

A Cactus Primer for the Sonoran Desert Region

by Mark Dimmitt, Ph.D., Curator of Botany



Cactus flower (Hybrid *Trichocereus*)

All photos by T.A. Wiewandt unless otherwise noted.

Cacti are a very conspicuous element in landscapes of the Sonoran Desert region. They make up only a small percentage of the species: for example, they represent only five percent of the 612 taxa in the Tucson Mountains where the Desert Museum is located. But their odd forms make them stand out, and in some places they occur in extensive stands. This issue of *sonorensis* is an introduction to this fascinating group of plants.

What is a Cactus?

Plants are classified mainly by the structures in their flowers and fruits. A cactus is any plant that belongs to the botanical family Cactaceae. It is easy to recognize a cactus by looking for its unique flower pattern. The pattern consists of several characteristics, but three are sufficient for recognition: 1) Cacti have many petals and sepals, and these two normally-distinct parts blend into one another. That is, there are some parts that are not obviously one or the other. 2) They have many anthers (the pollen bearing organs) — usually hundreds of them. 3) They have several-to-many stigma lobes (the female organ that receives pollen) — usually shaped like a three-dimensional asterisk.

A plant **MUST** have this flower pattern to be a cactus. Several plants in our region are often mistaken for cacti, but have very different flowers and therefore belong to other families. The most often confused are agaves (family Agavaceae) and ocotillos (family Fouquieriaceae). Agave flowers have three sepals and three petals, while ocotillo flowers have five of each; the petals and sepals in both of these groups are distinct.

Confusion stems partly from not knowing the difference between a cactus and a succulent. *Cactus* is a taxonomic term, meaning that all plants in the same taxon (family, genus, etc.) are related to one another. Thus all 2,000 or so species of cacti in the world are descended from a common ancestor, a proto-cactus with the flower pattern described above. *Succulent* is a non-taxonomic term for an adaptive strategy: succulent plants cope with arid climates by storing water during brief rainy periods for survival through the dry times. Many unrelated plants have developed the succulent life form in response to the need to survive drought. *All cacti are succulent plants, but not all succulent plants are cacti.*

Major Cactus Groups in the Sonoran Desert

PRICKLY PEARS are those species in the genus *Opuntia* that have ovoid, strongly flattened, jointed stems (they are not leaves). There are about a dozen species in our region.

The way the joints grow determines the form of the plant. Some branch only at the base near the ground and form low, compact clusters; beaver tail cactus (*O. basilaris*) is an example. Some branch at the tips of horizontally-oriented pads, resulting in a low, spreading plant like sprawling prickly pear (*O. phaeacantha* var. *major*). Still others branch at the tips and grow strongly upright, forming shrub-like cacti such as the abundant Engelmann prickly pear (*O. phaeacantha* var. *discata*, = *O. engelmannii*). Beyond our region, some prickly pears grow distinct trunks and become tree-like.

Beaver tail is one of the earliest cacti to flower in late March/early April, but most of our prickly pears flower at the end of the spring season, in late April and May.

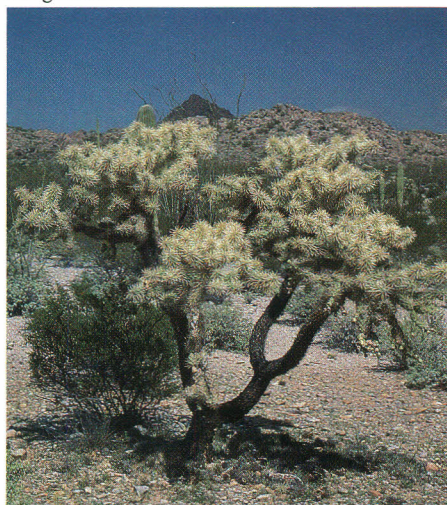
CHOLLAS (pronounced choy-ah) are those species in the genus *Opuntia* with cylindrical jointed stems. They are more drought tolerant and more numerous — more than 40 species in our region. Chollas range in growth form from low clustering or sprawling plants to large shrubs and small trees.

Most Arizona chollas bloom in April. Buckhorn and staghorn chollas (*O. acanthocarpa* and *O. versicolor*, respectively) are famous for having a wide range of flower colors; different plants may be yellow, orange, red, pink, purple, greenish, or brown.

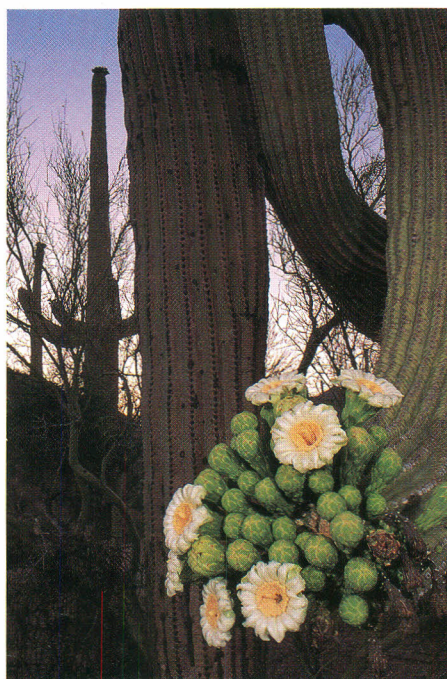
The genus *Opuntia* is in a different subfamily of Cactaceae from the other species, and is easy to recognize. Besides the distinctive “cholla” or “prickly pear” growth form (the common character is jointed stems). This is the only group of cacti that has glochids, those tiny, barbed spines that are more troublesome than the big conspicuous ones. (Glochids are an ingredient in itching powder.) This subfamily also has tiny leaves on young growth. All the other cacti in our region never bear any trace of leaves.



Prickly pear (*Opuntia littoralis*) pad, showing vestigial leaves



Jumping cholla (*Opuntia fulgida*)



Saguaro (*Cereus giganteus*)

COLUMNAR CACTI are a group of several genera characterized by long, cylindrical stems. This growth form is common in the arid tropics of North and South America, where height enables such cacti to compete with the dense tree canopy for sunlight. The presence of columnar cacti in the Sonoran Desert is one indication that our desert evolved from the tropical deciduous forest to the south (see *sonorensis*, Vol. 11, No. 3, Winter 1991).

Saguaro (*Carnegiea gigantea*) is the hardiest columnar species in North America, so its range extends farther north than any other. It is the only columnar cactus that is common north of the Mexican border. Its distribution is almost completely confined within the states of Arizona and Sonora. Its three-inch flowers appear in great numbers during the hot, dry foreshummer, May and June.

Organ pipe cactus (*Stenocereus thurberi*) also occurs in Arizona. More frost tender, it is restricted to Organ Pipe Cactus National Monument and adjacent warm areas. It has multiple stems that arise from ground level to a height of 20 feet. It blooms from April to August, but the two-inch white flowers are strictly nocturnal and rarely seen.

Senita (*Lophocereus schottii*) is the third columnar cactus found in the U.S. It resembles organ pipe in growth habit, and is distinguished mainly by its fewer ribs. Senita usually has five ribs, whereas organ pipe has more than 10. Young stems of senita have clusters of short, stout spines which do not obscure the very angular ribs. Mature stems develop a dense covering of long, gray bristly spines that protect the flowers from climbing animals. These bristles are the source of the Spanish common name senita, which roughly translates “little old lady.” This species occurs in Arizona only in one small valley near the Mexican border, but is widespread in Sonora and Baja California. It is actually harder than organ pipe cactus, but its distribution is

more restricted because its habitat is valley floors where cold air collects. Organ pipe grows on warmer, rocky slopes. The one-inch pinkish flowers are nocturnal, closing shortly after sunrise.

There are more columnar species in the southern parts of our region where frost is rare or absent, and still many more throughout the tropical Americas. Cardón (*Pachycereus pringlei*) resembles saguaro, but is much larger. It is common in Sonora and Baja California. Cochal (*Myrtillocactus cochal*) is a many-branched cactus from Baja California that resembles an upside down candelabra. Hecho (*Pachycereus pecten-aboriginum*) looks like a skinny cardón, with very bristly fruit that is used by native peoples as a comb. Galloping cactus (*Stenocereus gummosus*) is somewhat like an organ pipe cactus with thin, weak stems. These stems grow to about eight feet tall before bending over from their own weight, rooting and branching where they touch the ground, and thus form large thickets of tangled stems. A close relative, creeping devil (*S. eruca*), makes no effort to stand erect; its stems grow horizontally, rooting at the leading end and dying at the rear. They literally crawl across the desert in this fashion, ending up far from where they germinated. It is a rare species from the Pacific coast of Baja California.

Most of the columnar cacti are pollinated by nectar-feeding bats. The fruits are eaten and the seeds dispersed mostly by birds.

BARREL CACTI (*Ferocactus* and *Echinocactus* spp.) are named for their shape: they usually have single, massive stems. Some are truly barrel shaped; others are globular, discoid, or tall and cylindrical. There are two *Echinocactus* and about 12



Fishhook barrel (*Ferocactus wislizeni*)

Ferocactus species in our region. When mature, they range from less than six inches to over eight feet tall. The different species can be distinguished by their spine clusters. All have at least several per cluster, divided into one to four central spines and several to many radial spines. One of the central spines is usually much larger than the others, and may be broad and flat, curved or hooked, and/or strongly corrugated. The radial spines are smaller than the centrals and may be stout, or mere bristles.

All species of *Ferocactus* in our region are normally single-stemmed; if the tip is damaged they occasionally cluster. The commonest species in southern Arizona is the fishhook barrel (*F. wislizenii*), so named because the central spine is sharply recurved at the tip, unlike the other species in its range. It is a massive barrel-shaped plant up to six or more feet tall.

It flowers for two full months in July and August. A crown of two-inch flowers develops around the tip of the stem, with a wide range of colors. They are usually various shades of satiny orange, with some ranging to pure yellow or red. The fruits are yellow and can persist until the next summer, but most are eaten by squirrels and woodpeckers before that. Coville barrel (*F. emoryi*, = *F. covillei*) is a beautiful species from southwestern Arizona to southern Sonora. It has only a few spines per cluster, which accent rather than conceal the angular stems. The Arizona populations have bright red flowers in early summer. Spiny barrel (*F. cylindraceus*, = *F. acanthodes*) is a narrow-cylindrical barrel with dense spines that nearly conceal the body. It has yellow flowers in late spring.

One of the two species of *Echinocactus* in the region is known from only three small populations, so it is rarely seen. Eagle's claw cactus (*E. horizontalis nicholii*) is on the federal Endangered species list. It is a small, bluish-green barrel with bright pink flowers in late spring. Many-headed barrel (*E. polycephalus*) is not often encountered. It occurs in scattered localities in the driest habitats, such as the Pinacate lava field. It is our only barrel that clusters; old plants may be five feet across with well over 200 heads. It grows incredibly slowly in cultivation and is nearly impossible even to keep alive. Ten-year-old seedlings at the Desert Museum are only two inches across; the giant clusters are probably centuries old.

HEDGEHOG CACTI (*Echinocereus* sp.) are all small plants; the largest species in our region is rarely two feet tall. Most species have several to many unbranched stems up to a foot tall. The desert species bloom in April, typically with glowing purple flowers. Arizona rainbow cactus (*E. rigidissimus*) is always single-stemmed. Its comb-like spines do not puncture skin, and are arranged in alternating bands of white and



Pincushion (*Mammillaria microcarpa*)

pink. The flowers are spectacular: nearly flat and four inches wide, of dazzling pink with yellow anthers and green stigma at the center. This species occurs in the semi-desert grasslands and blooms in May.

PINCUSHION CACTI (*Mammillaria* and several smaller genera) are a very large group of very small plants. Few are more than four inches tall and twice as wide. But they are astonishingly diverse! There are about 100 species of *Mammillaria* in our region, seldom noticed because most are tiny and usually hidden under shrubs. Some, such as cream cactus (*M. heyderi*) grow flush with the surface, even shrivelling and pulling underground in the dry season.

Our common local species, *Mammillaria grahamii* (= *M. microcarpa*) can serve as a rain gauge. It sprouts a ring of one-inch pink flowers five days after the first summer rain; they last about a week. It repeats this performance once or twice in response to subsequent rains.



Hedgehog (*Echinocereus* sp.)



Night-blooming cereus (*Peniocereus greggii*)

NONE OF THE ABOVE There are a few leftovers that don't fit into one of the major groups. One of them is the Arizona night blooming cereus (*Peniocereus greggii*). It is a tuberous rooted plant and the above ground stems are thin and very cryptic. The stems typically grow among those of creosote bush or some other shrub and are very difficult to find. From these insignificant stems, however, spring a most beautiful flower. A flat trumpet six inches long and three inches wide, its white petals shine like a beacon at night. Some people can find it by its heady aroma; others can't detect a scent.

There is a legend that all the plants of this species flower on only one night a year. Like most legends, this is a bit exaggerated. The flowering is highly synchronous, most of the plants in a population blooming en masse on two or three nights a year, usually in June. A large wild plant may have a dozen flowers in a night; in cultivation more than 100 are possible. People have been known to throw parties on "cactus night" to share the spectacle with friends and neighbors.

A Culinary Tour of Sonoran Cactus Fruits



Fishhook barrel fruit

The fruits of many cacti are relished by people. No species of cactus has toxic fruit, but some are dry or so spiny as to be inedible. The columnar cacti have the best fruits.

Saguaro and organ pipe fruit are sufficiently large and abundant to be worth collecting; the pulp of both species is an appealing bright red, juicy and sweet. The fruits of saguaro ripen in the heat of June; they are best when they dry on the plant and turn into a natural fruit leather full of small, crunchy seeds. The fruit are easy to handle because they are spineless, but often difficult to reach because they are borne only on the tips of the branches. Organ pipe fruit is soft and messy, and very sweet. Like saguaro, the seeds are small and edible. The fruit is quite spiny, but the spines come off easily when the fruit is ripe.

Galloping cactus is a candidate for the finest of all cactus fruits. It is a large, three-inch globe, and filled with a firm yet juicy, bright red pulp that is both sweet and tart. Unfortunately, they are unpredictable; the plants bloom and fruit not in a given season, but after a rare good rain. They are never found in large quantities.

Some species of prickly pears have juicy fruit. In our area the best is Engelmann prickly pear (*Opuntia engelmannii* or *O. phaeacantha* var. *discata*). They are not very good to eat directly, because the seeds are large and very hard. They are most often made into juice, jelly, or syrup. The pulp is deep purple-red, quite tart, and with a distinctive flavor that is not like that of any familiar fruit. The fruit must be picked and handled with great care, to avoid the abundant glochids.

Some hedgehog cacti (*Echinocereus* spp.) have large, tasty fruit. The fruits are spiny, but, like organ pipe, the spines are easily removed when the fruit is ripe.

Strawberry cactus (*E. engelmannii* and others) supposedly taste like their namesake, but this takes some imagination. The flavor is unique.

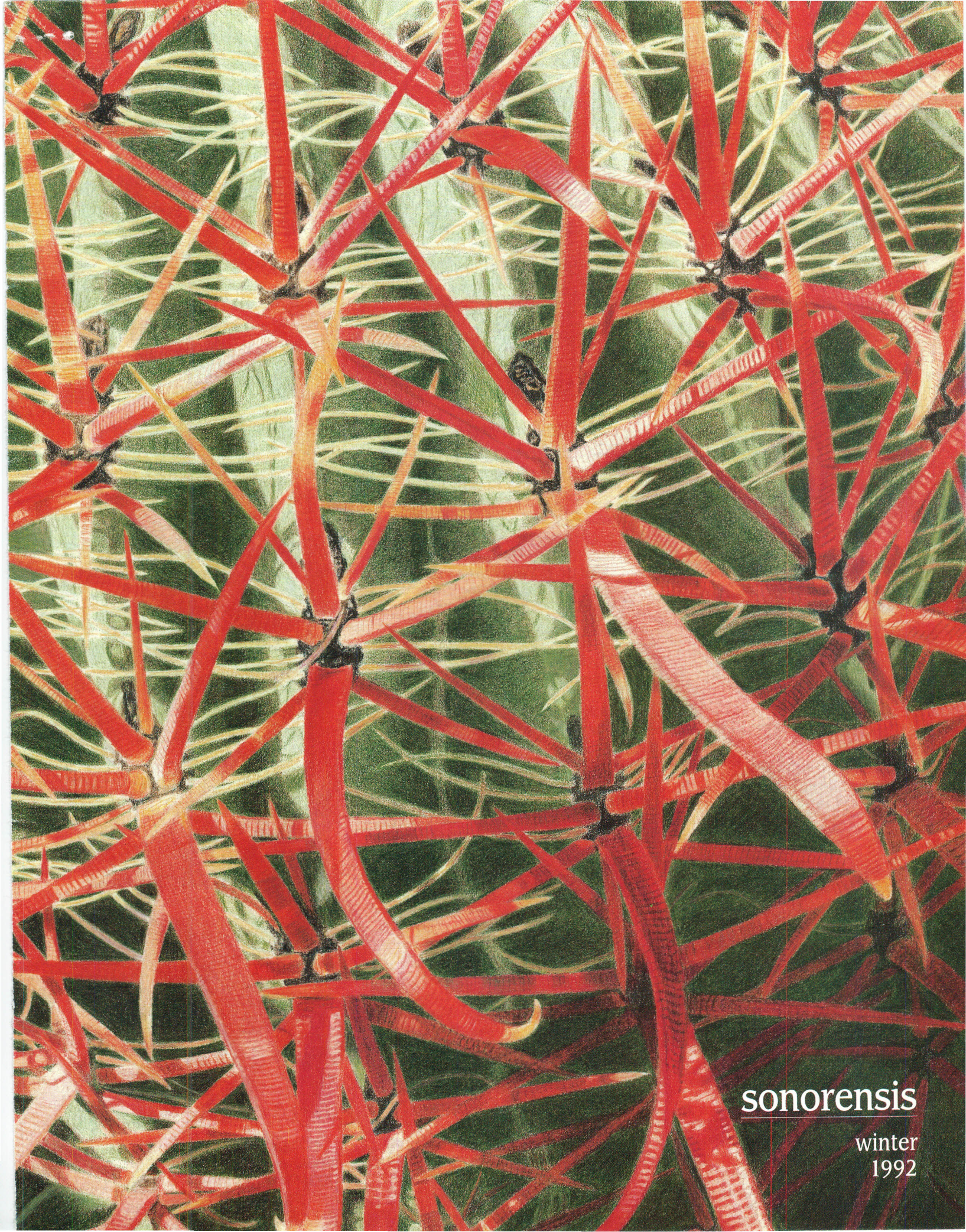
Barrel cacti have no juicy pulp around the seeds, but some species have an edible rind. The fruits of our common fishhook barrel (*Ferocactus wislizenii*) have a thick rind that is quite sour and somewhat lemony in flavor. It is eaten raw or made into a tart marmalade.

Pincushion cacti have tiny but edible fruits. Some species are bland; others are high in vitamin C which gives them a tart taste. For those of you familiar with the tiny wintergreen berries of the Midwest, some pincushion fruit have a taste reminiscent of them.

A legal note: In most parks it is permissible to eat cactus and other fruits on site, but only native Americans may remove fruit from the park. If you want to collect quantities of fruit to take home, you need to do so on Forest Service or BLM land. On private land you must obtain the landowner's permission.

A word of caution about commercial cactus candy. This is usually made from fruit, and is OK. Some, however, is still made from the BODIES of barrel cacti. These plants live well over 100 years, and such a harvest obviously kills the plants.

In the early part of this century the hills surrounding the Coachella Valley (Palm Springs and surrounding communities) supported a forest of spiny barrels (*Ferocactus cylindraceus* or *F. acanthodes*). Long-time residents of the area report that they were wiped out by makers of cactus candy. Barrels are uncommon there today, more than 50 years later. If the product does not say it's made from cactus **FRUIT**, don't buy it.



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Museum News

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sonorensis is the Latin, scientific term indicating the species classification of many plants and animals of the Sonoran Desert Region.

On the cover: red-spined barrel cactus (*Ferocactus gracilis*). Artwork by Pamela Ensign Wollam.



PHOTOS BY MARY GOODMAN

Evening with Tad Nichols a Wonderful Event

The third annual event sponsored by the Foundation's Directors Club, an evening with E. Tad Nichols (and salute to the major donors to the Campaign for the Sonoran Desert Habitats), was a huge success. Nearly 200 people attended the dinner - double the size of previous Directors Club events. Our gratitude to all who helped make the evening a night to remember.

E. Tad Nichols with a Navajo rug woven for a documentary film produced by Tad. That film, another film showing amazing footage shot by Tad of the eruption of Mexico's Paricutin volcano and Tad's narration of Glen Canyon photographs before the canyon was flooded, captivated the audience.

The committee which made the evening with Tad Nichols the most successful Directors Club event held (L-R): Reyn Voevodsky, Co-Chair; Patty Doerr; Margot Denny; Mary Foster, Co-Chair; JoAn Marder.



Members Meeting Attracts Record Crowd

The Annual Meeting of Members attracted over 200 people on October 12 to participate in special activities planned by docents and staff, enjoy an address by writer/entomologist Dr. John Alcock, and to hear reports on ASDM matters over the year. The results of the election of new Trustees by mail ballot were announced. They are: Dr. John Doerr; A. Alan Hanshaw; Nancy K. Laney; Mitchel P. McClaran; J. McCrary. We are pleased to welcome our new Trustees.

At the first meeting of the 1991-92 Board of Trustees on October 12, officers for the year were elected by the members of the Board. We congratulate Peter L. Kresan, President; Mary K. Foster, Vice-President; Dr. Suzanne Tumblin, Secretary; David O. Johnson, Treasurer.



L-R: Tad Nichols, Dan Norton. Dan Norton, President of the Foundation, expertly emceed the dinner.