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About the Institute

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

PAPAYA

Illustrations are OK and can be used just as they are: the captions are correct.

First paragraph should be changed to read:

PAPAYA, the fruit of Carica papaya (family Caricaceae) a large herbaceous (non-woody) plant cultivated throughout the tropical world and even into warmest parts of the subtropics. Its origin is rather obscure; it quite possibly represents the fusion of two or more species of Carica native to Mexico and Central America. In any event it seems to have had its origin in that region.

The second paragraph must be altered to recognize the new status of ~~xx~~ former British colonies, such as those of the West Indies. I suggest it read: "The name papaw of pawpaw, often used in English-speaking parts of the tropics" then continue the text as it is.

Last paragraph to be rewritten as follows:

The unripe fruit, as well as other parts of the plant, contains a milky juice in which is present an active principle known as papain. This enzyme greatly resembles pepsin in its digestive action. It is usually obtained by scarifying green fruits while they are still on the plant; the juice exudes and coagulates; it is then scraped off and dried, to be used in the preparation of various remedies for indigestion and in the manufacture of meat tenderisers. Its value has long been recognized in the tropics, where it is a common practice to leave tough chickens and tough meat wrapped in papaya leaves overnight before cooking, or even to rub these with the juice to render them more tender.

SAPODILLA, a fruit produced by the tropical tree Achras Sapota, of the family Sapotaceae. This is the botanical name given by the great Linnaeus, father of modern systematic botany. More recent authorities are responsible for several others: ~~names~~. Sapodilla, the common name used in southern Florida (the only part of the United States where this tree can successfully be grown) doubtless is an adaptation of the Spanish zapotillo, "small zapote", but in Spanish-speaking countries today the usual name is chicozapote, from the Aztec tzicotzapotl, "gum zapote", referring to the coagulated latex which in modern times has ^{be}come the basis of chewing-gum. This name is often abbreviated to chico. The name nispero, which properly belongs to the European medlar, is sometimes used in Spanish; this has been corrupted to naseberry in certain English-speaking regions, notably India.

While not a fruit of great commercial importance in any part of the world, the sapodilla is much appreciated in many regions. It is round to ovoid, rusty brown on the surface, 2 to 4 inches in diameter. The flavour is very sweet, difficult to describe; it has been compared to a combination of pears and brown sugar. The seeds are commonly 2 to 5 in number, shining black, the size of flattened beans; they are surrounded by the juicy, melting flesh which contains tannin and milky latex until the fruit is ready for eating.

Sapodilla trees occur wild in the forests of southern Mexico and northern Central America. Latex is extracted from them by primitive methods of tapping and prepared for shipment to northern markets by coagulation. As a cultivated species, the tree is medium-sized, of slow growth. The wood is very hard and durable; elaborately carved lintels a thousand years old are still to be seen in some of the Mayan ruins. The leaves are light green in colour, glossy, ovate to elliptic in outline, 2 to 5 inches long. The flowers are small and inconspicuous. Propagation is usually by means of seeds but superior trees can be reproduced by grafting.

The sapodilla is probably the best of its family, which includes, however, the popular zapote, Persea caroliniana, native to Mexico and Central America but cultivated in other regions. This

Sapodilla, 2.

large tree yields ovoid to elliptical fruits 4 to 8 inches long, brown and scurfy on the outside, with sweet salmon-colored flesh and a single large seed. The star-apple of the West Indies is another good sapotaceous fruit; it is round, the size of a tennis ball, green or purple in color, with whitish, translucent ~~sweetish~~ flesh which are embedded several seeds like those of the sapodilla.

SAPODILLA, a fruit produced by the tropical tree Achras Sapota of the family Sapotaceae. This is the botanical name given the tree by Linnaeus; more recent authorities are responsible for several others. The common names are also rather numerous. Sapodilla, the name used in southern Florida (the only part of the United States where this tree can be grown) doubtless stems from zapotillo, meaning small zapote, but the common name in Spanish today is chicozapote, from the Aztec tzicotzapotl, or "gum zapote", referring to the coagulated latex of the tree (chicle) from which were made the "rubber" balls used in ancient games. More modern peoples know chicle as a constituent of chewing-gum. The name chicozapote is used in some Spanish-speaking countries but this properly belongs to the European medlar; in several English-speaking regions it has been corrupted to naseberry.

While not a fruit of great commercial importance in any part of the tropical world, the sapodilla is much appreciated in many countries. The round to ovoid, brownish fruits ~~2 to~~ 4 inches in diameter, are seen in many tropical markets. They are sweet with a flavour difficult to describe; very pleasing to most persons but too sweet for some. The seeds are commonly two to five in number, shining black, the size of flattened beans; they are surrounded by juicy flesh which contains a milky latex until the fruit is fully ripe.

Sapodilla trees occur wild in the forests of southern Mexico and northern Central America; latex is extracted from them by primitive methods of tapping and prepared for shipment to northern markets. As a cultivated species, the sapodilla is a ^{tree} medium-sized ~~tree~~ of slow growth. The wood is so hard that carved lintels still remain in some of the Mayan ruins of Yucatan. The leaves are glossy light green, ovate to elliptic in outline, 2 to 5 inches long. The flowers are small and inconspicuous. Propagation is usually by seeds but superior trees can be reproduced by grafting.

The sapodilla is probably the best of its family, which includes, however, the tropical American zapote (Calocaryum mammosum), native to southern Mexico and Central America. This large tree yields ovoid to elliptical fruits 4 to 8 inches long, with sweet salmon-colored flesh and one large seed. The star-apple of the West Indies is another member of this family; its round, green or purple fruits the size of tennis balls have translucent, whitish, sweet flesh and a few seeds like those of the sapodilla.



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

April
1
1958

Mr. Wilson Popenoe
c/o Martha Sussmann
Embassy of the United States of America
Madrid, Spain

Dear Mr. Popenoe:

Thank you for your letter of March 21. We are pleased to learn that you will be able to revise the article MANGO for the Encyclopaedia Britannica.

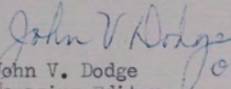
I am enclosing herewith a paste-up of the present article and a Contributors' Guide for your use. As we mentioned in our previous letter, the revised article should not exceed 730 words in length.

You will note that a cut is included in the text. If you plan to use a new text cut, either drawing or photograph, please let us know as quickly as possible.

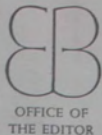
A payment information form is also enclosed which we should appreciate your completing and attaching to your manuscript.

The deadline for this material is June 1, 1958, and we shall look forward to receiving your copy by that date.

Sincerely yours,


John V. Dodge
Managing Editor

JVD:lif-REP
Encls.
cc: P.W. Goetz



ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

April
17
1958

Dr. Wilson Popenoe
c/o Martha Sussman
United States Embassy
Madrid, Spain

Dear Dr. Popenoe:

For a forthcoming printing of the Encyclopaedia Britannica we are planning to revise and expand to 270 words the article MANGOSTEEN; and revise the articles:

AVOCADO (775 words)
BANANA (1,240 words)
PAPAYA (445 words).

I am writing to ask if you will be able to accept this assignment. The revised material should not exceed the specified length and the Britannica rate of payment--\$5 per type page read but not substantially revised, and two cents per word for new copy--will apply. The deadline for this copy is August 1, 1958.

If you are able to accept this assignment, we shall be glad to send you paste-up of the present Britannica copy for your use.

We shall look forward to hearing from you at your earliest convenience.

Sincerely yours,

Walter Yust
Editor

WY:vo-REP

care of Martha Sussmann, American Embassy,
Madrid, Spain, 8 May 1958.

Mr John V; Dodge, Managing Editor,
Encyclopedia Britannica, 425 N. Michigan Avenue,
Chicago 11, Illinois, USA.

Dear Mr Dodge:

Referring to your letter of 1 April, I return herewith the paste-up on the article on MANGO, together with portions I consider should be re-written. I believe this material will fit, if you delete the cut included in the last edition, which is wholly inadequate as it does not represent a typical mango. The variety illustrated (Itamaracá, not Itomaraca as shown) does not have the form of a typical mango. If you desire to use an illustration, by all means get another from the U.S. Dept of Agriculture which looks like a common mango. I believe it would be more useful to delete the cut and use the material I am sending. If this is still too long, you can trim it a little.

Enclosed material should replace the lines I have crossed out on the paste-up.

Under date of 17 April, Mr Just inquired if I would be willing to revise and expand AVOCADO, BANANA, and PAPAYA, all to be ready by August 1st. I shall be glad to do so, and to do others later if desired as you come to them. I am travelling around the Mediterranean this summer but mail sent to me at the above address will reach me fairly promptly.

I do not think BANANA will require very much revision, but I was not satisfied with MANGOSTEEN and would very much like to do it, especially if you could give it a little more space. AVOCADO and PAPAYA will need some revision in the light of recent developments. Please send along the paste-ups of the four articles and I will try to get them back to you promptly.

Sincerely,

WILSON POPEÑO

countries

But most of the seedlings so abundant throughout the tropics do not represent this fruit at its best. While of good flavour, they are commonly characterised by coarse fibres throughout the flesh which makes eating an annoying process. In contrast, the fine grafted varieties which have originated in India and a few other regions, as well as seedlings of the race cultivated in the Philippines and a few other glons (known in ~~Mexico~~ as Mangos de Manila in Mexico and Filipinos in Cuba) are almost devoid of fibre and of excellent quality.

In 1889 the U.S. Department of Agriculture introduced into Florida the first of the grafted Indian varieties ~~to be~~ known in this country, the variety Mulgoba, of superb quality but not highly productive. In subsequent years, mainly through the efforts of Reasoner Brothers and David Fairchild, more than fifty other choice varieties were brought to the U.S., whence the cultivation of several gradually spread to many parts of the American tropics. The British and French also introduced a number into the West Indies. Some of the best imported varieties are Pairi (known in Jamaica as Bombay), Borsha, and Amini. In addition to these such varieties as Carabao from the Philippines and Saigon from Cambodia should be mentioned, as well as Julia which first received horticultural attention in the French West Indies and is now popular in Jamaica.

Due to the failure of many varieties to produce regular and heavy crops of fruit, they have been replaced in commercial orchards by Haden (a seedling of Mulgoba which originated in Florida) and others which have been developed in that state.

Mango trees are injured by a few degrees of frost. They are ~~successfully~~ grown commercially in southern Florida, but have not been wholly successful in California, though numerous trees have fruited in that state. The mango is not particular as to soil, but the finer varieties only produce good crops where there is a well-marked dry season to stimulate fruit production rather than vegetative growth. There is another serious problem in rainy areas: a fungous disease known as anthracnose (Colletotrichum) which destroys the flowers and young fruits and is expensive to control.

Propagation is by means of grafting or budding. Inarching is widely practiced in tropical Asia, but is tedious and relatively expensive. In Florida better methods have been developed and are used commercially. Chief among these are veneer grafting and chip budding. However, seedling trees of the Philippine race usually produce fruit like that of the parent and for this reason are extensively grown in Mexico. This race is polyembryonic, which means that trees usually do not develop from fertilized ovules, but from what are known as nucellar buds arising from the vegetative tissues surrounding the egg cell, hence they are in most respects similar to grafted plants. On the other hand, most of the Indian varieties are monoembryonic, which means that young plants develop only from fertilized ovules and therefore are subject to the variation which is characteristic of cultivated fruit trees in general.

Except with occasional dwarf varieties such as Julie, mangos in commercial plantings are spaced 35 to 45 feet apart. The tree has a number of enemies, chief among which are the anthracnose disease mentioned above and certain scale insects (family Coccidae). In numerous tropical regions the fruits may be infested by the larvae of fruit flies, which render them unfit for human consumption and are difficult to combat.

But the seedlings so abundant throughout the tropics do not represent this fruit at its best. While of good flavour, they are commonly characterised by coarse fibres throughout the flesh which makes eating an annoying process. In contrast, the fine grafted varieties which have originated in India and a few other regions, ~~as well as~~ seedlings of the excellent race cultivated in the Philippines as well as in several other parts of southeast Asia (known as Manila in Mexico and Filipino in Cuba) are ~~xxxxxxfxxxxx~~ almost devoid of fibre and of excellent quality.

In 1889 the U.S. Department of Agriculture introduced into Florida the first of the grafted ~~East~~ Indian mangos to be known in this country, the variety Mulgoba. In subsequent years, mainly through the efforts of Reasoner Brothers and of David Fairchild, more than fifty other ~~xxx~~ ~~fine~~ varieties were brought to the U.S., whence their cultivation gradually spread to many parts of the American tropics. Some of the best of these are Pairi (known as Bombay in Jamaica), Borsha, ^{and} Amini. In addition to these such varieties as ~~xxxxxx~~ Carabao from the Philippines and Saigon from Cambodia should be mentioned, as well as Julie which first received horticultural attention in the French West Indies and has become popular in Jamaica and elsewhere. Due to the failure of many ~~xxxxxxx~~ ^{of the} ~~best~~ ^{best} varieties to produce regular and heavy crops of fruit, they have been ~~supplanted~~ replaced in commercial orchards by Haden (a seedling of Mulgoba which originated in Florida) and others which have recently been developed ^{there.} ~~in this part of the world.~~

Mango trees are injured by a few degrees of frost. They are successfully ~~xxxx~~ grown commercially in southern Florida, but they have not been wholly successful in California, though occasional trees have fruited in that state. ~~xxxxxx~~ The mango is not particular as to soil, but the finer varieties only produce fruit abundantly where there is a well marked dry season to stimulate ~~xxxxxxx~~ production of fruit rather than continued vegetative growth. There is another serious problem in rainy areas: a fungous disease known as anthracnose (*Colletotrichum*) which destroys the flowers and young fruits and is ~~diff~~ expensive to control.

Propagation of ~~the better~~ varieties is by means of grafting or budding. Inarching is widely practiced in tropical Asia, but is

tedious and relatively expensive. In Florida better methods have developed and are used commercially. Chief among these ^{are} veneer grafting and chip-budding, ~~xxx~~ ^{Hopewell seedling} trees of the Philippine race ~~xxxx~~ ~~xxxx~~ ~~xxxx~~ ~~xxxx~~ ^{usually} almost always produce fruit exactly like that of the parent tree, and for this reason are extensively grown in Mexico. This race is polyembryonic, which means that trees usually do not develop from ~~xxxx~~ fertilized ovules but from what are known as nucellar buds arising from ~~xxxx~~ vegetative tissues surrounding the egg cell, hence they are ~~xxxx~~ in most respects similar to grafted plants. Most of the East Indian ~~xxx~~ varieties, on the other hand, are monoembryonic, which means that young trees develop only from fertilized ovules and therefore are subject to the variation common among seedlings of cultivated plants in general.

Except with occasional dwarf varieties such as Julie, trees in commercial plantings are spaced ~~xxxxxxx~~ 35 to 45 feet apart. The mango has a number of enemies, chief among which are ~~xxx~~ the anthracnose fungus, mentioned above, and ~~xxx~~ larvae of several fruit flies (principally species of the genus Anastrepha in tropical America), the larvae of which infest the fruit, and render them unfit for human consumption. A few scale insects also are serious in certain regions.

MANGOSTEEN. A beautiful, delicious, and almost legendary fruit of tropical southeast Asia, produced by a handsome tree (Garcinia mangostana, of the family Guttiferae) which under favorable conditions reaches a height of about 35 feet. It has thick dark green glossy leaves six to ten inches long; the flowers are large, polygamous (on the same tree some are staminate, i.e., male, while others are pistillate or female); the fruits are about three inches in diameter, round to oblate in form, and dark purple in colour. They have thick hard rinds surrounding a large cavity in which lie several segments of snow-white to pinkish flesh, somewhat resembling those of a mandarin orange in appearance, juicy, delicate in texture, and of delightful acidulous flavour, comparable to that of no other fruit. Since the days of the early voyagers unstinted praise has been heaped upon this "Queen of tropical fruits, the Prize of the Indies".

In spite of the fact that the mangosteen is so highly valued, and that its cultivation in such regions as Java, Sumatra, Indo-China and the southern Philippines dates from very early times, the tree has nowhere been planted on an extensive scale, in part because mangosteens are difficult to ship very long distances. It was introduced into the western hemisphere in the nineteenth century, where it became established in several of the West Indian islands; somewhat later on the mainland, as (for example) in Guatemala, Honduras, Panama and Ecuador. It has not proved well adapted to the climates of California and Florida, but has been grown successfully in Hawaii.

For best results the mangosteen needs a rich deep soil and a moist strictly tropical climate, but it ~~has been grown successfully~~^{will grow} under less ideal conditions, though not where temperatures often go below about 40 degrees F. Propagation is by seeds, which do not long retain their viability. Grafting has not proved very successful nor does it seem to be required, since the embryos which give rise to young plants are not derived from fertilized ovules; they develop from tissues surrounding the ovary, hence are of vegetative origin and produce trees which are as much alike as grafted ones.

Occasional trees produce as many as 500 to 600 fruits in a good season; there is a tendency to produce good crops in alternate years.

AVOCADO

Since production figures change from year to year, due to increased plantings, poor crops, and the like, I believe it best to leave them out entirely. I also think it best to leave out the names of present-day commercial varieties; this is a young industry and the favorites varieties of today may be forgotten ten years from now. I have scratched out two lines which I do not believe are necessary and suggest re-writing the indicated paragraph as follows:

Though it was widely cultivated in tropical America before the Conquest - in the form of individual seedling trees in dooryards - the avocado did not commence to receive serious horticultural attention until about 1900. At that time George B. Cullon and other horticulturists in Florida found that the production of grafted trees is not difficult, thus making possible the perpetuation of superior seedlings and the establishment of orchards which would produce fruit of uniform size, appearance and quality --all valuable commercial characteristics. Since 1900 there have developed flourishing industries in Florida and California, and in South Africa (whence shipment is possible to England), and on a somewhat smaller scale in Chile, in Brazil, in Hawaii, and in some of the islands of the South Pacific. Cuba produces quantities sufficient for its own needs and for exportation to the United States. Mexico - where avocados are extremely popular - produces large quantities annually; commercial plantings have been made in Israel and there are numerous trees in other countries around the Mediterranean.

care of Martha Summamm, American Embassy,
Madrid, Spain. 26 May 1958

Mr John V. Dodge, Managing Editor
Encyclopedia Britannica, Chicago.

Dear Mr. Dodge:

Having finished revision of Mango, Avocado, Banana and Papaya, and having re-written Mangosteen, I wish to call your attention to the possibility of going over some others before you get too far along with the new edition. Unfortunately I do not have available the last edition of the Britannica and some of the subjects I mention may not need revision, and some perhaps you do not wish to include; but in my desire to see the Encyclopedia cover the tropical and subtropical fruits in adequate manner I hope you will check up on the following, any or all of which I shall be glad to tackle and get them back to you on time:

CASHEW (Anacardium occidentale) Do you have this? It is an important fruit in the American tropics and in parts of Asia; the seed (nut) important in commerce. I would suggest 250 words.

CHERIMOYA (Annona cherimola) Widely grown in tropical America, also in California on a small commercial scale. I would include brief mention of its relatives the guanábana and the sugar apple, both well-known in the tropics but I don't believe they need separate articles. I believe 300 words would be about right - not less.

DATE PALM. Was this well covered last time?

LOQUAT. A fruit of importance in subtropical regions. 250 words.

GUAVA. I believe you had this. May need revision. 200 words.

LYCHEE. Chinese fruit which has become the basis of a small but growing industry in southern Florida. Would need revision if you had it last time, in any event. 250 to 300 words.

SAPODILLA. Well known in southern Florida and the tropics. Mention should be made of two or three of its relatives, but not in separate articles. 250 words.

JAPANESE or ORIENTAL PERSIMMON. An important subtropical fruit. I assume you had it, but it may need revision. 300 to 350 words.

POMEGRANATE. I believe you had this. Might need revision. 150 words.

BREADFRUIT. Should be included because of its great importance in tropical Asia and its historic interest. 200 words.

DURIAN. Interesting because of the literature and unique character of the fruit. If not included, previously: 150 words.

WHITE SAPOTE. A Mexican fruit gaining in importance in California - now in some of the nursery catalogs. Should have 150 words.

QUEENSLAND NUT (Macadamia ternifolia) Basis of a growing industry in Hawaii; attracting much attention in California. 150 words.

TAMARIND (Tamarindus indica) Well known in tropical America, important in parts of tropical Asia. If not included, should have 150.

Sincerely,



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

May
16
1958

Dr. Wilson Popenoe
c/o Martha Sussman
United States Embassy
Madrid, Spain

Dear Dr. Popenoe:

Thank you for your letter of May 8. We are pleased to learn that you will be able to revise and expand the article MANGOSTEEN, and revise the articles AVOCADO (920 words), BANANA (1,240 words), and PAPAYA (1,445 words) for the Encyclopaedia Britannica.

I am enclosing paste-ups of the present articles and a Contributors' Guide for your use. As you feel that MANGOSTEEN needs a little more space, we are increasing the length to 300 words. The length for the article AVOCADO as given in our letter of April 17 was in error; the correct length, as stated above, is 920 words.

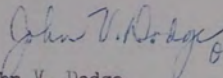
You will note that cuts are included in the articles BANANA and PAPAYA. If you plan to use new text cuts, either drawings or photographs, please let us know as quickly as possible.

Our adviser has suggested that the statistics in the article AVOCADO be generalized; and that PAPAYA be revised to include material on commercial production and use of papaya juice in commercial meat tenderizers.

Four payment information forms are also enclosed which we should appreciate your completing and attaching to your manuscripts.

The deadline for this material is August 1, 1958, and we shall look forward to receiving your copy by that date.

Sincerely yours,


John V. Dodge
Managing Editor

JVD:frb-REP
Encl.
cc: P. W. Goetz

QUEENSLAND NUT, Australian nut and macadamia are names applied to the fruits of two closely related trees of the family Proteaceae. As indicated by the name, these trees are native to Queensland (and New South Wales); Macadamia ternifolia has stiff oblong-lanceolate leaves 4 to 8 inches long with coarsely-serrate margins; the variety integrifolia has leaves of similar size and shape but with the margins smooth. Under favorable conditions of growth (a climate about like that for the orange, fairly moist and with good soil) the trees ultimately attain a height up to 60 feet, and are highly ornamental in appearance.

The nuts, about an inch in diameter, are abundantly produced in racemes 6 to 8 inches in length. They are hard-shelled, and covered by a thick husk which splits open and releases the nuts when fully ripe. The round kernels are rich in oil, and of unusually delicate flavour, which accounts for their popularity and the high prices they bring in luxury markets.

Propagation is commonly by seed, but superior varieties (of which a number have been established in Australia, and more particularly in Hawaii ^{where} a small horticultural industry is based on the production of macadamia nuts) must be propagated by grafting, which is commercially feasible but somewhat more difficult than the vegetative propagation of numerous other trees. Because they eventually attain large size ~~(they are not so large as the other trees)~~ though their growth is rather slow, they are planted in orchard form at distances of 35 to 40 feet. Small plantings ~~have been made in California and Florida~~ and Florida; occasional trees are to be seen in many tropical and subtropical regions.

QUEENSLAND NUT, Australian nut and macadamia are names applied to the fruits of two closely related trees of the family Proteaceae. As indicated by the common name, these trees are native to Queensland (and New South Wales). Macadamia ternifolia has stiff oblong-lanceolate leaves 4 to 8 inches in length, with coarsely serrate margins; the variety integrifolia has leaves of similar size and shape but with the margins smooth. Under favorable conditions of growth (a climate about like that for the orange, rather moist and with good soil) the trees ultimately attain a height up to 60 feet, and are highly ornamental in appearance.

The nuts, about an inch in diameter, are abundantly produced on racemes 6 to 8 inches long. They are hard-shelled, and covered by thick husks which split open and release the nuts when the latter are full ripe. The round kernels are rich in oil, and of unusually delicate flavour, which accounts for their popularity and the high prices they bring in luxury markets.

Propagation is commonly by seed, but superior varieties (of which a number have been established in Hawaii and Australia) must be propagated vegetatively. Grafting is commercially feasible but somewhat more difficult than with such trees as the orange. Because they eventually attain large size, though their growth is slow, they are planted in orchard form at 35 to 40 feet. There are numerous small commercial orchards in Hawaii and Australia; many trees in California and Florida; and occasional ones in many tropical and subtropical regions.

WHITE SAPOTE, a fruit known in Mexico as zapote blanco, is produced by the tree Casimiroa edulis which belongs to the same family as the orange -Rutaceae - though neither its general appearance nor that of the fruit would suggest, to the layman, this relationship. The ancient Aztecs, who developed an interesting system of fruit classification (sweet fruits, zapotl, sour fruits, jocotl, and the like) called this species cochitzapotl, meaning "sleep-producing sapote", which would imply something of a reputation as a soporific.

The white sapote, originally a tree of the Mexican highlands, here it is commonly seen in dooryards, has been carried to numerous tropical and subtropical regions, especially to southern California where local seedlings which produced fruit of superior quality have been named and propagated by grafting, using the shield-bud method was with citrus fruits. Pike, Suebelle, Wilson and Coleman are among the best varieties offered by nurserymen.

The tree, which is somewhat more frost-resistant than the orange, and tolerant of poor soils and drought, is characterised by palmately compound leaves and small inconspicuous racemes of yellowish flowers. The round, thin-skinned fruits are the size of an orange; they contain one to five (usually one to three) large oval seeds surrounded by soft yellowish-white sweet flesh of not very pronounced flavour. They often appear in the markets of the Mexican highlands; rarely in other parts of the world. They are eaten out of hand.

The matasano of the Central American highlands is either a geographical form of the white sapote or (as held by many botanists) a closely allied species, Casimiroa tetrameria. The under surface of the leaves is velvety pubescent, while it is glabrous (smooth) in C. edulis. The tree is somewhat less frost-resistant than the latter; the fruits are of the same size and appearance, but usually slightly bitter in flavour.



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

August
13
1958

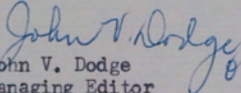
Mr. Wilson Popenoe
c/o Martha Sussman
Embassy of the United States of America
Madrid, Spain

Dear Mr. Popenoe:

I wonder if you have overlooked replying to our letters of July 10 and July 17 inviting you to prepare or revise the article CASHEW and others for the Encyclopaedia Britannica.

As we are most anxious to make this assignment, we should appreciate hearing from you at your earliest convenience.

Sincerely yours,


John V. Dodge
Managing Editor

JVD:lif-REP

Rancho California, Almuñecar (Granada)
SPAIN. 16 August 1958

Mr John V Dodge, Managing Editor,
Encyclopedia Britannica,
Chicago, Ill.

Dear Mr Dodge:

I have been absent in the eastern Mediterranean for two months, hence have fallen behind in my contact with you. I refer first to your letter of 10 July, in which you offer me the articles on Cherimoya, Loquat, Guava, Litchee, Sapodilla, Pomegranate, White Sapote, and Queensland Nut. I shall be glad to do these, and can meet your deadline of November 1st, provided you send me the paste-ups promptly and they had best be forwarded in care of Martha Sussmann at the American Embassy in Madrid - the address you have been using. I rather regret that the other articles I suggested have been allocated elsewhere as I think it would have been advisable to have a more or less uniform treatment of all of the tropical fruits.

On July 17 you wrote that you would like to have the articles on Cherimoya and Guava at an earlier date - 15 September. I have therefore prepared them without having paste-ups of your previous material (and there is no set of Britannica available here, as you can easily imagine); but I think they are suitable and that the length in each case is about right for your needs. I trust you will find them satisfactory.

This letter takes care of your postcard of 1 August, asking if I would do the articles requested. I am furthermore returning the sheet asking for revision of my data for the Contributors List, with necessary change. I am Director Emeritus of Escuela Agricola Panamericana and no longer live at the school, but at home in Antigua, Guatemala.

Sincerely,

Wilson Popenoe

CHERIMOYA (also spelled Chirimoya), the fruit of Annona Cherimola, a medium-sized tree of the family Annonaceae, originally from the Andes of southern Ecuador and northern Peru, now cultivated commercially, on a small scale, in California, Mexico, Chile, Argentina, southern Spain, Queensland, and several other regions. Throughout the highlands of tropical America it is a favorite dooryard tree and the fruit is often seen in local markets.

Its abundance of large, ovate, rich green leaves makes the tree a handsome one, while the fruit, which matures from September to January ~~in the northern hemisphere~~ ~~in the northern hemisphere~~ from September to January, was termed by Mark Twain "deliciousness itself". It is ovoid to round in form, sometimes two to three pounds in weight though usually less, pale green in color with a thin skin enclosing creamy white flesh in which numerous seeds the size of beans are embedded. The texture of the flesh is like that of firm ice cream, the flavor delicately subacid. It has been compared to a combination of pineapple and banana.

Though geographically tropical in origin, the cherimoya does not attain perfection in the tropical lowlands. Its culture is limited to elevations of 3000 to 7500 feet in the tropics, and to mild-wintered subtropical regions. Its climatic requirements are, in fact, quite specialised; it will grow satisfactorily in many regions but in some of these little fruit will be produced and this may be of unsatisfactory quality. Successful efforts to increase production in California and elsewhere by hand pollinating the flowers.

Propagation is commonly by means of seeds, but the cherimoya lends itself readily to grafting and superior varieties are perpetuated in this way. The method commonly used is the one employed with citrus

Cherimoya, 2.

fruits, i.e., shield budding. Trees are planted in orchard form, spaced about 25 x 25 feet; they are given much the same cultural attention as oranges. They come into commercial production at three to five years of age.

To this same family, Annonaceae, belong several other tropical American fruit trees. The best of these is probably the guanábana or sour-sop (Annona muricata) the large fruits of which are used to make ice creams and refreshing drinks, especially popular in Cuba. Another species, A. squamosa, usually known in English as sugar-apple, is commonly grown in drier parts of the American tropics as well as in India and elsewhere. A hybrid between this and the cherimoya is cultivated commercially on a small scale in Israel. Another species, A. reticulata, produces a fruit of mediocre quality, called custard apple, a name which tends to confuse it with the cherimoya to which the same name is sometimes applied in English-speaking regions.

GUAVA, in Spanish guayaba, is the name applied to the fruits of numerous trees and shrubs of the genus Psidium (family Myrtaceae), all of which are natives of tropical America. Horticulturally the two important species are the so-called common guava, P. Guajava, and the Cattley or strawberry guava, P. Cattleianum which occurs in two forms, one with maroon-red fruits and the other with bright yellow ones. The latter is sometimes listed botanically as P. lucidum.

The common guava is a large shrub or small tree with quadrangular branchlets, oval to oblong leaves about three inches in length, and white four-petalled flowers an inch broad. The fruits are round to pear-shaped, sometimes as much as three inches in diameter though usually less; the flesh, which is white to salmon red in color, contains numerous small hard seeds - more abundant in primitive forms of the fruit than in the modern improved varieties. The musky, at times pungent odor of the sweet flesh is characteristic and not always appreciated.

While useful in many ways, guavas are preëminently suited for the preparation of jellies, jams and preserves, highly popular in many tropical countries and exported from a few, notably Cuba. Fresh guavas are rich in vitamin C; they are eaten out of hand or may be sliced and served with sugar and cream as a dessert.

The plant resists little frost, hence is not cultivated in many parts of California but is successfully grown throughout southern Florida; while in several tropical regions it grows so abundantly in a half-wild state as to become a pest. Its propagation is usually by seeds, but the fine varieties which have been developed in Florida, California, and a few other parts of the world must be perpetuated by some vegetative means. Because of its hard dry wood and thin bark

Guava, 2.

propagation by cuttings and by conventional methods of grafting are not practical, but modern techniques have solved the problem to a highly satisfactory degree. Veneer grafting, using as rootstocks young plants in vigorous growth, and covering the grafts with strips of polyethylene plastic, gives excellent results.

The Cattley or strawberry guava is considerably more frost-resistant and is popular in many subtropical regions. It is a large shrub, attractive for its thick glossy-green oval leaves and its white flowers. The fruits are round, occasionally as much as two inches in diameter, and contain numerous hard seeds like those of the common Guava. The flavor of the soft whitish flesh has been likened to that of the strawberry, hence one of the common names. This species is frequently planted in gardens throughout southern California and several other subtropical regions; nowhere has it attained commercial importance. From the fruits an excellent jelly is made.

Other guavas which are used to a limited extent in parts of tropical America include the cas of Costa Rica (P. Friedrichstahlianum) and the guisaro (P. baliæ), both of which yield highly acid, not very pungent fruits.



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

August
27
1958

Mr. Wilson Popenoe
c/o Martha Sussman
Embassy of the United States of America
Madrid, Spain

Dear Mr. Popenoe:

Thank you for your letter of August 16. We are pleased to learn that you will be able to revise the articles LITCHI or LYCHEE (300 words); LOQUAT, JAPANESE PLUM (or Japanese Medlar) (250 words); and POMEGRANATE (550 words); and prepare the new articles SAPODILLA (250 words), WHITE SAPOTE (150 words) and QUEENSLAND NUT (150 words) for the Encyclopaedia Britannica.

I am enclosing herewith paste-ups of the articles to be revised and a Contributors' Guide for your use. As we mentioned in our letter of July 10, the revised and new articles should not exceed the lengths specified.

Six payment information forms are also enclosed which we should appreciate your completing and attaching to your manuscripts.

The deadline for this material is November 1, 1958, and we shall look forward to receiving your copy by that date.

Sincerely yours,

John V. Dodge
Managing Editor

JVD:mp-REP
Encls.

care Martha Sussmann, American Embassy,
Madrid, Spain, 6 Sept 1958

Mr John V Dodge,
Encyclopedia Britannica,
Chicago, EE UU de A

Dear Mr Dodge:

On returning from the Canary Islands I find your letter of August 13th, asking if I have overlooked replying to yours of July 10 and 17, and mentioning particularly the article on CASHEW. I replied to these two letters on 16 August, saying I would be glad to do the articles mentioned in yours of 10 July, and asking that you send paste-ups of those which require only revisions.

In your letter of 17 July you asked that the articles on Guava and Cherimoya be prepared at an earlier date than that originally contemplated, hence I did them at once, and I therefore sent you these two with my letter of August 16th. I trust they have been received

You now ask if I will revise the article on CASHEW. In your letter of July 10 you say "CASHEW. This article has already been scheduled for revision and a contributor has been asked to do it". You will therefore understand why I have done nothing about this entry. If you want the previous entry revised, and will send me the paste-up at once, I will send you the revision immediately. My problem is, I am moving around pretty constantly in this part of the world getting material for a forthcoming manual of tropical fruits in Spanish, and mail is sometimes slow in reaching me.

Under date of 14 August you advise that you have not yet received copyright releases on my articles, Mangosteen, Papaya, Avocado and Banana. These were mailed to you from Madrid on August 2nd, by surface mail. I assume they have reached you hence am not enclosing the duplicates enclosed with your letter.

Sincerely,

Wilson Popenoe

Rancho California, Almuñecar (Granada) Spain
8 September 1958

Mr John V Dodge, Managing Editor
Encyclopedia Britannica, Chicago, Ill.

Dear Mr Dodge:

On reviewing my letter to you of the 6th instant, and yours to me of 15 August asking me to prepare or revise the article on Cashew, I have come to the conclusion that something must have gone wrong with the program outlined in your letter of 10 July in which you stated that Cashew had been assigned to someone else. So just on the chance that you need this article and need it right away, I have written what I believe is an adequate treatment and enclose it herewith. If you don't need it you can chuck it in the waste basket.

If you can give me, as soon as possible, a definite list of material you wish me to handle, together with paste-ups where necessary, I will undertake to prepare everything before I leave Spain for a couple of months.

Sincerely,

Wilson Fopenoe

Address: Care of Martha Sussmann, American Embassy, Madrid, Spain.

CASHEW, a tree which occurs abundantly in a wild state in northeastern South America; as a naturalised or "semi-wild" species in southern India and other regions; and as a cultivated fruit-tree in dooryards and gardens throughout most of the tropical world. Botanically it is Anacardium occidentale, a member of the family Anacardiaceae which includes the well-known mango, the subtropical pistachio-nut, as well as the poison ivy and sumac of North America. The common name in Brazil is cajú; in Spanish-speaking countries, marañon.

Under favorable conditions of growth the cashew tree may reach a height of 40 feet. Its stiff leaves, ~~grows~~ on somewhat crooked, ungainly branches, are oblong oval in shape and four to eight inches in length. The flowers are produced in terminal panicles like those of the mango; they are small, yellowish pink; some of them are staminate or unisexual, others perfect or bisexual. Both kinds may occur on the same panicle.

The fruit is peculiar. It is kidney-shaped, an inch or so in length, attached to the lower end of the fleshy receptacle (as it is termed botanically) which is often but erroneously thought to be the fruit itself. This fleshy part, which is two to four inches in length and pear-shaped, yellow or bright red in color, juicy and highly aromatic is commonly termed "cashew apple" in English, while the true fruit is called "cashew nut". The latter, besides appearing in many tropical markets, is an article of international commerce, considerably quantities of the kernels (mostly from wild or half-wild trees) being shipped from India and a few other regions to the United States and Europe. For sale, they are often mixed with other salted nuts such as pecans, almonds, Brazil nuts and peanuts. They must be roasted before eating; the thin shell (not eaten) contains caustic substances which severely burn the lips and mouth of anyone who attempts to bite into a fresh cashew nut. From the aromatic "apple" are prepared refreshing drinks, as well as an excellent red wine which retains the characteristic, almost pungent, odor.

The climatic requirements of the tree are tropical, though it can be grown as far north as southern Florida where it is occasionally seen in gardens. It resists drought and unfavorable conditions of soil, which explains why it has become naturalised so readily in many tropical regions. It has received little attention at the hands

Cashew, 2.

of horticulturists, who have demonstrated, however, that the tree can be propagated by grafting, thus making simple the perpetuation of superior forms which originate as chance seedlings. In addition to its resistance to unfavorable environmental conditions, with exception of low temperatures, the cashew has the advantage of coming into bearing at a very early age, commonly three years from seed.

Rancho California, Almuñecar (Granada)
Spain, 16 Sept 1958

Mr John V Dodge, Managing Editor,
Encyclopaedia Britannica
Chicago 11, Ill.

Dear Mr Dodge:

This is to acknowledge receipt of your letter of 27 August. I am sending herewith the following material:

LOQUAT. The squib in the last edition is entirely inadequate, and I have written what I believe to be a sufficient treatment.

LITCHI. Since I wrote the previous treatment, there have been many developments and a new treatment is required. In addition, the preferred common name has become Lychee, now used by the Florida Lychee Association, and we had best change to that spelling, using Litchi as second choice.

SAPODILLA. I have done at what I believe is a good length.

WHITE SAPOTE and

QUEENSLAND NUT idem. The new edition would not be complete without these subjects, and I think the length is right for your purpose.

POMEGRANATE, as I prepared it for the last edition, really needs no revision. There have been no important developments in the last 10 years.

I enclose herewith copyright releases for CHERIMOYA and GUAVA.

Sincerely,

Wilson Popenoe

LOQUAT, a subtropical tree (Eriobotrya japonica) of the family Rutaceae, hence related to the apple and other well-known fruit trees of the Temperate Zone. It is occasionally called, erroneously, Japanese plum and Japanese medlar, but these names are gradually disappearing. In Spanish the name is níspero del Japon, in French neflier du Japon and bibassier.

Though its nativehome is probably in central eastern China, the tree was introduced into Japan in very early times and has received much horticultural attention in that country. Superior varieties were developed, some of which eventually reached Europe, the Mediterranean basin and a few other regions. Today theloquat is commercially grown (usually on a rather small scale) in many subtropical regions. It is not adapted to the tropics except at elevations where the climate is cool.

The tree is not deciduous; it is ornamental in appearance and for this reason is frequently planted in parks and gardens. It does not attain great size, rarely more than 30 feet in height. The leaves, which are clustered toward the ends of the branches, are thick and stiff, elliptic to lanceolate in form, ~~3 to 4~~ inches long, with coarsely serrate margins. The fragrant white flowers are small, in dense terminal panicles. The fruits are born in large loose clusters; individually they are round, ~~obovoid~~ pyriform in shape, 1 to 3 inches in length, with juicy whitish to orange-coloured flesh surrounding three or four large seeds. The flavour is sprightly, subacid, suggesting that of several other fruits of the same family.

While the loquat is commonly grown from seeds, commercial plantings are usually based on grafted trees of superior varieties, such as Tanaka of Japanese origin (with orange-coloured sweet flesh, perhaps the same as the varieties Thales and Gold Nugget of California) or Champagne, Early Red and Advance of California origin. Propagation by shield-budding and cleft grafting is simple; loquat seedlings or quince rootstocks grown from cuttings can be used, the latter if a dwarf tree is desired.

When planted in orchard form the trees are spaced 20 to 25 feet apart. They grow well on various soils, from sandy loams to clays, and come into bearing at an early age, 3 or 4 years.



ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

September
24
1958

Mr. Wilson Popenoe
c/o Mrs. Martha Sussmann
American Embassy
Madrid, Spain

Dear Mr. Popenoe:

Thank you for your letter of September 16 enclosing the paste-up of POMEGRANATE which you have read and recommended not to be changed, your revisions of the articles LOQUAT, JAPANESE PLUM; and LITCHI or LYCHEE; and the new articles SAPODILLA; WHITE SAPOTE and QUEENSLAND NUT which you have prepared for the Encyclopaedia Britannica.

I am enclosing a check in the amount of \$42.00 in payment for this material. Also enclosed are five copyright releases which we should appreciate your signing and returning at your earliest convenience.

Thank you again for handling these assignments.

Sincerely yours,

Walter Yust
Editor

WY:frb-REP
Encl.

MR. WILSON POPENOE
Dec. 18, 1958
EB GKB

This is proof of your article

CHERIMOYA

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

Note query.

Please check the following if indicated:

The material is 3 lines ~~long~~ short for the space allotted.
May we have your suggestions as to how you wish it adjusted?

An addressed, stamped envelope is attached for your convenience.

Receipt of these proofs means that the pages are due to go to press next week; it is earnestly suggested that you return your corrected proof immediately.

ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

January

7

1959

Mr. Wilson Popenoe
Antigua
Guatemala,
Central America

Dear Mr. Popenoe:

On December 18, 1958, we sent you page proofs of the article CHERIMOYA which you prepared for the forthcoming edition of Encyclopaedia Britannica. We hoped you would read the proofs carefully for any omissions or corrections and would send them back to us in the next mail.

Since we are anxious not to fall behind schedule in sending the revised proofs to the printer, I wonder if you would be good enough to return the proofs with your corrections as soon as possible.

May we hear from you at your earliest convenience?

Sincerely yours,

(Mrs.) Mae H. MacKay
Assistant to the Editor
In Charge of Editorial Production

MHM:emd

Mr. Wilson Popenoe
March 20, 1959
EB GKB
ENVEL. 1012
PAGE 944-945

This is proof of your article

GUAVA

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

PLEASE NOTE QUERIES

Please check the following if indicated:

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ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

Mr. W. Popenoe
May 15, 1959
Env. 1415, PP 800-01

This is proof of your article

MANGO

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Note query

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

Please check the following if indicated:

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May we have your suggestions as to how you wish it adjusted?

An addressed, stamped envelope is attached for your convenience.
Receipt of these proofs means that the pages are due to go to press next week; it is earnestly suggested that you return your corrected proof immediately.

ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

Mr. Wilson Popenoe
May 15, 1959
Env. 1415, P 801

This is proof of your article

MANGOSTEEN

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

Please check the following if indicated:

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May we have your suggestions as to how you wish it adjusted?

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ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

This is proof of your article

PAPAYA

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

Please check the following if indicated:

The material is _____ lines long [short] for the space allotted.
May we have your suggestions as to how you wish it adjusted?

An addressed, stamped envelope is attached for your convenience.

Receipt of these proofs means that the pages are due to go to press next week; it is earnestly suggested that you return your corrected proof immediately.

ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

June
12
1959

Mr. Wilson Popenoe
Antigua, Guatemala
Central America

Dear Mr. Popenoe:

On May 15, 1959 we forwarded to you proofs of the articles MANGOSTEEN, and MANGO which are to appear in the forthcoming edition of Encyclopaedia Britannica. We then wrote you on June 2, 1959 to the effect that we were very anxious not to fall behind in sending this material to the printer and asked if you would return the proof at your earliest convenience.

It is now June 12, 1959 and we still are not in receipt of your proof. I am therefore writing to you again urging you to send them as soon as possible, if you have not already done so. If you do not return the proof we will assume there are no corrections or omissions in the article and it will appear in Encyclopaedia Britannica as it is.

Sincerely yours,

(Mrs.) Mae H. MacKay
Assistant to the Editor
In Charge of Editorial Production

MHMacK:jaa

Antigua, Guatemala, 16 June 1959

Mrs Mae H Mackay
Encyclopaedia Britannica
425 N Michigan Avenue, Chicago, USA

Dear Mrs Mackay:

Herewith I return proofs of my articles on MANGO, MANGOSTEEN, and PAPAYA. I am sorry for the delay, which has been due to my absence in South America.

My only comment is this: The illustration "Florida Mangos" is poor. It does not give an accurate idea of the appearance of this important fruit. In fact, the lower fruit in the picture does not look like a mango at all. If it is not too late, I suggest you write to Dr George D. Ruehle, In Charge, Subtropical Experiment Station, University of Florida, Homestead, Florida, and ask him to give you a picture which will show what mangos really look like.

Sincerely,

Wilson Popenoe



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

June
17
1959

Dr. Wilson Popenoe
Antigua, Guatemala
Central America

Dear Dr. Popenoe:

On June 5, 1959 we sent you page proofs of the article PAPAYA, which you prepared for the Encyclopaedia Britannica. We hoped you would read the proofs carefully, make whatever corrections were necessary and return them in the next mail.

Since we are anxious not to fall behind schedule in sending revised proofs to the printer, I wonder if you would be good enough to return the proofs as soon as possible.

Sincerely yours,

(Mrs.) Mae H. MacKay
Assistant to the Editor
In Charge of Editorial Production

MHMacK:jaf

Antigua, Guatemala, 25 June 1959

Mrs Mae H Mackay
Encyclopaedia Britannica
Chicago, Illinois.

Dear Mrs Mackay:

Referring to your note of 17 June, I returned the proofs of my articles on MANGO, MANGOSTEEN and PAPAYA some days ago and am sure they are in your hands ere this. Delay in returning MANGO and MANGOSTEEN were due to my absence on an exploration job in the back country of Venezuela.

I shall do my best to return all proofs sent to me as promptly as possible. The trouble is that I am carrying on work in several tropical American countries and it is not always advisable to forward mail. I am now leaving for Mexico City to give a course of lectures on tropical fruits for the Organization of American States, but I do not expect to be absent from Guatemala more than a couple of weeks; and that about the 15th of July I will be fairly close to home for the rest of the year.

Sincerely,

Wilson Popenoe



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

June
29
1959

Mr. Wilson Popence
Antigua
Guatemala

Dear Mr. Popence:

Mrs. MacKay has forwarded to me your letter of June 16 concerning the MANGO illustration.

Unfortunately it is too late for us to replace this illustration in this printing. I am, however, following your suggestion and writing to Dr. Ruehle, asking if he would furnish us with a better photograph. If we receive such a photograph, we shall plan to replace the existing one in the next printing.

Sincerely yours,

Philip W. Goetz
Picture Editor

PWG:ma



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

June
30
1959

Mr. Wilson Popenoe
Antigua
Gautamala
Central America

Dear Mr. Popenoe:

We received your letter dated June 25 and also the proofs.
Evidently our letters must have crossed in the mails.

Thank you for your concern.

Sincerely yours,

(Mrs.) Mae H. MacKay
Assistant to the Editor
In Charge of Editorial Production

MHMacK:jaf

This is proof of your article

LOQUAT

WHICH YOU PREPARED (REVISED) FOR ENCYCLOPAEDIA BRITANNICA

Will you please read this proof carefully, answer all queries in the margin and bring up to date if necessary. Return by next mail with your comments or approval!

Please check the following if indicated:

The material is 2 lines long [~~XXXX~~] for the space allotted.
May we have your suggestions as to how you wish it adjusted?

An addressed, stamped envelope is attached for your convenience.

Receipt of these proofs means that the pages are due to go to press next week; it is earnestly suggested that you return your corrected proof immediately.

ENCYCLOPAEDIA BRITANNICA

Editorial Department

425 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

Antigua Guatemala, 2 July 1960

Mrs Mae H. Mackay,
Encyclopaedia Britannica,
425 N. Michigan Avenue,
Chicago 11, Illinois, USA.

Dear Mrs Mackay:

Herewith proof of my article on Lychee. This is so messed up that I believe it will have to be re-set. In the first place the official or accepted name of this fruit is now Lychee, which should come first. Another thing, which I cannot understand, is the change made in my original text, which now reads in the proof "some stands are found in California" which is not true at all.

I have tried to provide enough copy to fill the space required. I have indicated how it might cut down a line or two if necessary. If you cannot re-set this article, please eliminate the (W. Po.) at the end as I cannot be responsible for the text as shown in the proof.

Sincerely yours,

Wilson Popence

LYCHEE OR LITCHI (or lichi or leechee, etc.) The fruit of Litchi chinensis, a tree of the family Sapindaceae, believed to be native to southern China and perhaps adjacent regions. It is the favourite fruit of the Cantonese; neither the orange nor the peach is held to equal it. Its introduction into the western world came at a late day. It is recorded to have reached Jamaica in 1775, but is not yet commonly grown in the West Indies.

The first lychee fruits to mature in Florida - where the tree has attained commercial importance - are said to have ripened in 1916. A few trees introduced into California in the last century have occasionally produced a few fruits but in general conditions do not seem to be favorable in that State. Around the Mediterranean there are a few bearing trees; in South Africa a small horticultural industry is based upon lychee production; the tree is cultivated in numerous parts of India; it has received horticultural attention in the Hawaiian Islands; and occasional trees are to be seen in tropical America.

The lychee will tolerate about as much cold as the orange. It does not produce good crops in climates which are hot and humid throughout the year. It must be subjected to a period of cold weather annually, or failing this, a long dry season. In short, something must discourage vegetative growth and induce flowering. Even at best, the lychee has a strong tendency toward alternate or irregular production.

The tree is a handsome one. It develops a compact crown of bright green foliage, beautiful the year round. The leaves are compound, composed of two to four pairs of elliptic to lanceolate leaflets 2 to 3 inches long. The flowers, small and inconspicuous, are borne

Lychee.

2

in terminal panicles sometimes a foot in length. The fruits, which are produced in clusters, are oval to round ~~form~~, strawberry-red in colour, an inch or slightly more in diameter. The brittle outer covering encloses white, translucent flesh and one large seed. The flavour is subacid, sprightly, delicious, somewhat suggesting that of a Muscat grape.

Some fifty varieties have been described from southern China, of which No Mai and Haak Ip are considered to be among the best. In Florida, the Brewster from Fukien province in China has attained commercial importance; Groff, a Hawaiian production, and Bengal from India (where there are several varieties) are considered excellent. In South Africa, the most important commercial lychee is one which had its origin in Mauritius.

The tree is propagated by seed and by air-layering. When moved to the permanent orchard, lychees are set 25 to 35 feet apart. They require very little pruning and no unusual cultural attention, though they should have abundant moisture around the roots most of the time. They come into production at three to five years of age.

NOTE: If you need more words to fill the space, use either or both of the following sentences: (No paragraph)

They are attacked by few insect pests and fungous diseases. The lychee is a tropical (perhaps more accurately, tropical and subtropical) fruit tree which deserves much wider cultivation than it has received outside of southeastern Asia.

LYCHEE or LITCHI (or lichi or leechee, etc.) the fruit of Litchi chinensis, a tree of the family Sapindaceae, believed originally to have come from southern China and perhaps adjacent regions. This is the favourite fruit of the Cantonese; neither the orange nor the peach is held to equal it. Since ancient times its praises have been sung by Chinese poets. Its introduction into the western world, however, came at a late day. It is recorded to have reached Jamaica in 1775, but it ~~has never~~ ^{is not yet} become commonly grown in the West Indies. ~~Its migrations would doubtless have been more rapid had it not been for two factors: seeds do not long retain their viability, and young plants are delicate and difficult to transport.~~

The first lychee fruits to mature in Florida - where the tree has ~~since~~ attained commercial importance - are said to have ripened in 1916. A few trees introduced into California in the last century have occasionally produced a few fruits but in general conditions do not seem to be favorable in that State. Around the Mediterranean there are a few bearing trees; in South Africa a small horticultural industry is based upon lychee production; the tree is cultivated in numerous parts of India; it has received horticultural attention in the Hawaiian Islands; and occasional ~~bearing~~ trees are to be seen in ^{tropical} Latin America.

The lychee ~~is not strictly tropical in its requirements.~~ It will tolerate about as much cold weather as the orange. It ~~does~~ not produce good crops in climates which are hot and humid throughout the year. ~~The tree~~ ^{It} must be subjected to a period of cold weather annually, or ~~falling~~ ^{falling} this, a long dry ^{season} ~~period.~~ - perhaps not quite so effective. In short, something must discourage vegetative growth and induce flowering. Even at best, the lychee has a strong tendency toward alternate or ~~irregular bearing.~~ ^{production.}

The tree is a handsome one, ~~valuable as an ornamental, for parks and gardens.~~ It develops a ~~handsome~~ ^{compact} crown of bright green foliage, beautiful the year round. The leaves are compound, composed of two to four pairs of elliptic to lanceolate leaflets 2 to 3 inches long. The flowers, small and inconspicuous, are borne in terminal panicles sometimes a foot in length. The fruits, which are produced in clusters, are oval to ~~round~~ ^{round} in form, strawberry-red in colour, an inch or slightly more in diameter. The brittle outer covering

Lychee, 2.

encloses white, translucent flesh and one ~~rather~~ large seed. The flavour is subacid, sprightly, delicious, somewhat suggesting that of a Muscat grape.

Some fifty varieties have been described from southern China, of which No Mai and Haak Ip are considered to be among the best. In Florida, the Brewster from Fukien province in China has attained commercial importance; Groff, a Hawaiian production, and ~~Bengal~~ ^{Bengal} from India (where there are ~~quite a few~~ ^{several} varieties) are considered excellent. In South Africa, the most important commercial ~~variety~~ ^{Lychee} is one which had its origin in Mauritius.

^{The tree is} ~~Lycchees~~ are propagated ^{by seed and by} ~~by~~ air-layering, ~~grafting is feasible~~ but ~~not so successful~~. When moved to the permanent orchard, ~~the~~ ^{Lycchees} trees are set 25 to 35 feet apart. They require very little pruning and no unusual cultural attention, though ~~they~~ should have abundant moisture around the roots most of the time. They come into production at ~~2~~ ^{three} to ~~3~~ ^{five} years of age.



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

August
22
1960

Mr. Wilson Popenoe
Antigua,
Guatemala
Central America

Dear Mr. Popenoe:

Would you be kind enough to return the proofs of the article LITCHI which we sent to you on August 15th for your approval?

Our printer must go to press shortly in order to meet his production schedule.

Sincerely yours,

(Mrs.) Mae H. MacKey
Assistant to the Editor
In Charge of Editorial Production

MHMacK/ltf



OFFICE OF
THE EDITOR

ENCYCLOPÆDIA BRITANNICA

425 N. MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

August
30
1960

Mr. Wilson Popenoe
Antigua
Guatemala
Central America

Dear Mr. Popenoe:

Would you be kind enough to return the proofs of the article WHITE SAPOTE which we sent to you on August 23rd for your approval?

Our printer must go to press shortly in order to meet his production schedule.

Sincerely yours,

(Mrs.) Mae H. MacKay
Assistant to the Editor
In Charge of Editorial Production

MHMacK/ltf

Antigua, Guatemala, 3 Sept 1960

Mrs Mae H Mackay
Encyclopedia Britannica
Chicago, Ill.

Dear Mrs Mackay:

In reply to yours of 30 August, the article on "White Sapote" was returned to you promptly by air mail - though I never feel too sure about the promptly part down here. Previously you had inquired about "Litchi" which was a bit slow in being sent back to you because I was in Peru.

If we have reached the W's I reckon we are about through. In any event, I doubt that I shall be leaving Guatemala again this year, and as long as I am here, there will not be much delay in getting proofs back to you.

Sincerely,

Wilson Popenoe



ENCYCLOPÆDIA BRITANNICA

425 NORTH MICHIGAN AVENUE • CHICAGO 11, ILLINOIS
60611

Editorial Offices

January 22, 1964

Dr. Wilson Popenoe
Antigua
GUATEMALA

Dear Dr. Popenoe:

On October 15 we wrote to you concerning illustrations for your article LOQUAT. Since we have not heard from you, perhaps our letter has gone astray. At that time we wondered if you could supply us, on a consideration basis, with black and white photographs of Eriobotrya japonica, flowers and fruit cluster.

For your convenience, our request is also listed on the attached form, which we would like you to fill out and return whether or not photographs are available. Because of an impending deadline, if photographs are available, please send them by air-mail, and we will reimburse you for the expense.

We shall be grateful for your assistance with the article and look forward to hearing from you at your earliest convenience.

Sincerely yours,

(Miss) Sara Jane Ruffin
Assistant to the
Art Director

SJR,BCK.rrg

Enclosure



ENCYCLOPÆDIA BRITANNICA

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Editorial Offices

Dear Britannica Contributor:

Some time ago you contributed the enclosed copy to Encyclopaedia Britannica. We have been proud to be able to continue to publish it in the set.

Because the material is no longer brand new, however, we have thought it only fair to ask you as the author whether or not its condition is still satisfactory. Are you still content to be identified as the contributor? If not, would you be willing to indicate to us changes you consider necessary?

Please note that we are not asking you to undertake any major rewriting or revision at this time. If you believe that drastic changes are required, we would be glad to know that. If, on the other hand, only minor change or updating is necessary, you may if you wish make corrections on one of the two copies enclosed with this letter. (The second copy is for your own use.)

We also enclose a copy of your description as it now appears in Britannica. We find that it is no longer safe to assume that a contributor's description will remain accurate for more than a brief time. If yours is out of date, or if the address to which this letter was mailed is no longer current, would you please indicate changes on the enclosed sheet?

Britannica values highly the contributions of the thousands of writers represented in its volumes. We hope that you will welcome, as many of our authors have already said that they would welcome, this opportunity to review the condition of what is still being published as your statement.

The Editors

the Gallic pilgrim Etheria in Jerusalem (c. 395), have recorded the use of similar litanies also at the daily offices of matins and vespers.

The Western Latin liturgies soon adapted to their use litanies of the Eastern type. A *Deprecatio* ascribed to Pope Gelasius I (492–496) and preserved in the works of Alcuin, was possibly introduced by that pope at the beginning of the Mass. But by the time of Gregory I (590–604), at ordinary Masses, only the *Kyrie eleison* responses, alternating with *Christe eleison*, were in use; and since Gregory's day the full litany form has been lost from the Mass altogether. In the rite of Milan, however, a comparable litany survives at the beginning of the liturgy on the Sundays of Lent. The Gallican Council of Vaison (529) ordered the *Kyrie eleison* to be sung at all Masses and at the offices of matins and vespers, "as is the custom of the apostolic see and also throughout the whole East and the provinces of Italy." The Stowe missal (Irish, 8th century) contains a litany before the Gospel lesson that is undoubtedly borrowed from the East—*cf.* the petition for "the most pious emperors and all the Roman army." St. Benedict in his monastic Rule enjoined a litany at matins and vespers immediately before the concluding Lord's Prayer, and the recital of *Kyrie eleison* at the end of the other daily offices. From the same period, the Gelasian sacramentary directs "*Kyrie eleison* with litany" in all major rites of ordination.

Peculiar to Western custom were litanies sung in procession on special occasions of penitence and fast—adaptations of pagan Ambarvalia (*q.v.*) processions about the land to purify and protect crops. They are first heard of in Gaul c. 470, when Bishop Mamertus of Vienne instituted such litany processions on the three days before Ascension day, to invoke the blessing of favourable weather and fruitful seasons. Called rogations, these processions were enjoined upon all Frankish Gaul by the Council of Orléans (511). Some time in the 6th century, the Roman church instituted a similar processional litany (the *litania maior*) on April 25, to replace the pagan Robigalia. The Gallican rogations before Ascension (the *litaniae minores*) were adopted at Rome by Leo III (795–816). In Spain, rogation processions at sowing time were inaugurated in Pentecost week and at the autumn equinox, and also at the beginning of the Gallican Advent season in early November (Council of Gerona, 517; Isidore of Seville, *De officiis*, i, 39–40). The Benedictine missionaries to the Anglo-Saxons entered Canterbury in 597 singing the rogation day litanies (Bede, *Ecclesiastical History*, i, 25); and the English synod of Cloveshoe (747) ordered litanies on April 25 "after the manner of the Roman church" and on the pre-Ascension days "after the manner of our ancestors." (See also BOUNDS, BEATING THE; PROCESSION.)

Another type of litany originating in the East was introduced at Rome in the 7th century—one made up of invocations to the Trinity, the angels and the saints—and was combined with the petitionary rogation-type litany. It was employed at processions before papal Masses on Ash Wednesday, the Ember days and four chief festivals of the Virgin Mary. Their development is commonly attributed to a Syrian pope, Sergius I (687–701). The Irish and Anglo-Saxons cultivated this type of litany especially and spread its use in their missions on the continent.

The Roman litany, as it has historically developed, is still sung in procession on Easter Even after the benediction of the font and before Mass. In the breviary of Pius V it is recited after lauds on nonfestival weekdays of Lent, rogation days and April 25. The litany consists of (1) invocations to the Trinity (response: *Kyrie eleison*) and to the angels and saints (response: "Pray for us"); (2) deprecations or prayers for deliverance from all evils, and obsecrations or entreaties by virtue of Christ's atoning work (response: "Deliver us, O Lord"); (3) intercessions (response: "We beseech thee to hear us"); and (4) concluding devotions to Christ as Lamb of God, and the *Kyrie eleison*.

At the Reformation, Martin Luther issued (1529) both Latin and German revisions of the Roman litany, eliminating all invocations of saints. A similar vernacular revision of singular litany fesse, made for the Church of England by Archbishop Thomas Cranmer, was published in 1544. The English litany has been incorporated in all editions of the Book of Common Prayer since 1549. Its traditional use is after Morning Prayer on Sundays,

Wednesdays and Fridays; but it is also a common custom in Anglican churches to sing the litany in procession before the Holy Communion and on the rogation days.

BIBLIOGRAPHY.—E. Bishop, *Liturgica Historica*, pp. 116–164 (1918); F. J. Dölger, *Sol Salutis*, pp. 60–103 (1925); A. Baumstark, *Comparative Liturgy*, pp. 71–80 and *passim* (1958); for Anglican use, E. G. C. F. Atchley, *The People's Prayers* (1906). (M. H. SM.)

LITCHI (LYCHEE; also spelled lichi, leechee, etc.), the fruit of *Litchi chinensis*, a tree of the family Sapindaceae, believed to be native to southern China and adjacent regions. It has been the favourite fruit of the Cantonese since ancient times; neither the orange nor the peach is held to equal it. Its introduction into the western world, however, came relatively late. It is recorded to have reached Jamaica in 1775.

The first litchi fruits to mature in Florida—where the tree has attained commercial importance—are said to have ripened in 1916. A few trees introduced into California in the 19th century have occasionally produced fruits but, in general, conditions there are apparently unfavourable for their successful establishment. Around the Mediterranean are a few bearing trees; in South Africa a small horticultural industry is based upon litchi production. The tree is cultivated in numerous parts of India and has received horticultural attention in the Hawaiian Islands. Occasional trees are to be seen in tropical America.

The litchi will tolerate about as much cold as the orange. It does not produce good crops in climates which are hot and humid throughout the year. The tree must be subjected to a period of cold weather annually or, failing this, a long dry season. In short, something must discourage vegetative growth and induce flowering. Even at best, the litchi has a strong tendency toward alternate or irregular production.

The tree is a handsome one, developing a compact crown of bright green foliage, beautiful the year round. The leaves are compound, composed of two to four pairs of elliptic to lanceolate leaflets two to three inches long. The flowers, small and inconspicuous, are borne in terminal panicles sometimes a foot in length. The fruits, which are produced in clusters, are oval to round, strawberry-red in colour and an inch or slightly more in diameter. The brittle outer covering encloses white, translucent watery flesh and one large seed. The flavour is subacid, sprightly, delicious, suggesting that of a Muscat grape. The fruit is eaten fresh, canned or dried, as the litchi nut of commerce.

About 50 varieties have been described from southern China, of which No Mai and Haak Ip are considered to be among the best. In Florida the Brewster, from Fukien province in China, has attained commercial importance; Groff, a Hawaiian production, and Bengal, from India (where there are several varieties), are considered excellent. In South Africa the most important commercial litchi is one which had its origin in Mauritius.

The tree is propagated by seed and by air layering. When moved to the permanent orchard, litchi are set 25 to 35 ft. apart. They require very little pruning and no unusual cultural attention, though they should have abundant moisture around the roots most of the time. The trees come into production at three to five years of age. (W. Po.)

LITERARY FORGERY. A forgery is essentially a piece of work created or modified with an intention to deceive. This definition excludes from the category of literary forgeries both the copy made in good faith for purposes of study and the large class of writings that, in the course of their descent from antiquity, have become associated with the name of some great classical author or Father of the Church. A good example is the Pauline commentaries of the heretic Pelagius, which have been transmitted under the name of St. Jerome, one of his most bitter opponents.

Nevertheless, these exclusions made, there remains a heterogeneous collection of forged writings, proceeding from a variety of motives on the part of their authors. Certain broad divisions are possible; works produced to exalt or denigrate some religion, political party or race; works produced pseudonymously by an author who despairs of obtaining recognition under his own name, or who considers that he has been unjustly neglected and takes vicarious pleasure in hearing his forgeries lauded by the very critics

considered a cruel tyrant, López later was elevated to the pantheon of Paraguayan heroes. (H. G. Wn.)

LÓPEZ DE AYALA, PEDRO (1332-1407), Spanish historian, poet and chancellor of Castile from 1398 until his death (in Calahorra), was born at Vitoria. His most impressive works are the chronicles of the four kings under whom he served. After transferring his allegiance in youth from Peter the Cruel to Henry of Trastámara, he held high office under the latter and his successors John I and Henry III, seeing action against the Black Prince at Nájera (1367) and the Portuguese at the disaster of Aljubarrota (1385), where he was taken prisoner. Ayala has been called the first Castilian humanist because of his translations from Boccaccio and Guido da Colonna. As a poet, he is the last representative of the medieval "clerical craft," and his *Rimado de Palacio*, written largely in the old *cuaderna vía*, is notable for its blistering satire on contemporary society, sparing the mighty of neither church nor state. The chronicles (of which the standard edition is that of 1779-80) display the same powers of implacable observation and vivid expression as the *Rimado*, but substitute for the *saeva indignatio* of the poem an icily impassive surface objectivity even more effective, thanks to Ayala's shrewd choice of significant detail and incident, in conveying his moral judgments.

Ayala's *Poesias* were edited by A. F. Kuersteiner (1920) for the Hispanic Society of America. (F. S. R.)

LÓPEZ DE GÓMARA, FRANCISCO (1512-1557?), Spanish historian, who recorded the deeds of Hernán Cortés, was born in Soria, studied the humanities at Alcalá university and became chaplain in Cortés' household. There he acquired much of the material for his greatest work, the *Historia de las Indias y conquista de Mexico* (1552), the first part of which relates to the discovery and conquest of the Indies and the second part to the triumphs of Cortés. He made Cortés the central figure, giving him all the credit, and his biased account provoked a fellow soldier, Bernal Diaz (*q.v.*), into producing a rival version. His clear, individual style made his work popular, but its partiality caused it to be banned.

LÓPEZ DE MENDOZA, ÍÑIGO, MARQUÉS DE SANTILANA; *see* SANTILANA, ÍÑIGO LÓPEZ DE MENDOZA, MARQUÉS DE.

LOP NOR (LOB NOR, Chinese LO-PU-NG-ERH), a lake in Sinkiang Uigur Autonomous Region of China. It lies in the eastern Tarim basin, between the Astin Tagh on the south and the Kuruk Tagh on the north. Ancient Chinese and Greek accounts and maps placed the lake south and east of the great Silk Road station of Lou-lan, at a point about 42° 30' N. lat. About A.D. 330 the lower Tarim river broke out of its old course, turning southeastward, to establish a new terminal water body rather close to the base of the Astin Tagh, causing the abandonment of Lou-lan as a Silk Road station. No medieval European travelers mentioned this change, and European cartographers continued to place Lop Nor in the classical location. In 1876 the Russian explorer N. Prjevalsky discovered two closely connected lake basins 1° S. of the classical site of Lop Nor, which he regarded as being identical with the classical lake.

Several decades of exploratory search for the lake followed. Explorers and geographers engaged in heated debate over the physical history of the Tarim river and Lop Nor. In 1928 Sven Hedin, who had repeatedly sought to solve the puzzle, found both the lower Tarim river and Lop Nor back in their classical positions, the river having returned to its ancient channel in 1921. Hedin's studies made clear that the precise location of the terminal lake had steadily shifted over the centuries, and that the lake varied both in area (about 946 sq.mi.) and in depth.

See Sven Hedin, *The Wandering Lake* (1940). (J. E. Sr.)

LOQUAT (*Eriobotrya japonica*), a subtropical tree of the family Rosaceae, related to the apple and other well-known fruit trees of the temperate zone. It is occasionally called, misleadingly, Japanese plum and Japanese medlar, but these names are gradually disappearing. The latter name refers to its resemblance to the closely related medlar (*q.v.*).

Though its native home is probably central-eastern China, the loquat tree was introduced very early into Japan, where it was

much developed horticulturally and is still highly valued. Some superior Japanese varieties eventually reached Europe, the Mediterranean basin and a few other regions. The loquat is grown commercially (usually on a rather small scale) in many subtropical regions. It is not adapted to the tropics, except at elevations where the climate is cool. In Mexico the tree is known as *nispero del Japón*.

Ornamental in appearance and rarely more than 30 ft. in height, the evergreen loquat is frequently planted in parks and gardens. The leaves, which are clustered toward the ends of the branches, are thick and stiff, elliptic to lanceolate in form, eight to ten inches long, with coarsely serrate margins. The small fragrant white flowers are arranged in dense terminal panicles. The fruits are borne in large loose clusters; individually they are round, obovoid or pear-shaped, one to three inches in length, with a tough, yellow to flesh plumlike skin enclosing juicy, whitish to orange-colored flesh surrounding three or four large seeds. The flavour is agreeably tart, suggesting that of several other fruits of the same family.

While the loquat is commonly grown from seeds, commercial plantings are usually based on grafted trees of superior varieties, such as Tanaka of Japanese origin, Gold Nugget, Champagne and Early Red of California. Propagation is by shield budding and cleft grafting; loquat seedlings or quince rootstocks grown from cuttings can be used, the latter if a dwarf tree is desired.

When planted in orchard form, the trees are spaced 20 to 25 ft. apart. They grow well on various soils, from sandy loams to clays, and come into bearing at an early age, three or four years.

See Wilson Popenoe, *Manual of Tropical and Subtropical Fruits* (1920); W. H. Chandler, *Evergreen Orchards*, 2nd ed. (1958).

(W. Po.)

LORAIN, a city of Ohio, U.S., in Lorain county, is a port on the Great Lakes. Its harbour, the lower 3 mi. of the Black river, is on the south shore of Lake Erie, 25 mi. W. of Cleveland and 70 mi. E. of Toledo. The city occupies the level terrain on both sides of the river to and beyond the head of navigation.

In the early 19th century the area was occupied by Indians. Title to the Connecticut Western Reserve district passed to the Connecticut Land company with the signing of the treaty of Fort Industry in 1805. The territory was then surveyed and opened for settlement under the name of Mouth of Black River. The village was first incorporated as Charlestown in 1836. It declined in importance and lost its charter after Cleveland was selected as the terminus of the Ohio and Erie canal and when the westward extension of the railroad was routed through Elyria, leaving Charlestown's port without rail connections with the interior. When the Poe lock at Sault Sainte Marie, Mich., was opened in 1896 and the Cleveland, Lorain and Wheeling railroad (later part of the Baltimore and Ohio) to the coal fields of southeastern Ohio was completed in 1872, the coal and iron ore trade was established. The town was rechartered in 1874 as Lorain because the U.S. post office had approved another Ohio town as Charlestown.

In 1890 the Johnstown Steel company was located on 3,000 ac. of land at the head of navigation on the Black river. This company was chiefly responsible for the city's growth. Other manufacturing industries include shipbuilding, power shovels, cranes, bearings, steel stampings, car and truck assembly, railroad shops, gypsum lath and wallboard, and clothing. Coal averages 98% of all water-borne shipments, and iron ore and limestone constitute 95% of total receipts of the port of Lorain. About 50% of the iron ore and limestone are used locally.

Lorain is a cosmopolitan city with large population segments of Puerto Ricans, Hungarians, Poles, Germans, Italians, Czechoslovaks and Slovenians. Five public parks comprising 171 ac. provide recreational facilities. Population (1960) 68,932; Lorain-



JOHN H. GERARD
LOQUAT LEAVES (ERIBOTRYA JAPONICA)

Falmouth, where he continued his experiments under a government appointment. He recommended that roads should be raised above the adjacent ground for good drainage and covered with a surface of clean, graded stones. In 1815, having been appointed surveyor general of the Bristol roads, he was able to put his theories into practice. In 1819 he published a *Practical Essay on the Scientific Repair and Preservation of Roads*, followed, in 1820, by the *Present State of Road-making*. In 1827 he was appointed general surveyor of roads in Great Britain. McAdam died at Moffat, Dumfriesshire, on Nov. 26, 1836.

MACADAMIA, the generic and common name for the edible seeds of two closely related trees of the silk-oak family (Proteaceae) native to Queensland and New South Wales. Other names for the delicately flavoured, rich kernels are Queensland nut and Australian nut. *Macadamia ternifolia* has stiff oblong-lanceolate leaves four to eight inches in length, with coarsely serrate margins; *M. integrifolia* has similar leaves, but with smooth margins. Under favourable conditions of growth (a climate about like that for the orange) and rather moist rich soil, the trees ultimately attain a height up to 60 ft. (18 m.) and are highly ornamental in appearance.

Hard-shelled, shiny round nuts, covered by thick husks and following the small white flowers, are abundantly produced on racemes six to eight inches long. The husks split open and release the nuts when the latter are fully ripe. The kernels, used almost exclusively as dessert nuts, bring high prices in food-specialty markets.

Propagation is commonly by seed, but superior varieties (of which a number have been established in Hawaii and Australia) must be propagated vegetatively. Grafting is commercially feasible but rather difficult. Because of their eventual large size, trees in orchards are planted 35 to 40 ft. (11 to 12 m.) apart. There are numerous small commercial orchards in Hawaii and Australia; many trees in California and Florida and occasional ones in other tropical and subtropical regions.

(W. Po.)

McADOO, WILLIAM GIBBS (1863-1941), U.S. lawyer and railroad executive who served as secretary of the treasury and director-general of U.S. railroads during World War I, was born near Marietta, Ga., Oct. 31, 1863. He briefly attended the University of Tennessee, became deputy clerk in the U.S. circuit court at Chattanooga in 1882, and was admitted to the bar three years later. In 1892, disappointed with his law practice and the losses resulting from his efforts to modernize the Knoxville street railway system, he moved to New York city. There his main interest became transportation, and he organized and headed two companies (later consolidated as the Hudson and Manhattan Railway company) that built tunnels under the Hudson river and operated the railways connected with them.

McAdoo's abundant energy, his aptitude for politics, and a chance meeting with Woodrow Wilson led to his early participation in the movement to make Wilson president. His conspicuous part in the campaign and Wilson's confidence in him brought about his nomination as secretary of the treasury. In the cabinet he was one of the leading figures in the Wilson administration, gaining special recognition for his work connected with the federal reserve board, of which he was chairman, and for his service as director-general of U.S. railroads during the period of government operation (1917-19). Under his direction four successful Liberty bond drives were conducted. In 1919 he resumed the practice of law, first in New York and later in Los Angeles, Calif. Meanwhile, his first wife having died in 1912, McAdoo married Eleanor Randolph Wilson, daughter of the president, in a White House ceremony on May 7, 1914.

McAdoo emerged from public service as the acknowledged leader of a large segment of the Democratic party. He made a strong showing as a candidate for the presidential nomination at the party convention in San Francisco in 1920. His candidacy in New York in 1924, where a near majority of the delegates supported him, precipitated the famous deadlocked convention. He represented California in the U.S. senate from 1933 until his resignation in 1938.

He died Feb. 1, 1941. His career is well-documented by the

large collection of his personal papers in the Library of Congress. His autobiography, *Crowded Years*, appeared in 1931.

(J. C. V.)

MACAIRE, the title chosen by two successive editors, A. Mussafia and F. Guessard, for a French medieval epic romance, belonging to the Carolingian cycle, of which the only known manuscript is from the 14th century (Venice, Bibl. S. Marc, ms. fr. XIII). The title is derived from one of the chief characters in the romance, which relates what happens to Blanchefleur, wife of the old and infirm Charlemagne, when, having repulsed the advances of Macaire, she is accused of infidelity and condemned to death—a sentence commuted to perpetual exile. During this exile she is attended by the faithful Auberi de Mondidier who is assassinated by Macaire. He is avenged by his dog who, after savaging Macaire in the midst of the royal court, discovers Auberi's corpse, engages in single combat with the murderer and kills him. Meanwhile Blanchefleur has reached Hungary, where she gives birth to Louis, Charlemagne's son; she then takes refuge with her father, the emperor of Constantinople. The emperor decides to avenge his daughter's honour and summons a powerful army to attack Charlemagne. The war ends with a single combat between Ogier the Dane (*q.v.*) and Varocher, the queen's protector; during the fight Varocher proves to Ogier that Blanchefleur is innocent, and Charlemagne, learning the truth, seeks and obtains his wife's pardon.

This story is also developed in another *chanson de geste* called *La Reine Sebile*, though details (the name of the queen, among others) differ. The manuscript of this, which runs to 500 lines, has been reconstructed from 13th-century fragments, discovered in England, at Mons, Belg., and at Sion in Switzerland. The poem also is known in a remarkably faithful Spanish translation, the manuscript of which (end of the 14th or beginning of the 15th century) is preserved in the Escorial, Madrid. This formed the basis of a Spanish prose romance, the *Historia de la Reyna Sebilla*, and of a book popular in the Netherlands, printed at Antwerp at the beginning of the 16th century; the story was already known there in the 14th century.

The existence of an epic romance on this subject was attested in France at least as early as the first half of the 13th century. Criticism remains in doubt as to whether *La Reine Sebile*, composed in dodecasyllabic verse, is earlier than *Macaire*, written in decasyllables; but it is generally admitted that these two romance poems developed almost identical stories independently. Whatever the facts of their origin, both are concerned with themes belonging to folklore: a queen unjustly suspected of infidelity and a dog who avenges his master's death. The first (*see* GENEVÈVE) is found, for instance, in the *Thousand and One Nights*, in Vincent de Beauvais's *Speculum majus*, and in a German poem of the 14th century, in which the queen is named Hildegarde. The second, already with many of the details to be found in *Macaire*, is told in Plutarch's *Opera Moralia*, and the duel between Macaire and the dog is interpolated by Giraldus Cambrensis in a manuscript of the *Hexameron* of St. Ambrose. The name "*chien de Montargis*" is mentioned for the first time in the *Histoires prodigieuses* (1580) of François de Belleforest (1530-83), which asserts that the episode was depicted in a painting in the castle of Montargis. The story itself, again worked over by Gaston Phoebus in about 1390 and in the *Menagier de Paris* (1393), was thus already separated from its Carolingian context; Jean de la Taille, in his *Discours notable des duels* (1607), placed it in the reign of Charles V. *See* also CHANSONS DE GESTE; CHARLEMAGNE LEGENDS.

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McALLEN, a city of Hidalgo county, in southeastern Texas, U.S., about 50 mi. W.N.W. of Brownsville and 7 mi. from the International bridge over the Rio Grande at Reynosa, Mex. It was founded in 1905, incorporated in 1911 and named for John McAllen, a Scottish settler from whose ranch the townsite was

LANGUAGES: *The Macro-Sudanica Family.*

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MANGEL (MANGOLD, MANGEL-WURZEL) is a large type of beet belonging to the species *Beta vulgaris*, which also includes vegetable and sugar beets and Swiss chard. These types interbreed freely. The species probably originated from the wild beet *Beta maritima* and had its principal developmental centre in the eastern Mediterranean region. Mangold, the original name, is German and it has been somewhat modified in use. In France mangels are known as disettes. The mangel root is a store of food-stuffs in the forms of sugar and other carbohydrates. The sugar percentage is approximately 7%–8%, being about half that of sugar beets. The principal use of the crop is to provide a high tonnage of a succulent, nutritious feed for use in livestock, including poultry feeding. As feed for cattle and sheep, mangel roots are highly regarded and being very palatable they are often utilized as a relish for stimulating milk production. They are also considered valuable in conditioning animals for show purposes. Pound for pound the dry matter of mangels is equivalent in feed value to grain. The crop is usually grown in regions too cool or seasons too short for corn and where other conditions, such as soil fertility, soil type and moisture supply, are particularly favourable. Corn as compared with mangels will produce nearly double the yields of dry matter in the regions of its adaptation. Mangels are grown chiefly in northern and coastal western Europe and on the Pacific coast of the United States and Canada.

The plant is a biennial. During the first year of growth the stem remains short and a rosette of large, crisp, prominent-veined leaves arises from it. The upper portion of the primary root becomes large during midsummer and autumn, attaining a diameter of from 4–10 in. and a length of from 6–30 in. The shape of the root is a varietal characteristic. If it remains in place and survives the winter, or if it is properly stored, and transplanted the following spring, tall, angular, branching stems grow to heights of three feet or more and produce inconspicuous flowers and seeds. The flowers are perfect and arranged in dense, sessile clusters, each subtended by a small bract, along an axis. The seeds are embedded in the flower parts and usually several flowers clustered together give rise to the seed ball, from which several seedlings may develop. Five groups of varieties are recognized based upon root shape and colour and leaf colour. Shapes recognized are globular, flattened, cylindrical and fusiform while colours may be white, yellow, orange or red. Zonal coloration may also occur within the root.

Culture.—Like other root plants, the mangel is a row crop. The seed is drilled about 1½ in. deep in rows 24–36 in. apart at a rate of 10–15 lb. per acre. After emergence of the seedlings, cultivation is begun and continued until late summer. When the plants reach the four-leaved stage, they are spaced about 10–14 in. apart in the rows by thinning. Hand hoeing is then begun and the crop is weeded as required. Harvesting is done by mechanically lifting the roots previous to heavy frosts in the fall and removing the tops by cutting. The roots may be stored in large heaps or in covered pits or root cellars. Successful storage is dependent upon careful handling to avoid severe bruising, and also upon good ventilation. The roots may be pulled and fed directly as needed without topping.

The best soils for mangels are rich, well drained and in good cultivation. On more shallow land varieties with shorter roots may be grown. The crop responds markedly to heavy applications of barnyard manure and to potash, phosphate and nitrogen fertilizers. Although mangels are sometimes grown for several years on the same land, they more commonly occupy a place in rotation with grain and forage crops. Requiring careful cultivation and weed control, they leave the soil in excellent condition for succeeding crops.

The principal values of the mangel are its productiveness, yields usually being 20–45 tons per acre, and its succulence. Very few crops will produce as much succulent feed per area. Mangels re-

quire much hand labour in thinning, cultivating, harvesting and storage. In corn regions the cost of producing corn ensilage for succulent feed is much less than with mangels or other root crops. Mangels are more drought- and heat-tolerant but more sensitive to frost than are turnips or rutabagas, often grown for similar uses. Also, they are less affected by root maggots and aphids. Important objectives sought in better varieties are high yield of sugar and dry matter, freedom from disease and premature seed-stalk formation (bolting) and smooth, well-shaped roots of good keeping quality. (D. C. SH.)

MANGO, one of the most important and widely cultivated fruits of the tropical world. Its origin is lost in antiquity; according to some authorities, horticultural forms are derived from *Mangifera indica*, of the cashew family (Anacardiaceae), considered indigenous to the region of eastern India, Burma and Assam; but other species, such as *M. laurina*, may have entered into the composition of some, particularly those of the Malayan region.

History.—Few fruits are so inextricably connected with the folklore and religious ceremonies of India as the mango. Buddha himself was presented with a mango grove, that he might find repose in its grateful shade. The economic importance of the mango in ancient times is attested by one of the Sanskrit names, *am*, which has an alternative meaning of provisions or victuals. The Chinese traveler Hwen T'sang, who visited Hindustan between A.D. 632 and 645, was the first person, so far as known, to bring the mango to the attention of the outside world. Friar Jordanus wrote of it in 1328, and Giovanni de Marignolli in 1349. Akbar, the Mogul emperor who reigned at Delhi from 1556 to 1605, planted near Darbhanga the Lakh Bagh, an orchard of 100,000 mango trees. Nothing better attests the esteem in which the fruit has long been held than this immense planting, made at a time when large orchards of fruit trees were almost unknown.

The name mango, by which the fruit is known in English- and Spanish-speaking countries, is derived from the Tamil *man-kay* or *man-gay*, which the Portuguese adopted as *manga* when they settled in western India. Probably because of the difficulty in trans-



BY COURTESY OF U.S. DEPARTMENT OF AGRICULTURE

FLORIDA MANGO TREE IN FRUIT

porting seeds (they retain their viability a short time only), introduction of the tree into the western hemisphere did not take place until about 1700, when it was planted in Brazil; thence it reached the West Indies about 1740. It has taken on the appearance of a wild species in many parts of tropical America, trees springing up everywhere from seeds scattered by the roadside. During the ripening season, mangos are a major food-stuff wherever grown.

Description.—The tree is evergreen, often reaching large size (50-60 ft.) and attaining great age. It is one of the favourite shade trees of the tropics. The leaves are lanceolate, up to 12 in. long; the flowers, which are small, pinkish and fragrant, are borne in large terminal panicles. They are polygamous, *i.e.*, some have both stamens and pistil, others stamens only. The fruit varies greatly in size and character, as would be expected of a species (or combination of species) that has been in cultivation for a long time. The smallest mangos are no larger than plums, while others may weigh four or even five pounds. The form is oval, round, heart-shaped, kidney-shaped or long and slender. Some varieties are beautifully coloured with shades of red and yellow, while others are dull green. The single large seed is flattened, the flesh that surrounds it yellow to orange in colour, juicy and of delicious spicy flavour. Fryer, writing of mangos in 1673, said "for Taste, the Nectarine, Peach and Apricot fall short." Hamilton, who wrote in 1727, went even further. "The Goa mango," he declared, "is reckoned the largest and most delicious to the taste of any in the world, and I may add, the wholesomest and best tasted of any Fruit in the World." There are ample grounds for considering the mango—as has been done by many writers—the "king of tropical fruits."

Most of the seedlings so abundant throughout the tropics do not represent this fruit at its best. While of good flavour, they are commonly characterized by coarse fibres throughout the flesh, which makes eating them disagreeable. In contrast, the fine grafted varieties that have originated in India and a few other regions, as well as seedlings of the race cultivated in the Philippines and other countries (known as Mangos de Manila in Mexico and Filipinos in Cuba), are almost devoid of fibre and are of excellent quality.

Distribution and Cultivation.—In 1889 the U.S. department of agriculture introduced into Florida the first of the grafted Indian varieties known in the United States—the variety Mulgoba, of superb quality but not highly productive. In subsequent years, mainly through the efforts of the Reasoner brothers and David Fairchild (*q.v.*), more than 50 other choice varieties were taken to the United States, whence the cultivation of several gradually spread to many parts of the American tropics. The British and French also introduced a number into the West Indies. Some of the best imported varieties are Pairi (known in Jamaica as Bombay), Borsha and Amini. In addition to these such varieties as Carabao from the Philippines and Saigon from Cambodia should be mentioned, as well as Julie, which first received horticultural attention in the French West Indies and later became popular in Jamaica.

Because of the failure of many varieties to produce regular and heavy crops of fruit, they have been replaced in commercial orchards by Haden (a seedling of Mulgoba that originated in Flor-



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CLUSTER OF MANGOS

ida) and others that have been developed in that state.

Mango trees are injured by a few degrees of frost. They are grown commercially in southern Florida, but were not wholly successful in California, though numerous trees have fruited in that state. The mango is not particular as to soil, but the finer varieties yield good crops only where there is a well-marked dry season to stimulate fruit production rather than vegetative growth. There is another serious problem in rainy areas: a fungous disease known as anthracnose (*Colletotrichum*) which destroys the flowers and young fruits and is expensive to control.

Propagation is by means of grafting or budding. Inarching is widely practised in tropical Asia, but is tedious and relatively expensive. In Florida better methods have been developed and are used commercially. Chief among these are veneer grafting and chip budding. However, seedling trees of the Philippine race usually produce fruit like that of the parent and for this reason are extensively grown in Mexico. This race is polyembryonic, which means that trees usually do not develop from fertilized ovules, but from what are known as nucellar buds arising from the vegetative tissues surrounding the egg cell, hence they are in most respects similar to grafted plants. On the other hand, most of the Indian varieties are monoembryonic, which means that young plants develop only from fertilized ovules and therefore are subject to the variation that is characteristic of cultivated fruit trees in general.

Except with occasional dwarf varieties such as Julie, mangos in commercial plantings are spaced 35 to 45 ft. apart. The tree has a number of enemies, chief among which are the anthracnose disease mentioned above and certain scale insects (family Coccidae). In numerous tropical regions the fruits may be infested by the larvae of fruit flies (family Tephritidae), which render them unfit for human consumption and are difficult to combat.

See L. B. Singh, *The Mango* (1960); W. H. Chandler, *Evergreen Orchards*, 2nd ed., ch. 10 (1958). (W. Po.)

MANGOSTEEN, a beautiful, delicious fruit of tropical southeast Asia, produced by a handsome tree (*Garcinia mangostana*) of the family Guttiferae, which under favourable conditions reaches a height of about 35 ft. It has thick, dark-green, glossy leaves six to ten inches long; the flowers are large, polygamous; the fruits are about three inches in diameter, round to oblate in form, and dark purple in colour. They have thick hard rinds surrounding a large cavity in which lie several segments of snow-white flesh, resembling a mandarin orange; it is juicy, delicate in texture, and of delightful ~~slightly tart~~ flavour.

In spite of the fact that the mangosteen is so highly valued, and that its cultivation in such regions as Java, Sumatra, Indochina and the southern Philippines dates from very early times, the tree has nowhere been planted on an extensive scale, for mangosteens are difficult to ship very long distances. It was introduced into the western hemisphere in the 19th century, where it became established in several of the West Indian islands; it was later established on the mainland; *e.g.*, in Guatemala, Honduras, Panama and Ecuador. It did not prove well adapted to the climates of California and Florida, but has been grown successfully in Hawaii.

For best results the mangosteen needs a rich deep soil and a moist tropical climate, but it will grow under less ideal conditions, though not where temperatures often go below about 40° F. Propagation is by seeds, which do not long retain their viability. Grafting has been unsuccessful and not required, since the embryos develop from tissues surrounding the ovary; hence, being of vegetative origin they produce trees that are as much alike as grafted ones. Occasional trees may yield more than 1,000 fruits; there is a tendency to produce good crops only in alternate years.

See W. H. Chandler, *Evergreen Orchards*, 2nd ed., ch. 13 (1958). (W. Po.)

MANGROVE, generally, the name for tropical and subtropical vegetation forming dense thickets or forests along tidal estuaries, in salt marshes and on muddy coasts and being composed chiefly of shrubs or small trees that produce prop roots. Specifically, the term is applied to the most prominent trees of these florae, species of *Rhizophora* and *Avicennia*. The western man-

orders in Rome itself, and from the domination of the Saxon dynasty after the revival of the Holy Roman Empire for Otto I in the 10th century; but it reasserted itself in the second half of the 12th century thanks chiefly to the alliance with the Norman conquerors of southern Italy and to the genius of Pope Gregory VII (*q.v.*). The Duchy of Benevento was recognized as papal in 1052 and definitively acquired in 1077; and the countess Matilda (*q.v.*) of Tuscany bequeathed her great inheritance to the Holy See. Pope Innocent III (*q.v.*) took great advantage of the dispute between the Hohenstaufen and their rival Otto IV for the imperial crown to promote his claims, notably in the March of Ancona; and Otto in 1201 acknowledged the Church's right to the Duchy of Spoleto.

The rise of the communes (*see* COMMUNE [MEDIEVAL]) and the subsequent emergence of the *signorie* weakened papal authority, especially in the Romagna. The translation of the Papacy to Avignon (1309) left the dominion in Italy to chaos; and the brilliant work of reconquest and rehabilitation by Cardinal Albornoz (*q.v.*) in the 1350s and '60s was undone in the '70s by the War of the Eight Saints and by the beginning of the Great Schism.

At the end of the Great Schism in 1449 the Romagna, the Marches, and Umbria were still mostly in the lands of signorial houses exercising "vicariates" granted to them by the Holy See but in fact ruling as they saw fit. It was to subdue these places that Pope Alexander VI launched his son Cesare Borgia (*q.v.*) on his expeditions. Much of Borgia's conquests, however, fell away on Alexander's death (1503), and the restoration of the Papal State had to be undertaken again by Popes Julius II and Leo X (*q.v.*) in the period 1510-21: they also won Modena and Parma and Piacenza for the Church. Modena, however, was recovered in 1527 by the house of Este; and Parma and Piacenza were granted in 1545 to the house of Farnese, to which moreover the ancient papal territory of Castro had been given as a duchy in 1537. Efforts to recover Ferrara from the Estensi were finally successful in 1598, and Urbino returned to direct papal rule in 1626. The attempt of the Barberini pope, Urban VIII, to take Castro back by force (1641-44) was frustrated, but the duchy was reannexed to the papal state in 1649.

In the 18th century, though they were traversed by foreign armies in the course of dynastic wars, the Papal States enjoyed a period of prosperity under paternalistic government. The French Revolutionary Wars and the Napoleonic Wars (*qq.v.*) changed everything; Bologna, Ferrara, and the Romagna were ceded by the Treaty of Tolentino (1797), under which the French also occupied the Marche and Umbria; Rome was a republic from February to November 1799; and after an interval in which the lands south of the Romagna returned to papal rule the Marches were annexed to the Napoleonic Kingdom of Italy in 1808 and the remnant of the Papal State to the French Empire in 1809.

The Congress of Vienna in 1815 restored the Papal States; but the liberalizing influence of Cardinal Consalvi (*q.v.*), which had culminated in the statute of 1816, was largely counteracted in Pope Leo XII's pontificate. Administratively, the state was divided between (1) Rome and its Comarca or district, under a special regime; (2) the Legations or *Legazioni*, under a cardinal legate or a vice-legate; and (3) the Delegations, under prelates.

The Italian Risorgimento gradually destroyed the temporal power. Austrian intervention against a revolt in the northern Legations (1831-32) was followed by the French occupation of Ancona till 1838. The conduct of Pope Pius IX (*q.v.*) in 1848 led to the proclamation of the short-lived Roman Republic in 1849. Thenceforward the temporal power depended on Austrian or French protection. Through the defeat of Austria in 1859 and the Battle of Castelfidardo in 1860 (*see* ITALIAN INDEPENDENCE, WARS OF) the Romagna and the Marche, with Perugia, Spoleto, Orvieto, and Rieti, were annexed to the Kingdom of Sardinia-Piedmont, which in 1861 became the Kingdom of Italy. Garibaldi's attack on the remnant of the Papal State in 1867 was defeated at Mentana; but in 1870 the final annexation to Italy was achieved. The Lateran Treaty of 1929 recreated a temporal power in the Vatican City State.

PAPAVERINE, one of the alkaloids present in opium, is sometimes used as a vasodilator and antispasmodic in medicine because of its ability to relax smooth muscle (*see* MUSCLE AND MUSCULAR SYSTEM; *Smooth Muscle*). It was first obtained by J. H. Merck in 1848 and was first synthesized by R. P. Pietet and A. Gams in 1909. Papaverine, whose formula is $C_{20}H_{21}NO_4$ and whose chemical name is 6,7-dimethoxy-1-veratryloquinoline, crystallizes in colourless prisms or needles, melts at 147° C, and is optically inactive. It is insoluble in water but dissolves readily in chloroform or hot alcohol. The hydrochloride crystallizes in plates and melts at 231° C. On gentle oxidation papaverine is converted into papaveraldine, which is the alkaloid xanthaline found in opium. The papaverine structure is equally important as a starting point for syntheses in the berberine series. *See also* CHEMISTRY; *Proof of Structure*.

PAPAYA, the succulent fruit of a large plant (*Carica papaya*), barely a tree since its palmlike trunk, though up to 25 ft. tall, is not so woody as a typical tree. The papaya is cultivated throughout the tropical world and into the warmest parts of the subtropics. It is the only economically important member of the

family Caricaceae. Its origin is rather obscure; it may represent the fusion of two or more species of *Carica* native to Mexico and Central America.

The name papaw or pawpaw, often used in the West Indies, is likely to confuse this plant with *Asimina triloba*, the pawpaw (*q.v.*) of North America. Papaya is believed to be a corruption of the Carib word *ababai*. Several other common names are current in the Western Hemisphere: *mamáio* in Brazil, *fruta bomba* in Cuba, *lechosa* in Puerto Rico, and *melon zapote* in Mexico.



AUTHENTICATED NEWS
GROVE OF PAPAYA TREES

Papayas are usually grown from seed. Their development is rapid, fruit being produced before the end of the first year. Under favourable conditions the life of a plant may be five years or more. The plant bears no lateral branches but is crowned by deeply lobed leaves, sometimes two feet across, borne on hollow petioles two feet long. Normally the species is dioecious, male (staminate) and female (pistillate) flowers being produced on separate plants; but hermaphroditic forms are known, and all sorts of irregularities in the distribution of the sexes are common. Staminate flowers are borne in clusters on stalks three feet long; the flowers are funnel-shaped, about an inch long, whitish, the corolla five-lobed, with ten stamens in the throat. The pistillate flowers are considerably larger, on very short stalks, and are often solitary in the leaf axils; they have five fleshy petals united toward the base and a large cylindrical or globose superior ovary crowned by five fan-shaped sessile stigmas.

The fruit is commonly spherical to cylindrical in form, 3 to 20 in. or even more in length, sometimes weighing as much as 20 or 25 lb. In general character it strongly resembles a muskmelon. The very juicy flesh is deep yellow or orange to salmon-coloured, about an inch thick. Along the walls of the large central cavity are attached the numerous round, wrinkled, black seeds the size of peas. The fruit is slightly sweet, with an agreeable musky tang, more pronounced in some varieties, and in some climates, than in others. The papaya is a popular breakfast fruit in many tropical and subtropical countries, and is also used in salads, pies, sherbets, juices and confections. The unripe fruit can be cooked like squash.

The plant is killed by heavy frosts but has long been grown successfully in Hawaii, southern Florida, and to a limited extent in protected locations throughout southern California, though the fruit does not usually attain full flavour in the last region.

POMEGRANATE, the fruit of *Punica granatum*, a bush or small tree of Asia, which with a little-known species from the island of Socotra constitutes the family Punicaceae. Throughout the Orient this fruit has since earliest times occupied a position of importance alongside the grape and the fig.

King Solomon possessed an orchard of pomegranates; and when the children of Israel, wandering in the wilderness, sighed for the abandoned comforts of Egypt, the cooling pomegranates were



JOHN H. GERARD
(LEFT) WHOLE AND CUT FRUIT AND (RIGHT) LEAVES AND FLOWERS OF THE POMEGRANATE (*PUNICA GRANATUM*)

remembered longingly. Centuries later, the prophet Muhammad remarked sententiously: "Eat the pomegranate, for it purges the system of envy and hatred." It will thus be seen that this fruit is of exceptional interest because of its historic background.

While the pomegranate is considered to be indigenous in Iran and perhaps neighbouring countries, its cultivation long ago encircled the Mediterranean and extended through Arabia, Afghanistan, and India. The juicy subacid character of the ripe fruit makes it particularly agreeable to inhabitants of hot arid regions—precisely those areas in which the pomegranate attains its greatest perfection.

The ancient Semitic name *rimmon* was adopted by the Arabs as *rumman*, from which the Portuguese in turn formed *romão* or *roman*. From the early Roman names *malum punicum* (apple of Carthage) and *granatum* have come the modern botanical binomial and the common name *granada*, used in Spanish-speaking countries.

The plant, which may attain 15 or 20 ft. in height, has elliptic to lance-shaped, bright green leaves about 3 in. long, and handsome axillary orange-red flowers borne toward the ends of the branchlets. The calyx is tubular, persistent, 5- to 7-lobed; the petals lance shaped, inserted between the calyx lobes. The ovary is embedded in the calyx tube and contains several locules in two series, one above the other.

The fruit is the size of a large orange, obscurely six-sided, with a smooth leathery skin that ranges from brownish yellow to red; within, it is divided into several cells, containing many thin, transparent vesicles of reddish juicy pulp, each surrounding an angular elongated seed. The subtle flavour of the fruit is described by some Westerners as being delicately delicious, by others as insipid.

Presumably the plant was introduced into the New World by the early Spanish colonists. It is commonly cultivated in gardens from the warmer parts of the United States to Chile. Small commercial plantings have been made in California. Though the pomegranate will grow in a wide range of climates, good fruit is produced only where high temperatures and dry atmosphere accompany the ripening period. Deep, rather heavy loams appear to be the best soils. Seeds can readily be grown, but choice varieties are reproduced by cuttings and layerings. Commercial propagation is by hardwood cuttings 10 to 12 in. long, which can be rooted in the open ground.

The varieties of the pomegranate are numerous. Ibn al-Awam, a Moor who wrote in the 13th century, described about ten that were grown in southern Spain at that time. Varieties cultivated commercially in the United States include Wonderful, Sweet, and Acid. Several dwarf forms are grown for their handsome scarlet flowers. (W. Po.)

POMERANIA: see POMORZE.

POMO, a group of North American Indians who occupied California from the upper reaches of San Francisco Bay northward about 80 mi., and from the Pacific Ocean inland approximately 80 mi. The population is estimated to have been from 8,000 to 16,000 at the time of first European contact. By the 1960s about 900 Pomo were reported living in California. The many autonomous villages, each with its own territory and its own language distinct from the others, were interrelated by trade, warfare, a common religion, and a chiefly language of the Hokan (*q.v.*) family unintelligible to the general population.

Pomo women are reputed to have made the finest basketry in the world. The baskets had many purposes, including cooking and housing; the finest were used as higher denominations of money (see BASKET: *Primitive Basketry*). The Pomo practised professions that required a lifetime of training; some of these were fishing, deer hunting, gambling, doctoring (including a highly developed psychotherapy), and money manufacturing. There was a formal economic and monetary system. They were well fed on a wide variety of foods, most important being acorns and horse chestnuts (leached before eating), fish, and deer. The hunters commonly knew every deer in the territory and maintained a balance between the herds and the available vegetation to keep the animals from straying outside Pomo territory. Their religion included the idea of a separate creation of their territory, animals, vegetation, and the Pomo people, as well as accounts of destruction by their gods and reestablishment afterward. See also MAIDU.

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POMONA, Roman goddess of tree fruit—apples, cherries, etc. (*i.e.*, *poma*). She is obviously an old Italian goddess, for she had a special priest at Rome, the *flamen Pomonalis*. Although there is no festival in her honour in the calendar, there was a sacred area, the Pomonal, 12 mi. from Rome in the direction of Ostia. Ovid tells the story (*Metamorphoses* XIV, 623 ff.), perhaps of his own making, that she spurned all her woodland would-be suitors. The god Vertumnus, however, after wooing her in many disguises finally gained his suit. She is also said to have been associated with the agricultural deity Picus.

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POMONA OF MAINLAND (the latter is the more correct name), the central and largest island of the Orkneys, Scot. Pop. (1961) 13,495. Area, including smaller adjacent islands, 201.6 sq. mi. (522 sq. km.). It is irregularly shaped, and Kirkwall bay and Scapa Flow, cutting into the land on the north and south respectively, at one point reduce the width to less than 2 mi. The western coast is almost unbroken, but the eastern and southern shores are considerably indented. Ward hill (881 ft. [269 m.]) in the south is the highest peak in the island. There are numerous lakes, some of considerable size and most of them abounding in trout. Kirkwall (*q.v.*), the capital of the Orkneys, and Stromness (*q.v.*) are the only towns. Antiquities include Pictish *brochs*, chambered mounds, and weems, or underground dwellings afterward roofed in. North-east of Stromness, and within a mile of the standing stones of Stennes, lies the great barrow or chambered mound of Maeshowe. It is a blunted cone 300 ft. (91 m.) in circumference, and at a distance of 90 ft. (27 m.) from its base is encircled by a moat. The ground plan shows that it was entered from the west by a passage, leading to a central apartment, the walls of which ended in a beehive roof. The barrow is variously ascribed to the Stone Age and to 10th-century Norsemen. The stone circles forming the Ring of Brogar and the Ring of Stennes, traditionally pagan temples, lie 4½ mi. (7 km.) NE of Stromness. The former stands

ticipating in the anti-Russian insurrection of 1830. Settling in Galicia, he was active in political and economic life there; from 1861 to 1875 he was speaker of the Galician *Sejm*. His memoirs appeared in 1913. Leon's son ADAM (1828-1878), called "the Red Prince," was a parliamentarian and a journalist who wanted insurrection in Russian Poland and the restoration of an independent Poland with Austrian help. His youngest son, ADAM (1867-1951), from 1925 archbishop of Cracow, was created cardinal in 1946.

EUSTACHY (1881-1963), in the seventh generation from Kazimierz Jan, was Polish envoy to London (1919-20) and foreign minister (June 1920-May 1921), becoming later one of the leaders of the monarchist movement.

See A. Prochaska, *Archivum Domus Sapiehanae* (1892).

(E. M. R.)

SAPINDACEAE, the soapberry family, a large family of dicotyledonous plants, with about 150 genera and 2,000 species, chiefly tropical, consisting of trees, shrubs, and vines. The leaves are mostly alternate and compound, occasionally simple, while the flowers, mostly small, are irregular or unsymmetrical and the fruits various. Important fruit trees include the litchi (*q.v.*) of China; longan (*Euphoria longana*) of China and India; the rambutan (*Nephelium lappaceum*) and pulasan (*Nephelium mutabile*) of the Indo-Malayan region; the akee (*q.v.*) of Africa; and others. The seeds of *Schleichera oleosa* yield macassar oil, while the aril surrounding the seeds is edible. Other species yield important timbers, and the bark of still others is rich in saponin. The golden-rain tree (*q.v.*) is cultivated in Europe and North America as an ornamental.

SAPIR, EDWARD (1884-1939). U.S. linguist and anthropologist, who made important contributions in the field of American Indian languages, was born on Jan. 26, 1884, in Lauenburg, Pomerania. His parents took him to the United States in 1889 and he was educated at Columbia university (Ph.D., 1909). In 1910 he was named chief of the division of anthropology at the Canadian National museum; in 1925 he joined the staff of The University of Chicago; and in 1927 he moved to Yale university, New Haven, Conn., where he remained as professor of anthropology and general linguistics until his death on Feb. 4, 1939.

Sapir early became interested in linguistics and, chiefly through the influence of Franz Boas (*q.v.*), in American Indian languages, the study of which he continued widely and intensively most of his life. His profound grasp of problems in the Indo-European languages, his quick recognition of contrasts in structure and his ability to abstract the essential characteristics from masses of complex data enabled him to maintain a detached, synoptic view of language even while at work on minute linguistic problems in languages widely different from one another both genetically and structurally. His mind was vigorous, poetic and searching, his style crisp and lucid; by personal contact as well as through his published works he was often productive of work in others. Sapir was a scientist of extraordinary breadth who kept the study of linguistic phenomena in proper perspective as part of the study of man. His book *Language* (1921) is one of the most stimulating ever written on the subject.

A collection of Sapir's essays, edited by David G. Mandelbaum, appeared in 1949 under the title *Selected Writings in Language, Culture, and Personality*. See also LINGUISTICS: *History of Linguistic Studies: Descriptive and Structural Linguistics*.

(M. F.)

SAPODILLA, a tropical evergreen tree, *Achras zapota* (*zapota*), of the sapote family (Sapotaceae), and its delicious fruit. Sapodilla, the name used in southern Florida (the only part of the U.S. where this tree can be grown successfully), doubtless is an adaptation of the Spanish *zapotillo*, "small zapote." In Spanish-speaking countries the name *chicozapote* is commoner, and in certain English-speaking countries, notably India, naseberry (a corruption of *nispero*, Spanish for the medlar; *q.v.*) is used.

While the fruit is of no great commercial importance in any part of the world, it is much appreciated in many tropical and subtropical areas. It is spheroid to ovoid in shape, rusty brown on the surface and two to four inches in rough diameter. The flavour,

very sweet and difficult to describe, has been compared to a combination of pears and brown sugar. The seeds, two to five in number, shining black and the size of flattened beans, are surrounded (when the fruit is ripe) by translucent, yellowish-brown, juicy flesh. When immature, the flesh contains tannin and milky latex and is quite unpalatable. The milky latex, chief source of gum chicle (*q.v.*), once important in the chewing-gum industry, is extracted by tapping the trunk.

Sapodilla trees occur wild in the forests of southern Mexico and northern Central America. As a cultivated species the tree is medium-sized and of slow growth. The reddish wood is very hard and durable (elaborately carved lintels a thousand years old are still to be seen in some Mayan ruins). The leaves, two to five inches long, are glossy and light green in colour, ovate to elliptical in outline; the flowers are small and inconspicuous. Propagation is usually by means of seed, but superior trees can be reproduced by grafting.

Although sapodilla is probably the best of its family in economic importance, many other economically promising members—among them the star apple and the popular zapote, sapote or marmalade plum—are found in the Sapotaceae. (W. Po.)

SAPONINS AND SAPOGENINS. Saponins are water-soluble plant substances characterized by special properties, namely, the ability to lower the surface tension of water and hence to cause foaming, the ability to destroy red blood corpuscles (hemolysis) and the ability to kill fish, all at relatively low concentrations. They probably are present in all plants, having been identified in more than 75 families and more than 500 species. They may be distributed throughout the plant or occur in high concentration in one part of the plant; *e.g.*, the root or bulb, leaves, bark, flowers, fruit flesh or seeds. Their function in the plant is not known. Some appear to serve as a storage form of carbohydrates (sugars and starches) in the plant, whereas others seem to be waste products of plant metabolism.

Common names for plants containing high concentrations of saponins are soaproot, soapwort, soapbark, soap plant and amole. These names are indicative of their use as cleansing agents by peoples throughout the world since ancient times. They do not form a scum in hard water, and even in comparatively modern times were preferred to soap for laundering fine fabrics, such as silk shawls. They formerly were used as foaming agents in foam-type fire extinguishers and as wetting agents in agricultural sprays, but were displaced for these purposes by the less expensive synthetic detergents and wetting agents. Saponin solutions are used in photographic emulsions to permit even spreading on the base, and in multilayered coatings to permit spreading and adhesion of successive layers.

Aboriginal peoples throughout all parts of the world have used saponins for catching fish. A quantity of a plant having a high saponin content is crushed and stirred into a pool. After a short time the fish rise to the surface and are taken easily. It is estimated that from 500 to 400 species of plants have been used for this purpose. As early as the 13th century, in order to prevent extermination of fish, laws were passed forbidding the use of fish poisons. Saponins cause death in fish probably by disabling the breathing mechanism of the gills. Although saponins are hemolytic and toxic to warm-blooded animals when injected into the blood stream, they are not absorbed from the intestines. Hence fish killed by saponins can be eaten with safety. The nontoxicity to man on ingestion is evident when one considers that the foaming properties of certain beverages, such as root beer, result from the presence of saponins.

Chemically the saponins belong to a large class of substances known as glycosides (see GLYCOSIDES, NATURAL). When a water solution of a saponin is heated in the presence of a strong acid, the saponin molecule is split into fragments with the addition of the elements of one molecule of water at every point at which scission takes place (hydrolysis). The products are a molecule of sapogenin and several molecules of one or more kinds of sugar. For example, in the hydrolysis of digitonin, one of three different saponins isolated from foxglove leaves, each molecule combines with five molecules of water to yield one molecule of a sapogenin,

modern part is outside. The apse of the Romanesque cathedral forms part of the walls, giving it the appearance of a fortress. The city is a noted tourist centre. St. Teresa was a native of the town and a convent and church mark the site of her alleged birthplace. The fact of Avila's having been a *ciudad real* (Queen Isabella was born there) is reflected in the number of palaces and noble houses. Many of these buildings are in the plateresque (Renaissance) style, with magnificent doorways, as in the house of Gil González de Avila. Particularly noteworthy are the work of the goldsmith Juan de Arfe y Villafane (16th century), preserved in the cathedral, and the paintings of Pedro de Berruguete.

Ávila province extends to the Tiétar; it advances north for some distance across the plateau of Old Castile. On the level ground in the north, the centre of which is Arévalo, agriculture predominates, but the soils are poor, resting on outwash from the central Sierras. For the rest, Ávila is a province of sierras, mainly granite, rising steeply from the plateau to the Sierra de Gredos, and separated from each other by longitudinal valleys which are, in some cases, dried-up lake bottoms along lines of structural weakness. Of these the best known are the Barco de Ávila and the Valle de Amblés; the latter lies at the eastern end of an important structural line, giving a natural route from Plasencia to Ávila. The headwaters of the Alberche and Tiétar rivers, flowing to the Tagus, and of the Tormes and Adaja, flowing to the Duero, occupy these longitudinal valleys. The province is crossed by two main roads, from Madrid to La Coruña and from Villacastin to Vigo, and also by the railway lines from Madrid to Irún and from Ávila to Salamanca. The most important towns are Candeleda, Arenas de San Pedro and Arévalo. There is little industrial development and the economy is mainly agricultural. The raising of stock, especially of the Merino sheep (of which the purest breeds surviving in Spain are found in the central Sierras), is the principal occupation; the forests, mostly pine, are still important in places. The pastures and forests formed the basis of the life of the medieval communities, subdivided into *sexmos*, between which the area of the present province was divided. Wheat, with and without irrigation, is increasing its acreage. Rye, barley, oats, maize and tobacco are also grown. Modern methods are widely adopted; production of cereals exceeds consumption, and a surplus is exported to other parts of Spain. The vine flourishes only in such areas as the Tiétar and Alberche valleys, which produce wines of some repute; olive cultivation is confined to a few sheltered localities (Arenas de San Pedro, Cebreros) with very high yield. Estates are generally large; there is often a shortage of labour, and harvesters are brought in from Galicia. The sierras formerly abounded in game, but the diminution of the ibex of the Sierra de Gredos led to the creation in 1905 of an ibex sanctuary. There are also graphite quarries. (M. B. F.)

AVISON, CHARLES (1709–1770), English composer, organist and writer on musical aesthetics, was born at Newcastle upon Tyne, and baptized there in Feb. 1709. Little is known of his early life: he may have gone to Italy, and was perhaps a pupil of Francesco Geminiani, who was certainly a friend of his later.

He was appointed organist at St. John's, Newcastle, in July 1736 and at St. Nicholas' in October. He taught harpsichord, violin and flute, and conducted the newly founded subscription concerts. He composed and published many concertos for stringed instruments, sonatas for harpsichord and strings, etc. His *Essay on Musical Expression* (1752) excited comment and evoked a pamphlet, published anonymously, from William Hayes, professor of music at Oxford (1753), to which Avison replied with an enlarged edition of the *Essay*. A third edition appeared in 1770. Avison lived all his life at Newcastle, refusing appointments at York, Dublin, Edinburgh and London. He was visited by Geminiiani in 1760; among his many friends was the composer John Garth of Durham, whom he assisted in editing Marcello's *Psalms*. He died at Newcastle, May 10, 1770.

As a composer, Avison was a representative of the last phase of the late baroque "ancient" style. It is difficult to enumerate his many concertos, for, like Geminiiani, he was continually revising his earlier works. Although his music lacks the vigour of

Handel or Vivaldi, it has its own wistful beauty. His trenchancy as a critic is shown in the famous *Essay* and in his explanatory or didactic prefaces to his own and his friends' works, which also throw considerable light on 18th-century methods of performance.

See M. Kingdon-Ward, "Charles Avison," in *The Musical Times* (Sept. 1951); A. Milner, "Charles Avison," in *The Musical Times* (Jan.–Feb. 1954).

AVITUS (EPARCHIUS AVITUS) (d. A.D. 456), Western Roman emperor from 455 to 456, was born of a distinguished Gallic family and was father-in-law of Sidonius Apollinaris (*q.v.*). He acquired much influence with the Visigoths settled at Toulouse, and in 451 persuaded their king, Theodoric I, to join the Roman general Aetius in repelling Attila and the Huns from Gaul. He was appointed *magister utriusque militiae* ("master of both services") by the emperor Petronius Maximus, and when Maximus fell, the Goths proclaimed him emperor at Toulouse. At Arles, accompanied by a Gothic force, he was recognized as emperor by the Gallo-Romans. He then proceeded to Rome and entered upon his consulship on Jan. 1, 456, when Sidonius recited a panegyric on him. On Oct. 17, 456, he was forced by Ricimer (*q.v.*) to abdicate and to become bishop of Placentia. He died soon after.

(E. A. T.)

AVOCADO, the fruit of *Persea americana* of the family Lauraceae, a tree native to the mainland of the western hemisphere from Mexico south to the Andean regions of Colombia and perhaps Venezuela. The common name is a sound substitute for the Aztec *ahuacatl*, originating probably in Jamaica, where also the name alligator pear arose as a sound substitute, plus reference to the pearlike shape and appearance of many varieties.

The avocado first became known to Europeans through a description published in 1519 by Martín Fernández de Enciso in his *Suma de Geografía*. Enciso had seen the fruit near Santa Marta, Colom., as he coasted along those shores with one of the first Spanish expeditions to the mainland. In 1526 Gonzalo Fernández de Oviedo described it in greater detail. Garcilaso de la Vega tells how it was carried from Ecuador to the warm valleys near Cusco by the Inca Tupac Yupanqui, shortly before the Spanish conquest. The common name in Peru and southward is *palta*. In most Spanish-speaking countries, *aguacate*, an adaptation of *ahuacatl*, is used; in Brazil this becomes *abacate*.

The tree may be tall or spreading, with entire leaves commonly elliptic to obovate in form and 4 to 12 in. in length. The flowers, which are borne in dense racemes, are small, greenish, devoid of petals, with six perianth-lobes, nine stamens arranged in three series, and a one-celled ovary. The fruit is exceedingly variable in shape, size and colour; some of the Mexican varieties are no larger than hens' eggs, while those of other races may attain three or four pounds in weight. The form varies from round to pear-shaped with a long slender neck, the colour from green to dark purple. The single large seed, with two cotyledons, is round to conical. Between it and the outer skin, which is sometimes no thicker than that of an apple, sometimes coarse and woody in texture, is the greenish or yellowish flesh, of buttery consistency and rich nutty flavour, containing in some varieties as much as 25% of oil, and eaten most commonly in salads, whence the name "salad fruit" which has been used to emphasize the peculiar characteristics of the avocado.

Though it was widely cultivated in tropical America before the Spanish conquest—in the form of individual seedling trees in dooryards—the avocado did not begin to receive serious horticultural attention until about 1900. At that time George B. Celson



BY COURTESY OF U.S. DEPARTMENT OF AGRICULTURE

AVOCADO (*PERSEA AMERICANA*): (LEFT) WHOLE FRUIT; (RIGHT) CROSS SECTION OF FRUIT SHOWING SEED

an estimated 45,000 have left their homes and settled as farm labourers, farmers and traders in areas toward the coast, and among the Bamum, Nyokan and Banen to the east and southeast.

See R. LeCoq, *Les Bamileke* (1953); F. C. Egerton, *African Majesty* (1939). (Wt. B.)

BAMPTON, JOHN (1690?–1751), English divine who gave his name to one of Protestant Christendom's most distinguished lectureships, was educated at Trinity college, Oxford, M.A. in 1712 and became canon of Salisbury. He died on June 2, 1751. His will directs that eight lectures shall be delivered annually at Oxford in the university church on Sunday mornings in full term, "between the commencement of the last month in Lent term and the end of the third week in Act term." Since 1895 the Bampton lectures have been given every second year. Their importance may be gauged by the amount of controversy that has arisen over the Bampton lectures of various theologians—e.g., Charles Gore's (*q.v.*) of 1891 on the incarnation, William R. Inge's of 1899 on mysticism, Hastings Rashdall's of 1919 on the atonement and R. H. Lightfoot's of 1934 on *History and Interpretation in the Gospels*. The "Sarum lectures" have been established to enable other than Anglican theologians to lecture; these are also supported by the Bampton fund. (J. J. Pn.)

BAMUM (known also as MUM or MOM), a west African people numbering 75,000 who claim a common origin with the Tikar. Their kingdom, with its capital at Fouban in Cameroun, lies between the Bamileke on the south, the Tikar on the east and the many Tikar peoples of the Bamenda province on the west. It is ruled by the king (*Mfon*), whose position is hereditary within one of the exogamous patrilineal lineages, with the help of his queen mother (*Na*).

The first *Mfon*, Nchare, and his followers are believed to have come from Tikar territory over 250 years ago. Settling among the Bamileke and other Tikar, Nchare proclaimed himself king and established his palace at Fouban. The 11th *Mfon*, Mbuembue, was the first to enlarge the kingdom and, following an attack by the Fulani at the beginning of the 19th century, he fortified Fouban with a surrounding wall and ditch. The 17th *Mfon*, Njoya (1895–1923), became the most celebrated.

Familiar with writing in Arabic script from contact with Fulani and Hausa, Njoya invented a system of writing with 510 pictographic characters about 1895. This he revised six times, the seventh system being a syllabary of 73 characters plus 10 numerals. With the help of his scribes Njoya prepared a book on the history and customs of the Bamum which has been published in a French translation, a map of his country, a religious book and a book on medicine and local pharmacopoeia. In 1912 he established the first of 47 schools to teach reading and writing in his sixth script and in 1913 he commissioned a member of his court to prepare a printing press for it. In 1920, annoyed by his troubles with the French administration, which deposed him in 1923, Njoya destroyed the type, which had been cast by the lost-wax method, and closed his schools. Njoya was converted to Islam in 1918, and it is estimated that more than half of the Bamum are Muslims.

Njoya built a beautiful new palace, established what was really a museum, and was a patron of beadworkers, brass casters, weavers, dyers and other craftsmen. His palace contained 300 looms and six dye pits with different colours, some of which Njoya himself discovered. The arts for which the Tikar in general are noted flourished under his royal patronage.

Men do embroidery, weaving, leatherwork, wood carving, ivory carving, metalwork and blacksmithing, and women make pottery. Both men and women work the land. The Bamum are sedentary farmers who do some fishing but little hunting. Their principal crops are maize, millet, cassava and sweet potatoes.

They believe in a supreme god (*Njinyi*, *Nnuoi* or *Yoribang*) who creates children, and they practise ancestor worship. Bamum diviners interpret the manipulation of marked leaves by the earth spider (*ngame*).

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BAN, a title formerly used in Hungary to denote the governors of military districts known as banats and later used to designate the local representative of the Hungarian king in outlying possessions; e.g., Bosnia (see BOSNIA-HERZEGOVINA) and Croatia (*q.v.*). (See also BANAT for the province specifically so named.) Ban is a Persian word meaning "lord" or "master" and was first introduced into Europe by the Avars (*q.v.*). The office and title were revived in the kingdom of Yugoslavia in Oct. 1929 when the country was divided in *banovine*, or provinces, but the German-Italian invasion of April 1941 did away with them.

BANANA. One of the world's most important fruits, the banana is consumed extensively throughout the tropics, where it is grown, and in the temperate zone, where it is popular because of its flavour, its food value and its availability at all times of the year.

Botany.—The plant is a gigantic herb, springing from an underground stem, or rhizome, to form a false trunk 10 to 20 ft. high, composed of the leaf sheaths and crowned with a rosette of 10 to 20 oblong to elliptic leaves which sometimes attain a length of 10 to 12 ft. and a breadth of 2 ft. The large flower spike, carrying numerous yellowish flowers in half-whorllike clusters, emerges at the top of the false trunk and bends downward to become the bunch of 50 to 150 individual fruits, or fingers, which are grouped in clusters, or hands, of 10 to 20. Once the plants have fruited they die, and are replaced by others (suckers) which arise from the underground stem. The life of one stool or clump thus continues for many years.

Bananas belong to the genus *Musa*, of the family Musaceae (*q.v.*), but the botany of the cultivated forms is confused. Tall-growing varieties of which the fruit is eaten uncooked are commonly listed as forms of *M. sapientum*; the dwarf or Cavendish variety as *M. cavendishii*; and the plantains or forms eaten only when cooked as *M. paradisiaca*. However *M. paradisiaca* is viewed by some botanists as a subspecies of *M. sapientum*, while others hold the opposite to be the case. There has further been a tendency on the part of modern investigators to consider that many commercial bananas, including the all-important Gros Michel, are not derived from either of these, but wholly or in part from the species *M. acuminata*.

There are 100 or more varieties of the banana in cultivation; confusion exists because of diverse names applied to one and the same variety in different parts of the world. As regards the origin and early history of this fruit, Alphonse de Candolle wrote (*Origin of Cultivated Plants* [1883]):

The antiquity and wild character of the banana in Asia are incontestable facts. There are several Sanskrit names. The Greeks, Latins, and Arabs have mentioned it as a remarkable fruit tree. Pliny speaks of it distinctly. He says the Greeks of the expedition of Alexander Malabar. Sages reposed beneath its shade and ate of its fruit. Hence the botanical name *Musa sapientum*. *Musa* is from the Arabic *mus* or *maros*, which we find as early as the 13th century in Eba Baithar.

There is an immense number of varieties of the banana in the south of Asia, both on the islands and on the continent; the cultivation of these varieties dates in India, in China, and in the Archipelago from an epoch impossible to realize; it even spread formerly into the Islands of the Pacific and to the west coast of Africa; lastly, the varieties bore distinct names in the most separate Asiatic languages, such as Chinese, Sanskrit, and Malay. All this indicates great antiquity of culture, consequently a primitive existence in Asia, and a diffusion contemporary with or even anterior to that of the human race.

Cultivation.—Shortly after the discovery of America, the banana (an African name) was brought from the Canary Islands to the new world, where it was first established in Hispaniola, soon spreading to other islands and the mainland. Its cultiva-



BY COURTESY OF UNITED FRUIT CO.
BANANAS (VARIETY GROS MICHEL)
READY FOR HARVEST

tion increased until it became one of the staple foodstuffs in many regions; then in the 19th century it began to appear in the markets of the United States. Between 1870 and 1880 the present-day banana industry began to develop, mainly through the efforts of two men, Capt. Lorenzo D. Baker and Minor C. Keith.

Bananas thrive naturally on deep, loose, well-drained soils in humid tropical climates, but are grown successfully under irrigation in semiarid regions such as the south side of Jamaica. For the export trade they cannot profitably be cultivated where temperatures often fall below 50° F.; such temperatures result in "chilling" of the fruit, preventing its proper ripening; but for home use they are grown successfully in cooler regions, including the southernmost part of Florida. Suckers and divisions of the pseudobulb are used as planting material; the first crop ripens within 10 to 15 months, and thereafter production is more or less continuous. Frequent pruning is required to remove surplus growth and prevent crowding in the clump, or mat. Mechanical tillage is customary in semiarid regions, but in many countries this is not practised; weedy growth is controlled instead by the shade of the banana plants and through occasional cleaning with the machete. Nitrogenous fertilizers are often used to increase quantity and quality of production.

A good commercial bunch of bananas consists of nine hands or more and weighs from 50 to 125 lb. Three hundred or more such bunches may be produced annually on an acre of land, if the soil is good and cultural attention adequate. When ripe, the fruit contains as much as 22% of carbohydrate, mainly sugar; it is high in ash and a good source of several vitamins. Thus it is an unusually valuable source of human food.

Cooking varieties (plantains), which differ from other bananas in that the ripe fruit is starchy rather than sweet, are extensively cultivated and used in tropical regions, but rarely appear in the markets of the temperate zone.

Interesting features of the banana industry are the sudden and great changes that take place in production as the result of the opening up of new regions, the havoc wrought by floods and windstorms (to which the plant is peculiarly susceptible) and the ravages of Panama disease and of a few other pests.

The industry in the Caribbean is based largely on Gros Michel, which in terms of quantity and cash value of the crop is one of the world's most important fruit varieties. Its origin is almost certainly Asian; it is said to have been brought to the attention of horticulturists in tropical America by Jean Pouyat of Martinique. Jamaica was the first country to undertake its cultivation on an extensive scale; Costa Rica and Panamá were not far behind. In the Canary Islands, on the west coast of Africa and in Brazil the dwarf or Cavendish variety has been of greater commercial importance.

Beginning about 1925, great changes began to take place in banana agriculture, or horticulture as it should more properly be called, through the application of modern cultural practices in the Caribbean area. Careful examination of lands to eliminate unsuitable soils before planting, efficient drainage practices, the selection of proper planting material, overhead irrigation and, especially, the use of fungicides to control the Sigatoka disease (*Cercospora musae*) and other developments put the industry on an intensive basis.

The so-called Panama disease, caused by a fungus of the genus *Fusarium* (which lives in the soil), made necessary the abandonment of large areas from time to time, so far as the cultivation of the Gros Michel banana is concerned. This disease, however, does not affect the value of the land for the production of other crops.

Production.—After mid-20th century annual world exports of bananas were usually in excess of 3,000,000 tons. In 1958, for example, about 3,900,000 tons were exported. While the United States generally imports more bananas than any other country, large quantities also go to Great Britain and continental Europe, especially from the West Indies and the west coast of Africa.

Even for local consumption bananas are not left on the plant until fully ripe. For exportation, the degree of maturity they are allowed to attain before harvesting depends upon distance from

market and type of transportation.

Specially designed refrigerated ships operate between numerous tropical countries and centres of consumption in North America and Europe.

Chief sources of production in Middle America include Costa Rica, Honduras, Guatemala, Mexico, Panamá and the Canal Zone, Dominican Republic, Guadeloupe, Jamaica and Martinique; in South America, Brazil, Colombia and Ecuador; in Africa, Canary Islands, Eritrea, the Cameroons region, Guinea and Nigeria and in Asia, Formosa.

(W. Po.)

BANAS, the name of four rivers in India: (1) a river of Rajasthan which rises in the Aravalli range about 25 mi. N.W. of Udaipur and after a 330-mi. eastward course flows into the Chambal and so into the Jumna and eventually the Ganges; (2) another river, sometimes called the West Banas, rising in the Aravallis about 35 mi. W.N.W. of Udaipur on the opposite side of the watershed to (1) and flowing southwest across northern Bombay for 170 mi. to the Little Runn of Cutch; (3) a small river in Shahabad district, Bihar, forming the drainage channel between the Arrah canal and the Son canals system and finally falling into the Gangetic; (4) a small river in Baghelkhand rising in northwestern Surguja district, Madhya Pradesh, and flowing northward to the Son, 15 mi. S.E. of Rewa city.

(L. D. S.)

BANASKANTHA, the northernmost district of Gujarat state, India, is named after the Banas river which crosses it. Following Indian independence the district was formed from petty Muslim and Rajput principalities and *jagirs* ("feudal estates"). After boundary adjustments its area is 4,039 sq.mi.; pop. (1961) 995,980. Extending from the Runn of Cutch eastward to the Aravalli range, it is a sandy plain on the south of the Thar desert. One-sixth is barren, but parts are afforested and there are good pastures; millets and wheat are staple crops; maize, potatoes, timber, wool and handwoven cloth are produced for export from the district. There are also quarries for building stone. Communications are in general restricted to unimproved roads; but the district headquarters, Palanpur, the market town of Deesa (pop., 1951, 10,646) and a few other townships are on the Western railway. Palanpur (pop. 22,629) is 80 mi. N.N.W. of Ahmedabad. It is an ancient settlement, mentioned by Gujarat chroniclers as the home of Vanaraja, founder (A.D. 746) of the Chavada dynasty.

(V. A. M. J.)

BANAT, a region of Europe lying across the modern frontiers of Hungary, Rumania and Yugoslavia, being bounded by Transylvania and Walachia in the east, by the Tisa river in the west, by the Mures river in the north and by the Danube in the south. The name means frontier province or province governed by a ban (*q.v.*).

Largely an area of rolling plains, Banat is mountainous in the east with summits reaching from 4,000 to 7,500 ft. Its main rivers are the Timiş (Tamis), the Bega (Begej), the Caraş (Karas) and the Nera. Cattle, horses, sheep and pigs are reared. The main crops are wheat, maize, sugar beet and tobacco. There are also flourishing vineyards and some mineral deposits (coal at Anina, iron ore, zinc and petroleum at Kikinda). The main railway line Belgrade-Timisöara-Bucharest crosses the province.

Banat has been inhabited since prehistoric times and there are Paleolithic remains near Vrsac. The most important discoveries of the Neolithic period are at Starcevo, Srpski Krstur, Novi Knezevac and Crna Bara. Cemeteries with urns have been discovered at Vrsac and Ilandza. There are findings of the Bronze Age at Vatin and Dubovac (Dubova). Under the Romans Banat was either in Moesia Superior or in Dacia. Later the Goths invaded the province and after them there came the Gepidae, the Huns and the Avars. The Slavs began to establish themselves there in the 5th century.

Banat was occupied by the Magyars at the end of the 9th century. In 1233 the Hungarian king Andrew II created the Banat of Severin (Terra de Zevrino) and entrusted its defense to the knights of the Order of St. John of Jerusalem. After the battle of Kosovo (1389) and especially after the occupation of Serbia by the Turks (1459) a large number of Serbs immigrated into Banat. At the beginning of the 16th century four Serb bishoprics were

and titles, whereupon Campbell obtained a new patent (Aug. 13, 1681) as earl of Breadalbane and Holland, viscount of Tay and Paintland, Lord Glenorchy, Benederaloch, Ormelie and Weick, with special power to nominate his successor from among the sons of his first wife.

Breadalbane, who had sat in the Scottish parliament under Charles II and had supported the administration of the duke of Lauderdale by sending 1,700 Highlanders to overawe the disaffected southwest in 1678, became a member of the Scottish privy council in 1685. He was described as having "neither honour nor religion but where they are mixed with interest" and as of "the gravity of a Spaniard, cunning as a fox, wise as a serpent but as slippery as an eel." To gain the support in the Highlands of a man of such qualities, possessed of wide estates and related by marriage to several leading families, was of high moment to William III. Breadalbane did not commit himself to Lord Dundee, or join his rising, and after the battle of Killiecrankie (July 1689) he was entrusted by the government to offer a large sum of money to secure the submission of the clans. On June 30, 1691, he met the Jacobite chiefs and prevailed on them to agree to an armistice until October; not, however (so it was alleged), by expending the money but by holding out the hope that he might later join them. When asked to render an account, he is said to have replied, "The money is spent, the Highlands are quiet, and this is the only way of accounting between friends." On Aug. 27, 1691, indemnity was offered to all taking the oath of allegiance before Jan. 1, 1692, while all refusing were threatened with the penalties of treason. MacIan, the chief of the MacDonalds of Glencoe, postponed his submission till Dec. 31 and was prevented from taking the oath till Jan. 6, 1692, through the absence of a magistrate at Fort William. Subsequently, in the "massacre of Glencoe" (Feb. 13, 1692), a number of the MacDonalds were butchered in cold blood by troops to whom they had given hospitality. Opinion was strong against Breadalbane, who may well have welcomed the opportunity of destroying a clan which had for generations lived by plundering his lands and those of his neighbours, but although he was aware that violent action was planned it is less likely that he was personally involved in organizing the massacre. No real evidence against him was disclosed, and his imprisonment (Sept. 1695) was on the ground of his earlier dealings with the Jacobite chiefs. He was released when William III announced that he had acted with royal approval.

Breadalbane did not vote for the union of England and Scotland in 1707, but was a representative peer in the parliament of Great Britain (1713-15). He maintained his contacts with the Jacobites, whom he encouraged in 1708, without, however, committing himself on paper. At the time of the Jacobite rising in 1715 he excused himself (Sept. 19) from obeying a summons to Edinburgh on the ground of his age and infirmities; but the next day he visited the earl of Mar's camp at Logierait and afterward the camp at Perth, his real business being, according to the master of Sinclair, "to trick others, not to be trickt;" and to obtain a share of French subsidies. He is said to have promised and taken money for 1,200 men in the Jacobite cause, but he sent only 300 or 400, who acquitted themselves well at Sheriffmuir (1715) but were withdrawn after that battle. Breadalbane's son was imprisoned, but he himself escaped any punishment for his part in the rising because of his age. He died on March 19, 1717.

See William A. Gillies, *In Famed Breadalbane* (1938). (Gn. D.)

BREADALBANE, a district of Perthshire, Scot., bordered on the north by Loch Rannoch, east by Strathay, south by Strathearn and west by the districts of Argyll and Lorne, and occupying about 1,020 sq. mi. The Grampians (*q.v.*) are the chief mountain range; Ben Lawers (3,984 ft.), Ben More (3,843 ft.) and Ben Lui (3,708 ft.) the principal peaks. Loch Tay is the chief lake, and the rivers are the Orchy, Dochart, Lochay, Lyon, Almond and upper Tay. The population of Breadalbane centres in Aberfeldy, Fortingall, Kenmore and Killin (*q.v.*). It is a land of deer forests, shooting and fishing; only a little soil in glens and straths (broad river valleys) is cultivable. The famous Breadalbane vine is at Kinnell house, Killin.

* **BREADFRUIT**. The staple food of the South Pacific, culti-

vated less commonly in other parts of the tropics, is the fruit of *Artocarpus altilis*, a tree of the family Moraceae (*q.v.*).

The tree is extremely handsome. It reaches a height of 40 to 60 ft., and has large, oval, glossy green leaves entire toward the base and three- to nine-lobed toward the apex. Male and female flowers are borne in separate inflorescences on the same tree; the staminate or male ones appear in dense, club-shaped catkins; the female or pistillate, which are very numerous, are grouped together and form a large prickly head upon a spongy receptacle. The ripe fruit, which is composed of the matured ovaries of these pistillate flowers, is roundish, commonly four to eight inches in diameter, greenish to brownish-green externally, with white and somewhat fibrous pulp.

There are two distinct forms of breadfruit, one seedless, the other (sometimes known as breadnut) containing many seeds resembling chestnuts.

The seedless form is the most valuable and the one usually grown. It has been cultivated in the Malay archipelago (where the species is held to be indigenous) since remote antiquity. From this region it spread throughout the tropical South Pacific region in prehistoric times. Its introduction into the new world is connected with the memorable voyage of Capt. William Bligh in H.M.S. "Bounty," a voyage recommended by Capt. James Cook, who had seen the breadfruit in the Pacific islands and considered that it would prove highly useful as a foodstuff for Negro slaves in the West Indies.

After the failure of this voyage, a second was carried out which resulted in the successful establishment of the tree in Jamaica, where, however, it failed to live up to expectations, because the Negroes preferred bananas and plantains.

The breadfruit is not a fruit in the popular sense of the term, but a product containing considerable amounts of starch, not to be eaten uncooked. Regarding methods of preparing it for the table, W. E. Safford writes (*Useful Plants of Guam*):

It is eaten before it becomes ripe, while the pulp is still mealy, and of a consistency between bread and sweet potatoes. In Guam it was formerly cooked after the manner of most Pacific island aborigines, by means of heated stones in a hole in the earth—layers of stones, breadfruit and green leaves alternating. It is still sometimes cooked in this manner on ranches but the usual way of cooking it is to boil it or bake it in ovens; or it is cut in slices and fried like potatoes. The last method is the one usually preferred by foreigners. The fruit boiled or baked is rather tasteless by itself, but with salt and butter or gravy it is a palatable as well as nutritious article of diet.

In the West Indies and on the American mainland from Mexico to Brazil the breadfruit tree is grown in dooryards and the fruit appears upon the market. Propagation of the seedless forms is by means of root suckers or root cuttings.

Numerous varieties are cultivated in the Pacific islands, but these are not known in tropical America. The tree withstands no frost and has not been successful even in the southernmost parts of Florida.

In the South seas, cloth is made from its fibrous inner bark; the wood is used for canoes and furniture; and a glue and calking material are obtained from the viscid milky juice which exudes from incisions in the trunk.

See W. Popenoe, *Manual of Tropical and Subtropical Fruits* (1920); J. H. Julien, "Breadfruit Propagation," *Rev. Agr. Maurice* 24:31 (1945). (W. Po.)

BREADNER, LLOYD SAMUEL (1894-1952), Canadian air force officer and, during World War II, air officer commanding the Royal Canadian Air Force (R.C.A.F.) overseas, was born on



BY COURTESY OF CHICAGO NATURAL HISTORY MUSEUM

BREADFRUIT (*ARTOCARPUS ALTILIS*)

installations and the arsenal before evacuating the town, which was taken by the U.S. 7th corps in June 1944. By October the port was handling 200 tons of war material daily. The maritime station was reopened in 1952.

(R. A. H.; An. J. R.)
CHEREMIS, the name applied in the west, as it was in pre-Soviet Russia, to a people, now totaling about 500,000, who speak a language of the Finno-Ugric family. The people, however, refer to themselves as Mari, a term which has been adopted by the Soviet Russians and incorporated in the name of the Mari Autonomous Soviet Socialist Republic. Created on Dec. 5, 1936, this republic, with a Cheremis population in excess of 51%, is located in the upper Volga basin; there are also some Cheremis in adjacent regions, as well as nearly 100,000 in the Bashkir A.S.S.R.

The Cheremis language contains more than 1,000 Turkic loan-words, borrowed from two languages: Volga-Bulgar and Tatar. About half of them—the earlier layer—come from the language of the forefathers of the present-day Chuvash. The Cheremis and Chuvash have lived in a quasi-symbiotic relationship from about A.D. 700 to this day, although the period of most intense influence ended in 1236, when Tatar contacts became pressing. Tatar loans date from 1236 to 1552; then Kazan fell and the area came increasingly under the influence of Moscow. The process of Cheremis assimilation to Russian civilization accelerated during the 17th century, and the ever mounting symptoms of social and economic change may be traced in many forms, including strong nativistic movements.

The local group among the contemporary Cheremis is the cooperative village or *kolkhoz*; the principal source of subsistence is agriculture combined with animal husbandry. Yoshkar-Ola, the Mari capital, boasts of training schools in subjects such as animal husbandry, forestry, optics and papermaking, as well as factories and department stores.

See Thomas A. Sebeok, *The Cheremis* (1955); Thomas A. Sebeok and Frances J. Ingemann, *Studies in Cheremis: the Supernatural* (1956).

CHEREMKHOVO, a town of Irkutsk *oblast* of the Russian Soviet Federated Socialist Republic, U.S.S.R., stands on the Trans-Siberian railway, about 80 mi. N.W. of Irkutsk. Pop. (1959) 123,000. A branch line links Cheremkhovo to Svirk on the Angara river. The town is also on the Irkutsk-Krasnoyarsk motor road. Founded in 1772 as a station on the Siberian Post road, the town has developed as the chief mining centre of the Cheremkhovo coal field, which is the largest in eastern Siberia, and extends for about 150 mi. along the Trans-Siberian railway. There are also heavy engineering and timberworking industries. (R. A. F.)

CHEREP OVETS, a town of Vologda *oblast* in the Russian Soviet Federated Socialist Republic, U.S.S.R., stands on the right bank of the Sheksna river (70 mi. W. of Vologda), where it flows into the vast Rybinsk reservoir of the Volga. Pop. (1959) 92,000. The Sheksna is linked by the Mariinsk waterway system to Lake Onega and thus to the Baltic-White sea waterway, while Cherepovets lies also on the Leningrad-Vologda railway. These excellent communications led to the establishment there in 1955 of a large integrated iron and steel works, using iron ore from the Kola peninsula and coal from Vorkuta. The slag from the works is used to make thermo-insulating sheeting. Shipbuilding and repair and timberworking, especially the production of veneer, are also carried on. (R. A. F.)

CHERIBON (TJIREBON) is a city and residency of northeast West Java province on the Java sea, Indon. Pop. (1957 est.) 2,917,009. Although some Javanese live in the north, Cheribon is Sundanese country, its eastern boundary dividing the Sundaes from the Javanese territory of central Java. It has been for centuries the centre of Islam in west Java, for it is there that the Muslim power was strongly established as early as 1526, under Gunung Djati, and much of the opposition to Dutch rule at a later date came from this district. The northern half of the residency is flat and marshy in places, while the southern half is mountainous. Southwest of the city stands the huge volcano Tjaremai, clad with virgin forest and plantations, and surrounded at its foot by rice fields.

Sulfur and salt springs occur on the slopes of Tjaremai and

near Palimanan, where a cavernous hole exhales carbonic acid gas.

The principal products of cultivation are tea, rice, tobacco, essential oils, sugar, cinchona, cassava, peanuts and pulses. Cheribon city and seaport has a good open roadstead and quay and warehouse accommodation for lighters. It was formerly the residence of the powerful sultans of Cheribon. Indramaju is another principal town, and Kuningan, famous for a breed of horses, is a hill resort (2,200 ft.). The residency was occupied by the Japanese from 1942 to 1945.

On Nov. 15, 1946, the Dutch-Indonesian pact (the Cheribon, or Linggadjati, agreement) recognizing the Republic of Indonesia was drafted at Linggadjati, a resort village 13 mi. S. of Cheribon port. See JAVA: History.

CHERIMOYA (CHERIMOYER or CHIRIMOYA), the fruit of *Annona cherimola*, a medium-sized tree of the family Annonaceae, originally from the Andes of southern Ecuador and northern Peru, now cultivated commercially, on a small scale, in California, Mexico, Chile, Argentina, southern Spain, Queensland and several other regions. Throughout the highlands of tropical America it is a favourite dooryard tree and the fruit is often seen in local markets.

Its abundance of large, ovate, rich green leaves makes the tree a handsome one, while the fruit, which matures from September to January in the northern hemisphere, was termed by Mark Twain "deliciousness itself." It is oval to round in form, sometimes weighing 2 to 3 lb. though usually less, pale-green in colour with a thin skin enclosing creamy white flesh in which numerous seeds the size of beans are embedded. The texture of the flesh is like that of firm ice cream, the flavour delicately subacid. It has been compared to a combination of pineapple and banana.

Though geographically tropical in origin, the cherimoya does not attain perfection in the tropical lowlands. Its culture is limited to elevations of 3,000 to 7,500 ft. in the tropics, and to mild-wintered subtropical regions. Its climatic requirements are, in fact, quite specialized; it will grow satisfactorily in many regions, but in some of these, little fruit will be produced and may be of unsatisfactory quality. Successful efforts to increase production have been made in California and elsewhere by hand pollinating the flowers.

Propagation is commonly by means of seeds, but the cherimoya lends itself readily to grafting, and superior varieties are perpetuated in this way. The method commonly used is the one employed with citrus fruits, i.e., shield budding. Trees are planted in orchard form, spaced about 25 ft. apart; they are given much the same cultural attention as oranges. They come into commercial production at three to five years of age.

To this same family, Annonaceae, belong several other tropical American fruit trees. The best of these is probably the guanábana or soursop (*Annona muricata*); its large fruits are used to make ice creams and refreshing drinks, popular in Cuba. Another species, *A. squamosa*, usually known in English as sugar apple, is commonly grown in drier parts of the American tropics as well as in India and elsewhere. A hybrid between this and the cherimoya is cultivated commercially on a small scale in Israel. Another species, *A. reticulata*, known as custard apple, produces a fruit of mediocre quality; this tends to confuse it with the cherimoya to which the same name is sometimes applied in English-speaking regions. Annonas in general require care in handling and transportation. Harvested at an appropriate stage of maturity and carefully packed, however, they will remain in good condition for a week or so without refrigeration. (W. Po.)

CHERKASSY, an *oblast* (administrative division) and a town and administrative centre in the Ukrainian Soviet Socialist Republic of the U.S.S.R. Pop. of *oblast* (1959) 1,470,214. Area 7,992 sq.mi. By far the greater part of the *oblast*, which was formed in 1954, lies in the Dnieper right bank area. A small part, of low-lying flood plain, lies on the left (eastern) bank around Zolotonosha. The right bank consists of rolling hills of the Dnieper uplands, much cut up by the valleys of small streams flowing to the Dnieper and by the headwaters of the Sinyukha, flowing south to the Southern Bug river. The area is covered by

tary fund authorized credit up to \$15,000,000 to support the quetzal when it was threatened further by declining coffee prices. The quetzal, the monetary unit of Guatemala, is officially at par with the U.S. dollar.

Communications.—Guatemala has 720 mi. (1,159 km.) of railway, mostly operated by International Railways of Central America, a majority share of which is owned by the Transportation Corporation of America. The main line extends from Puerto Barrios, on the Caribbean, through Guatemala City to Ayutla, a point for connection with the National Railways of Mexico. Branch lines run to El Salvador and to San José, on the Pacific.

About 5,000 mi. of roads exist, although most are unpaved. Exceptions are the highway from Guatemala City to San José and sections of the Pan-American, Pacific Coast and Atlantic (Guatemala City—Puerto Barrios) highways. Puerto Barrios is the most important port. Three ports of lesser significance are Santo Tomás, on the Caribbean, and San José and Champerico, on the Pacific.

Air transportation is supplied by international lines and by the government-owned Aviatega, which provides the principal domestic service.

Most domestic telecommunications facilities, including telephone, telegraph and radio, are government owned. They provide contact between principal points in the country, but equipment and service are inadequate. Good local telephone networks are almost nonexistent except in the capital. International cable services connect with the government telegraph lines.

See also references under "Guatemala" in the Index.

(R. A. LA.B.)

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(L. W. BE.; M. L. M.; L. LL.)

GUATEMALA, a department in central Guatemala. Area 821 sq.mi. Pop. (1964) 813,696. A volcanic highland region, it extends northward to the Motagua river. In the southern part, in the midst of volcanoes, is Lake Amatitlán, a popular resort area with picturesque Indian villages on its shores and also the chief coffee-growing region of Guatemala. Other crops include maize, beans and sugar cane. There is much land in pasture for beef cattle.

Guatemala City (*q.v.*) is both the departmental and the national capital and is connected by paved highway and railroad to the lake district. Roads and railroads provide communications with Mexico to the west and El Salvador to the east, and also with the Pacific port of San José and the Caribbean ports of Puerto Barrios and Santo Tomás.

GUATEMALA CITY is the largest city in Central America (pop. [1964] 572,937 [mun.]), the political and social capital, the cultural centre and the economic heart of Guatemala. It is also the capital of Guatemala department. The city is situated 150 mi. S.W. of Puerto Barrios in an intermountain valley of the central highlands at an elevation of slightly less than 5,000 ft., and enjoys the temperate climate and invigoratingly fresh atmosphere characteristic of high altitudes in the tropics.

Guatemala City was founded (1776) to replace Antigua (*q.v.*), ruined by an earthquake in 1773, as the capital of the captaincy general of Guatemala. After independence from Spain was de-

clared (1821), it served successively as the capital of the province of Central America under the Mexican empire of Agustín de Iturbide (1822-23), the Central American Federation (1823-33), the state and, finally, the independent republic of Guatemala. The tradition of government from Guatemala caused distrust of the city in other areas of Central America that was a factor in the demise of the federation and the failure of subsequent attempts to revive it.

The modern city was largely rebuilt after the disastrous earthquakes of 1917-18. The characteristic appearance created by low, massive structures has been somewhat modified by the erection of steel and concrete multistoried hotels and office and apartment buildings of modern design. Elegant residential districts have grown up on the borders of the old city, particularly toward the south in the direction of La Aurora airport, and low-cost housing units have been constructed in various parts of the urban area. Most streets are well paved and well lighted, and their cleanliness has become proverbial.

In addition to the government offices and services concentrated there, Guatemala City employs nearly half of the capital invested in the country, accommodates more than half of the industrial establishments and accounts for a like proportion of the industrial production of the republic. It is the focus of transport, both local and international, by highway, railroad and air, and is the commercial and banking metropolis of the country.

The cultural role of the city is equally dominating. It is the seat of the principal faculties of the University of San Carlos; the major institutions for artistic, commercial, vocational and military education; the Society of Geography and History; and several of the important museums and related institutions of the country. Most performances by the national orchestra and the national ballet company and those of foreign artists on tour are given in the capital.

Public buildings of note include the National palace, the post office, police headquarters, the National Archives and the National library. Among the major religious structures are the cathedral and the churches of San Francisco, Santo Domingo and La Merced. Other points of interest include the remarkable relief map of the country in Minerva park (constructed in 1905 by Francisco Vela), the archaeological and historical museums, the colonial aqueduct, the central market and the Olympic city built for the 1950 Central American Olympic games.

In the environs of Guatemala City are the villages of Chinautla, famous for hand-formed pottery, and Mixco, which supplies the capital with fruits and vegetables. Nearby are the Indian towns of San Pedro and San Juan Sacatepéquez. (W. J. G.)

GUAVA, in Spanish *guayaba*, is the name applied to numerous tropical American trees and shrubs of the genus *Psidium*, of the myrtle family (Myrtaceae), and to their fruit, which is eaten in many ways where it is grown. Horticulturally the two important species are the so-called common guava, *P. guajava*, and the cattley or strawberry guava, *P. cattleianum*, which occurs in two forms, one with maroon-red fruits and the other with bright yellow ones. The latter is sometimes listed botanically as *P. lucidum*.

The common guava is a large shrub or small tree with quadrangular branchlets, oval to oblong leaves about three inches in length and white four-petaled flowers an inch broad. The fruits are round to pear shaped, sometimes as much as three inches in diameter, though usually less; the flesh, which is white to salmon red, contains numerous small, hard seeds—more abundant in primitive forms of the fruit than in the modern improved varieties. The musky, at times pungent, odour of the sweet flesh is char-



HORACE MCPHARLAND CO.
BRAZILIAN GUAVA—*PSIDIUM GUTTINENSE*

acteristic and not always appreciated. The Brazilian guava (*P. guineense*) has smaller but similar fruit.

Guavas are pre-eminently suited for the preparation of jellies, jams and preserves, highly popular in many tropical countries and exported from a few, notably Cuba. Fresh guavas are rich in vitamin C; they are eaten out of hand or may be sliced and served with sugar and cream as a dessert.

The common guava resists little frost, hence is not cultivated in many parts of California but is successfully grown throughout southern Florida; in several tropical regions it grows so abundantly in a half-wild state as to become a pest.

Propagation of the plant is usually by seeds, but the fine varieties that have been developed in Florida, California and a few other parts of the world must be perpetuated by some vegetative means. Because of its hard, dry wood and thin bark, propagation by cuttings and by conventional methods of grafting are not practical, but veneer grafting, using as rootstocks young plants in vigorous growth, and covering the grafts with strips of polyethylene plastic, gives excellent results. A method known as modified Forkert budding has been recommended in Hawaii.

The cattley or strawberry guava is considerably more frost resistant and is popular in many subtropical regions. It is a large shrub, attractive for its thick, glossy-green oval leaves and its white flowers. The fruits are round, occasionally as much as two inches in diameter, and contain numerous hard seeds like those of the common guava. The flavour of the soft whitish flesh has been likened to that of the strawberry, hence one of the common names. This species is frequently planted in gardens throughout southern California and several other subtropical regions; nowhere has it attained commercial importance.

Other guavas used to a limited extent in parts of tropical America include the *cás* of Costa Rica (*P. friedrichsthalianum*) and the *guisaro* (*P. molle*), both of which yield highly acid, not very pungent, fruits. The so-called pineapple guava is the *feijoa* (*q.v.*), a related fruit tree. (W. Po.)

GUAYAMA, a town and municipality on the southeastern Caribbean coast of Puerto Rico. Town pop. (1960) 19,183; municipality pop. (1960) 33,678. The town is located on a broad and fertile plain about 5 mi. from the coast. Extensive irrigation facilities have made the area around Guayama rich in sugar production. Five large *centrales* or sugar factories grind the cane which directly or indirectly supplies the livelihood for about 85% of the population in the area. The sugar is shipped from two small ports, Arroyo and Puerto Jobos. Guayama is connected by highways to the west with Salinas and Ponce, to the east with Humacao, and with Cayey to the north by the scenic Spanish-built military highway.

The central plaza of Guayama, dominated by San Antonio church and adorned by carefully pruned trees, is one of the most beautiful on the island. Textiles, optical products and soft drinks are manufactured. In the mountains to the north of Guayama are important hydroelectric plants which service the southeastern section of Puerto Rico. The town was founded in 1736 as San Antonio de Padua de Guayama. (T. G. Ms.)

GUAYAQUIL, chief port and largest city of Ecuador, capital of the province of Guayas (*q.v.*), located on the west bank of the Guayas river (*q.v.*) about 45 mi. upstream from the Gulf of Guayaquil. Pop. (1957 est.) 410,000; (1950) 258,966. The main part of the city is on high ground at the foot of a hill which has two humps called Cerro Santa Ana and Cerro Santa Carmen, about 30 ft. above sea level, and stands above the highest floods of the river although the lower town is at times inundated.

The climate of Guayaquil is equatorial but temperatures are never extreme: the average of the warmest month (April) is 27° C. (80° F.), and for the coldest month (July), 24° C. (75° F.). Rainfall is heavy from January to May, but there is little rain during the rest of the year. Violent storms and heavy winds are unknown, but the humidity is high, especially in the rainy season. The average annual rainfall is 38.8 in.

A settlement was established near modern Guayaquil in 1535 by Sebastián de Belalcázar. This site, at the mouth of the Babahoyo river, was subject to flooding and disease. The location was moved,

and finally in 1538 Francisco de Orellana established the town in its present location, naming it Santiago de Guayaquil to honour both the saint on whose day it was founded and the Indian chief Quaya and his wife Quila. The city has survived attacks by buccaneers, fires, earthquakes and pestilence. For many years Guayaquil, which is slightly more than 2° south of the equator, was regarded as a plague spot. In the 20th century notable engineering and hygienic achievements were accomplished by the government in co-operation with the Rockefeller foundation, and after 1920 health hazards were reduced to a minimum. In 1822 Guayaquil was the scene of the conference that took place between Simón Bolívar and José de San Martín, after which Bolívar emerged as sole leader of the South American liberation movement.

Traditionally the products of the Guayas lowland are brought to Guayaquil by river boat. Even in the dry season, shallow-draft steamboats are able to ascend the Guayas river for about 80 mi. to Babahoyo and to navigate the Daule river for about 40 mi. A branch of the Inter-American highway descends from the highlands to Durán on the left bank of the Guayas river opposite Guayaquil. This is also the western terminal of the Guayaquil-Quito railway (288 mi.). Passengers and goods cross the river in ferries. An all-weather highway runs from Guayaquil to Quevedo and thence up into the highlands at Latacunga, connecting there with the Inter-American highway; another highway connects Guayaquil with Salinas to the west. In the early 1960s a new highway was being built from Quevedo more directly to Quito by way of Santo Domingo de los Colorados. Guayaquil is served by both international and domestic airlines.

The port of Guayaquil can accommodate ships of up to 22-ft. draft. Larger ships, however, anchor about 40 mi. below Guayaquil at Puná Island and are met there by lighters and ferries. A new port on the Salado estuary, about 10 mi. S.W. of Guayaquil, was being built. Most of the exports and imports of Ecuador pass through the port. The decline in the importance of cacao, however, means that no longer is Guayaquil filled with the odour of the drying cacao kernels, which once were spread on the streets in the dry season and gave the city a distinctive aroma.

Guayaquil has numerous industrial plants, producing leather goods, alcohol, soap, candles, textiles, beer and cement. There are sugar refineries, iron foundries, machine shops, tanneries and sawmills. It has one of Ecuador's two leading universities, founded 1867, and among its older buildings are some notable examples of colonial architecture. Since the earthquake of 1942 much of the city has been rebuilt. (P. E. J.)

GUAYAS, a coastal province of Ecuador, bounded west by the Pacific ocean, north by Manabí, Pichincha and Los Ríos, east by Los Ríos, Cañar and Azuay and south by El Oro. Area 8,208 sq. mi. Pop. (1960 est.) 825,600. The provincial capital is Guayaquil (*q.v.*). The greater part of the province is a lowland surrounding the Gulf of Guayaquil. It is rainy and covered with tropical forest in the north, and becomes drier toward the south.

The flood plains of the Guayas river (*q.v.*) system and along the Guayas itself below Guayaquil, including the swampy Puná Island at the mouth of the river, are inundated each year during the rainy season from December to May. Above the flood plains, plantations produce cacao, bananas, rice, cotton, coffee and fruit. Much of the land, including the flood plains, is used for the pasture of beef cattle.

At the end of the Santa Elena peninsula, 75 mi. W. of Guayaquil, is Ecuador's only oil field. At the town of Salinas, in the midst of the oil field, there are salt-extracting works and a rapidly growing seaside resort. Salinas enjoys an arid climate, with blue skies and comfortable ocean winds, and sandy beaches.

The Galápagos Islands (*q.v.*), which form a separate territory of Ecuador, are administered from Guayas province. (P. E. J.)

GUAYAS RIVER, a river in the coastal region of Ecuador. Its tributaries rise on the western slopes of the Western Cordillera and descend to drain the wet lowland, upstream from Guayaquil. Chief among these are the Daule, the Vices, the Chimbo (Yaguachi in its lower course) and the Babahoyo. These tributaries join to form the Guayas which carries all this water about 37 mi. to the Gulf of Guayaquil.

comparatively simple *Kumihachi*. Ju-jitsu is a name covering many systems of fighting, each "school" giving its own jealously kept secret principles and specializing in particular methods against the sword, spear and knife or against another barehanded fighter. The peak of ju-jitsu was in the 17th and 18th centuries, during the period of peace enforced by the Tokugawa family, who forcibly closed off Japan from the rest of the world for about 250 years. It is a strange paradox that such fighting methods did develop during these years of comparative peace. During the middle of the 17th century, some influence came from China in the form of *Kempo*, but it is doubtful whether this greatly influenced the later development of ju-jitsu.

These comparatively tranquil centuries were shattered by the entry into Tokyo bay of U.S. Commodore M. C. Perry in 1854. During the next 50 years Japan underwent a remarkable transformation—from a completely feudal society to an industrial one.

Judo.—In this great upheaval, the samurai were officially abolished as a class, and with them the martial arts, which they alone propagated, tended to disappear. However, a man named Jigorō Kanō, who had studied in several of the ju-jitsu schools, thinking it would be a great loss if all the systems were to die out, founded, in 1882, his own "school," known as *Kōdōkan Judo*. As well as incorporating some principles and techniques of ju-jitsu, he made use of principles of physical education together with moral instruction. He thus made his system entirely a sport (unlike ju-jitsu, which certainly was not a sport) and, as such, it could be practised by anybody with the maximum of benefit and the minimum risk of injury.

Judo is a very fast, aggressive sport and has numerous and complicated rules (obtainable from Judo associations in various countries). Its techniques can be grouped into: (1) standing techniques (throws); and (2) groundwork techniques (holds, arm locks, and neck locks).

In a contest a win is scored by throwing the opponent (with force, intention and control) so that both his feet leave the mat, or by holding him approximately on his back, under control, for 30 seconds; a submission is obtained either by locking the elbow joint or applying pressure to the sides of the neck by means of the wrists. The duration of a contest is 5–20 minutes, depending upon the status of the match concerned. A judo contest is rather a test of skill than of endurance.

Standards of skill (for both sexes) are shown by the colour of the belt worn. These standards are divided into two main sections: *kyu* (loosely meaning "student") and *dan* ("leader"). *Kyu* and *dan* grades are subdivided again and each stage is represented by a colour. (These colours sometimes vary from country to country, although the classification is the same.) Although there is no set time limit, a rough indication of the time usually taken to reach these various standards follows; it is based on an average practice of two or three times a week. There are six *kyu* grades which are reached over a period of two to four years. The first three *kyus*

(6th–4th) take three to nine months. In Japan, these first three grades are white, the remaining three being brown. The U.S. follows the Japanese system. In most countries, including Great Britain, the colours in order of ascending *kyu* from 6th to 1st are white, yellow, orange, green, blue and brown.

Of the 12 *dan* grades, the first five take 10–17 years (the first three, 8–12 years), and the colour is black. The 6th–8th *dans* are either black or red-and-white blocks; the 9th and 10th are red; the remaining two have never yet been achieved.

The sport of judo expanded rapidly. It was adopted by the Japanese ministry of education (in which Kanō held a leading position) for use in all schools' sports programs. All government services (armed forces, police, firemen, etc.) soon followed suit. By the 1930s it was an established part of Japanese sporting life, and to a limited degree had spread to other parts of the world. However, only after World War II did real international expansion take place. By the 1960s virtually every country in the world had its judo association affiliated to the International Judo federation with its headquarters in Tokyo. (The British Judo association was a founder member.) There are world championships as well as many other international competitions at various levels, including the Pan-American games, from 1963, and the Olympic games (for the first time in 1964). The popularity of judo has, to a large extent, rung the death knell of ju-jitsu; only in such systems as *Aikido* and *Karate* can be seen the shadows of the old ju-jitsu methods. (*Aikido* is a system of self-defense founded in the 14th century and now closely linked with judo because of their sometimes very similar basic principles. *Karate* is a system of barehanded, offensive fighting founded in Okinawa in the 17th century. Basically the training entails severe hardening of body extremities—hands, fists, elbows, feet, heels, knees, etc., by repeatedly striking solid materials, e.g., posts, walls, sand. In this way these toughened parts become weapons and are capable of smashing or maiming an opponent. Needless to say, *Karate* is not a sport.)

The *raison d'être* of ju-jitsu died with the samurai and the need for survival of the individual in close combat; judo takes on the task of satisfying a social need by being a sport in which both body and mind can be exercised to the full.

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JUJUBE. While this name is often applied to variously flavoured confections of gum arabic, gelatin, etc., it belongs properly to the small, spiny trees of two species of *Zizyphus*, of the buckthorn family (Rhamnaceae), and their fruit. The best jujubes are produced by varieties of the common jujube (*Z. jujuba*), the native home of which is thought to be China, where they have been extensively cultivated for at least 4,000 years. This species, reaching to 25 or 30 ft., has alternate three-veined elliptic to ovate leaves one to three inches in length. The small greenish flowers are followed by dark brown, round to oblong fruits the size of small plums, each containing white, crisp flesh and a single large, pointed stone. When processed in sirup the fruits make an excellent confection, much resembling Persian dates—hence the name "Chinese dates" by which they are sometimes known. Jujube still remains one of the five chief fruits of China. Though introduced into the United States in 1837, the jujube attracted little attention until superior varieties were obtained from China about 1906.

The Indian or cottony jujube or *ber* (*Z. mauritiana*) differs botanically from *Z. jujuba* in having leaves that are woolly beneath instead of smooth. The fruit is commonly smaller and of poorer quality. Both species are subtropical in character, thriving in hot, dry climates where winter temperatures do not go below -9.4°C . (15°F). They are well adapted to cultivation in the southwestern U.S., where they are occasionally seen as dooryard trees.

Jujubes have not been planted commercially to any extent in the U.S., but because of their remarkable resistance to pests they show



BY COURTESY OF KAIKYO TANKO

(LEFT) SOMERSAULT OR SACRIFICE THROW: AS OPPONENT RESISTS, HIS ELBOWS ARE GRABBED AND PRESSED TOGETHER, THE LEFT FOOT IS SLID DEEP BETWEEN HIS LEGS AND WRESTLER FALLS ON HIS BACK, PLACES HIS RIGHT FOOT ON OPPONENT'S ABDOMEN AND THROWS HIM OVERHEAD. (RIGHT) DEFENSIVE STRAIGHT ARM LOCK: AS OPPONENT REACHES OR PUSHES, WRESTLER GRABS HIS WRIST, PULLS HIS ELBOW UNDER HIS OWN ARMPIT AND PUTS PRESSURE ON THE ELBOW TO FORCE RELEASE OF WEAPON

promise for exploitation. Propagation is by means of seed, though the named Chinese varieties must be propagated vegetatively. Suckers, root cuttings and grafting are used in China; in California whip grafting on two-year-old rootstocks is recommended. The trees are precocious and prolific in fruiting, rarely failing to yield good crops.

(W. Po.; X.)

JUJUY, a province in the extreme northwestern part of Argentina. Area 20,548 sq.mi. Pop. (1960) 239,783. The terrain is rugged although not unattractive and the varying altitudes exhibit a tremendous range in climate, temperature and vegetation. The eastern valleys, at less than 1,000 ft., are warm and humid. In sharp contrast are the treeless wastes of the Puna de Atacama and the cold, dry basins of the north and west at 10,000 ft., ringed by snow-capped peaks, which rise to more than 15,000 ft. in height.

Like the other northwestern Argentine provinces, Jujuy owed its early settlement and prosperity during the 16th and 17th centuries to the Spanish mines of Peru and Bolivia. The city of Jujuy, the provincial capital (pop. [1956 est.] 44,061), was founded in 1593 at the southern limit of the Humahuaca gorge, 4,127 ft. above sea level. The city and surrounding area prospered from the raising of mules and foodstuffs for the mines, and a flourishing trade was carried on across the mountains to Bolivia. The prosperity of the area declined in the 19th century as the focus of the national economy and commerce shifted to the littoral and to Buenos Aires. In the 20th century the province was linked by railroad to Bolivia and an alternate route of the Pan-American highway passed through the province from Bolivia.

At mid-20th century Jujuy was the major producer of minerals in Argentina, supplying most of the national production of zinc, lead, tin, silver and antimony as well as considerable amounts of salt, borates and gold. Efforts had been made to exploit the high-grade iron ore from the Zapla mines and a blast furnace at Palpalá had been completed, but full development was hampered by inadequate coal supplies and transportation facilities. The mountainous and arid terrain is not suited to agriculture and crops are restricted to the eastern valleys. Not much more than a tenth of the total area of the province was under cultivation in the 1960s.

Mules, asses and llamas are used extensively as pack animals and are raised in considerable numbers, as are sheep, goats and cattle.

(Js. R. S.)

JUKON (JUKON), a small tribe living on the upper Benue river in Nigeria, commonly believed to be composed of descendants of Kororofa, one of the most powerful Sudanic kingdoms in the late middle ages. The ruins of a great settlement to the northeast of the tribe's present location, on the south bank of the Benue, are said to be those of the capital of that kingdom, but the claim has not as yet been investigated by archaeologists. It is true, however, that many royal families of Nigerian tribes, such as those of the Nupe and the Igala, trace their ancestry back to this area and to the Jukon royal family.

The population is about 11,000 people who speak six separate dialects of their Kwa language. The tribe is a congeries of many smaller groups, each organized according to different principles, although the polygynous extended family seems to be the dominant social group in all. The characteristic which most marks the Jukon, however, is their complex system of offices which have both a political and a religious aspect. Such a system resembles the political organization of many African states, but the Jukon are a society of princes without subjects. The offices are also part of a priesthood which practises an involved form of religion, marked by a diurnal and annual round of ritual and sacrifice. The king, called the Aka Uku, was—until he became a member of northern Nigeria's house of chiefs in 1947—an almost perfect example of the semidivine priest-king.

See C. K. Meek, *A Sudanese Kingdom* (1931); G. P. Murdock, *Africa: Its Peoples and Their Culture History* (1959).

(P. J. B.)

JULIA DOMNA (d. A.D. 217), wife of Septimius Severus (Roman emperor 193–211), was a Syrian, daughter of the hereditary high priest Bassianus at Emesa (Homs in Syria) and elder sister of Julia Maesa (q.v.). She gathered about her in Rome a group of philosophers and intellectuals, best known through the writings of Philostratus (q.v.), and while in Britain was sufficiently

interested to cross-question Caledonian prisoners about their habits and beliefs. After Severus' death the murderous rancour of her two sons Caracalla and Geta culminated in the assassination of the younger by the elder in her presence (212). When Caracalla went to the wars, he left her with a considerable control of civilian administration. On the news of his murder in 217 she is said to have starved to death, either voluntarily or on the orders of the new emperor, Macrinus.

(Jn. R. M.)

JULIA MAESA (d. c. A.D. 226), sister of Julia Domna (q.v.) and daughter of the hereditary high priest at Emesa (Homs) in Syria. She married the senator Julius Avitus, possibly a Gaul, by whom she had two daughters, Soemias and Mamaea (see JULIA MAMAEA), mothers of the emperors Elagabalus and Alexander Severus respectively. When Caracalla was murdered in 217 and replaced by Macrinus, she induced the Syrian legions to declare Elagabalus (q.v.) emperor. But when the effeminate follies of Elagabalus threatened a speedy end to the dynasty she persuaded him to adopt his cousin Alexander. When Elagabalus was murdered, Alexander succeeded him, and Maesa retained a considerable influence till her death, about 226.

(Jn. R. M.)

JULIA MAMAEA (?–235), daughter of Julia Maesa (q.v.) and niece of Septimius Severus, was the mother of Alexander Severus (Roman emperor 222–235). When Mamaea's nephew Elagabalus persisted in his dangerous folly (see ELAGABALUS), Maesa persuaded him to adopt Alexander as his colleague and heir. When Alexander became emperor on Elagabalus' murder, Mamaea acted as regent for her son, with the advice and control of a council of 16 senators. She dominated the boy, secured the appointment of the jurist Ulpian (q.v.) as praetorian prefect, and accompanied the army in the Persian campaign of 232, the failure of which is blamed on her pusillanimous interference. She is condemned by ancient writers for parsimony and excessive interference in small details of government, and was killed with her son by the soldiers in 235.

(Jn. R. M.)

JULIAN (FLAVIUS CLAUDIUS JULIANUS) (331–363), commonly called JULIAN THE APOSTATE, Roman emperor A.D. 361–363, was born at Constantinople, the son of Julius Constantius, a half brother of Constantine the Great, and of Basilina, daughter of a prefect of Egypt. His mother died shortly after he was born, and his father was killed, along with most of the relatives of Constantine, by the troops in Constantinople in 337. His education was well begun by a eunuch called Mardonius, and about 341 he and his half brother Gallus (q.v.) were sent to Macellum, a remote estate in Cappadocia, not far from Caesarea (Kayseri), where they received a lonely and strictly Christian education. In 347 their cousin, the emperor Constantius II, allowed them to leave Macellum, and Julian returned to Constantinople. There he continued his education and acquired a tolerable knowledge of Latin, but was soon obliged by the suspicious emperor to retire to Nicomedia (Izmit). In 351 Gallus was elevated to the rank of *Caesar* (for explanation of this title see EMPEROR) and was appointed to rule at Antioch; and it seems to have been about this time, when he was associating with the best-known philosophers of the day, that Julian secretly abandoned Christianity. After the fall of Gallus in 354 Julian was summoned under suspicion to the court at Milan, but the empress Eusebia persuaded Constantius to send him back to the east, and he gladly took up residence at Athens, which was still a great intellectual centre. Among his fellow students there were Gregory of Nazianzus, who later published an attack upon him, and Basil of Caesarea.

In the autumn of 355 he was recalled to Milan, and on Nov. 6 Constantius presented him to the troops and proclaimed him as *Caesar*. After marrying Helena, the sister of Constantius, he set out for Gaul on Dec. 1 in order to repel the barbarian invaders of that country, who had broken across the Rhine frontier on a massive scale after the fall of the usurpers Magnentius and Silvanus. His powers were strictly limited by Constantius and he was escorted over the Alps by only 360 soldiers of poor quality. After wintering at Vienna (Vienne) he joined the main army under Marcellus in Champagne. During the summer the troops recovered Colonia Agrippina (Cologne) and other important centres, but in the following winter the Alamanni besieged Julian in Senones