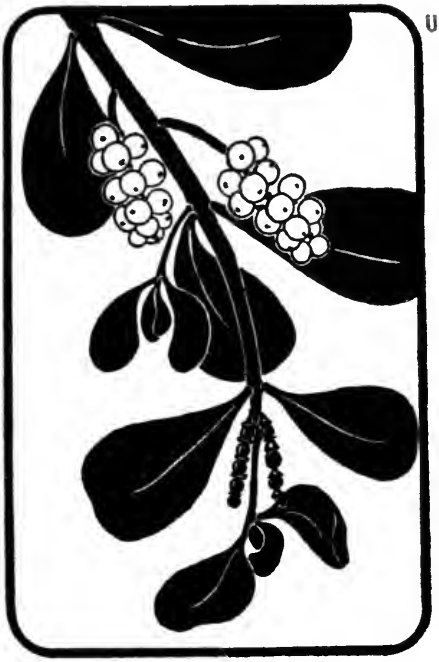
Mistletoe and Holly

BY

SOPHIA PRIOR



BOTANY

LEAFLET 24

FIELD MUSEUM OF NATURAL HISTORY
CHICAGO
1939

The Botanical Leaflets of Field Museum are designed to give brief, non-technical accounts of various features of plant life, especially with reference to the botanical exhibits in Field Museum, and of the local flora of the Chicago region.

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CLIFFORD C. GREGG, DIRECTOR

FIELD MUSEUM OF NATURAL HISTORY
CHICAGO, U. S. A.

AMERICAN MISTLETOE (*Phoradendron flavescens*)
About one-third natural size

FIELD MUSEUM OF NATURAL HISTORY
DEPARTMENT OF BOTANY
CHICAGO, 1939

LEAFLET NUMBER 24

MISTLETOE

Since earliest historic time, supernatural powers have been ascribed to the mistletoe plant, in myth, legend, superstition, and religious practices. When Jupiter descended from Heaven, he resided, according to legend, in a mistletoe bush. Medea, the sorceress, gathered the sacred plants with a brass hook and used the juice in magic potions. The records of the Persians, the writings of the Greeks and Romans, the mythology of the Norsemen, and the religious practices of the Druids bear witness to the awe in which the plant was held.

These ancient people employed the mistletoe as a charm against all sorts of evils. Pliny says that a sprig of the plant was found useful in extinguishing fires. According to classical mythology, it assured safe conduct into Hades; armed with the "golden branch," mortals could pass into Pluto's realm and if Charon interfered:

> They showed the bough that lay beneath the vest;
> At once his rising wrath was hushed to rest.

Since Balder, son of Odin, was deemed invulnerable, the other Norse gods amused themselves by shooting at him. But an enemy prepared an arrow of mistletoe and induced the blind Höder to shoot it at Balder, who fell dead the minute it struck him.

The medical virtues of the plant are mentioned at an early date. The ancient Persians knew it as a healing agent. Callimachus, writing in the third century B.C., mentioned mistletoe under the name "panacea," sacred to Apollo:

> Where'er the genial panacea falls,
> Health crowns the State and safety guards the walls

Pliny commented on the virtues of the mistletoe berry as follows: Of an emollient nature, disperses tumours, acts as a desiccative upon scrofulus sores, combined with resin and wax it heals inflamed swellings, useful in the treatment of wounds, and most noteworthy as a cure for epilepsy, "falling sickness." Recently a drug which affects blood pressure has been extracted from mistletoe. Rubber has been obtained from some species.

One of the most interesting and familiar phases of the history of mistletoe is that of its use by the Druids, the powerful religious order of the ancient Celts. The Druids studied the virtues of plants, and their discoveries and imagination led them to attribute divine power to certain ones. In his *Natural History*, Pliny says that the Druids "held nothing more sacred than the mistletoe and the tree that bears it." Its sanctity and mystery were increased by its rarity, and it was approached with reverence and solemnity. It was gathered on the fifth day of the new moon at the beginning of the year. When the time approached, the Druids summoned all people to assist in the collecting. In great procession they marched to the tree, where sacrifices and religious feasts were prepared. They led to the tree two white bulls, hitherto never yoked, their horns never before bound with ropes. The priest, clothed in white, ascended the tree and cut the mistletoe with a golden hook. The cut branches were placed in a white cloak because the plant would lose some of its magic if it touched the ground. After sacrifices to their god, the Druids made a potion from the mistletoe, for the prevention of sterility and as an antidote for poison.

It is interesting to note that some of these ideas of ancient times have their analogies in modern European customs. In the Swiss canton of Aargau, the mistletoe is gathered by shooting it down with an arrow and catching it with the left hand as it falls, for the plant must not touch the ground; it is cut only on the first, third,

or fourth day before the new moon. In Sweden a similar superstition exists: if the mistletoe is to retain all its virtues it must be shot down out of the oak. As late as the early part of the nineteenth century this same precaution was observed in Wales.

The magical virtues ascribed to the plant are varied and numerous. Swedish and Italian peasants hang bunches of mistletoe on the ceiling as a protection against harm, particularly against fire. In Bohemia, Switzerland, and the Tyrol it is hung up as protection against lightning. In Sweden persons afflicted with epilepsy carry knives with handles made of oak-mistletoe, or wear rings of it on their fingers to ward off the attacks. In Germany a piece of mistletoe is hung around the neck for the same purpose. In France a decoction made by boiling mistletoe in water with rye flour was recommended for epilepsy. In England and Holland mistletoe was prescribed as a medicine as late as the eighteenth century. The Japanese valued it as a remedy for any disease. It is said that when the people of Senegambia go to war they carry leaves of mistletoe on their person as a charm against wounds.

Most striking of the properties attributed to the mistletoe is its alleged virtue of producing fertility in plants, animals, and human beings. In a certain region of Japan mistletoe leaves are cut into fine pieces and sown with millet or other seeds in the belief that this will make the gardens bear plentifully. In England small amounts of mistletoe are fed to animals to make them more prolific. A similar belief as to the fecundating influence of mistletoe upon women is found in the folklore of many nations. It is told that on an island in Torres Strait the savages believe that twins will be born to the woman who touches or carries a piece of mistletoe.

In various countries even today divining rods and omen sticks of mistletoe are carried by peasants to enable them to see and speak with ghosts or to locate treas-

ures. With the advent of Christianity among the Druid worshippers, churches were built in oak groves sacred to the old religion, or under a solitary oak, to predispose the minds of the converts to the new doctrine. But Christian priests in their attempts to wipe out such superstition forbade their followers to bring mistletoe into the churches. However, it is said that the mistletoe not only found its way into these churches, but was given a place over the altar and brought goodwill to mankind.

The present-day custom of using mistletoe at Christmas time for decorative purposes seems to be a survival of mediaeval agricultural festivals celebrated during the winter and summer solstices, at which time mistletoe was gathered. At York, England, on Christmas Eve the mistletoe was carried to the high altar of the Cathedral, and this ceremony was followed by a proclamation of universal freedom. This custom was probably a relic of the festivals, of which the Roman Saturnalia is a famous example. The festival of Saturn was a period of general license, during which vice and crime were indulged in to excess. The traditional custom of permitting men to kiss any woman standing beneath a sprig of mistletoe undoubtedly originated in such festivals. An article in *The Country Magazine* of 1792 refers to this custom as "without doubt the surest way to prove prolific."

THE MISTLETOE FAMILY

The name "mistletoe," which has been applied to this mysterious shrub for many centuries in Britain, is derived from the Anglo-Saxon word *mistletan*. Linnaeus gave the plant the technical name *Viscum album*. This is the only European species; it is the mistletoe of literature.

The mistletoe family, known botanically as Loranthaceae, comprises thirty genera and more than half a thousand species. All the members of this family have green or olive-brown foliage and are, at least partly,

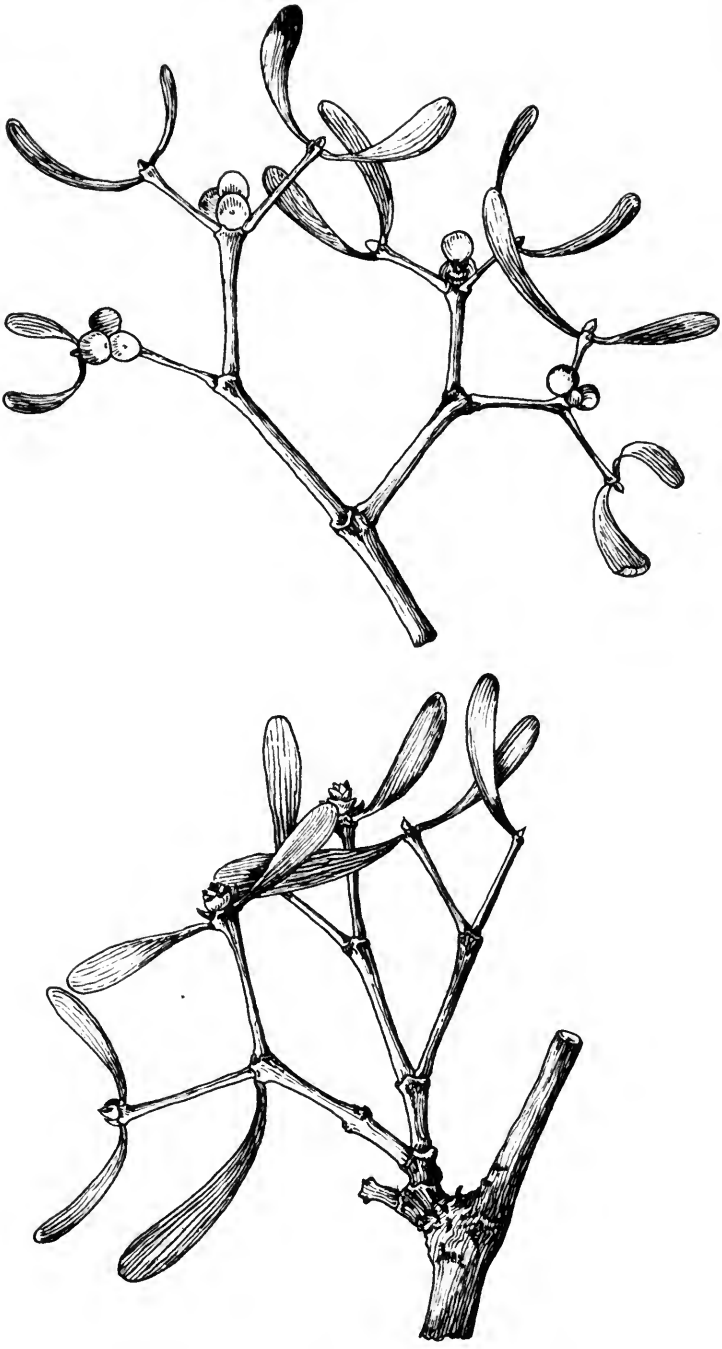
parasitic on evergreen and deciduous trees or shrubs. People who see the mistletoe only at Christmas time and have never seen it growing in nature cannot easily conceive of the idea that it is a parasite injurious to the tree upon which it grows and that in certain regions it becomes so abundant that its control and extermination are serious problems.

Since the genera of mistletoe are too numerous to describe here, representative types have been selected.

EUROPEAN MISTLETOE

The favorite host of the common European mistletoe, *Viscum album*, is the black poplar (*Populus nigra*); upon this tree it flourishes most luxuriantly. Along the shore of the Baltic Sea, tufts of the plant measuring four meters in circumference have been found. In localities where the black poplar does not grow, the mistletoe may adapt itself to the tree most common in that particular country. In the Black Forest, mistletoe covers the tops of the silver firs, and in the Tyrol the same parasite causes trouble in apple orchards. Less frequently it has been found on walnut trees, elms, limes, willow, ashes, white thorns, pear trees, medlars, almond trees, and various species of mountain ash. Occasionally, by way of exception, this mistletoe may be found on oaks and old vines. The mistletoe used so extensively in England during the Christmas season is gathered in the apple orchards of Normandy and the orchards of Herefordshire.

Viscum album is an evergreen bush from one to four feet in height, crowded with forking branches. The leaves grow opposite each other or in whorls of three on the stems, and are yellow-green in color, about two inches long, and obovate-lanceolate in shape. The male and female flowers, borne on separate plants, appear in February and March. The berry, white when ripe, measures nearly half an inch in diameter and contains



EUROPEAN MISTLETOE (*Viscum album*)

a viscous semi-transparent pulp of which birdlime is made. This species, a native of Europe, is also found in temperate regions of Asia, and about twenty closely related species are found in other warm parts of the Old World.

Viscum, the name of the genus, is the old Latin name used by Virgil and Pliny.

NORTH AMERICAN MISTLETOES

From time to time botanical explorations have added numerous representatives to the mistletoe family. A species found in the Carolinas resembles the European mistletoe so much that it was at first named *Viscum flavescens*. However, specimens found later in Texas showed this species to be different enough to deserve the separate generic name *Phoradendron*, meaning "tree thief." This mistletoe was then named *Phoradendron flavescens*, and later became known as the American mistletoe.

The common North American mistletoe is a parasitic shrub, bushy in appearance, varying from one to three feet in height. The stems are round, with branches arranged opposite each other. Nearly all the species have broadly ovate smooth green leaves. The yellowish hue of the mistletoe green is caused by a yellow pigment in the epidermal cells. The flowers are small and in short catkin-like spikes. The reduced leaves of a group of species in western North America, however, resemble short thin scales. These are so similar to those of the pine mistletoe described below that the two are often confused.

There are more than two hundred species of *Phoradendron* in the western hemisphere. About eleven of these grow in North America, five of them in Texas. The genus is parasitic on various species of deciduous trees, especially on tupelo and red maple. Each species,

PINE MISTLETOE (*Arceuthobium divaricatum*)
Natural size

however, seems to have a favorite host in the particular area where it is found. *Phoradendron flavescens* is found in a somewhat modified form from New Jersey throughout the South, northward through Missouri, and westward through Oklahoma, New Mexico, and Arizona to the Pacific coast. A large western form, *P. macrophyllum*, which forms clumps from two to eight feet in diameter, grows chiefly on poplars and willows. A common species on the Pacific coast, *P. villosum*, occurs on oaks. The cypress mistletoe (*P. Bolleana*), with pearl-like berries, thrives on the cypress, and similarly the juniper mistletoe (*P. juniperinum*) on the juniper.

PINE MISTLETOE

The pine mistletoe of North America has the generic name of *Arceuthobium*. This is a small genus, with European and Asiatic species as well as the American, whereas the genera mentioned above are recognized as belonging only to the Old World or only to the New. Species of this genus, sometimes referred to as the "lesser" or "false" mistletoe, are parasitic on conifers. These species are smooth and have scale-like leaves. The flowers are solitary, or several may grow from the same axil, often crowded together into spikes; they open in the summer or autumn. The fruit matures during the autumn of the following year. When ripe, the berries burst suddenly and with great force eject the glutinous seed for several yards.

The "false mistletoes" are of much greater importance in the West than in the East, where only one species is known to occur. Practically every Western conifer is subject to attack by mistletoe, but species of the pine mistletoe are particularly injurious to the timber trees: lodgepole pine, ponderosa pine, Douglas fir, larch, and hemlock. According to location and host, considerable variation in form occurs in these false mistletoes. On

some trees they may be so inconspicuous that only the noticeable hypertrophy of the trunk or branches leads one to suspect the existence of the parasite.

TROPICAL MISTLETOE

Tropical and subtropical mistletoes of the Old World belong mostly to *Loranthus* and related genera, comprising about 750 species. The New World ones belong to the *Phoradendron* group, with some 300 species. Some of these are of great interest because of the size and beauty of their flowers, with tubular corollas to which the stamens are attached. The fruit, a many-seeded berry, contains a viscid pulp characteristic of other mistletoes. Some tropical species attain such size that they appear like small trees grafted upon other trees. *Nuytsia floribunda*, called the western Australian Christmas tree, is covered with reddish-yellow flowers at Christmas time. It attains a height of from six to thirty feet. The flowers of some of these species vary from four to eight inches in length and are vivid purple and orange in color. The host plants of this genus are mainly broad-leaved trees. However, species of *Loranthus* occur also as parasites on one another.

PARASITISM

Among parasitic plants there exist partial and complete parasites. The mistletoes, with few exceptions, are partial parasites; that is, they do not depend entirely on the host for their nourishment. They contain abundant chlorophyll, the green coloring matter of plants, which with the aid of sunlight transforms inorganic compounds, such as carbon dioxide and water, into carbohydrate food materials. Because of this ability to manufacture food, the mistletoe requires only water and mineral nutrients from its host.

The degree of parasitism varies in the different species. Those with large leafy branches are not as dependent upon their hosts as the false or pine mistletoes,

A TROPICAL MISTLETOE (*Psittacanthus dichrous*)
After Martius, Flora Brasiliensis, Vol. V, Plate 5 (1848)

whose leaves are mere scales with a relatively small amount of chlorophyll. The mistletoe family as a whole shows a progressive development of parasitism and includes at one extreme a non-parasitic tree, the Australian *Nuytsia floribunda* and at the other extreme a true parasite, *Phrygilanthus aphyllus*, growing upon a cactus of the genus *Cereus* in Chile. The completely parasitic plant has no foliage and lacks the characteristic shrubby habit of the mistletoe.

DISSEMINATION

When ripe the mistletoe berry contains a clear sticky sweet pulp in which the seeds are embedded. It is covered by a tough, somewhat transparent skin and is resistant to drying. The berry is an article of food for many birds. In the vicinity of Austin, Texas, the principal birds which feed upon the berries are mocking birds, sparrows, and cardinals; the thrushes are particular distributors of the seeds of the European mistletoe. The berries are eaten by the birds, and the undigested seeds are deposited, with the excrement, upon the branches of the trees, where they lodge in fissures of the bark and germinate if conditions are suitable. Also, because the seeds are sticky, they often adhere to the beaks and feet of birds. The bird, in an attempt to clean its beak, wipes it on the bark of the tree and deposits the seed with some pulp remaining on it, and the seed becomes cemented to the bark with this sticky substance. The presence of mistletoe in the tops of trees may be explained by the fact that birds in their flight from tree to tree usually perch on the uppermost branches.

Birds, however, are not the sole distributors of the mistletoe seeds. As spring advances, the berries become softer and finally fall on the bark of the tree, where the pulp decays. They are often washed off by heavy rains and deposited on the branches below. This method of dissemination is noticeable in trees where the branches

become covered from the base to the tip with mistletoe plants. Rodents that build nests in mistletoe brooms also play a minor rôle in the distribution of the seed.

GERMINATION

In the mistletoe and certain other Loranthaceae, a connection with the water-conducting system of the host is effected by the development of a specialized absorbing tissue. As the seed germinates, the axis (hypocotyl) of the embryo elongates and bursts the seed jacket. As soon as the axis becomes exposed to the air and sunlight, it bends downward. Its tip (the root tip) turns toward the branch and becomes broadened into a disc, which adheres to the branch as does that of the Boston ivy. In the center of the disc the cells multiply and enlarge in the form of a conical tissue (a specialized rootlet) which bores its way through the bark as far as the wood. The central part of this tissue then becomes differentiated into spiral ducts or vessels which are continuous with similar cells in the wood of the host. Thus is established a system for conducting water from the host into the mistletoe plant.

Authorities disagree as to the process involved in the penetration of this specialized rootlet (sinker, haustorium) into the bark of the host. The rootlet may force an entrance through fissures, lenticels, or other natural openings in the bark. On the other hand, some authorities claim that the rootlet secretes an enzyme which dissolves the walls of the cells in the bark. However, there is little evidence to show that the specialized rootlet can actually penetrate other than very tender tissues of the host plant.

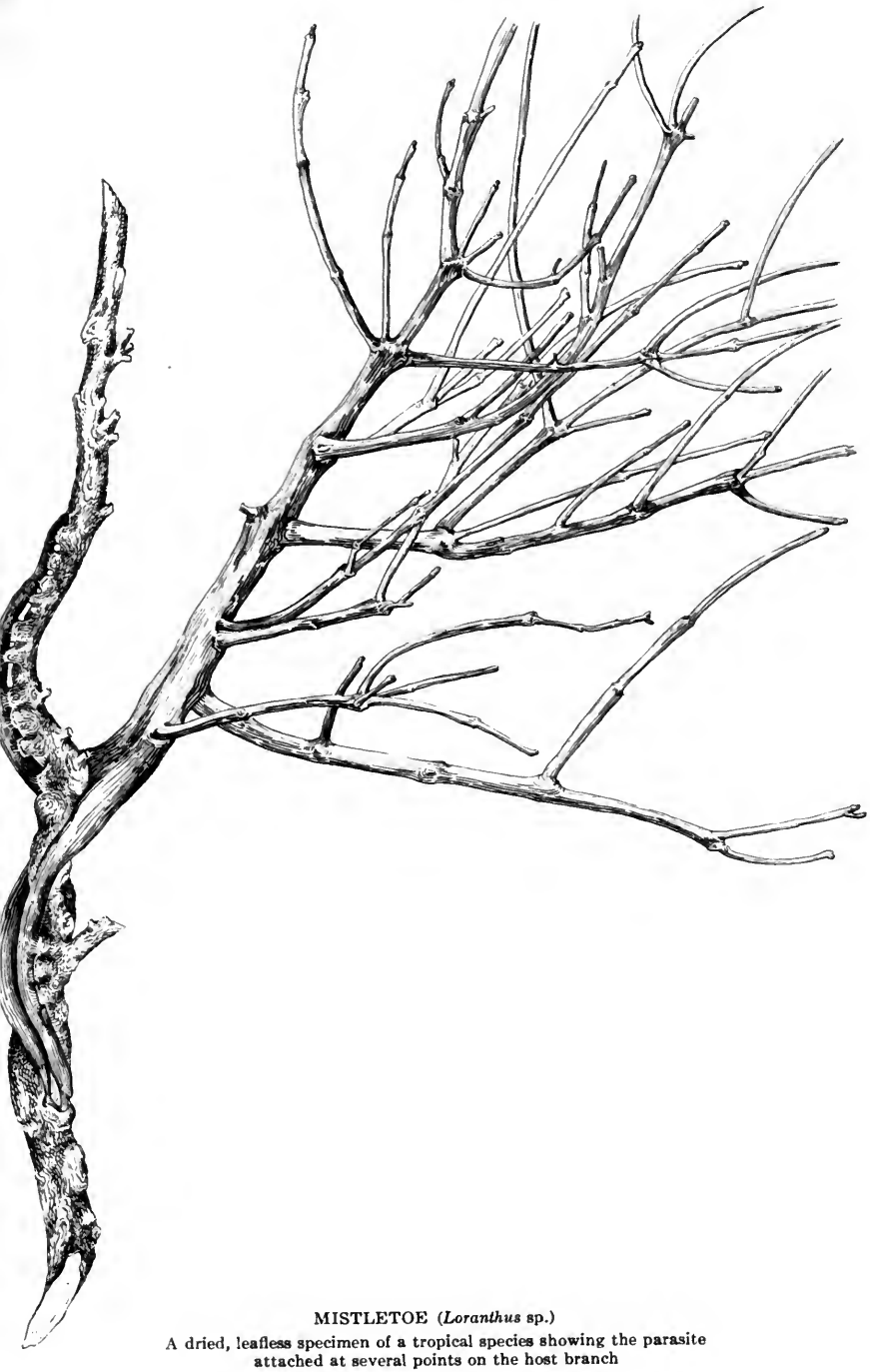
After the young mistletoe plant has established a connection with the host's system of water supply, the tiny first leaves (cotyledons) gradually emerge from the partly digested fleshy endosperm and seed coat, and become much enlarged. As a rule this completes the

growth for the first year. The mistletoe may not grow more than a quarter of an inch in length during a season, the amount of growth depending upon the type of host and whether or not conditions are favorable for growth.

During the second season there arise from the specialized rootlet lateral branches (also called haustoria), that spread along and above the host stem and establish an extensive and permanent water supply system. If at any time, the mistletoe is injured or broken off, these lateral branches, which eventually cover the entire circumference of the infected branch, give rise to new rootlets and also to new crops of shoots. This accounts for the persistence of mistletoe bushes on old branches and trunks of trees.

EFFECT ON THE HOST

As described above, the root of the seedling penetrates the bark of the host plant and establishes contact with the wood of the host stem. It does not penetrate the woody cylinder. As new wood forms in contact with the sinker, this root becomes enveloped and finally entirely covered, apparently sunken within the wood itself. In this way it becomes fixed within the woody cylinder, and although it does not push into the latter, it is banked year after year by new wood. This growth causes deformities, known as burls, on the branches and trunks of trees. These burls are often very large and form the conspicuous barrel-like swellings common in some hosts. One of the trees most seriously affected by burls is the Western larch. The swellings give rise to the "witches' brooms" common on nearly all trees heavily infested with mistletoe. The abundance of food and water supply in burls gives rise to numerous shoots of mistletoe on the surface of the tree which in time assume the size of small shrubs and are known as "brooms." Brooms vary in size according to species and may become so large that during a heavy rainfall or snowstorm they break off and



MISTLETOE (*Loranthus* sp.)
A dried, leafless specimen of a tropical species showing the parasite attached at several points on the host branch

MISTLETOE ON HORSE-RADISH TREE

A gall-like deformation of the branch of a horse-radish tree (*Moringa oleifera*) infested by a tropical mistletoe (*Phoradendron tetrapteron*). The cut stems of the parasite are distinguished by dark shading

carry the host branch with them. At times, an accumulation of pine needles, lichens, and debris adds considerable weight and causes the brooms to break off, thus depriving the tree of its normal food supply. The terminal buds of trees store food materials for development the following season, and since the original point of infection of mistletoes generally occurs upon small young branches, that part of the branch which lies beyond the point of immediate infection is starved. The formation of brooms and burls prevents, to a great extent, the storage of food in all parts of the tree above the point of infection. Such heavy infection in the trunk and branches of certain species of conifers results in the death of the upper part of the crown of the tree, a condition termed "staghead."

As a result of the presence of the parasite and its interference with their food supply the young shoots of the tree become stimulated to excessive and aberrant growth, causing deformities of all sorts, which vary according to the species. However, the young infected trees may live indefinitely and grow into mature trees, without showing noticeable deformation.

The age of a mistletoe plant is not easily determined. Plants of *Phoradendron,* approximately three feet tall, have been estimated to be at least twenty years old. Rootlets of the European mistletoe four inches long have been found enclosed in forty annual rings. A striking case has been noted where a cross-section through a burl showed that the mistletoe had lived in the host tissues for 340 years and could be traced to the original point of infection. The only fixed limit to the existence of the mistletoe seems to be the death of its host. Perhaps on the average the individual aerial parts do not survive longer than eight or ten years because they freeze or are broken off or otherwise damaged by mechanical agents.

Injuries to the host such as the breaking off of branches or the exudation of excessive pitch from old burls expose the trees to dangers from other destructive agents. Old

burls are invariably attacked by wood-boring beetles and fungi. Then, too, the broken brooms and branches at times litter the ground to such an extent that they become a fire hazard. Where parasites die and fall off old infected branches, there are often seen at the point of attachment the curious forms of wood structure known as wood roses.

CONTROL OF MISTLETOE

Sometimes the spread of mistletoe may be overcome by the watchful care of trees. Where the infection becomes established the spread of the parasite may be controlled by pruning the mistletoe from the trees each year. Young branches may be cut off a few inches below the point of infection and burned; in this way the danger that the mistletoe may spread to other parts of the host and to other trees is removed. Control of this parasitic growth in large forests involves great expenditure. In the tropics, neglected cacao plantations are sometimes completely ruined by the rapid spread of mistletoe.

COMMERCE IN MISTLETOE

The use of mistletoe for decorative purposes at Christmas time is more or less a universal custom. The North American supply is collected mainly in New Mexico and Oklahoma; smaller quantities come from Kentucky, Tennessee, and Arkansas. For commercial purposes, plants with numerous berries are preferred. They must be carefully crated to insure against freezing or breakage during shipment. The choicer branches, especially those of certain species, are handled by exclusive florists in the South and often command high prices.

The mistletoe is usually shipped to market in crates or pasteboard boxes containing from twenty-five to fifty pounds each. The greatest markets are in England and the northern United States. It is estimated that the north-central states import from 15,000 to 20,000 pounds of mistletoe each Christmas season.

It is not remarkable, if we consider the nature of the mistletoe plant, that curious beliefs and superstitions have grown up around it and have persisted from ancient times to the present, even in the remotest corners of the globe. A plant that grows and flourishes without roots or other direct contact with the earth may well have appeared to possess some supernatural powers and even to have been sent from heaven by the gods. The patient work of naturalists has destroyed the basis for these older beliefs and has substituted for them some scientific knowledge. However, as in so many of the phenomena of nature, the mistletoe of scientists is as remarkable in its way as the plant of legend and superstition which it has replaced. Yet even today, the age-old notions about this plant persist in communities remote from modern progress. Among cultivated people, superstitions of long ago still lurk in modified forms of old customs.

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HOLLY

The custom of decorating houses and churches with holly at Christmas probably originated in Rome. During the festival of the Saturnalia it was the custom to send holly boughs to friends, and as the festivals occurred in December, during the season when the oaks were bare of leaves, holly and evergreen boughs were used for decorations. There is no doubt that our practice of decorating houses and churches with holly at Christmas came down to us from ancient pagan times and was absorbed and connected in the course of time with the Christian festival by the monks, who bestowed on the tree the name "holy tree." In Germany holly is known as "Christdorn," as it is believed that the crown placed on the head of Christ at the time of the Crucifixion was made of holly.

According to an old English superstition, elves and fairies were allowed to join in the festivities at Christmas, as at this time they had no power to do harm. This led to the custom of hanging evergreen branches so that these spirits and fairies might hang in each leaf. Robert Herrick alludes to this superstition in *Ceremony upon Candlemas Eve,* as follows:

> Down with the Rosemary, and so
> Down with the Baies, and Mistletoe:
> Down with the Holly, Ivie, all,
> Wherewith ye drest the Christmas Hall:
> That so the superstitous find
> No one least Branch there left behind:
> For look how many leaves there be
> Neglected there (Maids trust me)
> So many *Goblins* you shall see.

De Gubernatis says that in certain parts of France, Switzerland, and Bologna the custom of hanging holly branches in houses and stables on Christmas Eve is followed, in the hope that the holly will drive away evil spirits and overpower witchcraft.

Legends and superstitions of ancient times still persist with slight variations in different countries. In parts of Germany and England the prickly variety of holly is known as he-holly, and the smooth variety as she-holly, or boy and girl holly. In Derbyshire the holly brought into the house at Christmas time determines who is to be master. If the holly is smooth, the wife will dominate the household, but if the holly is prickly the husband will be master. The leaves of the she-holly are used for divining purposes and are collected with great ceremony. These leaves are plucked late on Friday, by persons who can maintain an unbroken silence from that time until dawn of the following morning. If gathered in a three-cornered kerchief and placed beneath a pillow, the leaves will inspire pleasant dreams. In another form of divination three leaves are pinned on a maiden's nightdress, then three pails of water are placed on the floor of her room, and an involved ritual performed in the belief that because of this ceremony the image of the maiden's future husband will be revealed to her in a dream.

At Roman weddings a holly wreath was the most prized token of congratulations. It was believed that holly trees planted near dwellings would insure protection against the ill effects of lightning or sorceries. The fire worshipers, followers of Zoroaster (whose probable date is in the first millennium B.C.), believed that the holly tree casts no shadow. In his *Natural History*, Pliny describes the wonderful qualities of this plant, and relates that, according to Pythagoras, the blossoms congeal water, and that, if a staff of holly wood is thrown at an animal and does not "make the mark," it will return to the thrower. In Persia and India an infusion of holly leaves often is used, and newly born children are sprinkled with water in which holly bark has been soaked. According to a widespread belief, a sick child will be cured if it is passed through a cleft in a young oak or ash. In Surrey, England, the holly was thus used.

Various species of holly have been used in medicine from very early times. The root and bark are deobstruent, the berries, though eaten by birds with no ill effects, are used as an emetic, and the juice of the leaves is used to relieve jaundice. The European species (*Ilex Aquifolium*) has been said to be equal to Peruvian bark (quinine) as a cure for intermittent fevers.

THE HOLLY FAMILY

The name "holly" or "holm" is derived from the Anglo-Saxon *holegn*, and another ancient name, "hulver," is derived from the Norse name *hulfr*. The generic Latin name, *Ilex*, was derived by Linnaeus from the Roman name for the evergreen oak of southern Europe.

The holly (*Ilex*) is a genus belonging to the family Aquifoliaceae. The genus consists of more than two hundred species of shrubs and trees of wide distribution which inhabit temperate and tropical regions in Europe, Asia, and America, but are rare in Africa and Australia. They are absent from the western part of the United States but in the eastern and southern states there are thirteen species of holly. Most people, who identify holly by its shiny red fruit, are not familiar with some of these species, which have yellow, white, or even black berries. The leaves of the various species may also differ greatly; some are provided with spines, others are spineless. Spines cover the entire surface of the leaves of the hedgehog holly (*Ilex Aquifolium ferox*). Among cultivated varieties there also exists a great variation. One variety of the European holly has a profusion of fragrant flowers and no fruits, whereas another variety of the same species has an abundance of red berries. In cultivation, leaves of great beauty have been developed, such as the smooth leathery leaves of *aureo-marginata*, and the sharp spines of *ferox*.

Holly is important horticulturally as a decorative shrub or tree, since it can be clipped into almost any

shape, and is thus useful as a hedge plant. A famous hedge, in Deptford, England, known as Evelyn's holly, is said to have been 400 feet long, nine feet high and five feet in breadth. In France, particularly in Morbihan, peasants use the young stems of the holly as food for their cattle during the winter months. It is said also that the milk of cattle that feed on holly is of a superior quality and that the butter made from this milk is excellent. The leaves are eaten by sheep and deer in various parts of France. The wood of the holly is almost as white as ivory and is hard. It is much used for inlay. It stains very evenly and is often used as a substitute for ebony, as, for instance, in teapot handles. In older trunks of holly trees the wood turns brown near the center. When dry, the wood weighs from 30 to 47 pounds per cubic foot, the weight varying according to the species.

EUROPEAN HOLLY

The common species of European holly, also known by its ancient name "hulver," is *Ilex Aquifolium*. This is a shrub or tree of the evergreen variety, and is distinguished from other species by its smooth, shiny, wavy, spinous leaves, and many-flowered peduncles. The bark is of a gray ash color; the leaves are alternate and stalked. The fruit, a rounded red drupe, contains from two to sixteen one-seeded small nutlets. This tree generally reaches a height of about ten feet, but in favorable locations it may attain a height of sixty or more feet. In Shropshire, England, there exist trees whose girth is said to be fourteen feet. However, it is used so extensively in England for timber that, with few such exceptions, only small trees are now to be found. This species has a wide geographical distribution. With the exception of a small section of northern Scotland it occurs nearly everywhere in Great Britain, in western and southeastern Europe from as far north as Norway to Turkey, and in western Asia and the Caucasus.

EUROPEAN HOLLY (*Ilex Aquifolium*)

AMERICAN HOLLY

The holly which decorates our homes at Christmas time and which closely resembles the European holly is known as the American holly (*Ilex opaca*). The tree is common in the forests of southeastern parts of the United States, where it thrives in well-drained bottom-lands. It is an ornamental tree of a pyramidal outline, attaining a height of from forty to fifty feet. The smooth trunk varies in diameter from two to three feet. In winter, when other trees are denuded of their leaves, the American holly, with its dark green foliage and bright red fruits, is a very imposing sight in the forests. The leaves are thick, leathery, and spiny, though occasionally smooth-edged, of an obovate form, and persistent. The flowers, which blossom in the spring, are formed in the axils of new leaves. The staminate flowers are in three- to nine-flowered cymes while the pistillate occur singly or in twos. The fruit is a quarter of an inch in diameter, of a somewhat oval shape, bright red in color, rarely yellow, with narrow ribbed nutlets.

Two species of holly, called dahoon and yaupon, grow in the southeastern part of the United States.

Dahoon, known also as cassena, has the technical or scientific name *Ilex Cassine*. This is a beautiful small tree growing near the coast in the southern Atlantic and Gulf states. It attains its largest size in Alabama, Florida, and Georgia, where it is found in great abundance. It grows usually in humid soil near swamps and ponds. It varies in size from a shrub to a tree twenty or thirty feet in height. It has a rounded top, and a trunk from twelve to eighteen inches in diameter. The leaves are obovate, one to three inches long, without spines, and are of a dark green color above and somewhat yellow underneath. The flowers, less than half an inch broad, are white, in hairy clusters. The staminate clusters are three- to nine-flowered, the pistillate three-flowered. The fruit, which persists until spring, is bright red, a quarter

AMERICAN HOLLY (*Ilex opaca*)

of an inch in diameter, and contains prominently ribbed nutlets. The wood is often known as Henderson wood.

The yaupon (*Ilex vomitoria*) is a small tree, varying in height from twenty to thirty feet and often of a shrubby type, having several trunks from a common base. It grows best in coastal regions, not too far inland, from Virginia to Florida, Arkansas, and Texas. This is a tree of unusual beauty, and conspicuous in the autumn and winter. The leaves are persistent, elliptical, and notched on the edges. The staminate flowers, several in each cluster, grow from the axils of the leaves of the previous year, and the pistillate clusters are one- or two-flowered. The fruit, often very abundant, is a bright red color, with nutlets prominently ribbed and somewhat rounded at both ends. The wood of this species is used extensively for inlay work and turnery. The leaves were known by the Indians to possess emetic and purgative properties. A tea known as "black drink" was made from the leaves by the North Carolina Indians and used in their ceremonials as well as for medicine.

The following, regarding *Ilex Cassine*, is quoted from Hale:

> At a certain time of the year they [Indians] come down in droves from a distance of some hundred miles to the coast for the leaves of this tree. They make a fire on the ground, and putting a great kettle of water on it, they throw in a large quantity of these leaves, and, seating themselves around the fire, from a bowl that holds about a pint they begin drinking large draughts, which in a short time occasion them to vomit freely and easily. Thus they continue drinking and vomiting for the space of two or three days, until they have sufficiently cleansed themselves; and then, every one taking a bundle of the tree, they all retire to their habitations.

Tea from holly leaves is still used by people living along the coast. The medicinal properties of this species are responsible for its common name of emetic holly and its scientific name *Ilex vomitoria*.

In America there are numerous species of holly of the deciduous type which, although not often used for decorative purposes, are conspicuous because of their scarlet berries after their leaves have fallen in the autumn.

These species are most frequently found near swamps and are smaller than the evergreen trees. One of the most common of these is the so-called swamp holly (*Ilex decidua*) found in localities west of the Mississippi, especially in Arkansas. It is usually a shrub but on rare occasions it may be a tree, sometimes attaining a height of twenty-five feet. The mountain holly has red berries which are shed with the leaves in autumn.

Important among foreign hollies is the South American species known as Paraguay tea (*Ilex paraguariensis*). This tree yields one of the most important economic products of South America, Paraguay tea or *Yerba maté*. The leaves of this tree, like cassine, contain the same active principle found in common tea and coffee. In preparing maté entire branches are cut off and the leaves scorched and dried while they are still on the branch. They are then beaten, selected, and coarsely ground, after which they are packed in skins and bags of leather. Several other species of holly, found in Brazil and Paraguay, yield a similar product. The drink is used extensively by the entire population of South America. In preparing the drink the leaves are infused just as ordinary tea. In the South American pampas region, where maté is generally prepared in a gourd, a small bombilla or tube is used with a wire network or perforations at the bottom, through which the tea is sipped. It is estimated that more than five million pounds of maté are exported annually from Paraguay alone. It goes mostly to other South American countries.

PROPAGATION

Holly is generally propagated by planting seed or cuttings. The seed normally will germinate the second year. In planting cuttings matured summer shoots are used, as these root very quickly. Young plants from seeds and cuttings may be transplanted successfully during damp weather.

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The cover design and illustrations on this leaflet were drawn by Sophia Prior, except figures 3 and 5, which are the work of Albert Frey. With the exception of the copy of a plate from Martius, they were drawn from specimens in the Museum's herbarium or exhibits. The mistletoes may be seen in the Hall of Plant Life (Hall 29) in Field Museum.