

Balloon Flowers, Bladdernuts and Rattle-boxes

by RICHARD A. HOWARD

Many plants trap air or hold gases within their tissues resulting in inflated or swollen stems, leaves, flowers or fruits. The value of this characteristic in the survival of the plant is readily observed in some, but remains unclear in others.

An inflated calyx, corolla or inflorescence axis may be more conspicuous and aid in attracting pollinators, although this supposition may be pure speculation on the part of the human observer. However, the inflated calyx surrounding a fruit, or the inflated fruit itself aids in the dispersal of the plant as the swollen part of the plant rolls along the ground or is carried in streams or ocean currents.

A few aquatic plants may have stems, leaf blades or petioles with spongy, air-filled tissue that enables the plant to float and so be blown about the water surface by wind or carried by currents. It would appear to be an easy matter to extract a sample of the gas from within the plant tissue and analyze it. Apparently this has never been done, for no reference to the composition of the gas can be found in modern literature. One can only speculate that it is an air mixture, possibly heavily laden with carbon dioxide, possibly generated within the plant from the process of respiration.

In some plant parts the gas is under considerable pressure and so the swollen corolla or fruit is not alone the result of growth, but of turgidity. When pressed by hand, the organ may rupture or explode with a respectable noise, as observed in the Firecracker Plant. In other plants, the swollen calyx or seemingly inflated fruit may occur by growth alone without the trapping of gas, as evidenced by an opening or orifice to the calyx or the fruit.

The leaves of water lilies float because they trap gas in open spaces between the living cells of the leaf blade. Large air-filled cells occur in the Water Lettuce enabling the rosette of short stem and thick flat leaves to support the plant on the surface of the water. Finger pressure on the leaves may reduce their thickness to one-tenth of their natural size. The petioles of the Water Hyacinth contain air and are swollen, enabling this plant to float while extending the leaf blades well above the water surface. In military survival manuals the Water Hyacinth leaves and petioles are recommended as a green vegetable. When deep fried, the spongy petioles retain the crispness of corn crisps and have been used as an unusual hors d'oeuvre.

Plants that have developed swollen or inflated parts are found in many families and are among our cultivated garden plants. They are not only attractive and unusual, but subjects of conversation. Many have been used in dried arrangements or wreaths. Their names are often descriptive of the inflated condition, as for example the scientific name of the Desert Candle, *Caulanthus inflatus*. This plant is native to California and a member of the Mustard Family. The swollen hollow stem bears leaves below and flowers above, and a field of these plants in flower is an unusual sight of erect flowering stalks. *Lobelia inflata*, also known as the Indian Tobacco, has a swollen fruit in which the many small seeds are free to rattle when mature. The common names of Balloon Flower, Balloon Vine, Bladdernut or Chinese Lantern Plant also suggest some unusual characteristic.

Some of the more common plants with inflated parts are discussed below according to the inflated part.

Inflated Calyx

***Spathodia campanulata*.** African Tulip Tree. Bignoniaceae. Native to Africa.

This is a large tree of tropical Africa now cultivated in Florida, Hawaii and the tropics of both hemispheres. The bright red-orange flowers, slightly compressed and asymmetrical, have a brilliant margin of gold on the corolla. The calyx is similarly shaped, pubescent, and golden. Glands inside the calyx normally secrete a liquid, and when the young swollen calyx is pressed the secretion may squirt several feet from the pointed apex. Occasionally the calyx may contain a little or great amount of air and actually explode when pressed.

***Silene cucubalus*.** Bladder Campion. Caryophyllaceae. Native to Europe.

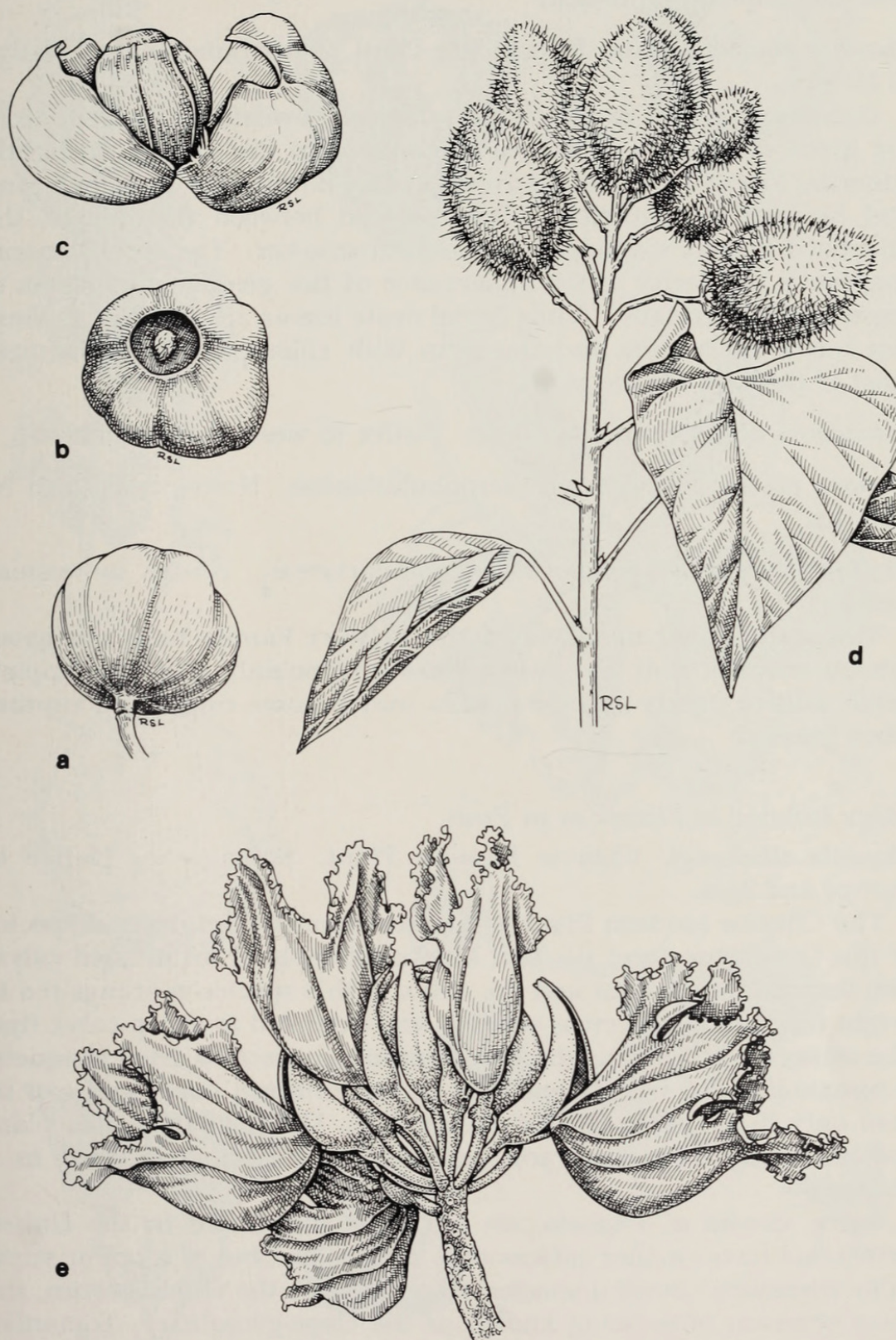
***Lychnis alba*.** White Campion. Caryophyllaceae. Native to Europe.

These are two of several members of the Pink Family that have become naturalized in the United States and often occur as weeds in northern gardens. The calyx is inflated in flower and continues to increase in size as the fruit develops. When young, the lobes of the calyx may be tightly appressed, but never tightly enough to hold gas. The mature capsule is enclosed in the swollen calyx which is clearly separated from the capsule.

Swollen Corolla

***Platycodon grandiflorum*.** Balloon Flower. Campanulaceae. Native to E. Asia.

An old-fashioned garden perennial with a swollen turnip-shaped corolla, blue-gray on the outside and eventually opening fully to reveal a vivid blue color inside. White-colored flower forms are known.



Hernandia ovigera. a. Whole fruit in expanded receptacle; b. from above; c. receptacle split open showing ribbed fruit. *Bixa orellana*. d. Habit of fruit cluster. *Spathodia campanulata*. e. Cluster of flowers with curved calyx. Drawing: Robin S. Lefberg.

The corolla swells as the flower develops and before opening is turgid and may pop when pressed.

***Russelia equisetiformis*.** Firecracker Plant. Scrophulariaceae. Native to Mexico.

Commonly grown in the tropics, this red-flowered shrub with arching green stems is well known to children in the area. The tightly adhering lobes of the corolla overlap. The flower may be 1 inch long and $\frac{1}{4}$ inch in diameter. When pressed between the fingers, the unopened flowers explode as a gentle firecracker. The specific name suggests a similarity in the appearance of the green-angled stems to those of the horsetails. While broad ovate leaves are developed, these last but a short time and the stem with chlorophyll manufactures most of the food for the plant.

***Penstemon* spp.** Scrophulariaceae. Native to western N. America.

***Chelone glabra*.** Turtlehead. Scrophulariaceae. Native to eastern N. America.

***Digitalis purpurea*.** Foxglove. Scrophulariaceae. Native to western Europe.

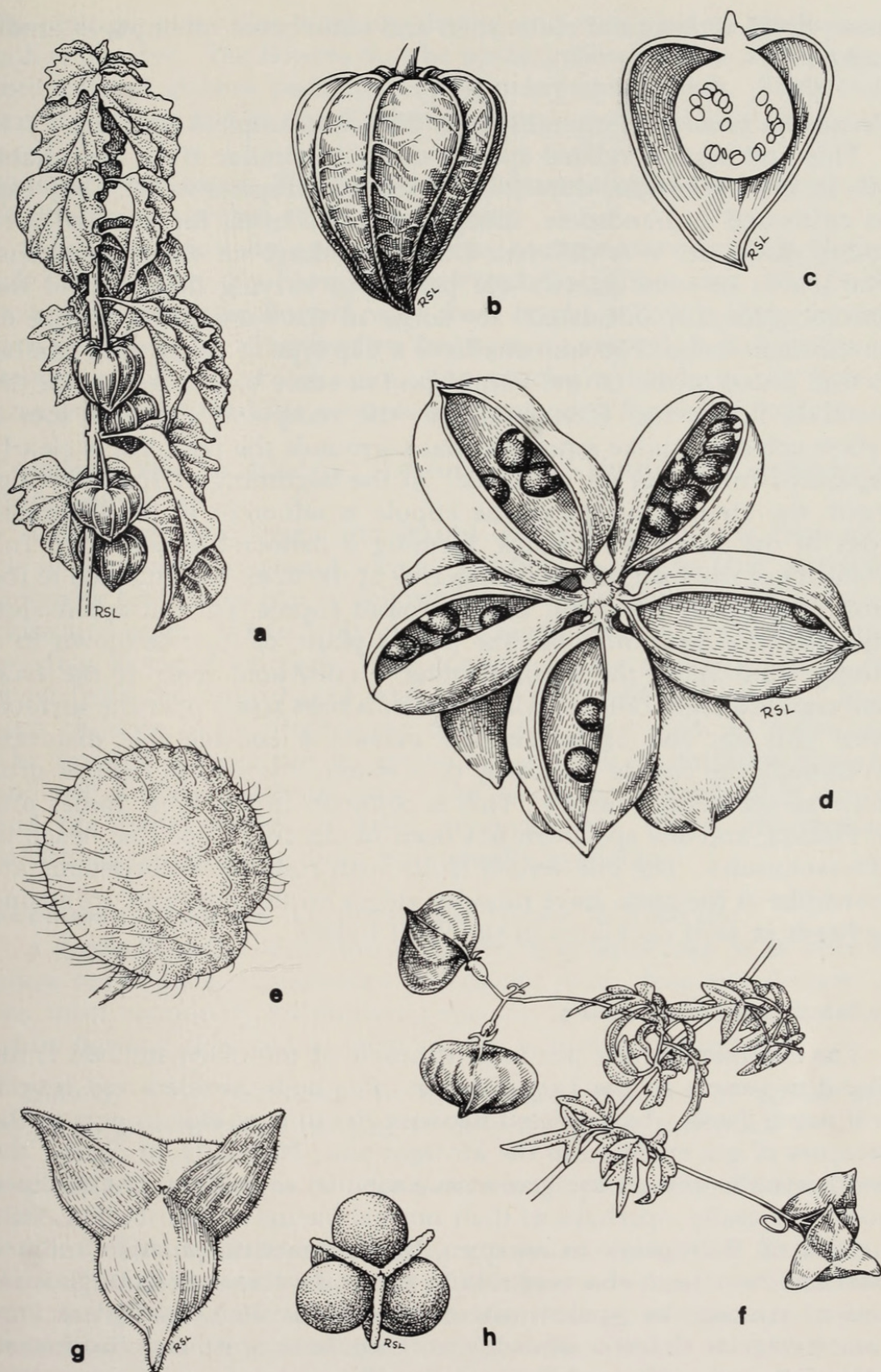
These additional members of the Figwort Family have elongated tubular corollas that are swollen in development. The overlapping petals adhere tightly and the corolla may become turgid and rupture when pressed.

Calyx Inflated in Flower or in Fruit

***Physalis alkekengi*.** Chinese Lantern Plant. Solanaceae. Native to Europe and Asia.

The Chinese Lantern Plant is the most familiar ornamental species of this large genus and the best known example of an inflated calyx. The flowers are pendant and the calyx in this species is orange-red to bright red, angular in cross section, and extended to sharp calyx tips. The stems are picked and dried and commonly used as dried bouquets. A tomato-like red fruit is enclosed in the enlarged calyx and can be seen only if the calyx is torn deliberately. Unfortunately, this plant spreads easily by runner and can become a persistent weed in a garden.

Other species of *Physalis* are native or introduced in the United States and have smaller calyces that are swollen, but of a tan or straw color when dry. Several species are grown for the edible berries, the most common ones being known as the Cape-gooseberry, Tomatillo, Husk-tomato, or Strawberry tomato. The fruits can be removed from the swollen husk and eaten out of hand or used to make a preserve. Many grow and produce prolifically so that the ground can be covered below the plant with the fruiting calyx and its enclosed berries. These plants also spread by runners or persist from seed for



Physalis alkekengi. a. Habit; b. whole fruiting calyx; c. section of calyx and berry. *Sterculia* sp. d. Open mature fruits showing marginal seeds. *Asclepias fruticosa*. e. Inflated fruit with soft spines. *Cardiospermum halicacabum*. f. Habit; g. single fruit; h. fruit walls have fallen showing spherical seeds. Drawing: Robin S. Lefberg.

many years after initial cultivation and subsequent attempts at eradication.

***Hernandia sonora*.** Hernandiaceae. Native to tropical America.

This and several related species occur in similar river bank habitats in the Caribbean, tropical America and tropical Asia. They can be cultivated as handsome, intriguing shade trees, for the leaves of young plants are very different from the foliage on older specimens. The leaves in some species are peltate to varying degrees and the flowers, generally unisexual, are borne in the same inflorescence or on different trees. The stamens have a flap type of dehiscence similar to that found in the Laurel Family and in some barberries. After the pistillate flower has been fertilized, the receptacle develops into a yellow colored cuplike structure that surrounds the fruit but is clearly separated from it by an air space. At the beginning of fruit development, the circular orifice of the cupule is adherent to the turbinate apex of the fruit and inflates, forming a balloon-like unit. On full maturity of the fruit, the cupule is free at the apex but attached to the fruit at its base. The fruit and its round cupule will roll a considerable distance downhill from the parent plant, or may be blown in a strong wind about the ground under a cultivated tree. If the fruit and cupule should fall into water, the unit bobs freely near the surface, open end up, and again may be carried a considerable distance. Eventually the cupule rots away or is eaten, leaving the fruit as drift material on sandy beaches. This is common in the West Indies and in Florida, and one specimen has been found on a Cape Cod beach in Massachusetts. The one-seeded fruits with ruminated cotyledons are crownlike at the apex, have rounded ridges on the side, and are strung as beads in seed necklaces in the West Indies.

Inflated or Swollen Fruits

The common garden pea is an example of the many inflated fruits found in genera of the Leguminosae. Pea pods, swollen and turgid, will pop if fresh when pressed between the fingers, due in part to the pressure of gas enclosed in the air-tight pod. Normally, of course, the pod is split to extract the green peas used as vegetables, but ripe pea pods float easily—perhaps as their normal means of distribution. Wild species of *Astragalus* in western North America produce inflated pods and have been observed rolling across desert sands through wind action. Among the garden ornamentals of the Pea Family are *Baptisia tinctoria*, *Colutea arborescens*, *Crotalaria* spp., and *Swainsona galegifolia*, all with conspicuously swollen pods.

***Baptisia tinctoria*.** Wild Indigo. Leguminosae. Native to N. America.

This native perennial herb was cultivated extensively not many years ago and persists in old garden plots or near old foundations.

The foliage turns blue-black on drying and was used to produce an indigo-like dye. The flowers may be white, yellow or blue, and develop into inflated globose pods containing many small seeds. Fruit clusters are often used in dried arrangements.

***Colutea arborescens*.** Bladder Senna. Leguminosae. Native from the Mediterranean region to the Himalayas.

Colutea is generally a shrub but may become a woody plant 15 feet tall. Dwarf varieties have been selected for garden use. The fairly large and attractive flowers vary from bright yellow to deep orange or a reddish color. The swollen fruits are elongated, 2 to 3 inches in length, and a pale cream color. The species is hardy in the Boston area and, although little used, is recommended for shrub borders.

***Crotalaria* spp.** Rattle-box. Leguminosae. Native and introduced from tropical areas.

A large genus of herbs and shrubs with foliage varying from simple to palmately compound leaves. The flowers may be blue, purplish, yellow or brown and can be followed by elongated racemes of inflated, elongated pods. When fully ripe the seeds tend to break loose and are free in the dried pods. The common name of Rattle-box is derived from the noise heard when the wind blows the pods. I have seen children in the tropics use clusters of these pods as maraccas. The tropical species can be grown as annuals in northern gardens and will flower in greenhouses. The plants are attractive in flower and the fruits useful in dried arrangements. Some enterprising seedsman should make these more readily available.

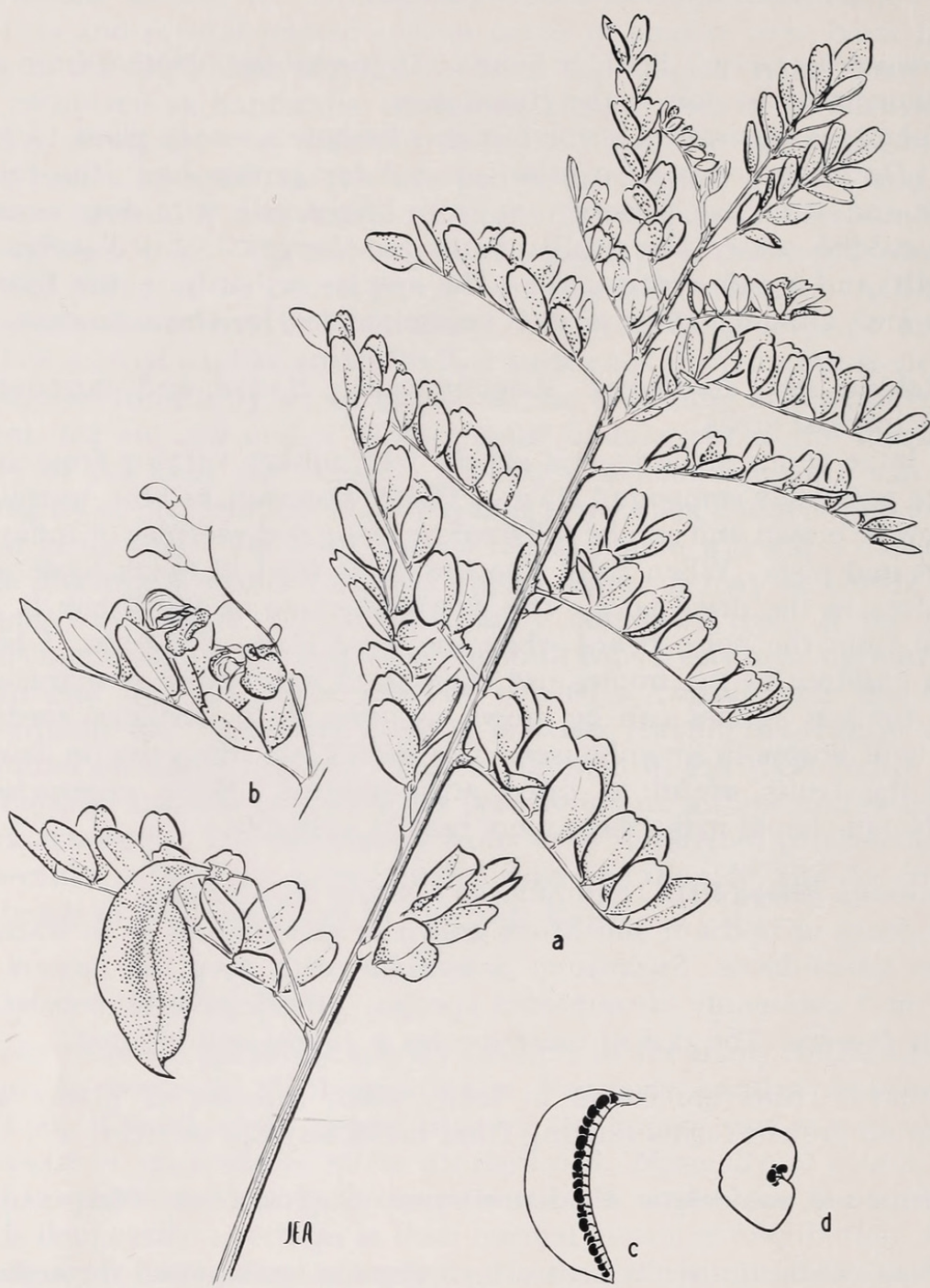
***Swainsona galegifolia*.** Leguminosae. Native to Australia.

A genus of herbs or subshrubs grown in greenhouses or in warmer areas out-of-doors. *Swainsona galegifolia*, with deep red flowers, is the most commonly encountered species: others have blue-violet or white flowers. The pod in most species is turgid and inflated.

Inflated fruits are found in many other families of plants and occur on growth forms ranging from herbs to vines or trees.

***Koelreuteria paniculata*.** Goldenrain-tree. Sapindaceae. Native to E. Asia.

The Goldenrain-tree is becoming a popular ornamental throughout the United States, and a number of cultivars now have been selected. It is useful as a shade tree and attractive through its bipinnately compound leaves with serrate margins. The trees flower in midsummer with conspicuous, large, bright yellow or golden-yellow panicles which show spots of red on close examination. The fruit is a large, bladdery, inflated, three-angled capsule produced in large numbers and remaining on the tree for long periods of time. The capsules are light and papery, rattle in the wind, and change color as they mature, becoming



Colutea orientalis. a. Habit showing fruit; b. flowers; c. longitudinal section of fruit; d. cross section of fruit.



Koelreuteria paniculata. a. Leaf; b. fruits; c. cross section of fruit; d. single bract of fruit.

a chestnut-brown color on many plants. Fully fruited panicles are spectacular in large scale dried arrangements.

***Bixa orellana*.** Annatto. Bixaceae. Native to S. America.

The *Bixa* is a truly handsome shrub or small tree with many points of interest. The heart-shaped leaves may have bright red petioles and veins, and change position during the daylight hours, drooping at night. The flowers are borne in panicles and the petals are a soft pink or rose color with clusters of stamens with bright red anthers. The fruit is heart-shaped in outline, a vivid red color when mature and fresh. Swollen and "popable," it is covered with soft spinose protuberances and dries dark red-brown. The seeds are borne along the walls of the fruit and when immature are soft and a pink-purplish color. When crushed they produce a vivid orange-red pigment. Fully matured or dried seeds are dark red in color and when boiled or powdered are the "annatto" used today to color rice for Latin-American cuisine. In South America the Indians have traditionally used the pigment to produce ornamental patterns on the skin, and more recently the pigment has been incorporated in some "natural product" lipsticks. Older Americans will remember coloring margarine with a capsule that contained this pigment. Dried seeds of annatto or the powdered seeds are available in nature food stores or in Latin-American markets. *Bixa* may be grown out-of-doors in the south but has a role in greenhouse collections in the north. Small plants are attractive for their foliage, but will also flower and produce fruit. The inflated capsules are highly prized for flower arrangements.

***Kleinhovia hospita*.** Guest Tree. Sterculiaceae. Native to tropical Asia.

Although this plant is not well known and is rarely cited, it is a handsome tree cultivated in warm areas of Florida and Hawaii. When in bloom with its abundant but small flowers, the tree appears to be covered with a gauze of pink. The fruits are angular, papery, inflated capsules with small seeds.

Kleinhovia contrasts with species of *Sterculia* of the same Cocoa Family. Plants of *Sterculia* may be stout-trunked large trees with simple or palmately compound leaves and comparatively inconspicuous flowers, often with a foul odor. One of the best known species has the appropriate scientific name of *Sterculia foetida*. In fruit, however, most of the *Sterculias* are spectacular. The flowers basically have five carpels, one to all five of which may expand into stalked, elongated, or globose "fruits" that are often brightly colored outside, or inside, or both. The woody or rigid walls of the fruits are expanded, if not inflated, with a conspicuous air space inside. When the fruits open, the colored seeds, small in comparison to most of the fruits that produce them, are borne on the edges of the fruit. They are commonly black or purple and contrast with the brightly colored

inner wall of the fruit which is often velvety in appearance. Caution must be used in touching the inner surface of all *Sterculia* fruits, for the soft appearance may be created by a myriad of sharp pointed needle-like hairs. Nevertheless, the mature open fruits with seeds are always prize winners in contests of floral or fruit arrangement.

***Cardiospermum halicacabum*.** Balloon Vine. Sapindaceae. Native to tropical regions.

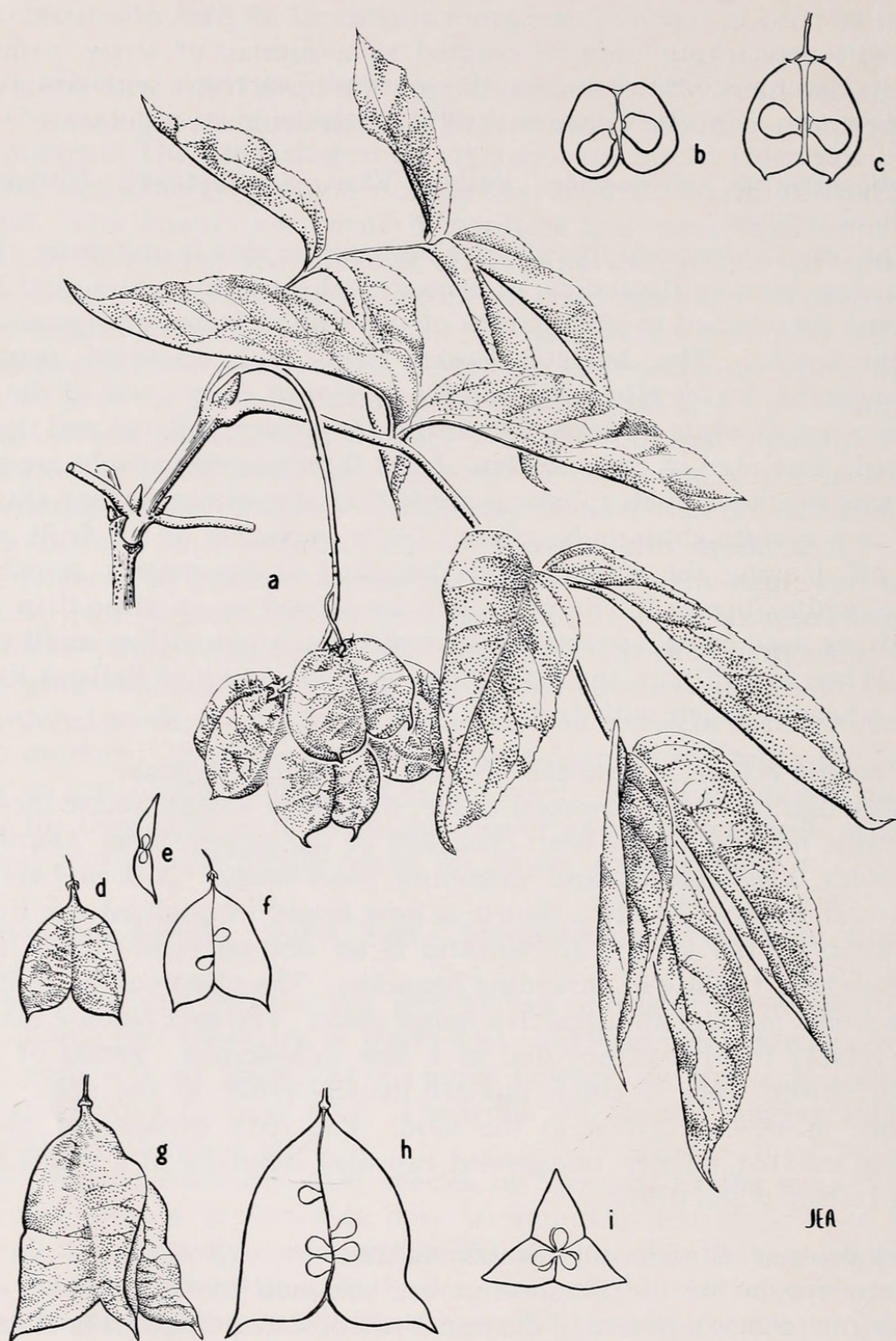
The original home of this slender herbaceous vine is unknown. The plant has been cultivated as an ornamental for many years, and has become established in many areas of the United States and generally in the tropics. The delicate slender stems with dissected, usually three-parted, leaves climb by tendrils developed from parts of the inflorescence of white flowers. The fruits are papery, inflated and three-angled. Enclosed in each section of the three-parted capsule are one or more black-purplish spherical seeds that sometimes appear silvery due to a minute shiny pubescence. Outer segments of the fruit may fall off, leaving the colored seeds attached to the papery, membranous, white "bracts." The plant can be grown as an annual in the north, or used as an attractive house plant in a pot with a small trellis. When in full fruit the plant lives up to its name of Balloon Vine, being heavily laden with fruit.

***Herissantia crispa*.** Malvaceae. Native to tropical regions.

Although lacking a common name, this plant has an abundance of scientific names. It has been classified in the genera *Sida*, *Abutilon*, *Gayoides*, *Bogenhardia*, and, currently, *Herissantia*. It is probably a native of tropical America, but it is now found throughout the tropical areas of the world. *Herissantia* is an annual semi-woody herb with slender trailing or spreading branches. The plant can be trained on a trellis to form an attractive house plant. The soft cordate leaves are velvety in appearance due to a fine pubescence. Petals of the small flowers vary in color, but are usually white at the apex, and yellow, orange, or green at the base. The fruit consists of about twelve inflated, papery, one-seeded capsules arranged in a whorl and long lasting when dried.

***Staphylea* spp.** Bladdernut. Staphyleaceae.

Four species of the Bladdernut are common in cultivation. *Staphylea trifolia* is a native of eastern United States; *S. pinnata* is from Europe; *S. colchica*, from the Caucasus area; and *S. bumalda*, from Japan. The plants form shrubs or small trees with leaves having three or five to seven leaflets in a pinnate arrangement. The short terminal racemes of white or greenish-white flowers are aromatic. The fruits are papery and inflated, greenish or yellow in color, and usually open at the apex. All species are hardy in northeastern United States and are grown both for the flowers and the attractive lantern-like fruits.



Staphylea elegans var. *Hessei*. a. Habit showing fruit; b. cross section of fruit; c. longitudinal section of fruit. *Staphylea Bumalda*. d. Fruit; e. cross section of fruit; f. longitudinal section of fruit. *Staphylea colchica* f. *grandiflora*. g. Fruit; h. longitudinal section of fruit; i. cross section of fruit.

Merremia tuberosa. Wood-rose. Convolvulaceae. Native to tropical America.

The common name applies to the fruits of this robust vine, which are well known for their use as corsage components or in dried arrangements. The light-colored, rigid but papery calyx enlarges in fruit, and surrounds an inflated capsule that is papery, dark or chestnut-brown in color. This contains free, large, angular seeds. Although seeds are often offered and suggested for culture as house plants, this vine has value as such only for the divided leaves. In tropical areas it quickly covers and obscures a fence, or it climbs to the tops of tall trees before displaying the bright yellow flowers and developing fruit.

Asclepias fruticosa (*A. physocarpus*). Milkweed. Asclepiadaceae. Native to Africa.

Although commonly cultivated in gardens in Europe, this plant is rarely seen in American gardens. The slightly woody stems may reach a height of 3 to 6 feet as an annual. The typical milkweed flowers are small and pink in color but develop an inflated fruit the size of a tennis ball or larger. Soft threadlike protuberances cover the surface of the green to light yellow or white fruit. The inflated portion consists of a spongy mass of tissue outside of the harder inner unit which contains the seeds.

Calotropis procera. Crown-flower or Dumb Cotton. Asclepiadaceae. Native to tropical Asia.

The pink, purple and white flowers of this tropical shrub or small tree are used in Hawaii for making the Crown-flower lei. In tropical America the plant is reputed to have medicinal properties. In either case, it is well to keep in mind that the copious milky sap may be caustic to sensitive skin. The fruit may be single or borne in pairs, and is inflated below the skin by spongy, cotton-like tissue. Large fruits may be 6 inches in diameter. The sessile gray-green leaves give the plant a characteristic appearance and allow easy recognition of it in drier areas of tropical America.

These are but a few of the inflated fruits or flowers one may encounter in the flora of the world. In the many ways plants have evolved and developed specialized means of distribution, the inflated fruit remains unusual. The characteristic, however, does make such plants attractive as ornamental occupants of a selected spot in your garden or greenhouse.



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