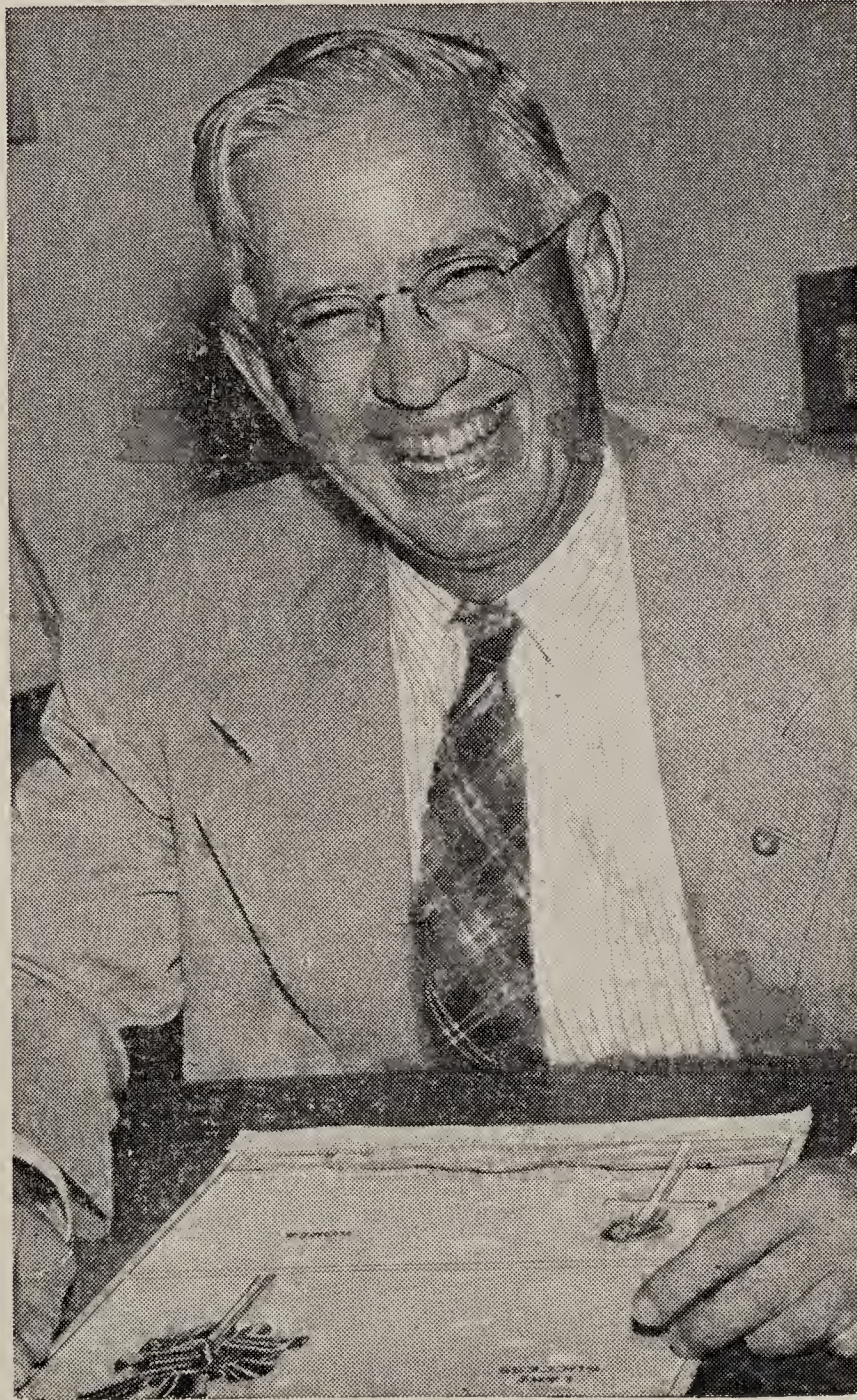


# SAGUAROUND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

JANUARY, 1952



Reg Manning Photo, F. Stroup



REG-MANNING



# Policy of Saguroland Bulletin

Our magazine has for its primary purpose the advancement of the Desert Botanical Garden and of interest in all forms of desert vegetation.

Our considerable experience with visitors to the desert has shown us that interest in desert plants is not confined to Succulent plants but extends also to the trees, shrubs and annuals of the regions of little rainfall both in the Americas and in Asia, Africa and, in fact, of desert regions generally.

One magazine in America, two in Great Britain and several in Europe are devoted to the succulent plants but we know of no magazine that is devoted exclusively to desert plants of all kinds and we hope that Saguroland Bulletin can be built, with much outside help, into such a periodical.

The first half of each issue will be devoted to articles of interest to everyone, even though they may have no interest in the scientific approach. The second half will contain semi-scientific articles, the publication of new species and reports of the progress of investigations or suggestions for needed investigations.

We solicit articles along the lines of our policy, reserving the privilege of editing such articles for factual statements but we will publish well thought out articles even when in disagreement with our opinions.

Specifically we invite our European friends to contribute articles, with the viewpoint of European thought, on desert plant life for either section of the Bulletin.

For uniformity we will follow

the rules of the International Botanical Congress and our authorities for certain families are as follows:—

Cactus Family: — Cactaceae of Britton and Rose as amended in Cactaceae Marshall & Bock and by Marshall in "Cactus" Paris 1944, No. 2, 3 & 4.

Spurge Family:—Succulent Euphorbiae of South Africa, White and Sloan in so far as it applies.

Milkweed Family: — Stapelieae, White and Sloan.

Crassulaceae: — The works of Robert Claussen.

Arizona Flora: — Kearney and Peebles.

In the popular section of the magazine; common names will be used with the scientific name following in brackets, for example: Apache plume (*Fallugia paradoxa*.)

In the second section; nomenclature will follow our authorities with the classification of other prominent writers following in brackets, for example:—*Carnegiea gigantea* (*Cereus giganteus* Engelman).

## South American Expeditions

Two interesting expeditions involving good friends of the Desert Botanical Garden are now in South America.

Paul Hutchison of the University of California Botanical Garden is in Chile to study and collect the plants of that county and a party consisting of Mr. and Mrs. Harry Johnson and Mrs. Florence Cariss are in Peru with the same object.

## EDITORIAL

This first issue of our enlarged Saguaroland Bulletin contains several types of articles designed to meet a diversified taste and we ask that you write to us your preferences for our future guidance. We have had to omit illustrations from this issue so that we could include more text and because the pictures to illustrate the articles were unobtainable at this time of year. We will have more illustrations in future Bulletins.

Our thanks to Reg Manning, who designed the cover in his usual clever way. Reg is Chairman of the Board for the Garden and a nationally syndicated cartoonist.

Our thanks also to Les Mahoney, Arizona's leading Architect, for his continued aid in our building problems. His advice has been most helpful in solving the problem of our defective roof. A new roof will be put on the administration building as soon as weather permits the removal of the old one, thanks to the generosity of one of the Executive Board members who wishes to remain anonymous.

Charlie Mieg, the chief cactomaniac, deserves praise also for the number of new members he has enrolled for the Garden.

We are now working on the details of the fifth annual cactus show to be held at the Garden February 17th to 24th, inclusive. We invite entries from Garden Clubs, Schools and individuals who can enter Cactus, other Succulent Plants and trees and shrubs of desert regions. Classifications include arrangements, bowls, table decorations, individual plants and collections of plants or educational exhibits. Both black and white photographs and kodachromes may

be entered in the photographic section through the Phoenix Camera Club. Frank Proctor is chairman for the Camera Club.

Write to us for schedule of the classes of entries for either the plant section or the photographic salon. Responsibility for this year's show will rest on the co-chairmen, Dave Henes of the Republic-Gazette organization, who will sponsor the show, and Hubert Earle, Chief Horticulturist of the Garden.

The drive for \$17,000.00 to complete our building program is off to a good start. Contributions to date (December 20th) are as follows:

Mrs. Alschuler.....	\$ 25.00
C. C. Pidgeon.....	10.00
A Board Member.....	2,500.00
John B. Hales.....	10.00
Miss Olive Leigh.....	100.00
Mrs. Friedrichs .....	10.00
Mr. Thomas Desmond	100.00
John H. Eversole .....	100.00
	<hr/>
	\$2,855.00

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## Nominating Committee

As provided by the by-laws of the Arizona Cactus and Native Flora Society Inc. I have this 12th day of December, 1951 appointed E. R. Blakley, Charles Mieg and James Cahill as members of a committee to prepare a list of candidates to fill the vacancies caused by the expiration of the terms of three members of said society and to report on or before January 15th, 1952, for submission to the membership at the annual meeting to be held the third Sunday of April, 1952.

W. Taylor Marshall  
President



Tumacacori Mission. Natl. Park Service photo.

## TUMACACORI NATIONAL MONUMENT

A typical old mission church which illustrates Spanish colonial endeavor and commemorates the introduction of Christianity into southern Arizona.

### HISTORIC SIGNIFICANCE

To hold the far-flung frontiers of the New Spain of 250 years ago, and to bring Christian civilization to hundreds of native tribes, Spain sent soldiers and missionary priests into the wilderness. Missions were founded among the settled tribes and presidios or military posts were set up on the borders of the hostile tribes. The frontier missions were both churches and centers of European culture and civilization. By such means, the outlying provinces of Spanish America were extended and secured.

The mission of San Jose de Tumacacori was a northern outpost of the Sonora mission chain, founded by Jesuit priests in the seventeenth century. As a reminder that Spain pushed back the frontier in our Southwest long before the United States became a nation,

Tumacacori remains today an inspiring symbol of faith, courage, and vigor of the early missionary priests and of the great loyalty and devotion of the Indian converts.

### FATHER KINO AND HIS WORK

One of the greatest missionaries was the Jesuit, Father Eusebio Francisco Kino, who introduced European culture to this region. He founded his first Sonora mission in 1687, and explored and mapped the Upper Pima Indian country in what is now northern Sonora and southern Arizona. Wherever he went he spread the Christian doctrine, gained friends among the Indians, and established missions. He initiated ranching on this frontier by introducing cattle and other livestock. To such beginnings some of our thriving modern towns owe their existence.

### TUMACACORI HISTORY

Father Kino came first into what is now southern Arizona in 1691, when he visited, at the request of the inhabitants, the small Sobaipuri Indian village of Tumacacori. He said Mass under a brush shelter built for that purpose by the Indians. By 1698 Kino

noted that Tumacacori had an "earth-roof house of adobe," fields of wheat, and herds of cattle, sheep, and goats. At every opportunity he and his successors visited Tumacacori to hold services and to encourage the ranching and farming activities. When a missionary was assigned to Guebavi, 15 miles southeast, Tumacacori became a *visita* of that mission. After the Pima Rebellion of 1751, a presidio was established at Tubac, 3 miles north of Tumacacori.

The Jesuits were expelled from all Spanish dominions in 1767, and the following year the Franciscan Order took over the Sonora mission chain. In 1773, because of Apache raids, Guebavi was abandoned and San Jose de Tumacacori became the headquarters mission of the district.

Tumacacori mission activity was at its height from about 1790 until the end of Spanish rule in the Southwest. Apparently, final building of the present church did not start until nearly 1800, and it was in use by 1822. With the small population of Tumacacori, construction of so massive a building must have required many years.

Mexico had won her independence from Spain in 1821, even before completion of the church. This change in government brought about abandonment of most of the frontier missions. The new government was unable to provide adequate military defense against hostile Indians, Mexico passed laws tending to weaken the power of the church, and mission churches were required to become parish churches. The close of the mission-building period was further hastened when Mexico ended the Spanish custom of providing government money for mission aid.

Exactly when the last resident priest left Tumacacori is not known, although this area was under the jurisdiction of a priest as late as 1841. We do know that after the Spanish settlers, soldiers, and priests departed, frequent Apache raids made life there almost impossible. In 1844, Mexico sold the Tumacacori mission lands to a private citizen. When the devout Indians finally left Tumacacori in 1848, they carried the church furnishings with them to the mission of San Xavier, near Tucson, where some of the statues are still used.

The church, deserted, slowly began to fall into ruins. Vandalism by treasure hunters and thoughtless persons gradually wrought havoc with the beau-

tiful structure, until only its massive-ness preserved it from complete destruction.

#### **THE MISSION BUILDINGS**

Various old descriptions and drawings of Tumacacori exist. These show the buildings to have been arranged with the long axis of the church running north and south. To the east was a closed courtyard, surrounded by arcades and rooms; here were the quarters of the priests, storerooms, work shops, granaries, and classrooms.

North of the church is the cemetery where many Christian Indians lie buried. An unfinished circular mortuary chapel dominates this area. After abandonment, the cemetery was often used as a round-up corral. Grave mounds of the mission period have long since been destroyed by weather, Milling cattle, and treasure hunters. Today, the visible grave mounds are those of later Mexican-American burials.

The church still stands, although the courtyard structures long ago fell almost entirely into ruin. In 1921, some repair work was done to the old buildings and walls to protect them against weather; a new roof was placed over the long nave, and lesser repairs were made to other portions. Repair work since that date has been limited entirely to preserving existing original construction.

#### **HOW TO REACH THE MONUMENT**

Situated on United States Highway No. 89, 48 miles south of Tucson and 18 miles north of Nogales, Tumacacori National Monument is readily accessible by oiled road throughout the year. Bus lines plying between both cities pass several times daily. The nearest rail connections are in Nogales. The nearest commercial airport is Nogales International Airport, 25 miles away by road.

#### **PUBLIC SERVICE AND FACILITIES FOR VISITORS**

The principal features of the area are the mission church and the museum. The monument is open daily throughout the year, from 9 a.m. to 5 p.m. The free museum is self-guiding. All visitors to the church are accompanied by a member of the National Park Service staff. The admission charge for each adult is 30 cents; children under 12 are free.

Guided trips to the church start from the Museum building at frequent in-

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## Identification of Plants

The art or system whereby we attempt to make possible the easy identification of plants in the field or in cultivation is called Taxonomy.

In the beginning of systematic botany taxonomy was largely based on morphology or external form of plants, particularly the form of the reproductive organs. Later the physiology of plants, that is their living internal organisms, supplied supplemental information to improve Taxonomy.

At this time Phylogeny, the theory of evolution of a species or other taxon, (genera, families, etc.) is aiding in the study of Taxonomy.

Phylogeny is a theory, not a proven fact, therefore the findings of Phylogeneticists are to be taken as a possible future aid in determination of taxa whereas they are frequently presented as fact. To prove the evolution of plants throughout the centuries, especially when fossil evidence is lacking or limited would require the actual observance of the change.

We ask the Phylogeneticist in the words of the Baron Mauchausen of the radio: "Vas you dere Charlie?"

Phylogeny may tend to confirm preliminary classifications or it may cast doubt on such preliminary work and changes in classification based on such evidence should be undertaken with great caution.

In approaching any biological study some form of formal classification is necessary and this first grouping of entities is subject to change as more facts are assembled.

Some Taxonomists favor a broad concept of specific, generic and

family grouping. To this first division of Taxonomists a species may cover many geographical forms provided there is a continuous intergradation throughout the range. Saguaroland Bulletin accepts this interpretation and broad generic and specific divisions will be the rule in our publication.

The second division of Taxonomists accept very narrow delimitations for both generic and specific separation. This works out fine if one is working with a few plants and far from the habitat of the plant. It does tend to provide an ever increasing number of genera and species, most of which are based on slight distinctions.

We, therefore, will continue to take a conservative stand on the taxonomy of all desert plants.

## CULTURE OF CACTUS.

There have been many articles and books written on the culture of cactus but each reflect the author's personal experience in getting his cactus to grow and bloom in his particular climate and portion of the world. One procedure that would work out fine in New Jersey would not apply in Oregon.

The growing of cactus is necessarily a matter of trial and error in any part of the world until you are able to determine what your plants need. The cactus clubs and societies in various parts of the world have aided materially in helping cactus growers to get their plants established by printing and circulating helpful hints on the care of cactus.

There are a few general rules that one must bear in mind to keep your cactus plants growing:

1. The soil must be very porous, rich in plant food and neither alkaline or acid, but well balanced.
2. Plants should have ample

light and some sun daily.

3. Do not overwater your plants.

4. Give the plants a good rest through the winter months if you want them to flower.

5. Do not plant cactus along with leaf succulents.

It should be noted that cactus that have many spines have grown in dry and sun exposed regions while cactus that have white spines or white hair-like spines indicate a liking for an alkaline soil. Plants that have few spines indicate that they have been growing in partial shade, good soil and have much water. Look over any new plants that you buy, trade or have been given and check them to see in which of the above categories they may fit.

It is important that your soil be porous and made up of proportions of sharp cut sand and top soil to which can be added a prepared fertilizer, such as Vigoro. This fertilizer is free from weed seeds, nearly odorless and does supply practically all of the needed elements to keep your cactus looking healthy. Peat moss is of no particular value as it holds the moisture too long, thus creating a hazard to your cactus plants' roots for rot may start from too much moisture. Cactus plants do not like to have wet feet. Many of the manures will burn the plants unless they have been aged for three or more years.

If you are planting your cactus in pots be sure that the pots have good drainage. A pot with a semi-glaze will not dry out as fast as a clay pot. Plants in clay pots have to be watered oftener, as the plants are in an unnatural environment as the moisture evaporates through the exposed side of the clay pot. It is a good idea

to plunge your pots into your outdoor cactus beds when the weather permits and then lift pot out of bed in the fall, thus not disturbing the roots of the plant.

Be sure and trim off all broken or bruised roots with a sharp knife, otherwise rot may form in the broken or bruised roots and then go up into the plant. Dip the cut section of the plant's root in sulphur or powdered charcoal to hasten callousing of the root. When the plant has calloused place it in a pot or dry section of your cactus bed and keep water away from it until it begins to set out new roots from the calloused root cuts. Lift the plant out of the pot or soil occasionally to inspect it for new roots before applying water.

More cactus plants are lost due to overwatering than through neglect of watering. Plants should have good soakings during the growing season and then taper off watering just before the colder months approach. Never water your plant if the ground is already moist; always let the ground dry out thoroughly between waterings. Keep water away from plants during the dormant period. There are very few of us who like to be awakened by a shot of water on a cold day in winter.

During the dormant period plants can be stored away in a cool, dry but light part of your basement and will do very well if put away in cold-frames, but must have some circulation of air.

Many times persons will try and try to get their cactuses to grow along with their crassulas, semperviviums, aloes, stapeliads, etc., and then wonder why the cactus dies or vice versa. The leaf succulents, and succulents other than cactus, have a growing period that is at a different time of the year than that of cactus. Cactus grow

during the warm months while many other succulents do most of their growing in the cool months. So it is thus a losing proposition to attempt to grow cactus along with other succulents.

Cactus is one of the toughest of plants and will stand lots of abuse and neglect and yet will in return give out with beautiful blossoms. What other plant will still grow and flower with but about six months of your attention?

Culture of leaf succulents, desert trees and shrubs, seed propagation and grafting will follow in later articles.

W. HUBERT EARLE.

## ELEPHANT-TREES OF ARIZONA

A large number of trees belonging to the *Bursera* family are found in Mexico, but only two species from this family are found in southern Arizona. They are *Bursera odorata*, commonly called fragrant bursera, and *B. microphylla*, or elephant bursera. Fragrant bursera is found in Arizona only on dry limestone foothills on the western side of the Baboquivari Mountains, near Fernal, in Pima County. The trees in this limited area appear to be relics left from a more favorable period. They are strongly aromatic shrubs or small trees up to 15 feet high. The leaves are pinnately compound and 2 to 4 inches long composed of 5 to 11 lance-shaped leaflets with smooth edges. When crushed they have an odor like tangerine peel, and from this odor get their name. In July the cream colored flowers appear in a cluster near the end of a short side twig. These are followed by gray three-angled fruits, which split into three parts,

exposing the single large seed. The young bark is gray-brown in color. The old bark on the trunk exfoliates in large thin sheets.

In Mexico the resin obtained from many of the species of *Bursera*, including *B. odorata* is used for cement and varnish, and for treating scorpion stings. It is burned as incense in the churches and was formerly employed for this purpose by the Aztec and Mayan people.

*Bursera microphylla* is found on the slopes of dry rocky desert mountains. In Arizona a few trees are found growing in Pima Canyon in the Salt River Mountains of Maricopa County, which is the northern extent of their range. They are also found from western Pima County west to the Gila and Tinajas Altas Mountains of Yuma County, and in southwestern California and Mexico. They are strongly aromatic shrubs to small trees 20 feet tall and one foot or more in diameter at the base.

The reddish barked, crooked branches taper rapidly, and resemble the trunk of an elephant. The pinnately compound leaves consist of 15 to 30 small, narrowly oblong leaflets. The small whitish flowers are borne in July. They occur singly or up to three at a node. These are followed by three-angled reddish colored fruit which split into three parts, exposing the single large, bony seed. The bark on the young branches is reddish brown. This turns to a whitish papery bark, which peels off in thin flakes. Under this exfoliating layer of older bark is a layer of green bark, which carries on photosynthesis when the leaves are lost because of drought. Under the green layers are several layers of thick corky red bark covering

the hard pale yellow wood. The tree cannot withstand much cold and therefore, the trees along the northern limits of the plant range are usually frozen back each year. The bark contains tannin and was gathered in Sonora, Mexico for export.

Elwood R. Blakley

## BALL-MOSS IN ARIZONA

Deep in the canyons of Santa Cruz County, in southern Arizona, is found the only flowering epiphytic plant in Arizona. This unusual plant is a member of the Bromeliaceae or pineapple family, which is native of tropical America. The ball-moss of Arizona, *Tillandsia recurvata* L., is a close relative to *Tillandsia usneoides* L. which is the Spanish moss commonly found hanging from the trees in the southern United States.

Ball-moss was first discovered in Sycamore Canyon, near Ruby, Arizona, by Phillips in 1910, and later by E. B. Bartram, at Flux Canyon, in the Patagonia Mountains. At these two locations the ball-moss is found growing as an epiphyte on the branches of live oak trees, *Quercus emoryi* and *Q. toumeyii*. The ball moss is not a parasite on these trees, but merely uses them as a point of attachment. The leaves are two-ranked, crowded, awl-shaped from an enlarged base, and scurfy-canescenscent. Water needed for its growth is absorbed from the moisture in the air by means of special hair-like trichomes, which cover the surface of the leaves. Due to the arrangement of the leaves, rain water is channeled down the leaf groove to the enlarged base, where it is held for a short time thus increasing

the amount of moisture available to the plant. Water loss by the plant is retarded by the presence of a cuticle layer over the outside of the leaf. The perfect flowers occur in a spicate inflorescence and bloom in September and October. The inner perianth segments are petaloid and violet colored. Numerous seeds are produced which aid the plant in spreading from one tree to another.

Elwood R. Blakley

## VEGETATION OF THE ARIZONA DESERT

### A SERIES—PART I.

In the explanations we shall give on the vegetation of the Arizona Deserts we will closely follow the outline of work as we give it to our Thursday afternoon classes at the Garden.

Our desire is to make desert plants familiar friends to our students so that they can appreciate the difficulties such plants have overcome and perhaps find that the desert is a most friendly place rather than the barren waste of their preconceived ideas.

What we have to say of our desert will apply in a general way to the vegetation of all deserts which has all had similar difficulties in similar ways.

Desert plants fall into four general divisions as follows:

Succulents or plants which store food and water when available for use during periods of drought. They make this storage either in the stem of the plants or in its leaf and are therefore either stem succulents or leaf succulents.

Xerophytes or dry dwellers:— Plants which survive by sending deep tap roots to water table, or

by reduction of leaf surface or by dropping all leaves and going into a complete rest during drought periods, or by a combination of these devices.

Mesophytes or plants intermediate between Xerophytes and plants of wetter regions, and these are found along streams in the desert or along dry stream beds with an underground water flow.

Annuals which greatly resemble the annuals of other regions but will be found on investigation to complete their life cycles in a much shorter time than do the same plants of wetter regions. We also find a difference in the coating of the seeds. These plants are dependent on seasonal rains.

## STEM SUCCULENTS

On the North and South American deserts most of the stem succulents are included in the Cactus family. A few species of the Spurge family (Euphorbiaceae) notably the Slipper Flower Plant (*Pedilanthus macrocarpus*) show stem succulence.

On the African and Asiatic deserts, Cactus is unknown except as it has been introduced since the discovery of America. The same forms as displayed by the Cactus family on the American deserts are found in member of the Spurge family (Euphorbiaceae) and the Milkweed family (Aizoaceae) on the deserts of the old world.

The fact that like conditions produce like forms is called Parallelism. Thus we find that not only are the cactus-like forms produced in different families on both old and new world deserts but that other recognized forms are duplicated. Some of these

duplications we will comment on in our chapter on leaf succulents.

The stem succulents meet adverse conditions by storing food and water within the stems in a special storage tissue of thin walled cells which permit the passage of sap through the cell walls. This action is called osmosis.

(Continued in the February Issue)

## Editorial

(Continued from Page 4)

No construction can be started until late April at the earliest, as the work would interfere with our visitors. This leaves us about three months to raise the additional funds for the work. As we said in December, most of the funds will have to come from large contributors, but we hope to have an increase in the \$10 to \$100 contributions after the first of the year. Remember that all contributions may be deducted from income tax reports.

Our attorneys, John H. Eversole and William Eliot are working on details of the proposed revisions of our by-laws to assure the continuance of the policies that have been so successful in the management of the Garden in the past five years and we will have details ready for presentation to the members for their vote very soon.

The staff at the Garden extends to the membership our best wishes for 1952.

## Tumacacori

(Continued from Page 6)

tervals.

Superintendent Jackson and Ranger Henson will be glad to see you and we ask that you mention to them that this article aroused your interest in Tumacacori.

From Desert Botanical Garden  
P. O. Box 647, Tempe, Ariz.  
TO:-

## Desert Botanical Garden

Book Dept.

P. O. Box 647

Tempe, Ariz.

### PACKAGED CACTUS PLANTS

Attractive packages with cut cellophane packing.

		Price	Post- age*
No. 5	5 plants	1.00	.30
No. 10	10 plants	1.50	.40
No. 10W	10 white spined plants, collectors items	3.00	.40
No. 15	15 larger plants	2.50	.50
No. 16	16 still larger plants	4.50	.60
No. 24	24 large plants many of flowering size	7.00	1.00

### JELLY AND CANDY

Prickly Pear Jelly—			
	4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor	2.20	.80
Prickly Pear Delight—			
	A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor		
	½ pound box	.80	.20
	1 pound box	1.50	.30

### BOOK SUGGESTIONS:—

	Price	Post- age*
Arizona's Cactuses; Marshall		
paper binding	1.00	.15
cloth binding	2.00	.20
A description of all of the species native to Arizona. 60 ills.		
Flowers of the Southwestern Desert—Dodge	1.00	.15
Flowers of the Southwestern Mesas—Patraw	1.00	.15
Poems of the Desert by Lou Ella Archer.		
Cloth bound, beautifully illustrated in color		
Canyon Shadows	2.00	.10
Sonnets to the Southwest	2.00	.10

\* Postage and wrapping charges.

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## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

FEBRUARY, 1952



*Ferocactus alamosanus* flowers.

Geo. Olin photo.



REG-MANNING



## COMING EVENTS

February 3rd. Photographic Society of America showing of Nature slides in color at the 3 P. M. and 4 P. M. lectures.

Tuesday evening, February 5th. 8:30 P. M. Meeting of Cactomaniacs in Webster Auditorium. No further notice will be mailed.

February 10, 12 and 13. Photographic Society of America's Salon of 50 nature studies in black and white. No lectures on this Sunday, Feb. 10.

February 17th. Opening of the Fifth Annual Cactus Show at 12 noon. The show will continue throughout the week and close at 5 P. M. Sunday, Feb. 24th. Exhibits of desert plants in pots, bowls and arrangements by individuals and Garden Clubs. Photographic Salon with black and white and kodachrome pictures. Open daily from 10 A. M. to 5 P. M. No admission charge.

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### Editorial

Our attempt to raise the money needed for our very essential building program has bogged down completely with no contributions to report since the January Bulletin went to press. It is certainly unreasonable to expect a family to camp in a trailer forever and the Earle family has done so for five years and is surely entitled to decent living quarters on the grounds when we require them to be there for the protection of the property. We must build them decent living quarters and we appeal to you for financial assistance to that end.

The number of interested visitors to the Garden is 25% higher than last year, which was the highest recorded. Attendance at classes and lectures is 33% higher than previous records.

The fifth Annual Cactus Show Feb. 17th to 24th inclusive should attract about 25,000 visitors this year and, we believe, it will be better and larger than ever before. Chief Horticulturist Earle is the year's show manager and he is exerting every effort to interest individuals and clubs in making entries. The Phoenix Camera Club, who sponsor the photographic salon at the show, promise a better exhibit than ever before. Mr. Frank Proctor is chairman of this section.

For schedule of classifications or information on the show write to the Show Committee, Box 647, Tempe, Ariz. or phone Phoenix 5-1815.

The nominating committee of the Arizona Cactus and Native Flora Society, which is the corporate name of the Desert Botanical Garden, has selected Reg. Manning, John H. Eversole and W. Taylor Marshall as their choice of candidates to succeed themselves at the April election. Members will be given an opportunity to write in any additional names they may prefer on the ballots which will be mailed with the March issue of Saguaroland Bulletin. Additional nominations may also be made from the floor at the Annual Meeting of the Society on Sunday, April 20th, at 3:30 P. M.

Our mineral exhibit in Webster Auditorium has been greatly enhanced by the loan of the mineral collection belonging to Jim Blakley but we still need additions to the collection of Indian artifacts, especially baskets, either by gift or loan.

Our thanks to Mr. Howard Soule for his excellent talk on the National Monuments of Arizona and his kodachrome illustrations. The talk was given on Sunday, January 13th and attracted a record attendance.

### VEGETATION OF THE ARIZONA DESERT A SERIES—PART II.

(Stem Succulents continued)

The storage tissue is both bulky and heavy, so the stem succulents are provided with a central woody

core composed of a circle of light but rigid poles, united at intervals for strength. As a result of this structure the stem succulents show to a marked degree the quality of rigidity.

Storage tissue is very likely to cause a swollen appearance in the stem, sometimes to a grotesque proportion. We call this quality massiveness.

A normal tree or shrub bears a multiplicity of leaves for most of the year. These leaves usually are smooth and green on the upper surface and roughened with numerous pores on the under surface.

These pores allow for transpiration or loss of excess moisture and would prove a handicap for desert plants. Therefore we find that stem succulents are mostly leafless or if leaves are present they are small, sometimes awl-shaped and remain on the plant for a very short time.

The green upper surface of leaves contains chlorophyll, which is necessary for the life process of plants and as our stem succulents are usually leafless we find the needed chlorophyll is present below the skin of the stems of such plants.

Therefore from the external appearance we can identify a stem succulent by its rigidity, its massiveness and by its green stems.

Since stem succulents are about 92% water it follows that an injury would permit the loss of an appreciable quantity of the stored water if the sap were watery. To guard against such loss the stem succulents have either a milky juice or a mucilage-like juice, either of which coagulate rapidly and stop water loss within a few minutes of an injury and finally harden into a woody scar tissue.

Milky juice is noted in succulents in the Spurge family (Eu-

phorbiaceae), the Milkweed family (Asclepidaceae and not Aizoaceae as erroneously stated in the January Bulletin) and in some species of the genus *Mammillaria* in the Cactus family.

Mucilage-like juice is noted in all species of plants in the Cactus family except the above noted *Mammillarias* and in the genus *Solisia*.

As a further preventative of water loss the stem succulents have a coating of wax overlaying the outer skin. This wax is sometimes so thick as to give a whitish appearance to the stem of the plants as notably exemplified in *Lemaireocereus beneckii* and *Pedillanthus macrocarpa*.

In the March Bulletin we will briefly discuss the leaf succulents.



COVER ILLUSTRATION

*Ferocactus alamosanus* B.&R. is the best barrel for flowers as it bears all during the summer months and the flowers are large, yellow with a red eye and easily visible because of the few spines.

The plant illustrated is a variety of *platygonus* Lindsay.



Tonto Ruins. National Park Service photo.

## TONTO NATIONAL MONUMENT

Fourteen-century cliff dwellings of the Arizona Salado tribe, who were among the finest craftsmen of the prehistoric Pueblo Indians.

Tonto National Monument is set aside to protect some of the most accessible and best-preserved cliff dwellings of southern Arizona. The southern Arizona group of Pueblo Indians, who built the cliff dwellings in this area, were not too different from the present-day Zuni and Hopi. They have been named the "Salado Branch" by archeologists, the term "Salado" meaning salty, having been derived from the Salt River, near which the Indians procured salt crystals.

The cliff dwellings were occupied during the 1300's, a period determined by comparison of pottery and other remains with material from other sites accurately dated by annual growth rings in timbers used in construction of the

buildings. A single date of A. D. 1346 is recorded from the cliff dwellings.

### THE CLIFF DWELLINGS.

On both sides of the Roosevelt Lake basin are many long canyons leading up into the mountains. Near the tops of some of the canyon walls are cliffs in which shallow caves are located. The cliff dwelling seen from the Tonto parking area is located in a natural cave in the quartzite cliff. A good trail, a half-mile long, with a rise of about 330 feet, leads to the ruin.

This cliff dwelling is a pueblo of rough masonry walls, with adobe clay used as mortar and plaster, native rock as a filler. The walls were laid up in courses two to three feet in height. When these walls were built to the ceiling level — about six feet high — juniper or pinyon poles were laid across the room, one end resting on the wall, the other on a center beam supported by an upright post. A substantial layer of saguaro ribs was laid on the poles, and this covered with a three- or four-inch layer of adobe. A

similar roof on the second-story rooms furnished good deck space which was well-lighted and ventilated.

When complete, this house had about 25 rooms.

#### DESERT PLANTS.

Although Tonto National Monument is primarily an archeological area, it has a variety of desert plants which are interesting. The Upper and Lower Sonoran life zones are represented by several species of cacti and by the desert chaparral cover. Barrel, herghog, fishhooks, and several kinds of cholla cacti are abundant, and of the various species some should be in bloom during April and May. The saguaro or giant cactus, most spectacular in this area, should bloom early in June.

The mesquite, paloverde, crucifixion thorn, graythorn, catclaw or acacia, and jojoba predominate to make the brushy desert chaparral cover. Many of the plants are labeled for identification by the visitor, and further information on plant life and archeology may be obtained from the interpretive staff of the monument.

#### HOW TO REACH THE MONUMENT.

Visitors from Phoenix, Mesa and other points in southern and western Arizona should turn off United States Highway 60-70 at Apache Junction, 24 miles east of Mesa, Ariz. The approach road from Apache Junction is the Apache Trail (State Highway No. 88), a good gravel road through the rugged Superstition Mountains to Roosevelt Dam and on past Tonto National Monument to Globe and Miami, Ariz.

Visitors en route to Phoenix through Globe and Miami may turn off on the Apache Trail between those towns. Tonto is about one hour from Globe, and four hours from Phoenix.

#### SEASON AND FACILITIES.

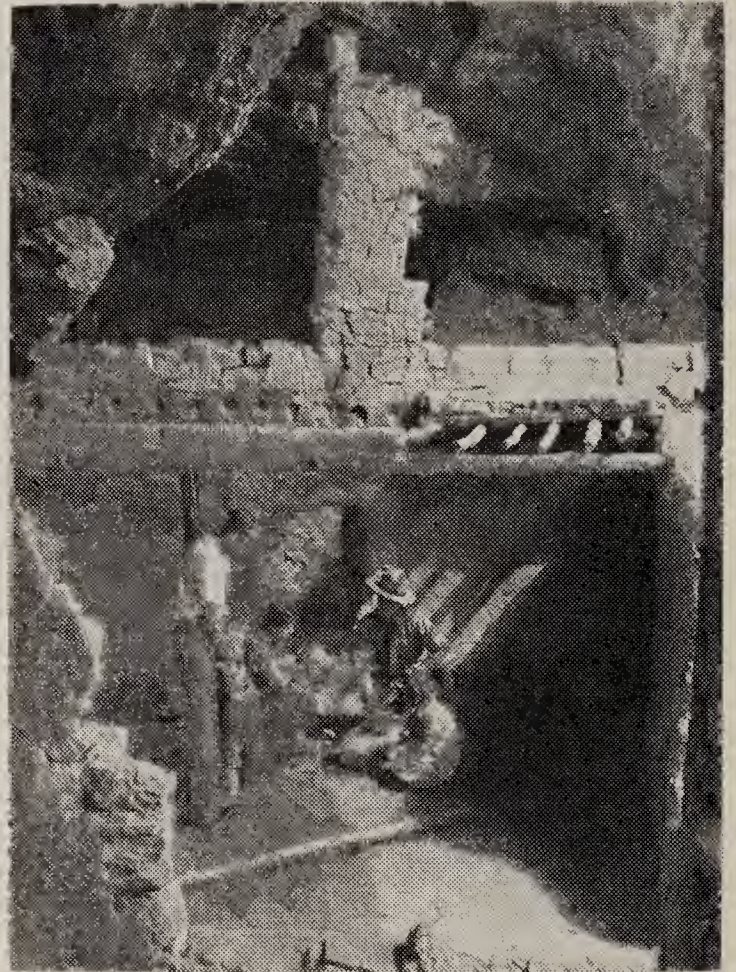
Tonto National Monument is open the year around, with the most comfortable weather for visiting occurring between late October and the last of June.

Interpretive service and guided trips are provided daily.

Good water and a small picnic area

are available in the monument, but there are no facilities for camping, and no concessions or accommodations. The small community of Roosevelt is three and a half miles from the monument.

Superintendent Sharp and Archeologist Wenger are typical examples of the well informed and courteous National Park Personnel and they will be glad to see our members.



In one of the rooms of lower Tonto ruins.  
National Park Service photo.

## ECOLOGY OF THE SANTA CATALINA MOUNTAINS

The Santa Catalina Mountains are located near Tucson, Arizona, in the northeast corner of Pima County. This range of mountains rises rather abruptly from the desert floor on all sides, except the southeast side where it is connected by a low pass to the Tanque Verde and Rincon Mountain ranges. The highest peak in this range is Mount Lemmon, which is 9,150 feet high and named after J. G. Lemmon, who collected in this area in 1880. The elevation at Tucson is 2,376 feet so the moun-

SAGUAROLAND BULLETIN

tain range actually rises 6,774 feet from the desert floor. With this increase in altitude one encounters a number of different ecological zones with different flora growing in each. The amount of moisture available, the type of soil, and the slope exposure very greatly influence the location of these zones. According to Shreve, the range can be divided into four zones. First is the desert zone, which extends up to 5,000 feet on the south side of the range and only up to 4,000 feet on the north side of the range. Above this is located the Encinal zone, which extends from 5,000 to 7,000 on the south side of the mountain and on the north side from 4,000 to 6,000 feet. The pine zone is still higher up the mountain. It extends from 7,000 feet to the top of the mountain at 9,150 feet on the south side and from 6,000 feet up to 8,500 feet on the north side. The last zone is the fir zone, which is located only on the north side of the mountain range from 8,500 feet up to the top at 9,150 feet. These zone divisions are based on only approximate elevations in feet, but they show that there is a decided difference between the south slope and the north slope of the range. This difference can be explained partly by precipitation and evaporation differences of the two slopes. The rain clouds come in mostly from the Gulf of Mexico, which is located toward the southwest. As the air currents carrying these storm clouds strike the south side of the mountain range they are forced to rise. At higher altitudes they are not able to hold all the moisture they contain so part of it is lost on the top or north slope of the range in the form of rain. This moisture is available longer to the plants of the north slope because the hot, dry desert winds are stopped by the moun-

tain range, thus cutting down evaporation of the available moisture. This altern effect is also noticeable on all slope differences over the entire extent of the mountain range, no matter how small these slope differences may be.

The desert floor west and northwest of the Santa Catalina Mountains is covered by the Arizona Succulent Desert, (Shreve). It is composed of open plains and low mountain ranges. These are covered with a large number of different plants, the most abundant of which are: *Larrea tridentata*, *Franseria deltoidea*, *Cercidium microphyllum*, *Opuntia Sps.*, and many other members of the Cactus family. The local distribution of these forms is dependent on the topographic and soil features of the area.

On the north and east sides of the Santa Catalina Mountains is located an isolated portion of the Desert Grass Region, Shreve. This region is located between 4,000 and 6,000 feet in elevation and has from 12 to 18 inches of rainfall a year. The dominant grasses are: *Bouteloua*, *Sporobolus*, *Aristida*, *Muhlenbergia*, *Hilaria*, and *Stipa*. Associated with the grasses are found a large number of different species of cacti and yucca. This region tends to pass into the scrub oak association along its upper limits.

If a person should drive up to the top of Mount Lemmon from Tucson and keep a record of the altitude at which the different species life zones appeared, they would get a general pattern of zones similar to that of Shreve. Starting at the base of the mountain and driving upward, at 2,600 feet they would notice that the Saguaro cactus are very numerous. Those growing on the rocky hillsides do not tend to put out arms, while those in the bottoms

of canyons develop numerous arms. At 3,200 feet the Saguaro cactus and *Larrea* are becoming less numerous and *Agave schottii* is very abundant on the exposed mountainsides. At 3,000 feet the Saguaro and *Larrea* have disappeared and their places have been taken by scrub oak and *Vaquelinia californica* or Arizona redwood, on the slopes and in the canyon bottoms by Arizona ash and sycamore trees. At 3,700 feet the oak trees are becoming more common and at 4,000 feet *Agave parryi* appears along with *Dasyilirion wheeleri* and *Nolina microcarpa*. At 4,000 feet manzanita begins to appear on some of the slopes, and at 4,800

feet Mexican pinyon and alligator juniper make their appearance. These are followed at 5,500 feet on the north slope of the canyon by Arizona cypress and silverleaf oak. At 5,700 feet ponderosa pine appears and at 5,800 feet at Bear Canyon campground pines are common along with walnuts and maples. At 8,000 feet, the highest point on the road to Summerhaven is found Douglas fir and quaking aspen. In about sixty minutes by automobile you have climbed from hot dry desert to the cool mountain top where an entirely different type of vegetation exists.

Elwood R. Blakley



The deliberate perpetuation of colors and combinations has been an Indian custom for centuries.

Left to right: White on black, Black and blue on rose-pink, Blood-red, Purple on pink, Purple, Black and white, Vari-color on white. The American Indian and his colored maize are inseparable.

R. C. Proctor photo.

# THE STORY OF INDIAN CORN

By R. C. PROCTOR.

## COLORATIONS.

The vivid colors of Indian corn are believed, by botanists, to be the representations of an art that first entered into the artificial breeding of maize more than 2,000 years ago. And, from botanical reasoning based upon comparisons with its wild relatives, maize may be confidently proclaimed the oldest of cultivated cereals—if not all cultivated plants. Its long existence as an artificially developed food plant is believed to have had its origin at the hands of the American Indians far earlier than 10,000 years ago; the date believed as the beginning of tillage in the Old World.

There is little doubt, by modern agriculturists, that the wide range of colors in the kernels and their complex combinations have been maintained by a traditional effort on the part of the Indians. They have been preserved over the centuries as certain planters of each generation were charged with the duty of ensuring their perpetuation by planting the seeds far enough apart to prevent mingling of colors through cross-pollination.

In the Southwestern United States, today, certain Indian families are entrusted with the responsibility of growing special crops for maintaining certain colors. Each color or combination of colors is planted on a separate plot to prevent crossing of the colors by the wind. Special color patterns are achieved by the hand method of cross-pollination.

Of course, the widely separated plots are spread out over more ground per crop—and hence fewer plants per acre—than would be the case of a crop of White Man's regular field corn but color and variety are more important to the Indian than is quantity—and he has no corn eating stock to feed. But the Indians make more subtle distinctions than the Whites in selecting variety and

quality—incidental to color—with regard to their many forms of corn food.

It is, therefore, no accident that Indian corn is the most decorative of all food plants.

## DOMESTICATION OF MAIZE.

How can food be grown in more perfect packages than the familiar ear of corn? The delectable seeds, securely packed and arranged in rows on the sturdy cobs provide a more easily handled food—long before they are ripe—than any other cereal. This advantage has many times saved the famished Indians from starvation when previous years' crops—of various food plants—had failed. The ears simplify storage for they can be stacked in wet weather for artificial drying; the smoke from the drying fires will discourage grain weevils. Crops that are harvested in dry weather can be placed in the sun and moved about with ease. The seeds, or kernels, when stored in a dry place will remain viable for twenty years and can be accumulated as a reserve stock for use during scant seasons.

Since corn is a wind-pollinated plant it produces a superabundance of golden-yellow pollen . . . weeks before the grain is fit to eat. The Indians gather the pollen for making a delicious, nourishing soup. And in Mexico the parasite, corn smut, is regarded as a delicacy; no more unpalatable than White Man's edible mushrooms.

Any idea that Indian corn was especially designed by Providence for the use of Man would, certainly, not be too farfetched. As far back as human remains have been found maize and the American Indian have been inseparable; the interrelationship being one of interdependence. No where can maize grow without the care of Man, because, unlike other cereals, it has not the ability to distribute seeds and, thus, perpetuate its kind. An ear of corn would retain its seeds intact if covered with soil, and if it did not rot the seeds might germinate in a mass and the

young plants would soon be choked off. Moreover, while other seeds can grow normally in competition with weeds, maize, the product of an individual plant culture, cannot survive a condition of forced competition with weeds and other grasses. The whole behavior of corn in any form—Indian, field, pop or sweet—bespeaks of a long, long period of painstaking, human care . . . not accorded to other plants.

Obviously, maize is no wild plant, nor has any wild plant been discovered that resembles it. When Columbus discovered America he found the plants, exactly, as we know them today. From the burials of the Basket Makers, of Utah (the earliest known people of the Southwest), archeologists have unearthed ears of corn that are identical with those that are grown by the successors of the original growers. From the United States, south, to Peru, the story is the same . . . ears of corn exhumed from the most ancient graves are fully developed, and like those that are now grown in the same regions. An ear exhumed from a pre-Inca grave matches the modern ears of Peru. There is no reasonable doubt that human hands—no telling how many centuries before—planted the seeds that produced that fossilized ear.

Thus, the record of maize as a cultivated plant embraces a period of many thousands of years; and it probably underwent a period of development fully as long before it was perfected to the point exhibited by the fossil ear.

The artificial development of maize, evidently, reached a very high level in extremely ancient times; considering not only the large sizes of the prehistoric ears but also their attractive colorations. Surely the colors of Indian corn today were not preserved by chance. In our modern corn belt where color is not a factor the colors have completely disappeared—except for the yellow and white ears—which leads to the inevitable conclusion that the colors of modern Indian corn are the results of the Indians' desire to maintain them.

## ORIGIN OF MAIZE.

The birthplace and parentage of maize are shrouded in mystery, but current botanical opinion places its original home in Guatamala or Mexico; for it is in these regions that all of its close, wild relatives are found today. The manner of origin, however, is not so easily determined but some very interesting hypotheses by men of science are on record, from which the following outline has been sketched:

Maize, or *Zea mays*, is a member of the grass tribe, *Tripsaceae*. All members of this tribe are characterized by the male and female flowers being born in separate flowering heads or on separate parts of the same inflorescence; a fundamental distinction, and indicates that all genera of this tribe are **closely related**. There are three genera of American plants in this tribe; they are *Tripsacum*, *Euchlaena* and *Zea*. The first two occur as wild plants in North America, and the latter is our cultivated corn, or maize. There are numerous species of *Tripsacum* and two *Euchlaena* but in *Zea* there is only one—namely, *mays*.

The male and female flowers of all species of *Tripsacum* are in the same panicle, or inflorescence. The male flowers are borne on the upper sections of the branches, the female flowers on the lower ones. In *Zea mays*, or corn, the male flower is borne at the top of the plant, as a tassel (except the freaks), and the female flower is on the ear; the two sexes are, thus, **separate inflorescences**. With reference to the separation of the sexes, *Euchlaena* plants fall midway between those of *Tripsacum* and *Zea*. The terminal panicle of the stem, or main plant, and its primary lateral branches bear only male flowers in *Euchlaena*—as in *Zea*—but the female flowers of the secondary lateral branches often terminate in a male spike; an arrangement of inflorescence that closely approximates those of *Tripsacum*.

There is a closer resemblance, in ap-

pearance, between *Euchlaena* and *Zea* than between either of these and *Tripsacum*; both, the former are more specialized . . . *Tripsacum* is considered to be lower in the evolutionary scale.

Botanical evidence points to the two species of *Euchlaena* as the closest wild relatives of *Zea mays*; one, *Euchlaena mexicana*, is an annual, the other, *Euchlaena perennis*, is a perennial. The annual form (*E. mexicana*) has become within the last sixty years an important forage crop in the Southern United States. Its natural habitat is the region between Chihuahua, Mexico, to Mexico City. The perennial form (*E. perennis*) is found only in a restricted area west of Guadalajara, Mexico. Both of these wild cousins of maize have provided some baffling problems for the plant detectives.

Both of *Euchlaena*'s species grow as weeds around the corn fields in Mexico, yet most Mexican farmers are unaware of the close affinity of corn and *Euchlaena*. Some do, of course, realize that it is a hazard to their corn crops because *E. mexicana* easily crosses with maize.

Maize hybridizes with both species of *Euchlaena*. *Euchlaena mexicana*, the annual, and corn cross freely; the subsequent generations are perfectly fertile. Indeed, in all Mexico where *Euchlaena mexicana* is found the hybrids are very common, which bespeaks of a very close kinship between the two. But such mongrelizing provides no good reason for a belief that Indian corn was derived from *Euchlaena* by selection.

*Euchlaena perennis* and maize hybrids are not so common; only a very few have been found in nature. Artificial crossing has been done with difficulty and the hybrid plants are usually sterile. This sterility, according to botanists, is owing to the wide cytological differences between *Euchlaena perennis* and *Zea mays*.

There is disagreement between botanists on the question of the derivation of maize from either of the two species of *Euchlaena*. Early investigators be-

lieved that the numerous natural hybrids between *Euchlaena mexicana* and *Zea mays* represent transitions from *Euchlaena* to maize. The assumption was that the evolution of maize is being continuously advanced, step by step . . . right before our eyes. This idea of course, is now recognized as wholly incorrect—in fact, it has been suggested by modern genetic experiments that the picture should be reversed. And there are many indications that *Euchlaena mexicana* has derived from hybrids between *Euchlaena perennis* and *Zea mays*. This hypothesis, if ever proven, will eliminate *Euchlaena mexicana* as a probable ancestor of Indian corn.

None of the salient characteristics of maize which render it so useful to Men are found in *Euchlaena* and although there is a fundamental relationship between the two, it is difficult to see how maize developed from *Euchlaena* by selection.

#### EVOLUTION OF THE EAR.

The ear of corn is a botanical riddle . . . for nothing foreshadows it in the way of a simple organ among its relatives. Nothing among the great family of grasses resembles it . . . not even a rudimentary organ that could conceivably contain, even, the germ of an ear. One theory holds that the ear developed from a branched structure that at one time was somewhat like the tassel at the top of a plant. But how such an inflorescence was transformed to the corn with its many rows of seeds is still a mystery.

In attempting to derive the ear from a complex inflorescence like the tassel, many difficulties have been encountered in the contradictory evidence presented by the ear itself. The homology of the ear with the central spike of the tassel once lead to the belief that the reduction of a ramified panicle to a spike by suppressing the branches explained the evolution of the ear. This explanation, however, is rather doubtful because the central spike of the maize tassel is in need of an explanation it-

self. The many-rowed central spike on the tassel of a maize plant is not found among any of its relatives. The spike in the tassel of *Tripsacum* and *Euchlaena* is merely an uppermost branch with only four rows of spikelets on a flattened axis; exactly like the other branches. Whereas, the terminal spike of a maize tassel is a cylindrical arrangement of eight rows or more of spikelets. Although the ear of corn is the homologue of the central spike of the tassel—or male flower—and differs from it, chiefly, by having the female flower and glumes, the problem is one of unraveling the mystery of the central spike. How the central spike derived is a matter of speculation, but three theories, all of which are in good standing, have been advanced—namely, fasciation, branch suppression, and twisting.

(Continued in March)



A—Maize tassel: The terminal, or central, spike is cylindrical, with eight or more rows of spikelets. This many rowed central spike is not found among any of the relatives of maize.

B—Whereas the central spike in the tassel of *Euchlaena*, and *Tripsacum*, is merely one of the numerous branches. The tassel is the male inflorescence of both *Euchlaena* and maize, or Indian corn. (Drawing by Sharon Proctor, after Smith.)

## Desert Botanical Garden

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# SAGUAROWAND

## BULLETIN

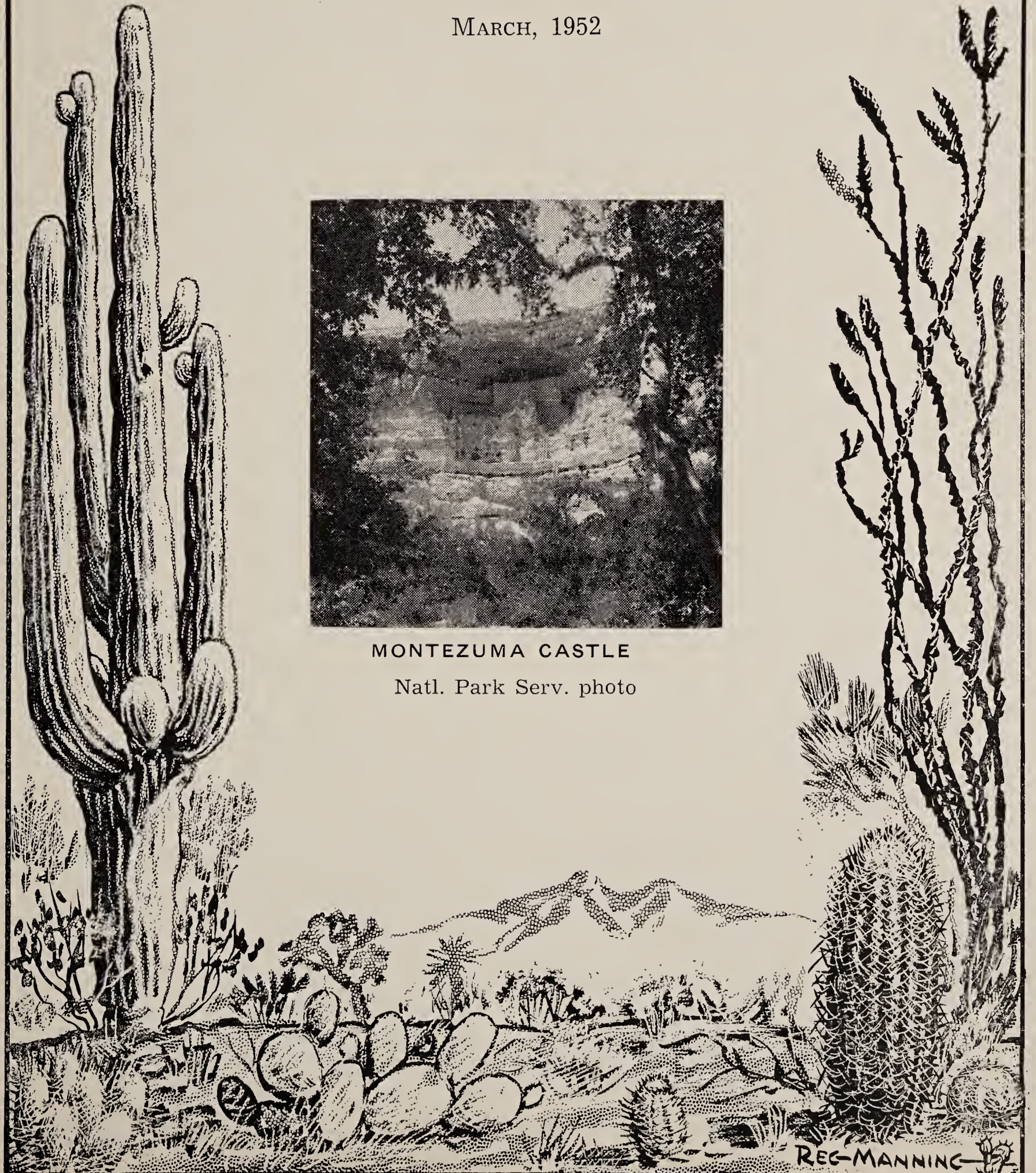
DESERT BOTANICAL GARDEN OF ARIZONA

MARCH, 1952



MONTEZUMA CASTLE

Natl. Park Serv. photo



# SAGUAROLAND BULLETIN

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W. TAYLOR MARSHALL, Editor

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## Desert Botanical Garden of Arizona

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Garden hours: October to April inclusive, open 10 A.M. to 5 P.M. daily and Sunday. Closed every Monday. Lectures on Sunday at 3 P.M. and 4 P.M. Instructions Thursdays at 3:30 P.M. No charge.

## ANNUAL ELECTION

With this issue of the magazine we are including a post card ballot for the 1952 election which will take place at the annual meeting on Sunday, April 20, at 3:30 p. m. in the Webster Auditorium.

The nominating committee has selected the incumbent board members to succeed themselves, so only three names are on the ballot, but three spaces are provided for write-in of additional names and further nominations can also be made from the floor at the annual meeting.

Please mark X after your three choices on the ballot and mail at once.

## CACTUS SHOW

The fifth annual cactus show was a tremendous success with more entries (106 in the plant section) and a greater attendance by nearly 40%. Twenty-eight members volunteered their time during the show as hostesses, guards and as salesmen and it was only because of this volunteer help that we were able to handle the large crowds in an orderly manner. They were: John Hales, G. L. Purdy, Miss Mae Krueger, Dr. Louis Blanchard, Scott Haselton, Mr. and Mrs. Joseph Birchett, Mr. and Mrs. John Eversole, Charlie Mieg, Mrs. R. Williams, Mr. and Mrs. Carroll Mills, Mrs. K. Trapnell, Mrs. Clinton Campbell, Mrs. Joseph Prophet, Mrs. C. O. Harter, Mrs. C. Cabossel, Mr. and Mrs. M. O. Swensen, Mrs. E. C. Kraatz, Mrs. W. T. Marshall, Mrs. Lois Porter Earle, John Earle, Arthur Earle, Mr. and Mrs. C. Lee. Our thanks to all of them.

Scott E. Haselton, editor of the Cactus and Succulent Journal, came from Pasadena, Calif., to act as judge. The second judge was Dr. Louis Blanchard of Crystal Beach, Ontario, Canada. Thank you both.

Howard E. Gates, (Famous Cactus Gardens) Herb and Angela Bool (Sandyland Cactus Gardens) and Wm. Mastrangel (Rockinghorse Cactus Garden) presented plants for prizes and to

be sold to help defray the expenses of the show. Scott Haselton presented a book prize.

Jim Cahill of the Prickly Pear Cacthills donated all of his time for the eight days of the show.

The winners in the plant section of the show were:

### Section A—POTTED PLANTS:

1. One species of cactus:
  1. Mrs. Gladys Prophet.
  2. Chas. Mieg.
  3. John Hales.
2. One species of a succulent plants other than cactus:
  1. Mrs. Monnie Speck.
  2. John Hales.
  3. Mrs. R. I. Turner.
3. Desert trees and shrubs. One species potted:
  2. Mrs. R. I. Turner.
  3. Mrs. Joseph Birchett.

### Section B—COLLECTION OF POTTED PLANTS:

1. Cacti, at least five species.
  2. Lani Mastrangel.
  3. Carroll Mills.
4. Cacti, ten species or more:
  2. Old-Fashioned Garden Club.
  3. Mrs. R. I. Turner.
- 4a. Cacti, ten crests or more:
  - Special—Chas. Mieg.
5. Other succulents, ten species or more:
  3. Mrs. R. I. Turner.
7. Collection of five plants of one genus, Cactus.
  1. Gertrude Mills.
  2. Old-Fashioned Garden Club.
  3. Mrs. R. I. Turner.
8. Collections of five plants of one genus, Succulents:
  2. Mrs. Richard Williams.

### Section C—DISH GARDENS (Accessories permitted):

1. Cactus only:
  1. Mrs. Gladys Prophet.
  2. J. S. Wise.
  3. Mrs. R. I. Turner.
2. Other succulents only:
  1. Mrs. W. W. Weissbach.
  2. Lorraine Mastrangel.
3. Cacti and other succulents:

2. Mrs. R. I. Turner.
3. Louise G. Freeland.
4. Junior entries by school:
  1. Lani Mastrangel, Westwood School.

#### Section D—ARRANGEMENTS WITH ACCESSORIES.

1. Cacti for centerpieces:
  1. Mrs. R. I. Turner.
  2. Mrs. Ricard Williams.
  3. Mrs. Joseph Birchett.
2. Succulents for centerpieces:
  1. Mrs. Richard Williams.
  2. Mrs. R. I. Turner.
  3. Miss L. L. Turner.
3. Cacti and succulents:
  1. Mrs. Joseph Birchett.
  2. Mrs. Richard Williams.
4. Cacti with garden flowers as accessories:
  1. Mrs. R. I. Turner.
  2. Lorraine Mastrangel.
5. Succulents with garden flowers as accessories:
  1. Mrs. R. I. Turner.
  2. Mrs. Richard Williams.
- 5a. Desert Shrubs:
  1. Mrs. Joseph Birchett.
6. Cacti, American Indian influence:
  1. Mrs. Richard Williams.
  2. William S. Sparks.
7. Corsage of succulents:
  1. Mrs. W. W. Weissbach.
  2. Lorraine Mastrangel.
10. Button Gardens:
  1. Mrs. P. Curtice.
11. Dried material:
  2. Miss Alice Carlson.

#### Section E—ROCK GARDENS.

1. Rock garden, not over nine square feet:
  1. Mrs. Richard Williams and Mrs. Agnes Silver.
2. Rock garden, over nine square feet:
  1. Cactomaniacs.

#### Section F:—

1. Educational exhibits:
  - Special—Mrs. Joseph Birchett.
  - Special—Mrs. Clarence Benson.
  - Special—M. A. Nathason.
3. Water colors—oils, pen and ink.
  1. Mrs. Sarah Humphrey.
  2. Mrs. Sarah Humphrey.

3. E. L. Freeland.

Honors for the great success of this show go to the show manager, W. H. Earle, of the garden staff, and to Dave Henes and Dennis Ferrell of the Phoenix Gazette, who sponsored the show. We had the finest publicity in the history of our show and its effectiveness was proved by the largest attendance ever.

#### ACCESSIONS

We are indebted to Charlie Mieg for a plant of *Melocactus broadwayi*, to Wm. Mastrangel for a plant of *Melocactus caesius* and these plants are the first representatives of the genus *Melocactus* we have had.

Charlie Mieg also presented a clustered plant of *Pelecypora aselliformis*. Ernest Beam a plant of *Epiphyllanthus microsphaericus*, Dr. and Mrs. Louis Blanchard presented a ming tree made of native desert material.

## VEGETATION OF THE ARIZONA DESERT

### A Series—Part Three.

A leaf succulent is a plant which stores food and water in its leaves just as a stem succulent stores in its stem. This storage may be made in awl-shaped leaves on normal stems where the plant is not exposed to extremely dry conditions or the leaves may be grotesquely swollen and stems absent on plants from extremely arid territories.

An example of the first mentioned form is found in Arizona in our five species of *Sedums* or stonecrops. Arizona does not have an example of extreme leaf succulent except as we show in our garden specimens of *Lithops* and *Pleispolis* both in the fig-marigold family (*Aizoaceae*) and both from South Africa.

In leaf succulents the storage tissue of thin walled cells in the leaves is surrounded by three skins and the green coloring matter is immediately under the inner skin.

The outer skin is always thick and

usually tough and it is covered with wax or hairs to reduce water loss. In *Sedum* a coating of wax on the leaves of many species suggest that they have been waxed and polished by a careful housewife. Other examples can be found in the fig-marigolds, *Portulacas* and *Crassulas*.

As in the stem succulents, this wax coating is sometimes so heavy as to resemble a powdering of the surface as well illustrated by our *Dudleya pulverulenta* found on almost perpendicular north cliffs in most of the mountain ranges in Maricopa, Mojave and Yuma Counties. This plant is also known as *Dudleya arizonica*, but it deserves recognition only as a sub-species of *D. pulverulenta*.

A hairy coating on leaves is noted in many desert species but not noticeably in native Arizona succulents. Excellent examples will be found in *Echeveria pulverulenta* and *Echeveria setosa*, both Mexican species, the leaves of which are covered with erect hairs and in *Kalanchoe tomentosa* whose close set gray hairs completely hide the leaves. This plant has spots of brown at the leaf tips to fully justify the common name of "Panda plant."

In *Kleinia tomentosa* the long, silky, white hairs are woven around the awl-shaped leaves in a manner suggesting the cocoon of a moth.

In the Arizona desert there are three families in which we find leaf succulents. The Orpine family (*Crassulaceae*) contains three genera of succulents, one of which the Stonecrops (*Sedum*) contains species with erect or decumbent stems and mostly awl-shaped leaves. In the genus *Dudleya* we find two species of plants which form rosettes of succulent leaves at ground level and send up long flower scapes with bell-like flowers in red or yellow.

In the Genus *Graptopetalum* the rosette of leaves is much smaller and the plants put out offsets in true "hen and chicken" form. The flowers are small in clusters at the end of flower scapes.

In the (*Amaryllidaceae*) *Amaryllis* family we find mostly plants arising from bulbs (corms), but one genus *Agave*, which includes the century plants, has 10 native species, all of them attractive and not too large.

*Agave utahensis* and its variety *nevadensis*, *A. kaibababensis* and *A. parviflora* form small rosettes of leaves which are beautifully marked, true ornamental plants that do not ever exceed 10 inches in diameter and are usually smaller.

*Agave schottii* gets slightly larger but the deep green of the leaves accented by the white, hair-like fraying of the leaf margins make this also an attraction.

Of the larger species *Agave parryi* and *A. chrysantha* are prized for the brilliance of the flowers which are golden yellow when fully opened but showing red buds on the unopened flowers of *A. parryi*.

The *Agaves* are very succulent in their leaves; in fact, the plants spend an entire lifetime storing food and water so that they can send up the large flower stalks, (6 to 30 feet) at the rate of six to sixteen inches a day. After flowering and fruiting once the plant dies.

The lily family (*Lilliaceae*) has three genera with succulence in leaves, but the succulence is not so pronounced in these as in the *Agaves* and they are really intermediate between the succulent and the xerophytes which we will discuss next month.

Best known is the genus *Yucca* which includes the Joshua tree, the Spanish bayonet, the soap-weed.

Fourteen species are found in Arizona, of which *Yucca brevifolia*, the Joshua tree is the largest, attaining to 40 feet in height and nearly as much in spread in rare instances of trees possibly 1,000 years old. All of our *Yuccas* are attractive when in flower and, unlike the *Agaves*, they produce flower stalks year after year without injury to the plant.

Another lily is the bear grass (*Nolina*) of which four species are noted for the state ranging in size from the true bear grass of our higher plateaus to a large, Yucca-like plant *N. Bigelovii* and its variety. The flower is smaller than that of the Yuccas and the male and female flowers are on separate plants as they are on the "Sotol" (*Dasyllirion wheeleri*) a handsome lily which grows to huge rosettes of sharp-

ly toothed, narrow leaves.

It is the leaf of the "Sotol" where the leaf clasps the stem of the plant that is used as the "spoon flower" with the resultant loss of thousands of handsome plants that have required 60 or more years to reach maturity and destroyed in violation of the State's conservation laws.

Do not encourage this vandalism by purchasing "spoon flowers."



Montezuma Well National Park Service photo.

## Montezuma Castle

Montezuma Castle National Monument, in the Verde Valley of central Arizona, protects one of the best preserved and most interesting cliff dwellings in the United States. Within the monument, occupying portions of a limestone cliff which borders Beaver Creek for half a mile, are the ruins of several prehistoric Indian house clusters. Among them is the large structure called Montezuma Castle, which is about 90 per cent intact and original.

### THE EARLY INHABITANTS

Scant archeological evidence so far available indicates human beings were

living in the Verde Valley over a thousand years ago.

These were industrious, sedentary Indians from southern Arizona who took up abode on the fertile river terraces and began farming. They lived a distinctly rural life, with no cities or large centers of population, in little villages of one-room, pole and brush houses.

These farmer folk probably lived in comparative peace in the valley until about the beginning of the twelfth century. After the year 1100, there was a gradual abandonment of the small houses and another group entered the valley from the north. This group began construction of great

communal dwellings or pueblos, which were compact structures in defensible locations on hilltops and in cliffs.

### THE ENEMY PEOPLES

The forerunners of the modern Yavapais were possibly the principal cause of the farmers building fortified pueblos. Upon entering the Verde Valley, nomadic hunting Indians must have found it easy to harass the peaceful farmers. There is also the possibility of inter-pueblo strife caused by an overcrowded condition after A. D. 1300, with too little farm land to go around.

### THE CLASSIC PERIOD

During the occupation of these dwellings, which lasted until close to A. D. 1400, a maximum of 200 persons may well have occupied the several house clusters. The Castle could have accommodated 12 or 15 families, possibly 50 people. These cliff dwellers lived through the peak period of Pueblo culture, producing stone implements; excellent turquoise and shell jewelry; cotton cloth, some of it elaborately decorated; sturdily constructed baskets; and many other objects.

The pottery made locally, at Montezuma Castle and in the Verde Valley generally, consisted mainly of plain brown or red ware. The prehistoric people of the Verde, although apparently highly talented along certain other lines, seem never to have developed a really ornamental painted pottery of their own. Instead, they acquired decorated pottery from the north by trade with the Flagstaff area and the Hopi country. The absence of later Hopi pottery indicates that Montezuma Castle was abandoned by the fifteenth century.

### ABANDONMENT

A disastrous fire destroyed the largest dwelling and forced its abandonment. Other troubles must have befallen the cliff dwellers, including the exhaustion of the soil by long continued intensive cultivation. Life in a crowded, poorly ventilated cliff tenement house, where the people knew nothing of disease germs or sanitation, might have led to epidemics. It is probable that before long an excess of

deaths over births caused a gradual reduction in population. Eventually, a discouraged remnant would have moved away.

A number of the cliff dwellers must have gone into northern Arizona to join the friendly Hopis, with whom they had long established trade relations. Modern Hopi traditions still indicate some ancestral origins in the Verde Valley. Many cultural traits of the Hopis are strikingly similar to those of the Verde Valley cliff dwellers, as well as to those of many other Pueblo groups scattered through northern Arizona in prehistoric times.

### MONTEZUMA WELL

Another example of prehistoric Indian work can be seen at Montezuma Well, a detached portion of Montezuma Castle National Monument, seven miles by road northeast of the Castle. This area contains a large limestone sink, half-filled with water which continually flows out at a rate of 1,500,000 gallons a day. The Indians, who constructed their small cliff dwellings and pueblos around this well, diverted the water into irrigation ditches which carried it to their farm lands below. These ditches are visible today because they were cemented up by the lime content of the water which flowed through them. The story of the Indians at Montezuma Well is similar to that at Montezuma Castle.

### HOW TO REACH MONTEZUMA CASTLE

Montezuma Castle is five miles north of Camp Verde, 60 miles south of Flagstaff, and 65 miles east of Prescott. It may be reached by State Route 89, from Flagstaff through beautiful Oak Creek Canyon, then via Sedona or Cornville, or the same State route from Prescott through Jerome, Clarkdale, and Cottonwood, via Cornville or Camp Verde. Good graveled roads lead from the south from Roosevelt Dam via Pine, Payson, and Camp Verde, and from Phoenix by State Route 69 via Mayer, Humboldt, and Camp Verde. Another scenic route, closed in winter, is from Flagstaff via Mormon and Stoneman Lakes.

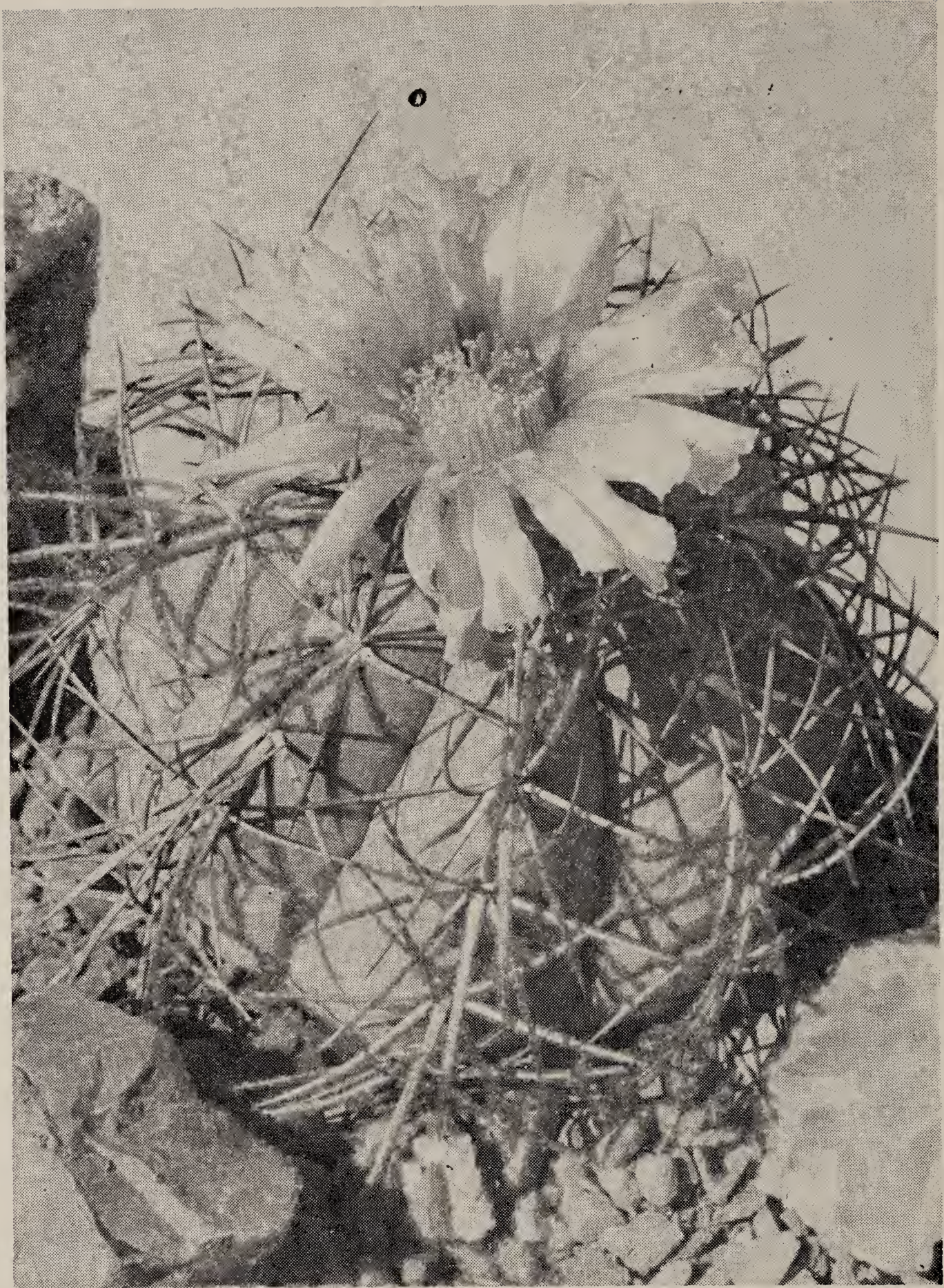


Fig. 43. *Echinocactus horizonthalonius* Lemaire. R. C. Proctor photo.

## A NEW PLANT FOR ARIZONA

Mr. Alan Blackburn of Tucson, a member of our Society, brought to us for identification a plant of *Mammillaria lasiacantha* which he collected near Sonoita, Arizona.

Britton & Rose, Vol. 4, p. 129, gave the distribution of *M. lasiacantha* as "western Texas and northern Chihuahua. Reported also from Arizona, but

doubtless incorrectly."

This discovery by Mr. Blackburn adds another cactus species to the flora of Arizona.

Dr. Louis Blanchard speaker:

On Sunday, March 2, Dr. Louis Blanchard gave two illustrated talks on his beautiful garden at Crystal Beach, Ontario, Canada. His pictures were so outstanding that we asked him to repeat them at the Cactomaniacs' meeting on Tuesday, March 4.

# THE STORY OF INDIAN CORN

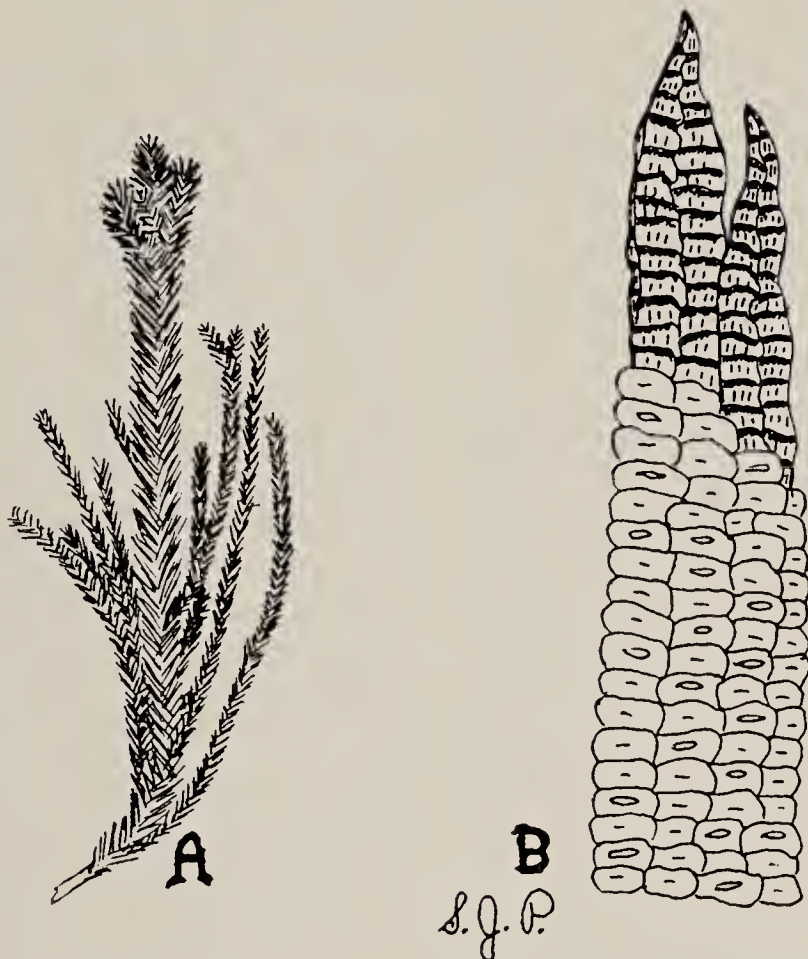
By R. C. PROCTOR

Part 2

**Fasciation:** This is the growing together of two four-rowed branches of the tassel into the central spike; and hence the ear. It is supported by examples of fasciated ears and central spikes. Eight-rowed ears divided by half their length into two four-rowed

segments have been frequently found . . . also a similar arrangement of spikes. Furthermore, geneticists have shown that fasciation is hereditary in maize by isolating true-breeding races with fasciated ears . . . and central spikes as well.

**Suppression:** There is a true-breeding type of maize—known to geneticists as “ramose”—that arose as a mutation out of the normal form, and



Fasciation, or the growing together of two four-rowed branches of the tassel; and hence the ear — a theory.

A—A maize tassel showing the growing together of two four-rowed branches into a central spike; and the fusion of the lateral branches; suggesting the origin of the ear by fasciation.

B—Fasciated ear showing division of two four-rowed segments at the top and eight rows (one side view) of seeds at bottom.

(Drawing by Sharon Proctor)

is recessive in inheritance. In crosses with *Euchlaena* the ramose character reappears in the second generation in the proportion that would be expected but modified in expression. The ear and tassel of the ramose type are very much branched inflorescences, and are sometimes lacking in central spikes. The branched ear character clearly shows through its various degrees of expression that the branches are often reduced

to pairs of spikelets. Thus, the central spike is formed—according to the hypothesis of suppression.

**Twisting:** In the second generation of *Euchlaena-mays* hybrids all stages of inflorescence development occur, from the simple two-rowed spike of *Euchlaena* with segmented rachis to the many-rowed solid rachis of the maize ear. These stages show clearly how the ear could have been built up by twist-

ing a two-rowed axis and compressing the rachis. A four-rowed ear would result from the first stage of twisting, but by gradual stages more rows could have developed until the many-rowed ear of maize was reached. The widely different pistillate inflorescences of *Euchlaena* and maize are, apparently, no unsurmountable obstacle to the combining of all their characteristics; an opinion supported by the hybrids.

All three of these hypotheses have been deemed as perfectly logical explanations of how the ear of corn could have been built up from a branched inflorescence like the tassel, but we still know little or nothing of the process and how it came about.

#### SELECTION? MUTATION? HYBRIDIZATION?

There is little doubt that *Euchlaena* and *Zea* are closely related, since they easily hybridize with each other. And *Euchlaena*, being a wild plant capable of self-propagation, would seem to be the logical ancestor of maize; but whether the relationship is one of a parent and offspring is not certain. Such an hypothesis meets serious objections from botanical and morphological evidence.

The spikelet is the flowering unit of all the grasses. In normal maize and *Euchlaena* plants it bears flowers of one sex only. There are male spikelets that bear two staminate, or male flowers . . . and female spikelets that, normally, bear only one pistillate, or female, flower. Rarely do *Euchlaena* spikelets develop, both, male and female flowers, but maize spikelets frequently occur bisexually, and, in both male and female inflorescences. In *Euchlaena*, the rachis and outer glumes of the female inflorescences are greatly modified. Such evidence indicates that the separation of the sexes occurred later in maize—and in a lesser degree—than in *Euchlaena*. The glumes, or bracts, surrounding each seed on a maize ear are not greatly differentiated from those inclosing the male flowers of the tassel.

Whereas the outer glume of the female spikelet of *Euchlaena* has become thickened and hardened. Both, male and female spikelets of maize are arranged in pairs—one, pediceled, the other, sessile—, whereas in *Euchlaena* the male spikelets are paired as in maize but the female spikelets occur singly, and the pediceled spikelet is aborted. In an evolutionary sense these differences between maize and *Euchlaena* in the separation of the sexes and development of the flower parts indicate that maize is not as highly specialized as *Euchlaena*.

The theory that maize evolved from *Euchlaena*, guided by human selection, overlooks the fact that neither of the two *Euchlaena* species, as growing at present, could provide a basis from which selection toward maize could start. Both sexes of inflorescence are already more highly differentiated in *Euchlaena* than they are in maize. Therefore, if maize derived from *Euchlaena* by selection—which would be to pass from the specialized to the unspecialized—, then, here, evolution, contrary to the rule, has reversed its usual direction.

The resemblance between maize and *Andropogoneae*, a large family of grasses, suggests that the former may have arisen from a natural hybridization between *Euchlaena* and some grass similar to a species of the subgenus, *Sorghum*, of the genus, *Andropogon*. This genus, of the Old World, and *Zea mays* are similar in many respects; and are parallel, cytologically. Some true-breeding, abnormal forms of, both, maize and cultivated *Andropogoneae* resemble each other so closely that they are botanically indistinguishable. But all attempts to cross maize with members of the family, *Andropogoneae*, have failed. However, the idea that a cross might have occurred with an American species of this family is tenable because of the intermediate position of *Zea mays* between *Euchlaena* and *Andropogon*. This hypothesis harmonizes with the known morphological facts and reduces, materially, the length of time necessary

that crop plants derived from their wild ancestors by a gradual process of selection. And hybridization is viewed by some as a rare event, not to be considered seriously as a factor in the evolution of modern crop plants. They hold that maize and *Euchlaena* evolved gradually from a common ancestor close to *Tripsacum*, and that Maize was controlled by human selection. But the immensity of time necessary for such a process of evolution far exceeds that of the most liberal estimates for the beginning of agriculture in its most primitive form.

Mutation, or sudden change in type, has been suggested, by which it is theoretically possible, in a gross sense, to produce any sort of plant almost over night — and without being fussy about ancestry. It can even be argued that maize arose as a mutation from *Euchlaena*, or almost any type of grass, but no such large scale mutation is known in any organism—and none is expected to occur. But mutations in maize are far from rare; several hundreds of such changes are known to be affecting many of its characters or single ones, and they are not of the magnitude necessary to explain the origin of maize. They always reappear unaltered in subsequent generations when crossed with the forms from which they arose. When crossed with each other *Zea* (maize) and *Euchlaena* exhibit a complete blending of their characteristics. There is no segregation into parental forms. And the difference between *Zea* and *Euchlaena* is, not by a single hereditary unit, but by hundreds of them. Therefore, if maize is to be derived from *Euchlaena* by mutation, not one but hundreds of mutations have occurred; a conclusion which in effect is a return to the hypothesis of selection.

The remarkable parallelism between all types of maize is the chief objection to a mutation theory. In crosses, all forms and sizes are perfectly fertile. Peruvian varieties and those of the In- to develop a plant like maize.

Some botanists favor the hypothesis

dians of the Southwestern United States are indistinguishable except by an expert; a fact which indicates that maize was not distributed (and widely, it is)—morphologically speaking—until it was a finished product. The wide distribution of plant forms, colors and seed types, and the large number of similar types grown in widely separated regions are further evidence on this point.

It would be expected that the first change, or mutation, in a plant form as economically useful as maize would have set off a chain of distribution to such an extent that the farthest extremities of the Western Hemisphere would have a cereal crop, of some sort, descended from pre-maize plants. Subsequent mutations would have occurred in the widely separated regions, and unless the intermediate forms were assembled and intercrossed, various degrees of maize-like plants would be growing throughout the Western Hemisphere today. But this is not the case, and maize is exactly the same today as it appears to have been many thousands of years ago.

Obviously, we know no more now about the genesis of the Indians' majestic plant than we did at the beginning of this story, but for the sake of a palatable ending a very interesting consideration in favor of the hypothesis of hybridization has been reserved for the last. That is, the relatives of maize are comparatively **stable**. Nothing approaching the degree of variability of maize has ever been found among them, for practically every organ of maize plants occur under a wide range of shapes, sizes and colors. This stability is considered—by an accredited authority—to be additional evidence that Indian corn is in fact a hybrid.

\* \* \* \*

Postscript: “. . . each creature has a special gift of strength and sagacity,

Postscript: “. . . each creature has while to men has been given only the power of guessing.” (From an old Zuni saying).

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## Desert Botanical Garden

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Attractive packages with cut cellophane packing.

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Title	Price	Post- age*
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Prickly Pear Jelly— 4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor	2.20	.80
Prickly Pear Delight— A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor		
1/2 pound box	.80	.20
1 pound box	1.50	.30

\* Postage and wrapping charges.

### RARE BOOKS AVAILABLE

A member has a rare copy of the first edition of Cactaceae by Britton & Rose with the original color plates in four volumes bound in cloth and Vol. 1 to Vol 14 of the Cactus and Succulent Journal also bound.

He would like to dispose of them. If interested submit an offer for either item or both items to the Saguaro Bulletin.

# SAGUAROWAND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

APRIL, 1952



Lophocereus Gatesii  
in the Garden.



REG-MANNING

# SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society,, sponsors of the Desert Botanical Garden of Arizona, P. O. Box 647, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription \$3.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. TAYLOR MARSHALL, Editor

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APRIL, 1952

No. 4

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## Desert Botanical Garden of Arizona

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Ass't Horticulturist .....	John H. Weber
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Hostess .....	Therese M. Marshall

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Garden hours: October to April inclusive, open 10 A.M. to 5 P.M. daily and Sunday. Closed every Monday. Lectures on Sunday at 3 P.M. and 4 P.M. Instructions Thursdays at 3:30 P.M. No charge.

## EDITORIAL

The Annual Meeting of the Arizona Cactus and Native Flora Society which sponsors the Desert Botanical Garden will be held at the Webster Auditorium in the Garden on Sunday afternoon, April 20th, at 3:30. In the past we had a faithful 5 or 7 members attend these meetings but we hope for a much greater interest this year.

Ballots for the election are coming in at a good rate and will be counted at the Annual Meeting.

At the meeting we will give you a complete report on finances and plans for the future and we believe you will like both.

On Monday evening, April 21st, a joint meeting of the executive and advisory boards will be held at the Garden at 6:30 P.M. A buffet supper will be served by the director and very important plans will be presented to the boards for consideration.

**Cactomaniacs** will meet on Tuesday evening, April 1st, at the Garden at 8:30 P.M.

The Garden will have an entry in the Flower Show at the Valley Garden Center April 5th and 6th. We will show flowering plants of native species of Cactus, Trees and Shrubs. Do not miss this Flower Show.

## BUILDING FUND

Our original estimate for building in 1952 was:—

Erection of two houses	11,000
Roofs on Administration Bldg.	2,500
Warehouse & carport	3,000

Total 16,500

We have completed the roof at a considerable saving	2,500
leaving a balance to be raised of	14,000

Previously reported contributions were	2,755
Harry Kay	10
A friend	100
Arizona Cactus Curios Co.	25
The Cahills	25

	Total of 2,915
Cost of new roof	1,217
Balance on hand in bldg. fund	1,698
Amount still to be raised	12,302

At this writing exactly 1,698.00 is in the building fund with two pledges amounting to over \$100 more, but this is not sufficient to start the project. We are confident that we will have additional contributions in April and May.

The building of at least one residence and a store room is so essential that the whole progress of the Garden depends on it. We believe that lack of interest, so far shown, in this program is due entirely to my lack of ability to present the necessity for the program.

Our problem is this. Each of our men must be trained in botany, entomology or zoology and must have a B.A., B.Sc., or Ph.D., or its equivalent in one of those sciences.

This is necessary because each man must be capable of teaching and lecturing as necessity arises.

In addition each of them must be trained horticulturists capable of growing desert plants from all the world from seed or from cuttings and know the cultural requirements of each type of desert plant.

Finally, they must be trained in courtesy and be able to meet the public and to police the grounds firmly but without offense to visitors and to answer the same questions day after day patiently.

For all of these qualifications we are able to pay a wage about one half that paid to an apprentice carpenter or bricklayer.

Our men work Saturdays and Sundays, all holidays and from dawn (in summer) to almost any time at night, when they are called on for lectures outside the Garden.

Three must live on the grounds because it is necessary to have some one to prevent pilfering at all times.

Up to now the director has lived in a very small apartment in the Administration Building and our chief horticulturist, Mr. Earle has lived with his family, consisting of Mrs. Earle and their two sons, of high school age, in a small trailer and cabana without sanitary facilities except in the Administration Building 150 feet away.

To keep the trained men that we have we must provide for them reasonably comfortable and fitting housing and this is the object of the present drive.

We have planned two residences of two bed rooms, a living room, kitchen and bath in lines to comply with the other buildings on the grounds.

In addition we must have a small store room for equipment not in use which now deteriorates rapidly in the open.

If these are not pressing needs we do not understand the term and we know that when these facts are known to our members we will have cooperation and contributions from them according to their ability and means.

Attendance has increased nearly 40% this year over any previous year and a still greater increase is anticipated for next season. This increase has made it necessary to have two men on duty in the Garden and at the lath house whenever the gates are open. A third man is needed inside the building to give the talks to schools, garden clubs and to the public and to give talks at noon to service clubs or at any time to garden clubs.

Finally, as it is necessary to grow many species from seed, and seed beds require attention both day and night, the mere fact of seed growing makes it necessary to have one or two men on the grounds to give constant supervision to the seed growing.

In the hot summer months much of the watering of the outdoor plants must be done in the evening.

From all of this you can see the necessity of our building program which we feel will interest you in giving ac-

ording to your means. Remember that all gifts to the Garden are deductible from income tax returns.

## COLLECTIVE NAMES FOR PLANTS

Visitors to the desert are frequently confused by the native use of words to describe a collective grouping of plants.

Chaparral (chap'a-ral) is such a word. According to Webster's Unabridged Dictionary the word actually means "a thicket of dwarf evergreen oaks; hence, in a general sense and more common usage, any dense, impenetrable thicket of stiff or thorny shrubs or dwarf trees."

Loosely the word is applied to any district with a fairly heavy stand of Acacias, Desert Thorn or any other spiny shrubs or small trees. Chaparral is not applied to one particular species of plant but to an association.

Sage-brush is applied to one plant in Nevada and some other Great Basin Desert States, a species or possibly several species of *Artemisia* belonging to the sunflower family. Sage-brush is the State flower of Nevada.

*Artemisia* is included in the composite family and not in the mint family which includes the true sage.

Local usage in most of the desert states applies the term "sage-brush" to any association of shrubs with prevalingly grey leaves.

Considerable confusion is caused by the loose local usage of the term "grease-wood" to any of the larger desert shrubs with high wax or oil content. The term is frequently misapplied to the Creosote-bush (*Larrea tridentata*) of the California, Arizona and Texas deserts. The creosote-bush can be easily identified by its mahogany colored trunk and branches, small yellow-green leaves in pairs, the leaves as well as the stem covered with a lacquer. The creosote-bush flowers are yellow, showy and its fruit is a small ball of gray hair suggestive of the pussy-willow.

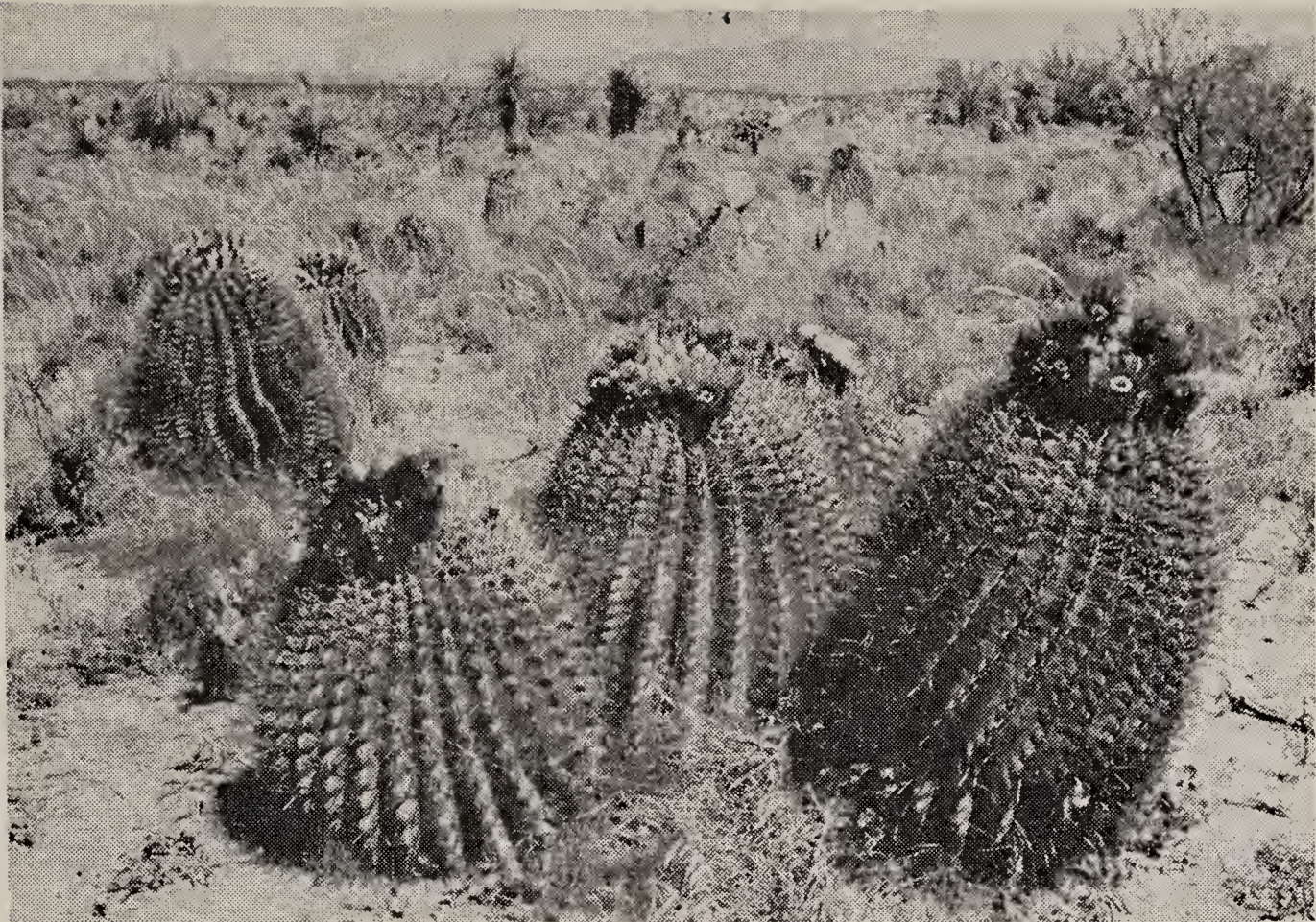


Fig. 46. *Ferocactus Wislizeni* (Eng.) B. & R.  
R. C. Proctor photo.

The true grease-wood is found only in extremely saline soil, that is soil with a high salt content. It has long, narrow, juicy leaves, bright green in color and the trunk and branches have smooth white bark.

The flowers of grease-wood (*Sarcobatus vermiculatus*) are small, the sexes on different parts of the same plant and the fruits suggest a small calabash pipe.

Manzanita is a term applicable only to species of *Arctostaphylos* which grow in the higher Mesas yet we find the name loosely applied to the whole association of plants of the Mesas.

Manzanita is a Spanish word meaning "little apple" and refers to the apple-like fruit of species of *Arctostaphylos* which consists of several nutlets surrounded by a soft pulp.

## CULTURE OF LEAF SUCCULENTS

There is a general misconception that all succulent plants belong to one family, but in reality they belong to many families.

It is interesting to note that there are approximately 25 plant families in which succulence exists, the fleshy members of eight of which occur in both Old and New Worlds, four in the New World only and the remaining 13 in the Old World.

In a general survey of the succulent plants of the world, we find only two types of succulents—stem succulents, with or without leaves, and the leaf succulents of rosette form of growth.

Some may think that we have a third form wherein the succulent portion is the much enlarged basal part of the stem, sometimes above the ground, sometimes below. This is in reality a modification of the stem succulent type.

Succulence is an alteration of plant form or growth caused by development of water storage tissues in order that the plant may survive under conditions of water supply so meager as to be otherwise inimical to the plant's life. These two types of succulents have been produced in response to arid or semi-arid climates. So in the culture of these succulents we must bear

in mind that we must attempt to duplicate the conditions under which the plants grow naturally, and abide by a few general rules to keep your leaf succulents in healthy condition so that they will live and bloom regularly.

1. Soil must be porous and rich in plant food.

2. Plants should be planted in pots, slightly larger than diameter of plant, with drainage hole.

3. Water leaf succulents lightly during growing season.

4. Dormant period of South African leaf succulents May-September.

5. Leaf succulents need sun, but should be lightly shaded.

6. Do not plant leaf-succulents along with cactus.

A very good soil for leaf succulents can be made up of one-third good loam or top dirt, one-third coarse sand, one-third well decayed leaf mold or humus. To this can be added one-tenth powdered charcoal and dehydrated lime. A small amount of a commercial fertilizer or well-aged manure can also be added. For most succulents the soil should be neutral or slightly alkaline.

The pots you use can be either clay or glazed. The latter hold the moisture much longer and prevent the soil from drying out too rapidly. To insure good drainage, use a pot with a drainage hole and fill the bottom, one inch of pot, with coarse sand or gravel. If your pots do not have a drainage hole, use much care and precaution in watering for the succulents do not like to have water standing around their roots.

The watering of your leaf succulents is very important and amounts must be governed by the growing and dormant periods. Plants can be lightly watered every other day or the ground well soaked and then not watered till the soil is nearly dried out.

South African leaf succulents are usually dormant from May to September. Water them once a month and if the temperature is constantly above sixty degrees water lightly weekly. Other succulents may have a

different period. Watch the plant and, when new growth appears, water them. If no growth appears do not water. It is better to keep the plant on the slightly drier side than too wet.

The amount of light your plants receive will determine its condition. Many of the leaf succulents grow in the partial shade of bushes in their natural environment. Although sunshine is essential, the hot afternoon sun is harmful, as it may burn and spoil the beauty of your plants. Thus your potted plants will do better in the east windows of your home or apartment.

One precaution must be taken if pests appear on your leaf succulents. Remove the pests with a soft toothbrush and running water. Never use an insecticide, as it will damage succulent plants.

The leaf succulents are most attractive, cause many comments and are very easy to grow and propagate. You can have lots of success without too much work and effort.

Culture of desert trees and shrubs, seed propagation and grafting will follow in later articles.

W. HUBERT EARLE.

## EPITHELANTHA MICROMERIS

A very small cactus, nearly globose but depressed at the apex, about 2 inches in diameter or less, without ribs but nipped, the nipples arranged in spirals; spines very numerous, white, about 2 mm. long, completely hiding the plant body, those at the apex of the plant longer, meeting over the center; flowers very small, white to light pink; fruit a scarlet, juicy, club-shaped berry, similar to the fruit of some *Mammillarias*, edible.

The Arizona plants are referable to the variety *Greggi* which differs from the species only in the grayish color of the spines.

Arizona in white limestone near the Santa Cruz Cochise County Line.

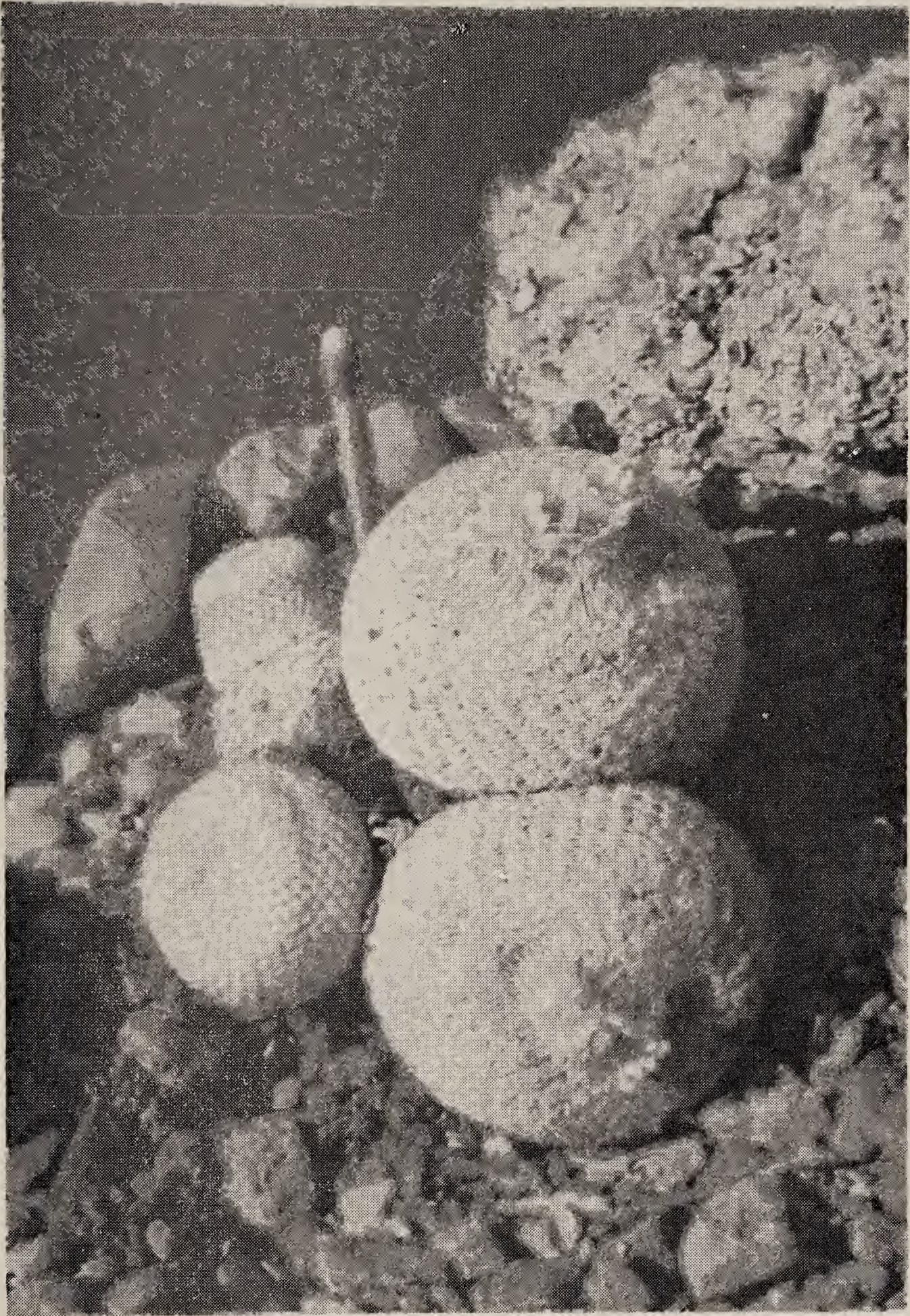


Fig. 49. *Epithelantha micromeris* (Eng.) Weber.  
R. C. Proctor photo.

# VEGETATION OF THE ARIZONA DESERT

a series—part four

Xerophytes, meaning dry dwellers, are trees or shrubs that occupy arid regions by adapting their forms in one or more of several ways to conserve water use. Usually this is accomplished by sending down deep tap roots to the underground water table even though the root must penetrate 60 or 90 feet to reach the water table. This is true of most of the desert trees and many of the larger shrubs especially the palo verdes, ironwood, mesquites, acacias and creosote bush.

In addition to the deep tap roots such plants are provided with a surface root system, to absorb rain water when available. This surface root system resembles that of the succulent plants although the succulents do not have the deep roots of the trees and shrubs.

It is because of the wide spread of the surface roots that we find desert plants so widely spaced, the competition between roots being so keen as to discourage new seedlings from starting very near to an established plant.

Usually, also, a great reduction in leaf size is noted in desert plants because water is lost through leaves. In the case of the palo verdes the individual leaflets are less than 5 millimeters long and still less in width.

Now as the green coloring matter in leaves acts for the plants as do the digestive organs of animals it follows that where leaves are greatly reduced the green coloring matter (chlorophyll) must be present in the branches of a plant with small leaves, to permit efficient functioning of the life processes and therefore the plants with the smallest leaves are green in all of their parts.

Where the leaves are larger they will be found to have a protective coating of lac or wax to discourage water loss. The leaves of the creosote bush

are covered with a lacquer distilled by the plant itself. Wax coating sometimes makes the leaves appear as though Johnson's wax had been applied by a careful housekeeper and sometimes the wax coating is so heavy as to create the appearance of a powder over the leaf. This can be particularly noted in the leaves of desert holly (*Atriplex hymemelytra*) and of the incense plant (*Encelia farinosa*).

Many shrubs shed their leaves with the approach of the dry season and go into a complete rest until rain again causes them to put out a new set of leaves followed by flowers and then back into a rest after again dropping their leaves. The Ocotillo (*Fouquieria splendens*) and the squawberries (*Lycium* sps.) are examples of plants which hibernate.

As mentioned earlier in this series, the Yuccas present a combination of protective devices. Yuccas sometimes lack stems above ground while developing an extensive underground stem system. Where definite trunks above ground are present the wood is pithy and dry and the trunk is protected from the hot sun by the dead leaves or earlier growth which persist after drying and lay against the trunk.

In almost all of the Yuccas the leaves are fibrous with but little storage tissue and the plant survives the hot, dry periods by going into a nearly complete rest.

Many of the smaller shrubs of the desert areas do not present marked differences from normal shrubs during and immediately after the rainy seasons but they all defoliate, that is lose their leaves, during the dry season. An example is *Franseria*, the bur-sage or burrobrush, the commonest small shrub in the Cactus-Palo Verde association.



Walnut Canyon National Monument. Overhanging ledges protected homes. National Park Service photo.

## WALNUT CANYON NATIONAL MONUMENT

Site of hundreds of little thirteenth century cliff dwellings which their Indian builders constructed in the shallow caves of a steep canyon Walnut Canyon National Monument preserves the remains of over 300 small prehistoric cliff dwellings. In addition, there are many small surface ruins of the same early period, which have all weathered to unspectacular mounds of rock and clay. Walnut Canyon is also a scenic area and of geological and biological interest.

### WHY DID THE PEOPLE LIVE HERE?

Through the monument area Walnut Canyon is approximately 400 feet deep. The lower part is carved into a cross-bedded sandstone believed to have been once the dunes of an ancient desert. The upper 270 feet of the canyon was cut through a marine limestone deposit containing many fossils.

The limestone formation is made up of layers varying in resistance. Due to the processes of "differential weathering" through past ages, the softer layers

have retreated, leaving a series of ledges and recesses along canyon walls. It was in these recesses that the cliff dwelling Indians built their one-room homes, using the over-hanging ledge for a ceiling. Usually, several rooms were constructed side by side in the same recess. As there were no doors in the dividing partitions, it appears that one family lived in each room.

Inducements for living in the canyon were many: There was sufficient water in the canyon (before the recent construction of a dam up-stream); dwelling sites were sheltered from rain and snow; difficult accessibility furnished some protection from enemies; fuel was abundant; and fertile soil for the cultivation of crops was available on top, close to the canyon rim.

### HOW DID THE PEOPLE LIVE?

These Indians were farmers, growing corn (maize), beans, pumpkins, and sunflowers; they gathered many wild plants; they hunted various animals;

they were excellent pottery makers; and they wove good basketry and perhaps cotton cloth.

Some of the more common wild plants in the canyon known to have been used by historic Indians for food, fiber, dye, medicine, fuel, construction, ceremonial purposes, or as materials for implements, weapons, and household furnishings, included: yellow pine, pinyon, oak, four species of juniper, Douglas-fir, locust, black walnut, aspen, willow, box elder, hoptree, hollygrape, serviceberry, elderberry, snowberry, lemonade sumac, mountain-mahogany, cliffrose, currant, saltbrush, tobacco, Mormon tea, grape, mescal, yucca, and several species of cactus.

Animals which they could have hunted for meat, sinew or skins were: deer, elk, antelope, bear, cougar, wolf, coyote, bobcat, fox, rabbits, pack rats, squirrels, porcupines, and many species of birds, ranging from wild turkeys to sparrows.

They traded extensively with other tribes for such things as red stone, sea shells, and turquoise for ornaments, pottery vessels of black-on-white types, stone axes, salt, and cotton.

The cliff dwelling Indians were Stone Age people with no knowledge of metal, nor did they have domestic animals, except dogs and possibly turkeys. Their modern descendants, such as the Hopi Indians of northern Arizona, make good use of sheep, goats, cows, horses, and burros, and of fruit trees, all introduced by Europeans since 1629. With only stone and wooden tools, it was more difficult to earn a living in prehistoric times than today, and the cliff dwellers must have worked long hours.

The period of occupation has been determined from the various types of pottery in Walnut Canyon. Identical pottery has been found at other sites which have been accurately dated by the Douglas tree-ring method. The period of greatest population was from 1000 to 1200 A. D. Pottery dating from earlier than 1000 A. D. is sometimes found.

For several hundred years the little

cliff dwellings stood deserted and unmolested. Then white men began to visit and plunder them.

Since the earliest known report in 1883, and before the area was placed under the protection of the National Park Service, pothunters had removed the great accumulation of cultural material seen by pioneer scientists, and our understanding of the area is largely derived from investigations at other contemporaneous sites. The dwellings themselves suffered a great deal of destruction and defacement in the same period from the selfish acts of a few unthinking persons.

#### HOW TO REACH WALNUT CANYON

Walnut Canyon National Monument may be reached from either east or west, by an unsurfaced road from U. S. Highway 66. The western entrance road is 6 miles long, leaving the highway 4½ miles east of Flagstaff. The eastern entrance road is 4 miles long, leaving Highway 66 at a point 11 miles east of Flagstaff. Autoists passing through Arizona via Highway 66 increase their mileage only 3½ miles to visit the monument, when entering by the first road encountered and departing by the other. Both entrance roads are sometimes impassable, however, in bad weather.

The monument season is from April 1 to December 5.

Admission to the monument is free.

A custodian and ranger are stationed in the monument. Visiting hours are from 8 a. m. to 5 p. m. There is no guide fee.

A good foot trail leads to 25 of the cliff dwellings, and from this trail about 100 more may be seen. Young people sometimes make the trail trip in 20 minutes, but the average time for all parties is 50 minutes.

For those who do not wish to climb steps of the trail, a good view of the canyon and some of its cliff dwellings may be seen from the observation porch at the canyon rim.

Construction in 1940 of an attractive exhibition and observation building has



Walnut Canyon National Monument. Ledges along canyon walls.  
National Park Service photo.

provided additional facilities for the comfort of visitors. When completed, museum exhibits will interpret various interesting phases of the life and ancient inhabitants of the Walnut Canyon region. Nearby there is a small picnic

area.

There are no accommodations except for picknicking. Meals and lodgings are available in Flagstaff and along U. S. Highway 66 between Flagstaff and the monument's western entrance.



Fig. 59. Left, *Mammillaria fasciculata* Eng.; right, *Mammillaria Mainiae* K. Brand.

## Desert Botanical Garden

Book Dept.

P. O. Box 647

Tempe, Ariz.

### PACKAGED CACTUS PLANTS

Attractive packages with cut cellophane packing.

			Post- Price	age*
No. 1	5 year old Saguaro Seedling 2" high	.50		.10
No. 5	5 plants	1.00		.30
No. 10	10 plants	1.50		.40
No. 10W	10 white spined plants, collectors items	3.00		.40
No. 15	15 larger plants	2.50		.50
No. 16	16 still larger plants	4.50		.60
No. 24	24 large plants many of flower-ing size	7.00		1.00

### BOOK SUGGESTIONS:—

		Post- Price	age*
Arizona's Cactuses; Marshall			
paper binding	1.00		.15
cloth binding	2.00		.20
A description of all of the species native to Arizona. 60 ills.			
Flowers of the Southwestern Desert—Dodge	1.00		.15
Flowers of the Southwestern Mesas—Patraw	1.00		.15
Poems of the Desert by Lou Ella Archer.			
Cloth bound, beautifully illustrated in color			
Canyon Shadows	2.00		.10
Sonnets to the Southwest	2.00		.10

### Gift Suggestions

		Post- Price	age
Prickly Pear Jelly— 4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor	2.20		.80
Prickly Pear Delight— A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor			
½ pound box	.80		.20
1 pound box	1.50		.30

\* Postage and wrapping charges.

### RARE BOOKS AVAILABLE

A member has a rare copy of the first edition of Cactaceae by Britton & Rose with the original color plates in four volumes bound in cloth and Vol. 1 to Vol 14 of the Cactus and Succulent Journal also bound.

He would like to dispose of them. If interested submit an offer for either item or both items to the Saguaro Bulletin.

# SAGUAROLAND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

MAY, 1952



*Opuntia glomerata* in the garden.  
Haselton photo.



# SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society,, sponsors of the Desert Botanical Garden of Arizona, P. O. Box 647, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription \$3.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. TAYLOR MARSHALL, Editor

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## Arizona Cactus and Native Flora Society

### EXECUTIVE BOARD

Chairman of Board	.....John H. Everdale	Treasurer	.....Tom Goodnight
President	.....W. Taylor Marshall	Secretary	.....Angela Bool
Vice President	.....Lou Ella Archer	Chief Counsel	.....William Eliot

### BOARD MEMBERS

Edward L. Burrall	Leslie J. Mahoney	Marguerite Rockwell
Reg Manning	John H. Rhuart	

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MAY, 1952

No. 5

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## Desert Botanical Garden of Arizona

### STAFF

Director	.....W. Taylor Marshall
Chief Horticulturist	.....W. Hubert Earle
Ass't Horticulturist	.....John H. Weber
Junior Botanist	.....E. R. (Jim) Blakley
Hostess	.....Therese M. Marshall

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Garden hours: May, June and September. Open Saturday and Sunday only, 1 P.M. to 6 P.M. July and August, closed to visitors.

## EDITORIAL

At the Annual Meeting of the Arizona Cactus and Native Flora Society, Inc., the non-profit, educational corporation that sponsors the Desert Botanical Garden seven members were present in person and 102 members by proxy.

Ballots were counted and the result of 101 votes for each of the three candidates proposed by the nominating committee resulted in their reelection.

On Monday evening, April 21st, the Executive and Advisory Boards met and canvassed the votes and found the count to be as reported. Election of Officers for the coming fiscal year resulted in the following:

Chairman of the Board—John Henley Eversole.

President—W. Taylor Marshall.

Vice-President—Lou Ella Archer.

Treasurer—T. A. Goodnight.

Secretary—Angela Bool.

Chief Counsel—Wm. Eliot.

Executive Board Members, in addition to the Officers, are:

Reg Manning,

Edward L. Burrall,

Leslie J. Mahoney,

John H. Rhuart,

Marguerite Rockwell.

Advisory Board Members are:

Mrs. Rose Alschuler,

Dr. Louis Blanchard,

James Cahill,

Fred Gibson,

David Henes,

Mrs. Homer Lininger,

Mrs. Edith Mayrath,

Dr. James McCleary,

Jack Stewart.

A financial report for the year just ending was presented to the boards. From this report the following highlights should prove interesting to the membership:

Income for the year:

From the Webster Trust....\$ 7,240.65

Membership, Approx. 385 1,222.35

Profit from sale of merchandise ..... 4,074.25

Contributions ..... 452.72

Total income.....\$12,989.97

Expenditures for the year:

Salaries .....\$ 9,436.42

Utilities ..... 461.88

Misc. Expense..... 2,870.04

Total expenditures.....\$12,768.34

Contributions to Building

Funds:

Cash received.....\$ 2,940.00

Pledges (2) ..... 200.00

Total ..... 3,140.00....

Replacement of roofs..... 1,217.00

Balance in Bldg. fund....\$ 1,923.00

Breaking down some figures in this report gives interesting background on the actual interest in our garden and the support given to us by Arizonans.

We hear frequently a remark to the effect that the Garden is principally supported by the Garden Clubs or by Phoenix Business Houses or by the resort hotels. Here are the actual figures of support from those sources last year:

Garden Clubs in the Valley  
of the Sun:

Nine clubs contributed.....\$ 42.00

In the remainder of Arizona

four clubs contributed..... 17.00

From all Garden Club..... 59.00

From Phoenix business

houses (3)..... 30.00

From resort hotels (1)..... 10.00

Support from all of these

sources .....\$ 99.00

About one-half of our memberships are held by Arizonans, the remainder outside the state.

Total Arizona support of Garden, \$600.00.

Ninety per cent of the merchandise sold is to visitors to the State and almost all of the cash contributions come from visitors.

From these figures we can determine a great lack of support for the Garden

from Arizonans despite the fact that the Garden attracts over 100,000 visitors a year, making it one of the outstanding attractions of the Valley of the Sun.

## ACCESSIONS

Mrs. Walter Douglas has presented to the Garden a Cycad fossil of very great antiquity possibly dating to the Mesozoic era.

The Cycads are palm-tree like plants that represent a survival of a very early type of vegetation. They are popular greenhouse plants sometimes called "Sago Palms." Two small living plants can be seen in our lath house.

From Mr. C. C. Pidgeon we have received a nearly perfect specimen of the pottery of Nampaya of the Hopi Tribe. This graceful and beautifully decorated bowl will be shown in a glass case to be constructed this summer to house both the bowl and the Cycad fossil.

The Garden, at the request of Mrs. Archer, entered an exhibit of wild flowers and flowering cactus in a natural setting at the Valley Garden Center Flower Show "Arizona in Bloom," on April 5-6.

Our exhibit was awarded a special prize by the judges of the show.

Our director was greatly honored by having the program of that flower show dedicated to him. A photograph of the director at his desk occupied half of the dedication page under which was the dedication and a list of his affiliations. The dedication was in the following statement:

"Mr. Marshall is the President of the Arizona Cactus and Native Flora Society and Director of the Desert Botanical Garden of Arizona. It is through his untiring work in the latter organization that the Desert Botanical Garden of Arizona has become outstanding, being the only Botanical Garden in the world devoted exclusively to Desert Growth."

We greatly appreciate this very complimentary gesture and thank Mrs.

Archer especially as we feel that she was responsible for it.

## REG MANNING

At his own suggestion, Reg has become a plain board member of the Society after serving for five years as Chairman of the Board.

For the tremendous help and encouragement he has given to me over those years, and as the first Arizonan to come to my aid when I first came to the Garden, I am deeply grateful.

To Reg goes a very large portion of the credit for our success and I sincerely hope that we shall continue to have his advice as a member of the board for many years.

W. TAYLOR MARSHALL.

## VEGETATION OF THE ARIZONA DESERT

### A Series—Part Five.

Mesophytes are plants intermediate between the desert vegetation and that of districts of normal rainfall. They survive in arid lands by selecting only districts where surface water is available, usually along stream beds where a surface flow is continuous or where a flow of water is available just under the gravelly stream bed.

The most prominent of the mesophytes is the Cottonwood Tree (*Populus fremontii*) but several species of Willow (*Salix* sps.), mulberry (*Morus microphylla*), desert willow (*Chilopsis linearis*) and others are recorded.

Mesophytes are interesting to desert visitors because they represent a type of plant life familiar in the visitors' home state and those plants have not modified their structure to meet desert conditions but have merely limited their residence to the few portions of the desert that present favorable habitats.

The Desert Annuals include many of the grasses and wild flowers and they seem, at first glance, to be identical with the grasses and wild flowers of regions of greater rainfall.

A close study of their life habits disclose that these annuals have been greatly modified to enable them to exist in arid lands.

For example, when spring rains are light, the annuals can complete a life cycle from seed germination through growth, flowering and fruiting in as little as three weeks while comparable species in more favored districts will spend three or four months from germination to fruiting.

Species of Lupines are found in both mountain and desert but the desert species have small, narrow leaves or broader leaves densely covered with matted hairs to prevent water loss and they grow faster and fruit earlier than their mountain sisters.

Spring and summer rains on the desert are usually spotty. Heavy precipitation in limited areas and no rain at all in many areas.

Any district that receives water in

spring and summer will put forth a carpet of wild flowers and grasses but many districts do not get any moisture for periods of ten to fourteen years. Yet as soon as rain does fall in those sun parched areas the wild flowers appear.

This is due to the fact that the seeds of the desert annuals have a flint-hard outer coating which enables them to remain dormant and viable for many years until enough water, followed by hot sun, causes the coating of the seed to split and the seed to germinate.

As we review the wonderful adaptations of the desert plants to their environments a thoughtful man can not reconcile such near intelligence in plants without being impressed with the certainty that all these marvels are the result of the Master Planner and to give thanks to God for the desert and the lessons in patience and hope that we can derive from it.

## THE BACK ROOM OF THE NATIONAL PARK SERVICE

By LLOYD PIERSON, Ranger  
Montezuma Castle National Monument

In line with the current series of articles in *Saguaroland Bulletin* concerned with National Park Service areas the following article is offered to acquaint the professional and interested amateur with some of the behind-the-scenes research work in these places.

The average visitor to a National Park or Monument usually sees the principal feature or features of the area, the exhibits, the nature trail if the area has one, and can hear the interpretive lectures which are given. Behind all of this is a vast amount of research work which has been done and is being done to make possible the presentation of accurate information to the visiting public. The most important results of this research work are available through the aforementioned interpretive services.

For those who are sincerely interested in some of the details and finer points the raw data and source materials are

also available for study. This fact, however, is rarely advertised to the general public because of the time-consuming nature of showing it to the average visitor.

Ideally a Park Service area should have material and information on everything within the immediate vicinity and surrounding region, no matter what the subject. That is the ideal, but most places are too limited in funds, space, time or trained personnel to cover all fields of knowledge. However, in every area will be found several collections and research aids such as those listed below.

**STUDY COLLECTIONS**—Collections of specimens in the fields of Archeology, Ethnology, History, Geology, Botany, Zoology and other subjects form the basis for research and information and provide material for the museum exhibits.

Naturally the most complete collec-

tion in an area is usually in the field of the principal feature of the area, such as archeology at Tonto and Casa Grande National Monuments, history at Tumacacori National Monument, botany at Saguaro and Organ Pipe Cactus National Monuments.

In the field of botany, which is of greatest interest to most readers of this publication, the herbarium or study collection may be supplemented by a garden of native plants and a "layman's herbarium." The layman's herbarium, a specially mounted series of more common plants, is readily available (usually in the museum) to the visitor so that he can identify for himself the plants that he has seen in the area. The live garden is kept to show the interested visitor many of the local plants all growing in one accessible spot and to allow the Park Service personnel to make better observations on certain important plants.

**OBSERVATION RECORDS** — These records are concerned with interesting factual observations of the habits of the flora and fauna of the area. Weather observations, either through a local or a nearby official Weather Bureau Station, are kept on file. Bird-banding records may also be included in this category, as many places have or have had bird-banding stations. This series of records aids in determining the approximate dates of flower blooming, bird migrations, weather conditions, etc., and provides a check list of the flora and fauna inhabiting the region. Helpful predictions as to future natural history events can also be made from this file.

**FACT FILES.** These records cover a multitude of sins but usually contain, besides purely administrative or maintenance material, a great amount of information and misinformation about the area. Misinformation, especially tall tales, are actually recorded, definitely identified as such. Principally, however, the fact files are concerned with bibliography of the area and notes of information on all subjects of interest,

including those not readily available from other sources, and short concise summaries of previous work.

**LIBRARY.** Here are found the books, periodicals, pamphlets, newspaper clippings, maps, and photographs, which are the basic tools of research and observation in any area. To facilitate the use of the library, a catalog of the contents is maintained. In addition, most areas have for sale through their Natural History Association books which deal with the natural and human history of the region and are offered because of their factuality and readability.

**LABORATORY OR WORKSHOP.** To keep in operation such a program as is outlined here it is necessary to have a place where research work may be accomplished, museum exhibits made, and maintenance of the collections be done. An integral part of the workshop is a photographic dark room, which also finds much favor with the harried tourist with a tangled film in his camera.

**PERSONNEL.** The last source of information to be mentioned but probably the first that should be consulted is the men and women who administer and interpret the National Park Service areas to the public. Many facts and much information can be obtained from these people. Those who are interested in scientific collecting can get information on where the species can be found outside the park or monument (collecting on National Park Service areas is prohibited except in some special cases), as well as on road conditions, sights to see, and many other items which are not to be found in any book, file, or record.

## WUPATKI NATIONAL MONUMENT

The red sandstone prehistoric pueblos of Wupatki, gleaming against a background of black basaltic cliffs and facing a view of the Painted Desert of the Little Colorado River, were built by

home sites have been discovered in the monument, varying from the pits of ancient earth lodges to house structures three stories high. Studies of ancient wooden beams in the ruins have dated the major occupation as occurring during the eleventh and twelfth centuries.

These abundant prehistoric ruins constitute the tangible and colorful remains of an eleventh-century Indian "land rush" that resulted from the earlier eruption of Sunset Crater, a nearby volcano.

Coming from several directions and bringing different customs, the various tribes met and mixed, though remaining in large part distinct groups, forming a local cultural pattern differentiated from its contemporaries in other sections of the prehistoric American Southwest.

The many ruins in Wupatki National Monument are in an unusual state of preservation. The most accessible are the Citadel and the Wupatki, located five and 14 miles, respectively, from U. S. No. 89.

groups of farming Indians, ancestors of the picturesque Hopis. More than 800

## THE ERUPTION AND THE LAND RUSH

Prior to the eruption of Sunset Crater, the vast area from the San Francisco Peaks to the Little Colorado River was sparsely inhabited due to scarcity of rainfall for raising crops. A few families were scattered along the base of the peaks where abundant snow and frequent summer rains made farming possible.

Between A. D. 1046 and 1071, there were rumblings in the valley at the foot of the peaks. Earth lodges abandoned by the frightened Indians decayed into ruins. Then came the eruption of what is now Sunset Crater. Huge clouds of volcanic cinder or ash buried remains of the homes and spread a black mantle over more than 800 square miles of territory between the mountains and the river.

While this was probably regarded as a great catastrophe at the time, some of the Indians soon discovered it was possible to raise corn where plants previously had shriveled and died from lack of water. The fine layer of cinder over the soil formed a mulch which



Wupatki Ruin. Nat'l. Park Service photo.

absorbed moisture from the scanty rain and snow. Gradually, news of this new farming land filtered out over the Southwest. The land rush was on.

#### **THE PEOPLE**

Here truly was a "melting pot." Indian families came from the north, south, east, and west. In the cinder-covered area is the only place where we find the Pueblo dry farmer from eastern and northern Arizona mingling with the Hohokam irrigation farmer from the south; where there are strong influences from the Mogollon groups to the south and east along with those from a more backward and, as yet, little known people from the west.

Each tribe came with their precious corn seed and digging sticks to cultivate the cinder soils. They met and mingled. In the earlier village ruins it is possible to distinguish these various people by characteristic styles of their utensils, tools, and weapons, but as time went on these differences became less and less apparent.

#### **THE VILLAGES**

Villages were developed throughout the cinder-covered area. One of the most important and longest inhabited of these was a ruin which is now called Wupatki—a Hopi Indian word for "Tall House." Here was a spring, one of the few in this arid region.

Wupatki is one of the most spectacular pueblos in northern Arizona. Its sandstone walls rise from a sandstone spur at the base of a black lava mesa that overlooks the Painted Desert. From an insignificant pueblo of a few rooms, Wupatki grew until it became the largest in the region. During the 1100's it contained more than 100 rooms, was in places at least three stories high, and had an estimated population of from 150 to 200 persons. To one side of the ruin, protected from the prevailing winds, was an open-air amphitheater which apparently was used for public ceremonies. In the valley below is a "ball court," the only stone-masonry one that has been discovered in the Southwest. Little is

known of the game itself, but it was very popular in southern Arizona and was brought up by migrants from that region. In 1933-34 Wupatki was partially excavated by the Museum of Northern Arizona in cooperation with the National Park Service.

Around the Citadel was another concentration of prehistoric Indians. Within a square mile there are more than 100 sites, varying in size from earth lodges to the larger pueblos. The Citadel itself, as yet unexcavated, is a fortified apartment house. Probably it was once two stories high and contained nearly 50 rooms. Its impregnable position on top of a small lava-capped mesa, overlooking a wide expanse of country, suggests that it served as a retreat during times of stress. Numerous loopholes through the thick walls strengthen this impression. On the terraced slopes of the mesa are circles of boulders, the remains of more temporary homes. It is possible that the Citadel was built to guard a water supply that existed in the nearby limestone sinkhole.

Just below the Citadel is the small pueblo now called Nalakihi, a Hopi word for "House Standing Alone." It, like Wupatki, was excavated and partially restored in 1934.

Other outstanding ruins in the monument are Wukoki ruin, another fortified apartment house; and Crack-in-the-Rock ruin near the Little Colorado River. To reach these more inaccessible ruins, it is necessary to make arrangements with the superintendent, whose office is near the Wupatki ruin.

#### **ABANDONMENT**

All of the ruins were abandoned in the 1200's. This is accounted for, partly at least, by several factors—high winds sweeping the moisture-conserving cinder fields, climatic changes, and disease among the Indians. It brought to a close one of the unique chapters of Southwestern archeology. Probably among the present day Hopis the descendants of these people are to be found.



Wupatki Ruin. Nat'l. Park Service photo.

Drought and disease, possibly also attacks of nomad enemies, caused the abandonment by the Pueblos of most of northern Arizona during the thirteenth century. This region, the Segi region (Navajo National Monument and vicinity), and the region of Canyon de Chelly National Monument were deserted. The survivors from all these areas must have congregated at the Hopi mesas, where the springs never fail. Later, in the fourteenth century, the great pueblos of Chaves Pass and Homolovi (near Winslow, Ariz.) and of the Verde Valley (notably Tuzigoot and Montezuma Castle National Monuments) were abandoned, their people going northeast to swell the Hopi nation. When the Spaniards arrived in 1540, there were no pueblo villages occupied in Arizona save those of the Hopi, in Tusayan.

#### **TREE-RING DATES**

The time of occupation of each ruin in this region is fairly well known, through the tree-ring method of dating

prehistoric sites. The date of eruption of Sunset Crater is approximately known from the dating by the tree-ring method of houses built before and after the cinder fall.

#### **NEARBY POINTS OF INTEREST**

This is one of the most interesting archeological and scenic localities in the United States. Walnut Canyon and Wupatki National Monuments are different manifestations of the effect of the eruption of Sunset Crater. In the Verde Valley are Tuzigoot and Montezuma Castle National Monuments, which are notable as the refugee areas during the Great Drought of prehistoric times. Montezuma Well is an important spot on the prehistoric trade route from the South. The Museum of Northern Arizona, near Flagstaff, displays many exhibits of interest to visitors. There are a number of scenic drives and points of interest in the general area surrounding Flagstaff, including the Coconino National Forest.

## HOW TO GET TO WUPATKI

Wupatki National Monument is easily approached from U. S. No. 89 at a point 25 miles north of its junction with U. S. No. 66, four miles east of Flagstaff, and 23 miles south of its junction with State Highway 64 close to Cameron. Roads within the monument are not improved. There is also another entrance road from Sunset Crater National Monument. However, it is one-way, runs through deep cinder, and is not advisable for drivers unaccustomed to this type of road. It is generally impassable in winter.

Free guide service is available at the Wupatki ruin from 8 a. m. to 5 p. m. No accommodations for visitors are provided in the monument, but such facilities may be obtained at either Flagstaff or Cameron, each approximately 40 miles away. Lunches may be purchased at a few points along U. S. No. 89.

For information, write the Superintendent, Wupatki National Monument, Tuba Star Route, Flagstaff, Ariz.

## CULTURE OF DESERT TREES AND SHRUBS

Many people admire and are interested in growing some of the beautiful and unusual desert trees and shrubs for they believe that these trees and shrubs need very little water to live. In part that is true, but to first get the plants established lots of water is needed the first year, but the watering can be tapered off the next year.

To understand the desert trees and shrubs, always remember that they usually send down a tap root seeking the water table and then send out roots near the surface to absorb the water from showers. Many of these trees and shrubs will die in transplanting if a portion of the tap root is injured or broken off. Bear this in mind when you select one of the following four methods to get plants established in your area:—

1. Plant the seeds of the desert trees

or shrubs in spots that you have selected as the permanent location for your plants.

2. Plant the seeds in one or five gallon cans and in a year or two set-out your seedlings in desired locations.
3. Transplant small trees and shrubs. This is seldom successful.
4. Propagate from cuttings.

When planting seeds of desired species in permanent locations be sure to loosen the ground deeply and plant seeds about one inch below the surface. Make a shallow depression around the seed area to hold the water and water daily. Some weeds or branches should be placed over the area to keep the ground shaded so that the sun does not dry out the soil. It is very important that the soil be kept moist during the germination period as any drying out will stop germination of the seeds. As a precaution place a wire netting around the seed bed so that birds or rodents do not eat the seed and that the rodents and rabbits do not eat off the seedlings. After germination watering can be gradually tapered off until about once a week is sufficient.

The following plants have been started from seed in our Garden and the table will give you an idea as to the rate of growth that can be expected.

	Blooming	
	Age and Size	
Palo Verde	4 years	4 feet
Blue-Green Palo Verde	3 "	4 "
Parkinsonia Palo Verde	2 "	6 "
Bird of Paradise Tree	2 "	3 "
Tobacco Tree	1 "	3 "
Desert Willow	3 "	4 "
Mesquite, honey	5 "	5 "
Scented Acacia	4 "	6 "
Creosote Bush	4 "	2 "

If you are undecided as to where you wish to place your seeds or seedlings you can save some time by starting the seeds in one or five gallon cans and then set them out when they are large enough to begin to make a showing.

Use clean cans, place drainage holes

in the bottom of the cans and fill the lower portion of can with rocks or very coarse gravel. The rest of the can can be filled with a mixture of equal parts of sand, top-soil and leaf mold. Plant the seeds about one inch below the surface and place cans in a tray filled with water so that the water will soak up into the cans through the drainage holes. Keep the tray filled with water at all times. After the seeds have germinated and the seedlings are about two inches tall remove the cans from the tray and then water the seedlings from the top gradually tapering off on the watering until you water only once a week. Keep the cans during germination and growing period lightly shaded.

These plants can be grown for a year in the one gallon cans and two to three years in the five gallon cans.

When you are ready to set out these plants in the spring it is important that the root crown be set slightly lower than the ground level and that dirt be piled up around the stem so that water may not be directly against the bark as the water may cause a bacterial infection. Be sure to make a wide depression around the plant to hold water. Sprinkling does very little good. It is better to let the hose drip near the plant overnight so that the ground is well saturated. After a couple of good soakings you can then water once every 2 or 3 days, then about once a week for the rest of the summer. The following year you will not have to soak more than once a month depending on the weather, although many of the desert plants will lend themselves to regular garden culture.

As the rainfall in the deserts is very small, most of the desert plants have developed root systems far beyond the proportions of the plants. In attempting to move or transplant these plants to your grounds you will probably be able to get less than 10% of the roots of the plant. So to start with, it does seem to be a losing proposition in view of all the hard work involved to attempt

to move the desert plants. Some persons are successful but the plants grow very slowly until they are established; whereas if seeds were used, the seedling would in time make more growth than a transplanted plant and give you a healthier sapling.

If you want to transplant a tree or shrub do it when the ground is moist during the dormant period of the plant, usually the winter. Dig a two-foot circle around the plant and downward as deep as you can go and then place burlap around the roots and ball-out the plant. In transplanting be sure that the crown or former ground level is slightly lower than your present ground contour. Make a wide shallow depression to hold water and soak the ground overnight with a dripping hose. Water weekly until plant begins to show strong growth, then taper off the watering slowly but never enough to damage the plant.

You can gain a year in getting additional plants by taking cuttings from your trees or shrubs. The cuttings should be of 2 or 3 year growth and can be placed in a can or bed of sand and kept moist. The cuttings will root in a few weeks and then can be transplanted to 1 or 5 gallon cans with a soil suitable for seedlings and then kept moist. Desert-holly, desert-willow, ocotillo and many other woody shrubs can be rooted readily.

In closing would like to say that just because desert plants are extremely drought resistant it does not mean that they can get along without much water. They must have water to sprout, grow, flower and bear fruit.

W. HUBERT EARLE.

## Desert Botanical Garden

Book Dept.

P. O. Box 647

Tempe, Ariz.

### PACKAGED CACTUS PLANTS

Attractive packages with cut cellophane packing.

			Post- Price	age*
No. 1	5 year old Saguaro Seedling			
	2" high	.50		.10
No. 5	5 plants	1.00		.30
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No. 24	24 large plants many of flowering size	7.00		1.00

### BOOK SUGGESTIONS:—

	Post- Price	age*
Arizona's Cactuses; Marshall		
paper binding	1.00	.15
cloth binding	2.00	.20
A description of all of the species native to Arizona. 60 ills.		
Flowers of the Southwestern Desert—Dodge	1.00	.15
Flowers of the Southwestern Mesas—Patraw	1.00	.15
Poems of the Desert by Lou Ella Archer.		
Cloth bound, beautifully illustrated in color		
Canyon Shadows	2.00	.10
Sonnets to the Southwest	2.00	.10

### Gift Suggestions

	Post- Price	age
Prickly Pear Jelly—		
4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor	2.20	.80
Prickly Pear Delight—		
A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor		
½ pound box	.80	.20
1 pound box	1.50	.30

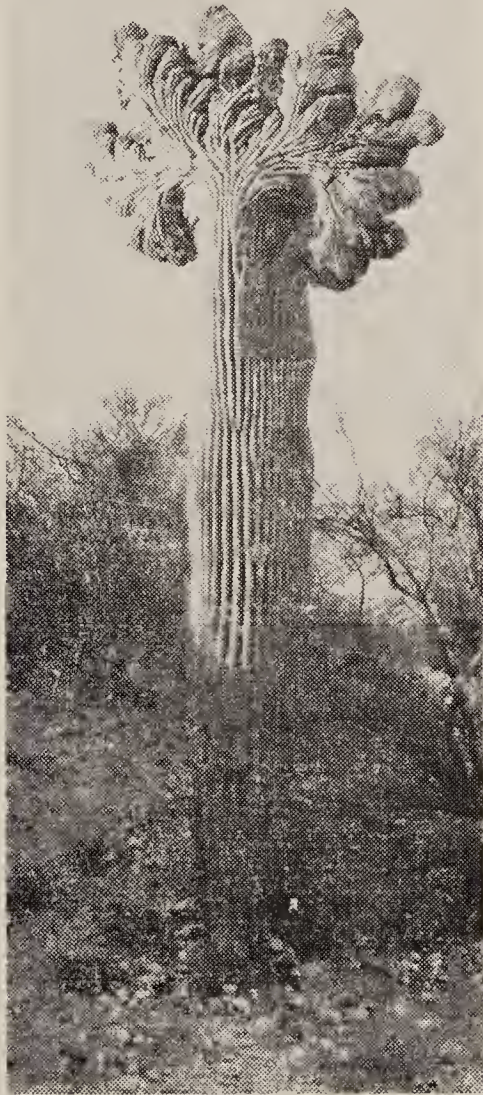
\* Postage and wrapping charges.

# SAGUARO

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

JUNE-JULY, 1952



A crested Saguaro near  
Wickenburg.  
I. O. Adams photo.



REG-MANNING

# SAGUAROLAND BULLETIN

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W. TAYLOR MARSHALL, Editor

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Volume VI

JUNE-JULY, 1952

No. 6

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## Desert Botanical Garden of Arizona

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Garden hours: May, June and September. Open Saturday and Sunday only, 1 P.M. to 6 P.M. July and August, closed to visitors.

## EDITORIAL

This issue of our Bulletin will be mailed about July 1st and our next issue for August-September about September first after which monthly issues will be resumed.

The Garden will be closed to the public during July and August but will be open each week-end in September and the first half of October. During all of this period members are welcome but admission is only through the west or service entrance.

We have started work on a residence building even though we will be nearly \$1000.00 short of the money needed as we are sure that there will be additional donations to our building fund during the construction period. Much of the work will be done by the Garden staff to keep costs down to a minimum.

If you have not already donated to this work, and can afford to do so, please join in the good work. Remember donations are deductible from income tax reports.

## SOUTHEASTERN ARIZONA TRIP

The planned trip by our Garden Staff and several scientists from Arizona State College at Tempe was made with the idea of checking a number of species of plants, birds and insects described as indigenous only to the Guadeloupe Valley.

The personnel of the trip include Dr. James McCleary, Botanist, Dr. Hugh Hanson, Ornithologist and Dr. Herbert Wallace, Entomologist from Arizona State College, the director and Jim Blakley, junior botanist from the Garden and Mr. Alan Blackburn of Tucson.

The State College group left Phoenix on Sunday morning, May 25, 1952 and spent the afternoon and evening at Peppersauce Canyon on the north slope of Mt. Lemmon and camped there for the night.

Jim and I left Phoenix at 4 P.M. and

met Mr. Blackburn at Tucson and went to his ranch home for dinner and to inspect his two plants of *Mammillaria lasiacantha* collected by him in the Whetstone Mountains in Cochise County, Arizona.

We were fortunate in that one of his plants was in flower, making positive identification possible and making it possible to include this species in the Flora of Arizona.

Our party met at 7 A.M. Monday for breakfast and then started in three cars on Highway 80 to Vail, on Highway 83 from Vail to Sonoita and on Highway 82 to a point a few miles into Cochise County where we stopped to try to locate additional specimens of *Mammillaria lasiacantha* but failure attended our efforts.

Jim did find a beautiful "trumpet bush" *Tecoma stans* (L.) H.B.K. which bore butter yellow trumpet shaped flowers over 2 inches long. We felt that this find would justify our trip if we made no other finds at all. Herbarium specimens, several cuttings and a packet of seeds were taken and we hope to establish the plant in our Garden.

We had lunch in a mesquite thicket on the San Juan River, then on through the towns of Tombstone, Bisbee and Douglas where we took a road unmarked on the State Highway map which leads to the exact southeast corner of the State.

Thirty miles east of Douglas we made camp at the foot of a hill thickly covered with plants of *Agave schottii*, *Agave plameri*, *mammillaria heyderi*, *Coryphantha aggregata* and *Echinocereus fendleri*. While some of our party collected plants and insects I prepared dinner but just as it was ready to serve a heavy thunder shower drove us into the cars where dinner was eaten without formality.

Continued rain after dinner made it advisable to head back to Douglas, but 12 miles before we reached the town

we ran out of the storm and made camp for the night.

Tuesday morning we collected at our campsite *Echinocereus pectinatus*, *E. pectinatus* var. *rigidissimus*, *Manihot angustiloba* and numerous wild flowers.

After breakfast of ham and eggs we again started for our destination, Guadeloupe Canyon, which was 30 miles further east but nearly two hours were required for that distance.

In the lead was Mr. Blackburn in his Jeep with a trailer loaded with equipment, then the Arizona State College contingent in a Chevrolet Carryall and my Ford with Jim and me last. Seldom did we make as much as five miles until a new plant, bird or insect would attract one of the party and a halt would be called.

At such stops it was amusing to us in the last car to see the Carryall stop and our three scientists erupt through the doors, Dr. Wallace, who looks well fed, waving a butterfly net, Dr. Hanson with binoculars and a jacket with large pockets filled with bottles and boxes for specimens and Dr. McCleary with his Vasculum and miners pick, scattering in all directions in search of the victims of their choice.

The stop might last 5 minutes or 30 minutes depending on what new species were found and collected and the time required to put the plants into the plant presses or to kill, dry and mount the insects.

After our evening meal and well into the night the specimens were determined from extensive literature we carried with us. Coleman lamps were sometimes set out on sheets on hill tops for the collection of night flying insects.

A few hours would then be wasted in sleep but by 5 A.M. the camp was astir and some of the men would be off collecting while the others prepared breakfast.

As this trip was into high country, 5000 feet to 6200 feet, the nights were cold and the days warm with occasional

thundershowers each day. Sleeping bags were supplemented with extra woolen blankets and woolen shirts and sweaters were indicated for early morning wear, but by noon many of us wore nothing above our belts. Our light noontime costumes resulted in many scratches from thorny vegetation.

By noon we reached the beginning of Guadeloupe Canyon and the party separated to explore while I prepared lunch. Dr. McCleary climbed to the top of a low cliff across the clear cold stream and went over a fence to explore, the other members of the party spread out along the stream and were searching for plants and insects when a border patrol officer came along and informed Dr. McCleary that he was in Mexico and the fence he had crossed was the international boundary.

Collections made here and at the head of the Canyon four or five miles further east, which brought us to the New Mexico border, consisted of many species of plants including *Mammillaria wrightii*, *M. olivae*, *Echinocereus triglochidiatus* var. *melanacanthus*, *E. fendleri*, *Yucca schottii*, *Y. thornberi*, *Agave schottii*, *A. palmeri*, the coral tree (*Erythrina flabelliformis*) and a very interesting chuparosa bush (*Anisacanthus thornberi*).

We returned that afternoon to our last night's camping spot where we again spent the night, to start early Wednesday morning through Douglas on Highway 80 to Apache, where we turned off to Rucker Canyon which is 6200 feet high in the Chiricahua Mountains. Here we collected plants of the Apache plume (*Fallugia paradoxa*) and also seeds.

A careful search was made here and in the Guadeloupe Valley for a species of *Escobaria* reported indefinitely as from Southeastern Arizona but no trace of the plant was found.

Wednesday night we camped at Portal at 5400 feet after collecting *Echinocereus triglochidiatus* var. *octacanthus* near

Paradise. At Portal Jim found an evening primrose with flowers of clear yellow and over two inches in diameter.

The scenery at this camp was very impressive as the camp was located in a narrow canyon between almost perpendicular cliffs. Pines, sycamore and oak trees, ferns and wild flowers grow along the stream and birds and wild life abound.

Here we stayed in a Forestry Camp and nice tables were provided so that cooking and eating could be done in normal position and not hunched on one's heels, cowboy fashion, as all the other meals had been cooked and eaten.

On our last day we went to the San Simon valley to collect *Coryphantha muehlenpfordtii* and after hours of search a single plant was found. The Garden has other specimens from this same valley but that is not the same as collecting in person so we were well pleased to find even one of a plant which is so scarce.

Our observations of *C. muehlenpfordtii* and *C. robustispina* leads us to

believe that the former is a mere geographical variation of the latter in which case the San Simon Valley plant and its brothers from New Mexico and Texas would be *C. robustispina* var. *valida*.

Flowers and fruits are identical on plants of *C. robustispina* from Santa Cruz County and its eastern variation; the only difference we can detect is that the variety is slightly more cylindrical in shape and the spines are more numerous and acicular while *C. robustispina* has fewer and subulate spines.

Near the town of San Simon we collected four plants of *Koberlinia spinosa*, one of the three species of Arizona plants called "Crucifacion thorn."

At San Simon, Mr. Blackburn left us to make a further search for *Coryphantha muehlenpfordtii* and the balance of the party drove to Bowie for lunch, after which the College group left us for additional explorations of their own while Jim and I made the 225 mile drive back to the Garden, which we reached at 6 P.M.

W. T. M.

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## POPULAR ENTOMOLOGY

Mort Spielman of Chicago is responsible for this one:—

A father, greatly concerned that his 16 year old son spent too many evenings at the pool room, suggested to the boy that he take up a hobby to occupy his spare time.

The boy was not receptive to a suggestion that coins, stamps or buttons would make an interesting hobby but became more interested when the study of insects was suggested and he was particularly impressed by the possibilities in night insects such as moths.

At his father's suggestion he went to the public library to get source information books to study up on moths but

as he first stopped at the pool room he reached the library after it was closed. A janitor was cleaning up, however, and the boy solicited his help in the selection of an appropriate book.

The father was somewhat amazed at breakfast next morning when the boy displayed the book he had selected with the janitor's help, as it was entitled "Advice to expectant moth-ers."

## QUILT PATTERNS

Mrs. A. O'Connell, 9301 Scottdale St., Jennings, 21, Mo. has 28 cactus quilt patterns and 28 succulents quilt patterns which she will send together with a color chart for 80c a set or \$1.60 for the two sets.

# MAMMILLARIA WRIGHTII

## Engelmann

This polymorphic species was first described by Dr. George Engelmann in Report of the U.S. and Mexican Boundary Survey based on three collections as follows:—

Wright; New Mexico near Coppermines (Santa Rita)

Bigelow; on the upper Pecos, east of Santa Fe

Parry; near El Paso

This first description was dated 1856 but the actual publication of the report was not until 1859 and meanwhile Engelmann published his Synopsis of the Cactaceae of the United States in Proceedings of the American Academy of Arts and Sciences in 1856 including in it *M. wrightii* based only on the Santa Rita collection of Wright.

In 1898 Schuman in *Gesamtbeschreibung der Kakteen* 545 published Toumey's *Mammillaria wilcoxii* based on an Arizona collection.

In 1923 Britton and Rose in *Cactaceae* IV:153 published *Neomammillaria viridiflora* based on a collection by Orcutt at the boundary monument on the old Superior-Miami Highway and by Mrs. Ross near Tula Spring south of Aravaipa, Arizona.

Comparison of the original descriptions of these three entities on page 67.

Observations of 12 plants from Anton Chico, New Mexico, 7 plants from south central New Mexico, 3 plants from San Simon Valley in Arizona, 12 plants from boundary monument on the Superior-Miami Highway, 18 plants from Mount Lemmon near Tucson, 8 plants from Springerville, Ariz., 2 plants from Mojave County, Ariz., and 2 plants from Maricopa County, Ariz., show the following comparisons:—

Plant bodies not deeply seated or very deeply seated and obconic from any of the range. Size varies from 5 cm. to

10 cm. in diameter and from 5 cm to 12.5 cm. in height in the growing season but about one half of that height in winter.

Globose plants are reduced up to 50% and become depressed globose to flattened as winter approaches.

Radial spine from 8 to 30 and from acicular to heavy in specimens from any part of the range. Color of the radials is from reddish brown to white, mostly gray.

Central spines 1 to 4 of which one, two or all may be hooked. Color brown to black, shape acicular to subulate.

Flowers very variable in size not only on different plants but also on the same plant from season to season, 15 cm. to 25 cm. in length and diameter.

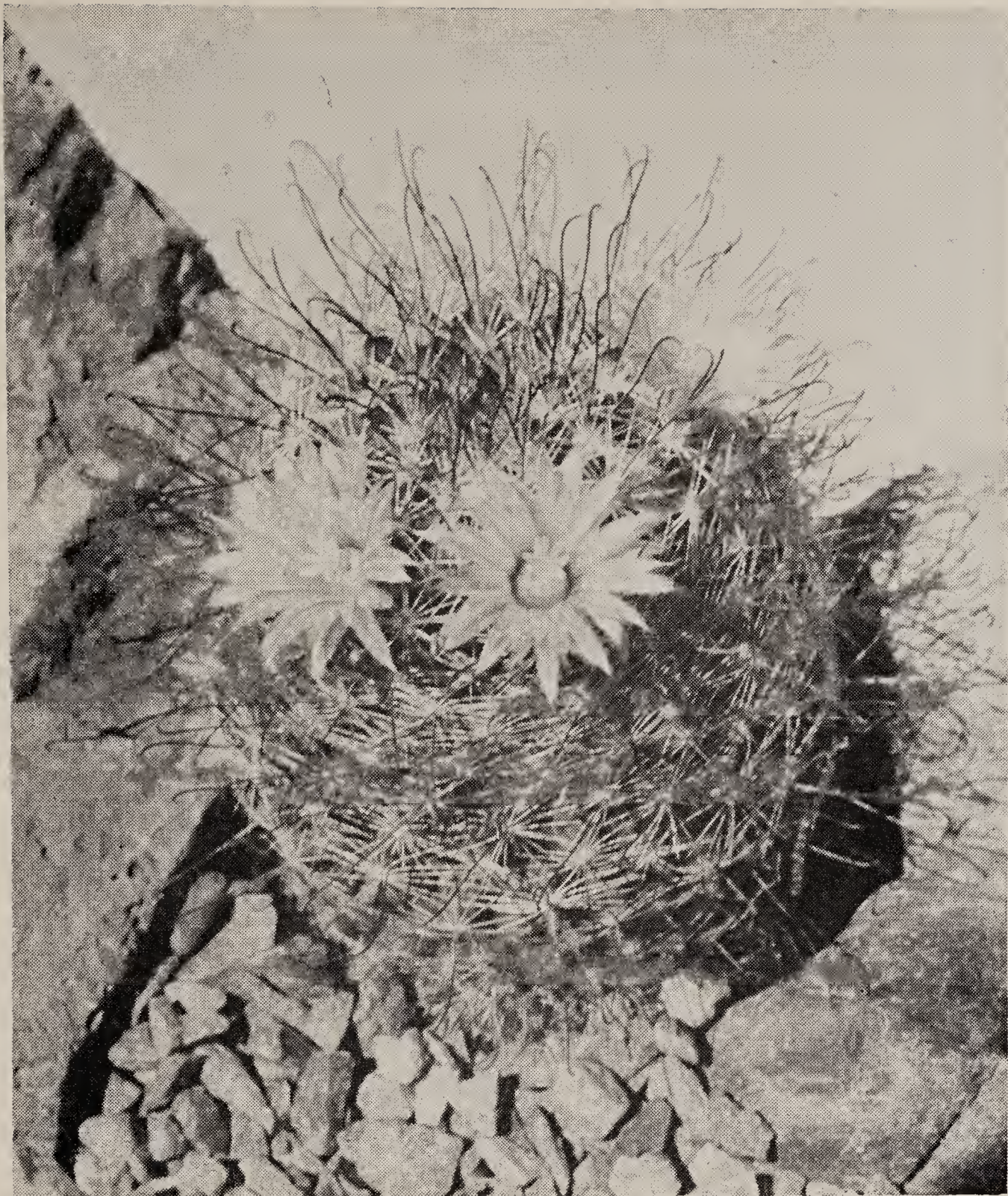
Flower color varies from green through yellowish and pinkish to deep magenta. All of the green flowered plants collected in 1951 at the boundary monument and on Mount Lemmon bore deep magenta flowers in 1952.

Only in their fruit are these plants fairly constant and the fruit is unusual for the genus *Mammillaria* in which clavate red berries are usual. The fruit of *M. wrightii* is large, globose, 2.5 cm. long and about the same in diameter, bearing the floral remains persistently.

The color is at first green but as the fully grown fruit gradually ripens the color becomes tinged with pink and finally deepens into purplish. So large is the fruit that several tubercles are deflected as it ripens and a large bare spot is left when the fruit is removed.

At one time the writer thought that *M. wrightii* could be differentiated from *M. wrightii*\* but the accumulation of additional material and many weary miles of field work have convinced me that they are identical.

In *Cactaceae* 182, 1941 *M. viridiflora* was reduced to a variety of *M. wilcoxii* but it now seems advisable to disregard



*Mammillaria wrightii* var. *viridiflora*.

Claire Meyer Proctor photo.

	Roots	Body Shape	Size	Radial spines	Central spines	Flowers	Fruit
Wrightii	obconic	depressed globose		8 - 15	1 - 3 1 or all hooked	large purple	obovoid 25 mm. long large
Wilcoxii	fibrous	almost globose	10 cm.	14 to 20	1 - 3 1 or all hooked	large purple	obovoid 25 mm. long large
viridiflora	fibrous	globose to short oblong	5 cm. to 10 cm.	20 to 30	1 - 3 1 or all hooked	greenish large	obovoid 25 mm. long large

it even as a variety and to unite all three of the entities under the oldest name of *M. wrightii*.

Craig in *Mammillaria Handbook* 185, 186, 187. 1945 has included both *M. wrightii* and *M. wilcoxii* but notes on page 187 in remarks on *M. wilcoxii*: "This species is very closely related to,

if not just a geographical variation of *M. wrightii* although the radial spine count is slightly more and the stigma lobes count is slightly less (7-11)."

*M. wrightii* prefers an altitude range of 3000 to 6000 feet where it is found widely scattered in Oak or Juniper association.

W. T. M.

\* *Cact. & Succ. Journ* XIV:73:1942.

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## TUZIGOOT NATIONAL MONUMENT

Remnants of a prehistoric fortified town of Indians who farmed Arizona's colorful Verde Valley for two centuries before A.D. 1300

TUZIGOOT National Monument consists of the excavated ruins of a prehistoric pueblo which flourished between A. D. 1000 and 1400, and a museum which houses the entire collection recovered from the site during the excavations of 1933-34.

Tuzigoot, an extensive ruin on a hill across the Verde River from Clarkdale, Ariz., is an outstanding example of the large late-prehistoric pueblos of the Verde Valley. It is strategically located on a naturally defensible limestone ridge rising 120 feet above the river.

A fairly typical hilltop pueblo of 110 clustered rooms covering the summit of the ridge and terraced part way down the slopes, two-storied in part, Tuzigoot is about 500 feet long over-all and 100 feet across at its greatest width. An open patio, or plaza, separates an outlying unit from the main body of the pueblo, an unbroken mass of rooms 325 feet long. Many rooms are quite large; the average is about 18 by 12 feet.

There are only a few doors, the rooms having been entered through small openings in the roofs, as was customary in prehistoric pueblos.

### VERDE VALLEY PREHISTORY

**The Early People:** The story of Tuzigoot, as pieced together by students of American antiquity, opens 1,000 years ago. Early in the tenth century Indians of the Verde Valley were living peace-

fully in the midst of their cornfields. In nearby patches and between the hillocks of corn they raised beans, pumpkins, and cotton. These pioneer farming Indians occupied shallow pit dwellings—simple wattle-work huts with dirt floors. They were a northern offshoot of the Hohokam culture of the Gila Basin, with similar customs and similar red-on-buff pottery.

Around the year 1000, new peoples were coming into the Verde Valley from the north. The newcomers were accustomed to building compact masonry houses on mesa tops and in caves. These were Pueblo Indians, who soon erected the first small cluster of rooms on the hill at Tuzigoot. For almost two centuries this small pueblo of 15 or 20 rooms continued to shelter perhaps half a hundred natives.

**The Great Drouth:** In the late thirteenth century came a disaster in the northern Southwest (the country north of the Little Colorado and Flagstaff) which has never since been equaled. For an incredible 23 years, 1276 to 1299, the rains failed, crops lay stunted and dying in the parched soil, and whole villages faced starvation. Presently, from the great pueblo villages of what is now northeastern Arizona, a steady stream of fugitive humanity came in search of lands which might have escaped the drouth, where water still



Tuzigoot National Monument. Nat'l Park Service photo.

filled the streams and where rain spirits sent showers over growing crops. Word soon spread of a great valley of the south that was still green and through which a crooked river flowed. The luckiest of the refugees finally reached the Verde Valley.

During these terrible 23 years the pueblo of Tuzigoot doubled and redoubled its population until, by the drouth's end, there were 110 rooms on the hill-top.

Within sight of Tuzigoot, at the beginning of the fourteenth century, were more than twoscore other new pueblos, many of which are visible from Tuzigoot today. As the drouth abated, the newcomers were content to remain in their valley homes.

**Abandonment:** For almost 100 years the pueblo of Tuzigoot flourished; then

came disaster which this time could not be averted. Actually, archeologists cannot be certain of the reason for the pueblo's abandonment. It is possible that enemy invasions succeeded in storming the hill village. Indeed, some of the rooms had been burned, although signs of carnage are not present. Another explanation seems very probable. As in the case of pueblos still occupied in the days of the white man, crowded quarters, lack of adequate sanitation, and contamination of water supplies may well have brought sickness to the Verde Valley people.

The archeological story indicates that year after year more villagers were buried in the great refuse piles on the hillsides below the dwellings, and even more Indian babies were laid beneath the room floors in typical Pueblo man-

ner. At Tuzigoot, 170 infant burials have been excavated from beneath the pueblo house floors. The final abandonment by the much reduced population might have been due to attacks by hostile nomads. By this time there probably were Apaches in central Arizona, though some students believe they spread west from the plains of eastern New Mexico only in historic times. Aside from this, the ancestors of the modern Yavapai were probably in the region and may have attacked the Pueblos..

Finally, near the end of the fourteenth century, the Indians gradually left their fertile valley, and probably wandered northward to the great Hopi villages beyond the Painted Desert.

### REDISCOVERY

For five centuries the Tuzigoot pueblo, its rooms obscured under fallen material from the ruined upper floors and roofs, lay forgotten and undisturbed. In 1933 and 1934, complete excavation of the site was carried out with Federal relief funds and with the cooperation of the Phelps Dodge Corporation.

Through the interest of public-spirited local citizens, the entire hill of Tuzigoot, with museum and complete collection, was donated to the Federal Government, and on July 25, 1939, Tuzigoot National Monument, a tract of 42.67 acres, was established by Presidential proclamation.

### RELATED POINTS OF INTEREST

Of the thousands of open pueblo sites in the Southwest, the National Park System includes, besides Tuzigoot, outstanding examples in Casa Grande and Wupatki National Monuments, in Arizona; Aztec Ruins, Bandelier, and Chaco Canyon National Monuments, in New Mexico; and Mesa Verde National Park, in Colorado.

Many related features in interest lie ahead of the visitor who plans to con-

tinue north on United States Highway No. 89A to Flagstaff, Ariz. First and nearest is Montezuma Castle National Monument, one of the best-preserved cliff dwellings in the United States. It is 27 miles from Tuzigoot and can be reached by a good road branching from United States Highway No. 89A. The Castle, which was actually a community dwelling, offers many interesting comparisons with Tuzigoot, since it was inhabited at the same time and by people of the same general culture.

Continuing through famous Oak Creek Canyon and its vividly colored rock formations, many more attractions can be easily reached from Flagstaff. They include Walnut Canyon National Monument, a natural area of great beauty featuring 5 miles of cliff dwellings clinging to rock ledges; Wupatki National Monument, a series of remarkable pueblo dwellings; and Sunset Crater National Monument, the last active volcano in the Southwest, which erupted cinders over many early pit house dwellings about A. D. 1066.

Traveling south, the visitor passes through Jerome, Ariz., one of America's unique mining towns, perched high on the mountainside, 2,000 feet above Clarkdale. From Jerome one may enjoy a 50-mile view to the San Francisco Peaks, and a panorama of Oak Creek Canyon.

### FACILITIES AND ADMINISTRATION

Tuzigoot National Monument is a part of the National Park System and is administered by the National Park Service, United States Department of the Interior. Tours of the ruins are conducted from 8 a.m. to 5 p.m. An archeologist takes visitors through the museum, one of the largest in the Southwestern National Monuments. The museum exhibits include rare turquoise mosaics, delicate sea shells traded from the California Coast and made into

beads and bracelets, and painted pottery which accompanied the dead as offerings.

There are no visitor accommodations in the monument, as it is not far from

several small towns in which meals and lodging can be obtained. Inquiries should be addressed to the Superintendent, Tuzigoot National Monument, Box 36, Clarkdale, Ariz.



Tuzigoot National Monument. Nat'l Park Service photo.

## BOOK REVIEW

Flowers of the Southwest Mountains. Leslie P. Arnberger with drawings by Jeanne R. Janish. Southwestern National Monuments Assn. 1952. Price \$1.15 postpaid.

This final book in the series of plants of the Southwest is also the best. The drawings as usual are excellent and designed to accent the factors of each species that identify it.

The text is simple and interesting, which in our opinion indicates a very scholarly mind for Mr. Arnberger as simplification of botanical facts is not

easy and to make the facts interesting to the lay person is sheer genius.

Like the preceding books in the series, *Flowers of the Southwestern Deserts* and *Flowers of the Southwestern Mesas*, it is paper covered in three colors and describes about 150 of the most noticeable species in the altitude range.

All three books give very complete coverage of the Southwestern Flora. The *Desert Book* covers the lower Sonoran Zone at 500 to 4,500 feet, The *Mesas Book* covers the upper Sonoran Zone at 4,500 to 6,500 feet and this new book covers plants growing at 6,500 feet to timber line in the Transition, Canadian and Hudsonian Zones.

## Desert Botanical Garden

Book Dept.

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Tempe, Ariz.

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# SAGUAROWAND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

AUGUST - SEPTEMBER, 1952



*Echinocereus chisoensis* Marshall  
Photo courtesy of Cactus and  
Succulent Journal.



REG-MANNING

# SAGUAROLAND BULLETIN

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W. TAYLOR MARSHALL, Editor

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AUGUST-SEPTEMBER, 1952

No. 7

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## Desert Botanical Garden of Arizona

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Garden hours: October to April inclusive, open 10 A.M. to 5 P.M. daily and Sunday. Closed every Monday. Lectures on Sunday at 3 P.M. and 4 P.M. Instructions Thursdays at 3:30 P.M. No charge.

## EDITORIAL

The new residence of our chief horticulturist is becoming a reality and the contract on it will be completed about September 5th, after which the garden staff will have to paint it inside and out as the funds available did not permit contracting the painting. We have had to supply the continuous time of one man from our staff to the contractor in order to keep the price within our reach and you may remember that all the foundations were dug by our staff. Even with all of our own work, at which work each staff member has taken turns, the cost is so high that we have very seriously overextended ourselves and additional contributions will be necessary if we are to keep going until our next dividend from our trust fund on January first.

We have been helped out in the last two months by the following contributions:—

Mrs. Alfred Alschuler	108.77
Mr. & Mrs. John Schreuder	30.00
Mr. & Mrs. A. Malcolm Martin	20.00
John H. Eversole	100.00

A very severe wind storm damaged our lath house requiring an estimated \$1400.00 repairs. Most fortunately we have carried wind insurance on this building and the insurance company is making the repairs. No damage was done to the plants and the building will be strongly reinforced to prevent a recurrence of the damage.

We are pleased to report that Mrs. Rose Collom, well known botanical collector of Arizona, has given to us her complete herbarium consisting of about 1000 sheets of native plants, many of which were determined by the U. S. National Herbarium. This is a most valuable addition to our herbarium and we are thankful to Mrs. Collom, who has been an honorary life member of the Garden for the last six years.

## TEXAS EXPEDITION

W. Taylor Marshall

In 1939 the late Frank Radley of Oakland, California made a trip to what was called "The Big Bend Country" of Texas for the purpose of collecting cactus plants. There he found a plant new to him and he collected about 300 specimens of it and stopped off in Los Angeles on his way home to show me the plants and to leave ten or more of them with me.

When a careful check of recorded plants showed his plant was indeed new I described it in the January issue of *Cactus and Succulent Journal* for 1940 after depositing the type plant in Dudley Herbarium of Stanford University. Accompanying this article was a photograph of the type plant which we reproduce on our front cover. The new plant was named *Echinocereus chisoensis* because it was collected near the Chisos Mountains.

No report of the re-collection of *E. chisoensis* has appeared, in so far as I know, and the plants brought in by Radley have doubtless died, with the exception of two plants preserved by grafting by J. Whittman Evans of Phoenix, one of which is in the collection of the Desert Botanical Garden.

A trip to the type locality and an attempt to locate *E. chisoensis* has been on the agenda of the Garden for the last five years but time has not been available until this year. To further complicate matters the type locality is within the boundaries of Big Bend National Park, a district of 707,895 acres which includes that portion of Texas where the Rio Grande, forming the boundary between the United States and Mexico, makes a great U-shaped bend in its course and goes through three great canyons. Plant collecting within National Parks or Monuments is prohibited.

The discovery last year of another new cactus plant by Herman Tobusch of Villa Park, Illinois in East Central

Texas and the necessity of collecting additional species of it for herbarium sheets and getting notes on its environment provided the final incentive for a Texas expedition which we made in June. The plant discovered by Tobusch is described in this issue as *Mammillaria (Ancistrocactus) Tobuschii*.

On Monday morning, June 16th, accompanied by Jim Blakley, I left the Garden for Big Bend, stopping at numerous points to collect plants and seeds, and we arrived at Alpine, Texas on Wednesday evening. A report on these collections and other collections made on the return trip will appear in the next issue of the Bulletin.

Thunderheads over the mountains which threatened rain discouraged us from taking the direct road to the Park from Alpine, as we had planned, for this road is largely unpaved and is reported to be difficult during rains. Instead we went to Marathon, Texas and found a good paved road from there to the Park. Even this road would be difficult in heavy rain as there are no bridges and the road dips through many washes. It is 80 miles from Marathon to Park headquarters with no houses, stores or gas stations en route.

Preliminary arrangement with the National Park Service assured us of the cooperation of the rangers of the Park in our investigations but our first stop was at the new headquarters building, located near the junction of the roads to Marathon, Boquillas Canyon and the Basin, where we met Chief Ranger Sholly and a very cordial welcome and were shown a copy of a government publication, "Plants of the Big Bend National Park." In this book we found an excellent picture of *E. chisoensis* which was titled *Echinocereus enneacanthus*.

From headquarters we went to the "Basin" where, at an altitude of 5400 feet, National Park Concessions provides two types of cabins and a "chuck wagon" where excellent meals are

served at a reasonable price. We had made reservations for a deluxe cabin and found ourselves quartered in a handsome, spacious, concrete block cabin of two rooms and a bath. After a talk with the ranger at the Basin, Jim started on an eight mile hike on the south rim trail around Emory Mountain. I spent the afternoon identifying and packing plants collected on our way down.

On Emory Peak Jim located *Mammillaria meiacantha*, and a *Mammillaria* with long, in-curved, red spines, milky juice and a hemisphaeric shape which may be of Mexican origin. It is unknown to me. He also found *Escobaria tuberculosa*, *Coryphantha vivipara neomexicana* and a variety of *Echinocereus triglochidatus*.

On Friday morning we started on the Boquillas Canyon trip over paved roads which later became well graded dirt roads through striking scenery as we skirted the Chisos Mountains east slopes with the Carmen range across the Ernst Valley to the east of us. Tornillo Creek runs through this valley and on a side road which crosses the valley we found *Echinocereus chisoensis* but not plentifully. We also observed large clumps of *Echinocereus stramineus* and individual plants of *E. pectinatus* var. *neomexicana*. *Opuntia engelmannii*, *O. leptocaulis*, *O. schottii*, *O. macrocentra* and *O. rufida* were plentiful. *O. rufida* is not the plant that is commonly seen in collections under that name but is the plant that Fred. Gibson of Boyce Thompson Arboretum has always claimed it to be. *O. Schottii*, a clavate, ground cover is captioned "Potts prickly pear" in the book "Plants of the Big Bend National Park," a very obvious error.

*Coryphantha echinus* here formed large clumps and we found a few, usually simple *Coryphantha macromeris*. *Yucca elata*, *Y. baccata* and *Dasyllirion leiophyllum* represented the Lily family and *Agave lechugilla* was present in

great colonies. *Fouquieria splendens*, the ocotillo was plentiful but the majority plant of the desert was *Larrea*, the creosote bush. *Jatropha spathulata* and *Portieria angustifolia* were also plentiful.

Rejoining the main highway we drove southeast to Hot Springs where Tornillo Creek joins the Rio Grande River. Here in limestone we found a complete change of vegetation with *Agave lechugilla* sharing prominence with a member of the pineapple family, *Hechtia texensis*. *Echinocactus horizontalis* was in flower and the bright rose blossoms betrayed the location of the small plants which otherwise were as well camouflaged as was *Ariocarpus fissuratus*, the living rock plant, which was also plentiful. *Escobaria tuberculosa* and *Mammillaria denudata* as well as *Hamatocactus hama-canthus* were found but not plentifully. *M. denudata* was another cactus illustrated in "Plants of the Big Bend National Park" but unfortunately the illustration was captioned *Mammillaria micromeris*.

A few miles further brought us to the ford of the Rio Grande and the village of Boquillas in the State of Coahuila, Mexico was in sight. Nothing about the collection of adobe huts attracted us so we remained on the American side of the river.

A side trip of a few miles downstream brought us to the point at which cars are parked if one would make the hike to Boquillas Canyon. The temperatures were high that day and the humidity in the river bottom was almost saturation point so we decided against the walk. We did enjoy a grove of the giant *Yuccas* on this river road and got a fine kodachrome of the car dwarfed by the big lilies. We became better acquainted with *Yucca carnerosana* two days later on a side trip to Giant Dagger Flat. At Boquillas we observed specimens of what we believe to be *Opuntia strigil*.

On our return to the Basin that afternoon we found that Ranger Schaafsma had returned from his two day relief and we got valuable information from him. That evening Jim made the hike to the window, from which a magnificent view can be had.

Friday we made the trip to the west side of the Park, observing *Agave scabra* in the mountains and then cactus species as we came to the lower altitudes. On our first stop we located a species of *Echinomastus* which seems to be closely akin, if not con-specific with, the *Echinomastus* from Organ Pipe Cactus National Monument in Arizona. Here also we found clumps of an *Echinocereus* which we thought to be a robust form of *E. enneacanthus* and a member of the Gourd family for which we had been looking, *Ibervillea tenua-secta*, which produces a long vine annually from a partially submerged, perennial tuber. Actually the tuber we found was completely buried, apparently by wind action.

Further along this road we again found *Coryphantha macromeris* but this time it formed very large clumps of 50 or more heads. Wind action was slowly burying these clusters, as well as large clusters of *Echinocereus stramineus* and *Opuntia schottii*, causing the branches to elongate to keep above the drifting sand.

Santa Elena Canyon deserves pages of description beyond my capabilities and I can only suggest that you visit this wonderful National Park and see for yourself the beauty of it.

A side trip to the trading post at Castolon and explorations along the Terlingua-Alpine road completed our day's work and we returned to the basin to work with the drying of our herbarium specimens and to hear the evening camp fire talk by Ranger Schaafsma at the camp ground and found it both instructive and enjoyable.

On Sunday we drove to Dagger Flat in the foothills of the Sierra del Carmen

over a fair dirt side road eight miles off the main road. Here *Yucca carnerosana* abounds and dominates the landscape, attaining a height of 12 feet or more. *Opuntias* and large clumps of *Echinocereus stramineus* and individual stems of *E. pectinatus neo-mexicanus* cover the ground as you cross the flats and start into the foothills.

On the slopes *Echinocactus horizontalis*, *Neolloydia texensis*, *Ariocarpus fissuratus* and two *Escobarias* were noted as well as at least four *Opuntias*.

We had filled all of the herbarium presses we had with us, as we made a press for the Garden and one for the National Park Service of each plant, so we returned to the Basin and our cabin to change dryers and to pack dried specimens in boxes, which work kept us busy all afternoon.

Sunday evening Jim projected the kodachromes we had brought with us and I talked on them to the Park Personnel, and to as many of the guests of the camp as wished, in the school house.

Jim found time in the afternoon to hike over the Lost Mine Trail and observed *Echinocereus triglochidiatus* in one of its varieties, possibly *octacanthus*, which we were rather startled to find labeled *E. fendleri* in the guide book for the trail, as this was the first instance of misidentification we had noted in any of the Park Service publications.

Jim also noted *Echinocereus viridiflorus* on this trail.

On Monday we regretfully checked out and started on the long trip to Vanderpool to try to locate the species of cactus reported by Herman Tobusch. We collected as many more herbarium specimens as our presses could accommodate before we reached the ranger station at Persimmon Gap which marked the northern boundary of the Park.

Persimmon Gap is so named because of the number of plants of the wild Texas persimmon (*Diospyros texana*) in this section and the ranger station provides the first contact with the National Park Service as you enter the Park.

We drove that day to Sabinal where we stopped early to have the car serviced. This is also the last point where good Auto Courts were available to us.

Early Monday morning we drove through Utopia to Vanderpool and located the Henri ranch where we were welcomed by Mrs. Ted Ryan in the absence of her husband. Aided by her charming daughter, Ruby, we located our plant and made our collections and pictures and were on our return trip by eleven o'clock.

A report on our findings in other sections of Texas and New Mexico will be found in the next issue of the Bulletin.

## A NEW AND INTERESTING CACTUS FROM TEXAS

W. Taylor Marshall

In April of 1951, Mr. Herman Tobusch of Villa Park, Illinois, collected several plants of a species of cactus with which he was not familiar. One plant was sent by him to the Desert Botanical Garden for identification.

In the spring of 1952 this plant flowered at the Garden and a description of the flower and photographs were made. A description of the fruit found on the first plants collected, supplemented by two fruits later sent to the Garden by

Mr. Tobusch, and dried fruits on the plants collected in June, 1952 by the Garden staff form the basis of the fruit description for this publication.

The flowers, fruit and plants indicated that this species was a *Mammillaria* as considered by the general botanist or an *Ancistrocactus* to a specialist in Cacti. It does not in any way fit into any described species with which we are familiar.

The species was collected on the ranch of G. W. Henri near Vanderpool, Texas,



*Mammillaria (Ancistrocactus) tobuschii* spec. nov.

first by Mr. Tobusch in April, 1951, then by Mr. Henri and his foreman, Ted Ryan, in the spring of 1952, and finally by the writer and Mr. Blakley in June of 1952.

It grows in a juniper-oak association in limestone at an altitude of 1400 feet and the plants are usually found growing in clumps of *Aristida* grass and we found them in a restricted district and quite rare. They should be looked for in similar association in the Sabinal River Valley.

Seedlings have been grown by Mr. Tobusch and by the Garden and the percentage of germination of seeds is high. Seedlings were also found at the type location immediately around established plants and scattered throughout the area.

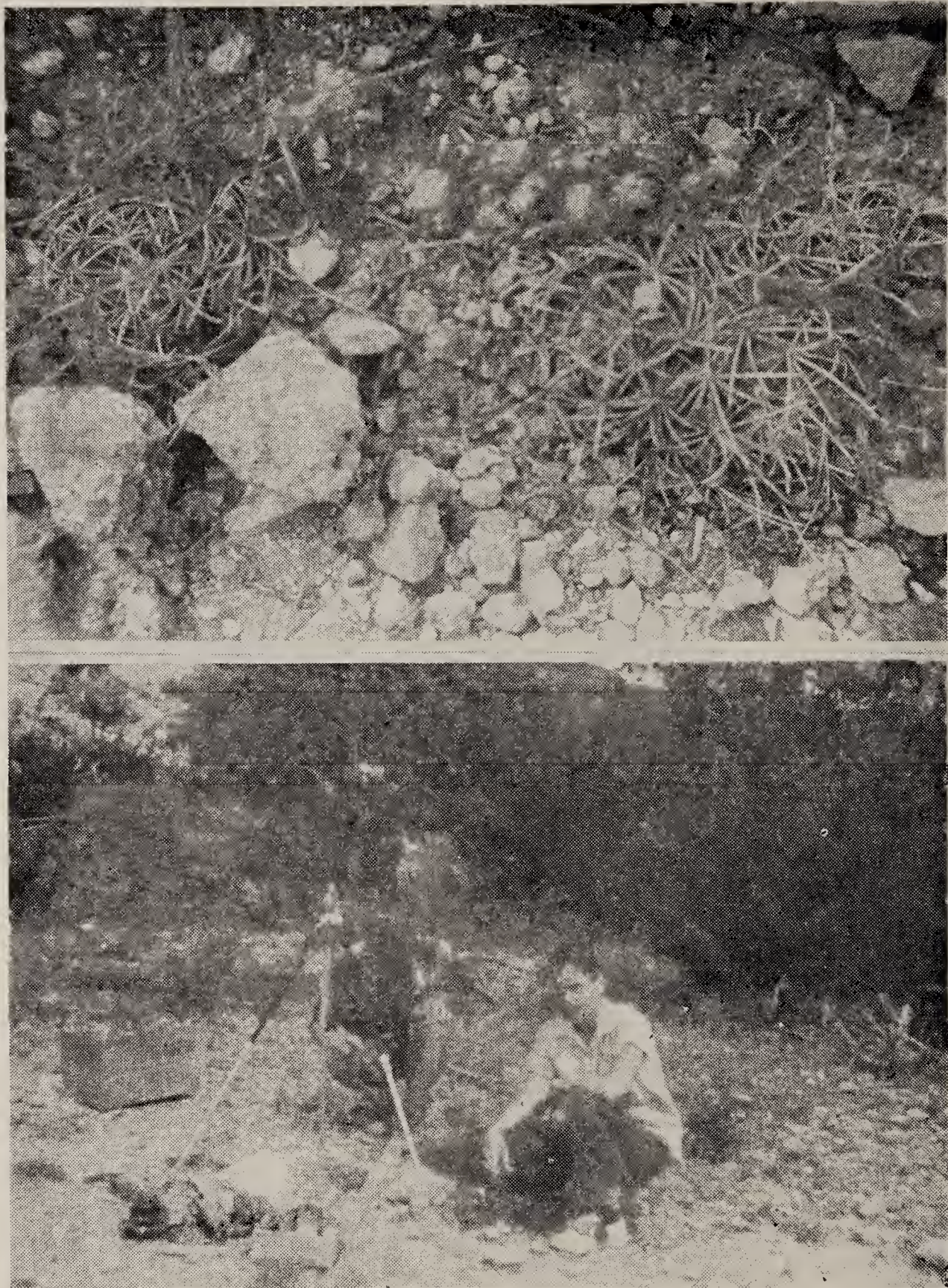
It is also apparent that a seedling of about 100 plants, that they are always simple unless the meristem is injured in which case branching is noted. As our plant is found on a goat ranch many plants have been injured by the hooves of the goats.

It is also apparent that a seedling plant is globose but that it pulls down

into the ground at the approach of cold weather so that in three or four years the plant assumes a top-shape with the narrowed end in the soil and only the hemispherically rounded apex above the ground.

*MAMMILLARIA (ANCISTRO-CACTUS) TOBUSCHII* Spec. nov.

Plant body napiform, 6 to 7.5 cm. in diameter at ground level, 6-7 cm. long with about  $\frac{2}{3}$  of the plant underground; aboveground portion hemispheric, dark green, tubercled; tubercles in 5-8 series, 10-12 mm. long, laterally flattened, grooved  $\frac{1}{2}$  way down on upper surface; grooves filled with yellowish wool; areoles at apex of tubercle white-woolly when young, naked in age; radial spines 7, spreading, acicular, pungent, white at first but becoming gray in age, 10-15 mm. long; central spines 3, the upper two ascending, the centermost porrect, hooked, up to 30 mm. long, all central spines flattened, at first light yellow with dark tips, later all gray; flowers borne at the base of groove on nascent tubercles, campanulate, 4 cm. long; tube 1 cm. long, bearing a few thin scales on



Upper:—Type and Isotypes of *Mammillaria tobuschii* in place.  
 Lower:—Jim Blakley and Ruby Ryan at type locality. Note Juniper trees in background.

the ovary; outer perianth segments oval to spatulate, obtuse, entire, brownish-red with lemon-yellow margins; inner perianth segments oblong, acute, cream to lemon-yellow; pistil longer than the stamens but included; stigma lobes 7, filiform, lemon-yellow; style green; filaments cream; anthers golden yellow; fruit oblong, ripening slowly, bearing persistent perianth and a few thin scales,

2.5-3 cm. long, 1-1.5 cm. wide, green until fully ripened then with a rosy flush, basal attachment large; seeds globular, dark brown, papillae not pronounced; hilum large, depressed.

Cactus parvus cum corpore napi-formi, cuius tertia pars suprema hemispherica sola supra solum protrudit; tuberculatus, tubercula in 5-8 ordinibus, a latere compressus, de

media apice ad basem sulcatus; areoles orbiculares, imprimis albae laneatae, nudaе in statu senili; spinae 7, aciculares, radiantes, imprimis albae, in statu senili griseae; spinae centrales 3, quarum duae supreme ascendentes, cum spina centralis porrecta, hamata, compressa, imprimis lutea, in statu senili grisea.

Flores nascentes de base sulcatae, in nascentibus tuberculis, campanulatae, de colore lactis usque ad colorem citrinum; 4 cm longi, ovarium paucas squamas tenues ferrens.

Carpus oblongus, tarde maturans, usque ad 3 cm longus, imprimis

viridis, sed roseata in plena maturitate, paucas squamas tenues ferrens.

Semina rotunda, carychroa, papillae non distinctae, hilum magnum, depressum.

We are indebted to Dr. L. Parker, Arizona State College at Tempe for the foregoing Latin translation.

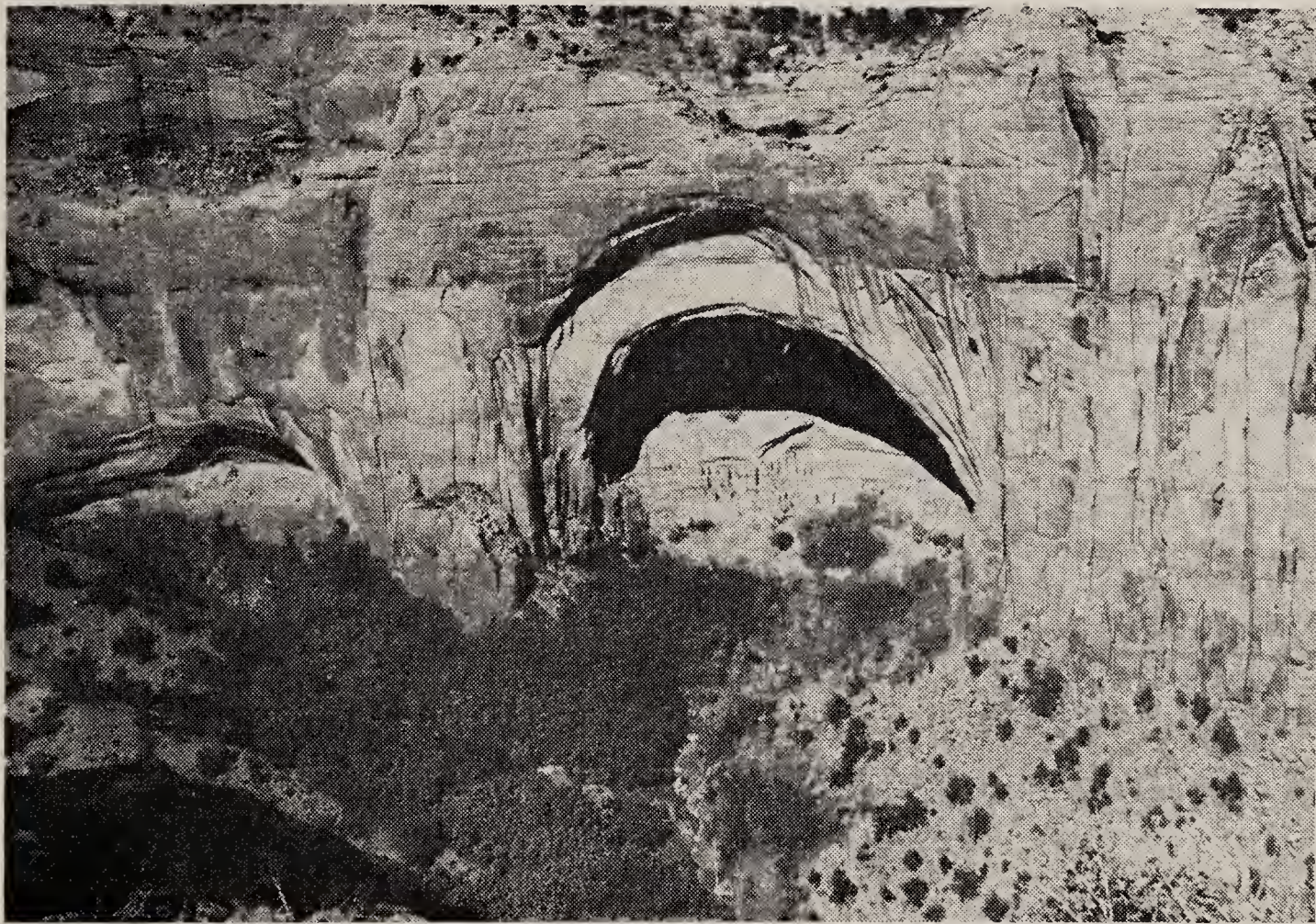
Type locality:—Henri Ranch, Vanderpool, Texas.

Distribution:—Known only from type locality.

The type specimen has been deposited in the Herbarium of the Desert Botanical Garden No. 606.

\*Isotype has been sent to the herbarium of the University of Texas.

## NAVAJO NATIONAL MONUMENT



Betatakin, seen from the canyon rim. National Park Service photo.

Prehistoric cave villages abandoned by drought-stricken Indian farmers before 1300 A. D.

Navajo National Monument has three of the largest and most intricate of known cliff dwellings, together repre-

senting a local tribal subpattern of the prehistoric Pueblo culture in its greatest period, the thirteenth century.

Perched high in their matchless settings, the dwellings of this superb triad are among the finest of their class. Al-

most perfectly preserved by their caves and the dry atmosphere, they appear as if they had been abandoned only yesterday.

The monument is completely surrounded by the Navajo Indian Reservation and lies on the edge of a "roadless area" nearly 100 miles from paved highways. The National Park Service has established monument headquarters in Betatakin, the most accessible ruin. Visitors to outlying areas may obtain information and guidance by calling first at the Headquarters Area.

Betatakin is the only ruin in the monument which has been excavated and restored. It is in a great cave which is 450 feet long with a maximum depth of 150 feet. The cave was carved by stream meander and wind erosion, in the side of a soft, red, sandstone cliff which forms the sheer and vertical 500-foot north wall of a picturesque and beautiful canyon. The cave roof projects far out over the village, which originally contained more than 130 ground-floor rooms and occupied every foot of available building space. Sand storms had piled among the central rooms an accumulation in which oaks 4 inches in diameter and varied shrubbery had taken root.

In the canyon fronting Betatakin are tall, slender quaking aspen, alder, and birch; pines deck the talus slopes; cedar and piñon cap the bordering cliffs.

#### BETATAKIN

Betatakin is a well preserved apartment house, 700 years old (as determined by the tree-ring dating method, the village was occupied between the years 1242 A. D. and approximately 1300 A. D.). The Navajo name "Betatakin" means "Hillside House."

Betatakin once had almost 150 rooms, of which more than 50 were residential, 6 ceremonial (kivas), 13 open courts or patios, about 30 storage, and 2 grinding rooms. The last mentioned are among the many rooms which are still well preserved. The manos and metates on which the ancient people

ground their corn meal may be seen by those who enter the canyon, or through binoculars from the opposite rim.

Because of the rugged character of the country and the necessarily arduous trip to the cliff house, the National Park Service has provided a trail to the opposite rim, where a splendid view of the cave and ruin may be had.

Betatakin was discovered in 1909 by John Wetherill and Byron Cummings, and was excavated and stabilized in 1917 by Neil M. Judd, of the Smithsonian Institution.

The pottery found in Betatakin and the other Tsegi cliff ruins is of exceptional quality, very artistically painted, including both black-on-white ware and varieties of polychrome redware.

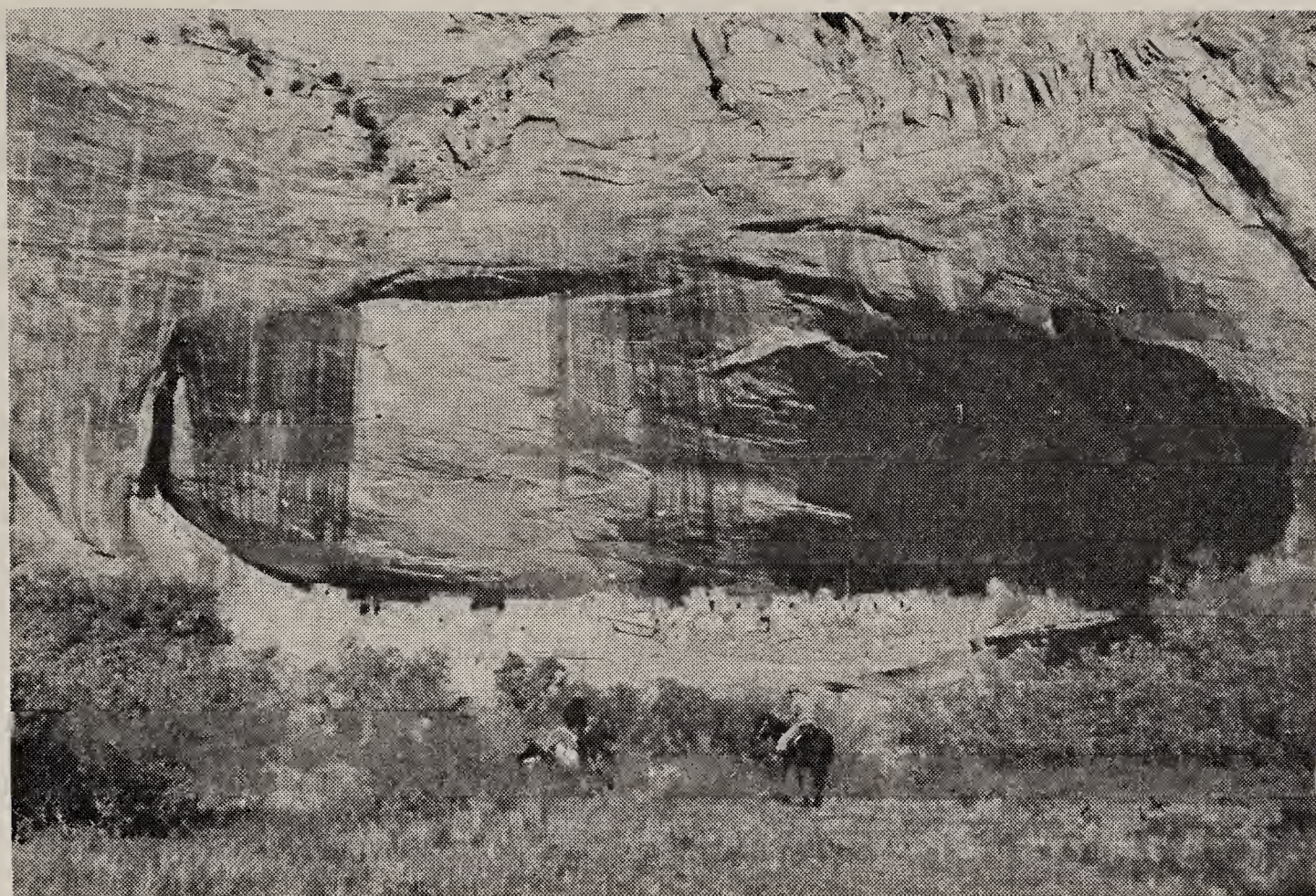
#### KEET SEEL

Keet Seel is the largest cliff ruin in Arizona and one of the last to be abandoned in the Tsegi Canyon region. It may be reached by horse or on foot from Betatakin by an 11-mile trail, which is primitive and crosses the canyon stream many times, making the trip on foot a difficult one. Horses may be obtained from the nearby Navajos through the custodian of the monument. One full day is required for the round trip.

Keet Seel was partially excavated and stabilized in 1934, and today it still gives the impression that it might have been abandoned only a few years ago. Actually, almost 700 years have passed since the Anasazi last lived in this cliff city. Keet Seel was discovered in 1893 by Richard Wetherill.

#### INSCRIPTION HOUSE

Inscription House lies almost 20 miles in an airline west of Betatakin, the Headquarters Area. This fine ruin, the smallest of the three (with approximately 75 rooms) was so named because of an inscription found scratched into the plastered wall of one of the rooms. Weather-beaten, little remains of the original inscription. It is gener-



Keet Seel, accessibly only by trail. National Park Service photo.

ally believed to be of Spanish origin, and to date from the 1660's, but the exact wording has been variously reported. John Wetherill, from his second trip to Inscription House in 1909, remembers the inscription thus:

C H O S  
1661 A d n

with more letters which were illegible.

#### ADMINISTRATION

Navajo National Monument is a part of the National Park System and is administered by the National Park Service, United States Department of the Interior. For further information write the Custodian, Navajo National Monument, Tonalea, Ariz.

Other cliff dwellings in the National Park System include those in Canyon de Chelly, Walnut Canyon, Montezuma Castle, and Tonto National Monuments in Arizona; Mesa Verde National Park in Colorado; and Bandelier and Gila Cliff Dwellings National Monuments in New Mexico.

#### ACCOMMODATIONS

Picnic benches and designated camp-

grounds are available in the monument. Trading posts and guest ranches in Kayenta, Tonalea, Goulding, Shonto, Tuba City, and Rainbow Lodge offer modern accommodations.

#### SERVICE TO THE PUBLIC

Because of the need of protecting the ruins, and the difficult unmarked trails by which they are reached, no one will be allowed to enter any ruin unless accompanied by a guide.

Betatakin may be viewed from the binocular station on Betatakin Point at any time, with or without a guide.

Trips to Betatakin should start at 9 a.m. or 1 p.m.; to Keet Seel at 8 a.m. Further information regarding these trips may be secured from the custodian.

#### CACTOMANIACS MEETINGS

Monthly meetings of the Cactomaniacs were discontinued during the summer months but will be resumed on the first Tuesday of each month during the winter starting on Tuesday, October 7th at 8:30 P.M. at Webster Auditorium at the Desert Botanical Garden.

## Desert Botanical Garden

Book Dept.

P. O. Box 647

Tempe, Ariz.

### PACKAGED CACTUS PLANTS

Attractive packages with cut cellophane packing.

		Post- Price	age*
No. 1	5 year old Saguaro Seedling 2" high	.50	.10
No. 5	5 plants	1.00	.30
No. 10	10 plants	1.50	.40
No. 10W	10 white spined plants, collectors items	3.00	.40
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No. 24	24 large plants many of flowering size	7.00	1.00

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	Post- Price	age*
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A description of all of the species native to Arizona. 60 ills.		
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Sonnets to the Southwest	2.00	.10

### Gift Suggestions

#### Prickly Pear Delight—

A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor

½ pound box	.80	.20
1 pound box	1.50	.30

Post-  
Price age

#### Prickly Pear Jelly—

4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor

2.20 .80

\* Postage and wrapping charges.

# SAGUAROWOOD

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

OCTOBER, 1952



*Fouquieria*  
*Splendens*  
Ocotillo or Candle-  
wood



REG-MANNING

# SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription \$3.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. TAYLOR MARSHALL, Editor

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## Arizona Cactus and Native Flora Society

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Volume VI

OCTOBER, 1952

No. 8

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## Desert Botanical Garden of Arizona

### STAFF

Director .....	W. Taylor Marshall
Chief Horticulturist .....	W. Hubert Earle
Ass't Horticulturist .....	John H. Weber
Junior Botanist .....	E. R. (Jim) Blakley
Hostess .....	Therese M. Marshall

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Garden hours: October to April inclusive, open 10 A.M. to 5 P.M. daily and Sunday. Closed every Monday. Lectures on Sunday at 3:30 PM.

## GARDEN SCHEDULE

October means reopening for the winter and a steady flow of visitors through the Garden. We will be open every day except Monday from now until next May 1st from 10 A.M. to 5 P.M. We expect more than 125,000 visitors will see the Garden in the coming year.

Sunday lectures will not be resumed until October 26th but on that date and each Sunday during the winter we will have an illustrated talk. Until January we will have only one lecture, at 3:30 P.M., given by a member of the Garden Staff, but on January 4th we will start giving two lectures each Sunday, at 3 P.M. and at 4 P.M. In January, February and March we will have some guest speakers.

The sixth annual Cactus Show will be held February 22nd to March 1st inclusive.

Our usual three series of instructions in "Appreciation of Desert Plants" will be given. The first course commencing on Thursday, November 13th, at 3:30 P.M.

After the first of the year we plan an evening class if enough people are interested. If you would like to attend an evening series of 5 weekly lessons drop us a postcard and we will supply additional information.

Cactomaniacs will meet the first Tuesday of each month at 8:30 P.M. Friendly plant discussions with other interested people, kodachrome slides and coffee and cake feature these meetings, and they are open to any member of the Desert Botanical Garden.

Classes from Public and Private Schools are welcomed to the Garden and special attention given to them on any morning Tuesday to Friday by advance appointment.

Garden Clubs and Service Clubs or any interested group may arrange to meet at the Garden where facilities for their meeting will be provided and they may arrange for luncheons in the patio

or on the terrace. Evening meetings can also be arranged. A small charge for electricity for evening meetings or for the use of the kitchen for lunches constitute the only cost for any of our services, as admission is free. Advance arrangements for meetings is required.

A member of the staff is available to give talks outside the Garden to Clubs or to Hotels either during the day or in the evenings. No charge is made in the Phoenix area but travel charges are assessed for talks at more distant points.

Plant identification service and landscaping advice for desert plantings are additional free services offered by the Garden.

The Garden is supported in part by an endowment from Mrs. Gertrude Divine Webster which cares for about one half of the cost of operation and by memberships and contributions. Memberships and contributions are deductible from your income tax. We invite you to become a member to assist in supporting this great tourist attraction. Members receive Saguaroland Bulletin 10 times a year.

### Membership Fees

Founder	\$500
Life	100
Annual	
Benefactor	50
Sustaining	25
Sponsor	10
Builder	5
Active	3

### EDITORIAL

The new residence of our Superintendent is now complete and the Earle family have moved into it to their great delight after nearly seven years of trailer life.

The concrete block structure has two bedrooms, bath, living room, kitchen and service porch. Only the kitchen and bath have plastered walls, all of the other rooms have walls which show the concrete blocks painted in light colors.

The windows and sash are steel and the floors waxed concrete so that the house, except the beamed ceiling is fireproof.

The building is entirely paid off but to do this we drew dangerously close on the funds to operate till January 1st when our next endowment payment is due. We sincerely hope that we can increase our membership and contributions to cover the operating costs and that we will not have to curtail our services for the period.

And speaking of memberships reminds me that we have had many of the leading business houses of Phoenix as members in the past years when a drive for memberships was on but most of them did not continue the memberships.

Some did and have kept up their subscriptions for year after year without publicity or any gain to themselves other than the satisfaction of backing a civic project. From now on we plan to call to your attention some of these merchants, not at their request, but as a voluntary tribute on our part and so that you fellow members can give to them your business to show your appreciation to them.

One such business house is Porters, headquarters for Western clothes at Adams and First Street in Phoenix, also at Tucson, Scottsdale and Camelback Center.

Another is Suncrest Nursery at 3830 N. 16th St., Phoenix, where Leonard Etter would be delighted to extend special courtesies to our members.

You would be doing the Desert Botanical Garden a real favor if you patronize these firms and the others we will mention in later issues of Saguaroland Bulletin, and mention that you were recommended to them by us.

## New Catalogue

The Rocking Horse Cactus Garden, 2415 W. Glenrosa St., Phoenix, Ariz. has issued a new catalogue in which they list over 200 species of Cactus and other Succulents for sale by them.

Many of the plants are illustrated by

black and white photo reproductions and common as well as scientific names are given but some of the scientific names are unpublished and not accurate.

Sizes of plants to be shipped are noted in most cases and there is a chapter on general culture. The price of the catalogue is 25c in stamps, coins or checks and a free plant will be included in your first order.

## Front Cover--OCOTILLO

The Ocotillo or Coachman's whip is a member of the very small plant family Fouquieriaceae called the candlewood family. It is frequently miscalled a cactus.

There are about 8 or 9 species in the family all but one of which are in the genus Fouquieria. The final genus is *Idria*, the living telegraph pole or boogum tree.

The plant pictured on our cover is *Fouquieria splendens* Engelmann which is found in arid and semi-arid districts from California to Texas and south of the border in Mexico. *F. splendens* is the only species of the genus found in the United States.

The long, whip-like, woody stems are covered with bark and are leafless much of the year. The first leaves on seedlings or on new growth are rather large, shaped like a spatula and borne on long pedicils or stems. This primary leaf lives for a week or two and then dries, leaving the stem or pedicil hardened into a spine.

Thereafter, following any heavy rain, the plant leafs again, but this time a bundle of leaves without stems are borne at the axil of the spine remains of the primary leaf.

After leafing an inflorescence grows on the tip of each stem which bears numerous red flowers which greatly resemble the flowers of the red-flowered *Gilias*. As soon as the tubular flowers start to open our plant again sheds its leaves to go into a rest period until sufficient rainfall causes a repetition of the process.



The new residence as it looks from the garden path.

Staff photo



Rear view of the new residence.

Staff photo



Front view of residence before landscaping  
A terrace will be built across the front.

## WEST TEXAS TRIP

On June 16th Jim Blakley accompanied your director on a trip to Big Bend National Park in Texas as reported in the last issue of *Saguaroland Bulletin*.

On the first day we drove to Lordsburg, New Mexico where we had reservations and arrived there about 4 P.M. Before dinner we drove south on the Animas road, the southern portion of which road we had investigated in May on the Guadeloupe Canyon trip. In May we failed to find an *Escobaria* for which we were searching and we hoped to locate it from Lordsburg on this Animas road but in this we were unsuccessful.

We however made presses of several shrubs which we had not previously encountered.

Tuesday morning we drove to El Paso, Texas stopping at intervals to make collections, the most notable of which was a *Lycium* with exceptionally large and red fruits.

Through El Paso and on the Carlsbad Cavern road we drove through desolate country with little vegetation until we reached Guadeloupe Canyon where

many interesting plants were observed and collected. Here we saw magnificent specimens of the Texas Madrone Tree.

At Carlsbad Caverns, Jim accompanied the 3:30 P.M. guided tour while I roamed the hills checking plants. We later checked with the Park Naturalist and then went to Whites City for the night. After dinner Jim went on a lone collecting trip and returned with *Epithelantha micromeris*, *Echinocereus stramineus*, *E. pectinatus neo-mexicanus*, *E. triglochidiatus*, variety, *Escobaria tuberculosa* and *Mammillaria lasiacantha*.

On Wednesday we retraced our route through Guadeloupe Canyon collecting *Echinocactus horzonthalonius* and a *Coryphantha* in the Canyon. There are two Guadeloupe Canyons in New Mexico and two mountain ranges that bear the name Guadeloupe, one in the Southwest corner which extends into Arizona and was discussed in the July issue of this *Bulletin* and the one mentioned above which is in the Southeast corner.

Just north of Van Horn, Texas we collected *Thelocactus uncinatus*, *Coryphan-*

*tha vivipara neo-mexicana*, *Echinocereus viridiflorus* and *Echinocactus horizontalis*.

After lunch at Van Horn we went south to Alpine for the night and after supper made a trip into the Davis Mountains where we collected *Opuntia kleinea*, *O. davisii*, *Hamatocactus hamatocanthus* and a large form of *Echinocereus viridiflorus*.

From Alpine we went into Big Bend National Park and then east to Vanderpool for *Mammillaria tobuschii* as reported in the last Bulletin.

Leaving Vanderpool we went to Sonora, Texas for our night stop finding little of interest en route other than a small *Yucca*.

On the 25th we drove through extremely arid country to Pecos, Texas then north to Carlsbad, New Mexico. All of this country has been overgrazed until little vegetation remains.

From Carlsbad we crossed the Sacramento Mountains getting into the high, forested country of beautiful scenery and abundant vegetation. A thunder storm in the late afternoon just as we came to a section of road under construction induced us to go into Alamo-gordo for the night but early the next morning we returned to the Sacramento Mountains and collected *Mammillaria lasiacantha*, *Echinocereus triglochiatum* var. *conoideus* and *Echinocereus pectinatus* var. *neomexicanus*.

From the Mountains we had a wonderful view of the great white sands and our next stop was at the White Sands National Monument where we were welcomed by J. W. Faris. The eight mile auto trail through a portion of the White Sands is most interesting and we were given the proposed text of the guided tour planned for that trip to try out.

The pamphlet explained the features of the White Sands and at stations numbered by sign post the efforts of vegetation to become established in the Sands was explained. I would strongly urge any of you who pass by take the

time to visit this Monument and drive the 8 mile trail. It is both interesting and educational and affords opportunity for wonderful pictures.

From White Sands we drove through a part of the Bombing Range to the Organ Mountains, home of *Echinocereus rosei* and the point at which I made my first collection of *Mammillaria wrightii* many years ago.

From the Organ Mountains the road descends into Las Cruces and from here we retraced the route over which we had traveled two weeks before and reached Safford, Arizona as our stopping place for the night.

We had now traveled over 2500 miles and saw no accidents at all, but after entering Arizona Jim witnessed an accident in Safford and the next morning as we left Safford for home we saw a car overturn into the ditch just a few miles out of town and later arrived on the scene just a short time after a large oil truck went over the grade on the Canyon Diablo switchbacks.

This would have confirmed our belief that we have the world's worst drivers in Arizona except for the fact that the cars involved in the accidents all had out of State licenses.

Every moment of the trip was enjoyable and we reached the Garden at the hottest part of our not too cool summer and with work piled up and awaiting us but we still were glad to be back to the Desert Botanical Garden.

## CACTOMANIACS MEETING

Monthly meetings of the Cactomaniacs were discontinued during the summer months but will be resumed on the first Tuesday of each month during the winter starting on Tuesday, October 7th at 8:30 P.M. at Webster Auditorium at the Desert Botanical Garden.

Kodachromes of the Texas expedition will be shown and plans for an evening class in plant identification will be discussed and a date set for such a class. No charge of course.

## Canyon de Chelly National Monument



White House Ruin from opposite rim.

Nat'l Park Service photo

Everything that goes to make up the popular conception of southwestern Indian country is to be found in Canyon de Chelly National Monument—Indians, prehistoric ruins, and a high, beautiful mesa cut by deep canyons. These features make Canyon de Chelly typical of the Navajo country, but the grand scale in which the canyons are carved sets it aside as unique. Seemingly, the cliffs are higher and redder than elsewhere; the Indians more primitive and colorful; and the ruins, built at the bases of sheer cliffs or in caves high on the canyon walls, appeal more to the imagination than do most ruins.

### THE CANYONS

The Rio de Chelly rises near the Arizona-New Mexico line, and follows an extremely tortuous course westward. It empties into the Chinle Wash, which drains north to the San Juan River. Except for the last few miles, the Rio de Chelly is enclosed by vertical cliffs ranging in height from 800 feet at the

\*Pronounced Can'-yon de Shay

maximum to 30 feet at the mouth of the canyon.

The streams flow during the rainy seasons and during the spring run-off; at other times of the year they are dry.

During and immediately after periods when the streams are flowing it is dangerous to drive into the canyons because of quicksands. Many automobiles and wagons have bogged down in the sands and have been lost. It is important that none but drivers accustomed to conditions of this sort be allowed to enter the canyons.

The name "de Chelly" is probably a Spanish corruption of the Navajo words Tse gi which mean approximately "rock canyon."

Monument Canyon has received its name from two great stone monoliths which rise 800 feet above the canyon floor on each side of Monument Creek near its junction with Rio de Chelly.

The name of Canyon del Muerto (Canyon of Death) was applied by Spaniards after a massacre which is

described in the section on the Navajo Indians.

### THE RUINS

There are several hundred prehistoric Indian ruins in the canyons. These range in age from early Basketmaker sites to "Pueblo III" ruins, cliff houses of the twelfth and thirteenth centuries. Some of these ruins are very large and are among the most famous prehistoric sites in the Southwest. White House, Antelope House, Mummy Cave, and Standing Cow Ruin are the best known.

**Mummy Cave and the Basketmakers.** During the first several centuries of our era, a group of Indians, whom we refer to as Basketmakers, occupied the drainage of the San Juan River.

The culture of these people was characterized by the use of a dart thrower (not the later bow and arrow), excellent baskets and woven sandals, and, in the final period of the Basketmaker epoch, pottery-making and the construction of circular houses, the floors of which were sunk a foot or more into the ground.

Mummy Cave is one of the best known Basketmaker sites. It was excavated by Earl Morris for the American Museum of Natural History, New York, in 1926-27. Centuries after the cave had been abandoned by the Basketmakers, Pueblo Indians built their homes over the old pit houses, and now the earlier structures are almost entirely hidden by a three-story cliff dwelling.

**The Pueblo Indians.** Pueblo Indians, predecessors of such modern tribes as the Tewa and Hopi, developed in the San Juan region, early in the eighth century, from the Basketmakers. The apparent change in race is merely the new custom of flattening the back of the head with a hard cradleboard. The Pueblos are simply Basketmakers modified by cultural change, possibly with the intrusion of a few newcomers.

The Pueblos also were farmers and raised crops of maize, beans, and pumpkins; their homes were rectangular rooms constructed of masonry entirely above the ground. Later, apparently for defense, these living rooms were

grouped into large "apartment houses" and situated in sites which could easily be defended.

White House, Antelope House, Standing Cow, and the masonry structures at Mummy Cave all belong to the later period. White House is so called because a long wall in the upper part of the ruin was plastered with white clay.

At Antelope House the prehistoric Pueblo Indians stood on the roofs of their two- and three-story buildings and painted lively pictures of antelopes on the cliff. The houses have fallen, but the paintings remain, clear, bright and lifelike. Standing Cow Ruin received its name from a large Navajo pictograph painted in historic times on the cliff above the fallen walls; the painting is of a blue and white cow. All these ruins, except White House, are in Canyon del Muerto.

### THE NAVAJOS

Navajo Indians live in the canyons today, farming the same wide spots in which the prehistoric Pueblos raised their crops. The Navajos have lived here for over 200 years.

During the winter of 1804-5 the Navajo men living in Canyon del Muerto went on a raid after establishing their women and children and old men in a high, safe cave. A Spanish punitive expedition arrived while the men were gone and went up the canyon in search of Indians. One old woman, who had been captured and kept a slave by the Spanish during her youth, taunted the soldiers as they were passing the cave, thus revealing the hiding place.

While some soldiers remained below the cave, others climbed to the top of the cliff and fired from a jutting point down on the Navajos. All the occupants of the cave were killed. It was at this time that Canyon del Muerto received its name. The cave is known as Massacre Cave, and Navajos do not willingly enter it.

During the War Between the States, Kit Carson entered the canyons with a detachment of United States Cavalry



White House Ruins from Canyon.

Nat'l Park Service Photo

and rounded up all the Navajos living there. This was a part of an ill-fated scheme of the Government to transport all Navajos to a reservation on the Pecos River, in eastern New Mexico, in an effort to stop raids on towns and ranches. The experiment was not a success, and in a few years the Navajos were allowed to return to their homeland.

#### ADMINISTRATION

Canyon de Chelly National Monument is a part of the National Park System and is administered by the National Park Service, United States Department of the Interior. The monument has an area of 83,840 acres, and its establishment was authorized by Congress on February 14, 1931.

A custodian resides near the mouth of the canyon. Inquiries concerning road conditions, accommodations, etc., should be addressed to the Custodian, Canyon de Chelly National Monument, Chinle, Ariz.

Other interesting prehistoric cliff dwellings in the National Park System

may be seen at Mesa Verde National Park in Colorado; Bandelier and Gila Cliff Dwellings National Monuments in New Mexico; and Navajo, Montezuma Castle, Walnut Canyon, and Tonto National Monuments in Arizona.

#### APPROACH ROAD AND FACILITIES

The only feasible means of approach to the monument is from United States Highway No. 66. Visitors from the east should turn off at Gallup, N. Mex., and travel by way of Ganado, Ariz., to Chinle.

From the west a road runs from Chambers, Ariz., to Ganado, to Chinle. Inquiry should be made concerning road conditions before leaving the highway; in bad weather the roads are sometimes impassable.

Accommodations may be had at Thunderbird Ranch, a guest ranch, which is located across the road from the custodian's residence and office. The operator of Thunderbird Ranch maintains a car especially equipped for canyon travel. This car can be rented for trips.



Fig. 48. *Sclerocactus Whipplei* (Eng. & Big.) B & R  
R. C. Proctor photo

Whipple's hard cactus would be a literal translation of *Sclerocactus Whipplei* but it would be indeed difficult to explain the use of the term "hard" in connection with this northern Arizona plant.

This photo shows a plant of the purple flowered race but both yellow and green flowers are equally common.

It is a difficult plant in cultivation except in regions of very dry air and little rainfall.

It has a wide range through many types of soils and at varying altitudes therefore it assumes many forms and has been split into six or more species by various authors.

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4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor

Post-  
Price age

2.20 .80

\* Postage and wrapping charges.

# SAGUAROWLAND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

NOVEMBER, 1952



Engelmann's *Prickly pear* growing  
in the crotch of a mesquite tree.



REG-MANNING

# SAGUAROLAND BULLETIN

Published and owned by the Arizona Cactus and Native Flora Society, sponsors of the Desert Botanical Garden of Arizona, P.O. Box 547, Tempe. Saguaroland Bulletin attempts to promote the Garden and to provide information on the desert plants and their culture. Subscription \$3.00 per year, the subscription including active membership in the Society and the Desert Botanical Garden. Issued 10 times a year.

W. TAYLOR MARSHALL, Editor

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## Arizona Cactus and Native Flora Society

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Volume VI

NOVEMBER 1952

No. 9

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## Desert Botanical Garden of Arizona

### STAFF

Director	.....W. Taylor Marshall
Chief Horticulturist	.....W. Hubert Earle
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Hostess	.....Therese M. Marshall

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Garden hours: October to April inclusive, open 10 A.M. to 5 P.M. daily and Sunday. Closed every Monday. Lectures on Sunday at 3:30 PM.

## EDITORIAL

Winter activities have started at the Garden and our schedule for November and December is as follows:—

Garden open from 10 A.M. to 5 P.M. every day except Monday.

Closed all day on Mondays.

Sunday lectures at 3:30 P.M. given by a member of the Garden Staff and illustrated by kodachrome slides.

November 9th. Northern Arizona.

November 16th. Flora and Fauna of the Desert.

November 23rd. Southern Arizona.

November 30th. Texas and New Mexico trip.

December 7th. Cactus flowers.

December 14th. Northeastern Arizona and Utah.

December 21st. Night flowering cactuses.

December 28th. Arizona Deserts.

A class for identification of Succulent Plants is held each Monday evening at 8:15.

The first of three series of lessons in Appreciation of Desert Plants will commence on Thursday, November 13th, and continue for five successive Thursdays. A second series will commence early in January.

There is no charge for attendance at any of these classes nor for the Sunday afternoon lectures. There is no charge for admission to the Garden.

Last month we told you of two Phoenix firms who have kept memberships in the Garden for a number of years and this month we want to tell you of two more.

Sandyland Cactus Garden at 28th Street and Turney deal in cactus and other succulent plants and supply dealers with packaged plants for resale. They package all of the plants sold at the Garden and our satisfied customers can testify to the quality of the mer-

chandise. Herb. and Angela Bool, the proprietors, have been wonderful friends to the Garden from its inception and Angela is and has been the Secretary of the Society ever since its reorganization.

Paul and Camille Kimsey operate the Sunland Photo Shop at 2329 E. McDowell and they have done all of our photographic work in a most satisfactory manner for the past five years and have held a membership in the Garden for the last three years. Our camera equipment, tape recorder and projector all came from Sunland and we are well pleased with the equipment and the servicing of that equipment.

Why not drop in and see these folks when you need plants or photographic supplies and tell them you appreciate their support of the Garden.

We have now completed the series of articles on the National Monuments of the State and in the space previously devoted to them we propose to inaugurate a question and answer column, covering desert subjects generally. We have picked the questions most frequently asked by our visitors and by mail to start the series and ask that you write us about any desert subject that may interest you for reply in later issues of Saguaro Land Bulletin.

Questions on the plant life of the Deserts will be answered by our own staff while questions outside of our field will be referred to recognized experts on the subject matter of the questions.

## FRONT COVER PICTURE

An epiphyte is a plant that grows on another plant, but is not nourished by it, and hence, not a parasite: an air plant. Epiphytes are known in the Cactus family in the rain forests of the tropics where many species of the family occupy tree tops and produce the

most spectacular of the night flowers.

Occasionally a cactus plant normally terrestrial is found growing in the leaf-mold in the crotch of a desert tree apparently starting by the germination of a seed dropped by a bird which has eaten a cactus fruit while perched in the tree.

The first time I noticed such a plant was in Sonora, Mexico, where I found one which resembled a rat-tail cactus growing in a palo-blanco tree. This surprised me as Sonora is a long way from the normal range of the rat-tail (*Aporocactus* sp.). On close inspection the plant proved to be an undernour-

ished specimen of *Rathbunia* which was plentiful in the neighborhood.

Years later, Emil Bien took me to Florita Canyon, near Aravaca, to show me a cholla growing in the crotch of an ironwood tree which had grown one stem which was unjointed and 16 feet long and supported by the branches of the tree.

Recently Jim Blakley told about a prickly-pear growing in the crotch of a Mesquite in the Pinnacle Peak district and he brought the picture illustrated on the front cover to prove his story. The tree is *Prosopis juliflora* and the cactus is *Opuntia engelmannii*.

## THE JOSHUA TREE

*Yucca brevifolia*, the short leaved *Yucca*, was given the name "Joshua Tree" by early Mormon settlers because the tree, with its contorted branches, suggested Joshua praying with uplifted arms.

When viewed in large forests it is awe inspiring. Early in my acquaintance with the plant I made camp just after dark in the forest of Joshuas on the road from Nipton, California to Searchlight, Nevada. It was a dark night so I opened my army cot and fell asleep at once. Sometime during the night I was awakened by moonlight in my eyes and was startled by the appearance of the ghostly trees in the bright but soft moonlight. One had the feeling of awakening on another planet.

It is generally accepted that an old plant may be 600 to 800 years or in exceptional cases 1000 years old but there can be no confirmation of this.

Systematically the *Yuccas* are members of the Lily family, consequently the Joshua tree is just a big brother of the lowly onion. It differs from all

other *Yuccas* in that the fruits do not open. Some botanists consider it as belonging to a separate genus, *Cleistoyucca*, for that reason.

It is certain that the species is very old for scientists have determined by microscopic examination of the dung found in two caves in Nevada formerly occupied by the extinct ground sloth that the Joshua tree comprised a large percentage of the food of that ancient monster.

Joshua trees are found in Arizona, Utah, Nevada and California on granite slopes above 2500 feet and below 5000 feet altitude. The type location for *Yucca brevifolia* is Date Creek, Arizona while the type locality for a smaller form, *Yucca brevifolia* variety *Jaegeriana* is in Utah.

They flower in March in Arizona but the flowers are not attractive and they have a peculiar "earthy" odor. The flower stalk is about 18 inches long, usually curved by the great weight of the numerous flowers which are so closely set that they do not open widely

as do the flowers of most other *Yuccas*. Only a small proportion of the flowers develop into fruits.

Not too much is recorded on the association of animals with this plant but we know that one species of the *Prenuba* moth pollinates it. In our garden we have seen both the white winged dove and the cactus wren build nests in the plants.

The reflexed leaves with their sharp points discourage tree climbing of this *Yucca* by most ground animals but the wood rat uses the points of the leaves with other spiny plants and sharp bits of rocks in the mounds it builds above

the mouth of its burrows as a protection against coyotes and other enemies. Starting at the base of the plant the wood rat cuts off the leaves of the Joshua, ascending the trunk in a spiral.

Susan Delano McKelvey in her monograph on the *Yuccas*\* reports that according to a report of J. Van Denburgh the Desert Night Lizard is frequently found hiding during daylight hours in the fallen trunks or branches of Joshua Trees.

\**Yuccas* of the Southwestern United States, Part 1. 1938. Arnold Arboretum of Harvard University.



The *Joshua Tree* in Arizona

Ira Adams photo

Shown is an old plant of the Joshua tree near Congress Junction. Associated with it are several species of chollas. Note the heavy flower stalks, erect on this particular plant which is in full bloom.

In this same district we find the small cactus plant, *Echinomastus johnsonii*. In Arizona the chartruse flowered variety is more common. Under the chollas there are plants of *Mammillaria tetran-cistra*.

## ASK MR. CACTUS

**Question:**—What causes the holes in so many Saguaro cactuses and why do the lower part of their trunks appear so weathered?

**Answer:**—The round holes observed in the upper trunk and branches of Saguaros are made by one of two birds, the Gilded Flicker or the Gila Woodpecker, who dig the holes through the tough skin of the plant and then hollow out a shoe shaped nest in the soft storage tissue which surrounds the woody central framework of the Saguaro.

The sap of a cactus plant is usually mucilage-like and coagulates as soon as it is exposed to the air. Therefore the Saguaro sap hardens almost as fast as the bird hollows its nest and forms a hard scar tissue lining for the nest.

The nest lining becomes so hard that it remains intact long after the plant dies and can be found in the debris of any fallen Saguaro.

After using the nest for one season the builder bird abandons it and many of the abandoned nests are then occupied by the little elf owl.

To understand the weathered appearance of most of the lower trunk of many Saguaros it is necessary to consider the growth habit of the species. Saguaros flower in May and bear fruit in June and July. Seeds from the ripe fruit are immediately ready to germinate. Our tests show approximately a 90% germination of fresh seeds and the same percentage of germination of seeds eight years old.

In the central valleys of Arizona we have two rainy seasons, one in August and the other in mid-winter and the August rain will germinate any seed scattered by birds.

Growth is very slow and the seedling at one year is scarcely larger than a

large pea, therefore any seeds that germinate in open ground are burned out by the intense summer heat and only those seeds that germinate in the shade of trees or shrubs can survive. In twelve years the plant is less than six inches tall and it requires about one hundred years to attain a height of eight feet.

Our seedling growing through a palo verde tree, for instance, is rubbed by the branches of a tree in any wind and its spines rubbed off and its "bark" scuffed.

Then the shorter lived tree dies off and leaves our Saguaro standing alone but with a weathered trunk. Sometimes the rubbing of the tree branches so deeply wears into the flesh of the cactus that a weak spot develops and a high wind will break off the cactus at the worn spot as happened to the cactus illustrated. The plant pictured then grew branches from the remaining stump.



A *Saguaro* can survive decapitation  
Ira Adams photo.

Question:—Which is the plant from which water can be obtained to relieve thirst in summer?

Answer:—Although both the barrel cactuses and the Saguaro contain 94% water by weight when turgid the water is not in a usable form but is a mucilage-like liquid designed to coagulate immediately on contact with the air.

This is to prevent undue loss of moisture in the event of injury.

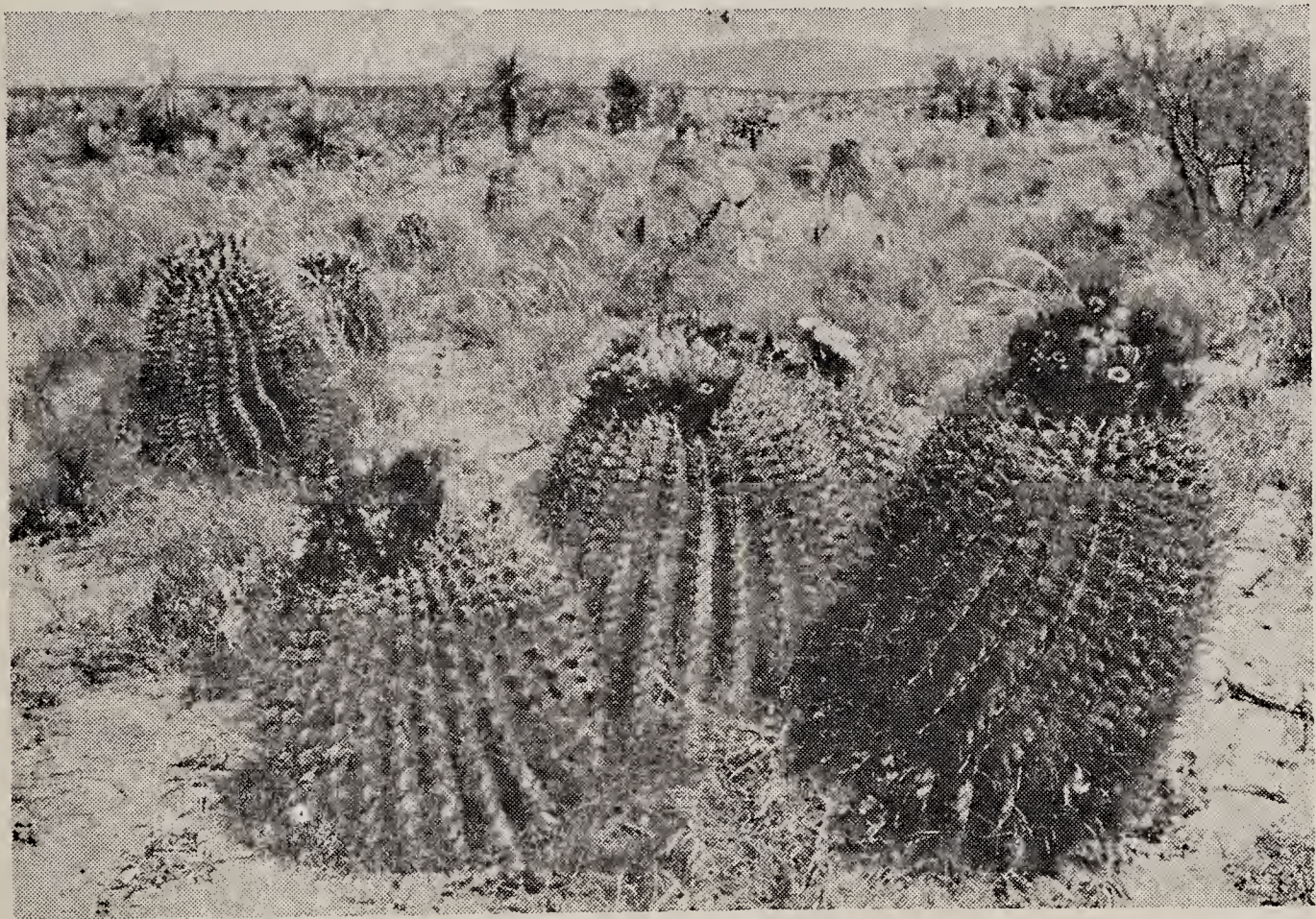
The mucilage-like juice is unpleasant to the taste and will actually produce thirst and is mildly injurious to the tissues of your throat.

Furthermore neither of these plants are turgid in the hot summer months

and consequently the juice is thicker and less palatable at that time.

The story of the life-saving quality of the barrel cactus, while untrue, is too good to be abandoned by most writers who feel that nothing is accomplished by spoiling a good story by sticking to facts.

On the other hand, fruits are available on the Saguaro in June and July and on the barrel cactuses mostly all summer and the very juicy and tasty prickly pear is available during the hottest months. Any of these fruits would provide a lot of moisture to relieve thirst and the Saguaro fruits and the prickly pears are delicious in flavor.



*Wislizenus' barrel cactus (Ferocactus wislizenii)*

R. C. Proctor photo

This picture of Wislizenus' barrel and the picture on the next page of the California barrel were taken by R. C. Proctor, foremost photographer of cactus subjects. Both are from our publication Arizona's Cactuses.

A second edition of our book is now in preparation and Mr. Proctor has recently made pictures to replace some less desirable ones used in the first edition.



The California Barrel Cactus  
*Ferocactus acanthodes* (Lem.) B. & R.  
R. C. Proctor photo

## BUYING CACTUS PLANTS

By CHARLES MIEG

The best advice I can give to the collector who wants to add to his collection is to buy his plants from a reputable dealer. These people go to a lot of trouble to secure their seed and exercise great care in raising the seedlings. They usually sell seedlings of a size which has enough strength to reestablish itself in a new home.

Plants acquired in this manner are

free from disease, pests and blemishes. They are also acclimated to cultural conditions in our gardens or windows and their chance for survival is excellent. Reliable dealers plants are correctly labeled and their price is much lower than that of a collected plant.

There are dealers who specialize in boxed plants for gifts and dish-gardens. Their plants are usually purchased in wholesale quantities from reliable

growers or raised by themselves and are selected for the ability to grow under the conditions in the north and east. The plants, however, are not named nor are they rare so have little appeal to the collector.

Dealers in foreign countries provide a good source of interesting plants and an import permit can be obtained without difficulty. Several dealers in Mexico, for example, issue catalogues and the prices quoted are post paid to your home and they are very reasonable. The same plants can be purchased from dealers in the United States who have imported them from Mexico but the prices are very high. For example, species of those colorful Mexican Mammillarias can be purchased from Mexican dealers for less than 50c each but the same plant purchased from a dealer in the United States would sell for anywhere from \$1.50 to \$2.50.

A percentage of loss may be expected in reestablishing any wild plants but the loss is not too high in plants from districts of greater rainfall such as Mexico. On the other hand, plants from arid districts such as Arizona are very difficult to reestablish and the percentage of loss on strictly desert plants is very high.

I have imported many Mexican plants and my orders usually arrive within three weeks, after inspection and treatment when needed, well packed and in good condition. Since the exporter pays the postage and export duties my cost on such plants are 10% to 20% of what the same plants would cost from an American dealer. The one difficulty is that these foreign dealers usually use the system of classification of Vaupel or Backeberg which is frequently at variance with the Rosean system of classification as used by us.

Plant catalogues make very interesting reading, also they are frequently amusing as they reflect the mentality of the dealer who issued them. Most catalogues are accurate in use of scientific and common names and in the cultural information they contain, but there are exceptions.

Recently a dealer who advertised in a magazine of national scope put out a catalogue with some remarkable creations. We find there an *Echinopsis arizonica* which is an impossible name that the dealer, without any justification, selected for a hybrid plant. In the same catalogue we find plants which are extremely plentiful listed as very rare and priced accordingly. Many species of collected Arizona plants are listed, all of the arid desert type that have no chance of survival in humid climates. It is an interesting question as to where these plants, highly protected by Arizona law, were secured.

The Cactomaniacs, a group of Arizona collectors affiliated with the Desert Botanical Garden, are greatly concerned at the disappearance of many Arizona species of Cactuses in very recent years and we intend to make an attempt to trace the cause of our denuded deserts and bring to the attention of the proper authorities any persons we can catch removing plants illegally.

We are also opposed to dealers who offer strictly arid district plants for sale because we know that such plants will not survive anywhere off the desert and their sale to beginners can only result in a quick loss of interest by such beginners.

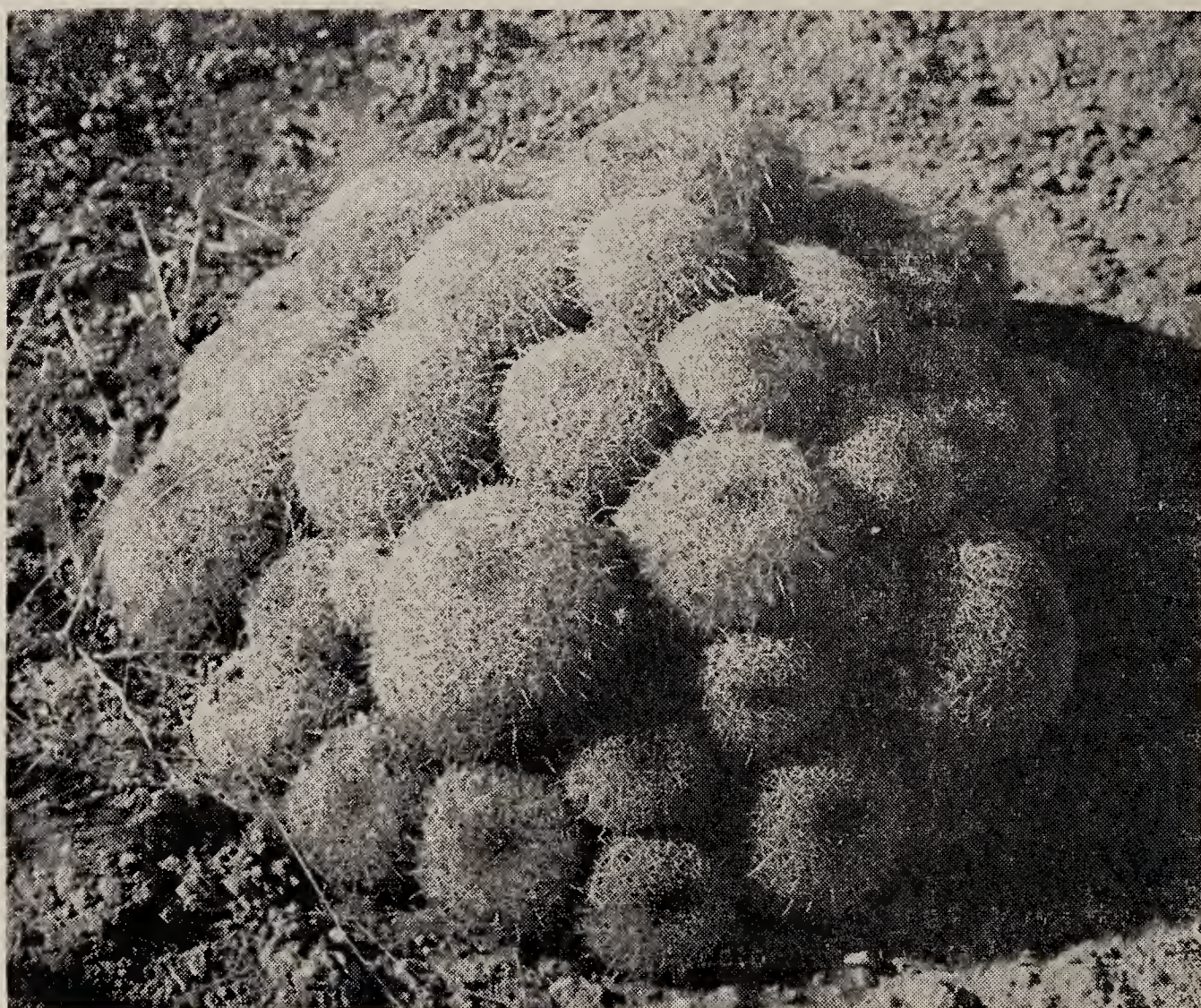
I am not trying to become a cactus Westbrook Pegler but I am wondering when some dealers will realize that good, old fashioned honesty in repre-

sentation of merchandise in catalogues is the only way in which an interest in desert plants can be furthered.

The Arizona Cactus and Native Flora Society, sponsor of the Desert Botanical Garden, has always believed in and encouraged conservation of desert plant life and we certainly believe that nothing is accomplished by offering arid

district plants to people in climates of damper air. Therefore we accepted Mr. Mieg's article for publication in *Saguaroland Bulletin* because in it he has noted the faults sometimes found in dealers catalogues and has given a constructive basis for acquiring a healthy and satisfactory collection.

Editor.



*Coryphantha recurvata* (Eng.) B. & R.

A strictly desert species that does not do well in cultivation.

### For Easier Living

Modern science offers many inventions for easier living. For example, Kleenex is a paper handkerchief which is "disposable" and which saves laundry bills by making linen or cotton handkerchiefs unnecessary.

Unfortunately many of our visitors "dispose" of their kleenex by carefully placing them into a cactus plant from which our men must remove them with considerable loss of epidermis. Sometimes they are just discarded on the paths.

## A BEAUTY SPOT

Here is a staff photo of one of the numerous beauty spots in the Desert Botanical Garden, the entrance to the Director's living quarters.

Twelve years ago, when the building was erected, one ironwood tree represented the entire vegetation of this area and the landscaping was begun by the first director, George Lindsay.

At first the small plants George col-

lected in Lower California and replanted here still left the area bare looking, but time, and our favorable climate, brought on the growth necessary to create this beautiful landscape just as he envisioned it at the time of planting.

We want to take this occasion to congratulate George on the excellence of his planning in the early days of the Garden and to give him credit for a job well done.



*Sclerocactus Whipplei* (Eng. & Big.) B. & R.  
R. C. Proctor photo

## For Easier Living

Nature has a way of keeping up with events, however, and we have now in our garden a cactus wren who is collecting kleenex for us and incorporating the paper into one of the three nests

it is building in a Saguaro, a Palo Verde Tree and a Yucca.

Now all we need is some animal to collect for us the slightly used chewing gum so liberally scattered along the paths by some of our visitors.

## Desert Botanical Garden

Book Dept.

P. O. Box 647

Tempe, Ariz.

### PACKAGED CACTUS PLANTS

Attractive packages with cut cellophane packing.

		Post-Price	age*
No. 1	5 year old Saguaro Seedling 2" high	.50	.10
No. 5	5 plants	1.00	.30
No. 10	10 plants	1.50	.40
No. 10W	10 white spined plants, collectors items	3.00	.40
No. 15	15 larger plants	2.50	.50
No. 16	16 still larger plants	4.50	.60
No. 24	24 large plants many of flowering size	7.00	1.00

### BOOK SUGGESTIONS:—

	Price	Post-Price	age*
Arizona's Cactuses; Marshall paper binding	1.00		.15
Arizona's Cactuses; Marshall cloth binding	2.00		.20
A description of all of the species native to Arizona. 60 ills.			
Flowers of the Southwestern Desert—Dodge	1.00		.15
Flowers of the Southwestern Mesas—Patraw	1.00		.15
Flowers of the Southwestern Mountains—Arnberger	1.00		.15
Poems of the Desert by Lou Ella Archer.			
Cloth bound, beautifully illustrated in color			
Canyon Shadows	2.00		.10
Sonnets to the Southwest	2.00		.10

### Gift Suggestions

#### Prickly Pear Delight—

A Turkish delight type of confection made from prickly pear cactus fruits, provocative flavor

½ pound box	.80	.20
1 pound box	1.50	.30

Post-Price  
age

#### Prickly Pear Jelly—

4-12 oz glasses in shipping carton. A clear red jelly of exceptional flavor

2.20 .80

\* Postage and wrapping charges.

# SAGUAROLAND

## BULLETIN

DESERT BOTANICAL GARDEN OF ARIZONA

DECEMBER, 1952

VOL. VI

No. 10



*Cereus hildmannianus* in fruit



REG-MANNING



# *Feliz Navidad y Feliz*

## *y Prospero Año Nuevo*

To the grand people who constitute the membership of the garden, the staff sends sincere wishes that each of you may enjoy a happy and peaceful Christmas and that 1953 will be good to you.

We are grateful for your financial and moral support of the garden and for the happy contacts we have had with you during the past year. Please continue your interest and visit us often.

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### EDITORIAL

What better gift could you select than a membership in the garden for your friends. The Bulletin will remind them of you ten times within the year and they will have the satisfaction of participating in a valuable and educational civic project.

You will have the satisfaction of materially assisting us to keep the garden going because we must keep our membership up to requirements if we are to continue to receive the income from the Webster Trust Fund. This fund carries about half of the cost of the gardens operation.

In November of last year we printed the first edition of our self-guided nature walk which is purchased by one out of eleven of our visitors. The first edition was 10,000 copies and these lasted us just one year. We have now issued the second edition which is also 10,000 copies.

As we know that one visitor in eleven purchases a copy of the nature walk it follows that we had about 110,000 visitors in the year.

In December 1950 we printed Arizona's Cactuses with 4,000 copies of the

first edition and we are now working on a revised and corrected second edition which will go to the printers in January by which time all of the first edition will be gone.

This sale is beyond our expectations and very gratifying.

February 22nd. Opening of the Sixth Annual Cactus Show at 12 noon. The show will continue throughout the week and close at 5 p.m. Sunday, March 1st. Exhibits of desert plants in pots, bowls and arrangements by individuals and Garden Clubs. Photographic Salon with black and white and kodachrome pictures. Open daily from 10 a.m. to 5 p.m. No admission charge.

We welcome a new member to our advisory board in the person of Mel. Hinman, proprietor of El Rancho Motor Hotel at 1300 W. Van Buren Street, one of the largest and finest Motor Hotels in the city. Mr. Hinman will be our contact with the Motor Hotels and he intends to show the value of the Garden for the entertainment of their guests to the Motel operators.

Most of our eastern visitors want to know about the desert vegetation and

we can answer their questions and show them a wider variety of desert plant life than can any other source of information and we make no charge for admission to the Garden or to our lectures.

We have told you in the last two Bulletins of some of the business houses that have held memberships in the Garden for many years and today we want to tell you of another faithful friend of the Garden, Camelback Inn.

Under the friendly management of Jack Stewart, Camelback Inn has become known as one of America's outstanding hotels. The whole surroundings of the Inn suggests the ultimate in western hospitality and the detached cottages, swimming pool and the won-

derful food leaves nothing to be desired. Your director gives illustrated lectures at Camelback at frequent intervals during the season and the Camelback guests are very frequent visitors to the Garden.

Another section of the Desert Botanical Garden is shown in this view of a part of the north walk which shows the China Berry Tree of Texas, a Joshua Tree and several species of night flowering Cerei. This path is near the end of the nature walk and is the last section of the Garden viewed by our visitors. We think you will agree that it will leave a lasting impression of the beauty of the Garden.



A section of the Desert Botanical Garden

### COVER PHOTO

At this time, in late November, we have numerous Christmas Trees throughout the garden. They are cactus plants of the genus *Cereus* which

form tree shaped plants and bear many globe-shaped, bright red fruits.

Our cover photo is of a plant of *Cereus hildmannianus* Schumann, a native

of the State of Rio de Janeiro, Brazil where it is extensively used as a common yard and park plant both because of its large white flowers and its colorful fruits.

The plant will attain a height of 16 feet with a cylindrical trunk and many 5 or 6 ribbed branches, grayish-green in color. Flowers are borne by our plants from April to late September. The flowers are funnel-shaped, 5 to 6 inches long and about 5 inches in di-

ameter, the outer petals reddish but the inner petals a shining white.

The flower opens about 9 p.m. and remains open until about 9 the next morning. They are followed by the oval, bright red fruits which are spineless and about 3 inches long.

The fruits are sold in the market places in Brazil to be eaten raw and are highly prized. Our fruits are eaten by birds almost as soon as they ripen.

## RECENT IMPORTANT PUBLICATIONS

The International Bureau for Plant Taxonomy, Lange Nieuwstraat 106, Utrecht, Netherlands, publish a magazine "Taxon" for their membership which is, by far, the best of the Taxonomic magazines. They also publish a series of articles on Taxonomy under the title "Regnum Vegetabile" Vol 2 of which was issued in February 1952 and titled "Index Herbariorum" which list the Herbariums of the world.

Vol. 3, "International Code of Botanical Nomenclature" has just been received by us. It is a compendium of all the rules adopted by the Seventh Inter-

national Botanical Congress, Stockholm, 1950. Price \$4.20.

The British Section of The International Organization for Succulent Plant Study also issues a series of papers under the title "Repertorium Plantarum Succulentarum" of which No. 2 is a listing of all new publications of species for 1950-51 and No. 3 (which is now en route to us). A list of names and synonyms of Mammillarias to 1940. A few of the latter are still available at \$2.20 per copy from H. M. Roan, Editor, Tree Tops, Church Lane, Adel, Leeds, England.

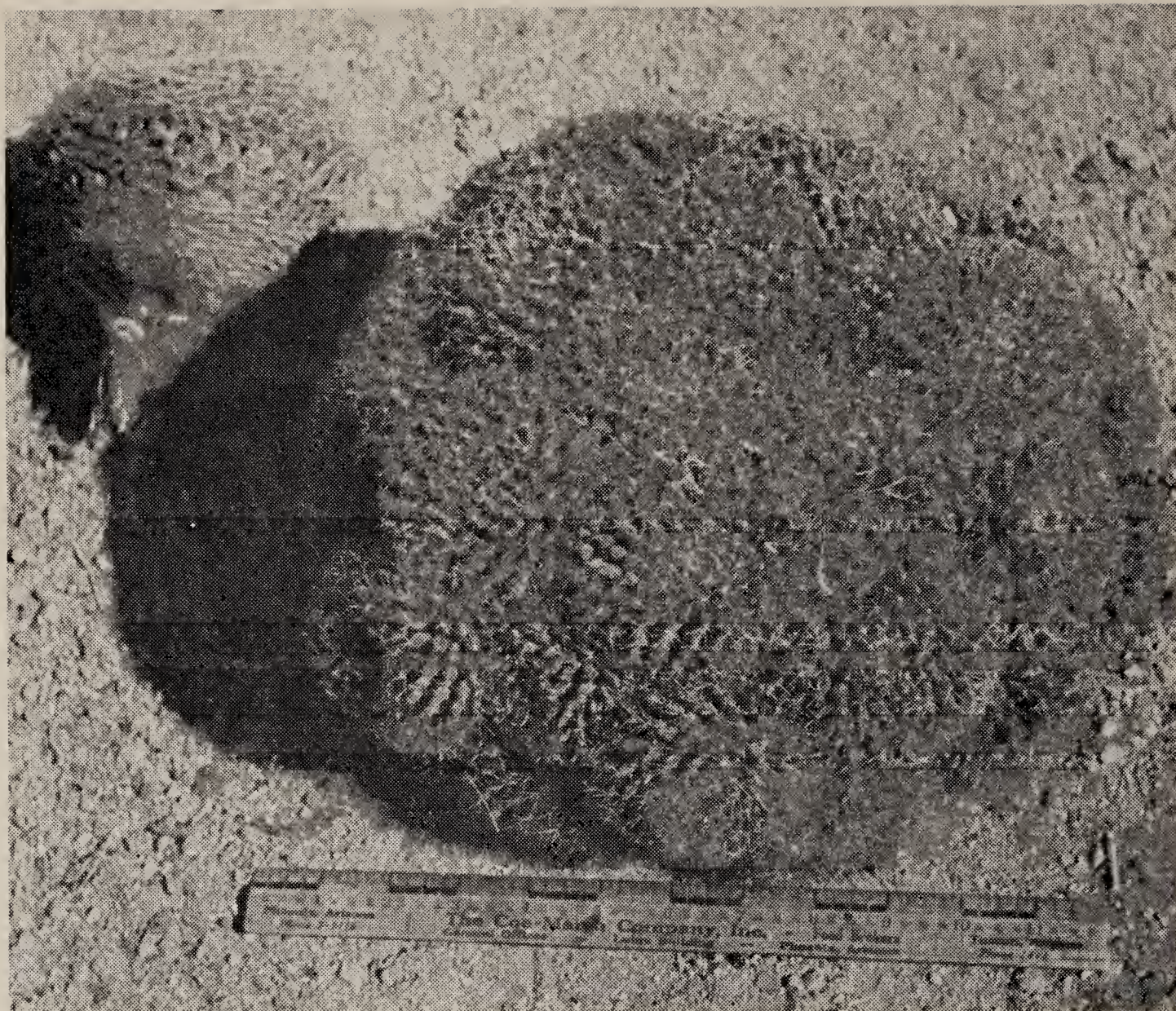
## MAMMILLARIA HEYDERI EXTRAORDINARY

R. C. PROCTOR

I have been told that specimens of the Cream Cactus—or *Mammillaria heyderi*, if you prefer—have been found in Texas in sizes so large as to make our Arizona plants of this species appear to be dwarfs. This is, no doubt true, but I doubt if a freak of this species has yet been found in Texas, or anywhere else, as large as the one I stumbled onto, on a ranch, near Benson, Arizona. This curiosity plant consists of a main-stem and thirty heads that measure twelve inches across the plant's widest surface. The main-stem,

alone, is six inches in diameter. Obviously, this is an extraordinary *Mammillaria* and is an extreme case of proliferation.

The point of interest here, however, is not in the size of the plant but in the problem of how so much superficial growth was stimulated into so uniform an aggregation, from what is, normally, a solitary stem. To give you a sound explanation for this freakish growth, I must, of necessity, lean heavily on the expressed opinions of W. Taylor Marshall, Editor of this Journal



*Mammillaria heyderi*  
A cluster of proliferations

and Director of "The Desert Botanical Garden," since I'm no Einstein of the cactus family: —

To understand how this unique growth came about we must first consider the growth mechanism inside of a plant, which is the meristem, or growing point, and which consists of cells (the meristem cells) that multiply by division. As the meristem cells increase in number we are able to observe new growth on a plant at its tips. New branches, heads, stems, leaves and other members crop out when a potential bud becomes active.—according to the nature of the plant. While the formation and growth of a cactus are developing, by the upward extension of

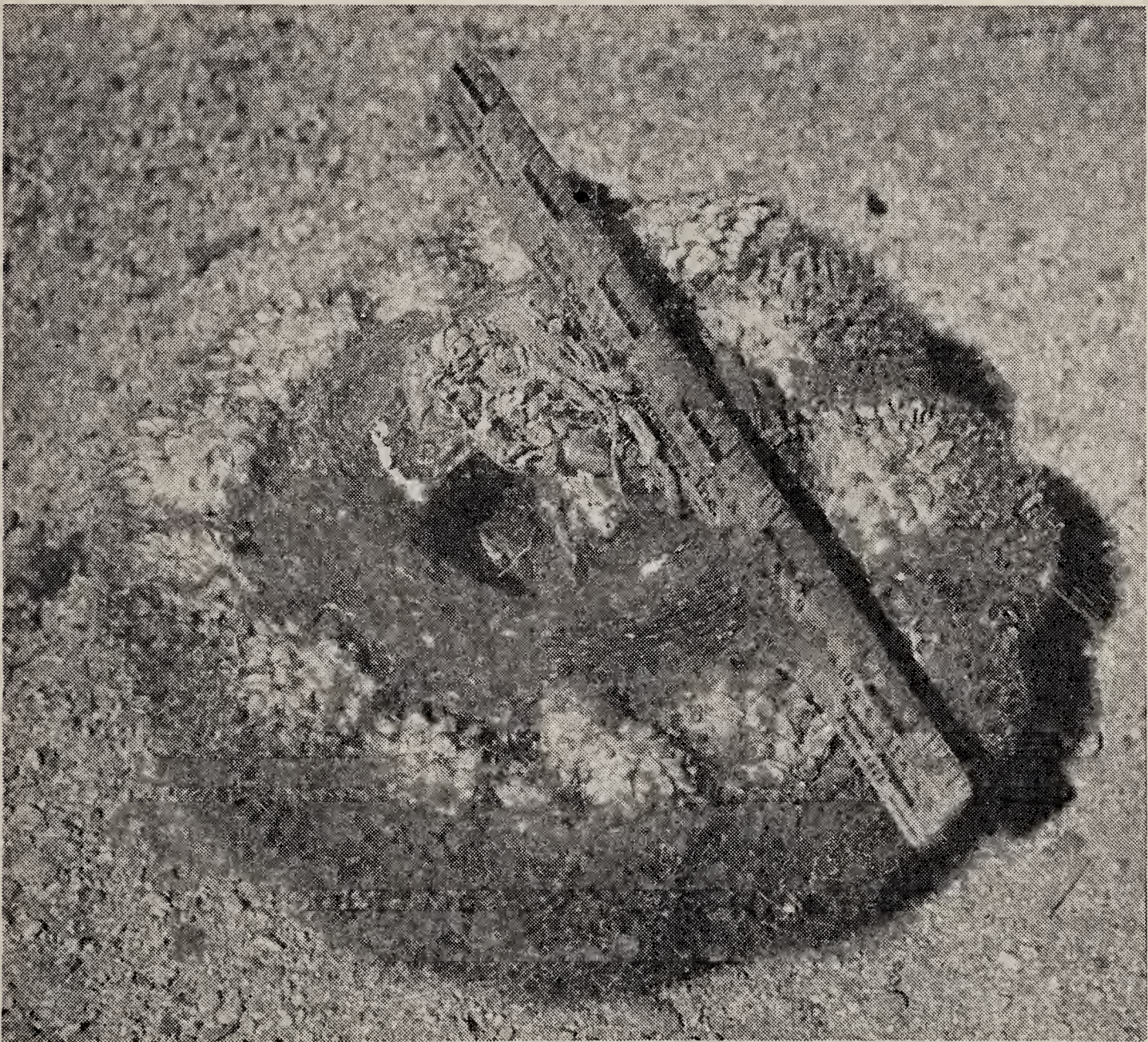
its meristem, potential growth buds are always present at the areoles. These buds may retain their potential ability for years, or for the entire life of the plant, and at some period become excited into activity as a result of the destruction of the meristem.

Now let us take a look at the photograph (1B) that shows our plant bottom-side up. The giant main-stem, of great age, and what was at one time a normally solitary growth, is clearly outlined by the circle of branches around it. At the center is an opening to a large cavity through which I have been able to insert my hand and discover the stem to be little more than a thick shell. Obviously, and as W. T.

Marshall has concluded, this is the work of an underground animal that chewed out all of the meristem, thus stimulating dormant buds into action, and likewise equally on all outer sides . . . hence, the uniform arrangement of the resulting new growth. A gardener, when he trims a hedge, achieves the same effect, and by the same biological process, as did the little animal who feasted on our cactus plant, by destroying the meristems. Pruning ex-

cites potential bud development.

The photograph also shows us that enough of the root system was left on one side of the shell of the stem to sustain what was left of it and nourish the tremendous, new growth. This shows us how persistently a few potential buds in a cactus will forge ahead with the business of living and multiply into a great organization. . . as long as there are some remnants of a root system to nourish them.



*Mammillaria heyderi*

Reverse of the cluster showing the damage to the meristem which caused the proliferation

## SELAGINELLA—THE RESURRECTION PLANT

Commonly found in all southwestern Indian stores are small packets of plants sold under the name of "resurrection plant." These packets are generally labelled somewhat as follows: "Miracle of Nature—put in water and watch it grow, referred to in the bible as the Rose of Sharon, known in Mexico as Siempre viva." Scientifically specimens are known as *Selaginella lepidophylla* which is a species of a small club moss. These plants are gathered in the Chihuahuan desert of Mexico or in Texas and shipped to various markets.

The name "resurrection plant" comes from the habit of *Selaginella* of re-

maining expanded when moist and thus exposing the green leafy portion of the plant (fig. 1); as the plant dries the branches curl to form a ball thus exposing the brown undersides (fig. 2). When again moistened, the plant uncurls and shows green.

*Selaginella* is the only genus of the class Selaginaceae of the phylum Lycophyta (phylum Pteridophyta, class Lycopodineae of older systems). Approximately 600 species of this taxon are known of which 37 occur in the United States with 11 in the Pacific Coast States and about 15 in the south and west into New Mexico (1). Seven species and one variety are reported

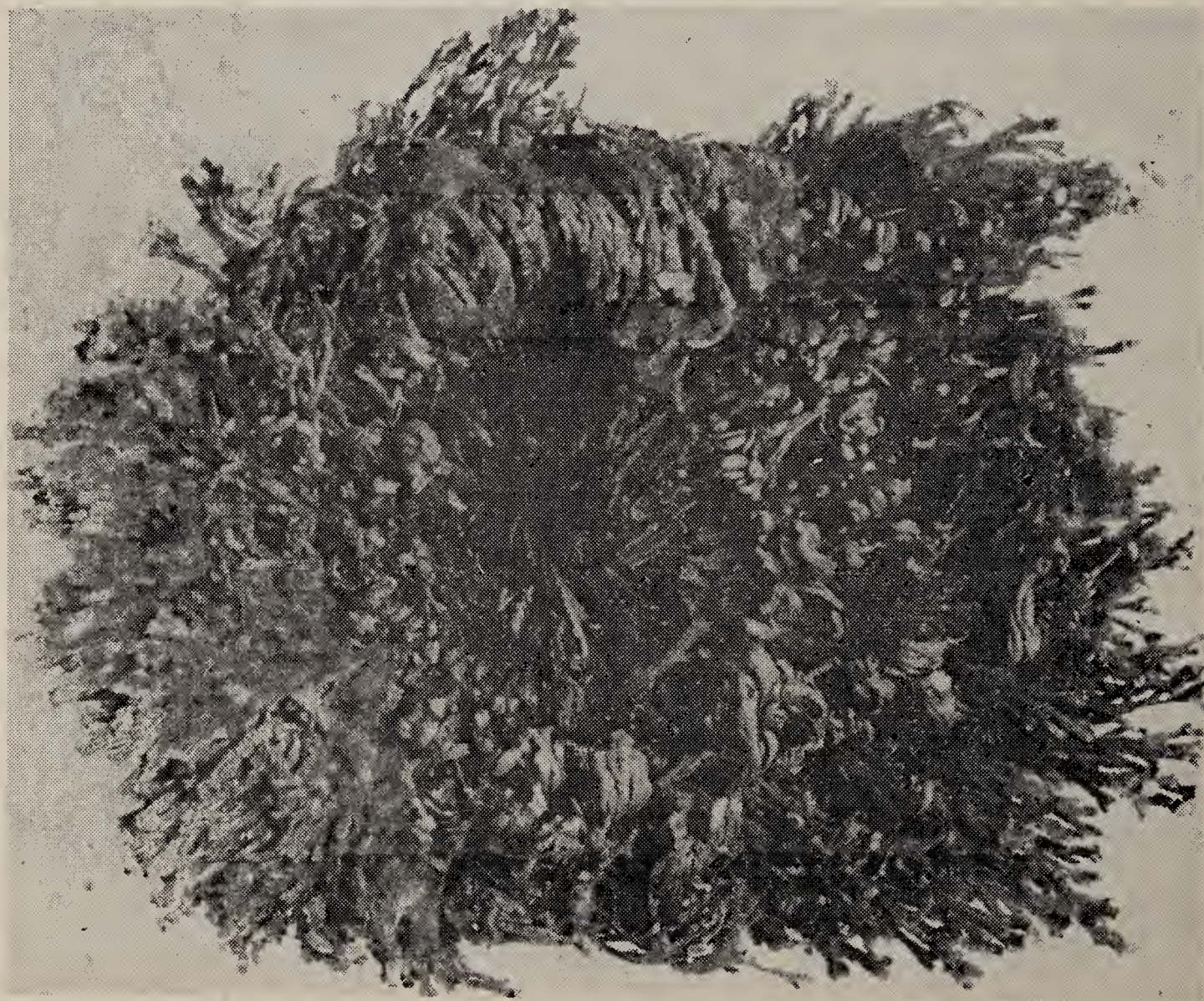


Fig. 1 *Selaginella lepidophylla*  
Partially spread out exposing the upper side



Fig. 2. *Selaginella lepidophylla*

Dried condition showing the typical "resurrection plant" characteristic from Arizona (2) although most of these are rare. At least 25 species are cultivated as ornamentals.

*Selaginella* is a mosslike, terrestrial, evergreen plant with dichotomously branching stems. The leaves of all Arizona species are spirally arranged on the stem. The entire vegetative structure rarely (in Arizona) grows more than 5 or 6 inches in height although a single clump may have a circumference up to 12-14 inches.

The life history of this plant extends through two totally unlike phases, an asexual reproductive stage and a sexual reproductive stage. Botanically speaking, the leafy, easily observed phase which reproduces asexually, is known as the sporophyte (spore-plant) generation (figs. 1-3). The second phase, the sexual or gametophyte generation, is seldom noticed in these plants except by careful examination.

In the Arizona species, the ends of

the branches may produce cones (strobili) composed of leafy bracts (fig. 4). Each bract bears a spore containing structure, a sporangium, on the adaxial side. Sporangia are of two distinct kinds, microsporangia, usually borne toward the tip of the cone, and megasporangia, borne basally on the cone. Within the microsporangium many spores are formed. Each microspore undergoes a series of cell divisions and is now known as a gametophyte plant although still extremely small. This gametophyte plant is now shed and sifts down to the lower portion of the cone where development continues and

male gametes or sex cells are released. Within the megasporangium only four spores are formed. These become the female plants or female gametophytes which bear female sex organs known as archegonia. In each of the archegonia, a single egg cell is formed. The male gamete comes into contact with the egg, fertilization occurs and a new generation, the sporophyte plant, begins.

The act of fertilization may occur while the female gametophyte is still on the parent plant or may occur away from the parent according to the species. At any rate, the new embryo

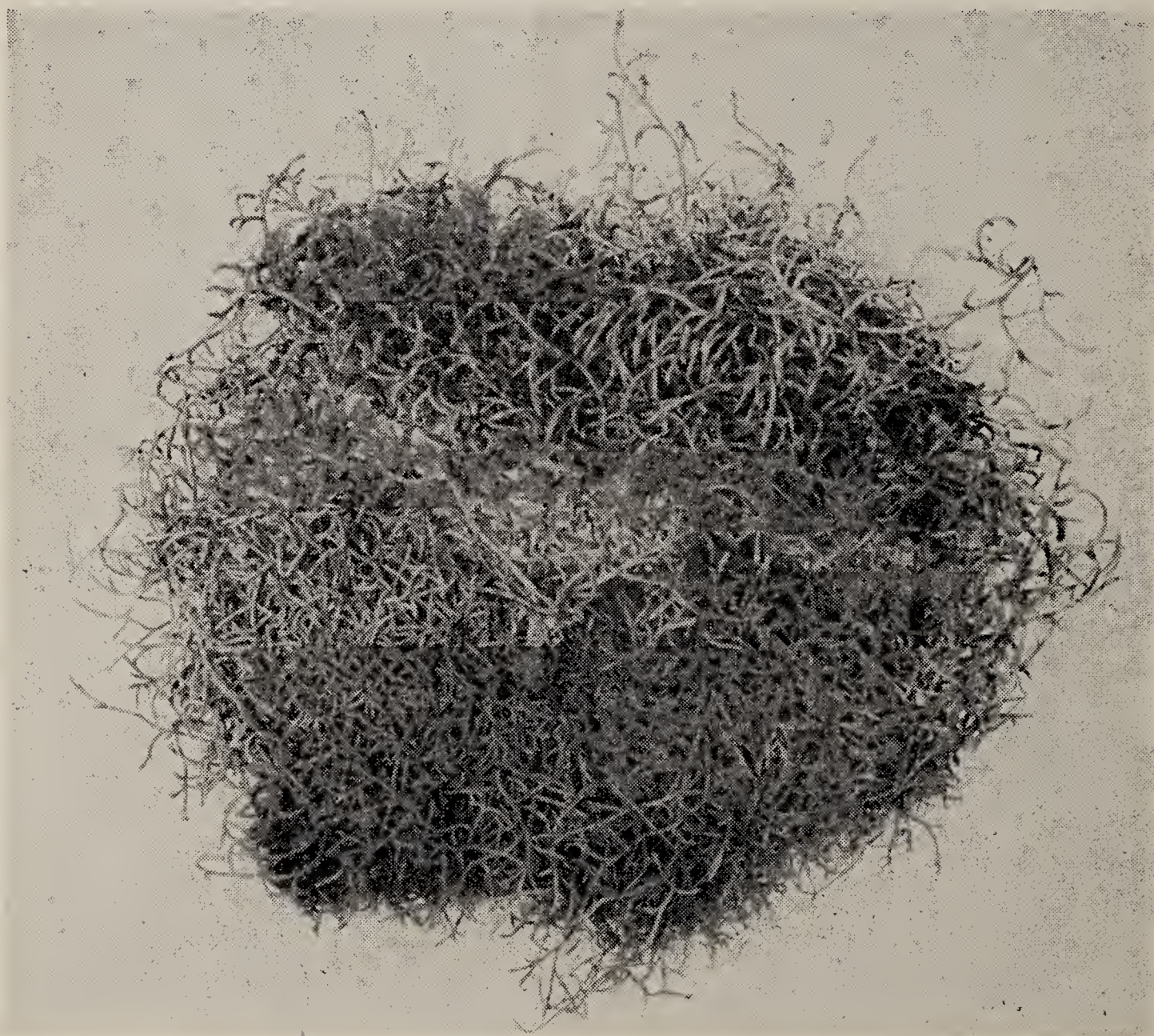


Fig. 3. *Selaginella mutica* D. C. Eaton

An Arizona species collected in Havasupai Canyon by Elwood Blakley

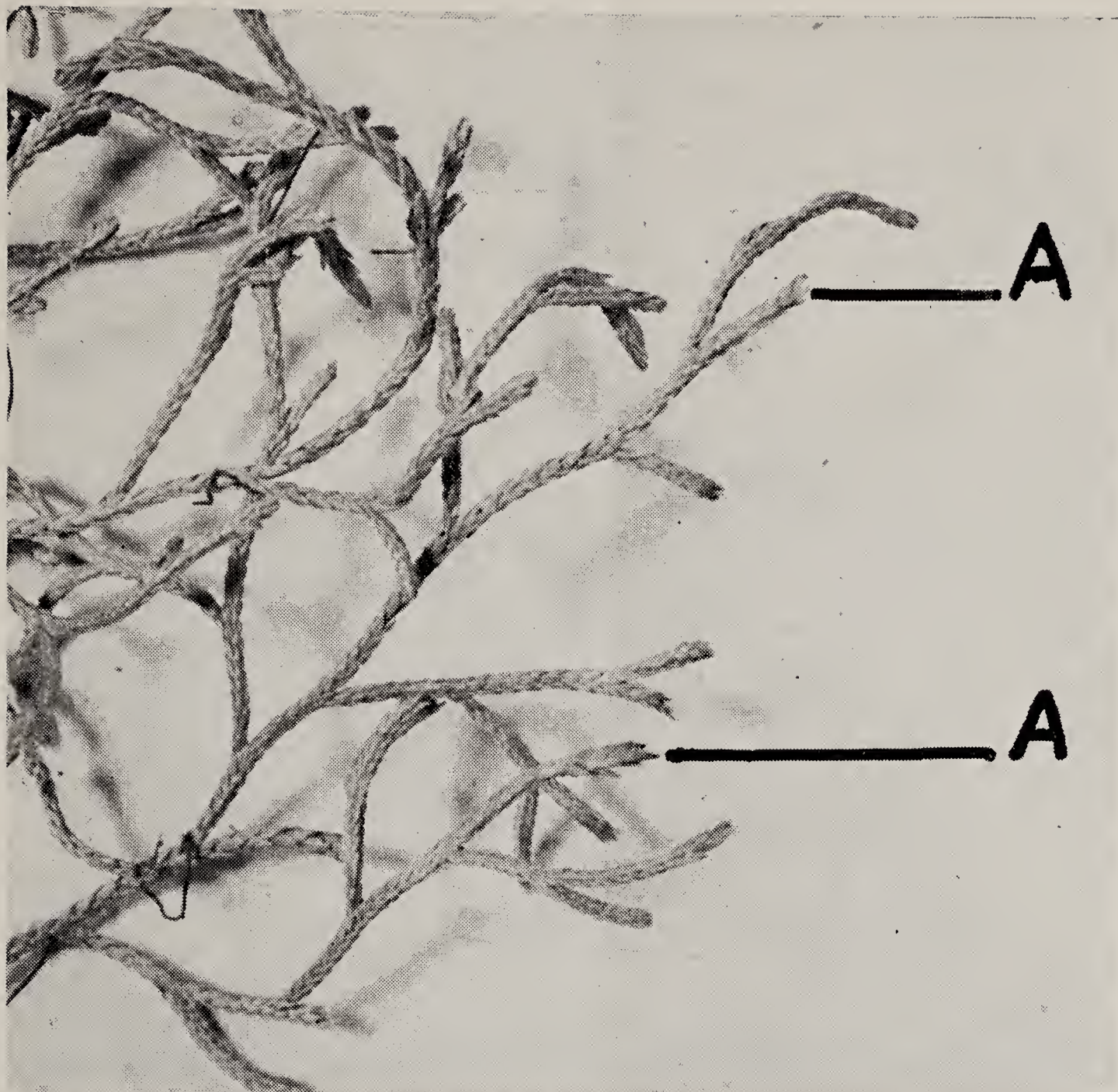


Fig. 4. A close up of a portion of *S. mutica* showing the strobilis (A) where the spores are produced

grows, and sends forth roots and a leafy shoot which matures in the plant known as the "resurrection plant."

Although not of tremendous economic importance, *Selaginella* may be of more value than ordinarily realized due to its ability to prevent soil erosion. Several desert species, especially *S. arizonica* Maxon, tend to grow in the shade of bur sage and creosote bush and other xerophilous plants in sufficient masses to accumulate quantities of soil. Other uses of *Selaginella* except

as horticultural curiosities are unknown. Literature Cited

(1) Lawrence, George H. M. 1951. *Taxonomy of Vascular Plants*. The Macmillan Co., New York.

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