C., the latter is the Yew *par excellence*. At Haddonfield, New Jersey, grow two famous trees of the Common Yew which were planted in 1713 by Elizabeth Haddon Estaug, a Quakeress, whose history is partly given in Longfellow's poem "Elizabeth." The circumference of each tree-trunk is about $12\frac{1}{2}$ feet. These have several times suffered from winter storms. It is true that around New York, Philadelphia, and

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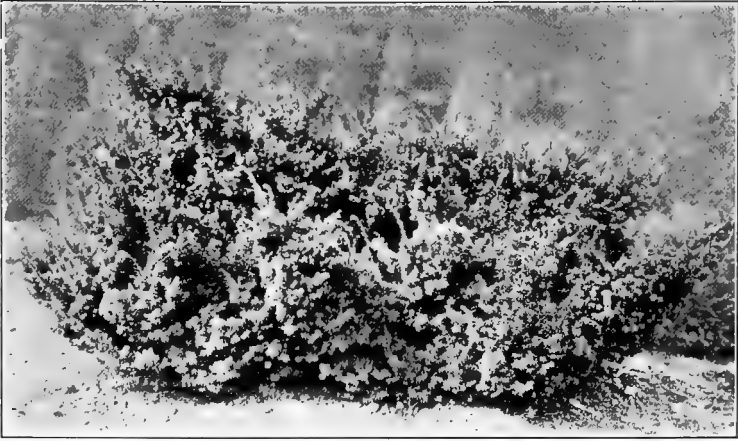
Baltimore, on Long Island, and along the Hudson River, there are large old specimens of the English Yew, but in severe winters they brown badly. In New England this happens nearly every winter and this Yew—except a variety of which mention will be made later—cannot be recommended for gardens. In Virginia there are fine old trees which must have been introduced in the 18th century, if not earlier; in California, in the neighbourhood of San Francisco, the English Yew is a success.

The Japanese Yew was introduced into America in 1862 by Dr. George R. Hall who gave it to Parsons and Company, nurserymen, Flushing, N. Y. It appears to have made slow headway for many years, but it is now becoming well known and its merits as the hardiest of all Yews properly appreciated. It came through the winters of 1917-18 and 1919-20 unscathed in the Arnold Arboretum, and it is known to be hardy as far north as central New Hampshire, and also in Minneapolis, Minn. On Long Island there are a number of fine specimens, so also are there in the Hunnewell Pinetum, Wellesley, Mass., and in the Arnold Arboretum. But undoubtedly the largest by far in America is on the estate of the late Dr. George R. Hall, Bristol, R. I., which is 22 feet high and 120 feet around, but, unfortunately, in poor health.



JAPANESE YEW IN ITS NATIVE LAND

ATTAINS A HEIGHT OF ABOUT 160 FT. AND A GIRTH OF ABOUT 19 FT.



DWARF SPREADING HABIT OF *Taxus cuspidata* var. *nana*



JAPANESE YEW
AS IT IS GENERALLY SEEN IN GARDENS
(*Taxus cuspidata*)

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In Japan *Taxus cuspidata* is found scattered through woods and over the countryside from the south to the extreme north, but is nowhere common. I saw more of it in Hokkaido than anywhere else but even there it is now rare. Its wood is useful for a variety of purposes and lasts especially well underground. Of late it has been used in Japan as pencil-wood. On the central slopes of the Diamond Mountains in central Korea grow more trees and finer specimens than I have seen elsewhere. Scattered through woods of Spruce, Fir, Oak, Birch, and other broad-leaf trees are hundreds of specimens—trees from 40 to 60 feet tall, and from 6 to 10 feet in girth, with large, spreading branches forming handsome crowns. On the Korean island of Quelpaert, in pure woods of Hornbeam, I found the Japanese Yew in bush form to be a common undergrowth. In Japanese gardens it is a favourite as a low, clipped bush, and it is also used as a hedge-plant, but not extensively. It was one of those garden forms (*nana*) that was first introduced into this country and this has been propagated largely by cuttings. It is a low, wide-spreading shrub with short leaves. There is also another form (*densa*) which is a low, compact shrub. When seedlings from these dwarf forms are raised they revert to the tree type. The first tree-forms of this Yew raised in this country were from

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seeds collected in Japan by Professor Sargent in 1892, and the tallest of these in the Arnold Arboretum is now 8 feet high. Quite recently an erect form (*Hicksii*) has appeared in the nurseries of I. Hicks & Son, Long Island, N. Y. As time goes on, and the Japanese Yew is largely raised from seeds, other forms will appear and there is little doubt that it will ultimately produce as great a variety as the English Yew has done. This is a matter nurserymen should pay attention to.

The principal varieties of the English Yew are about a dozen in number, and of these the Irish or Florence-court Yew (var. *fastigiata*) is perhaps the most strikingly distinct and best known. A detailed account of this Yew is reserved for the chapter on upright trees. The Dovaston Yew (var. *Dovastonii*) is another well-known form, and a fine specimen of this grows on the Dana estate, Dosoris, Long Island. This is a tree or wide-spreading shrub with branches arising in whorls and becoming very pendulous at their extremities. The original tree was planted as a seedling about 1777 at Westfelton, near Shrewsbury, England, and is a female tree. There is a form of this Yew (*aurea-variegata*) in which the leaves are variegated with yellow. There is another Weeping Yew (var. *pendula*) which is a low, dense shrub with no definite leader.

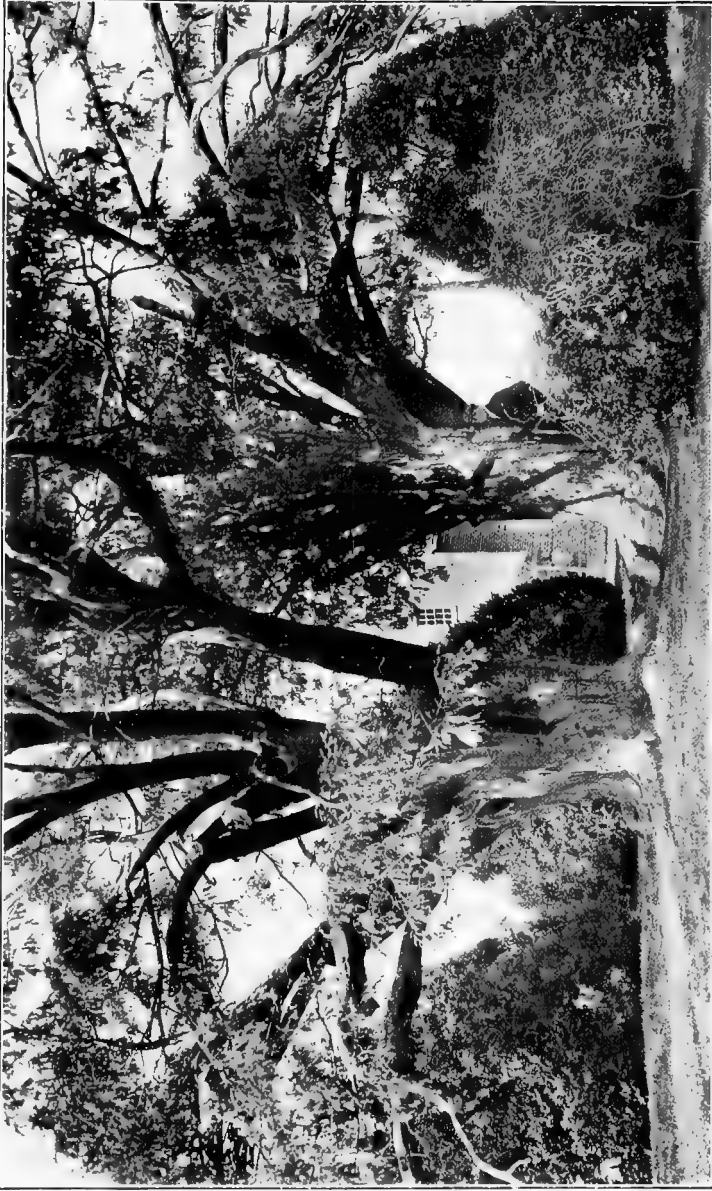
THE COMMON YEW

There are several forms of Golden Yew and one is known to have been growing in Staffordshire in 1686. The best known (var. *aurea*) is a male, a dense shrub or low tree with narrow sickle-shaped leaves which are variegated with yellow. Another good sort is var. *washingtonii*, a low dense shrub in which the leaves on the young shoots are golden yellow. Of low-growing forms there are several including vars. *horizontalis*, *recurvata*, and *procumbens*, sufficiently distinguished by their names. But another dwarf form which is grown in the Arnold Arboretum under the name of *Taxus baccata repandens* is worthy of fuller mention. Its origin is unknown and it is remarkable as being the only form of the English Yew which is properly hardy although it, too, suffered slightly during the winter of 1917-18; it has wide-spreading, semi-prostrate branches and broad, black-green leaves.

There are many other forms of the European Yew differing more or less from one another. These include the Glaucous Yew (var. *glauca*), the Yellow-fruited Yew (var. *fructu-luteo*), and several small-leaved Yews of which var. *adpressa* is very distinct. This variety is a large, spreading bush with densely crowded branchlets having remarkably small, broad leaves not more than one quarter to one half inch long. It is a female, and originated as a chance

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seedling in the nurseries of Messrs. Dickson at Chester, England, about 1826, and is sold under the erroneous name of *T. tardiva*. Of this pleasing Yew there are varieties *aurea* and *variegata*. Altogether fifty or more varieties and forms of the European Yew have received names, and they exhibit the widest possible range of variation in form and general appearance. I forbear mention of more in detail, but I do wish to emphasize the fact that the most distinct forms are of seedling origin, mostly chance finds in a long period of cultivation. So if the Japanese Yew be raised from seeds over a long period, and in separated localities, there will beyond doubt arise just as great a variety of forms of it, and these will find a ready welcome in the gardens of all parts of this country where the seasons are as severe as those in New England. For the region of the Pacific seaboard and other mild parts the English Yew and its forms are well suited, but for the colder parts of this country the Japanese Yew is the only really hardy Yew.



TWO FAMOUS YEWS AT HADDONFIELD, N. J.

SPECIMENS OF ENGLISH YEW PLANTED IN 1713. THE CIRCUMFERENCE OF EACH TREE IS ABOUT $12\frac{1}{2}$ FT.



THE HORSE-CHESTNUT AVENUE AT BUSHEY PARK, ENGLAND
A MILE IN LENGTH AND 170 FT. WIDE; THE TREES SET 42 FT. APART

CHAPTER VIII
THE STORY OF THE HORSE-
CHESTNUT

CHAPTER VIII

THE STORY OF THE HORSE- CHESTNUT

IF A census of opinion were taken as to which is the most handsome exotic flowering tree in the eastern part of the United States there is little doubt in my mind but that it would be overwhelmingly in favour of the Horsechestnut. In England also the same would be true. For no other tree is a day especially set apart in England as is Chestnut Sunday for this famous exotic. According to season it is a rather movable feast but is usually between May 19th and May 26th. From London and its suburbs people journey in thousands to bask in the glory of the avenue of Horsechestnut-trees in Bushy Park on the banks of Father Thames.

The width of the avenue is 170 feet and its length about one mile. It was planted by the celebrated architect, Sir Christopher Wren, in 1699. There are one hundred and thirty-seven trees on each side and they stand 42 feet apart in the line. A quarter of a mile from the Hampton Court Palace end of the

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avenue a round pond 400 feet in diameter, with a noble fountain in the centre, forces the Horsechestnut-trees from line to circle with great enhancement of effect. Some of the larger trees have died and are replaced by young ones, but the show of blossoms is wonderful year after year. The largest trees are fully 100 feet tall and from 10 to 20 feet in girth of trunk, with handsome crowns and branches sweeping the ground.

The tree is so common a feature of the landscape of the British Isles that a majority of the people take it for granted that it is a native tree. With schoolboys it is a great favourite for does it not furnish the seeds used to play the famous game of "Conquerors"? Among my earliest recollections is that of a grove of trees in an ecclesiastical seminary, and much I used to appreciate a generous gift of nuts from the student priests. How carefully one used to bore a hole through them—a horseshoe nail being a favourite tool—dry them afterward, and test their strength in battles with other boys. Some were clever in hardening them by roasting, but, as far as memory serves, mine always burst when placed in the oven. Many a mile do boys in England walk to gather the Horsechestnut seeds and when seven or eight years old my proudest possession was a long rope of them. Young schoolboys can

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scarcely be expected to be interested in trees for their beauty alone. Of fruit as something to eat it is quite a different matter, and I know of no other tree that boys take interest in unless to satisfy their appetite. Deer eat the nuts of the Horsechestnut greedily but cattle leave them alone.

Considering its striking appearance, its handsome flowers, and its general popularity, comparatively little has been written about the tree. No poet or writer of prose has immortalized it in the sense that the Holly, Yew, Weeping Willow, not to mention the Rose, have been immortalized. Some have seen in its prodigality of blossoms and the manner in which they strew the ground a symbol of ostentation, but surely this is harsh judgment. Should it not with more propriety be likened to the exuberance of joyous youth—healthy, carefree, and overflowing with happiness—as schoolboys on holiday? Of all trees the Horsechestnut is most fitting to be regarded as an emblem of vigorous youth. An alien to the parks and gardens of western Europe and to those of this country it came, and by merit of its hardiness, its sturdy growth, and lovely flowers it conquered, established itself among us and holds its own among the wealth of indigenous trees.

In literature and art Greece has given much to the world, and the western world gladly acknowledges the

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debt it owes. It is less generally known that to her many other gifts Greece added the Horsechestnut, but the fact is established after a lapse of three and a quarter centuries. Western Europe's first knowledge of the Horsechestnut was of trees cultivated in Constantinople—just as was the case with the Lilac, most familiar of garden shrubs. The two discoveries almost synchronized. The Lilac was sent from Constantinople to Vienna in 1560. Seeds of the Horsechestnut were sent in 1570 from Constantinople to Vienna by Dr. von Ungnard, Imperial Ambassador to the court of Suliman II, and a tree was raised by the celebrated Clusius. But a Flemish doctor, one Quakleben, who was attached to the embassy of Archduke Ferdinand I at Constantinople, in 1557 first mentioned the tree in a letter to Mattioli as told in the letters, "*Epistolarum medicinalium libri quinque*," published in Prague in 1561. Later Mattioli received a fruit-bearing branch and published the first description of the tree with a good figure of the leaves and fruit on page 212 of his "*Commentarii in libros sex Pedacii Dioscoridis De medica materia*," which was published in Venice in 1565. Mattioli called it *Castanea equina* because the fruits were known as At-Kastan (Horsechestnut) to the Turks who found them useful as a drug for horses suffering from broken wind or coughs. Here then we have the origin of

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the popular name which has remained unchanged to this day. The generic name *Aesculus*, from *esca*, nourishment, was adopted by Linnaeus, but was first given by Pliny to a kind of Oak having an edible fruit. The specific name *Hippocastanum* was also adopted by Linnaeus in 1753, and is the vernacular name latinized. The tree raised in Vienna by Clusius grew rapidly and is mentioned by him, with a good figure of the leaves and fruit and the history of its introduction to Vienna, on page 7 of his work entitled "*Rariorum Plantarum Historia*," published in 1601.

To France seeds were brought from Constantinople by Bachelier in 1615. It was probably introduced to England about the same time, for in Johnson's edition of Gerard's "*Herbal*," published in 1633, it is stated that the Horsechestnut was growing in John Tradescant's garden at South Lambeth. In the original edition, published in 1597, Gerard mentions it as a tree growing in Italy and sundry places of the eastern countries.

In the early struggling days of this country its English settlers found time to introduce many plants of æsthetic value as well as those of purely economic worth. But unfortunately dates are so often lacking that the exact history is seldom available. Were these more ascertainable the romance of familiar garden flowers and crops would be apparent. History in

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general as taught in schools may be as "dry as dust," but the salient historical facts appertaining to the commonplace things of every-day life and acquaintance are rich in interest. And, moreover, their teaching is not without its direct value in present-day affairs. Our ancestors sought food for the body and things of beauty to delight the soul even as we do to-day. We enjoy the results of their labours, and it is our bounden duty to hand them on, and in increasing worth, to the generations that succeed our immediate own. Whether this is done through selfish or altruistic motives it matters not at all in the practical results which accrue. And it will be done though in a measure unconsciously. Improved strains of wheat, pulse, cotton, of Roses and new flowers, of everything which increases the food resources or ministers to the soul have to-day, as they always have had and must ever have, not only immediate but progressive value to the human race.

As we realize what our forbears did under adverse conditions the question as to what we are doing naturally presents itself. After all the present generation is not a slothful, heedless one; selfish and thoughtless it may be but the fault is not deliberate on its part. Ignorance is not yet eradicated neither is it ineradicable, but instruction is needed to-day just as

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it has always been needed. Every father has thoughts for providing toward the future welfare of his children, and if these thoughts tend more to their material advancement in bodily comforts it is not that he wishes to starve their minds. From personal experience every present-day father knows the needs of the one, fewer know the needs of both. As the race develops so a proper appreciation of the needs of body and mind will be attained, and the fact clearly appreciated that mind is greater than matter and its needs even more important. In God's great book of Nature will be found food essential to the full and proper development of the human race. All this may seem to belong more to the realm of philosophy than to the matter of the Horsechestnut, and yet the story of the tree is, after all, the commonplace story of the triumph of the beautiful over the sordid cares of life. And it demonstrates anew the truism that beauty is transcendental.

Thanks to the letters published by William Darlington in his "*Memorials of John Bartram and Humphry Marshall*" in 1849, the story of the introduction of the Horsechestnut into America is on record. Thus page 146, London, September 16, 1741:

"I have sent some Horsechestnuts which are ripe earlier than usual; hope they will come fit for planting." P. Collinson, p. 175; April 16th, 1746:

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“I have some hopes of the Horsechestnut though most of them were blue moulded yet some seemed to be pretty sound.” J. Bartram.

And finally, p. 252, London, August 4, 1763: “But what delights me is, to hear that our Horsechestnut has flowered. I think it much excells the Virginia, if the spikes of flowers are as large with you as with us. To see a long avenue of these at Hampton Court—of trees 50 feet high—being perfect pyramids of flowers from top to bottom, for all the spikes of flowers are at the extremities—is one of the grandest and most charming sights in the world.” P. Collinson.

I have had some experience in sending seeds from distant lands and consider the Horsechestnut among the most difficult to transport safely. I marvel that in those days of slow sailing ships it should have been successfully done. From the lapse of time between Collinson's reply it may be inferred that more than one consignment was sent. But sticking to it does wonders, and to-day we benefit from these grand old plant-lovers' successful efforts. In this one accomplishment they made the American people their debtors and such debts are pleasant to acknowledge and to bear.

So well known is the Horsechestnut that it seems superfluous to attempt a description of the tree.

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It will grow well on sandy or on calcareous soils but luxuriates best in rich, cool loam. Given plenty of room in park or on lawn it will exceed a hundred feet in height and 20 feet in girth of trunk. Its massive branches with their laterals form a splendid oval or bell-shaped crown, and sweep the ground. In spring pyramids, fully ten inches high, of flowers are up-thrust from the ends of thousands of branches. No tree is more prodigal in its wealth of blossoms, and none is more spectacularly beautiful. The petals are erect and tend to curve backward, the stamens—seven in number—and the style are slightly curved and projected forward, and serve as a platform for bees—their chief visitors. On the face of the upper petal are yellow spots which later turn red and are called honey-guides. A closer inspection will reveal other interesting facts. In each thyrsoid inflorescence the upper flowers open first and are potentially male; the lower flowers are perfect, but the pistil matures first and is ready to receive the pollen immediately the flowers open; the stamens in these flowers are at first bent down below the style, later on they move up to its level. We see here a provision for cross-pollination from the upper male flowers and, if this fails, self-pollination is assured by the rising of the stamens in the same flowers. The scent of the flowers is remotely like that of the Haw-

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thorn and is not particularly pleasant. The bright green leaves unfold slightly before the inflorescence appears and are full grown when the flowers are wholly expanded. The leaves are disposed in opposite pairs on the shoots, have a long, stout stalk, and the blade is of from five to seven separate leaflets radiating from a common base like fingers of the hand. When the leaves fall in the autumn they leave prominent scars on the shoots. The winter-buds are large, chestnut-brown, and are covered with resinous scale-leaves and contain next year's shoots in an advanced state including the flowers. If sliced vertically all this may be clearly seen in winter. In spring the buds expand very rapidly as the least observant must have noticed. A whole shoot from 1 to 1½ feet long being fully developed inside of three weeks. These viscid winter-buds are a character of importance. In eastern North America several species of Horsechestnut grow wild. Here they are known as Buckeyes; and is not Ohio the Buckeye State? But all these have gray winter-buds, perfectly free of any suspicion of resin. The Old-World species, of which there are six (one in Japan, two in China, two in India, and one in Greece), and the one which grows wild in California have viscid winter-buds.

The large, nearly globular, fruit with its prickly studded shell is well known. It splits and falls

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when ripe and liberates the seeds which vary from one to three and are glossy, shining brown with a broad pale gray base. The Horsechestnut is easily raised from seeds, grows rapidly, and is readily transplanted. In dry summers and in towns its leaves turn brown early and for this reason, and also on account of its fruit, it is not a good tree for street planting. It is for specimens and for avenues and parks, however, exemplary.

The wood of the Horsechestnut is soft, lacks strength and durability, and is of little or no value. It burns badly and is not much good as fuel. The bark contains gallic acid and a bitter principle, which gives it value as a tonic equalling that of the Willow. The seeds have many uses besides that employed by schoolboys, and the ancient one of the Turks. Their taste is at once mild and bitter and they are rich in starch. Reduced to powder they serve as soap; roasted they are used as coffee; fermented they yield a spirituous liquor which yields alcohol by distillation. The young aromatic buds have been substituted for Hops in the manufacture of beer. During the Great War the nuts were tried in England for the preparation of acetone by the fermentation process, and it was considered that the difficulties attendant on their use for this purpose were in a fair way of being surmounted when the armistice was signed.

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Until comparatively recently the Caucasus, Persia, northern India, and Thibet were variously given as the supposed home of the Horsechestnut. On the authority of Doctor Hawkins, Siphthorp in his "*Flora of Greece*" published in 1806, states that this tree is wild on Mt. Pelion in Crete but later investigations have decided that it was only planted there. Trees introduced into Greece by the Turks are always found in the neighbourhood of towns, and it is doubtful that the ancient Greeks had any knowledge of the Horsechestnut. For centuries the native country of this tree was a matter of doubt and the question was not settled definitely until 1879, when Theodor von Helldreich published a full account of it. It is now known to be wild on the mountains of Thessaly, Epirus, and other parts of northern Greece. In 1897 it was found growing wild on precipices in the district of Janina in Albania, below the lower limit of the coniferous belt.

Quite naturally in a tree so long cultivated several varieties have been detected and perpetuated by vegetative propagation. Among the most distinct are the varieties *pyramidalis*, *umbraculifera*, *tortuosa*, and *pendula*, sufficiently described by their names. A form with leaflets incised into narrow lobes has been distinguished as var. *laciniata*; another with short-stalked, yellowish variegated leaves suggests a diseased condition and ought to be discounte-

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nanced. A variety with double flowers (var. *flore-pleno*), however, has merit since the flowers last longer than those of the type, and as it bears no fruit it may be planted where the type is objectionable. In 1822, near Geneva, a Mr. A. M. Baumann discovered on an ordinary Horsechestnut-tree a single branch which bore double flowers. This branch was propagated by the Bollweiler Nursery in Alsace, and this is the source of all the plants of the double-flowered variety in cultivation.

Of the other Horsechestnuts in the world it is not my intention to tell. A Chinese species is planted sparingly in temple grounds in Peking. The Japanese species grows to as large a size and is no less beautiful than the common species. Several of the eastern American species have coloured flowers from yellow to orange and dark red. Also, there are hybrids between the American and Grecian species and two of these (*carnea* and *Briotii*) are strikingly beautiful. But my theme concerns the Common Horsechestnut, the favourite of the schoolboy, one of the most accommodating of all trees, hardy, quick-growing, floriferous; perhaps the handsomest of all the trees of the north temperate regions, familiar to all, a tree of beauty, a joy to behold—*Aesculus Hippocastanum* L.



THREE GLORIES OF THE HORSE-CHESTNUT

ONE OF THE MOST DECORATIVE OF ALL TREES,
IS EQUALLY EFFECTIVE IN TRACERY OF BRANCHES,
IN SPECTACULAR FLOWER AND IN FULL LEAFAGE
(*Aesculus Hippocastanum*)



TWO POPULAR ASIATIC MAGNOLIAS

THE YULAN (*Magnolia denudata*), AND ITS HYBRID (*M. Soulangiana*)

CHAPTER IX
THE MAGNOLIAS

CHAPTER IX

THE MAGNOLIAS

THE group it is intended to discuss here is remarkable in having the largest flowers and largest undivided leaves of any group of trees hardy in this climate. The American species all flower after the leaves are developed and are among the handsomest of native trees. There are Asiatic species which blossom after the manner of the American kinds but only three of these are common in gardens. The Asiatic members which produce their blossoms before the leaves unfold are, however, familiar and popular garden plants. Magnolias grow wild in the eastern United States and in eastern Asia from Japan westward to the Sikkim and Bhutan Himalayas, having their northern limit in Hokkaido and their southern in Malacca and Pinang. In all some 34 species and numerous varieties are recognized; but only 12 species, several hybrids, and about half-a-dozen varieties have proved hardy as far north as Boston, Mass. The Japanese, with two exceptions (*M. salicifolia* and *M. Watsonii*), are hardy here; like-

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wise the American species except the noble evergreen *M. grandiflora* and the dwarf *M. pyramidata*. None of the Himalayan nor the Malayan species can be grown out of doors in New England, and of the Chinese two species only. Yet these two with their numerous forms and hybrids are, with the Japanese *M. stellata*, the familiar Magnolias of our gardens.

In our second chapter the Magnolia is mentioned among the types of trees which in earlier geological ages were found widespread in north temperate regions. It is, in fact, an ancient type, and its members to-day are a mere remnant of a very extensive group of north temperate forest trees which formerly grew in Europe, Siberia, western North America, Canada, and Greenland. Though much less ancient than the Ginkgo, the Magnolias had in early times a similar distribution and fossil remains are common in Tertiary lands of the Northern Hemisphere.

I hope readers will not tire of these historical facts which are necessary to the proper appreciation of the types here selected. I do not wish them to be deemed "dry-as-dust" facts, but tangible proofs of the venerable character and of added interest to whatever appreciation we may hold these trees in. I want readers to look upon these types as examples of forest growth that have long and nobly played their part in the world's history, and to think of them as we do

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of old art treasures—as things to be proud of and grateful for their having been preserved for our edification and enjoyment. And not for ours alone but for that of the generations which come after us. A nation's finest trees should rightly be counted among its most prized national treasures; but of the countries of the world to-day Japan alone regards ancient trees as a national treasure asset! Such they truly are, and there is no escape from the punishment Nature metes out to lands whose forest growth is destroyed. In this country the price is being exacted, and in countries like China and Korea the multiple interest is so great that the lands groan beneath the burden. With no trees to hold the soil on steep slopes when heavy rains fall, rivers become charged with silt, break their bounds, and destroy everything within their reach—crops, villages, and inhabitants.

No other genus of hardy or half-hardy trees and shrubs can boast so many excellences as the Magnolias. The free-flowering qualities and great beauty of blossoms and foliage are only equalled by the ease with which they may be cultivated. As a single specimen in a conspicuous position on the lawn the Yulan and its hybrids are unrivalled, and as an avenue tree the Cucumber-tree (*M. acuminata*) is hard to excel.

All Magnolias grow naturally in moist, rich woods

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and they detest drought. They will withstand considerable hardship and abuse, but the best results are obtained when they are protected from strong winds and are planted in cool, deep soil, rich in humus. An ideal place is open, moist woods. In northern gardens the best time to transplant Magnolias is late in the spring. They may also be moved successfully in late August, but at either season they must not be allowed to suffer from lack of water, and it is advisable to mulch them with well-decayed manure. These are practical items of the highest importance which no aspirant to success can afford to neglect. Moreover, such magnificent garden plants are worthy of a little extra attention and repay it a hundred-fold.

The most delightful of American Magnolias hardy in New England is the Sweet Bay (*M. virginiana*, better known as *M. glauca*). In the North this is never more than a large bush or small tree, but in the South it is often quite a large tree from 50 to 70 feet tall and from 6 to 10 feet in girth of trunk. It has dark green shining leaves which are silvery-white on the underside; in shape they are oblong to somewhat oval; they are leathery in texture, and in moist, sheltered places the plant is sub-evergreen. The bark on the young shoots is a rich apple green and on the older branches it is gray. The flowers

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are small, cup-shaped, creamy white, gradually acquiring a pale apricot hue, and are delightfully fragrant, scenting the whole neighbourhood. They continue to open in succession from about mid-June until August when the red fruit cones begin to show in marked contrast against the dark, glossy green foliage. The roots yield a yellow dye. According to Emerson, the plant affords a good tonic and warm stimulant, and it was formerly used with great success in chronic rheumatism, in intermittent fevers, and particularly in fever and ague. The Sweet Bay grows wild in swamps, and is found in Essex County, Mass., and from Queens County, Long Island, to Louisiana and eastern Texas. There is not a more delightful North American shrub to plant in gardens, not one that will give larger returns in beauty and fragrance. It is an old garden plant, having been discovered and introduced into Europe before the 17th century, yet it is unknown to most American planters of this generation. In eastern Florida there is said to grow a dwarf form (var. *pumila*) which does not exceed 3 or 4 feet in height. A hybrid (*M. major*, better known as *M. Thomsoniana*) between the Sweet Bay and the Umbrella-tree (*M. tripetala*) has the general appearance of *M. virginiana*, but has larger leaves and larger flowers.

The most stately of the hardy American Magnolias

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is *M. acuminata*, the Cucumber-tree, so called from the slight resemblance borne by the young fruits to a small cucumber. It is a tree from 70 to 90 feet tall with a stout trunk and ascending-spreading branches forming a bold, broad-pyramidal crown. The leaves are from 6 to 10 inches long, oblong and pointed, green on both surfaces, and slightly hairy below. The flowers are erect, cup-shaped, glaucous-green tinged with yellow, and are slightly fragrant. It is hardy as far north at least as Hanover, New Hampshire, and is found wild from southern Ontario and western New York to Ohio and southward. A shapely, free-growing tree it is eminently suitable for avenue planting and as a specimen tree on lawns and in parks. It was one of the trees introduced into Europe by the famous John Bartram who sent it in 1746 to Collinson in London, with whom it flowered for the first time on May 20, 1762. There is a form of the Cucumber-tree (var. *aurea*) with yellow leaves slightly streaked and mottled with green.

Somewhat similar to *M. acuminata* is the Yellow-flowered Cucumber-tree (*M. cordata*) whose history is quite romantic. It was originally discovered by the French botanist and traveller, Michaux, in the neighbourhood of Augusta, Georgia, sometime between 1787 and 1796 and by him (or his son) immediately sent to France. All the trees now in gardens have

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been derived from the original introduction. Many efforts to re-discover this tree were made but all failed until six years ago when Mr. Louis A. Berckmans accidentally happened upon it in a dry wood some eighteen miles south of Augusta, Georgia.

Michaux described it as a tree from 40 to 50 feet tall but the recent discoveries are bushes from 4 to 6 feet high. As we know it in cultivation Michaux's plant is a medium-sized tree with a shapely, rounded crown, and broadly ovate leaves, more or less heart-shaped at the base, and hairy on the underside. The cup-shaped, faintly odorous flowers are yellow, about 4 inches across, and have the inner petals frequently marked with reddish lines. It flowers freely about the beginning of June and in wet seasons bears a second crop of flowers in late July and August.

Most remarkable is the Great-leaf Magnolia (*M. macrophylla*) which has the largest undivided leaves of any tree hardy in the gardens of the north temperate regions. The leaves are sometimes as much as $3\frac{1}{2}$ feet long and from 8 to 9 inches wide and are obovate-oblong, narrowed and heart-shaped at the base, and hairy and white on the underside. The flowers open about the end of June and are from 8 to 12 inches across, bowl-shaped, fragrant, white with a purple blotch at the base of the inner petals. It is

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not a large tree, seldom exceeding 40 feet in height with a trunk about 3 feet in girth. It attains its maximum development in sheltered valleys and forest glades on the limestone of North Carolina. A rare tree in a wild state, it is distributed from North Carolina to central Florida and westward to southeast Kentucky and eastern Mississippi and southward to central Alabama. It is another discovery of the elder Michaux who found it in North Carolina in 1789 and introduced it to European gardens the following year. Naturally with such huge leaves it requires protection from the wind and should be planted in a cool, sheltered place. It is hardy in the Arnold Arboretum and at Rochester, New York, where there are fine old trees in the Elwanger and Barry Nursery. Such a wonderful tree is worthy of the widest recognition among garden lovers.

Ranking next in size of leaf to the above is the Umbrella-tree (*M. tripetala*) which has leaves from $1\frac{1}{2}$ to 3 feet long, obovate-lance-shaped, tapering at both ends, and clustered at the end of the shoot. The flowers are white, slightly scented, and from 5 to 8 inches across. The Umbrella-tree seldom exceeds 40 feet in height, and grows wild from York and Lancaster counties, Pennsylvania, along the Alleghanies to Virginia and Kentucky. It is an old denizen of gardens, having been introduced into Eng-

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land about 1750 where it flowered the first time on May 24, 1760.

The first of the American Magnolias to open its flowers each year in Massachusetts is *M. Fraseri*, the Ear-leaf Umbrella-tree. It is native of the south Appalachian region but is quite hardy in the Arnold Arboretum. A small tree, rarely more than 40 feet tall, it has an open crown of long branches, foot-long leaves, oblong-obovate and spatulate in shape, deeply cleft at base, green above and glaucous below. Its flowers, which are very conspicuous by reason of their standing well above the end of the branches, are creamy white, sweet scented, and from 8 to 10 inches across; they open about the end of May. This tree was discovered by W. Bartram as long ago as 1776 and introduced into Europe about 1786 by John Fraser.

Closely related to the above but smaller in all its parts is *M. pyramidata*, which grows wild in the extreme southwestern corner of Alabama and adjacent Florida and is not hardy in the Arnold Arboretum.

We have now mentioned all the deciduous Magnolias of this country and it remains to say a few words about the Bay Laurel or Bull Bay (*M. grandiflora*), the noblest evergreen, broad-leaf tree of the Northern Hemisphere. It is native of the warm Southern states and unfortunately cannot be grown

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out of doors in northern latitudes. It is worth a journey to Louisiana to see this tree luxuriating on its native heath where it is sometimes 100 feet tall and 12 feet in girth of trunk. It has many relatively short, spreading branches which form a bell-shaped crown. The leaves are of good size, glossy green above, gray to rust-red on the underside. The flowers are cup-shaped, fully 8 inches across, white fading to cream with a rather heavy spicy odour. Like other American Magnolias it was early introduced into Europe; it was in England in 1737 but is only properly hardy in the most favoured parts of that country. The Bay Laurel is one of the few American trees that have been introduced to the Orient. In the Public Gardens, Shanghai, there are several shapely trees, and in Japan it grows well in Yokohama, Tokyo, and places to the south. In Europe a great many seedling forms have appeared differing in trivial characters, chiefly those of the leaf. The most marked are varieties *angustifolia*, *ferruginea*, *lanceolata*, and *obovata*.

The Asiatic Magnolias, or rather the few hardy species that open their blossoms before the leaves unfold, are the most popular members of the family and the most conspicuous of spring-flowering plants. Two of these are great favourites with the flower-loving peoples of China and Japan where one—the

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Yulan—is known to have been cultivated for more than thirteen centuries. Its flower is regarded as a symbol of candour, and in paintings, porcelains, and embroideries it has been portrayed by all the best oriental artists.

The typical white-flowered Yulan (*M. denudata*, more generally known as *M. conspicua*) was introduced by Sir Joseph Banks from China into England in 1789. It grows wild in moist woods in the central parts of China, though this fact has only recently been made known. This form, however, is rare in a wild state, and that most usually found has rosy or reddish-pink flowers and is very like the *M. Soulangiana* of gardens. This coloured variety has likewise been long cultivated in China and Japan; in the latter country it is known as “Sarasa-rence” and in Japanese nursery catalogues as *M. obovata* var. *discolor*; correctly it should be *M. denudata* var. *purpurascens*. In 1900 I introduced this variety by means of seeds collected from wild trees in central China, and the plants are now flowering in England. However, I strongly suspect that it has been growing in western gardens for a much longer period under some other name and its identity obscured.

Both the white and coloured varieties of the Yulan are handsome trees fifty feet tall with a trunk 8 feet in girth and ascending-spreading branches.

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Such trees I have seen in the forest of central China laden with thousands of flowers, and the spectacle they presented will never be forgotten. In the gardens of eastern North America examples of the white Yulan from 20 to 25 feet tall are known and it is a deservedly popular tree. In regard to this Magnolia and also the one next mentioned a point worthy of remembrance is that they have been propagated vegetatively, by layering and grafting, for we know not how many centuries. This does not appear to have impaired their constitution and accounts for plants less than a yard high flowering profusely.

Less hardy than the Yulan but a great favourite in gardens south of Philadelphia is the Purple-flowered Yulan, commonly known as *M. obovata*, *M. purpurea*, or *M. discolor* but correctly as *M. liliflora*. It was introduced from China into England in 1790 by the Duke of Portland but has not yet been discovered in a wild state. It appears to be always a shrub, and its handsome flowers vary somewhat in colour, the finest being a rich wine-red.

Under cultivation in Europe several hybrids between *M. denudata* and *M. liliflora* have originated and have proved themselves hardier and even better garden plants than their parents. The oldest and best known of these hybrids is *M. Soulangeana* which originated near Paris. It is a vigorous-growing tree

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with flowers suffused with rose colour. Many fine examples grow in this country and at Hampton, near Baltimore, Maryland, there is a specimen with a trunk 8 feet in girth. Very similar to this are forms known in gardens as *M. speciosa*, *M. superba*, *M. cyathiformis*, *M. Alexandria*, *M. spectabilis*, and *M. triumphans*. Quite distinct is *Magnolia Lennei*, with its large blossoms, the outside of the petals of which are port-wine coloured at the base, and rich crimson toward the tips. It is a late-flowering kind which originated as a seedling in Italy, and is regarded as a natural hybrid of the two Yulans. Perhaps the finest of all these hybrids is that known as *M. rustica rubra*, with its large, cheery, rose-red flowers each petal of which is edged with white. It is a chance seedling supposed to be from *M. Lennei* and originated in a nursery in Boskoop, Holland, some twenty-five years ago.

The Japanese *M. kobus* is common in the forests throughout the greater part of Japan. The southern and typical form is a large bush or low tree, but the northern form (var. *borealis*) is a fine tree from 60 to 75 feet tall, broad-pyramidal in outline with a smooth trunk 6 feet in girth. This variety is the most northern of all Magnolias and was introduced into this country by Mr. W. S. Clark in 1876 and later was sent to Europe. It has proved to be the

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most free-growing of its group, and trees raised from the original seeds are now 35 feet tall with broad, pyramidal crowns. This *Magnolia* first produced flowers in the garden of Professor Sargent, Brookline, Mass., in April, 1899. The blossoms are pure white, cup-shaped, and smaller than those of the Yulan. On young trees the flowers were sparse but with age it has proved to be as floriferous as any other *Magnolia*.

The first of all *Magnolias* to open its flowers each spring is the lovely *M. stellata*, to my mind the most charming of all. It is always a broad, shapely shrub from 10 to 15 feet high and more in diameter; the star-shaped, snowy blossoms are smaller than those of other species but are produced in such profusion as to cover the bush with white. We owe this *Magnolia*, one of the most beautiful and most satisfactory of hardy spring-flowering shrubs, to Dr. George R. Hall who brought it from Japan in 1862 and gave it to Mr. S. B. Parsons, Flushing, Long Island. It was distributed as *M. Halliana* and it is a pity that the rule of priority prevents the use of a name which would so worthily commemorate its introducer. In addition to the type there is a pink-flowered form (var. *rosea*) which makes a delightful companion to it.

There are in Europe several other Asiatic *Magnolias* which flower before the leaves but only two of



MAGNOLIA FLOWERS

BULL BAY (*M. grandiflora*), ABOVE
YULAN (*M. denudata*) BELOW

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them (*M. Campbellii* and *M. salicifolia*) have so far borne blossoms. The first named is native of the Outer Himalayas between 8,000 and 10,000 feet, and in flower is one of the most gorgeous of all northern trees. It has scented, cup-shaped blossoms from deep rose to crimson in colour and 10 inches across. It has not proved hardy in Europe save in one or two favoured places in England where it has produced rosy-pink flowers. In this country I have not heard of any one succeeding with it, though in the South and on the Pacific seaboard there are places where it should thrive. Certainly such a strikingly beautiful tree ought to be given a fair trial. Rivaling the Himalayan treasure, however, is *M. Sargentiana*, which I discovered and introduced in 1908. It is growing in France and England but has not proved hardy in the Arnold Arboretum. The other species (*M. salicifolia*) is Japanese and is distributed on the mountains from Kyushu to northern Hondo, and was introduced into this country by Professor Sargent in 1892. It is a slender tree with small, cup-shaped white flowers and narrow, thin leaves. The shoots when bruised emit a strong smell of camphor, in fact when I first found it wild I took it for some member of the Camphor family. Somehow this plant has not taken kindly to cultivation though it has flowered in the arboretum of Mr. T. E. Proctor,

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Topsfield, Mass., and in the Cottage Gardens Nursery, Long Island. It is essentially a woodland plant, delighting in moist slopes and quite likely, if we could get it properly established, all would be well.

Finally there are the Asiatic Magnolias which open their flowers after the leaves unfold, in the manner of the American species. Of these, three only are in cultivation in this country, but none is well known. The most striking is *M. obovata*, more generally known as *M. hypoleuca*, which in general appearance resembles the American *M. tripetala*. It is widely distributed in forests of Japan from the south to the north and is known as the "Honoki." At its best it is a tree 80 feet tall and 7 feet in girth with smooth gray bark and a shapely crown of stout branches. The leaves are from a foot to a foot and a half long by half this width in the broadest part, which is above the middle, and are deep green above and silvery beneath. Its flowers are bowl-shaped, 6 to 8 inches across, milk-white fading to apricot with a ring of red-purple anthers, and are heavily fragrant. It has very large cone-like fruits which are bright scarlet when ripe and very conspicuous. This Magnolia is an important timber tree in the forests of Hokkaido, and with *M. kobus* var. *borealis* reaches the most' northern geographical limit of the

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family. Like a number of other valuable plants it was first introduced into this country and afterward into Europe where it flowered for the first time in the garden of Mr. B. E. C. Chambers at Grayswood Hill, Haslemere, Surrey, in June, 1905. Closely related to the Honoki is a Chinese species (*M. officinalis*) which is growing in England from seeds which I sent there in 1900, but has not proved hardy in the Arnold Arboretum. In China, the bark and dried flowers of this Magnolia are a highly valued tonic medicine.

A Magnolia whose beauty fascinated me in the forests of Korea is *M. parviflora*, which also grows in southern Japan. Its snow-white flowers are egg-shaped in bud and bowl-shaped with infolded petals when expanded, and have scarlet stamens and long stalks. The specific name is misleading for the flowers are from 4 to 5 inches across. It is a large bush often 20 feet high, of straggling habit, with ovate leaves from 3 to 6 inches long by from 2 to 4 inches wide, and is remarkably floriferous. It delights in rocky, granite country and is especially happy by the side of forest streams. On the Diamond Mountains in northeast Korea, where the winter temperature is more severe than in Massachusetts, this lovely Magnolia is a feature, and I have hopes of this Korean form being a better garden plant than the Japa-

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nese one now in cultivation. There is also in Japan a form (*plena*) with semi-double flowers. Growing and blossoming in European gardens but not hardy here is *Magnolia Wilsonii* which is closely akin to the above. This I discovered and introduced in 1904, and again in 1906, together with several other Magnolias.

Of mysterious origin is the Japanese *M. Watsonii* which was introduced into Europe by the Yokohama Nursery Company at the Paris Exhibition in 1889. The plant was purchased and taken to Kew Gardens where it flowered the following year. It has not been discovered in a wild state and I am inclined to regard it as a hybrid between *M. obovata* and *M. parviflora*, but against this view must be stated the fact that it is much less hardy than either of the above. Very likely it will some day be found wild in the island of Shikoku or some other part of southern Japan. Its leaves are rather larger and thicker in texture than those of *M. parviflora*; its open, cup-shaped, white flowers with blood-red stamens have a strong spicy odour and are short stalked, and about 6 inches across.

These are all the Magnolias found in gardens of the cool-temperate parts of this country, but in the South *M. coco*, better known as *M. pumila*, is here and there cultivated. This is a shrubby southern China species with elliptic, wavy, rather leathery, glaucous

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leaves and sweetly fragrant, nodding, egg-shaped flowers. It was introduced into England as long ago as 1786 by Lady Amelia Hume who had a garden at Wormley Bury in Hertfordshire, where she cultivated with success many rare and beautiful plants.

Of the evergreen Asiatic Magnolias only one species calls for mention here. That is *M. Delavayi* which has pointed, leathery leaves, dull green above and pale below, and in size larger than those of any other evergreen that can be grown in cool-temperate lands. It should be an excellent tree for the Pacific seaboard and for the South. The flowers are fragrant, white, cup-shaped, from 6 to 8 inches across, and are followed by large, red, cone-like fruits. A native of Yunnan, southwest China, it is a broad, much-branched tree fully 50 feet tall. I had the pleasure of introducing this Magnolia to English gardens by means of seeds sent in the late autumn of 1899. Plants raised from them flowered for the first time in Kew Gardens in 1908.

CHAPTER X
THE EUROPEAN BEECH

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THE EUROPEAN BEECH

Gardens may boast a tempting show
Of nectarines, grapes, and peaches,
But daintiest truffles lurk below
The boughs of Burnham Beeches.

AMONG the familiar trees of the northern forests none is more stately or beautiful than the Common Beech (*Fagus sylvatica*). A cleanly looking tree and the epitome of vigour this Beech has been aptly termed the Hercules and Adonis of European forests. There is something peculiarly attractive about the tree at all seasons. In winter the pale gray, smooth bark and the delicate tracery of the myriad branches suggest a light white mist hovering in and about the trees; in spring, the clear green mantle of foliage is exquisitely delicate but soon assumes a darker hue and forms a dense and cooling shade in the summer heat, and in autumn the warm yellow- to russet-brown tints, and the long persistence of the dead leaves on the branches—all have peculiar charms. Further, the ground beneath

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Beech-trees is generally dry and free from weeds and is inviting to sit upon and rest.

The crown of the Beech tree is broad and far-spreading; the middle and upper branches are sharply ascending, the lower spread horizontally often downward to midway in their length but are upturned at their extremities. There are famous trees, like the Newbattle Beech near Dalkeith, some eight miles from Edinburgh, in which the lower branches lying on the ground have taken root and developed into independent trees. The branches of the Beech are very numerous and crowded and, having a smooth bark, are particularly liable to cross and grow into each other and, as it were, inosculate. Hence, according to some old authorities, it was this tree that first gave the idea of grafting. At its best the Common Beech is a magnificent tree 100 feet or more tall with a trunk fully 20 feet in girth. When growing thickly together the trunk is straight and free of branches for from 30 to 50 feet or even more, but usually the unbranched trunk is not more than 20 feet high. On old trees, and especially on those pollarded as in Epping Forest or the famous Burnham Beeches, huge gnarled burrs develop on the trunk and arrest attention. It is gregarious, and its branches so numerous and dense that few plants will grow beneath its shade. The firm, close, smooth,

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pale gray bark, "its glossy rind," from early times seems to have proved an irresistible attraction to love-sick swains, sentimental adolescents, and other irresponsibles. Everywhere one sees lovely Beech trunks disfigured by letters and symbols cut into the bark. No other tree suffers to the same extent from this peculiar form of egotistical vandalism.

Geologically, the Beech is not ancient, having apparently first appeared in Tertiary times. It is in fact an aggressive modern type of tree. Lyell in his "*Antiquity of Man*" speaks of it as follows: "In the time of the Romans the Danish Isles were covered as now with magnificent Beech forests. Nowhere in the world does this tree flourish more luxuriously than in Denmark, and eighteen centuries seem to have done little or nothing toward modifying the character of the forest vegetation. Yet in the antecedent bronze period there were no Beech-trees, or at most but a few stragglers, the country being then covered with Oak. The Scots Pine buried in the oldest peat in Denmark gave place at length to the Oak; and the Oak after flourishing for ages, yielded in its turn to the Beech; the periods when these three forest trees predominated in succession tallying pretty nearly with the ages of stone, bronze, and iron in Denmark."

The Common Beech (*Fagus sylvatica*) is indigenous

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to England and in western Europe as far east as about the old Russian frontier from Norway and Sweden south to the Mediterranean and reappears in the Crimea. It is absent from Portugal and is not considered to be wild in Ireland or Scotland though it probably is in the southernmost parts of the latter country. Usually it forms pure forests of considerable extent, some of the finest of which grow on the northern slopes of the Balkans from their base to 4,000 feet altitude. Fossil remains of the Beech have been found in neolithic deposits in the Fen districts and elsewhere in England and in the pre-glacial deposits in the Cromer forest-bed. Julius Cæsar stated that *Fagus* did not occur in England; but apparently the tree he meant was the Chestnut (*Castanea*). Yet the mistake is a curious one, for the Roman, Pliny, described as *Fagus* a tree which cannot be anything else than the Common Beech. However, the *Fagus* of the Old Greek philosopher, Theophrastus, was undoubtedly the Chestnut, and Virgil's statement that *Castanea* by grafting would produce *fagos* seems to indicate that the name *Fagus* was in common use among the Romans for the Chestnut.

In all there are ten species of Beech now recognized, eight of which are growing in the Arnold Arboretum, and it is doubtful if any other garden is so fortunate. We are here primarily concerned with the Common

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Beech but it is not out of place to say a word or two about the other species. They all have the same general appearance and cannot be mistaken for any other tree. All have the same sort of thin, firm, smooth, light gray bark; and the leafage, and the character of the branches and their disposition is much the same. They differ one from another in the shape and character of their fruits and in the habit of the bole. In the Common Beech the bole or trunk is single, and this obtains in one Japanese (*F. japonica*) and one Chinese species (*F. lucida*). In another Japanese species (*F. Sieboldii*) and in the Chinese *F. Engleriana* the trunk divides at or near the base into few or many stems. In the Dagelet Island *F. multinervis* and the Chinese *F. longipetiolata* the trunk is usually single, but often divides near the base into several stems. The habit of the rare Formosan Beech (*F. Hayatae*) is unknown, also that of the Caucasian *F. orientalis*, though from an account I have read of the latter it would appear to have many stems like the Japanese *F. Sieboldii* and the Chinese *F. Engleriana*. The American Beech (*F. grandifolia*) exhibits even greater diversity in habit. Normally it has a solitary trunk, but in pastures and places where the roots get near the surface, and are consequently exposed and damaged, a multitude of suckers (sprouts) are developed which grow into

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trees and form a dense copse. Near the foot of the Hemlock Hill by the collection of Arborvitae and Yews in the Arnold Arboretum, there is a splendid example of this type of growth of American Beech.

This distribution of the various species of Beech is remarkable, and is a good illustration of the isolation of members of a genus which I referred to in the second chapter. The range of the Common Beech has been given. The American Beech is distributed from Nova Scotia to the northern shores of Lake Huron and northern Wisconsin; south to western Florida, west to southeastern Missouri and Trinity River, Texas. It grows mixed with other trees, and occasionally with Yellow Birch makes nearly pure woods. Outside of America it has not proved amenable to cultivation and in Europe only a few small examples exist. In Japan *Fagus Sieboldii* grows from the southern end of Hokkaido, through Hondo, the main island, and Shikoku, to Mt. Kirishima in the south of Kyushu; in places it forms pure woods, though usually it is merely the dominant tree in the mixed forests of certain zones on the mountains. The other Japanese Beech (*F. japonica*) is more rare and I have seen it only in the Nikko region where it grows mixed with Siebold's Beech and other trees at from 3,500 to 5,000 feet altitude. On the tiny Dagelet Island, a lonely spot in the Japan Sea some fifty miles from

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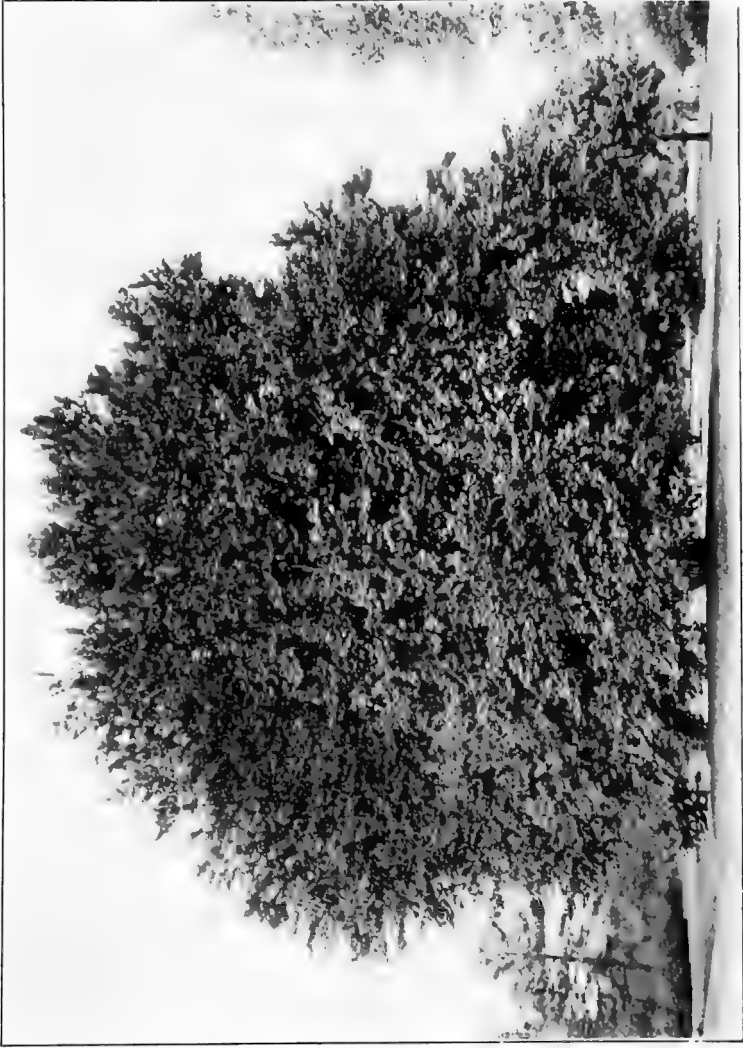
the east coast of central Korea, grows an endemic Beech (*F. multinervis*), recently discovered. It is quite plentiful in forests of mixed broad-leaf trees on volcanic soil. I collected a number of small plants but the time was early June and I failed to get them to America in a living condition. No Beech grows in Korea, Manchuria, eastern Siberia, nor in China until the central provinces are reached. But there in Hupeh, Szechuan, Kweichou, and Yunnan three species have been found, in fact in Yunnan, in about Lat. 23° N., the Beech finds its southern limit. In western Hupeh and adjoining parts of Szechuan the three species grow together, though *F. longipetiolata* is the more common and occurs at the lowest altitudes. These three Beeches sorely puzzled me (though really they are as distinct as they possibly could be) and it was not until the eleventh and last year of my travels in China that I was able clearly to distinguish them. They were successfully transported to the Arnold Arboretum where I am happy to say they are all growing to-day. The Formosan Beech (*F. Hayatae*) is known only from a mountain in the heart of the savage country where I was not allowed to visit. No Beech has been found on the vast Himalayan range, and this is rather curious since so many Chinese types have their western limits of distribution in Sikkim and Nepal. The tenth and

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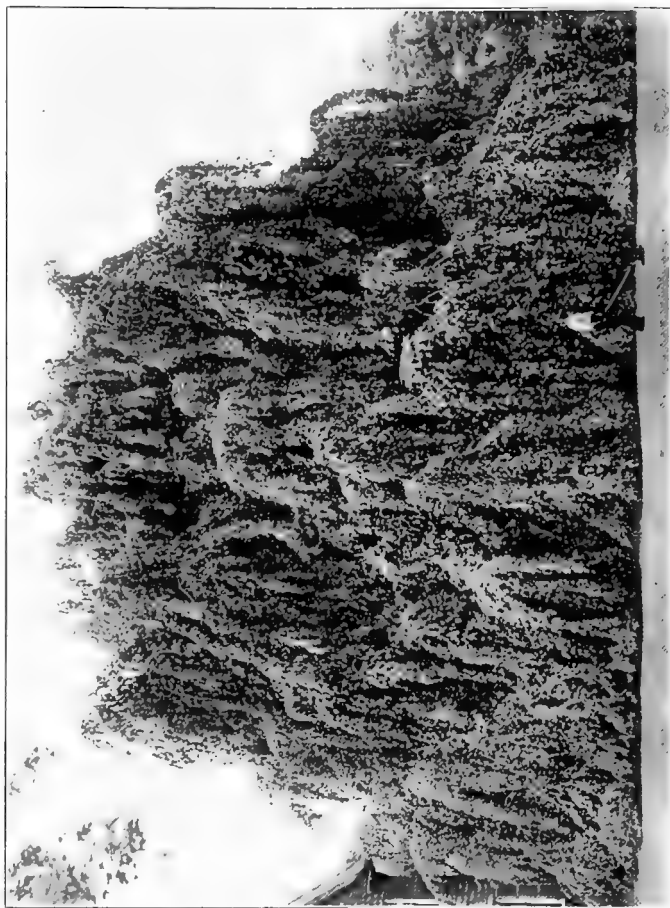
last species (*F. orientalis*) is found on the Caucasus, in Asia Minor, and in northern Persia; the Caucasus being its centre of distribution. Of these ten Beeches the Dagelet Island and Formosan species are the only ones not growing in the Arnold Arboretum.

All the Beeches are lovely trees in their native haunts. Their wood is similar and makes excellent fuel but is not much esteemed otherwise. It is more used in France perhaps than in other countries, and in parts of Buckinghamshire, England, where the manufacture of Beech-wood furniture constitutes a local industry of some importance.

The Common Beech is the only kind whose merit as a planted tree is properly known, and it is one of the very few European trees that thrives in eastern North America. It will grow on almost any soil except pure peat and heavy clay, but prefers dry soil and attains its greatest perfection on calcareous land or on deep loam. On light, sandy soils, the bark often splits longitudinally, and the trunks singularly resemble those of Hornbeam (*Carpinus*). For park and lawn the Beech is a most worthy tree, picturesque, and always gives satisfaction. Very many forms are recognized—the Purple, Copper, Fern-leaf, and Weeping being the best known—but as a matter of fact the Beech is more prolific in varying forms than any other broad-leaf tree. Several of these



EUROPEAN BEECH (TYPICAL)
ON AN ENGLISH LAWN
(*Fagus sylvatica*)



• WEEPING BEECH AT FLUSHING, N. Y.
• THIS SPECIMEN IS ONE OF THE FINEST IN EXISTENCE
(*Fagus Sylvatica* var. *pendula*)

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variants call for detailed notice but first a few words on the usefulness of the typical form are necessary.

The Common Beech is an excellent avenue tree provided it be planted thickly but is perhaps best as a screen tree, and when planted to form pure groves the effect is perfect. Owing to its dense branching habit it is splendid for forming tall, narrow hedges. Under such conditions it carries its leaves, whose russet-brown give a sense of warmth, through the winter. Properly clipped, Beech hedges last for centuries, are impenetrable to man or beast, and form the finest of windbreaks. In Europe, and especially in Belgium and England, they are common. The most famous Beech hedge, probably, is that of Meikleour, in Perthshire, Scotland. It is claimed that this hedge was planted in 1745, and that the men who were planting it left their work to fight at the battle of Culloden, hiding their tools under the hedge, and never returned to claim them. It is 580 yards long and is composed of tall, straight stems set about 18 inches apart and now almost touching at their base. The average height is about 95 feet and branched from the ground up. This hedge is cut periodically, the work being done by men standing on a long ladder from which they are able to reach with shears to about 60 feet. There is also a Beech hedge at Achnacarry, on the estate of Cam-

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eron of Lochiel, the history of which is even more remarkable. Here in 1715 the trees were laid in slantingly ready to plant when the men were called away to take part in the rebellion of that year. The trees were never planted and have grown up in a slanting position close together just as they were left.

There are in England many fine Beech woods celebrated in song and story, the most famous perhaps being that known as the Burnham Beeches, situated some 25 miles west of London and a few miles from the Royal borough of Windsor. This remnant of the vast forest that once stretched right across England from the Thames to the Severn covers now about 226 acres. In 1879 it was purchased by the Corporation of London and is a worthy memorial to the wise discretion and public spirit of the city fathers of the time. The age of these venerable Beeches is unknown. They are pollarded trees with huge, burlled boles and far-spreading umbrageous crowns. 'Neath their shade the poet Gray, author of the immortal "*Elegy*," was wont to sit and read his Virgil. Tradition has it that the pollarding was done by Cromwell's soldiers, but much more likely it was the overt act of some greedy lord of the manor at a more remote period for purposes of temporary gain. But, by whomsoever the act was committed, the effect has been remarkable in presenting a spectacle

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which, taken as a whole, has no parallel elsewhere in the British Empire. In picturesque beauty the Burnham Beeches are unique, and no tree lover should miss a pilgrimage when opportunity offers. It is nearly a quarter of a century since I paid my humble tribute to this shrine but the memory of that glorious Saturday afternoon is vivid and undimmed, notwithstanding that I have seen the forests' glories of half the world.

In Britain grow many famous Beech-trees, but none are finer than those in Ashridge Park, Buckinghamshire, where stands the majestic Queen Beech fully 135 feet tall with a trunk straight and branchless for about 80 feet. Except for certain Elms this is the tallest deciduous-leaved tree in Great Britain. Incidental mention has been made of the self-layered Beech at Newbattle Abbey. This tree is about 105 feet high and $21\frac{1}{2}$ feet in girth of trunk at five feet from the ground, and has a total circumference of about 400 feet. In Windsor Park, the Royal domain, are many magnificent Beech-trees. The finest is near Cranbourne Tower and is about 125 feet tall with a fine, clean bole 15 feet in girth; near the Ascot Gate is a venerable old pollard 30 feet in girth, and is said to be 800 years old. Of "inosculated" Beeches perhaps the finest is that at Castle Menzies, Perthshire, Scotland, which is 95 feet high.

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A little above the ground it is forked and then grown together again leaving an opening through which a youth can pass.

The Purple Beech (*F. pylvatica* var. *purpurea*) is in my opinion the only tree with coloured leaves worth planting. One, possibly two, but not more, properly placed near a house or buildings with plenty of open space around add effective dignity to the surroundings. Unfortunately, however, the use of this tree is all too frequently abused. The Purple Beech is a natural variety of the common European and so far as is known all of them in cultivation have been derived from a single tree discovered in the 18th century (and still living) in the Hanleiter forest near Sondershausen in Thuringia, central Germany. Propagation has been effected chiefly by grafting and to a less extent by seeds, but only a percentage of the seedlings come purple. This tree grows to as great a size as the parent form and there are specimens in England nearly 100 feet tall. It is popularly supposed that the Thuringian tree is the only wild Purple Beech known. This is not so, neither is that tree the oldest of which records exist, but it is the mother tree of those cultivated in this country and elsewhere. Trees of the Purple Beech grow wild in the Tyrol and at Buch, a village in the Canton Zurich, Switzerland, three specimens, growing among the common green-leaved

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type, Oak, and other trees, have been written about since 1680. At one time there were five of these trees and the tradition is that five brothers murdered one another on this spot, and five blood-besprinkled Beech-trees sprang up as righteous testimony from God as a lasting witness to so horrible a deed. The armorial shield of the village bears a picture of a Purple Beech and the probability is that its name of Buch, which is the German for Beech, was derived from these trees.

The Copper Beech (var. *cuprea*) is only a seedling form of the Purple kind with leaves and shoots of a lighter colour. It originated about a century ago, presumably in England where there are specimens fully 90 feet tall and 15 feet in girth of trunk. In the sunshine and when the leaves are ruffled by a gentle breeze this tree is strikingly handsome. There is also a weeping form (var. *purpurea pendula*) which is of slow growth, and another (var. *atropurpurea*) with leaves darker than those of the typical Purple Beech; also a var. *tricolor* with leaves dark purplish green, spotted with bright pink and shaded with white.

The Fern-leaf Beech (var. *heterophylla*) has relatively small, variously cut green leaves, and often hairy twigs. Its origin is unknown. At Newport, Rhode Island, there are fine specimens of this distinctly beautiful tree. In England it is known to have been in cultivation for a century. There are forms of

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this Beech designated by such varietal names as *asplenifolia*, *comptoniaefolia*, *incisa*, *laciniata*, *salicifolia*, etc., which indicate the degrees of lacination obtaining. Also there is a form (var. *atropurpurea Robanii*) with incised leaves of the same hue as those of the Copper Beech.

The Oak-leaf Beech (var. *quercoides*) has long-stalked leaves, pointed at the base, with long, drawn-out apex and deeply incised margins with the individual segments pointed. Other forms with green leaves are the Crested-leaf Beech (var. *cristata* or *crispa*) a curious, small tree, with small, shortly stalked leaves crowded into dense tufts which are scattered at intervals on the branches; var. *macrophylla* with very large leaves; var. *rotundifolia* with small round leaves; var. *grandidentata* with conspicuously toothed leaves, and several others.

The Weeping Beech (var. *pendula*) has the main branches very irregularly disposed and often the outline is rugged. Trees of this Beech may be tall and slender, or low and broad, or quite irregular according to the direction of the larger branches which may grow outward or upward or in almost any direction; the smaller branches only are uniformly pendulous. The Weeping Beech is a natural variety and has been found wild in the forest of Brotonne in Seine-Inférieure, France. Other forms of pendulous habit are var. *borneyensis*, which

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was found wild in the forest of Borney, near Metz, and is said to have all the lateral and subsidiary branches weeping; var. *pagnyensis*, found in the forest of Pagny, Meurthe-et-Moselle, France; var. *remillyensis* from the forest of Remilly, near Metz; and var. *miltonensis*, with only moderately pendulous branches, found wild in Milton Park, Northamptonshire, England.

The Parasol Beech (var. *tortuosa*) is of French origin having been found in the forest of Verzy, near Rheims, and elsewhere. This form has a short, twisted trunk and a hemispherical crown with all the branches directed downward and often touching the ground. It is seldom more than 10 feet high and more curious than beautiful. A similar form was discovered in Ireland some thirty-five years ago.

The Fastigate Beech (var. *dawyckii*) is a remarkable variety with all the branches erect. The original tree grows at Dawyck, Peebleshire, Scotland, on the estate of F. R. S. Balfour, Esq. Finally there are forms with variously variegated leaves of no particular merit, and the Golden Beech (var. *zlatia*), discovered in Serbia and introduced to gardens about a quarter of a century ago. I have by no means mentioned all the known forms, but enough has been said to show the adaptable and precocious character of the Common Beech.

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The fruit of the Beech is a stalked capsule clothed with simple, pliant prickles, and when ripe it opens at the apex into four divisions and sheds the two nuts each contains. The nut is sharply 3-angled, is rich in oil and of pleasant flavour. In France, and more especially in former times, the oil is expressed and used for culinary and illuminating purposes. The nuts are greedily eaten by wild pigeons and other birds, and by squirrels, deer, wild pig, and other animals.

The Common Morel (*Morchella esculenta*), a mushroom-like fungus much used in culinary art for flavouring, grows in Beech woods. It is always found in the spring, and in France and Germany the gathering of morels is quite an industry among the peasantry. But more esteemed by the gourmet is the Truffle (*Tuber cibarium*) which grows on the roots of the Beech. This fungus is subterranean in habit and never appears above the ground. It is black, of irregular shape, about the size of a hen's egg, covered with warty excrescences, and possesses a very strong but agreeable odour. It matures in the month of October, and the flesh is brown veined with white. It is generally found by pigs and dogs trained to search for it. Though by no means confined thereto France supplies commercially the bulk of the truffles of the world.

CHAPTER XI
OUR NUT TREES

CHAPTER XI

OUR NUT TREES

EVERY tree bears fruit and the fruits are much diversified in form and appearance. In the Birch it is a cylindrical catkin which disintegrates and allows the seeds to be scattered by the wind; in the Willow and Poplar it is also a slender catkin which opens and the seeds with their tuft of fluffy hairs are carried long distances by the air currents. In the Elm the fruit is a light, winged vesicle adapted for wind transportation, and in the Maple it is a two-winged keylike affair also disseminated by the wind. In the Crabapple family and others it is pulpy and attractive to birds and animals who eat the fruit but do not digest the seeds which are ejected in their excrement, usually at some distance from the parent trees. In the Chestnut it is a spiny burr which clings to the furry coats of animals and is thus distributed. In the Walnut and Hickory it is a globose structure having a thin outer coat containing an unpalatable bitter principle and a hard-shelled nut within. Trees producing dry or winged

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fruits or fruits containing winged seeds, and those with succulent fruits containing small seeds are best adapted for distribution, and in the Northern Hemisphere they are the most abundant types. The Oak, strange as it may sound, is much distributed by water-fowl that swallow the acorns and eject them whole. All nut-like fruits are much sought after by squirrels and other rodents who store them and thus help to distribute them, for though they take heavy toll they seldom devour all. Nevertheless, trees which bear a nut-fruit are handicapped in the struggle for existence, and sometimes one thinks that Mother Nature made a mistake when she evolved this particular kind of fruit. However, man, as well as rodents, should be thankful for some of these fruits supply him with wholesome food.

In the case of succulent fruits man has from the dim and distant early days striven to improve their size and flavour, and his efforts have been abundantly rewarded. In a subsequent chapter I treat of these so we may dismiss them for the moment. With nut-fruits the story is different though undoubtedly primitive man ate the acorn, walnut, hazel-nut, hickory, pecan, and pine-nut long before he did succulent fruits.

The acorn has fallen into disfavour though that of *Quercus ballota* is still eaten by the peasants in Spain

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as it was in the days of Don Quixote. The North American Indians also eat the acorns of certain Oaks, but so far as American people are concerned the acorn will never come back as an article of food. The nuts of the European and some other Beech-trees are of fair size, sweet and good flavoured but are eaten only sparingly by the peasantry. The seeds of the Swiss Pine (*Pinus cembra*) are eaten in Europe, and in Siberia they are a very important article of food. The same is true of the Korean Nut-pine (*P. koraiensis*). The kernels of the seeds of this Pine mixed with honey make a delicious sweetmeat. In western North America and in Mexico the seeds of several species of Pine are eaten, including those of the Sugar-pine (*P. Lambertiana*).

I have earlier stated that the Ginkgo is probably the oldest cultivated nut-tree and its history supports the statement. The European Hazel-nut has been improved and such forms as the Cob and Filbert established; probably the European Walnut (*Juglans regia*) has also been subject to like treatment, but for all practical purposes selection and cross-breeding among nut-fruits has only quite recently begun to receive attention. To-day, and especially in this country, the culture and breeding of nut-trees are beginning to receive some attention and the future will see a tremendous advance in this work. In every

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case it is the fleshy kernel which is sought after, and so for the present it is not necessary to confine ourselves to strict botanical morphology. It will include any edible kernel, whether it be part of the seed as in the Ginkgo or of a fruit as in the Hazelnut, and whether the outer covering be hard and woody as in the Walnut or thin and fibrous as in the Chestnut.

The most valuable and most used nut in the world is the Cocoa-nut, the product of a maritime Palm (*Cocos nucifera*), probably of South American origin and now cosmopolitan within the tropics of both hemispheres. Many other nut-trees grow within the tropics but few only find their way into our markets. The Brazil-nut (*Bertholetia excelsa*) is familiar to all, and in recent years the Pili-nut (*Canarium commune*) from the Philippines has been not uncommon in city stores in this country. But this résumé deals with those that grow in north temperate lands the number of which is quite limited. The most important of these are the Walnuts of which if we include Butternuts there are about a dozen species (some of them doubtful), one natural variety, and several hybrids. In Mexico and South America there are several others but they are little known. The most important is the European Walnut (*Juglans regia*), the classical "Jovis glans" and the "Nux" of Greek poets. It grows wild in Greece,

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Bosnia, the Balkan peninsula and eastward through Asia Minor, the Caucasus, Persia to Afghanistan and on the Himalayas of Kashmir, and northward to near Bokhara and Ladak. From western Asia it was long, long ago carried to China where it is abundantly cultivated throughout the cooler parts of that land and here and there naturalized. From China it has been taken to south Manchuria and Korea, where it is abundant, and to Japan where it is only sparingly cultivated. Also, it is much cultivated throughout the temperate region of the Himalayas. It is grown in quantity in all but the coldest countries of Europe, likewise in this country, and especially in California. In the temperate regions of the Southern Hemisphere it is also grown. No other northern nut-tree has been so widely planted, and no other nut is so much appreciated as an article of food in temperate lands. It is one of the very few exotic economic trees cultivated in the Orient where its nut is vastly esteemed. An important desideratum is a type of this Walnut which would be perfectly hardy in northern New England. A few trees are known around Boston, Mass., and a few miles to the northward, but properly speaking the tree is not hardy here. From the colder parts of western China I sent seeds in the hope of securing a perfectly hardy type, but I am not sanguine. The resultant trees

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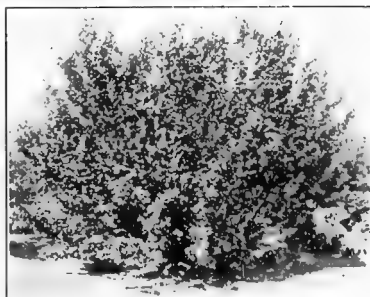
have grown fairly well but have suffered slightly nearly every winter.

The European Walnut is one of the noblest of northern trees, at its best it grows a hundred feet tall with a broad, rounded crown of massive branches and a bold, often gnarled, trunk fully 20 feet in girth. Through long and wide cultivation many varieties have originated and the nuts vary much in size, shape, sculpturing, and thickness of shell. The most superior kinds have a thin shell and are fully $2\frac{1}{2}$ inches in diameter. By careful selection it is possible that even greater improvement will result. A very interesting variety and one that deserves to be better known is *praeputuriens*, which originated in the nursery of Louis Chatenay at Doué-la-Fontaine, France, about 1830. Monsieur Chatenay found among a batch of seedlings of *J. regia* three years old an individual plant which bore fruit. This variety was propagated and put on the market by M. Janin of Paris. The nuts are generally thin-shelled and though small of good flavour. It is necessary to propagate this variety vegetatively since it does not breed true from seeds. In the garden of Professor Sargent, Brookline, Mass., there is a supposed plant of this variety but it is a tree 40 feet tall; this tree fruits freely and is quite hardy. It is not necessary to speak of other varieties, but of

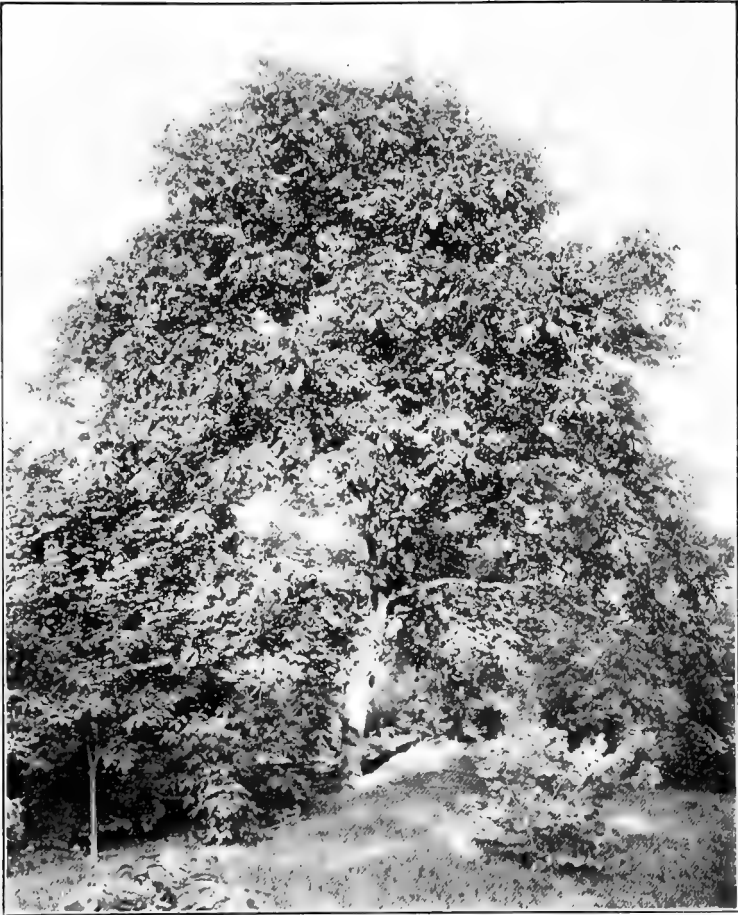


ATTAINS THE DIMENSIONS OF
A TREE 120 FT. HIGH IN CHINA
(*Corylus chinensis*)

EASTERN AND WESTERN
HAZELS



BUT THE COMMON HAZEL IS A
LOW BUSH
(*Corylus Avellana*)



JAPANESE WALNUT

GROWING IN THE ARNOLD ARBORETUM
(*Juglans Sieboldiana*)

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the hybrids I shall have something to say later. I believe that in this country the best results will be obtained by hybridizing *J. regia* with the Japanese *J. Sieboldiana* and its variety *cordiformis*, which are hardier, and the importance of this fact cannot be over-estimated. What is needed is a hardier race of thin-shelled Walnuts. From the viewpoint of nut-fruits the next important Walnut is the Japanese *J. Sieboldiana*, which is quite a recent introduction to the west. It was first introduced into Leyden, Holland, about 1864 by Von Siebold, and from there to France in 1866. There is good reason to believe that it was introduced into this country by Dr. G. R. Hall in 1862, but the largest tree I know of is in the Arnold Arboretum where it was raised from seeds received from France in 1879. In Japan the Walnut is known as "Kurume" and is distributed from the south to the bitterly cold regions of central Hokkaido. The Kurume grows in moist forests and is a much smaller tree than its European relative. The fruit is borne in long racemes, and the nuts are ovoid or globose, rounded at the base and pointed at the apex, very slightly wrinkled and pitted, not ribbed, and rather thick-shelled.

Much cultivated in central Japan is the variety *cordiformis*, characterized by its heart-shaped, much-flattened, sharply two-edged nut which is smooth

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and rather thin-shelled. In Japan there are two well-marked forms of the type and intermediate ones which connect it with the parent species *J. Sieboldiana*. Raised from seed the var. *cordiformis* cannot be depended upon to come true, for many revert to the wild type. The Black Walnut (*J. nigra*) is a magnificent tree producing valuable timber but its nut is small, has a very hard shell, and is of little economic value. The Texan Walnut (*J. rupestris*) is a tree of quite moderate size and bears small nuts of no particular use. The two Californian Walnuts (*J. californica* and *J. Hindsii*) are large trees but their fruits are poor. The Formosan species (*J. formosana*) is a large tree but the fruit is small and, moreover, the plant will be hardy only in the warmer parts of this country. It is growing in the greenhouses of the Arnold Arboretum from seeds I gathered in 1918.

The other species of *Juglans* to be considered are best classed as Butternuts, and the best known and most valuable is the American *J. cinerea*. This is a tree occasionally 100 feet tall and 10 feet in girth of trunk with a broad, round-topped crown, and is distributed in eastern North America, from the valley of the St. Lawrence River southward. It was introduced into England with the Black Walnut as long ago as the middle of the 17th century. The

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ovoid, pointed, 8-ribbed nut has a thick shell but the flesh within is sweet. The Chinese *J. cathayensis* is a bush or slender tree with a small, very rough nut of no particular value. It has not proved very hardy in the Arnold Arboretum. I introduced it first to England in 1903 and to this country in 1908. The Manchurian *J. mandshurica* rivals the American Butternut in size and the nut shows a decided approach to that of the true Walnuts. The shell is very thick and the flesh limited in quantity. It is a common tree in the forests of Korea and is very hardy. The little-known *J. stenocarpa* of Russian Manchuria is only a form of *J. mandshurica*.

Having dealt with all the species of *Juglans* within our province it remains to say a word or two about the hybrids though none of them is valuable for the nuts. A supposed hybrid between the American *J. nigra* and *J. cinerea* was described as long ago as 1857 from a tree in the Botanic Garden at Marburg in Germany. The other hybrids, and there are several, are between the European Walnut (*J. regia*) and the American species. One of these is a cross between *J. regia* and *J. nigra* and known as *J. intermedia* var. *Vilmoreana*. This originated at Verrières les Buisson, near Paris, about 1805. The original tree is now nearly 100 feet tall and 10 feet in girth; in bark, branchlets, and buds it is intermediate, but in habit

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and nut it resembles the Black Walnut. Another hybrid of the same parentage is *J. intermedia* var. *pyriformis* which has pear-shaped fruits.

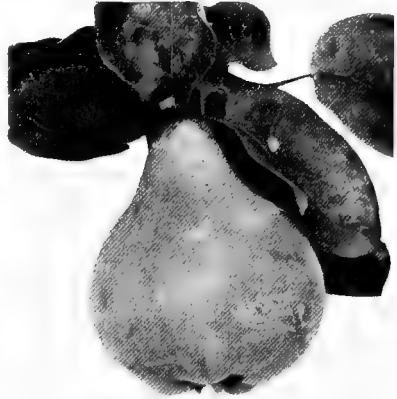
Of *J. intermedia* there is on Rowes Farm, James River, opposite Brandon, Va., a magnificent specimen which must rank with the largest Walnut-trees known anywhere; the trunk at two feet from the ground measures more than 31 feet and at 6½ feet, 25 feet in girth. The spread of branches is enormous but the height I have not been able to ascertain.

In the neighbourhood of Boston, Mass., a number of trees of *J. regia* × *J. cinerea* are known. The name of this hybrid is *J. quadrangulata*. In California are grown several hybrids between *J. regia* and *J. Hindsii*, one of them, which Burbank claims to have originated, is named "Paradox." Another which Burbank calls the "Royal" is said to be also a cross between *J. nigra* and *J. Hindsii*, and to fruit freely. I know nothing about the value of the nuts. All these hybrid Walnuts are fast-growing, handsome trees and like the species the wood of all is valuable. However, for nuts the breeder will do well to stick to the European and to the Japanese species and its variety. By intermingling these valuable and more hardy races of Walnuts will result.

The most famous and oldest cultivated nut-tree



AMERICAN CHESTNUT
IS IT ACTUALLY DISAPPEARING?



COMMON FRUITS WHICH TAKE US BACK INTO
ANCIENT DAYS

THE PEACH
THE PEAR

THE PLUM
THE QUINCE

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native of this country is of course the Pecan (*Carya pecan*), which grows wild in western Mississippi, in parts of Louisiana, Oklahoma, and Texas. The latest authorities consider that it was planted by the Indians in the Mississippi Valley and elsewhere, and it is therefore not easy to determine the natural distribution of this tree. The *Caryas* are among the noblest trees of North America and furnish tough and valuable timber. A few years ago a species (*C. cathayensis*) was discovered in eastern China but up to that time the genus was considered peculiarly North American. The Pecan probably exceeds all other species in size, and in rich alluvial soils trees 175 feet tall by 16 feet in girth of trunk often occur. In the Arnold Arboretum there is one healthy young Pecan-tree which is one of our proudest possessions for its hardiness is a surprise to us. In this connection it is necessary to emphasize the fact that the Pecan is a Southern tree which cannot be expected to be hardy in the cold Northern states. There is a wide region in this country where Pecans can be successfully grown but it is not New England nor any of the cold Northern or Middle-West states. If intending nut growers will properly appreciate this fact it will save them money and disappointment. Pecan-nuts are too well-known to need description here. They are variable in size, and the best forms are about $2\frac{1}{2}$

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inches long and 1 inch broad and have a thin red-brown shell and a sweet-flavoured reddish-brown kernel. They are borne in clusters of from three to twelve, each is contained within a thin, brittle, dark brown, 4-angled husk which is coated with yellow hairs and when ripe splits nearly to the base. The next in importance is the Shagbark Hickory (*C. ovata*) which is distinguished by its thin-shelled nut, its leaves of five, rarely seven, leaflets, its scaly bark, and other less obvious characters. It is a Northern tree being distributed from the neighbourhood of Montreal and southern Minnesota southward to the Carolinas, east central Mississippi, southern Arkansas, Louisiana, and eastern Texas, where it is rare. It is common in the New England and other Northern states and in Livingston County, western New York, a natural hybrid between it and the Kingnut (*C. laciniosa*) named *C. Dunbarii* occurs. There are several varieties of the Shagbark distinguished by the shape of their leaves or fruit. In the typical form the fruit is short-oblong to sub-globose and depressed at the apex. There are a number of named selected forms of this Hickory valued for the size and quality of their nuts. Of much potential value is *C. Laneyi* a natural hybrid between the Bitternut *C. cordiformis* and *C. ovata*. It has a nut with the thin shell of the Bitternut and the large, sweet kernel of the Shagbark Hickory

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and as the shell is so thin the kernel is larger than that usually produced by the Shagbark. The nut of this hybrid keeps remarkably well, and *C. Laneyi* is probably one of the most valuable of all Hickory-nuts which have been found. The type tree grows in the Riverview Cemetery, Rochester, N. Y., and it is fitting that this interesting hybrid should have been named for the capable Superintendent of the Park system of that city.

A third species of *Carya* is *C. laciniosa* the Kingnut or Big Shellbark. This is essentially a tree of the central states, being particularly abundant in the river swamps of central Missouri and of the Ohio basin. It exceeds 100 feet in height by 10 feet in girth of trunk. The fruit is solitary or in pairs, about 2 inches long with a hard, woody shell; the nut is compressed, four-to-six-ridged with a bony shell and a light brown, sweet kernel.

The Shagbark and the Kingnut are, as nut trees, the most important of the fifteen species of *Carya* now recognized in this country. In several others the kernels are sweet though the nuts are small. Seven natural hybrids have received names and there are probably others yet to be distinguished. In the hands of the hybridist other superior forms will assuredly appear.

The Hickories and the Pecan are easily raised from

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seeds but the seedlings develop long, thick tap-roots and in consequence are difficult to transplant. The best plan is to sow the nuts and leave the seedlings to develop in situ. The better varieties are increased by grafting and budding and old trees can be headed-back and top-worked in a satisfactory manner in the warmer states. In the North the propagation is more difficult but yearly it is becoming better understood and in time will probably become as easy as that of the Apple and Peach. In the Arnold Arboretum the Bitternut (*C. cordiformis*) has been found to be the best stock. The work is done under glass in January and side-grafting close to the collar of the stock is favoured. The pecan industry is of course well established in the warmer states but it can never become profitable in New England nor in the colder parts of this country. But there seems to be no reason why Hickory orchards cannot be successfully established in regions where the Pecan is not hardy.

To write of the Chestnuts when those in this country are fast disappearing through disease is not a pleasant task. No cure has been found for this fatal disease, and it looks as if in a few years one of the valuable timber trees in eastern North America will have vanished. It is sad, but we may as well realize that it cannot be helped. Thousands, yes, billions, of types have risen

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and disappeared since first organic development began, and the fittest only survive. The Chestnut blight is a new and deadly thing in this country, but it is an old pest in the Orient. In Korea it has existed beyond the memory of the oldest inhabitant yet there are to-day millions of Chestnut-trees in Korea, where the nut is a staple article of food. The same is true of Manchuria, but in Japan the blight appears to be a comparatively recent visitant and is deadly. In Korea and Manchuria the older and larger trees are more resistant than saplings. Doubtless the Chestnut blight (*Diaporthe parasitica*) a fungus—rages in a cycle and when the zenith of the curve is reached decreases in virulence. Let us heartily hope that this zenith may be reached while yet a goodly number of trees remain to us. Meanwhile, the hybridist should be busy endeavouring to breed Chestnuts immune to the blight. Some good work in this direction has been done by Dr. Van Fleet, at Washington, D. C., working with the Chinquapin (*Castanea pumila*) and an Asiatic species, but it is desirable that additional workers take up the burden for the task is heavy.

The fruit of all the Chestnuts, and there are eight species, is edible. In eastern Asia grow four species, in this country three, and in southern Europe, Asia Minor, the Caucasus, and northern Persia one species.

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There is a strong family likeness among all the Chestnuts, so much so that many botanists have united them all into one species, but the eight species may be distinguished by the absence or presence and distribution of minute, scale-like glands and of hairs on the leaves, and by other less obvious technical characters. The European (*C. sativa*) is the best known and the most famous of all Chestnuts but unfortunately it is not hardy in the colder parts of this country. It is much cultivated in Italy, Spain, and France, where the nut is a staple article of food. In England the Chestnut has been widely planted but except in a few favoured localities the fruit does not properly mature. This Chestnut is one of the largest and noblest of European trees; it is indeed the largest of the genus and trees 100 feet tall and 20 feet in girth of trunk with a wide-spreading crown of massive branches are not uncommon. The nuts are usually three in each spiny, round husk, occasionally more, sometimes one only. There are many garden varieties and some with a very large-sized nut are grown in Madeira.

Rivalling in size of nut the European species is the Japanese *C. crenata*, wide-spread in Japan and in Korea. It is hardier than the European Chestnut but is prone to disease. It is not a very large tree but some of the named sorts like "Tamba" or "Mammoth" have huge nuts but the flavour is rather inferior.

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The type and the best known varieties have been introduced into this country. The trees grow rapidly and fruit at a comparatively early age, and it is regrettable that they are not more disease resistant.

More valuable is a Chinese Chestnut (*C. mollissima*) introduced into this country from Peking by Professor Sargent in 1903. The nut is rather smaller than those of the preceding species but is sweet and of excellent flavour. It is a tree of moderate size, wide-spread in China from east to west and northward into Manchuria. It is cultivated in northwest Korea and is esteemed above the native species. Long, shaggy hairs on the shoot distinguish this species from all others. Though subject to Chestnut blight in the Orient this species seems to be immune or nearly so in this country, and this combined with its hardiness makes it a most useful tree for cultivating and breeding purposes here. The largest of the Asiatic Chestnuts is *C. Henryana*, which is occasionally 100 feet tall and 18 feet in girth of trunk and is characterized by having normally a solitary, ovoid nut in each spiny husk. The leaves are smooth, without glands, and the lateral nerves project beyond the margin in long, hair-like points; the petioles and shoots are quite smooth and dark coloured. The nut, though small, is very sweet and of most excellent flavour. It is common in central and western China,

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growing in mixed forests on the higher mountains. I introduced it in 1907 to the Arnold Arboretum where it has proved quite hardy.

We need say nothing here about the American *C. dentata* but a passing word is due the Chinquapin or shrubby Chestnut (*C. pumila*). This bush or small tree is distributed from southern Pennsylvania to northern Florida and westward to southern Arkansas and eastern Texas. It bears usually in each husk a single nut which though very small is sweet and good to eat. This species in the hands of the hybridists may be the progenitor of a race of Bush-chestnuts of great value for orchards. As before mentioned Doctor Van Fleet has already made some very promising crosses. There is no reason why future generations should not have a strain of Bush-chestnuts bearing fruits as large as the European and Japanese kinds, and as hardy and as sweet in flavour as the Chinese. In the southeastern United States, in the neighbourhood of the coast, from North Carolina to western Florida and west to Louisiana grows the dwarf *C. alnifolia* in which the husk is only sparingly clad with spines. This is a shrub or low tree from 10 to 30 feet tall. There is in China a Bush-chestnut (*C. Seguinii*) which ought to be re-introduced into our gardens. It has long been known and Robert Fortune introduced it into England in the fifties of the last century,



THE APRICOT IN CHINA, WHERE IT IS A NATIVE



THE SHADE OF THE OLD APPLE TREES

ASSOCIATED WITH THE HISTORY OF MAN FROM HIS BEGINNING THE ORIGIN OF OUR PRESENT DAY
VARIETIES IS LOST IN THE MYSTERIOUS PAST

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but it seems to have soon become lost and its value unappreciated. I introduced it into the Arnold Arboretum in 1907, but the plants were afterward destroyed by a grass-fire caused by a careless visitor. This Chestnut is abundant on the hills throughout the Yangtze Valley and there should be no difficulty in securing seeds though they travel badly. It forms a bush from 10 to 18 feet high and is sometimes a small tree; the husk contains from three to six small nuts which have a peculiarly sweet and pleasant flavour. I never saw it attacked by the Chestnut blight. Summing up the question of the Chestnuts it would appear that in hybridizing the large-fruited tree-forms with the three bush-forms there is a field of much promise.

The genus *Corylus* which yields the hazel-nuts is spread throughout the Northern Hemisphere. Some twelve species and several varieties are known, three species in this country, four in eastern Asia, two on the Himalayas, three in Europe and Asia Minor. Three of them (*C. colurna*, *C. Jacquemontii*, and *C. chinensis*) are large trees, the others are best described as large bushes though occasionally they form small trees. The Chinese *C. chinensis* is a very large tree and I have a vivid recollection of one giant, growing in central China, fully 120 feet tall and 18 feet in girth of trunk with a broad oval

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crown. The nuts of all the species are edible but in the tree-species the shell is very thick. For orchard culture the European *C. Avellana* only has so far received attention. This is much grown in Italy, Spain, France, and the county of Kent in England, but the bulk of the nuts in commerce are shipped from the Spanish port of Barcelona, hence the name Barcelona nut. This species is wild in the hedge-rows and coppices of Europe, and nuts of the wild plants are excellent eating and in England are much sought after by country-people. According to French authorities the nuts of Provence and Italy are preferable to those of Spain and the Levant. A number of varieties are grown and in France the better kinds are called "Avelènes." The best are known as Full-beards or Filberts and Cob-nuts. The first-named have a long nut enclosed within the long, tubular husk which is contracted above the apex of the nut. There are several forms differing in the shape of the nuts and the relative length of their husks. The red and white filberts are similar in external appearance but in the former the pellicle which covers the kernel is red and in the latter pale gray-brown. Both are much grown in Kent, England, and are esteemed because they admit of being kept fresh in the husks. According to the books the filbert was first known from Pontus on the Asia Minor shores of

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the Black Sea, and was known to the ancient Greeks as "Nux pontica." The cob-nuts are short and roundish and have a thick shell, the most familiar being the Barcelona nuts of commerce. A form with large nuts is known in England as the "Kentish Cob."

Some consider the cob-nuts to belong to a separate species known as *C. pontica* but this seems to be doubtful. The other European species (*C. maxima*) is a large shrub confined to southern Europe and has a husk contracted above the apex of the nut into a short tube. A recent view is that the Filberts are hybrids between this and *C. Avellana*. There is also a hybrid between the common *C. Avellana* and *C. colurna* (*C. intermedia*) which has been known in Europe since about 1836 but is still rare. It is fairly intermediate in character though the nut is more like that of *C. colurna*.

Of the three American species *C. rostrata* is most widely spread and grows throughout Canada from the east coast to British Columbia, and in this country as far south as Virginia and west to Minnesota. It is a bush of moderate height producing suckers freely; the husk completely encloses the nut and is contracted beyond into a long tube. Another species (*C. californica*) grows in Colorado and westward through northern California, Oregon, and Washington, and differs in having the husk terminate in a

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very short tube. The remaining species (*C. americana*) has a roundish nut contained in an open husk with jagged almost fringed margins. This is a broad shrub, from 5 to 12 feet tall, distributed from New England southward to West Virginia and westward to Mississippi, Arkansas, and South Dakota. These native species of Hazel-nut have been neglected and ought to be taken in hand for orchard culture. The three Tree-hazels all have roundish nuts with thick, hard shells and small kernels and need to be much improved before they have value as nut-trees. The Himalayan *C. ferox* and the Chinese *C. tibetica* have spiny husks resembling those of the Chestnut and are unpromising subjects for the nut growers.

The two Bush-hazels of eastern Asia (*C. heterophylla* and *C. Sieboldii*), each of which has several recognized varieties, are worthy of passing notice. Both are hardy in the Arnold Arboretum and will some day play a part in nut culture in this country. The first has leaves variable in shape, as its name indicates, and an equally variable husk which is lacinated and often crested but open at the summit exposing the roundish, thick-shelled nut. It is a low bush, seldom more than 6 feet high and usually less, which suckers freely and is a particular feature of open mountain slopes in Korea. It is also widespread in Japan, the Amur region, Manchuria, and north-

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ern China. In central and western China it is represented by the varieties *sutchuenensis* and *yunnanensis* which are large bushes often 20 feet tall and differing in technical characters. The other species (*C. Sieboldii*) resembles the American *C. rostrata* in that the husk completely encloses the nut and, moreover, is contracted above the apex of the nut into a narrow tube which is often twice as long as the nut itself. Several varieties, based largely on the length and shape of the husk, have been distinguished. On Quelpaert, a volcanic island off the south coast of Korea, grows a small-fruited form in which the husk is contracted into a very short beak. This has been named *C. ballaisanensis*. Siebold's Hazel is a large bush, similar in habit and foliage to the European *C. Avellana* and is widely distributed in Japan and on the mainland of eastern Asia westward to the Chino-Thibetan borderland.

Lastly, mention may be made of the Almond (*Prunus Amygdalus*), a tree closely related to the Peach and Apricot, native of Persia and Asia Minor. In Syria and in southern Europe, especially in Spain, and also in California, it is much cultivated for the kernels of its fruits which constitute the almonds of commerce. There are many varieties mainly distinguished by the thickness of the shell enclosing the kernel.

CHAPTER XII
OUR COMMON FRUIT TREES

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OUR COMMON FRUIT TREES

THE origin of our common fruit trees is lost in the dust of antiquity. Some—the Damson, for example—can be traced in old Greek literature back to the sixth century before Christ. But they are much older for charred remains of the Apple and stones of the Bullace (Yellow Plum) have been found in the pre-historic lake-dwellings of Switzerland. They are, of course, the oldest trees cultivated by man, and did we know just where the human race had its cradle we might be a little more sure of the birthplace of our Plums, Apples, Pears, and Cherries. Books generally make them of Eurasian origin giving their distribution as from south-eastern Europe, the Asiatic shores of the Black Sea, the Caucasus, Persia to Kashmir, and north to Bokhara. Doubtless this vast and vague area includes the home of some of our fruit trees but there is nothing definitely known. Possibly some of them, like the common Plum, were first cultivated on the shores of the Caspian Sea and on the plains of Turan where the Huns, Turks, Mongols, and Tartars, flowing back

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and forth in tides of war-like migration, maintained in times of peace a crude agriculture long before the Greeks and Romans tilled the soil. All that can be definitely stated to-day is that our common fruit trees are native of those parts of the Old World west of the highlands of central Asia. In North America grow wild more species of true Plums than are found in Europe and Asia, but the cultivation of none was attempted until early in the 19th century, and even to-day their true worth is not sufficiently appreciated. The native Apples and Cherries of this country have to date no value as fruit trees, and America's only contribution to the fruit trees of the world are her Plums. So small a part do these play even in American orchards that it is correct to write that this country owes all her fruit trees to Europe and Asia. Indeed, the introduction of these trees began with the earliest settlers. In Massachusetts some were planted by the Pilgrims, for Francis Higginson, writing in 1629, says: "Our Governor hath already planted mulberries, plums, raspberries, corrance, chestnuts, filberts, walnuts, smalnuts, and hurtleberries." John Josselyn, writing of a voyage to New England in 1663, says: "the Quinces, Cherries, and Damsons set the dames a work, marmalade and preserved Damsons are to be met with in every house." In the voyages undertaken for exploration

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and commerce soon after the discovery of America by Columbus the Peach was introduced by the Spaniards, for immediately after permanent settlement had been made in the South the settlers found this fruit in widespread cultivation by the Indians, and its origin could only be traced to the Spaniards who early visited Florida and the Gulf region. As early as 1682 William Penn wrote, "there are very good peaches in Pennsylvania, not an Indian plantation is without them."

In the Northern Hemisphere, during the course of ages, two forms of civilization have developed. They are commonly expressed as that of the west and of the east; i.e., that of Europe and that of eastern Asia whose dominant factor has been China. So, too, have two distinct stocks of fruit trees. There is the Eurasian group of apples, pears, plums, and cherries and there is the Chinese group of these same fruits. They are separate and distinct one from another, and have been evolved independently from the wild species found in areas separated by the high table-land of central Asia. This important fact has only quite recently been properly established. It has been my privilege and good fortune to discover in China and Korea the wild types of the apples, pears, cherries, and plums of the Orient. The Peach is of Chinese origin and probably the Apricot also, though there

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is still doubt about the real home of the latter. The peach and apricot have been grown in this country since the early times of settlers; the oriental plum, under the name of the Japanese Plum, for about half a century, but the pears, apples, and cherries of the Orient have scarcely received any attention here.

Since the wild habitat of certain of our fruit trees is not clearly known it will occasion no surprise to learn that botanists differ in opinion as to the species to which some of our domesticated fruits belong. Naturally they have become so vastly changed under long cultivation that they bear but a remote resemblance to their ancestral forms. Another fact that adds enormously to the difficulty is that the parts of Europe, western Asia, and the Orient where they are supposed to have had their home have changed completely under long, if intermittent, practice of agricultural husbandry. The ravages of a thousand wars, the migration to and fro of peoples down the ages have likewise profoundly influenced the problem. In the case of the Common Apple and the Domestic Plums it is doubtful if we shall ever be absolutely sure of the original habitat and identity of the wild types. Crabapples, or reversions toward the wild type or types, are found everywhere in the world where Apples have been long cultivated, and casual observers have concluded that they are truly wild

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whereas "naturalized" is the correct term to employ. In this connection it must be confessed that often it is well-nigh impossible to distinguish between naturalized and spontaneous plants. Let us take the case of the Common Apple. Loudon in his "*Arboretum et Fruticetum Britannicum*," II, 894, says, "the Apple grows spontaneously in every part of Europe except the torrid zone. It is found throughout western Asia. . . . In the north of Europe it is found as far west as Finland in Lat. 62°; in Sweden in Lat. 58° or 59°; in central Russia to 55° or 60°. In Britain, the Apple is found in a wild state in hedges, and on the margins of woods, as far north as Morayshire. It is found wild in Ireland, but it is rare there."

The latest authority as represented by Bailey's "*Standard Cyclopaedia American Horticulture*," V. 2870 (1916), gives southeastern Europe to western Asia as the home of the principal, or supposed principal, parent of the Apple and western and central Europe for its other and lesser parent. The Apple, according to the best authorities, was introduced into France and Britain by the Romans, as was also the Pear; and like that fruit probably reintroduced by religious houses on their establishment, after the introduction of Christianity. Others claim that the Apple was to the Druids a sacred or semi-sacred tree, that it was cultivated in Britain from the earliest

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ages, and that Glastonbury was called Apple Orchard, from the great quantity of apples grown there previous to the arrival of the Romans.

The Apple-tree is mentioned by Theophrastus and Herodotus, and is also distinguished by legends in the mythologies of the Greeks, the Scandinavians, and the Druids. Hercules was worshipped by the Thebans under the name of Melius, and apples were offered at his altars. The ancient Welsh bards were rewarded for excelling in song by "the token of the Apple spray." In the apple-growing parts of England many quaint ceremonies were in olden times practised. In Devonshire on Christmas Eve the farmers and their men used to take in state to the orchard a large bowl of cider with toast in it, and salute the Apple-trees with much ceremony in order to induce them to bear well the next season. The farmer and his men each took an oblation of the cider, threw some of it about the roots of the tree, placing bits of toast on the branches; then forming themselves round the most fruitful Apple-tree sang:

Here's to thee, old Apple-tree,
Whence thou mayst bud, and whence thou mayst blow;
And whence thou mayst bear apples enow.
Hats full! caps full!
Bushel-bushel-sacks full!
And my pockets full, too!
Huzza!

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In other parts of the country this ceremony took place on Twelfth-Night-Eve, and roasted apples took the place of toast. The song varied somewhat in different parts of the country but everywhere fecundity was invoked. Putting roasted apples in ale was another old English custom. Shakespeare alludes to it in "*Midsummer Night's Dream*" where Puck says:

Sometimes I lurk in a gossip's bowl,
In very likeness of a roasted crab;
And, when she drinks, against her lips I bob,
And on her wither'd dewlap pour the ale.

But a large volume would be required to record the folk-lore and facts that have accumulated round our premier fruit and then much would perforce be omitted.

The species now considered the principal parent of our favourite orchard fruit is known as *Malus pumila*, and is characterized by having its branchlets, leaves, inflorescence, and sepals covered with woolly hairs. It is considered to be wild from southeastern Europe to the Caucasus. Another species from which a few kinds of apple have been derived is *M. sylvestris*, which is nearly smooth and hairless in all its parts, and is regarded as indigenous in western and central Europe. The apples of the Orient have been

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derived from *M. prunifolia* var. *rinki* which grows wild on the margins of woods and on the banks of mountain torrents in Hupeh, central China, where I discovered it in 1907. In habit, general appearance, and flowers it resembles *M. pumila*, but the fruit-stalk is much longer and more slender, and the fruit, which is small, is not impressed at the apex but has the calyx raised, thickened, and fleshy at the base. When the Chinese first began to cultivate the apple is not known, but it was long, long ago. From China it has been introduced to Korea and Japan where, however, it is fast being displaced by apples of the European type introduced from America. The Chinese apple is small, ripens early, is greenish to greenish-yellow and is rosy on one side; occasionally it is nearly all red; the flavour is pleasant and bitter-sweet. It ripens its fruit in the hot, moist Yangtze Valley round Ichang in July, and on the mountains, where the climate is severe, in early September. As a fruit it has no particular value to recommend it to Western gardens but since it thrives under extremes of climate it may be useful to the hybridist.

The history of the Common Pear closely parallels that of our Apple but there is much less folk-lore gathered round it. In Britain, until about a century ago, it was more valued for making Perry than for

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dessert. In fact, many of the best varieties were originated in France and Belgium, especially in gardens attached to religious establishments of which Louvain was among the chief, and were introduced into general cultivation after the battle of Waterloo. The Pear is less hardy than the Apple, and in England the better sorts are grown against walls and on sheltered trellises. The Common Pear is mentioned by the earliest writers as common in Syria and Greece, and from the latter country it appears to have been brought to Italy. The Romans introduced it into France and Britain, and it was brought to this country by the early settlers. Theophrastus speaks of the productiveness of the old Pear-tree, and Virgil mentions some pears which he received from Cato. Pliny in his fifteenth book describes the varieties in cultivation in his time as being exceedingly numerous. In Gerard's time the Katherine Pear, a small, red, early sort, was considered the best, and it remained a market variety in England down to about 1840.

The parent of our pears is undoubtedly of Eurasian origin, being found over a considerable portion of Europe and eastward to the Caucasus and northern Persia, but it is difficult to tell between naturalized escapes from cultivation and true wildlings. A variety (*cordata*) sometimes regarded as a distinct

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species is indigenous to western France and England, and has a round, or slightly turbinate, fruit about half an inch in diameter. The Pear in a wild and naturalized state is pyramidal in habit and is armed with spines.

The pears of the Orient are flattened and depressed top and bottom like our apples and not of the familiar pear-shape; a few are egg-shaped. They are very firm and gritty in texture, rich in a sweet watery juice, and one group is generally known as Sand Pears. At present it is certain that two species (*Pyrus serotina* and *P. ussuriensis*) have been concerned in their evolution, but whether other species have played a part or whether there are hybrids between the above-named species has yet to be determined. Much attention is now being given in parts of this country to these Pears for stock on which to work our own Pears and for breeding purposes. We are entirely without knowledge as to how long the Chinese have cultivated their Pears but three thousand years is not an exaggerated estimate. The Sand Pear was introduced into Japan more than a thousand years ago and is very extensively cultivated there to this day for the Japanese, like the Koreans and Chinese, prefer them to our pears.

The Sand Pears, of which there are brown- and green-skinned kinds, are characterized by the ab-

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sence of the calyx. They have apparently all been derived from *P. serotina*, a common wild tree in the woods on the mountains of the province of Hupeh in central China, where I discovered it in 1900 and introduced it into the Arnold Arboretum in 1909. Though widely cultivated over the greater part of China, Korea, and Japan it has not been found wild except in central China. The other species (*P. ussuriensis*) is more northern, being abundant in central and northern Korea, and in Manchuria also; it has recently been found wild in Japan in the region around Mt. Fuji, and on the mountains of Shinano province in mid-Japan. In this species the skin is green, russet-green, or rosy; the calyx is usually persistent but sometimes it is deciduous. Many varieties of this Pear are grown in Korea and Manchuria, and in the more northern parts of China. Around Peking a variety having a delicious little apple-shaped pear of a pale yellow colour is much grown and is known as the White Pear. In parts of Japan it is called the Stone Pear and is not esteemed. There are a few hybrids between the Sand Pear and the European Pear the best known being the Kieffer and Le Comte.

There are many other species of Pear-trees in Eurasia and the Orient which some day may be found of value in the pear industry in Western lands. One

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(*P. Calleryana*), with minute fruits, which I introduced to the Arnold Arboretum from central China in 1909, is already achieving prominence as the most resistant to the dreaded Pear blight of all the species and in consequence a valuable stock on which to work our garden Pears.

The Quince (*Cydonia vulgaris*) is nowadays more esteemed in New England than in Britain. A low tree with tortuous, rambling branches, and considered native of southern France and central Europe, it was known to the Greeks and Romans and by both nations held in high esteem. By the ancients it was considered the emblem of love, happiness, and fruitfulness and was dedicated to Venus. The nuptial chambers of the Greeks and Romans were decorated with the fruit, and the bride and bridegroom also ate it as soon as the marriage ceremony was performed. In eastern Asia grow three species of Quince but their fruits are of little value; they are, however, very decorative garden plants. Another old fruit tree seldom seen nowadays is the Medlar (*Mespilus germanica*) whose fruit is not eaten until it is in a state of incipient decay, when it is very agreeable to some palates.

Now let us consider the stone-fruits which, like the preceding, all belong to the great Rose family. At the head of these stands the Peach (*Prunus persica*)



CHERRIES AND APPLES

BOTH SWEET AND SOUR CHERRIES OF OUR WESTERN GARDENS
COME FROM THE EAST. OUR APPLES COME FROM THE CAUCASUS



A CHINESE PEAR AT HOME

PARENT OF THE SAND PEARS OF THE ORIENT
(*Pyrus serotina*)

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which, as previously stated, was introduced to this country by the Spaniards soon after Columbus's time. The Romans, during the reign of the Emperor Claudius, received the Peach from Persia and for centuries it was considered native of that country and received a specific name to that effect. Present-day authorities, however, are pretty well agreed that its real home is China, though undisputable wild trees have never been discovered. Nevertheless, it is found naturalized over the greater part of China where it has been cultivated for its fruit as far back as records go. In Chinese folk-lore, in arts such as porcelain-ware, wood-carving, embroidery, and painting it figures largely. Personally, I think there can be no doubt about its Chinese origin, and am convinced that it reached Persia and the Caspian region through seeds carried by the old trade-route across central Asia. In China are grown to-day freestone and clingstone varieties with white, reddish, or yellow flesh; also a curious variety having the fruit compressed top and bottom and known as the "pien-tao" or flat peach. The Smooth-skinned Peach or Nectarine likewise is of Chinese origin and seems to prefer a rather warm climate. It is much grown in northern Formosa. From China the Peach was long ago taken to Korea and to Japan where to-day a great many local varieties are cultivated. Into France and

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Britain it was introduced by the Romans, but in England it was not much cultivated before the 16th century. The Spanish introduced it into South America. It has been planted in the more temperate parts of Africa (the famous missionary-traveller, Livingston, planted it by the Victoria Falls on the Zambesi River), and in Australasia; indeed, no fruit tree is now more widely grown. There is no need to tell of the importance of the Peach industry in this country, where probably high-class fruit is produced in greater quantity than in any other land, but a real desideratum is a Peach "bud hardy" in northern New England. I think there is a possibility of this being found through the medium of the Peach which is semi-wild on the mountains west of Peking.

Two other species of Peach grow wild in China, namely, *P. Davidiana* and *P. mira*. The first-named is native of the cold northern provinces of China and although the fruit is of no value the plant is favoured in parts of this country as a stock for varieties of the Common Peach. The other is native of the alpine regions of the Chino-Thibetan borderland, where I discovered it. It has a palatable white-fleshed fruit and an exceedingly small, perfectly smooth stone. I had high hopes of it being useful to the hybridist when introducing it to the Arnold Arboretum in 1908, but apparently its alpine character is against

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its successful acclimatization. By analogy it ought to be very hardy but as a matter of fact with us it has suffered badly each winter.

The Apricot (*Prunus Armeniaca*) is another fruit-tree whose specific name is a geographical misnomer. Originally considered native of the Caucasus and Armenia it is now pretty generally accepted as being of Chinese origin. Its history is similar to that of the Peach. The Romans cultivated it and it is described by Pliny and Dioscorides. To France and England it was almost certainly carried by the Romans though the first mention of its being in England is in Turner's "*Herbal*" published in 1562. In China I know it only as a cultivated tree but many travellers have seen it wild in the northern provinces. It is much grown in Korea and, though I have not yet had time critically to compare the material, I am inclined to think that an Apricot I gathered on cliffs in northern Korea, and unquestionably wild there, represents this species. It may, however, belong to *P. sibirica*, by some considered merely a variety of *P. Armeniaca*. In Japan the Apricot is much cultivated, and the fruit is pickled and eaten as a relish. Its Japanese name is "ansu" and there are many beautiful garden forms with white, pink, to rose-red single and double flowers. In Afghanistan and other regions of the northwestern Himalayas the fruit

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is preserved by sun-drying, and dried apricots are an article of commerce in High Asia and Thibet. I have eaten fruits of such origin in the frontier town of Tachien-lu, situated on the Chino-Thibetan borderland. Apricots make a delicious preserve and to my thinking are very much better as jam than as fresh fruit.

In central Korea the Manchurian Apricot (*P. mandshurica*) is a common wild tree and grows to a very large size. Its fruit is similar to that of the Common Apricot but the leaves differ and its bark is thick, corky, black outside and red beneath. Then there is the so-called Black Apricot (*P. dasycarpa*) of uncertain origin but probably west Asian. It was introduced into England in 1800, has white flowers produced very early, and purplish black fruit. There is a strong family likeness among all the Apricots and what is needed is to get all the kinds together in one place and study them comparatively. In any case this would serve to provide the hybridist with material for further effort to improve the existing races of Apricot.

The Cherry-trees cultivated in gardens and orchards of the West for their fruit are the product of two species—*Prunus avium* and *P. Cerasus*—respectively the Sweet and Sour Cherries—both of Eurasian origin. They have been cultivated from

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very early times and their history is very similar to that of the Apple and Pear. The Sweet Cherry, Mazzard or Gean, from which the Heart and Bigarreau Cherries have been derived, is a native of western Europe, including England and Norway and eastward to Asia Minor and the Caucasus, but is rare in a wild state in Spain and Italy; in Russia it is apparently confined to the southwestern provinces and to the Crimea. It favours well-drained light soils on the margins of woods, and especially among Beech-trees. It is a handsome, more or less loosely pyramidal tree from 80 to 90 feet tall by 10 feet and more in girth of trunk. In Beech woods on the Chiltern Hills in England it grows to perfection. It is less hardy than the Sour Cherry, suckers little from the roots, and from the fact that birds favour its fruit it owes its specific name. The Sour or Pie Cherry from which the Kentish Cherries and Morellos have been derived is native of southeastern Europe, Asia Minor, and the Caucasus, and in this country is a much hardier tree than the Sweet Cherry. It is a low tree, rarely 40 feet tall, with a broad, wide-spreading crown and suckers freely. It is naturalized in the colder states of this country and over a great part of Europe. A variety (*marasca*), native of Dalmatia, is worthy of mention as the source of Maraschino, a distilled liqueur much used in Europe

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and elsewhere, and in America in the preparation of maraschino cherries.

Theophrastus in his "*History of Plants*," written some 300 years before the Christian era, gives a good description of the Sweet Cherry but in ancient Greece it was little esteemed as a fruit tree. Pliny states that Lucullus, the Roman soldier and epicure, brought them to Rome 65 years before the birth of Christ; but that Pliny was in error is proved by the illustrious Roman scholar, Marcus Terentius Varro, who in his book on farming, written in 37 B. C., treats of them as commonplace orchard trees of the period and tells when and how to graft them. The Romans carried cultivated varieties of Cherries to England and this fruit tree became well established in Kent during their occupation of Britain. In the time of Henry VIII and Queen Elizabeth the cherry was a highly favoured fruit and an excellent account of it is given by the Elizabethan herbalist, Gerard.

The cherry was one of the first fruit trees planted in this country and was brought to New England by the earliest settlers. Francis Higginson, writing in 1629, states that the Red Kentish was the only cherry cultivated in Massachusetts. In 1641 Cherry-trees were on sale in a nursery in Massachusetts. John Josselyn, who made voyages to New England in 1638, 1639, 1663, in his "*New England Rarities*

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Discovered" says: "It was not long before I left the Country that I made Cherry Wine, and so may others for there are a good store of them both red and black. Their fruit trees are subject to two diseases, the Meazels, which is when they are burned and scorched with the sun, and lowsiness when the woodpeckers jab holes in their bark; the way to cure them when they are lowsie is to bore a hole in the main root with an augur, and pour in a quantity of Brandie or Rhum and then stop it up with a pin made of the same tree."

In China Cherries are the product of *Prunus pseudocerasus*, a small tree, wild in the woods of the province of Hupeh, central China. It is not very hardy but is cultivated over a considerable area in China, and also in the warmer parts of Korea and southern Manchuria. Formerly it was much grown in Japan, but its place has been taken by European Cherries. The Chinese Cherry is a red, sweet fruit of little flavour, suggesting a White Heart Cherry in miniature. It was introduced into England about 1822 but was soon lost or nearly so. It has not proved hardy in the Arnold Arboretum but has fruited in Chico, California.

Much more valuable is the Bush-cherry (*P. tomentosa*), a common wild shrub in central and western China and much cultivated in northern China,

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Manchuria and Korea for its fruit. It is a very hardy plant and will thrive in the coldest parts of the United States. It has short-stalked, globose, scarlet fruit, very juicy and pleasantly acid. The plant seldom exceeds 6 feet in height and as much in diameter, and has leaves clothed with gray, woolly hairs on the underside. The Sand Cherry (*P. pumila*) of eastern North America and its western relative (*P. Besseyi*) have received a little attention from fruit breeders during recent years and may ultimately prove of some value, but their fruits are decidedly astringent.

The consensus of opinion is that our common Plums have been evolved by long cultivation from two Eurasian species, *P. insititia* and *P. domestica*. To the first-named belong the damsons, bullace, mirabelle, and St. Julien plums; the second is the more important of the two and here belong the green-gages (Reine Claude plums), the prunes, the perdrigon plums, the yellow egg plums, the Imperatrice, and the Lombard plums. The Insititia plum was mentioned by the old Greek poets Archilochus and Hippona in the 6th century B. C. and has been cultivated from the earliest times. Nowadays it grows wild in all the temperate parts of Europe, and in western Asia to the Caspian region. The Damsons derive their name from the old city of Da-

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mascus, and old works on pomology state that Alexander the Great brought these plums from the Orient after his expedition of conquest and that some centuries later Pompey, returning from his invasion of the near East, brought plums to the Roman Empire. It may be assumed with reasonable probability that the Syrians and Persians were the first to cultivate these Plums.

The Domestica Plums were apparently first known and cultivated in the Transcaspian region and did not reach Europe until after the dawn of the Christian era. Pliny is the first to give a clear account of these and he speaks of them as a new introduction from Asia Minor. The prune group of the Domestica Plums are very rich in sugar which enables them to be preserved by drying without removing the stone. They probably originated in Turkestan in early times, were brought to Europe by the Huns, becoming established in Hungary where in the 16th century they were an important trading commodity. When and where the Reine Claude Plums originated nobody knows. The name commemorates Queen Claude, wife of Francis I, the fruit having been introduced into France about the end of the 15th century. The English synonym, Green-gage, is named for the Gage family who procured them from the Chartreuse Monastery in Paris early in the 17th

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century. The Perdigon Plums are an old group and take their name from an ancient geographical division of Italy. Of the Egg Plums the Imperial or Red Magnum Bonum was known in England in 1629 and the Yellow Egg is described by Rea in 1676. Parkinson in 1629 describes half-a-dozen sorts of Imperatrice Plums distinguished by blue-black bloomy fruits. Both Insititia and Domestica Plums were among the earliest fruits planted by the settlers in this country but they have never attained the importance here that they hold in Europe.

Before leaving the subject of Eurasian Plums mention ought to be made of *P. cerasifera*, the Myrobalan Plum, native of Transcaucasia, northern Persia, and Turkestan. It is a hardy, handsome tree but its fruit is much inferior to that of the two already mentioned so it is but little grown.

The Plum cultivated in the temperate parts of eastern Asia is *Prunus salicina*, better known as *P. triflora* and in the vernacular as the Japanese Plum. It is indigenous in central China where I have found it to be fairly common, but is unknown in a wild state from any other region. Curiously enough it is the only true Plum known from all that vast region. In China it has been cultivated from time immemorial and there are varieties in quantity, some with greenish, others yellow, red, or bloomy-black fruits. From

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China it has been taken to southern Manchuria, Korea, and Japan where to-day it is extensively cultivated. From Japan it was introduced into this country about 1870 by a Mr. Hough, of Vacaville, Cal., through a United States Consul to Japan, Mr. Bridges. The first ripe fruit of these east Asiatic Plums was produced in the grounds of Mr. John Kelsey, Berkeley, Cal., in 1876. So impressed with their value was Mr. Kelsey that he urged others to take them up and this resulted in their propagation being undertaken on a large scale by Messers W. P. Hammon & Co., Oakland, California, about 1883. To-day about one hundred varieties of Japanese Plum are grown in this country. It reached Europe, where it is less valued, later, and from America.

A hybrid between a cultivated form of the east Asiatic Plum and the common Apricot, known as *Prunus Simonii*, has been cultivated for nobody knows how long in the provinces of Shantung and Chihli. It was introduced to France in 1867 and has since been much grown in this country. This Plumcot is short-lived and of no particular value.

Authorities are not yet agreed as to the exact number of species of Plums found wild in this country and Canada but undoubtedly they exceed in number the total found in the rest of the world. Virtually

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all have fruit useful for culinary purposes if not for dessert and were so employed by the early settlers. The Indians knew their value and utilized them. In recent years different Agricultural Experimental Stations have undertaken proper investigations with promising results. By selection and hybridizing there is much promise of future usefulness, and especially for the Prairie states and those of the Mississippi Valley where European Plums do not succeed. The best known perhaps is *Prunus americana* which is distributed from the Atlantic coast to the Rocky Mountains. It was known in Europe before 1768 when it is mentioned by Duhamel under the name "Prunier de Virginie" but has never become important there. Among the oldest known is *Prunus nigra*, the Canada Plum, first described in 1789, and undoubtedly the dried plum which Jacques Cartier saw in the canoes of Indians, in his first voyages of discovery up the St. Lawrence in 1534. These primitive prunes were a staple article of diet among the Indians in those early times, and it is possible that they planted trees of this species about their habitations. The comparatively recently recognized *P. hortulana* and *P. Munsoniana* are perhaps the most promising and valuable of American Plums, especially for the more southern states of the Middle-West. The Pacific Plum (*P. subcordata*) is one of the staple

OUR COMMON FRUIT TREES

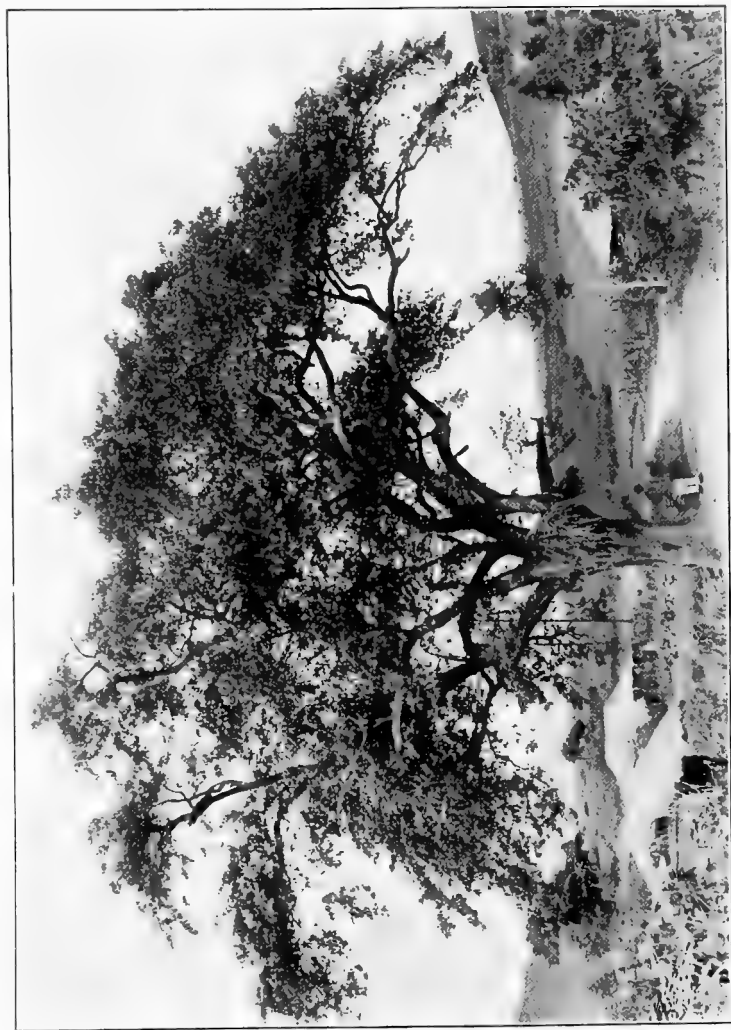
foods of the Indians east of the Coast Range from southern Oregon to central California, being eaten raw or cooked and is sometimes dried in quantity. The Chicasaw Plum (*P. angustifolia*) and the Beach Plum (*P. maritima*) were both named by Marshall in 1785 and were known to the earliest settlers along the Atlantic seaboard. There are several other named species and numerous varieties, and intimate study will assuredly result in new discoveries. A century hence these American Plums will probably be in the first rank among the stone-fruits of this country.

In northern China a Jujube (*Zizyphus sativa*) is very extensively cultivated and the varieties are very numerous. Some of the best of these have been introduced into this country by the late Frank N. Meyer for the Department of Agriculture and may eventually rank among the fruits of America. The most popular fruit in China, Korea, and Japan is the Persimmon (*Diospyros kaki*), and several of the best kinds have been introduced by Mr. Meyer, but there has not yet been time to establish the industry here. Were unlimited space at my disposal I would tell of the Fig and other fruits but there must be an end to this chapter. The attempt has been to set forth some of the more interesting aspects and facts centred around our common fruit trees. The practical side of pomology is not part of the scheme but in

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emphasizing the ancient character of the cult, its remote and crude beginnings, it is obvious that the end is not yet. Even as we now enjoy fruits in greater variety and of a quality superior to those of the Roman period, so also will the fruits of the future assuredly be better and of greater variety than those of to-day.

CHAPTER XIII
THE LOMBARDY POPLAR AND
WILLOW OF BABYLON



KOREAN WILD PEAR-TREE

SPECIMEN IS GROWING NEAR THE DIAMOND MTS., AND PROBABLY THE LARGEST PEAR-TREE
IN THE WORLD. HEIGHT 60 FT.; GIRTH 14 FT.; SPREAD OF CROWN 75 FT.
(*Pyrus ussuriensis*)



WEeping WILLOWS

(ABOVE) TRUE "WILLOW OF BABYLON" WHERE IT GROWS WILD, IN THE MIN VALLEY OF THE CHINO-THIBETAN BORDERLAND
(*Salix babylonica*)

(BELOW) SALAMON'S WILLOW, NOT QUITE SO PENDULOUS, BUT MUCH MORE HARDY
(*Salix Salamonii*)

CHAPTER XIII
THE LOMBARDY POPLAR AND
WILLOW OF BABYLON

IN THE realm of tree-life no stronger contrast exists than that presented by these two trees. It is true that upright and pendulous branching forms occur in other trees but none is fixed in the popular mind so firmly as this Poplar and Willow. Their very names conjure up mental pictures of the trees, and they are known far outside the fold of garden-lovers. Both are intimately associated with mankind in many parts of the world, indeed, it is doubtful if any deciduous-leaved trees have been more widely planted on purely æsthetic grounds. In the case of the Poplar some consider that its planting has been over-done—certainly it has been planted where it should not have been and its legitimate uses much abused. But this is the fault of man and not of the tree. Rightfully used it is a valuable subject in landscape work and quickly develops a unique effect. By water these trees are complimentary and create a splendid and harmon-

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ious effect. The Willow has not suffered in this respect. With its pendent branches, lithe and graceful, moved by the faintest breath of wind, it has stirred the sentiment of different races of mankind. Usually it is associated with grief. In Korea it is planted to form avenues leading to the tombs of royalty. And did not Napoleon on St. Helena sit beneath a Weeping Willow? Grieving over his fallen fortunes he may have found sympathy beneath this tree, for in the cynical expression that misery likes company there is much truth.

An old Chinese book says "the Emperor Yang Ti of the Sung dynasty built a great canal a thousand li [Chinese miles] in length, and encouraged the people to plant Willows along its banks. For each tree planted a roll of silk was given and the trees were named after the Emperor and called 'Yang-liu.'" In Japan the highest type of feminine beauty is symbolized by the Willow for gracefulness, the cherry-blossom for youthful charm, and the plum-blossom for virtue and sweetness. A celebrated Japanese beauty is known as Yanagi-no-oriu, or "Willow-woman," and is said to have a Yamagikoshi—willow-waist, because she is slender and graceful like the hanging branches of that tree. Dancers, too, are said "to sway like the branches of the Willow when wafted by the summer's breeze." On the

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“willow-pattern” crockery and porcelain is perpetuated the legend of the Chinese maiden Koong Shee who loved her father’s secretary, Chang, and ran away with him. A similar legend is current in old Korean literature. In our own folk-lore and songs the Willow is associated with love, unrequited or forbidden. The note of sadness is present and the bond of sympathy is ever to the fore. Someone has asserted that the beautiful always awakens sadness, and perhaps this explains why the Willow and grief are inseparably linked in the poetry and prose of many lands.

The Poplar, on the other hand, inspires no such thoughts. Each and every one of its branches grow erect and cluster closely together as if afraid to leave the bosom of the parent trunk. Rapidly it grows and thrusts its narrow, spire-like crown heavenward. Like ambition its one desire seems to be to excel its fellows and flaunt in the breeze far above their heads. Trees from 100 to 150 feet tall are known—gaunt in winter but spires of green in summer, like sentinels they stand and dare both the laws of gravity and the fury of storms. For their great daring they often suffer, but so do others of greater timidity. To watch a Lombardy Poplar in a wind-storm is inspiring. No tree puts up a better struggle. It bows far over and defiantly regains its equilibrium

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at the first lull. Think of the strain on its millions of cells; of their elasticity and supple strength. Compare them with the buildings erected by man, and their superiority in tensile strength is immense. On calm days the Lombardy Poplar may be considered stiff, even frigidly so, but in a storm its grace and litheness are unmistakably shown.

And why the name Lombardy Poplar? All the trees of this Poplar are male, and the accepted view is that they have all descended by vegetative propagation from a single tree which originated on the banks of the River Po in northern Italy, probably early in the 18th century. It is not mentioned by mediæval Italian writers nor by travellers in Italy during the 17th century. An 18th century writer, Jean François Sèguier in his "*Plantae Veronensis*" II, 267 (1745), says it was known anciently in Lombardy and mentions a superb avenue which he saw in 1703 at Colorno, the residence of the Duke of Parma. It was apparently carried by the Genoese to the Levant, and by 1798 it was known to be abundant on the plains of Damascus. It has, indeed, been widely planted in northern Africa, Egypt, in southwestern Asia, and is common in Asia Minor, Persia, Afghanistan, and Kashmir. In Turkestan a fastigate form of the White Poplar (*P. alba*) has by some travellers been mistaken for it. It has reached China,



BRANCHED AND LEAFED TO THE VERY GROUND THE LOMBARDY POPLAR IS THE MOST HANDSOME TREE OF ITS TYPE OF GROWTH—A MODERN TREE

THE LOMBARDY
POPLAR
(*Populus nigra* var. *italica*)



DECORATIVE EFFECT OF THE
LEAFLESS BRANCHES



FLORENCE COURT OR IRISH YEW

A NATURAL VARIATION OF THE ENGLISH YEW
(*Taxus baccata* var. *fastigiata*)

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but when is unknown, and is often seen to-day as a planted tree. In and around Tsingtao it has been much planted and from there taken to southern Manchuria and Korea, where it has been planted to a ridiculous extent. Also it has reached Japan, but there the tree has not found favour. To France the Lombardy Poplar was introduced in 1749. It is usually stated to have been brought to England in 1758 by the Earl of Rochford, ambassador at that time in Turin, and planted at St. Osyth's in Essex, but there is good reason for believing that it was introduced some years earlier by the Duke of Argyll and planted at Whitton. It was introduced into America by William Hamilton from England in 1784, and planted on his estate at Woodlands, Philadelphia.

The Lombardy Poplar was first recognized and described as a variety of the Black Poplar by Du Roi in 1772. Since then it has received several other names but experts now agree with Du Roi. Such is the history, in brief, of one of the most common and best known of planted trees. It is of essentially modern origin and yet, thanks to its distinct appearance, which has singled it out for favouritism, and the ease with which it is propagated, it has been spread over a wider area of the world's surface than any other European tree of purely ornamental character.

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The story of the Babylon Willow (*Salix babylonica*) is older. Its distribution has been in the reverse order and its early history is shrouded in mystery. It is a Chinese tree and it is doubtful if it was ever known by the waters of Babylon for which it is named and endeared to the minds of most people. Truth often shatters fond delusions and robs us of many pretty myths and stories to which we fain would cling. So much has the name "Willow of Babylon" captivated the popular mind that Weeping Willows generally are considered to be this tree. In spite of the shock to popular belief truth necessitates the record that the trees in the Psalmist's wail (Psalms CXXXVII, verse 1, 2. "By the rivers of Babylon, there we sat down, yea, we wept, when we remembered Zion. We hanged our harps upon the willows in the midst thereof.") are not Willows at all but a Poplar (*Populus euphratica*)! The Willow of Babylon is native of China where it is common on alluvial areas, especially those of the Lower Yangtze. It has been much planted and it is often difficult to tell the wild from the cultivated trees. Near Shanghai it is abundant but it does not grow so far north as Peking where the winters are too cold for it. In the neighbourhood of Ichang in central China it is common, but the largest trees I have seen are in the western province of Szech'uan, near the Chino-

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Thibetan borderland. In its typical form it is a broad-topped, spreading tree often from 60 to 80 feet tall, from 6 to 10 feet in girth of trunk, and from 50 to 60 feet through the crown. The pendent form is really an extreme condition but it is common. And in relation to this it is worthy of note, for the fact has not been properly appreciated that many Tree-willows have weeping forms. The typical form has a broad crown, and one extreme inclines to be more or less conical and the other pendent. This range of variation—this diversification into three forms—obtains in the Chinese *Salix babylonica* under consideration; *S. Matsudana*, common around Peking and westward; *S. koreensis*, abundant in Korea, and in *S. Warburgii* of Liukiu and Formosa. It also occurs in other Korean and in certain Japanese Tree-willows, whose names are less familiar, but is not quite so marked.

In China the Babylon Willow is a favourite garden tree and is also planted by graves and in temple grounds. In northern China and Korea its native confrères are used in the same manner. To Japan the male form of *S. babylonica* was long ago taken and in many cities—Tokyo, for example—it is a favourite street tree, being kept severely pruned; in Japanese gardens, temples, and palace grounds, it is also common. This male tree has been introduced from

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Japan to California where it is also a favourite and around San Francisco it is commonly planted.

How, when, and by what means it reached the near East is not known, but in all probability by the old caravan routes across central Asia. Or it may have been carried by old voyagers from Canton by sea to India though this is less likely. The first mention we have of the tree is of a specimen collected in China by James Cunningham and recorded by James Petiver in his quaint work "*Musei Petiveriani centuria*" No. 997, published in 1703, who gives its Chinese name and says it is a Tree-willow with pendulous foliage branches. In the neighbourhood of Mt. Olympus in Asia Minor, Wheler, in his "*Journey in Greece and Asia Minor*," p. 217, published in 1682, tells of a tree which may have been a Weeping Willow. But the first definite mention of this tree in the Levant is by Tournefort, in his "*Corollarium*," page 41, published in 1719, who describes it as the Oriental Willow with shoots beautifully hanging downward. Either he or Wheler took it to western Europe. It was introduced into England before 1730 for in a catalogue, published by Philip Miller in that year, it is stated to be on sale in gardens near London. Peter Collinson, whom we mentioned when writing about the Horsechestnut, was of the opinion that it was introduced by Mr.

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Vernon, a merchant at Aleppo, Turkey, who planted it at his seat in Twickenham Park. Collinson saw it there in 1748 and claims that this tree was the original of all the Weeping Willows in England. The celebrated poet, Alexander Pope, who died in 1744, had a tree in his garden at Twickenham and the story is that he happened to be with Lady Suffolk when she received a present from Spain, or, as others claim, from Turkey, and observing that some of the withy bound round it seemed to be alive took one and planted it in his garden where it grew and afterward became a celebrated tree. It is said that the Empress of Russia took cuttings from Pope's Willow in 1789 for the gardens at Petrograd. Pope's tree was destroyed either by storm or axe (there are two stories) in 1801, and the wood was worked up by an eminent jeweller into all sorts of trinkets and ornaments which had an extensive sale.

On St. Helena Babylon Willows were planted by General Beatson, governor of the island, about 1810. One of these trees became a favourite with Napoleon during his exile there, and, at his own request, a seat was placed beneath it and there he often used to sit.

All the Babylon Willows known in Europe are female and in all probability originated from a single tree introduced either by Wheler or Tournefort. It is a rather tender tree, not long-lived and large

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specimens are rare in England and in northern Europe. When it was brought to this country is unknown but probably toward the end of the 18th century. It has also been carried to South America, and travellers say that in Chile, especially by sides of irrigation canals, magnificent specimens occur. Near Boston, Mass., it is scarcely hardy, but in the Arnold Arboretum some trees raised from cuttings I sent from near Ichang in central China are promising.

A hybrid, supposed to be between *S. babylonica* and *S. alba*, named *S. Salamonii* and of which only the female is known, is a much more hardy tree. It is not quite so pendulous but its increased hardiness is a great asset. This valuable tree originated on the estate of Baron de Salamon near Manosque (Basses Alpes) before 1869, when it was put on the market by Simon-Louis of Metz. Another handsome Weeping Willow, a supposed hybrid between *S. babylonica* and *S. fragilis*, named *Salix blanda*, is a much more hardy tree than the Babylon Willow. It is a very fast-growing tree with long, pendent branchlets which almost reach to the ground. There are two forms of *Salix blanda*, one with yellow shoots called "Niobe" and one with reddish shoots known as the "Wisconsin Weeping Willow." Then there are *Salix purpurea pendula* and *Salix alba vital-*

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lina pendula, both Weeping Willows. In the cold, northern parts of this country these forms pass for the Willow of Babylon but, as a matter of fact, the real tree is unknown there since the cold is too great for it to live. Even in England, and also in Germany and northern France, the true Babylon Willow is not very hardy and is rare, and other Weeping Willows are frequently grown under its name. They are all very beautiful and right well take the place in a practical manner of *S. babylonica* but they suffer through lack of historical interest when their identity is disclosed.

The Lombardy Poplar and the Weeping Willow have peculiar merits in landscape planting, but the former especially has been abused. Their strong contrast makes them companions and near water they are seen to good advantage. The Poplar adds grace and lightness when sparsely associated with round-topped trees. The Willow is best kept well away from buildings but the Poplar may be associated with them to advantage. The Poplar is also well adapted for planting in narrow streets, and by bridges of masonry it is seen to excellent advantage. Rightly placed and rightly used the Lombardy Poplar is one of the most useful trees in garden art. In this country it has been widely planted and is too well-known to need further com-

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ment. To South America also it has been carried, and in Chile (where possibly are the finest specimens in cultivation) and the Argentine it is a commonly planted tree near dwellings and on the side of irrigation canals where it luxuriates. In France this tree has been planted a-plenty but it is not now looked upon with so much favour as in the past. To thrive properly it requires fairly good soil and to be well supplied with water at the roots. Nowadays it has a decided tendency to form dead wood and become scrawny, and some have suggested that this is a sign of old age. Since all are and have been propagated by cuttings from the original tree this suggestion may be the true explanation of the present decline in health and vigour of the Lombardy Poplar.



UPRIGHT GROWING FORMS OF TWO AMERICAN MAPLES

(*Acer rubrum*
var. *columnare*)

(*Acer saccharum*
var. *monumentale*)



UNUSUAL UPRIGHT HABITED VARIETIES OF TWO WELL KNOWN TREES

FORM OF TULIP-TREE
(*Liriodendron Tulipifera* var. *pyramidale*)



FORM OF WHITE PINE
(*Pinus Strobus* var. *fastigiata*)

CHAPTER XIV
TREES OF UPRIGHT HABIT

CHAPTER XIV

TREES OF UPRIGHT HABIT

THE Lombardy Poplar and the Weeping Willow dealt with in the preceding chapter represent two extreme types and the most diverse variations from the normal habit of tree-forms. Though the oldest authentically known deciduous-leaved trees of their class they are by no means unique examples and, since trees of their remarkable shapes have a considerable field of usefulness in park and garden decoration, it may be useful to enlarge upon the subject. If it be asked why Nature should indulge in the development of such abnormal types no answer is forthcoming. The manner in which the peculiar branching habit takes place can be explained, but what induces it and the reason why are mysteries. Light and gravity exercise diametrically opposite effects on the primary root and primary shoot of a tree. The root grows away from light and toward the centre of the earth; the shoot contrariwise grows toward light and away from the earth. The behaviour of secondary and tertiary roots

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and branches toward light is identical with the primary ones but toward gravity it is about intermediate for usually they grow more or less horizontally away from the central axis. In the case of the roots to ensure a broad field from which to draw water and food salts; in the case of the shoots to give a wide field for the leaves to intercept light and air the more completely to perform their allotted work in the tree's economy. In the Lombardy Poplar all the secondary and tertiary branches grow erect after the manner of the primary shoot; in the Weeping Willow the tertiary branches simulate the behaviour of primary roots in that they grow downward toward the earth's centre. Of the remarkable and opposite behaviour of the branches of these two trees the most casual observer is cognizant, but the why of this phenomenon is a poser to those most deeply versed in tree-lore. The secret has not yet been wrested from the living substance scientists designate as protoplasm. But if it is beyond the wit of man to explain the cause. Garden-lovers, from early times, have not been backward in appreciating the value of such strikingly distinct forms of tree-growth for garden embellishment.

Among such Conifers of the Northern Hemisphere as Juniper, Thuja, Chamaecyparis, and Cypress many species are columnar in outline. In some,

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especially the Thuja, the branches are actually ascending, but in most the habit is produced by the branches being very numerous, short, and of equal length and radiating at a right angle. In every case these trees assume a different form as they grow into adults, the character being essentially a youthful condition even though in many it obtains for very many years. Some of the more distinct forms are perpetuated by vegetative propagation, and wherever these and the parent forms are hardy they have great garden value. In fact, the oldest cultivated tree of upright habit, the Italian Cypress (*Cupressus sempervirens*), belongs to this class. In some trees both erect and pendulous forms are known in the same species. This is the case in the English Yew, the European Beech and Birch, and in the Norway Spruce, yet curiously enough there is no truly fastigiata Willow and no weeping Poplar.

Let us consider the upright-branched forms of tree-life typified in the Lombardy Poplar and known as "fastigiata trees." Of such there are quite a number that are hardy in the colder parts of this country. They belong to widely separated families and their number is constantly being added to. Probably all known are seminal variations of spontaneous origin, and owe their preservation to man who has propagated them vegetatively by cuttings or graftings.

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In countries where raising trees from seeds has long been practised most of these fastigate trees have been detected. Among American species five only (Silver, Sugar, and Red Maples, Tulip-tree and White Pine) have given rise to fastigate trees. Of these that of the Tulip-tree and of the Silver Maple originated in Europe and probably that of the Red Maple also. The other two owe their preservation to the Arnold Arboretum, and they rank among the best of their class. The fastigate Sugar Maple (*Acer saccharum* var. *monumentale*) is one of the narrowest of all trees and is strikingly distinct in appearance. The branches are comparatively few and quite erect, and the tree is well adapted for planting by the side of narrow roads. The parent tree was discovered in 1885 growing in a cemetery in Newton, Mass. The specimen in the Arboretum collection is 50 feet tall and is a graft from the original tree. The upright form of the Red Maple (*A. rubrum* var. *columnare*) was found growing in 1889 in the old Parsons Nursery, Flushing, New York, but nothing is known of its history. It is rather broader in outline than the fastigate Sugar Maple and is most decidedly a valuable tree. The form of the Silver Maple (*A. saccharinum* var. *pyramidale*) originated in Späth's Nursery in Germany and we have only small specimens. As its name suggests it is

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pyramidal in outline and not so striking in appearance as the two already described. Of the many species of Maple native of the Old World only the Norway Maple has sported into an upright form. It is known as *Acer platanoides* var. *columnare* but is really pyramidal in habit.

A very distinct tree is *Liriodendron Tulipifera* var. *pyramidale*, the fastigate Tulip-tree. This originated in the nursery of Simon Louis, near Metz, Alsace, and has been grown in the Arnold Arboretum since 1888. It has the familiar, large leaves of the type but the branches are quite upright. Like the parent it is not attacked by pests of any sort and it deserves to be widely known.

One of the narrowest of trees is *Ulmus glabra* var. *fastigiata*, the Exeter Elm, a form of the Scotch Elm which originated in a nursery in Exeter, Devonshire, nearly a century ago. Truth to tell it is a rather ugly tree of little merit save that it is curious. On the other hand, the Cornish Elm (*U. nitens* var. *stricta*) is beautiful. This is the common Elm in Cornwall and parts of Devonshire, and at its best is a tree 80 feet tall and 15 feet in girth of trunk. The lower branches curve outward and upward while the upper ones are short and ascending, and the symmetry of the tree is graceful and pleasing. Very similar in habit is the Guernsey Elm

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(*U. nitens* var. *Wheatleyi*) which appears in some nurserymen's catalogues under the name of *Ulmus campestris monumentalis*.

Fairly well known is *Quercus pedunculata* var. *fastigiata*, the Cypress Oak, a variety of the English Oak, and very variable in foliage. In western Europe it grows to a large tree but in this country, though it is quite hardy, it is short-lived. It grows rapidly here but rarely lives more than thirty or forty years. The same is true of the fastigiate Birch (*Betula pendula* var. *fastigiata*), which has a narrow crown of erect branches. It is strange that among such a large tribe as the Birches the common White Birch of Europe alone has sported distinct forms.

Among that summer-flowering group of trees, the Lindens, there is but one with upright branches. This is *Tilia platyphyllos* var. *pyramidalis*, a European tree whose branches taper from a broad base to a pointed apex, and is pyramidal rather than erect in habit. The European Hornbeam (*Carpinus Betulus*) has given rise to two forms of upright habit. One (var. *globosa*), in spite of its name, is a dwarf, very compact, fastigiate plant, the other (var. *pyramidalis*) is well described by its varietal name.

One of the most interesting of all fastigiate trees is the Dawyck Beech (*Fagus sylvatica* var. *dawyckii*). This remarkable form of the European Beech origi-

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nated on the estate of my friend Mr. F. R. S. Balfour at Dawyck, Peebleshire, Scotland, and is now 50 feet tall. It is an old tree with dense, quite upright branches and is a striking contrast to the type. The propagation of this fastigate Beech has recently been taken up by European nurserymen, and young plants in the Arnold Arboretum are doing well.

The European *Crataegus monogyna*, a Hawthorn, has produced two varieties with upright branches. One (var. *stricta*) is a tree with a broad crown and bears dull red fruit; the other (var. *monumentalis*) is a narrow and strictly pyramidal plant, and is a recent acquisition to our collection. In some European nurseries there is grown a fastigate form of the common Horsechestnut (*Aesculus Hippocastanum* var. *pyramidalis*) but I have not seen this tree.

Besides the Lombardy there are two other Poplars that have erect branches. One of these is *Populus alba* var. *pyramidalis*, better known as *P. Bolleana*. This form of the White Poplar is a native of central Asia and was introduced into Europe and this country about forty years ago. In habit it is as fastigate as the Lombardy Poplar, and it exhibits much variation in shape of leaves which are white on the underside. The second Poplar is known as *P. thevestina* and though in habit and foliage it is simi-

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lar to the Lombardy, its bark is nearly white. This tree grows in Serbia, in the Crimea, and in Algiers; in the Arnold Arboretum it has made rapid growth and has proved quite hardy.

Among Conifers of the type of growth under consideration *Pinus Strobus* var. *fastigiata* is destined to be of great importance. The original tree was discovered about 1895 in a garden at Lenox, Mass., and the trees now growing in the Arnold Arboretum are grafts from it. This handsome tree has compact, ascending branches forming a conical crown, and it ought to be widely propagated by nurserymen. The Scots Pine (*P. sylvestris*) has many seminal and geographical forms and among them one (var. *pyramidalis*) of fastigate habit. Of the Norway Spruce (*Picea Abies* or *P. excelsa*) a great number of abnormal forms are known and among them at least two (var. *columnaris* and var. *pyramidalis*) with erect branches. The parents of these are said to have been found wild in the European forests.

One of the loveliest of hardy pyramidal Conifers is Douglas's Arborvitæ (*Thuja occidentalis* var. *pyramidalis*), sold by many American nurserymen under the name of *Thuja occidentalis pyramidalis Douglasii*. It is a tall, narrow tree of a rich green hue, and was raised some time before 1855 by Robert Douglas in his nursery at Waukegan, Ill. Since I have

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mentioned an *Arborvitae*, I cannot resist saying a word or two about the Incense Cedar (*Libocedrus decurrens*). This tree grows wild on the western slopes of the Cascade and Sierra Nevada mountains from Oregon southward to near the Mexican boundary, and also on the California coast ranges. In the Arnold Arboretum it is hardy only in a sheltered nook near the top of Hemlock Hill. It has ascending branches forming a columnar crown, and is of a rich, dark shining green hue. This is one of the most distinct of all hardy or nearly hardy Conifers, and in Great Britain and Ireland, where it was introduced by John Jeffrey in 1852, many stately, columnar specimens fully 50 feet tall adorn lawns and pleasure grounds.

One of the most famous and best known of erect-growing trees, but alas! not hardy in the New England states, is the Irish or Florence Court Yew (*Taxus baccata* var. *fastigiata*). This most distinct Yew was discovered on the mountains of Fermanagh, Ireland, near Florence Court, the seat of the Earl of Enniskillen about 1780, by a tenant-farmer named Willis. He found two plants, one he planted in his own garden where it died, the other he gave to Florence Court where it grows to this day. From this tree, which is female, cuttings have been distributed and from it all the true Irish Yews in existence have been

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derived. Many fine specimens of this Yew are known, some more than 30 feet tall. The habit is columnar and compact with all the branches and branchlets directed vertically upward. The leaves are dark green and shining and spread radially in all directions from the branchlets. It is very effective as a garden tree but requires pruning and tying at intervals to keep it in good shape. There are forms with golden (*aurea*) and silver (*argentea*) tips to the branchlets. Pollinated by the Common Yew seeds have developed and have given rise to less fastigate forms, such as *erecta* and *chesbuntensis*, which have found their place in gardens. Another form (*elegantissima*), raised from seeds the result of pollination by the Golden Yew (*Taxus baccata* var. *aurea*), has the young leaves yellow and the old ones with white margins.

Very valuable for gardens in the colder parts of this country should prove the upright form of the Japanese Yew (*Taxus cuspidata* var. *Hicksii*) which quite recently appeared among some thousands of seedlings of the type in the Nursery of I. Hicks & Son, Westbury, Long Island, New York. Mr. Henry Hicks obligingly informs me that the seeds were "probably collected from the plant which stood northwest of the residence of the late Charles A. Dana, Glen Cove, Long Island, and which was later

TREES OF UPRIGHT HABIT

moved to the estate of William D. Guthrie, Locust Valley, Long Island.”

A Japanese plant analogous to the Irish Yew is *Cephalotaxus drupacea* f. *fastigiata*, which was introduced to the Botanic Garden at Ghent in 1830 by Von Siebold. It is commonly cultivated in the warmer parts of this country but is not hardy in eastern Massachusetts. The branches are strictly erect and the leaves, which spread on all sides of the shoot, are leathery and blackish green.

There are other trees of fastigiate and pyramidal habit but finality is not attempted, and this chapter may fittingly conclude with reference to a remarkably distinct and valuable variety of our old friend *Ginkgo biloba*.

This form (*fastigiata*), with its compact ascending branches, has a bright future before it as a street and avenue tree. The oldest and finest trees known grow in Fairmount Park, Philadelphia, concerning which the Commissioners courteously supplied the following information: “There are five specimens of the pyramidal form of Maidenhair-tree, *Ginkgo biloba*, at Horticultural Hall. One measures 3 feet $2\frac{1}{2}$ inches in circumference and is 36 feet high; the other four measure from 4 feet 5 inches to 4 feet $9\frac{1}{2}$ inches in circumference and are from 45 to 55 feet high. The one with the smallest circumference has two

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leaders. We have no definite information as to when these trees were planted, but our oldest employee at Horticultural Hall states that a group of young Ginkgo-trees was exhibited on the south side of the Hall in 1876. Two of this group were transplanted in 1882 to the north side of the Hall, and from the similarity of measurements we presume the others were moved at the same time. It might be of interest to you to know that near Woodford Guard House in Fairmount Park we have a specimen which shows both the spreading base and the pyramidal top."

CHAPTER XV
PYGMY TREES

CHAPTER X V

P Y G M Y T R E E S

P REVIOUS chapters have dealt with the patriarchs, the giants, and the eccentric types of tree-growth; also with trees of strictly utilitarian interest, and it now remains to treat of the pygmy forms which also have their niche in Nature's scheme. A number of these plants, the dwarf Conifers in particular, have considerable garden value. Most people are familiar with the dwarfed trees of Japan which in recent years have been much in demand in this country and in Europe. I shall have something to say about these later, but first let us consider the diminutive forms of tree-growth produced by Nature to suit the exactions of exposed situations and severity of climate. In the rich valleys and on the lower, sheltered slopes of mountains grow the giants of the tree world. On the higher parts of mountain ranges the wind exercises a strong influence on vegetation, diminishing the height of trees and on the topmost regions reduces them to a

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low, scrubby growth. On seacoasts the wind has full play and the same effects are seen; also on broad plains and plateaux. In short, the effect of strong winds everywhere is to retard tree-growth, and so it comes about that on the coasts, open plains, plateaux, and on the summits of mountains dwarf, stunted forms of tree-growth are common. These adaptations to environment, or ecological forms, as they are technically called, are often very distinct from the parent types, but if raised from seeds and cultivated under normal conditions they usually revert to their ancestral forms. For example, the upper slopes of Mt. Fuji in Japan are clothed almost exclusively with dwarf Larch which is merely an ecological form of the type that in the forests which cover the base and lower slopes of the mountains grows fully 80 feet tall. Near its altitudinal limits the gnarled stems of this dwarf Larch fairly hug the lava and cinders. Some twenty-eight years ago seeds from this prostrate form were sown in the Arnold Arboretum but the plants raised from them have rapidly grown into tall trees, and are now quite indistinguishable from others raised at the same time from the typical Larch-tree of the lower forest-zone. Of course there are genuine dwarf Larches which cannot be persuaded to grow into anything else, no matter how they are propagated; but in general the stunted forms of tree-types have to be

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increased by cuttings or by grafting or they lose their diminutive character.

Besides the wild pygmies of tree-growth which are the product of the eternal war waged between the Vegetable Kingdom and the elemental physical forces of Nature represented by temperature, wind, and precipitation, there are others of similar appearance which from time to time have appeared among trees long associated with our gardens and pleasure grounds. In fact, many of the dwarf trees best known are of this origin. The Japanese are passionately fond of pygmy trees and their skill in developing them by starvation, clipping, and grafting exceeds that of any other nation. Among the familiar types of deciduous-leaved trees of our northern forests—the Oaks, Beeches, Birches, Alders, Chestnuts, Elms, and others—there are scrubby forms. Some of the dwarf evergreen Oaks of western North America, eastern Asia, and the Mediterranean are worthy plants where climate admits of their outdoor culture; so, too, are certain Maples, but in general the dwarfs of the broad-leaf trees of the north have very little garden value. Among the Conifers and Yews the story is different and in passing it may be mentioned that these frequent alpine regions more generally than do their broad-leaf kin. And so it comes to pass that the Arborvitæ, Junipers, Pines,

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Spruces, Firs, Hemlocks, and Yews supply nearly all the decorative dwarf forms of tree-growth our gardens possess.

One of the best known and most widely used of these dwarf evergreens is the Mugho Pine (*Pinus montana*, better known as *P. mughus* or *P. pumilio*). This is a native of the mountains of central and southern Europe. On the Pyrenees it occurs both as a shrub and as a tree of moderate size; on the Tyrolese Alps it is everywhere a low, densely branched bush. In cultivation it is a broad shrub with many erect stems, occasionally reaching the height of 15 feet, and covered with dark green leaves.

On the higher mountains of eastern Asia and northern Japan, and reaching sea-level in Saghalien, grows *Pinus pumila*, in many ways the counterpart of the Mugho but belonging to another section of the genus. This oriental dwarf Pine is creeping in habit and forms an impenetrable tangle from less than a yard to fully 10 feet in height. Unfortunately it has not taken kindly to cultivation—yet why it should be intractable is unexplainable.

Of the noble White Pine of eastern North America (*P. Strobus*) there are several dwarf forms of pleasing appearance. The best is var. *nana*, a compact, bushy shrub with short, slender branches and numerous branchlets clothed with short leaves that are densely



DWARF MOUNTAIN OR MUGHO PINE

IT VARIES GREATLY IN FORM, AND IS MUCH USED FOR GARDEN PLANTING
(*Pinus montana* var. *Mughus*)



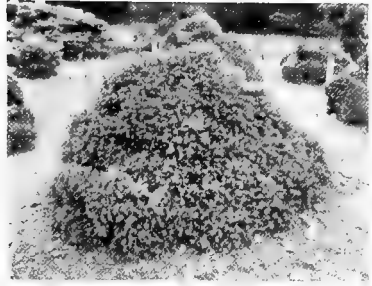
PENDULOUS DWARF HEMLOCK

FOUND ON THE BANKS OF THE HUDSON RIVER IS A PLANT OF REMARKABLE REFINEMENT
AND DELICATE GRACE

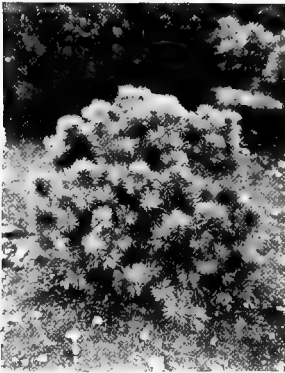
(*Tsuga canadensis* var. *Sargentii*)



DWARF COLORADO FIR
(*Abies lasiocarpa* var. *compacta*)



DWARF NORWAY SPRUCE
(*Picea Abies* var. *Gregoryana*)



DWARF WHITE PINE
(*Pinus Strobus* var.
nana)

SOME
REALLY
DWARF
EVER-
GREENS



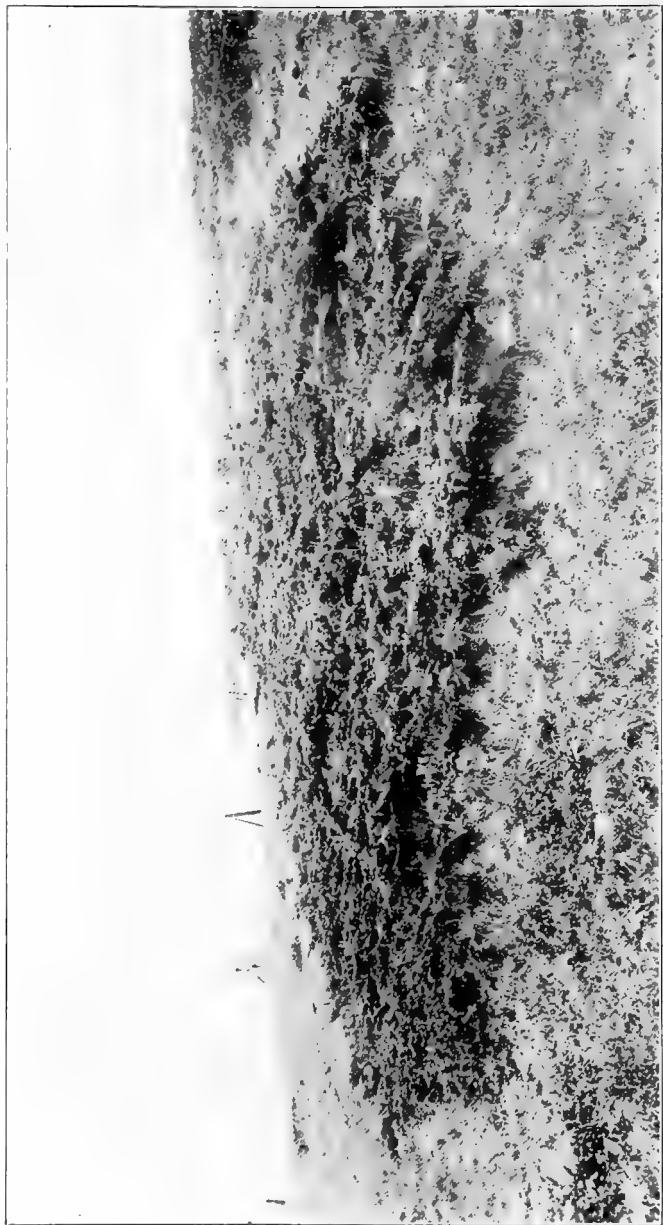
DWARF ORIENTAL SPRUCE
(*Picea orientalis* var.
compacta)



JAPANESE TABLE PINE
(*Pinus densiflora* var.
umbraculifera)



DWARF BLUE SPRUCE
(*Picea pungens* var.
compacta)



PROSTRATE FORM OF THE RED CEDAR

FOUND AT BALD HEAD CLIFF, YORK HARBOR, ME. AN EXTREME DIVERGENCE FROM THE NORMAL,
PYRAMIDAL, ERECT HABIT OF THE SPECIES AS COMMONLY SEEN

(*Juniperus virginiana* var. *reptans*)

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clustered at the extremities of the branchlets. Others are *compacta* and *pumila*, sufficiently described by their names, and rare in cultivation.

The Scots Pine (*P. sylvestris*), widely distributed in northern Europe and northern Asia, has given rise to many varieties, among them two or three pygmies. The best are var. *nana* and var. *Watereri* which are pyramidal in outline and, with their gray-green, stiff foliage, quite attractive little shrubs. A stunted form of the Japanese White Pine (*P. parviflora*) is common in the gardens of this country and Europe often under the name of *P. pentaphylla*. This form is produced by grafting on the Black Pine (*P. Thunbergii*), which is an uncongenial stock that causes very slow growth and stunted development.

Of the Japanese Red Pine (*P. densiflora*) there are many forms, and the Tanyosho (var. *umbraculifera*) and Bandaisho (var. *globosa*) are among the most useful of all dwarf Pines. The Tanyosho or Table Pine grows from 5 to 12 feet tall and has a dense, rounded, umbrella-like crown and gray-green leaves. The Bandaisho is more diminutive, being seldom 6 feet high, and has grass-green foliage.

The Norway Spruce (*Picea Abies*) has been extraordinarily prolific in abnormal forms of many kinds and among them half-a-dozen dwarfs. The var. *Clanbrassiliana* is seldom seen taller than from

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5 to 6 feet; it is globose or rounded in habit and has much-shortened and close-set branches, branchlets, and leaves. It originated on the Moira estate near Belfast about the end of the 18th century and was introduced into England by Lord Clanbrassil, hence its name. A diminutive variety is *Gregoryana* which seldom grows higher than 2 feet; its branches and branchlets are very numerous, short, and spreading and are thickly clothed with short, stiff leaves spreading obliquely from all sides. The var. *pygmaea* is equally small and its branches and branchlets are excessively shortened; the leaves are very small, prickly, and close set. Of dense conical habit is the var. *pumila* and its leaves, spreading from all sides of the branchlets, are dark green and glaucescent. Lastly, mention may be made of var. *dumosa* in which the branches are quite prostrate and furnished with many slender branchlets clothed with rather distant, short leaves. For general purposes the varieties *Clanbrassiliana* and *Gregoryana* are the best and they rank among the most useful of dwarf Conifers.

Of the native Black Spruce (*P. mariana*) there is a variety (*Doumettii*) which is compact and pyramidal in habit and seldom more than 10 feet high and of bluish colour. There is also an interesting dwarf form of the Blue Spruce (*P. pungens*). This origi-

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nated several years ago in the nurseries of the Arnold Arboretum and promises to be of value as a decorative plant. Also, of the White Spruce (*P. glauca*) there is a diminutive form (*nana*) which has been known for nearly a hundred years. The most delightful of dwarf Spruces and a most charmingly attractive plant is that being distributed under the erroneous name of *Picea Albertiana*. It is of narrow, pyramidal growth with short, close-set, twiggy branches and is densely clothed with almost pellucid grass-green leaves of singular delicacy. It much resembles the Summer Cypress (*Kochia scoparia*), and for its successful cultivation requires a moist soil and a shady situation with protection from strong winds. It is essentially an alpine plant and is really a dwarf form of the western variety of the White Spruce (*Picea glauca* var. *albertiana*) and has recently been named f. *conica* by Rehder. Its history is simple. In 1904 Mr. J. G. Jack of the Arnold Arboretum collected near Laggan, Alberta, some seedling plants of what he thought was the var. *albertiana*. These he sent home where they developed into the lovely plant above described.

The Firs have produced but few dwarf forms. The oldest known is the var. *budsonica* of the common Balsam Fir but this has very little horticultural value. Of the common European Fir (*Abies Picea*) there is a

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reputed dwarf form but after a few years this is apt to lose its character and to grow into a tall tree. The best pygmy Fir is *A. lasiocarpa* f. *compacta* which originated in the Arnold Arboretum from seeds sent in 1873 by Dr. C. C. Parry from Colorado. It is a genuine dwarf of compact habit. Both interesting and useful are the diminutive forms of the Douglas Fir (*Pseudotsuga taxifolia* f. *compacta* and f. *globosa*).

The common Hemlock (*Tsuga canadensis*) has given rise to several abnormal forms the most distinct of which are vars. *pendula* and *compacta*. The first-named is a compact form with closely overlapping pendulous branches forming a broad, low, round-topped mass. It was discovered many years ago on the mountains back of Fishkill Landing on the Hudson River by the late General Howland of Mattapan, New York, and named by him Sargent's Hemlock for his friend and neighbour, Henry Winthrop Sargent. General Howland found four or five of these Hemlocks, and one of his original discoveries is still living at Holm Lea, Brookline, Mass., the estate of Professor C. S. Sargent. The variety has been extensively propagated by grafting but such plants grow more rapidly, are of more open, less compact habit, and less beautiful than the original seedlings. The var. *compacta* is of upright, broadly pyramidal habit, very dense, and of rather stiff appearance.

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Both these Hemlocks are exceptionally useful garden plants.

The White Cedars (*Chamaecyparis*) and *Arborvitæ* (*Thuja*) supply our gardens with a majority of the dwarf Conifers they enjoy. These and the Junipers seem extraordinarily unstable in character and when raised from seeds all sorts of abnormal forms develop. Some have round, compact heads only a foot or two high, others grow into large globular masses and some into narrow pyramids. They are of much value for the rockery, lawn, and for making hedges. Many dozens of such forms have received names, and specialists are often at fault in determining their identity. Their number is legion, and did I attempt to enumerate a tithe of them the rest of this article would be a catalogue. The *Arborvitæ* of the eastern United States (*Thuja occidentalis*) has been amazingly prolific in these seminal variants a number of which are valuable dwarfs. Among them the forms *umbraculifera*, *recurva nana*, *Tom Thumb*, *Woodwardii*, *Reedii*, and *Little Gem*, are of the best. The Chinese *Arborvitæ* (*T. orientalis*), which has been in cultivation in Europe since 1752, has given rise to many abnormal forms parallel in character to those of the native species but less hardy. Of the common White Cedar (*Chamaecyparis thujooides*) there are two pygmy varieties (*ericoides* and

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leptoclada) which are very hardy. The Japanese species (*C. obtusa* and *C. pisifera*) have vied with the Arborvitæ in the production of a multiplicity of curious forms, and such as *obtusa nana* and *pisifera filifera* are now indispensable to our gardens. Their American relative *C. Lawsoniana* of the Pacific Slope has been equally prolific though its progeny are more tender. In England and parts of this country favoured with a moderate climate the dwarf forms of the Lawson Cypress are delightful garden plants.

The inherent peculiarity of the above Arborvitæ and White Cedars to produce when raised from seeds great variety in form, height, and appearance is likewise shared by some Junipers. The Red Cedar (*Juniperus virginiana*), its Chinese relative (*J. chinensis*), the Common Juniper (*J. communis*), the Savin (*J. Sabina*), and the scaly Juniper (*J. squamata*) are well-known illustrations. In fact, the probability is that all Tree Junipers develop dwarf forms, but the genus is difficult to classify and its nomenclature is in a sorry state. Such dwarf Junipers as *J. virginiana* var. *tripartita*, *J. chinensis* var. *Pfitzeriana*, *J. communis* vars. *montana* and *adpressa*, and *J. Sabina* vars. *tamariscifolia* and *humilis* are too well known to need comment. The typical *J. squamata* is a favourite ground-cover, and its tree-form is represented by the var. *Fargesii*. The low-spreading *J. virginiana*

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var. *reptans* is a comparatively recent discovery in Maine where it grows on the seacoast at Bald Head Cliff near York Harbour; the var. *globosa*, well described by its name, is a lovely plant worth a place in every garden. The prostrate *J. chinensis* var. *Sargentii*, common on the mountains of Korea, and in eastern Siberia, and less so in northern Japan, is perhaps the best of all prostrate Junipers that are ecological forms of arborescent species. Dwarf Yews have been mentioned in a previous chapter so there is no need to discuss them here.

There are a few flowering trees that must not be forgotten. Foremost among these is the Fuji Cherry (*Prunus incisa*) native, as its name suggests, of the region around the famed Mt. Fuji. At its best this is a small tree, occasionally 30 feet tall but as usually seen it is less than 10 feet, with twiggy, ascending-spreading branches from near the ground up. The petals are pure white and the sepals are reddish and long persistent. It commences to blossom when young and not more than a yard high and is exceedingly floriferous. I saw it first in the spring of 1914 when travelling in Japan and then and there became its willing captive. It is a quite recent addition to gardens having been introduced into Germany by seeds sent from Japan under the erroneous name of *Prunus pseudocerasus*. It is appreciated by the Japanese

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gardeners as the only Cherry they can dwarf and cause to flower in pots. Another dwarf Japanese Cherry is *P. subhirtella* var. *autumnalis* which has semi-double pink flowers, and blossoms in spring or autumn or both seasons. It is a twiggy, often vase-shaped tree from 6 to 12 feet tall, and about as free-blooming as its most charming parent, the lovely Spring Cherry, *P. subhirtella*.

The low-growing *Malus Sieboldii* is less beautiful in flower and fruit than other Japanese Crabapples but a close relative *M. Sargentii* is especially valuable. This species is native of the salt marshes around Muro-ran, Hokkaido, northern Japan, where it was discovered in 1892 by Professor Sargent, and introduced into the Arnold Arboretum. It has rigid, spreading branches, the lower ones flat on the ground, and is particularly well suited for covering slopes and banks. The flowers, abundantly produced in umbel-like clusters, are saucer-shaped, round, and of the purest white; they are followed by a wealth of wine-coloured fruit which is covered by a slight bloom and remains on the plants until the following spring.

An earlier chapter is devoted to the Common Horsechestnut and it is fitting that in bringing this work to a close to say a few words about the Dwarf Buckeyes of which three species are thriving in the Arnold Arboretum. They have long been overlooked or

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confounded with other species yet rank among the handsomest flowering plants of the Southern states. One (*Aesculus georgiana*) has short, compact clusters of red and yellow flowers; those of another (*A. discolor*) are yellow flushed with rose and have a red calyx. A variety (*mollis*) of the latter, and known in books as *A. austrina*, has scarlet flowers. This plant is widely distributed from Georgia to Texas and southeastern Missouri, and is the only red-flowered Buckeye found west of the Mississippi River. The third (*A. Harbisonii*) is probably of hybrid origin and is the latest of its class to blossom. The stem and branches of the flower-cluster and the calyx of the flowers are rose coloured; the petals are canary-yellow, slightly streaked with red toward the margins. It is fortunate that these pygmy Buckeyes with their handsome flowers are so hardy for they are among the most desirable plants that have been added to our gardens, and for them garden lovers have to thank the Arnold Arboretum.

THE END

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