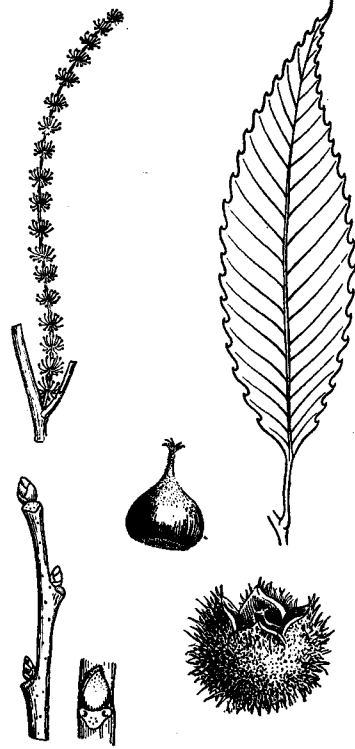


NUT PINE, CHINQUAPIN AND CHESTNUT

"Nuts"

The eleventh in Nature Magazine's series of Educational inserts

By E. LAURENCE PALMER



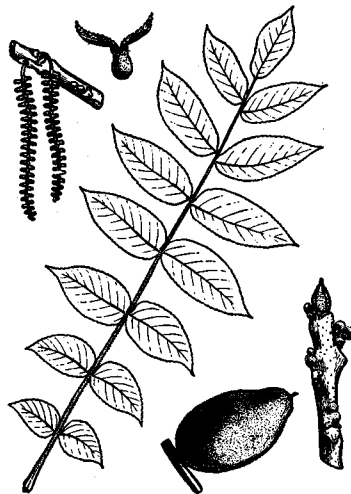
IN MANY cities one now finds stores that sell nothing but "nuts". Few people, however, know much about the plants that produce these delicacies, the parts of the world from which they come; the rise or fall in prosperity associated with their production, or of the uses other than food to which these plants, and the "nuts" themselves, are put. Materials for study should easily be obtainable by all. The species covered in this feature include all of those kinds commonly included in the "mixed nuts" of the grocery store, the "blanched nuts" of the delicatessen or drug store, and the "nickel a bag" nuts of the circus, ball park or street stand.

A number of plants included in this selection are not

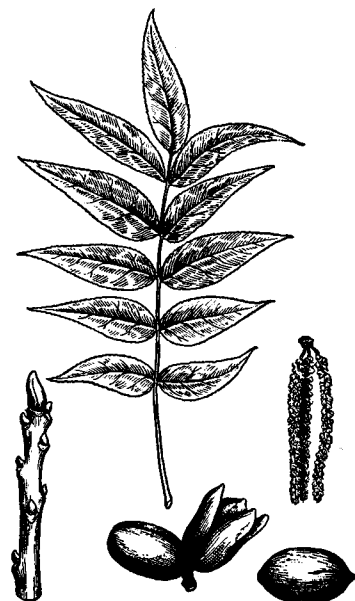
considered by the botanist as producing nuts. To students of plants, the horse chestnut is a seed; the peanut is a pod, and the shelled peanuts are seeds. The peanut plant differs from the others here considered in being non-woody.

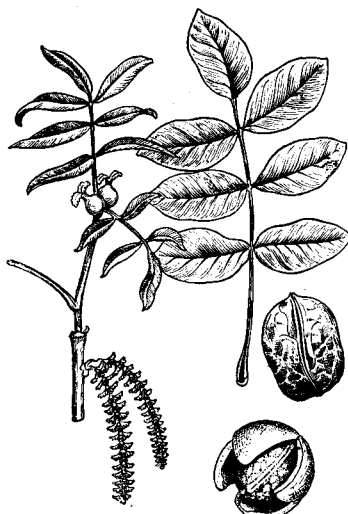
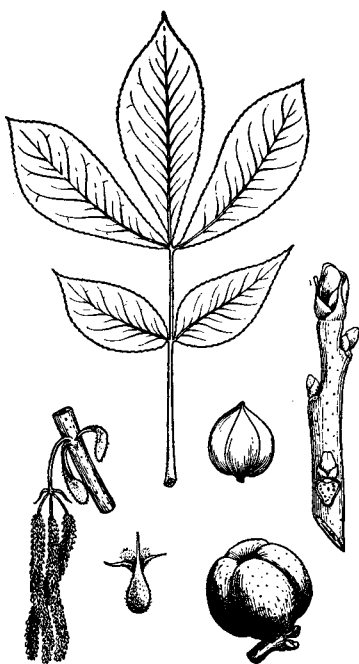
What is a Nut?

Technically, a nut is a hard, bony, one-seeded fruit. By this measure, the butternuts, hickory nuts, walnuts and almonds would not be nuts because of the spongy husk that surrounds them. All of these would be "drupes" rather than true nuts, while the acorns of the oaks, and the fruits of chestnuts, beeches and chinquapins fit the

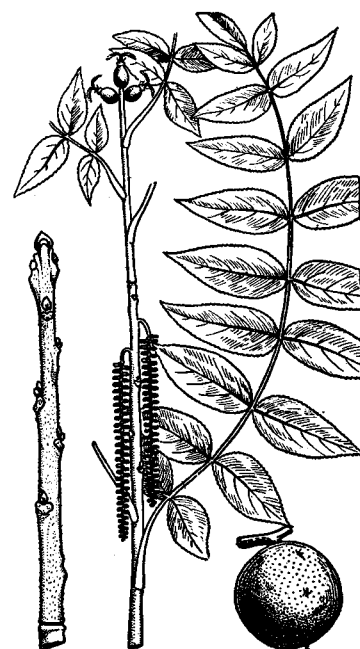


BEECH, BUTTERNUT AND PECAN





SHAGBARK HICKORY, ENGLISH WALNUT AND BLACK WALNUT



definition satisfactorily in the accurate sense of the word.

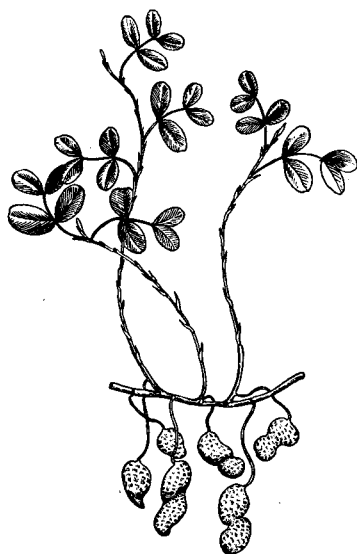
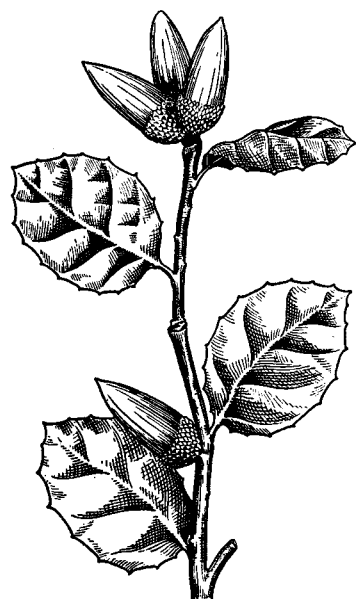
It is rather hopeless to look to the political or the legal profession for definitions in the field of natural history. A glimpse at what these professions recognize as fish should guarantee the truth of this statement. There are reported to be cases, however, of persons being prosecuted for leaving peanuts exposed for sale, on the ground that they were fruits, and local ordinances forbade leaving fruits so exposed. One who tried to apply a policy of "truth in advertising" to the average nut store could force the salesman to remove from his shelves most of the things that are to be found there. In a strict sense, the average "nut store" might better be called a "seed store", although it is doubtful if such advertisement would attract customers. The item that most truly can be called nuts might be the "mixed nuts" of the grocery store. Yet if one studied such a mixture critically it would be found that the Brazil nut would have to be put out because they were

seeds; the almonds because they were drupes; the pecans because they represent only a portion of the fruit.

The Geography of Nuts

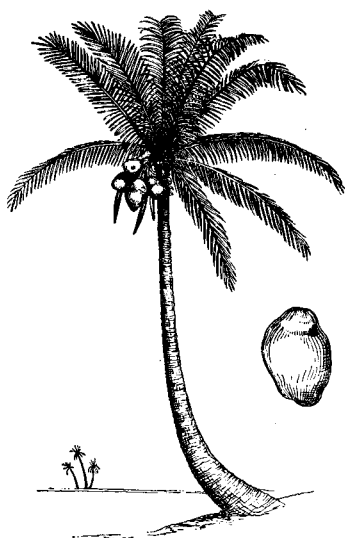
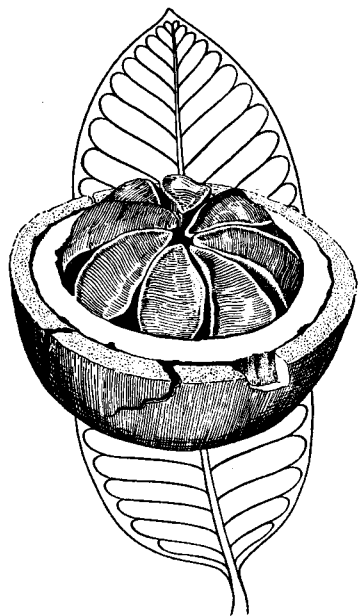
A glance through the charts of this insert will show that there is a geography of nuts. It ranges from the tropical requirements of the Brazil-nuts, cashews and coconuts, through the subtropic and subtemperate pecans, English walnuts, filberts, almonds, pistachios and peanuts, and up to the more cold-enduring chestnuts, oaks, hazels, black walnuts, and butternuts. We can look in vain for many important nut plants in the colder parts of the world.

Thus, in a broad sense, agriculture and the industries dependent upon nuts are localized. Such distribution also helps define the range of many of the wild animals that depend largely upon nuts for their food, and which they may store to tide them through the more severe winter



COAST LIVE OAK, PEANUT AND BEAKED HAZEL NUT, WITH FILBERT





BRAZIL-NUT, COCONUT PALM,
AND ALMOND

weather. Such associations in Nature are interesting.

Copra, the dried meat of coconuts, may, with sugar, be considered among staple products of the tropics that enable people of these warmer parts of the world to purchase the things they need from sources in the temperate zones. In the dried form, copra may be shipped long distances more easily, cheaply and with less necessary rapidity than can bananas, pineapples and citrus fruits. Moreover, it is doubtful that the production of copra will ever completely satisfy the demands that the findings of chemical research will put on it as a basic organic substance. Through the medium of this nut, at least, it will long be necessary that friendly trade relationships be continued between widely separated parts of the earth. This, of course, is to be desired.

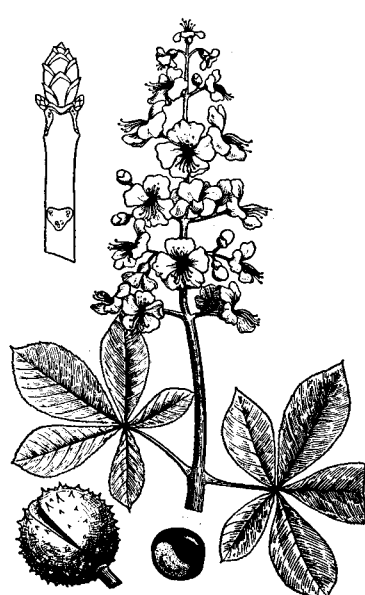
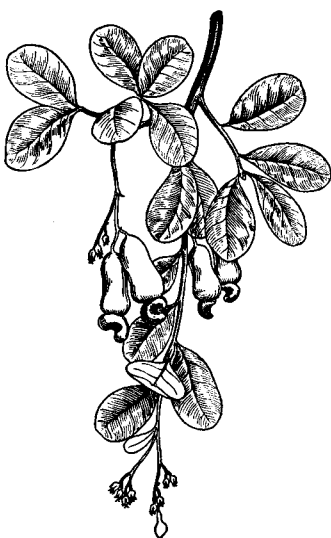
Nuts as Food

We shall always think of nuts essentially as sources of food, but how do they compare with other foods and

under what circumstances are they superior or inferior to other kinds of nourishment? One cannot safely live solely on nuts, but there may be times when their use may greatly reduce the necessity of transporting, over a difficult terrain, more bulky foods.

It is easy to conceive of ten tablespoonfuls of corn flakes, of eight ounces of beef or chicken broth, or two slices of rye bread, one egg, five ounces of milk, one pat of butter, one large apple or one strip of bacon. But what would it take to equal each of these in food value if one had to depend upon nuts as a source? Briefly, any of the above could be duplicated with portions of ten almonds, or two tablespoonfuls of hickory nut meats, or twelve peanuts, or ten pecans, or ten English walnuts. Obviously, on a hike, one could carry the nut portions more safely and with less danger of spoiling than would be true of the eggs, the butter, the bacon, or the milk. This comparison refers to the heat or energy units produced by the different foods mentioned.

Nuts also enter into the bal- (Continued on page 468)



PISTACHIO, CASHEW, AND
HORSE CHESTNUT

COMMON NAME SCIENTIFIC NAME	NUT PINE <i>Pinus edulis</i>	CHINQUAPIN <i>Castanea pumila</i> OTHER CHESTNUTS	AMERICAN CHESTNUT <i>Castanea dentata</i>	AMERICAN BEECH <i>Fagus grandifolia</i>
DESCRIPTION	Tree, to 40, but more commonly 20 feet high, with horizontal, bushy branches when young; low and round-topped when old. Needles, 2 or 3, rigid, dark green, 3/4 to 1 1/2 inches long. Branchlets, light yellow-brown. Whole plant almost bush-like in northern part of range.	Chinquapin is a native shrub or small tree with leaves whitish-downy beneath. Other chestnuts include the European chestnut, the Japanese, the Chinese, and the golden Chinquapin, <i>Castanopsis</i> , together with many varieties developed by orchardists.	Tree, 60 to 100 feet high. Old bark, gray and with long, coarse furrows. Leaves, short-stalked, alternate, 2 to 3 times as long as broad, veined. Twigs, medium, brown, with short, compact, few-scaled buds and broad leaf-scars. Roots, relatively deep.	Tree up to 75 feet high. Trunk, up to 4 feet through. Bark, smooth, close, gray, beautiful. Leaves alternate, pointed at each end, often persistent into winter in young trees. Twigs, moderately coarse with spreading, slender, long, pointed buds. Roots spreading, giving rise to shoots.
RANGE	Colorado to New Mexico and Texas, though may be planted and prove hardy as far north as Massachusetts. One ornamental variety has white leaves mixed in with the green. Normally found on dry hills and slopes within its range.	Chinquapin is native of region from New Jersey to Indiana and southward. <i>Castanopsis chrysophylla</i> is an evergreen tree of Pacific coast. Other species mentioned above are located by their names.	On hillsides, even on relatively poor but well-drained soil, and commonly associated with beech, maple and similar trees. Southern Ontario to northern Georgia, Mississippi and Michigan, but practically gone east of the mountains except as suckers and seedlings.	Rich, highland woods from New Brunswick to Virginia and west to Minnesota and Texas, sometimes forming an almost clear stand because of trees springing from roots. The related beech of northern Europe closely resembles American species.
CLASSIFICATION AND REPRODUCTION	Family Pinaceae with the spruces and firs. Order Coniferales. Cones, almost stemless, greenish yellow, shining, about 1 1/2 inches long, with scales strongly-keeled or ridged. Seeds, about 1/2 inch long with a narrow wing that remains attached to the scale when separation takes place. Seeds, sweet and very edible. Pollination, by wind.	Family Fagaceae, with the oaks and beeches. Order Fagales. Nuts sprout soon after they fall in autumn. Because of this, do not thrive in North since wood cannot set before severe weather. Chinquapin, in general, is like chestnut but is more resistant to blight. Has been hybridized with chestnut.	Family, Fagaceae, with the beeches and oaks. Order Fagales. Flowers appear in late spring after the leaves, the staminate in loose yellow catkins. Pollination, by wind; fruits enclosed in spiny burs maturing by fall. Nuts; sweet and borne on younger wood than staminate flowers. Nuts germinate following spring if planted.	Family Fagaceae, with the oaks and chestnuts. Order Fagales. Trees begin bearing fruit relatively late, sometimes not until 13 years old. Pollination, by wind from ball-like cluster of staminate flowers to terminal pistillate flowers. Nuts freed in fall and germinate in late fall or spring.
ECOLOGY AND WOOD	<i>P. edulis</i> normally distributed at altitudes between 5000 and 9000 feet. <i>P. parryana</i> , another nut pine, or pinyon pine, from 3500 to 6000 feet. <i>P. monophylla</i> , Single-leaf pinyon, from 2000 to 7000 feet and <i>P. cem-broides</i> , Mexican pinyon, from 4500 to 7500 feet. All are nut pines.	Do not reach great size or age of chestnut so have much less value as wood producers. Nuts are smaller and, while sweet, are badly infested with a nut weevil, particularly in the South. Short-lived nature, with smallness of fruits, makes them less desirable than chestnut except for blight-resistant qualities.	Wood, relatively coarse but uniform, strong, light and easily split; used in general construction work and withstands weathering well. Becoming scarce because trees have for most part been killed by fungus <i>Endothia parasitica</i> —chestnut blight. Also is attacked by a leaf spot disease. Was formerly budded and grafted for improvement.	Wood, hard, strong, durable, uniform, but does not withstand weather well; weighs 42 pounds per cubic foot and is used freely in furniture, tools, charcoal and fuel. Trees are susceptible to a leaf blight and to a bark disease, and nuts are commonly badly infested with an insect parasite. Trees are not always easily transplanted.
ECONOMIC IMPORTANCE	Nuts of these pines highly important to Indians as food. May be collected by pack-rats and the rats' stores robbed by man. The nuts are sometimes found in the eastern markets. European nut pines, "Pinocchi" of Italy, are used in cakes and puddings, or as delicacies, but have strong turpentine flavor.	European chestnut highly susceptible to blight. Japanese chestnuts too coarse to be popular. Chinese, of superior quality and relatively blight-resistant. Chestnuts, used as flour in bread or in stuffing fowls, are too good to be lost entirely to man. Chinquapin, or some other chestnut hybridized with American chestnut, may solve problem. Hybrids of chinquapin and Chinese or Japanese chestnut are blight-resistant.	Both nuts and wood had commercial value, the former being harvested and stored, or roasted, or boiled. A meal made from nuts was used by Indians and early settlers, and wood provided interior trim and heavy construction in many of older buildings of its range. Blight-resistant varieties may be discovered, or hybrids developed to save.	The wood makes trees valuable, as do ornamental properties. Nuts, where abundant, provide excellent food for hogs, poultry and humans. They may be crushed and the oil extracted for use in cooking, or in food for many animals. The flavor of nuts is a standard of perfection to many people.

BUTTERNUT <i>Juglans cinerea</i>	PECAN <i>Carya illinoensis</i>	SHAGBARK HICKORY <i>Carya ovata</i>	ENGLISH WALNUT <i>Juglans regia</i>	BLACK WALNUT <i>Juglans nigra</i>
<p>Tree, to 100 feet high. Bark, gray with long, waving furrows as contrasted with shorter units of black walnut. Leaves, compound, 11 to 19 leaflets, rather sticky and alternate, leaving large, 3-lobed leaf scars. Twigs, coarse with pith cross-walled. Deep taproot.</p>	<p>Tree, to 150 feet high. Leaves, compound, with 9 to 17 leaflets, each tapering gradually to a slender point, minutely downy at first but becoming smooth. Bark, smoother than in most hickories. Roots, deep. Twigs, coarse with broad leaf-scars. Pith not partitioned.</p>	<p>Tree, up to 120 feet high, with gray bark which strips off in long, loose, irregular pieces. General shape, cylindrical. Leaves, alternate, compound, of 5 to 7, stalkless leaflets, each pointed at ends. Roots, deep. Twigs coarse, with large, loose-scaled, hairy terminal buds.</p>	<p>Tree, to 70 feet high. Leaves, alternate, compound, of 5 to 13 leaflets, almost smooth, bright green, with leaflets, 2 to 5 inches long. Twigs, relatively coarse. Leaf-scars, broad. Buds, conspicuous. Bark, roughened.</p>	<p>Tree, to 75 feet tall. Trunk, to 8 feet through. Bark, evenly roughened into squarish units; dark. Leaves, alternate, compound of 15 to 23 leaflets pointed at end, heart-shaped at base, downy beneath. Roots, deep. Twigs, coarse. Buds and leaf scars, shorter than in butternut. Pith, with cross plates.</p>
<p>In well-watered woodlands or uplands preferably on neutral soils but doing better on sour soils than most other nut trees. New Brunswick to the Dakotas and south to Georgia and Arkansas. Requires reasonably good drainage; will withstand more severe conditions than black walnut or most other nut trees. Never in pure stands.</p>	<p>Cannot survive or ripen nuts where growing season is under 150 days and where summers are not warm enough. This limits commercial pecan raising to the South. Indiana to Georgia, Texas and eastern Kansas is chief range. Do best in lowlands such as river bottoms.</p>	<p>On hillsides and in mixed forests where soil may be rocky but well-drained. From St. Lawrence River to Florida, Texas and Minnesota except along southeastern coast. Requires warm summer and long season to mature fruits. At least 15 northern varieties recognized in nursery catalogs.</p>	<p>Cosmopolitan species, cultivated in United States in Oregon and California; grows in East from Pennsylvania to Georgia. Though tree can survive more severe climates, does not there bear well. Large plantations have been established in various parts of World. Europe, China.</p>	<p>Rich lowlands and river bottoms, doing well where there is good sun and about 150 growing days to season, with average temperature of 62° F. Massachusetts to Florida and west to Minnesota and Texas. Do best in slightly alkaline soils. Thinner-shelled varieties being developed by horticulturists.</p>
<p>Family Juglandaceae. Order Juglandales, with the hickories. Stamens and pistils in separate flowers on the same plant; former in catkins near ends of branches. Pollinated by wind. Fruits, nuts about twice as long as thick, covered with spongy husks and hard shells; mature first year; germinate following spring if buried about 2 inches.</p>	<p>Family Juglandaceae. Order Juglandales, with walnuts. Pistillate flowers that produce fruits may not be formed in buds until 12 weeks of growing season have elapsed; as a result, flowers may be prevented from forming in North even though trees may grow. Pollination, by wind. Nuts should be planted 2 inches deep and 4 inches apart.</p>	<p>Family Juglandaceae. Order Juglandales, with the walnuts. Staminate flowers in catkins at base of season's shoot; pistillate flowers, at the tip. Pollination by wind. Nuts, maturing in fall, surrounded by a thick husk that splits to free delicious nuts weighing about 90 to the pound; 50 to 75% germination. May live 300 years.</p>	<p>Family Juglandaceae, with hickories. Order Juglandales. Staminate and pistillate flowers, in separate clusters on same tree; latter, borne at ends of year's growth and producing nuts enclosed in relatively thin husks, technically drupes. Seedlings, normally transplanted when two years old.</p>	<p>Family Juglandaceae. Order Juglandales, with hickories. Stamens and pistils in different flowers on one tree, appearing before leaves. Nuts weigh 34 to pound, with 75-80 percent germination, often delayed to several years. Should be planted 1½ inches deep, 3 to 6 inches apart. Seedling, 6 to 36 inches first year; mature at about 150 years, but may live 250.</p>
<p>Trees rarely live more than 75 years; attacked by slow-growing fungus, sometimes taking twenty years to cause death. Fruits weigh 16 to the pound, ordinarily germinate 75 percent and should be husked before stored; should be planted permanently rather than transplanted, in early spring; in one year, should reach height of 10 to 18 inches.</p>	<p>Wood, hard, durable but plant may be easily winter-killed because of lateness of maturity of terminal buds. Seedlings and grafts may be bought for starting a plantation. Seedlings for transplanting should be reset every two or three years to develop proper mass of roots. This seems to lead to earlier fruiting habit.</p>	<p>Wood, exceptionally hard, tough, strong, heavy and flexible; therefore used in making wagon spokes, axe handles, baskets. Leaves may bear a mildew; the twigs, a witches' broom disease; the wood, a white rot. One of our strongest woods and also one of our best firewoods. Not good city ornamental because of litter of bark and fruits.</p>	<p>Wood, a valuable furniture and interior finish product known as French, Turkish, Italian or Circassian walnut. Fruit known in commerce sometimes as Persian walnut. Wood is durable, lighter than black walnut in color and weight. Important timber tree, particularly in India where it reaches great size.</p>	<p>Wood, heavy, strong, rich, not easily split, durable, 36 pounds per cubic foot. Relatively free from insect and fungus enemies, but have a tent caterpillar and a red butt-rot. Relatively fast growing trees whose fruits are favored by squirrels, and whose wood is more valuable than that of its associates. Dye obtained from bark.</p>
<p>Wood, known as white walnut, softer, less durable, lighter in color and weight than black walnut, but used in furniture. Sap is sweet and often added to maple sap in making sugar. Young fruits are pickled—as "pickled oil nuts"—in vinegar, sugar and spice. A dye was extracted from husks and inner bark; used in dyeing cloth until about 1860. Roots, used medicinally.</p>	<p>In 1937, 81,093,000 pounds of pecan nuts were sold in United States at total value of \$5,941,000 to farmers. In 1926, there were 95,861,000 pounds produced, for \$14,964,000. Read Stuckey and Kyle, <i>Pecan Growing</i>, Macmillan, and state and government bulletins. Nuts provide labor for many persons; crushed, make superior hog fodder.</p>	<p>A sweet gum made from sap. Mixture of bark and glucose tastes like maple sugar. Nuts have commercial value, though not great, and attract squirrels that may be valuable game or interesting neighbors. Probably trees are not developed as rapidly as they are destroyed for fuel and lumber.</p>	<p>Nuts are valuable as food. While United States imported in 1911, 37,214,000 pounds of nut meats, this dropped to 4,980,000 in 1936, probably largely because of local production competition. In 1935, we imported about 3½ million pounds from China; ½ million from France, and remainder from Italy and other countries.</p>	<p>Nuts sell from \$1 to \$4 a bushel, or meats at 72 cents per pound for use in candy. Wood so valuable it is being used largely in making of veneers, fine furniture, gun stocks. Can be cultivated with profit in upper Ohio Valley region, Missouri and southern Iowa. Tomatoes and some other crops do not thrive near walnuts. See Farmers Bulletin 1392, U. S. Dept. of Agriculture.</p>

COMMON NAME SCIENTIFIC NAME	COAST LIVE OAK <i>Quercus agrifolia</i>	PEANUT <i>Arachis hypogaea</i>	BEAKED HAZEL <i>Corylus rostrata</i>	BRAZIL-NUT <i>Bertholletia excelsa</i>
DESCRIPTION	Forest trees growing to 90 feet. Trunk diameter, to 6 feet, the trunk generally dividing low into crooked heavy branches. Leaves, stay on for 1 year; 1 to 4 inches long, oval, rather coarse and heavy. Twigs, hoary for 2 seasons. Bark, brown to black and deep-furrowed.	Technically, not a nut. About 1 foot high, with rich, green leaves, of 2 pairs of leaflets and no tendril, pinnately arranged. Two plant-types recognized, a vine and the bunch-nut type, of which the Spanish and the Valencia are popular varieties.	The beaked hazel figured is a low tree or shrub, with alternate leaves and "beaked" fruits. The twigs are not bristly as in the American hazel. The filbert of commerce is a small tree with a number of varieties, including Barcelona, DuChilly, Alpha, Daviana and Clackamas. See lower fruit in illustration.	Tree, from 100 to 150 feet high. Trunk, to 4 feet in diameter. Bark, smooth. Branches, high. Leaves, alternate, about 2 feet long, and 6 inches wide, bright green. Also known as Nigger-toe, Butternut, Cream-nut, Para-nut.
RANGE	Dry loams or gravelly soils of open slopes from sea-level to 4500 feet elevation from San Francisco south to Lower California and rarely more than 50 miles from coast. If near salt water and exposed, become more shrubby in appearance.	Will grow as far north as New York, but not commercially successful much above Virginia. Eight of nine species of the genus are Brazilian. Commonly cultivated in sub-tropic countries where summers are long enough to permit ripening of the fruits. Also may be grown in greenhouses.	Beaked hazel ranges from Quebec to British Columbia and south to Missouri and the mountains of Georgia. The region where filberts are raised most in America is in Washington and Oregon. They winter-kill at 0° F. and fruit buds are injured at below 12° F.	Found in great forests, largely along the banks of the Amazon and the Rio Negro in South America, but is not grown in the open anywhere in the United States.
CLASSIFICATION AND REPRODUCTION	Family Fagaceae. Order Fagales. Flowers appear in early spring. Pollination, by wind. Fruits maturing in one year into acorns 1 inch long, with cup over the lower ¼ or ½ the nut, having silky, closely-pressed scales. Seedlings may develop under moderate cover, and, while growth is not rapid, maturity may be reached in 150 years.	Family Leguminosae, with the peas. Order Rosales. Flowers, yellow, in close spikes of 1 to 3 flowers. These first are above ground and immature fruit is enclosed in the calyx; the flowers are then thrust underground by the plant, and reach maturity there. When fully developed, vines bearing fruits are pulled and dried.	Family Betulaceae, with the birches. Order Fagales. Staminate flowers, in long, yellow catkins, open short time; pistillate, in short, red-tipped clusters, open long time (4 to 6 weeks). Pollination, by wind. In orchards, Barcelona commonly pollinated with White Avelina, Daviana or DuChilly. Fruits mature in late summer or fall.	Family Myrtaceae. Order Myrtales, which includes evening primroses. Flowers, cream-colored with calyx parts united but tearing into two parts when flower opens. Petals, 6. Stamens, many. Fruit, about 6 inches across, with hard, thick shell containing 18 to 24 three-sided nuts.
ECOLOGY AND WOOD	Trees, often found in almost pure stands, alone in the open or mixed with other trees. May be associated with California sycamore, big-cone spruce and white alder. Trees are too distorted to produce any great amount of clear lumber, but they produce great quantities of acorns.	Plants cannot survive a frost, and if tops are to be used for feeding they should be harvested in time to avoid this. Peanuts are grown in crop rotation to add nitrogenous substances to the soil, as a forage for hogs, as a food for man, or as interesting plants in greenhouses. They are high in food value for their fats and oils.	Wood, of little value, but trees and shrubs are used in landscape work. Filberts, from hybrids of Eurasian species of <i>Corylus</i> , do best on average bottomlands. They do not thrive on poor lands. Hazel stems formerly supposed to serve as divining rods to locate water. Plants easily pruned and grafted and may thus be improved for fruit production.	Trees are not attractive nor hardy enough to be used as ornamentals. Bark used in calking ships, chiefly at Para.
ECONOMIC IMPORTANCE	Acorns of this and of some other oaks, including swamp white oak, chestnut oak, basket oak, and white oak are edible. Indians, especially in west, ground the meat, either before or after roasting, and sometimes removed tannin by soaking in water. From this, flour cakes were made which, according to John Muir, were most valuable food for hiking trips.	In 1935, ⅓ of all "nuts" consumed in America were peanuts. High year of importation was 1919 when 128,390,000 pounds were brought in; in 1936, 1,500,000, a low, were imported. Nuts are used in making special butters, oils and plastics. They are roasted for direct consumption and treated chemically to provide a host of different products. One of the South's most important crops.	In 1932, United States consumed 13,000,000 pounds of filberts, only 1,000,000 of which were raised locally. Yields of 3000 pounds per acre possible, but 1000 more normal. Production costs average under 14 cents per pound. ⅓ current cash. In 1937, Oregon produced 2230 short tons, worth to farmer producers, \$479,000. Imports, mostly from Europe.	Nuts, collected by natives and exported. In 1929, United States imported more than 20 million pounds, mostly unshelled. Recent high year was 1935-36, when more than 32 million pounds were imported, about ⅓ being in shells. Oil is extracted from nuts by pressure and finds various uses, particularly by watchmakers and artists.

COCONUT PALM <i>Cocos nucifera</i>	ALMOND <i>Prunus communis</i>	PISTACHIO <i>Pistacia vera</i>	CASHEW <i>Anacardium occidentale</i>	HORSE CHESTNUT <i>Aesculus hippocastanum</i>
<p>Tree, 50 to 100 feet high, or much smaller. Leaves, pinnately compound and to 20 feet long, springing from a common head or restricted area. Trunk, tough and fibrous, often curved, and diminishing in diameter to the head. Bark, rough and fibrous.</p>	<p>Trees, to 25 feet tall. Bark, gray, bitter. Leaves, alternate, shining, firm, with margins finely uneven. Commonly cultivated and developed by grafting on suitable root systems of related plants.</p>	<p>Tree, to 30 feet high, with spreading branches. Leaves, at first fuzzy, then smooth, pinnately compound, alternate, of 7 to 15 leaflets, though one cultivated variety has only 3 to 5 leaflets; leaflets, stemless. Bark of young twigs, brown to rusty.</p>	<p>Tree, to 40 feet high. Leaves, oval, rounded, pinnately veined, evergreen, alternate, very susceptible to frost. Juice, milky, but hardening to a gum, like gum arabic when exposed to the air. Known also as cadju or acajou.</p>	<p>Tree, to 90 feet high. Bark, roughly scaly. Twigs, coarse. Buds, sticky and large. Leaf-scars, broad and conspicuous. Leaves, opposite, palmately compound, of 5 to 9 leaflets, broadest near tips and with irregular margins. Trees, often irregular because of winterkill and disease.</p>
<p>Probably originally from America but widely spread by man early in history. Require mean annual temperature above 72° F., and unless underground water is available, must have at least 40 inches annual rainfall. Found in California and Florida in United States, and in Tropics generally, near coast.</p>	<p>Cannot survive early fall or late spring frosts, and are therefore limited somewhat more than are peaches. Cultivated in America most commonly on Pacific Coast, where they have been grown for more than half a century. More tolerant of drought than most fruit trees, but roots will not survive standing water. Do best in light soils.</p>	<p>Native of the Mediterranean and western Asiatic regions with a close relative, <i>P. mexicana</i>, found in Mexico and southern California. Should be hardy in southern United States. Has long figured in human history.</p>	<p>Native of tropical America, particularly the West Indies, and may survive climatic conditions in southern Florida. Widely cultivated in the tropics, or grown in greenhouses as a curiosity.</p>	<p>Best in well-drained, loose, rich soil. Originally, this species was a native of Asia, but it has been planted world-wide as a shade and street tree. The American species, called buckeye, are essentially of the upper Ohio and Allegheny highland region.</p>
<p>Family Palmaceae. Order Palmales. Flowers, borne at head of tree beginning at 4 years in some, but more commonly from 7 to 10 years. Flowers, club-like spathes, white or yellow; staminate having 6 stamens, and pistillate producing one-seeded fruits. Fruits may float in water and thus be distributed.</p>	<p>Family Rosaceae, with the roses. Order Rosales. One of earliest flowering of fruit trees; in California, blossoming in February. Bitter almonds are white-flowered; sweet almonds, pink-flowered. Propagation mostly by budding and grafting, trees being kept compact in warm regions and open in cooler. Over twenty-five varieties in California.</p>	<p>Family Anacardiaceae, with the sumacs. Order Sapindales. Flowers, brownish-green, in loose panicles, which develop reddish, wrinkled, 1-inch drupes or double-shelled nuts, the outer shell being red, and the inner smooth and brittle. Kernel varies from pale green to cream yellow, and is rich, oily and sweet tasting.</p>	<p>Family Anacardiaceae, with the sumacs. Order Sapindales. Flowers, fragrant, rose-tinted, in clusters at ends of young branches, producing 3-inch white, yellow or red, sweet-sour, edible cashew apple; crowned by the 1-inch, curled nut. Nut, enclosed in 2-layer leathery, oily, acrid covering.</p>	<p>Family Sapindaceae, near the maples. Order Sapindales. Flowers, in large, terminal clusters, in late spring or early summer, appearing white, spotted with purple and yellow; showy but not long persistent. Insect-pollinated. Fruits developing as coarse, weak-skinned spheres, enclosing 3 large, shiny seeds, which are shed when ripe.</p>
<p>May tolerate salt water and may withstand drought, though latter may affect crop for a year or more. Tough fibers of trunk, up to 20% elastic and used in making "coir" of commerce. Have a number of insect and fungus pests, including a scale, a beetle; also rats and certain crustacea. Nut-sizes vary from 3300 to 7100 to produce ton of copra.</p>	<p>Wood, hard but not valuable compared to nut. In dry weather, the hulls open normally, freeing nuts. Sulphur used in removing stains. Bitter almonds are raised for extraction of prussic acid. Sweet varieties include those which are thin-shelled, and those which are hard-shelled. In better of these, 3/4 weight may be edible meats.</p>	<p>The related <i>P. terebinthus</i> is the Cyprus turpentine tree; <i>P. lentiscus</i> of Smyrna is the mastic, producer of a gum used in varnish and for chewing, the latter procured by slashing the bark and collecting the extruded gum.</p>	<p>Obviously not hardy in severe climate. Oil driven from cashew apple by heat is highly irritant to skin and eyes. Nuts when roasted are, as is well known, delicious, but may yield, if crushed, an oil valuable in cooking and, in many respects equal of high quality olive oil. May be grown from cuttings of mature wood that bear leaves.</p>	<p>Wood, uniform, hard, white and reasonably durable, but does not weather well. The trees were introduced into Europe from Asia more than 300 years ago. The seeds have the appearance of being edible, but contain a narcotic substance, which, unless removed, makes them of no food value to man.</p>
<p>Liquor from flower cluster fermented to produce a toddy or sugar, vinegar or yeast. Copra, greatest product used as food by man and beast, as soap, as lubricant and otherwise. United States imported in 1912 a low of 34,268,000 pounds of copra and in 1933 a high of 653,187,000 pounds. 1936 yield, 405,784,000 pounds. Copra is dried coconut meats.</p>	<p>In 1936, United States imported 11,441,000 pounds of almonds, chiefly from Italy, with Spain and France following. Used largely as food. Sweet almonds yield 44 to 55% oil; bitter, 35 to 45% oil. Oil is used in cosmetics and with drugs. The Rod of Aaron was supposed to be from an almond tree, and Jews carry almond rods on certain festivals.</p>	<p>Pistachios are not cultivated in the United States. Instead, in 1936-37, we imported 3,207,000 pounds, 2/3 coming from British Indies, 1/4 from Syria and the remainder from Iran, Italy, and other countries. Reported to have been sent by Jacob into Egypt, and has been grown and naturalized in Palestine for centuries.</p>	<p>A fermented and distilled beverage is made from cashew apple in Brazil and West Indies. Gum from juice used in varnish to resist termites and other insects. United States imported products of this American plant largely from British Indies at rate of 3,277,000 pounds in 1929-30 and 25,721,000 pounds in 1936-37.</p>	<p>It is believed that the prefix "horse" was derived from practice of the Turks to feed seeds to horses afflicted with a cough, or being wind-broken. They have been fed to cows to increase flow of milk; have been used by book binderies for making a paste, and, treated chemically, to produce certain acids and alcohols, but not on a commercial basis.</p>

(Continued from page 463) anced diet as appetizers and as sources of vitamin B. The disease beri-beri may result where this vitamin is absent from the diet. While it may be taken in a variety of foods, it is well represented in peanuts, Brazil-nuts, chestnuts, almonds and pecans.

The oils extracted from many nuts, as indicated in the charts, provide superior cooking oils of high nutritive value. A generous proportion of the "nut butters" comes from plant parts that are either technically or popularly known as nuts.

Other Products of Nut-bearing Plants

The plants that supply nuts of food value often make other valuable returns. The wood of walnut, chestnut, beech, hickory and some others may be considered among the more valuable lumbers of the regions in which they grow. This, in general, seems to be more true of the nut producers of the temperate zones than of those of the tropics.

Coconuts, hickories, cashews and some other nuts produce, by various techniques, liquors of an intoxicating or refreshing nature. In fact, the name hickory was derived from one of these liquors. Dyes come from the bark and other parts of the walnuts and hickories; lubrication oil from Brazil-nuts; chewing gum from pistachios; fibers of unique natures from coconuts and Brazil-nuts; varnish from cashews. Filters for gas masks used in war may come from nut products, and some of the acids used in manufacturing explosives are derived from certain nuts. When we consider what chemists have done with peanuts, we can just about let our imaginations go as far as we like, for they give us textiles, a great variety of plastics, foods of many forms, fuels, and so on. The peanut shucks, sweetened with molasses, cooked and properly crumbled, provide the basis for some breakfast foods, and the plants themselves serve to help in crop rotation and in maintaining the productiveness of farm soils. The peanut has been the salvation of much of the cotton belt when the boll weevil (in part) wrecked the single-crop farm philosophy.

When considering these by-products of nut-producing plants, we should not overlook the rôle some nut trees have played as shade trees and as ornamentals. An almond tree in bloom is a thing of beauty as well as a potential source of income. A hillside covered with chestnuts in bloom in late spring is a sight enjoyed by many of a generation ago, and one that may be denied to those of the future. And these trees not only titillate our vision with pleasant things, but the nuts themselves, like the beech-nuts, set standards of taste that some of us think put them

beyond any serious competition from other food items.

Nut Culture

The culture of nuts for commercial purposes is widespread, and most of the regions of the United States have agricultural experiment stations that issue bulletins dealing with the problems of raising the appropriate local species. The essence of many of the bulletins has been presented in the life history charts. Anyone interested in the raising of nut plants for profit should seek information from the Federal government in Washington and from the nearest agricultural experiment station.

The summaries of exports and imports of the various species may give some index of the degree to which our national needs are met locally, and some idea as to the probability of local competition making nut culture unprofitable. However, it must be recognized that new uses of nuts are being developed constantly and the future may be even brighter than the records of the past indicate. It has been said with some reason that, even in the North, a man fifty years old who had some steady source of income might set out a goodly number of black walnut trees with reasonable assurance that he would live to see them begin to earn their keep. There is every reason to expect that they would be valuable to more than one succeeding generation.

The techniques of handling nut trees are considered in most manuals dealing with agricultural practices. These include tricks of budding and grafting, of controlling insect and fungus pests, activities involving harvesting problems, and the preparation of the harvested nuts so that they may bring a maximum price in the market.

The nut industry provides considerable employment of the year-round nature when one considers the uses made of nuts. The trees may be cared for at times of the year when other agricultural activities are at a minimum. The crops may be harvested later in the year than most other crops. If the meats are to be extracted from the shells to bring a higher price, their removal may provide labor for persons not able physically to do more active types of work. With the machines developed for this purpose, it does not require great skill to do superior work.

More challenging than any of these possibilities in the field of nut culture are the problems calling for the development by crossing and selection of nuts of superior flavor, size, keeping qualities, and more resistant to severe weather and the attacks of fungi and insects. It may be distinctly worth while for all of us to know more about nuts than we probably now know.

The illustrations in this insert are by Elizabeth L. Burckmyer