The Annual Saguaro Harvest and Crop Cycle of the Papago, with Reference to Ecology and Symbolism

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Frontispiece. Modern Papago basket with designs depicting the annual Saguaro harvest. The *kuipaD* and other black elements are woven using Devil's Claw (*Proboscidea*) fiber. The red fruits are depicted using Catclaw (*Acacia greggii*). Green comes from using shade-dried *Yucca*, white from sun-bleached *Yucca*. Basket in collection of author.

Photographs by

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Abstract

The Papago Indians ceremonially called upon the supernatural, through intermediacy of Saguaro wine communion, to ask for rain for their agricultural fields. Speeches relating to the *nawait* (wine) rituals, although archaic and difficult to interpret, seem to comprise an epic cycle dealing with natural history of the Saguaro and history of the Papago. For example, 1) The running speech may detail the life cycle of the Saguaro and its reaching to the sky in supplication to the supernatural for rain; 2) the seating speech may refer to pre-agricultural plant-gathering by the Papago which was made possible by the Saguaro having successfully asked the supernatural for rain; 3) the mockingbird speeches seem to describe drinking of Saguaro wine, subsequent rain sent by the supernatural, and "de temporal" growing of corn by Papago to the east, north and south but only growth of wild plants in the western sector. The westerly Sand Papago were less agricultural because of deficient rainfall in their homeland.

Harsh areas of the Sonoran Desert were made habitable to the Papago 1) by their developing or assimilating techniques of Saguaro fruit harvest, fruit processing technology, "hermetic sealing" and food storage technology, and also 2) by their growing desert-adapted races of corn, beans and squash with rapid life cycles, using a "de temporal" agriculture made possible by run-off water harvested from brief summer thunderstorms. Were it not for the June and July fruit harvest, the Papago would not have had food reserves for the period when crops were planted in July and before they were finally harvested in September and October. Wild mesquite collected in August was also important.

The Papago demonstrated profound respect for the Saguaro, successfully emulating some of its qualities to survive on the desert as it did. They may have believed, according to the running speech, that the Saguaro had a supernatural anthropomorphic dimension coming from its contact with the man who resided at the rainhouse where winds, clouds and seeds were located. They began their annual calendar with ripening of Saguaro fruit and kept it on schedule by referring to phenology of the Saguaro, crops and wild plants: the progression of the seasons in the environment.

Knowledge of ecology was combined by the Papago with a goodly amount of symbolism to develop an annual Saguaro harvest and crop cycle notable for its ritualism and its effectiveness in keeping the people on schedule with gathering and planting and providing a sense of fulfillment in a difficult subsistence economy. The promise of wine from the fruit may have made easier the hard work of fruit harvesting, processing and storing which resulted in eleven other food products aside from wine.

The rituals have previously been well-discussed in relation to rainmaking and to the Papago year, as well as with respect to rituals of salt-gathering, war, curing, hunting and so forth. Albeit imperfect, the present analysis has brought together some twenty ritual elements. These seem to relate to a Saguaro harvest and crop cycle which, although implied in much ethnological literature, has not definitely been stated as such previously.

The symbolic importance of Saguaro wine may have been responsible for the Papago *nawait* remaining a relatively pure Saguaro product without addition of maize or other fruits and without adulteration by addition of alkaloidal plant materials known to have been used in other cultures.

An incidental suggestion from the present study is that a fermentation culture of micro-organisms may have once been used as a "starter culture" in Papago wine-making but eventually became contaminated resulting in a type of acetic fermentation. If so, the fermentation period may have been shortened from four nights mentioned in a legend to two nights to avoid the wine turning to vinegar before being consumed. Although wine examined in this century is uniformly said to turn to vinegar quickly, a sample obtained in 1867 or before was found by botanist Edward Palmer to have improved with three years of aging and to have become superior to commercial wine. This observation indicates that a non-acetic fermentation was present at that time. An acetic fermentation is recorded on the 1867-68 San Xavier Calendar Stick due to the wine having been left standing as a result of an Apache raid. If the only starter culture had been used for this wine-making ceremony, this calendar stick record might document the circumstances of the actual loss of the micro-organism culture through bacterial contamination of abandoned standing wine left in open-mouthed vessels while the men chased after the Apaches.

Introduction

The Papago have mostly been an agricultural people of the Sonoran Desert of northern Mexico and southern Arizona. In the past they depended on channelled run-off water from temporary but intense summer thunderstorms for a type of farming intermediate between purely dry-land methods and those of usual irrigation agriculture. Similar variations in such "water-harvesting" techniques are even now coming into use in other parts of the world. According to Stone (1943: p. 5) the Papago had a farming skill which was very effective and was the envy of ordinary dry farmers.

Historically the Papago have depended on a summer harvest of Saguaro cactus fruit and an autumn harvest of beans, corn and squash. Some wild plants such as mesquite beans were also gathered. A wine-feast growing out of the Saguaro harvest is the rain-making event that allows the beans, corn and squash to be planted.

Unlike the related Pima, the Papago have had no major rivers or canals for irrigation purposes. They call themselves and the Pima by a common name, *O'odham*. Translated from their own language, they are the Desert People (*Tohono O'odham*), while the Pima of the Gila and Salt Rivers, who speak essentially the same language, are the River People (*Akimel O'odham*). The Sand People (*Hiach-eD O'odham*) were a less agricultural western Papago.

The Papago have been strongly associated with the Saguaro (*Carnegiea gigantea*), but also with a special crop plant, the Tepary Bean (*Phaseolus acutifolius* var. *latifolius*). This bean has an astonishingly quick life-cycle adapted to the "de temporal" summer thunderstorm agriculture of the Papago. Mathews (1951: p. 1194) believed that the name *Papago* itself became associated with these people from *pavi coatam* "the bean-eating people" while Castetter and Underhill (1935: p. 32) suggested *papawi o'otam* "bean people." *Papawi* is the plural of *pawi* "tepary bean." The name *tepary* itself is said to derive from the Papago sentence *t pawi* "it is a pawi." Aside from their close association with the Saguaro and with the Tepary, the Papago were masters of growing a locally adapted race of maize or corn (*Zea mays*) and this may have been their most important crop plant.

Castetter and Underhill (1935) thought that due to the inhospitality of the desert homeland of the Papago, they "did not suffer the thorough conquest which befell the other Mexican tribes, and have thus kept many of their ancient customs intact." Al-

though the Papago have now adopted the culture of the United States, they retain a few customs which they fondly remember and try to perpetuate. One of these, dealt with in the present paper, signifies their respect for and historic dependence on the Saguaro cactus, together with a religious belief in the supernatural, and is observed in beginning each new agricultural season.

As a prelude to the seasonal "de temporal" agriculture, the Papago have observed a rain-making wine feast, the *nawait* ritual, with memorized speeches thought to bring down the clouds. The new year of the Pima and Papago calendar traditionally begins with the intense heat of late June and early July and a fruit harvest leading into the wine-making and wine-drinking *nawait* ceremony. The ceremony has a direct agricultural significance as it is the ancient Papago way to bring rain to the fields. According to Joseph, Spicer and Chesky (1949), "many individuals tell of having been caught in a heavy rain on the way home from a ceremony." Underhill (1946: p. 43) was told that "In the old days no planting was allowed until after the ceremony."

The fruit from which the ceremonial wine is made comes from the giant Saguaro cactus, a plant which is not cultivated but rather grows wild in the desert. The appearance of fruit on this cactus comes during a period of food scarcity due to the absence of rain. The fruit was processed into syrup, jam, dehydrated pulp, chicken feed, seed flour, oil, pinole, atole, snack foods, soft drinks, wine and vinegar, only the outer husk of the fruit going to waste. And even in discarding the fruit husk, a good result is thought to inure to these agricultural people, as it is always laid on the ground with the red inner part pointing upward "to hasten the rains."

Coming as it does during a period of little food, the Saguaro harvest has been of tremendous past importance to the Papago and indeed is said to have been lifesaving. The wine ceremony is thought to represent renewal, purification or purging and has an element of thanksgiving, socialization and merry-making but basically is the event that drenches the ground to allow revitalization of the vegetative forces—to allow seeds of agricultural crops to be planted by the Papago. Ritual components of the Saguaro wine cycle, both of words and of actions, some obvious and others perhaps subconscious, are examined in sections below.

It is intended in the present paper to review the knowledge which has accumulated concerning the annual Papago Saguaro harvest and wine ceremony,

to identify a definite Saguaro harvest and crop cycle, to point out some possible scientific explanations underlying phenomena in the rituals and legends, and incidentally to comment on some real and suspected instances of cultural change.

The Saguaro in History; Discovery and Naming

According to Shantz (1937: p. 515), Coronado and the Conquistadores discovered the giant cacti in 1540 "and named them saguaros." An examination of the literature reveals that the chronicler of the 1540-1542 expedition did indeed refer to a giant cactus, but by the name *pitahaya* (cf. Castañeda de Najera, 1940: p. 251). Castañeda wrote that the Indians of Suyá, a location believed by many historians to have been in what is now northern Sonora, "are inveterate sodomites. They drink the juice of the pitahaya, a fruit of great thistles which opens like the pomegranate. They become stupefied with this drink. They make preserves of prickly pears in large quantities without additional sugar. They make mesquite bread..."

The term *pitahaya* was used in old Spanish writings for several kinds of tall fruit-bearing cacti (Mitich, 1972: p. 557), is said to be of Carib or Haytian etymology rather than being from a southwestern Indian language (Safford, 1909: p. 557) and is of very little present diagnostic value in determining the cactus referred to in Sonora. From the description and geographic location, however, Castetter and Bell (1937: p. 23) were convinced that the plant mentioned was the Saguaro. If so, this would appear to be the first contact by Europeans with this giant cactus. It also might be the first record of the use of Saguaro wine by the Papago or by closely related Pimans.

Father Eusebio Kino, missionary sent by the Society of Jesus to the inhabitants of the Sonoran Desert, ministered to the O'odham from 1687 until his death in 1711. He once wrote that Indians even neglected their livestock to eat the fruit of the pitahaya (reprint, Kino, 1948: Vol. I, p. 291). A quite similar "neglect of cattle" in favor of cactus fruit harvest, interestingly enough, was again independently observed over 250 years later by Wickham (1971: p. 3). This indicates no failing on the part of the Indian, merely that the Saguaro harvest would not wait.

The Saguaro became known to the United States government and to science when U.S. Lieutenant (later Major and finally General) W. H. Emory led a military reconnaissance from Fort Leavenworth to San Diego during the Mexican War. He "discovered" the cactus in 1846 growing along his route which paralleled the Gila River in what then was Mexico

and now is central Arizona. On November 11, 1846 (reprint, Emory, 1951: p. 133) he wrote that his camp "was soon filled with men, women and children, each with a basket of corn, frioles, or meal, for traffic. Many had jars of the molasses expressed from the fruit" of the giant cactus to trade for beads or cloth. The next day (op. cit.: p. 135) Emory observed that the cactus syrup was "put up in little jars, hermetically sealed." The cactus was technically described and given the scientific name *Cereus giganteus* by botanist George Engelmann in an appendix to Emory's original report (Engelmann, 1848: pp. 158-159).

About 60 years later, Britton and Rose (1908: pp. 185-188), scientists at the New York Botanical Garden, showed that the cactus was more or less unique when compared to other types of *Cereus*, and established the distinctive generic name *Carnegiea* for it, choosing to memorialize Andrew Carnegie who had funded the research efforts of the Desert Laboratory on Tumamoc Hill, the black hill at the foot of which was Tucson. "Tucson" derives from *Chukson*, Papago for "foot of the black hill" in true reference to this location, now a botanical landmark.

There is a story, apocryphal indeed, but well known to many botanists, that the naming of the plant for Carnegie was a ploy to extract further funding from him for plant research. As the story is commonly told, Carnegie was asked to come to Arizona and look at the unusual plant which had been named for him. He obliged and was shown the great forests of Saguaro near Tucson which the Papago had depended on for hundreds of years. When told that these giants all now bore his name, he inquired innocently how such a characteristic and useful plant had evaded detection near a highly populated area of the state for so long. When the blushing botanists tried to explain how it had been scientifically necessary to change the name of the plant and that the cactus had been well known for many years, Carnegie reportedly became disgusted with a kind of science that could change well-established names of plants to cater to a wealthy person.

Nevertheless, and although there is still active debate as to the proper scientific name for the Saguaro, the designation "*Carnegiea gigantea* (Engelmann) Britton and Rose" has for the most part been used for the last seven decades. During this period the Saguaro has declined in importance to the Papago as these people have adapted themselves to Anglo culture and to using resources outside of their natural environment. The most popular use of this

cactus today is probably in landscaping and it has been necessary for the government to make laws prohibiting unlawful digging of the plant for transplanting (Countryman, 1979: p. 65). It has also been necessary to prohibit vandalism of the plant and its use for target practice.

Papago Respect for the Saguaro

Murbarger (1948: pp. 144–148) wrote that “The Papago of old who willingly inflicted damage on a Saguaro was ostracized.” Lumholtz (reprint, 1971: p. 47) recorded that to the Papago “the sahuaro is invaluable, and by tacit understanding they consider it a crime to cut one down.” Nabhan (in manuscript) recounted an incident in which a boy asked a Papago woman if, when lacking a pole, it would be possible to harvest the fruit by knocking it from the Saguaro with rocks. The reply was “... Saguaro ... they are Indians too. You don’t ever throw anything at them. If you hit them in the head with rocks you could kill them ... You don’t do anything to hurt them. They are Indians.”

An observation implying that Piman (from the location either Kohatk Papago or Gila River Pima) Indians commonly used Saguaro for target practice was published by Bartlett in 1854 (reprint, 1965). It would be interesting to know if the Pimans were Papago or Pima and whether only certain Saguaro, perhaps designated as Apaches, were shot at. It seems possible that Bartlett merely found arrows shot into Saguaro and assumed that Pimans had done this. Such desecration of the Saguaro would seem not at all characteristic of the Papago. Cutak (1939) certainly voiced the consensus of opinion when he wrote that the Saguaro was “the sacred tree of the Papago Indians.” The legend published by Wright (1929: pp. 116–17) claims that before the Papago knew about the qualities and nature of the first Saguaro, some little Papago boys did indeed shoot arrows into it, causing the cactus to go away and the “people were sorry.” Eventually the wine ceremony was given to the Papago and it is implied that the little boys wouldn’t think of shooting arrows at the Saguaro again.

It has been said (Murbarger, 1948: pp. 144–148) that the first Saguaro was believed by the Papago to have sprung up from drops of sweat that had fallen into the dust from the brow of I’itoy, the “Elder Brother” of Papago legends. Lumholtz (reprint, 1971: p. 48) had previously reported a similar but more active version whereby Elder Brother intentionally “created the sahuaro by placing beads of his perspiration in the ground.” Bowen (1939: p. 5) considered

this sweat of the brow of I’itoy to be symbolic of honest toil necessary to extract food from the Saguaro.

The “sweat of the brow” legend is at odds with another Papago version of Saguaro origin recorded by Enos (1945: p. 66) and Underhill (1946: p. 42), whereby a ten year old girl (fide Enos) or a baby whose mother would not nurse it (fide Underhill) “sank into the earth and came up on a mountain slope as a giant cactus.” Similar but not identical versions of Saguaro origin from a child who sank into the earth have been recorded by Wright (1929: pp. 109–122) and by Densmore (1929: pp. 149–150). But it is interesting that although these versions of Saguaro origin are different, they are all more or less in harmony with a belief that Saguaro are indeed Indians, too, as Nabhan’s informant believed.

The Papago legend preserved by Wright (1929: pp. 109–122) involved resurrection of the first Saguaro from a child’s bones. Moser (1970: p. 205) reported a custom of the Seri whereby human life was linked to a giant cactus (either Saguaro or Cardón): to insure a long, healthy life for a newborn, the placenta of the baby would be buried at the base of a giant cactus. Although there was once an O’odham practice of burying the placenta and placing ashes over it (reprint, Russell, 1975: p. 185), whether this was done at the base of a Saguaro is not known.

Some of the Indian respect for the Saguaro might result from its anthropomorphic form. But beyond this superficial factor, the life cycle of the Papago was apparently once so strongly linked to the Saguaro as a resource, that there developed rituals of symbolic union of Papago and Saguaro. The details of the ritualistic union of the Papago with Saguaro wine is discussed in later sections of the present paper, as are rituals involving two other ceremonies involving Papago-Saguaro symbolic union, one involving Saguaro seed meal and pieces of Saguaro skeleton, the other involving placing Saguaro pulp on the chest.

The respect that the Papago show for the Saguaro is undoubtedly based on their historic dependence on it. Thackery and Leding (1929: p. 407) wrote that “it is easy to understand why they should still show such marked respect for ... the Saguaro. There is little doubt that it has frequently been a life-saver to their ancestors ... when all other sources of food failed.” The same authors (loc. cit.) noted that the Papago “when clearing away brush for the construction of roads ... frequently curve the road for the sole purpose of saving one or more of the Saguaro.”

Although O’odham in general seem to have utilized Saguaro, different groups of them have

Figure 1. A stand of Saguaro cactus near Tucson, Arizona, in country where the Papago have traditionally harvested the fruit. Photograph by H. L. Shantz.

probably run the gamut from a rather strict dependence on the fruit to little or no use. The Sand Papago to the west and the River Pima to the north certainly had food habits different from those Indians who lived near dense stands of Saguaro close to Tucson. Murbarger (1948: pp. 144–148) was of the opinion that the Saguaro was the Papago “food and drink, their shelter and religion; no other single factor was so important to the tribe’s welfare.” Such a strong statement would seem to have been colored by the situation that has prevailed in the dramatic groves of Saguaro that eventually became protected by the government as Saguaro National Monument. In this respect, it might be noted that the elderly informant of Nabhan, who showed great respect for the Saguaro, collected Saguaro fruits within the boundaries of Saguaro National Monument and was

doing so long before the National Monument was set up. Nabhan (in manuscript) reported that the informant’s grandfather used to take her to the area by horse-drawn wagon to collect the fruit and that she has personally collected there for over sixty years. Her anthropomorphic view of the Saguaro might well be characteristic of the branch of the O’odham which was closely associated with Saguaro.

Saguaro Ecology and the Papago

A Strategy for Surviving in the Desert. Largest cactus of the United States, the Saguaro survives in a rather inhospitable desert by sending out numerous lateral roots in a wide expanse just under the surface of the soil to catch water even from light rains. The concept of using water from an expanse of land greater than that upon which plants are grown

has been similarly adopted by the Papago as a water-harvesting technique. As water is taken up by the giant cactus, its massive body swells, the accordion-pleated ridges allowing expansion around a wooden skeleton of ribs. A mature Saguaro can weigh thousands of pounds.

Subtropical Elements. That the Saguaro is part of a subtropical element extending into the United States from Mexico is seen from the plant's relative intolerance for freezing weather of even moderate duration. Likewise, the Papago have been a warmth-loving people and it has been suggested that they have occupied the northern fringe of an alliance of subtropical Indian tribes of Mexico.

Correlation with Climate. Running across central Arizona and down into Sonora is an imaginary line separating colder land to the north and east (where there has been a complete day of freezing weather) from the warmer land of the Sonoran Desert. The Saguaro does not transgress this line. Neither do the O'odham. The Papago and Pima, although historically travelling beyond these limits for short-term war engagements with the Apache, never felt comfortable at higher elevations.

The Saguaro will not tolerate a climate where the temperature of the surrounding air does not rise above freezing, even for one day. The correlation of the distribution of this cactus with climate very conveniently allows the northern and eastern boundaries of the Sonoran Desert to be drawn essentially as the limit of distribution of the Saguaro in these quarters.

Exploitation of Warmth; Avoidance of Cold. Since climate changes over the years, the boundary of the Sonoran Desert and of the Saguaro naturally fluctuates. Calder (1977: p. 99) has presented a lucid description of present and past climate in the northern hemisphere. The last ten thousand years have been relatively warm and would have allowed northward movement of the Saguaro. Cold periods, the last major one of which was from 1500 B.C. to 500 B.C. must have killed many Saguaro in what is now Arizona. A general warm trend from 500 B.C. to 1500 A.D. theoretically allowed subtropical elements to push forward.

Cold snaps dated at A.D. 1550–1650 and again at A.D. 1750–1850 in the northern hemisphere represented at least minor reversals. The Pima and Papago calendar stick records tell of intense cold with "snow three feet deep" in the decade of the 1840's. The Covered Wells Calendar Stick (Kilcrease, 1939: p. 300) shows that Papago "from both sides of the border had gone down into the low lands

or coast country of Mexico" but returned to their desert homeland because of a "miasma of death, hanging over the low lands. (This was probably yellow fever.)"

The northern hemisphere has again cooled since 1950 and a particularly cold winter in 1978–79 (Desert Plants 1: 37–39. 1979) killed many desert plants in southern Arizona. Saguaro in colder locations were killed, in more moderate locations injured and in warm spots not damaged.

Even within the limits of the Sonoran Desert there are microhabitats where the Saguaro can not live or at least does not thrive, because of the cold. Traditionally the Papago have shunned these areas in the winter too. This seems to have changed with adoption of Anglo culture, building warmer houses, wearing warmer clothing and using fossil fuels.

Figure 2. A mature Saguaro with abundant fruit at the tops of branches. The fruit is processed into twelve products by the Papago. Photograph by H. L. Shantz.

The Typical Southern Exposure. The north-facing slopes of typical hillsides of the Sonoran Desert, being more apt to lie in shadow through the days of the winter when the sun is at a low angle to the south, are often too cold for the Saguaro. At night the coldest air, being heavy, pools up on the valley floor. Low lying land, for example much of the Gila River Indian community, is not very suitable for Saguaro. The results of air drainage and exposure result in the Saguaro being much more abundant, often impressively so, on the south-facing slopes. The Papago have realized that the plants grow more frequently on south-facing slopes and their explanation is discussed in a later section.

The Papago winter quarters were traditionally associated with the small mountains, too, with a southern living exposure and a water source nearby, usually at the foot of a hill and associated with a more northerly exposure. Whereas present climatic trends are causing considerable changes in the population dynamics of the Saguaro, as will be seen below, a cessation of semi-migratory habits imposed by creation of the U.S.-Mexico boundary and by the U.S. government drilling wells in the valleys to encourage valley dwelling, may have eliminated the capacity of the Papago to cope with cold cycles by traditional means. Indeed, the predicted cold cycle from A.D. 1950 to A.D. 2050 (cf. cycles in Calder, loc. cit.) may prove disastrous to many Saguaro populations and, perhaps, cruel to the Papago.

Precipitation as a Limiting Factor. Aside from temperature fluctuations, amount of rainfall also influences Saguaro population dynamics. Notwithstanding its notable adaptation to recurrent drought conditions, the Saguaro cannot survive where annual precipitation is repeatedly low. The range of the species in western Arizona and adjacent California is restricted by the low rainfall there.

Steenbergh and Lowe (1977: p. 13) have observed that "In southwestern Arizona and at the westernmost limits of its distribution in southeastern California within a few miles of the Colorado River near Blythe, sparse populations are directly associated with areas of concentrated runoff." Interestingly, the Papago do not naturally transgress the barrier represented by the Colorado River and the line of increasing aridity any more than does the Saguaro.

Further Details of Distribution. Except for the very few plants across the Colorado River in California, the Saguaro is virtually restricted to southern Arizona and adjacent Sonora. It is much more common in the northern part of its range than in the southern. The report of the Saguaro growing

in New Mexico by Hemsley (1879) has been repeated by several succeeding authors even down to an article on the Papago Saguaro harvest in 1948 (Anonymous, 1948: p. 32).

The original error of Saguaro growing in New Mexico can be traced to a change in political boundaries. The large tract of land ceded to the United States in 1848 by the Treaty of Guadalupe Hidalgo was simply known as "New Mexico" until 1863 when President Lincoln signed a bill separating off an "Arizona Territory." Saguaro did indeed live in the New Mexico of 1848-63, but certainly not in the New Mexico of 1879. The same could be said of the Papago.

Decline in Saguaro Populations. Scientists have noted numerous cases of decline in Saguaro populations over the years and have advanced numerous theories regarding Saguaro ecology and population dynamics. Everyone agrees that the environmental impact of our modern culture has resulted in enormous destruction of Saguaro where cities, farms, roads and clearings have been made. Disrespect for cacti by non-Indian schoolchildren, hunters and persons on "outings" to the desert may have resulted in scarring and destruction of literally tens of thousands of Saguaro. The relatively defenseless plants have been chopped, cut, shot at, hit with stones, cut down with chain saws and rolled down hills by non-Indians for no reason at all.

Aside from intentional destruction of Saguaro, a great amount of unintentional impact to Saguaro habitat has occurred due to the influence of mankind. If estimates of Papago Saguaro fruit harvest of 600,000 pounds of pulp per year in the first half of this century are at all accurate, then reproduction in some groves could be less than optimum on these grounds alone.

A more insidious type of negative influence on Saguaro populations, and one which was minimal when only Papago occupied the land, comes from compaction of soil in the root zone by the constant trodding of man. For this reason, Saguaro tend to die out by the simple encroachment of civilization even when the plants were originally thought to have been spared from the bulldozer by moving a planned building, a parking lot or a picnic area by a few feet. Notwithstanding all of the above, more Saguaro probably die naturally than are killed or injured by man either intentionally or unintentionally.

Bacterial Necrosis. Hastings and Turner (1965: p. 195) believed that bacterial necrosis disease had been a "major cause of Saguaro death." Alcorn and May (1962) have predicted that Saguaro in

one section of Saguaro National Monument will die out by the end of the century because of bacterial necrosis disease and a failure to naturally repopulate. Shortly after Engelmann first scientifically described the Saguaro, he wrote a paper (Engelmann, 1852) describing "decomposition of the fleshy parts" of the Saguaro. The bacterial organisms that caused the decomposition were identified by a later scientist and named *Erwinia carnegieana* (Lightle et al., 1942).

A study by Gill (1951: p. 4) indicated that the rot or "bacterial necrosis disease" as it has been called, is linked with overmaturity, plants in old age or lacking in vigor being affected by the rot. Steenbergh and Lowe (1977: p. 190) believed that bacterial necrosis was not a disease at all, but rather the observable means of decomposition of Saguaro succumbing from old age, lightning or freeze. They concluded that "The ecologically unsupportable myth of the 'bacterial necrosis disease' must be supplanted by a possibly less appealing, but ecologically realistic, interpretation: the decline of once spectacular Saguaro populations at Saguaro National Monument and elsewhere in Arizona is an inevitable and continuing response of these populations to uncontrollable climatic events."

Underhill (1951: p. 41) observed that "The Desert People are not sorry to see a cactus fall apart, for that is the way they get their best wood." The Papago utilize the wood of Saguaro ribs from birth to death (cf. Gaillard, 1896: p. 600, for an account of Saguaro ribs used in Papago graves). In their traditional culture, Papagos unknowingly depended on the fact that bacterial necrosis will naturally rot away the fleshy parts of old and fallen Saguaro to allow the wooden skeletal ribs to fall away to be used as construction materials and for other purposes. The bacterial rot also allows the callous "boots" from dead Saguaro to separate out; these are used by the desert people as containers and for other purposes. Without *Erwinia carnegieana*, decomposition might be much slower and might possibly proceed concurrently with fungal decay of the ribs themselves so that a clear separation of ribs and boots from the plant carcass might be difficult.

On theoretical grounds, a large number of Saguaro ribs would have become available for construction purposes as a result of the A.D. 1550–1650 and A.D. 1750–1850 cold snaps. A corollary to this would be that the ribs were probably less abundant from 500 B.C. to A.D. 1500 and alternative methods of house building might possibly have been necessary.

Flower, Fruit and Seed Production. Just as surely as a Saguaro dies, natural reproduction occurs, al-

though not necessarily at the same rate. Plants start producing flowers when 40 or 50 years old. The large, white, waxy horn-shaped flowers have centers of gold, actually the numerous pollen-laden anthers. This impressive bloom is the state flower of Arizona. Any one of these flowers remains fully open only a day and is pollinated by long-nosed bats, white-winged doves or various insects.

A separate grain of pollen is necessary for each of the 2,000 seeds of a potential fruit to mature. As the seeds become black, the fruit will soon ripen. The last month of the O'odham year is the "Kai Chukalig Mashad" or the month when Saguaro seeds are turning black. Mature Saguaro produce about 200 flowers per year, a few opening each day, with the peak of bloom falling the last week of May and the first week of June. The peak of fruit ripening occurs the last week of June and the first two weeks of July, the "Hahshani Mashad" or Saguaro harvest month, the beginning of the new year.

Johnson (1924) found that phenology of Saguaro flower and fruit production was controlled mainly by warm spring temperatures coupled with increasing day length. As a result, Saguaro tends to produce fruit earlier in the southern part of its range than in the northern and at lower elevations than at higher. After introduction of the horse and wagon to the Papago, there is some evidence that a few Papago may have moved with the progression of the season to pick Saguaro fruit. A month long loop was mentioned by an informant of Nabhan (in manuscript).

In Saguaro, climate affects the physiological aspects of flowering and fruiting so that the dates vary considerably from year to year and the species has become evolutionarily adapted and attuned to the progression of the season with its eventual rain. From literally thousands of years of natural selection the plant has come to produce its seeds when both heat and moisture are abundant—the subtropical requisites for Saguaro germination and establishment. Maturing of fruit by the Saguaro is indeed an accurate indicator of impending rain. This the Papago have long realized, even if they have not fully known the reason why.

During its lifetime an average Saguaro has been estimated to produce up to 40 million seeds (Steenbergh and Lowe, 1977: p. 43). For Saguaro populations to remain relatively stable, only one of the 40 million seeds needs to produce a mature plant. The fact that the populations, although well adapted, are not for the most part significantly increasing, speaks much for the rigors of the Sonoran Desert. Of course, great quantities of Saguaro seed have been used by the Papago as human food and for feeding chickens.

Figure 3. Flowers of Saguaro, with one sectioned to show the structure. The ovary at the base of the flower swells and matures in about four weeks time to become a fruit. Photograph by H. L. Shantz.

Lumholtz (reprint, 1971) commented on the great variety of birds and wildlife which voraciously consumed the fruits of Saguaro, both on the plant and as soon as fruits fell to the ground. Wickham (1971: p. 6) noted that Saguaro seeds got wide distribution in the feces of rodents, coyotes, birds and humans. The seeds have hard impervious seed coats and are relatively indigestible until ground into a meal with a mano and metate.

There is probably no nutritional degeneration in fecal seeds and once washed and dried, some Indians utilized them as a "second harvest," grinding them into meal after parching them. Utilization of previously eaten cactus seeds as a "second harvest" has

been claimed for the Pima by Russell (reprint, 1975: p. 71) and seemingly for the Papago by Standley (1924: p. 909). Felger and Moser (1974: p. 266) thought that the Seri utilized only seeds of the Cardón (*Pachycereus pringlei*) as a second harvest, not those of Saguaro. Cardón seeds are somewhat larger but otherwise rather similar.

The Nurse Plant Concept. Young Saguaros ordinarily require a "nurse plant" for survival. Seedlings which germinate in the open die from sunburn or else freeze to death. The canopy of a Palo-verde or similar tree provides shade from the intense sun of summer and protection from frost during the winter. Early explorers were quick to notice that young

Saguaros were almost never found in the open. Underhill (1979b: p. 18) quoted some Papago words that indicate they may have had the nurse plant concept before it was suggested by Anglo botanists. The Papago belief was "sahuaros have trouble getting started in life. They are so big. Like a fat child, they get sick. But paloverde grows fast like a mother. It bends down the leaves and keeps the wind away."

Hazards of Survival of Seedlings and Young Plants. Javelinas (wild pigs) root up Saguaro seedlings, while packrats (*Neotoma*) and other rodents eat whatever Saguaro seedlings they can find. Schmidt-Nielsen (1964) found that packrats can live exclusively on cactus such as Saguaro by physiologically eliminating oxalate compounds which would be deleterious to ordinary animals. The Indians have found a way to constructively recycle the Saguaro flesh lost to packrats, as *Neotoma* has often been recorded as a traditional O'odham food.

Steenbergh and Lowe (1977: p. 77) have written the following: "Of the many thousands of Saguaro seedlings that emerge each summer, all but a few are doomed to destruction within the year. Most of the succulent, weakly rooted seedlings are eaten or uprooted by foraging animals, or they die from drought or winter cold. The few surviving individuals are usually concealed beneath protecting shrubs, fallen limbs, or among rocks. There they may be further hidden by detritus."

Curiously, perhaps, the hero of the "Running Speech" which starts the Papago wine feast, seems to behave as a Saguaro seed by falling to the ground at the base of a tree and allowing the wind to cover him with detritus. That the hero "emerged" and voiced kinship to his relatives and was given a little liquid, only strengthens the parallel if the belief that "Saguaro are Indians too," uncovered by Nabhan (in manuscript) is accepted.

During the first ten or twenty years of growth, the root system of the Saguaro is developing to allow dramatic later growth spurts, but while young, the plant body itself seems to grow little. Juvenile saguaros are armed with relatively long spines which point downward to discourage small animals such as *Neotoma* from eating the cactus (Benson, 1969). As the plants mature and become robust, the spines point outward.

Abundance on Sloping Land with Coarse Soil. Although Saguaro will grow on flat land, most that survive to maturity grow on coarse soils of south facing slopes and bajadas. Flat ground of valley floors usually consists of fine, poorly aerated soil. Water

also pools up on flat land, especially when a carbonate (caliche) layer is present. The roots of Saguaro require good soil aeration and "good drainage"—characteristics of coarse soils and sloping land. That the slope is facing south, on the average, relates of course to the warmer "southern exposure" where freeze is less apt to occur. Also, large Saguaro weighing a ton or more are more apt to be wind-thrown when growing on finer soils where the roots cannot be anchored by large boulders or by growing into fissures and cracks of cliffs or bedrock.

The Papago Explanation for the Saguaro Habitat. The Papago have noticed the correlation of Saguaro with the sides of hills and particularly with the south-facing slope. This is articulated in a legend recounted by Jose Anton, Chief of Pisinimo and recorded by Underhill (1946: p. 42). The story tells how the Saguaro was once a single plant which had been transformed from a Papago infant whose mother wouldn't nurse it. Fermented product of the cactus caused drunkenness and the Papago decided to do away with the cactus. They "sent Badger to throw the seeds into the ocean, but Badger met Coyote, who persuaded him to open his hand and show the seeds. Coyote then struck his hand a blow and scattered the seeds, which fell in clumps. Since the wind was blowing from the south, they were blown against the southern side of the hills, where the cactus now grows." A similar but not identical version of this legend has been published by Densmore (1929: p. 161), Wright (1929: p. 121), and Lang (1961: p. 4). A version encountered by Underhill (1979b: p. 19) said that Coyote was given the job of planting Saguaro seeds throughout the desert by I'toi, but lazy Coyote, being tired after a little work, dumped the whole bag of seeds on the ground which happened to be a south-facing slope.

The legend, of trying to destroy a species by throwing its seeds into the ocean, marks the early Papago as agriculturists, for who else would think of letting a plant die out by destroying the seeds? Respect for the Saguaro is shown by not killing the plant itself, but rather choosing to practice plant birth control.

Storing From Time of Plenty to Time of Scarcity. Although Saguaro is drought-tolerant, it is so only because it has the capacity to store water from time of plenty to time of scarcity. Indeed, it is this capability that allows it to mature a large crop of fruit during the climax heat and drought of summer. Because of unreliable rainfall and the not infrequent failure of crops, the Papago used to have a "feast or

famine" economy and learned like the Saguaro to save their resources from time of plenty to time of scarcity.

Legendary Use of Stored Water in the Saguaro. Harshberger (1926) claimed that Indians tapped the Saguaro for drinking water, but this has been questioned. The text of his statement is as follows. "In the midst of the Pinal and Superstition Mountains in Arizona, where the Apaches have battled the Papago, Pima and Maricopa tribes, the bases of the Saguaro are surrounded by circles of stones. These are rude forts, which were used by the Indians for protection against their enemies. The giant cactus furnished drinking water to the besieged, for holes were dug into the heart of the cactus to get the bitter, juicy pulp. The Indians seem to have become accustomed to this bitter, cactus water, for white men lost in the desert who have tried the same expedient to quench their thirst, have become very ill on account of the bitterness of the watery pulp."

The Calendar of the O'odham in Relation to the Saguaro, Crops, Wild Plants and the Environment

The Papago have been an indigenous people attuned to the environment of the Sonoran Desert. They have lived in harmony with the *hahshani* (Saguaro) and with their environment for hundreds of years. They could almost be considered as much a part of the desert as the cactus itself. They attuned their calendar to the phenology of the Saguaro and to the natural progression of the seasons rather than to the sun and its equinoxes. This is at variance with the sun-regulated calendar of the citified Aztecs even though the Papago speak a language which relates them, although distantly, to those people. One wonders how the Hohokam, prehistoric riverine city-dwellers of southern Arizona, from whom the Papago have sometimes been claimed to have been descended, regulated their calendar.

The phenological calendar would theoretically be quite effective in regulating the activities of peaceful and democratic agriculturists. Students of Papago ethnology have mentioned the egalitarian principles that have run through the fabric of Papago life before these people fell under the influence of Anglo capitalism, the 5+2 day week and the profit motive. There was apparently little division of labor other than between man and woman. A family unit was relatively self-sufficient in that its dependence was more directly upon the ecology of nature and the agricultural fields rather than on fixed groups of other people.

This is a common peaceful agrarian pattern in many parts of the world where families are dispersed over the countryside as opposed to the "civilized" trend toward living in ever larger cities (partly for protection from without) with rigid division-of-labor and forced specialization—the butcher, the baker, the candlestick maker, etc. Did some "Pax Aztecum" once extend to the countryside of the Papago? The way of life closely attuned to the environment, whenever and however established, endured successive threats of Spanish conquest, Apache warfare and Mexicanization, less well enduring the ultimate threat—Anglo industrial culture.

Once attuned to the environment, the people had to adapt to both subtle and major changes in it. A good example of change is seen in the River Pima, where one of Russell's (reprint, 1975: p. 36) informants stated when recounting the names of the Piman months that the year began with "Saguaro Harvest Month," while another informant already gave "Wheat Harvest Month" as the beginning of the year. Wheat had been unknown to the O'odham until it was introduced to them by Father Kino, the Jesuit missionary. The months of the calendar of the O'odham are listed below, summarized from Lumholtz (reprint, 1971: p. 76), Russell (reprint, 1975: p. 36), Underhill (1939: pp. 124–125) and Saxton and Saxton (1969: pp. 178–180).

1. *Hahshani Mashad* (June)—the "Saguaro [harvest] month," sometimes referred to as the "hot month." This is the time to set up the cactus camp and begin to harvest, process and eat the fruit—a joyous time but one with hard work.

2. *Jukiabig Mashad* (July)—the "rainy month." Now it is time to finish the Saguaro harvest, to start the rain by means of a *nawait* ritual and then to plant the seeds of beans, corn and cucurbits.

3. *Shopol Eshabig Mashad* (August)—the "short planting month." This is the last chance of the year to get crops into the ground. If the *nawait* ritual at one village has already started the rains, now other villages should have ceremonies to ask for the rains to continue.

4. *Washai Gak Mashad* (September)—the "dry grass month." When the rains stop, the desert grass turns brown and the late crops ripen.

5. *Wi'ihanig Mashad* (October)—the "month of persisting [vegetation]." Certain food plants characteristically surviving seasonal drought and the onset of cold weather are harvested now. It is autumn and one might expect to see frost on the pumpkin soon. This has also been called the month of winds, light rain, light frost or "when cold touches mildly."

6. *Kehg S-hehpijig Mashad* (November)—the “month when it is really getting nice and cold.” Also translated as the fair cold, pleasant cold or low cold month. This would be a good time to go hunting.

7. *EDa Wa’ugad Mashad* (December)—the “inner bone [backbone of winter] month.” This is the dead of winter. It is also referred to as the month of great cold or the month when leaves [e.g. of Mesquite] fall.

8. *Gi’ihodag Mashad; Uhwalig Mashad* (January to early February)—the time when animals “have lost their fat,” then “go into heat” and mate. There is not a lot of activity in the desert and time seems to hang heavy. This was once a good time for Desert People to go south to work in Mexico or travel north to work among the River People.

9. *Kohmagi Mashad* (February)—the “gray month.” This is the time at which the landscape is at a bleak climax of gray. The trees are without leaves but the flowers are already coming on the Cottonwood trees.

10. *Chehdagi Mashad* (March)—the “green month.” Leaves are finally coming on the Cottonwood and Mesquite trees and there are abundant green growing herbs and grasses. A Saguaro ritual is held.

11. *Oam Mashad* (April)—the “yellow-orange month.” It is spring and the beautiful yellow and orange flowers of Desert Poppy, Brittlebush, Desert Marigold and other wildflowers make the desert colorful and happy, but food stored by humans is beginning to run low.

12. *Kai Chukalig Mashad* (May)—the month when Saguaro “seeds are turning black” in the developing fruit. This is the optimistic name; the pessimistic name was “painful month.” The flowers of spring have disappeared. Hunger pangs were once a real possibility. A parent might have chosen painful sacrifice to make sure the children were well nourished. After Father Kino introduced wheat, the River People harvested grain during this month and it became a good time for the Desert People to demonstrate friendship by helping them with harvesting and singing.

To Insure a Good Saguaro Harvest

Lumholtz (reprint, 1971: pp. 60–61) uncovered a Papago ceremony in the month of March which dealt with the Saguaro. This was the “green month” *Chehdagi Mashad*, the beginning of spring and universally a time of renewal, including in other cultures, for example, the resurrection and Easter. “It should be noted that in March, about the time of

Figure 4. Fruits of Saguaro, with sectioning to show the developing seeds. The last month of the Pima and Papago calendar is *Kai Chukalig Mashad*, the month when Saguaro “seeds are turning black.” Photograph by H. L. Shantz.

the equinox, a ceremony, accompanied by singing, is performed to insure a good sahuaro harvest.” Saguaro seeds were ground and put into a basket with four pieces of rib from a Saguaro skeleton, one at each cardinal point. “Sitting around the basket, people spend a night singing, while the medicine-man makes prognostications for the coming harvest.” The people who were present ate the seeds. The pieces of Saguaro skeleton were given to four persons, each of whom later, during the Saguaro harvest, left one at the base of a separate Saguaro. Whether the Saguaro ribs were left on the surface or were buried is not stated.

That vitality of Saguaro might be enhanced by the sacrificial offering of consecrated Saguaro ribs, could tie in with a Papago resurrection legend involving life after death: A child sank into the ground and its

Figure 5. A cactus camp west of the western unit of Saguaro National Monument. The ramada at right makes structural use of a tree of ironwood (*Olneya tesota*). The flat top of an old cook-stove is placed on a wash-tub which has had the side cut out to make a camp stove. 6-30-70. Arizona State Museum photograph by Helga Teiwes.

mother asked Coyote to help dig it out. Coyote did this but secretly ate the child and gave the bones to the mother saying "someone must have eaten your son. This is all I could find." The mother then asked Coyote to bury the bones, which he did. In four days something green came up on that spot and in four more days it was a baby Saguaro—the first (Wright, 1929: p. 115).

Further renewal rituals, in April and May, which "anticipate the rainy season," were discussed by Underhill, Bahr, Lopez, Pancho and Lopez (1979: pp. 141–144). Upon renewing ocotillo branches at the children's shrine west of Santa Rosa, ritual speeches dealing with crops and wild food plants were made.

At Mesquite Root village a sacred bundle was opened and "scraping stick" songs were sung "at intervals through the spring as the cactus picking season drew nearer ..." Reportedly this was done 1) first when Saguaro came into bud, 2) next when it came into flower, 3) then when it had its first fruit, and 4) finally just before harvesting.

The Cactus Camp

In the old traditional way of doing things, a Papago family had a winter home, a summer home and a cactus camp. Papagueria consisted of broad valleys filled with alluvial soil and bounded by small steep

Figure 6. View of a cactus camp showing that only essential items needed for cooking, eating, sleeping and processing the cactus fruit are ordinarily present. Note the barrels for water. Photograph by Merritt S. Keasey, III.

mountains (Bryan, 1925: p. 1). In winter, water was reliably found only in such hills so the winter home, called "the well," was established there (Castetter and Bell, 1937: p. 13). Summer thunderstorms brought moisture to the valleys so they could be inhabited and farmed. The summer home was known as "the fields." As part of the annual process of moving from the winter well-site to the summer fields, the Papago camped in large groves of Saguaro cacti for a few weeks to harvest and prepare the fruit.

In more recent years, after the cycle of movement from winter home to summer home had been broken for most families, it remained popular for many years to go out to the cactus camp, harvest and

process some fruit and generally have a good time in the fresh air. But these camps are being used less frequently as time passes. Fisher (1977: p. 2) noted that there are "fewer jars of syrup or jam found on the shelves in the relatively modern reservation homes" of the Papago. Mrs. Kate Johnson, a Pima from Blackwater, explained to Mahoney (1956: pp. 14–16) that only a few of her people still harvested Saguaro fruit because prepared jam could be bought in the store.

Moving to the Cactus Camp. In olden days the families migrated from their winter quarters to the Saguaro cactus camp by foot, laboriously carrying baskets, ollas, various needed possessions and water

for rather long distances. Later the trek was accomplished by means of horse and wagon and eventually by pickup truck. Wagons and trucks allowed transport of material possessions and large barrels of water with much less work.

Wickham (1971: p. 3) wrote that at Saguaro harvest time years ago, the Papago would "pack up enough beans and dried jackrabbit for a week, fill clay ollas with water for stewing the fruit, and trek all day to their hereditary picking camp in the rocky foothills where the saguaro flourish." In Wickham's 1971 trip with the Papago, however, the Indians "stopped at the trading post for spaghetti and cold cuts and drove 45 minutes to the Saguaro National Monument, where the federal government permits the Papagos to pick."

When Bowen (1939: p. 4) wrote of the Saguaro harvest, many of the Papago living near Sells were still in the habit of using cactus camps through the season, whereas those living at San Xavier and near Tucson preferred to drive by automobile "to harvest what they can in a few hours and return with it to their homes for the cooking."

Underhill (1951: p. 44) described arrival in cactus camp: "The girls run to dig up the grinding stones. Mother goes to look at the long poles she uses to hook down the cactus fruit from the top ... Many people have passed by this place ... and they have all seen the poles, but of course they have not touched them ... everything is safe."

In pre-horse and wagon days, the large cooking ollas represented a real transportation problem. According to Fisher (1977: p. 2), the Papago placed the huge ollas "in pits and covered them with branches of mesquite and greasewood, before the hole was covered with dirt. And there they would remain until the next season." Densmore (1929: p. 151) reported that a few ollas "were usually left in the camp and were not disturbed by travellers." Keasey (1975: p. 29) reported the custom of a Papago lady to leave her fruit harvesting pole from year to year in an upright position securely fastened within the branches of an ironwood tree.

A Camp Ritual. According to Underhill, Bahr, Lopez, Pancho and Lopez (1979: p. 21), when a family arrived at its camp there was a customary ritual. "Each person is supposed to take the first ripe fruit that he encounters, open it, extract some of its juicy, red pulp, apply it to his heart, and say a prayer of thanks for having lived another year. Then there would be one, two or three weeks of picking, eating, cooking, drying and storing" the fruit. Applying

juice from the first cactus fruit of the season to the body was apparently not unique with the Papago, as Felger and Moser (1974: p. 259) have reported that the Seri practiced such a tradition, but in this case they applied pulp to "the cheeks and the tip of the nose to bring good luck."

Descriptions of Cactus Camps. Castetter and Underhill (1935: p. 20) wrote that each family had a camp on some slope where Saguaro grew, and there they had a "rough shelter, with a water jar, perhaps a metate, and a cooking pot." Lumholtz (reprint, 1971: p. 77) described a cactus camp as consisting "simply of a roof of branches resting on four poles." Keasey (1975: p. 26) characterized cactus camp ramadas as being "constructed of palo verde poles with a roof made of ocotillo branches, saguaro ribs, palm fronds and tar paper." Densmore (1929: p. 151) described a thatch in a tree in the cactus camp used for drying the fruit products.

Nabhan (in manuscript) described a recent cactus camp as having a ramada of mesquite poles and plywood patchwork, with furniture consisting of "a card table, three foldups, the bulging single bed and an ice chest ... A fruit crate was hung from one of the upright posts, serving as a shrine with a metal crucifix, a porcelain Virgin Mary ... On a second post, a cross made of cottonwood leaves was hung to keep the lightning away from camp ..."

Referring again to Wickham's trip with a Papago family to pick Saguaro fruit in 1971 (op. cit.: p. 6), the modern camp was "blanket rolls, pots, groceries, and water jugs" piled under a Palo-verde tree. The family had to eat their spaghetti cold by the light of a flashlight because campfires were prohibited in the National Monument except in designated recreational areas. No shelter was built because the man of the family had to be back to work in his village on Monday and the cactus camp could only be a week-end affair.

Jollity and the Promise of Good Food and Drink. LaBarre (1938: p. 232) said that when the Saguaro fruits were ripening, the Indians pointed at them laughing and said "see the liquor growing" and sang songs about it. According to Castetter and Underhill, cactus camp was "always an occasion of jollity." It meant the first fresh food, the first taste of something sweet and was "principally the preparation for the great drinking ceremony which is regarded as responsible for bringing the rains." Underhill (1979b: p. 19) noted that in cactus camp many songs "forbidden up to now" during the year were finally sung. Some apparently were being re-

Figure 7. Wagon and ramada at the Lorentine Noceo family summer camp, four miles southwest of Sil Nakya. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

heard for the coming wine ceremony. Herbert (1969: p. 3) put it well when he wrote, "In addition to providing a good excuse for a family camp-out, gathering Saguaro fruit has a threefold objective: jam, seeds for meal or chicken feed, and wine for the Rain Making Ceremony." And these were only the chief uses for the fruit; in addition there was the promise of syrup, dehydrated pulp, oil, snack foods, soft drinks and even vinegar.

Apparently it was not uncommon to set camp up a little before the fruit was actually ready. Herbert

(1969: p. 4) observed that "with camp in order and equipment ready, it's time to wait and visit with neighboring families in their camps. Saguaro harvest time is also a social gathering time when politics and weather are discussed along with local gossip."

In Wickham's (1971: p. 6) experience with the Papago harvesting fruit, "you eat the perfect ones on the spot, turning your back to the other harvesters. You chew the oily seeds into a thick syrup before you swallow. It feels luscious and wicked, but no one says anything back at camp. Everyone's mouth

is pink and sticky." Niethammer (1974: p. 23) said that each fruit contained about 34 calories and recounted a story written by a priest in the seventeenth century to the effect that after the Indians had been eating the fruit for about three weeks, the priest could not recognize many of his friends because they were temporarily so corpulent.

Tenancy Details of the Camps. Castetter and Underhill (1935: p. 20) stated that the picking season lasted for about two weeks. Later, Underhill (1946: p. 41) wrote that for three weeks prior to the wine ceremony the Saguaro fruit was "ripe on all the southern hill slopes, and every family left its winter quarters and went to camp in some grove to which it had a more or less hereditary right." Waddell (1973: p. 217) thought that the people began to collect Saguaro fruit four weeks before the drinking ceremony.

Lumholtz (reprint, 1971: p. 47) observed that the Saguaro harvest season lasted from the middle of June until the middle of July. A Papago informant of Nabhan (in manuscript) said that her father used to take her to certain collecting grounds by horse-drawn wagon about 60 years ago as part of a month-long loop through the Saguaro stands around the Tucson basin. Today six weeks can be devoted to harvest by a Papago lady who demonstrates fruit gathering and processing for visiting classes and serious onlookers (cf. Keasey, 1965: p. 29; Fisher, 1977: p. 2).

Thackery and Leding (1929: p. 409) recorded their understanding of the use of cactus camps: "the Papago Indians still have many camping places which are used year after year ... These camps are usually continuously occupied during the harvest season as one family after another prepares the quantity of fruit it desires and then returns home ... As a rule a family does not move from one camp to another ..."

On the other hand, Murbarger (1948: pp. 144-148) claimed that "today mid-summer finds the tribesmen roaming over the desert camping temporarily where saguaros grow densest, gathering the harvest, moving on." The statement by Thackery and Leding would tend to indicate sequential use of one camp by several families, while the statements by Murbarger and by Nabhan's informant would indicate the reverse, sequential use of several camps by one family. Notwithstanding these possibilities, it seems likely that one family ordinarily used only one camp whenever possible.

Underhill, Bahr, Lopez, Pancho and Lopez (1979: p. 19) discussed how families maintained separate territories for cactus picking. Such territories were

not fenced like ranches or fields but they were meant to be respected. "In the midst of the family's territory is a simple camp; an open walled sunshade ... a fireplace, and little more. These, however, are somebody's place just as surely as a house is."

Herbert (1969: p. 3) thought that the time for the Saguaro fruit harvest was "forecast by the elders according to how the season went, how much rain in the Spring and how much hot sun. Wise families go out periodically, however, to check up and see how things are coming along."

Correlation of the Harvest with the Phenology of Fruiting. The last month of the Papago-Pima year, Kai Chukalig Mashad, the month when Saguaro seeds are turning black in the developing fruit, theoretically must have been determined by cutting into the immature Saguaro fruits to determine the color of the seeds and, as a result, their maturity and the progression of the season.

Although there is some difference of opinion in the literature as to duration of fruit collecting, anywhere from one to six weeks, the question can undoubtedly be settled by reference to phenology of fruiting in the plant itself. The harvesting period probably coincides almost precisely with the period during which the fruit of the Saguaro becomes ripe. The onset and termination of this period vary from year to year although the duration probably changes very little. Steenbergh and Lowe (1977: p. 34) stated that a few individual Saguaro bear their fruit as early as the last week of May or first week of June and "the number of ripe fruits increases rapidly, reaching a peak that occurs from the last week of June into the second week of July according to the year. The remaining fruits ripen and the number remaining on the plants falls abruptly during the following ten days in any year."

The Harvest Pole. The Saguaro fruit harvest pole of the Papago seems generally to have been made by splicing together two long willow-like ribs of the wooden skeleton of a dead Saguaro to which cross-pieces were attached. Such a harvest pole is styled a *kuipaD*. Lloyd (1911: pp. 123-124) noted that the Pima called the constellation Ursa Major by this name, "The Cactus Puller." This was also true of the Papago and even of the Seri. The same group of stars is referred to as "The Big Dipper" by Anglos, also imagining a resemblance to a domestic implement. Although most observers have reported that two ribs of Saguaro comprise the *kuipaD*, Keasey (1975: p. 26) has encountered three-ribbed ones. Alison (1975: p. 4) has published a photograph documenting use of such a three-ribbed pole.

Stone recorded an instance of a harvest pole being

Figure 8. Fruit gatherers with *kuipaD* in hand walking out to begin picking. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

made from "a bundle of bamboo sticks" brought from the village. Since true bamboo does not ordinarily grow in Papago country, perhaps this was the native Carrizo (*Phragmites communis*) often referred to loosely as bamboo in southern Arizona.

The *kuipaD* is usually 15 to 24 feet long according to Thackery and Leding (1929: p. 412) or up to 30 feet long according to Herbert (1955: p. 16). The attachment of the cross-pieces has been detailed by Herbert (1969: p. 4): "After smoothing off the rough edges of the *kuibit* [*kuipaD*] with a knife, a *matsuguen* is made from a fifteen-inch section of tough creosote or catclaw acacia sharpened on both ends and fastened near the top of the *kuibit* at a forty-five degree angle. The tie is made with rawhide

rope, native grass or wire, whichever is handy, and the *matsuguen* hook is in place. A second *matsuguen* is secured to the midsection of the *kuibit* to pluck fruit from the shorter arms."

Thackery and Leding (1929: p. 309) originally stated that the cross-pieces were made from Creosotebush (*Larrea tridentata*) or Catclaw Acacia (*Acacia greggii*) and this has been repeated by most succeeding authors. Actual examination of museum specimens preparatory to publishing this present paper indicates that the relationship is not as specific as the literature would indicate, as other types of wood, such as Saguaro itself, have apparently also been used.

The essential feature of the cross-piece seems to

be that it should be tapered at each end to allow its insertion between tightly spaced fruits. The dislodging of ripe fruit seems from examination and experimentation to result from pulling or pushing and also from inserting the tapered cross-piece between tightly spaced fruit.

Setting Out to Harvest the Fruit. Once the *kuipaD* had been fashioned and the fruit was ready, the harvest was on. Herbert (1969: p. 3) noted that flocks of birds fed on Saguaro fruit as it ripened and that sometimes a race developed between the Papago women and the birds to see which got to the fruit first. A Saguaro legend of the Papago admonishes them to share the fruit with the birds and not kill them or drive them away (Enos, 1945: 64-69).

Keasey (1975: p. 27) reported that "work in the saguaro camp begins each morning at the rising of the sun, for the Indians must hurry out into the desert to get the freshly-ripened fruit before the birds and the squirrels ..." Setting out for fruit gathering has been described by Castetter and Underhill (1935: p. 20): "the women of the camp, sometimes assisted by the men, make two trips a day into an area perhaps half a mile square, which is their acknowledged territory, visiting every cactus plant in this area once in three or four days to gather the fruit as it ripens."

Once Lumholtz (reprint, 1971: p. 77) recorded that "early in the morning all the female members of the household could be seen proceeding on their fruit-gathering expedition." Herbert (1969: p. 5) observed that fruit pickers "went out a good distance, then turned back towards camp and started picking in a pattern that would bring them close to camp when the baskets were full and heavy." Stone (1943: p. 9) described starting at the top of a hill and working down toward the camp. At the peak of the Saguaro harvest a woman may walk 40 feet on the average from one cactus to another, but over 100 feet in late July as the season wanes (Nabhan, in manuscript).

Division of Labor. Thackery and Leding (1929: p. 411) reported a division of labor in the cactus camp, the women collecting fruit and the men caring for the horses and keeping the camp supplied with water and firewood. Water was reportedly hauled for as far as 10 or 15 miles. Herbert (1969: p. 4) reported that "the young women and small children, with their *kuibits* and colorful baskets, start picking, while the men look for game and more wood and Grandmother stays at the camp to start the fires and cook." Wickham (1971: p. 9) stated that although a Papago man filled a bucket with Saguaro fruit faster than women at the same camp, "he will

not pick while I am standing close by, maybe because picking is traditionally women's work."

Harvesting the Fruit. The stance and action of a Papago woman in harvesting Saguaro fruit has been reported by Wickham (1971: p. 7). The woman stood back from a cactus "her hands well apart on the stick like a girl with a baseball bat, for control. She plants her feet, keeps her eyes on the fruit, and hooks with a slow rhythm. When she has cleaned all of the branches within reach, she stoops to gather them up. Her face is always protected against direct sun. She puts the best fruit in a bucket and dried hard ones into a plastic shopping bag." The dried fruits are more or less sun-preserved and can be used at a later date.

Thackery and Leding (1929: p. 412) stated that as the fruit was dislodged and allowed to fall to the ground, no attempt was made to catch it. On the other hand, Wickham (1971: p. 11) noted that a Papago man could hook with one hand and catch the opened fruit with the other. Felger and Moser (1974: p. 261) say that Seri boys may try to catch the falling pulp in their mouths, but this seems to have been recorded as a form of play.

According to Niethammer (1974: p. 25), "it is important to try to catch the fruit as it falls, especially ripe fruit, for it will burst upon hitting the ground and pick up gravel that is almost impossible to clean out." When Stone (1943: p. 10) helped a Papago family harvest fruit, she noted that "the fruit was ripening rapidly now and must be gathered before it burst atop the plant. Then it was useless to try to rake it off."

Herbert (1969: p. 5) found that "two women worked as an efficient team. One pushed or pulled down the fruit pods with the *kuibit* while the other gathered them up, removed the fruit meat and put it in the basket." Niethammer (1974: p. 25) thought that "Saguaro gathering seems to work best in pairs: one person knocks the fruit off the cactus while the other person catches it as it falls." Thackery and Leding (1929: p. 412) noted that "all of the ripe fruits on a number of adjacent plants are knocked to the ground before any are picked up." Stone (1943: p. 9) described a Papago family knocking fruit onto a "clean canvas spread at the foot of the plant." None of the older literature mentions catching the fruit to avoid contact with the ground and this well may be a modern hygienic concept.

Photographs have been published showing how an Anglo woman would go about harvesting fruit from the Saguaro (Anonymous, 1948: p. 32) and these make an interesting commentary on differences

Figure 9. Juanita Ahill collecting Saguaro fruit west of the western unit of Saguaro National Monument. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

between Papago and Anglo ways of thinking and doing things.

Filling the Basket and Returning to Camp. As the fruit is dislodged, as often as not it will split open upon hitting the ground. If not, most authors agree that the sharp calyx adhering to a fruit is used like a knife to split open fruit that remains intact. A sharp thumbnail is also used for this purpose (Thackery and Leding, 1929: p. 412). In the old days a fingernail was allowed to grow long to be used like a knife. Niethammer (1974: p. 25) mentioned a small knife that can be used. Regardless of how the fruit is opened, the thumb and thumbnail are used to quickly separate the pulp and seeds from the husk-like ovary-wall of the fruit. Castetter and Underhill (1935: p. 21) stated that two motions of the thumb are used and Thackery and Leding (1929: p. 410) have documented the procedure with a photograph showing a Papago woman holding a split-open fruit over a basket so that the "pulp is turned into" the basket. All authors agree that once the pulpy seed-mass is in the basket, the husk is laid upon the ground with the red interior pointing toward the sky to hasten rain.

According to Underhill (1951: p. 46), a large fruit basket was often placed in a bush while it is filled, so as to keep ants out of it. Other smaller baskets may be filled and then dumped into the larger one. Lumholtz (reprint, 1971: p. 77) wrote that two or three hours after setting out, Papago women returned to camp, each "carrying on her head a heavy harvest ... the inside of a huge water-tight basket presented an appetizing mass of crimson fruit pulp, as well as a great amount of similarly colored juice, which would keep for a few hours only."

Herbert (1969: p. 5) also described return of fruit pickers to camp: "With baskets on head and *kuibit* in hand, they made the now short walk back to camp. We offered them a ride but they politely refused. Later we learned that every detail of the Saguaro harvest is governed by long-standing tradition almost like a ritual, and tradition required them to bear their burdens."

Thackery and Leding (1929: p. 412) noted that it took "most of the morning" for a Papago to gather a basket full of fruit. Castetter and Underhill (1935: p. 20) said that two trips per day were made. Herbert (1955: p. 16) reported three trips in the morning by a pair of Papago women, each carrying in a basket of fruit. Later (Herbert, 1969: p. 5) he mentioned two trips in the morning for fruit gathering. Thackery and Leding (1929: p. 412) recorded collection of another basket of pulp in the afternoon "if there is need for hurry" in finishing the harvest. Keasey

(1975: p. 27) reported on a Papago lady who would often fill "two large pails in the early morning hours ... then go out again in the afternoon for more." A Papago basket full of fruit pulp weighs 15–20 pounds (Herbert, 1955: p. 16) and holds about 14 quarts (Thackery and Leding, 1929: p. 412).

Fruit Quantities Utilized. Thackery and Leding (1929: p. 411) stated that at least half of the 1200 Papago families of that time gathered Saguaro fruit and that the average family prepared three to ten gallons of syrup "and a smaller quantity of preserve" each year. A Papago lady informed Herbert (1955: p. 17) that "if a family has two women to gather fruit and another to keep the fires and jam-making going, the family can, during a week in camp, produce eight gallons of syrup, two gallons of jam, and a potato sack full of dried fruit and roasted seed."

Thackery and Leding (1929: p. 410) believed that 600 Papago families collected a total of 100,000 pounds of fruit annually. Castetter and Bell (1937: p. 13) reported the same number of families but 600,000 pounds of fruit, while another author (Anonymous, 1948: p. 33) wrote that 600 families each gathered 100 pounds of fruit each summer.

If one assumes that each family had two women to collect fruit or one woman and children, or in any event that two baskets of fruit per day were collected and that each basket weighed 15–20 pounds, then three weeks of harvesting by 600 families would have yielded about 450,000 pounds of fruit pulp per year or about 750 pounds per family. Such an estimate might very well be equivalent to 600,000 pounds of fruit when the weight of the outer husk is included as well.

The Perils of Rain. The Papago do not want rain to fall during the fruit picking itself. Underhill, Bahr, Lopez, Pancho and Lopez (1979: p. 21) pointed out that "the one complication in this period is rain which, if it comes, can wash away the ripe and opened fruit and set the picking back two or three days until a new batch has opened." Keasey (1975: p. 28) observed that "heavy storms knock down the ripening fruit prematurely, and the saguaro camps are not constructed to provide much shelter from bad weather."

Saguaro Fruit Preparation and Recipes

After eating the mid-day meal, perhaps of rabbit stew (Herbert, 1969: p. 5) it was generally too hot to collect more fruit so almost everyone stayed in the shade while someone, usually the grandmother, processed the fruit. Whether it arrived in a traditional basket on the head of a Papago woman, or was

Figure 10. Laura Williams shaking dried Saguaro fruits to remove dirt and pebbles. West of the western unit of Saguaro National Monument. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

Figure 11. Laura Williams putting dried Saguaro fruit in a sack for future use. Note the basket of dried seeds which have been separated from heated and strained fruit. Details of the cactus camp in the background. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

carried in by means of a modern bucket, the fruit pulp was first cleansed of stones, sticks, dirt or other foreign matter and immediately placed in water. Care was taken that the mixture not stand too long before cooking, lest spoilage or fermentation set in. Later, just prior to the rainmaking ceremony, fermentation will be assisted, but during fruit processing it is not wanted. Wickham (1971: p. 8) noted that processing had to be done immediately: "It must be started cooking before it turns sour; otherwise the syrup is inedible."

In reference to the moist pulp, Keasey (1975: p. 27) observed that "upon return to camp the fruit is dumped into a tub of water and is soaked for two or three hours ..." It is then kneaded by hand to thoroughly mix the pulp and water, and boiled one-half hour.

Use of Dried Pulp. Pulp that had already dried in the hot sun sometimes was separated from the moister pulp either when collected or as the foreign material was removed. Such dried pulp could be pressed into a mass for short-term storage. "When prepared in this manner and stored for a time, it is said by the Indians to make better flavored syrup. After being thus sun-dried the pulp is said to keep indefinitely" (Thackery and Leding, 1929: p. 411). Castetter and Underhill (1935: p. 46) did not entirely agree, noting that Saguaro and other cactus fruits "could be dried and stored in jars, but not for long because they became wormy." Niethammer (1974: pp. 24–25) found that dried Saguaro fruit became wormy even when carefully dried in a screened-in porch, wrapped in aluminum foil and stored in a coffee-can with an air-tight lid.

A Refreshing Drink. Keasey (1975: p. 28) described how a Papago woman would offer a cup of liquid from the soaking fruit pulp to a visitor in camp. It was "thick and sweet and warm." Densmore (1929: p. 151) reported that Saguaro syrup retained by a Papago family for household use was sometimes diluted with water to make "a pleasing drink in hot weather." Apparently the drink could be made from dried fruit as well. In this respect, Wickham's (1971: p. 11) Papago informant, in reference to taking some dried Saguaro fruit to "the people back home," admitted that anymore the Papago really preferred soda pop.

Preparing the Syrup. After the moist fresh pulp had soaked in water for a while and had been mashed and mixed by hand, it was boiled for one-third hour (Herbert, 1969: p. 5), one-half hour (Keasey, 1975: p. 27) or heated for two hours (Lumholtz, reprint, 1971: p. 77). The soaking and heating of the pulp in water extracts the sugar from

Figure 12. Mrs. Augusta Noceo processing Saguaro fruit products using traditional basket and modern metal containers. Four miles southwest of Sil Nakya. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

the pulp into the liquid. Sugar represents about 6.6% of the dry weight of a Saguaro fruit and is concentrated in the fibrous material surrounding the seeds (Greene, 1936: p. 311).

In the old days, a special straining basket made from leaves of Sotol or Desert Spoon (*Dasyllirion wheeleri*) was used for straining the heated mixture to separate the juice from the seeds and pulp. This straining basket was placed on top of a large olla and separated from it by means of two horizontal wooden sticks. An excellent photograph documenting use of such a straining basket was published by Herbert (1955: p. 14; 1969: p. 6).

By 1929 (Thackery and Leding, *op. cit.*: p. 412) ordinary screen wire was already being used for straining seeds and pulp from the juice. Fabric of flour sacks and burlap bags also has been used for straining the heated pulp. The fabric could be

Figure 13. Juanita Ahill mixing the Saguaro fruit pulp with water before cooking. West of the western unit of Saguaro National Monument. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

attached to a frame resting on an olla, metal pot or washtub, or could be attached at four corners to sticks driven in the ground. Fisher (1977: p. 4) illustrated a strainer made by a Papago lady from a cloth flour sack with "sticks hemmed to the top edges of the opening to form handles."

When the juice had been removed from the pulp and seeds, the pulp and seed mixture was spread out on a canvas in the sun to dry. After cleaning the olla or metal pot of any sand or sediment (Herbert, 1969: p. 5), juice was returned to the fire to be cooked down to a thick syrup. The sugar concentration in the syrup was high enough to inhibit spoilage. Thackery and Leding (1929: p. 412) gave about an hour of cooking as the time necessary for turning the juice into syrup. Teiwes (1979) considered two to three hours more accurate. Herbert (1955: p. 17) reported boiling for four to five hours for thickening the juice into syrup.

Figure 14. Mrs. Augusta Nocco adding wood to the fire while cooking Saguaro pulp in a traditional olla. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

Greene (1936: p. 309) observed the syrup to be "a deep reddish-brown in color" and similar to sorghum molasses in appearance and taste "although it usually has a somewhat burnt taste." Thackery and Leding (1929: p. 411) estimated that a gallon of Saguaro syrup could be made from 20–30 pounds of fruit and noted that frequently families prepared more cactus fruit products, especially the syrup, than actually needed, "with the purpose of sale in view."

Papago Saguaro syrup has been an item of commerce for many years. In 1846, Lieutenant Emory commented on the jars of "molasses expressed from the fruit" of Saguaro which the Pima offered for trade (reprint, Emory, 1951: p. 133). In 1871, Palmer (1871: pp. 416–417) published \$2–5 as the customary price for a one-gallon jug of Saguaro syrup. Thackery and Leding (op cit.: p. 411) gave 50¢ per quart as the price in 1929. In recent years 50¢ has been the price

Figure 15. Mrs. Augusta Nocco with ladle over olla of cooking Saguaro fruit. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

Figure 16. Cooked Saguaro pulp slowly draining on a burlap bag tied to four upright sticks in the ground. The pulp has been dipped from the olla in the foreground. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

for a sample of syrup or jam in a baby-food jar. According to Nabhan (in manuscript) the price of Saguaro syrup sold by a Papago woman to a tourist has recently gone up from \$7 to \$10 per pint.

Preparing the Jam. Thackery and Leding (1929: p. 412) stated that the preserve made by the Papago was "merely the unstrained pulp cooked to the desired consistency." Herbert (1969: p. 6) presented a more detailed version of preparing "jam" by the Papago. Dried seedless pulp was mixed with water and added to a boiling olla of Saguaro syrup. "When it swelled, forming a gelatin-like mass, it was transferred to a large mixing olla and beaten vigorously for half an hour."

Castetter and Underhill gave yet another version

of preparation of Saguaro jam by the Papago: "All households make cactus jam, the most important sweet in their diet, and for this only a portion of the juice is drained off. The remaining moist pulp is boiled to a sweet, sticky mass, looking much like raspberry jam." Stone (1943: p. 10) recorded that a Papago friend added honey to Saguaro jam when it was processed if a cache of the substance from wild bees could be found.

Preparing Seeds, Dehydrated Pulp and Other Products. Once the pulp and seeds, from which the juice had been thoroughly drained, was spread out in the sun, it was allowed to dry for an entire day. Then the pulp was rubbed between the hands to separate out most of the seeds. Castetter and Underhill (1935:

Figure 17. Since ollas are now rarely used for cooking the fruit, a metal grill supported by cement blocks makes a good fireplace upon which to place the metal cooking pot. The first step in the cooking process is to build a hot fire of Mesquite logs. Photograph by Merritt S. Keasey, III.

p. 22) recorded the juiceless pulp and seed mixture being "desiccated on the housetop. It is then beaten with a stick to separate the seeds."

After seeds had been removed from the pulp, the pulp was allowed to dry for another day in the sun. When the relatively seed-free pulp was thoroughly dehydrated, it could be stored for winter use or could be combined with Saguaro syrup to make jam. Stored dehydrated pulp could always be boiled with water to produce more syrup at a later date.

Keasey (1975: p. 29) described a Papago process for further separating seeds from dried pulp when the pulp was being used for making jam. The pulp was soaked in a bucket of water and seeds floating to the surface were skimmed off with a bent piece of wire

screen. "Then a short ocotillo branch is dipped in and out of the bucket, the pulp sticking to the long spines, but many of the seeds remaining behind." These seeds are then spread out to dry.

According to Castetter and Underhill (1935: p. 22), once seeds were dried, parched and stored, "they may be used to make meal cake or as chicken feed. One final product from the giant cactus is oil, which can be extracted from the seeds by parching them, grinding and adding water, after which a small quantity of oil comes to the surface."

Castetter and Underhill (1935: p. 45) reported that the Papago commonly used flour from Saguaro seeds and cultivated grain to make a gruel called pinole or *waka* if simply mixed with water, and atole or *ator*

Figure 18. Juanita Ahill straining Saguaro fruit juice after the first cooking. Note the use of screen wire attached to Saguaro ribs in a manner to fit perfectly over a shiny new wash tub. 7-1-70. Arizona State Museum photograph by Helga Teiwes.

when boiled with salt and water. "All sorts of combinations were possible, the favorite being cornmeal with saguaro seed flour..."

Herbert (1955: p. 17) reported that roasted and ground Saguaro seeds mixed with sugar made "a favorite Papago sweet." Niethammer (1974: p. 26) gave a recipe for a similar Papago snack using Saguaro syrup in place of the sugar. Thackery and Leding (1929: p. 409) recorded that seeds of Saguaro and Organ-pipe Cactus could be purchased in local markets, "but their present value is mainly for chicken feed for which they are very good."

Traditional Papago Saguaro Pottery. Fontana, Robinson, Cormack and Leavitt (1962: pp. 37-40, 47) presented the definitive treatment of Papago pottery associated with the Saguaro. The wide-mouthed

pot used for boiling the fruit was termed a *hi-to-ta-kut*, a word which would have also been used for the smaller wide-mouth pot pictured by Herbert (1955: p. 14) which was used to catch the strained juice. The yet smaller narrow-necked jar that the syrup itself was stored in was a *si-to-ta-kut*. A larger narrow-necked jar, probably referred to by the latter term and traditionally decorated with red paint was reported by Fontana, Robinson, Cormack and Leavitt (op. cit.: p. 40) to be used for storing Saguaro wine. This would appear to be the fermenting vessel itself since the wine is typically not stored for any time before it is drunk. Russell (1908: p. 124) recorded that many of the smaller decorated pots used by the Pima had been received in trade from the Kwahadk (Kohatk) and Papago, "the latter bringing

Figure 19. Two Papago ladies straining fruit pulp west of the western unit of Saguaro National Monument. 7-1-70. Arizona State Museum photograph by Helga Teiwes.

them filled with cactus sirup to exchange for grain."

Storage Technology. According to Thackery and Leding (1929: p. 412) Saguaro syrup to be stored for the winter "is placed in ollas and sealed tight, the seal being accomplished with a piece of broken pottery chipped into a circular form to fit the mouth of the olla. This crudely constructed cover is held in place by a preparation either of adobe mud mixed with fine grass or a transparent yellowish-brown gum of lac gathered from the 'Samo prieto' (*Coursetia glandulosa*) upon which it is produced by a scale insect (*Tachardiella fulgens*). When properly put up in this manner the syrup or preserve will keep more than a year."

Bowen (1939: p. 4) reported that "leaves, corn-husks, tin, broken pottery or other available mate-

rial" was used for covering the top of the jar before application of the "adobe mud" air-tight seal. Pots with the air-tight seal are pictured by Herbert (1955: p. 17) and by Fontana, Robinson, Cormack and Leavitt (1962: pp. 38-39). Sealing ollas of jam with melted beeswax has been documented for the Papago by Stone (1943: p. 10). Whittemore (1893: p. 55) stated that Saguaro jam was "stored away in small earthen jars hermetically sealed a foot or two under ground..." Stone (1943: p. 10) recorded Papago storage of sealed jam pots by their being "swung from the rafters so nothing can get into" them.

Recipes. Several Papago recipes for Saguaro fruit products have been recorded by the University of Arizona Cooperative Extension Service, by Niet-hammer (1974: pp. 22-28), or can be reconstructed

Figure 20. Olla with boiling Saguaro syrup in the foreground, ladle in the background. 7-1-68. Arizona State Museum photograph by Helga Teiwes.

from ethnological literature. The recipes below are average representative examples for each product.

SAGUARO SYRUP

(Yield: 1 quart syrup)

2 buckets raw Saguaro fruit pulp

1 bucket water

Clean foreign matter from fresh ripe fruit pulp. Discard spoiled fruit. Save any sun-dried fruit for future use. Combine fruit pulp with water, squeezing the pulp by hand to break it up. Heat for 1–2 hours over a low heat or $\frac{1}{2}$ hour at a boil. Remove from heat and strain to remove the juice. Clean the pot of sediment; return the juice to it for 1 hour or more of gentle boiling. Try to avoid scorching. Pour the syrup into a clean jar and store for future use.

SAGUARO SEED MEAL

Take drained pulp and seed (the by-products of the syrup recipe) to a sunny spot and spread on a cloth to dry for one day. Rub the pulp and seeds between the hands, allowing the seeds to fall out. Let the seeds air-dry in a shallow basket or other container for another day. Parch the seeds in a hot pan, shaking or turning well to avoid burning. Store in a clean jar. Grind the parched seed with a stone *mano* and *metate* just before using. The flour is an oily meal.

DEHYDRATED SAGUARO FRUIT PULP

Allow the juice-free and seed-free pulp that is a by-product of making Saguaro syrup and Saguaro seed meal to sun-dry one additional day. Store for future use as a dried fruit product.

SAGUARO FRUIT JAM

(Yield: 2 pints jam)

1 pint Saguaro syrup

1 pint water

2 pints dehydrated fruit pulp

Soak the dehydrated pulp in the water and simmer for half an hour, stirring to obtain a uniform mixture. Add the Saguaro syrup and boil until the mixture swells and thickens. Remove from heat and beat vigorously for half an hour. Seal the jam in clean jars for future use.

ATOLE PORRIDGE

(Serves 4)

1 cup wheat flour

6 cups water

1 cup Saguaro seed meal

1 teaspoon salt

Mix a cup of wheat flour with a cup of water. Add to 5 cups of salted boiling water. Simmer and stir until thickened. Add Saguaro seed meal. Cook for one minute and continue to stir while cooling. Season with a little Saguaro syrup or cream to taste and use like hot oatmeal or cream of wheat as a breakfast cereal.

PINOLE

(Serves 1)

1 tablespoon wheat, corn or mesquite flour

1 tablespoon Saguaro seed meal

1 cup water

Stir the ingredients together and drink before the flour settles to the bottom. For a richer drink, use milk instead of water.

Figure 21. Juanita Ahill separating dried Saguaro seeds from the fruit pulp. West of the western unit of Saguaro National Monument. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

PAPAGO SNACKS

(Yield: 3 dozen)

5 cups Saguaro seed meal

1 cup Saguaro syrup

Combine ingredients in a bowl and mix. Roll into little balls and air-dry. Sugar can be used as a substitute for most of the Saguaro syrup or can be dusted onto or rolled onto the snacks.

Making the Wine

Castetter and Underhill (1935: p. 31) said that "Any village which found it convenient" held the first ceremony of the season to cause rain and that after this, other villages in succession had ceremonies during the summer to encourage the rains to continue. At the middle of the twentieth century, Joseph, Spicer and Chesky (1949), writing on the social structure of the Papago, said that wine ceremonies were still being held generally throughout the Papagueria "with the exception of the two western districts, where the custom lapsed 20 years ago." According to the same authors, "At one of the modern Hicikiwan villages a round house was built about 1941 and wine is made each year, but there is no accompanying ceremony."

Densmore (1929: p. 152) stated that the wine making had a leader, a mixing crew, a taster, four men who watched the ollas, four medicine men, and finally singers, usually 16 in number. Waddell (1973: p. 217) wrote that the dates upon which the making of wine and the communal drinking were to occur were set "by the feast leaders, the elders, and the chief wine maker, after consulting with the *siwani mahki* [chief rain shaman]."

Legendary Origin of Saguaro Wine Making. Underhill (1951: p. 50) stated that I'toi "told the people to drink the saguaro juice just as the earth drinks rain, and that will help the rain come." The same author (Underhill, 1946: pp. 42-43) wrote that when Elder Brother ordered cactus liquor to be drunk annually to bring rain, he declared "that there must always be a speech of admonition forbidding people to quarrel or misbehave when they drink."

Densmore's (1929: pp. 149-150) Papago informant told how the custom of "tiswin-drinking" originated. A child wearing a feather in a head-band sank into the ground and became a Saguaro cactus. He told the people to take his fruit, mash it, boil it, strain it, put it into an olla and seal it up. The child who was a Saguaro gave the people the following song—"I DRAW THE RAIN. Here I am sitting with my power. I draw the south wind toward me. After

the wind I draw the clouds, and after the clouds I draw the rain that makes the wild flowers grow on our home ground and look so beautiful." This was the first of many songs, "probably more than a hundred" which the child-Saguaro gave to the people, "saying that they were to be used in a ceremony to bring rain." The Saguaro syrup was to be mixed with water, fermented and drunk. "This is the way in which the tiswin ceremony started, and that is why we believe that if we make tiswin and go through the same actions as when the custom started we will have rain that day or very soon."

Preparations. Joseph, Spicer and Chesky (1949) stated that "each family donates syrup for ceremonial use, probably about enough to fill a 4-pound lard pail." Late in the decade of the 1970s, Nabhan (in manuscript) wrote that "one or two mornings near the end of the [Saguaro] season, a wagon still comes around in a few of the villages, to collect each family's donation of syrup ... This is the stuff that sacred wine is made of."

At Pisinimo, according to Underhill (1946: p. 44) "the syrup must be cleansed by a shaman before it was set to ferment, since it might have been subject to the influence of a menstruating woman." The shaman blew into the jar, took a reed or hollow weed stem, "put one end into the jar and blew smoke into the other end" four times. According to Underhill (1946: p. 44) it was the head man of the village who usually presided over the wine making, receiving the contributions of syrup and sending messengers to bring the water that it was mixed with.

Lumholtz (reprint, 1971: p. 48) described the announcement of wine making rituals at the rancheria of Noria. "An hour after dark, as we were preparing our supper, a loud Indian voice from the other side of the arroyo on which we were camped sounded forth in the dark, still night, inviting people to gather for a festival ..." Underhill (1946: pp. 42-43) stated that any village possessing sacred objects brought them out of hiding to be placed with the liquor during its fermentation.

The Wine House. Lumholtz (reprint, 1971: pp. 51-52) described the ceremonial round house used for making wine as a circular, dome-shaped grass hut with framework of mesquite posts with two to four forked uprights in the middle supporting the dome-shaped roof "made of sahuaro ribs, surmounted with greasewood twigs and some large coarse grass called *sacate colorado*." The grass was kept in place "by hoops of ocotillo inside and outside, placed at intervals of eight or ten inches," with the top of the house covered with earth.

Figure 22. Laura Williams rotating a basket to separate remaining pulp from dried Saguaro seeds. 7-7-70. Arizona State Museum photograph by Helga Teiwes.

Figure 23. Traditional roundhouse used for wine-making and ramada, Santa Rosa. 1-13-70. Arizona State Museum photograph by Helga Teiwes.

Waddell (1973: p. 217) noted that the wine making room at Ali Chukson is now located at one end of an adobe house "in which are kept the sacred objects, such as divining crystals, sacred rocks and shells, eagle feathers, divining rods, and other village fetishes." The door is said to be kept padlocked "or is closely guarded in order that only the ritual specialists may enter."

Mixing the Syrup With Water. There is disagreement in the literature as to the dilution of Saguaro syrup with water to make the wine. Lumholtz (reprint, 1971: p. 153) stated that either a 1:1 or 1:2 mixture of syrup with water was used. Greene (1936: p. 311) stated that a Papago wine maker told him that a 1:4 mixture was used. Densmore (1929: p. 153) said that a half pint of syrup was added to a gallon or a gallon and a half of water, a 1:16 or 1:24 mixture.

According to Densmore (1929: p. 153), a requirement in mixing the syrup with water was that no implement be used. Lumholtz (reprint, 1971: p. 120) described the mixing of Saguaro syrup with water to begin the wine-making ritual at Santa Rosa. "The

sweet stuff was first poured into a large and deep water-tight basket, with symbolic designs in the weaving, one placed before each young man. Water was poured into this ... The operators, who had their shirt sleeves turned up to the elbow, mixed according to rules and regulations.

"Slowly stretching their hands, palms down and forward, over the fluid, they would immerse them and draw them along the bottom toward themselves, then rubbing the hands twice against each other over the fluid. This was repeated several times. As a change they sometimes dipped them into the liquid, lifted up what the two hollows of the hands would hold, and rubbed it into foam, continuing rubbing until the foam disappeared. An elderly man then tasted the mixture, carried the basket into the house, and emptied it into one of the big jars. This procedure of mixing lasted nearly four hours." Densmore (1929: p. 153) recorded a Papago belief that if a woman mixed the wine, "the people who drank it would do nothing but cry."

Ingredients and Possible Adulteration. Accounts

Figure 24. Ali Chukson. The adobe room to the right is used for the traditional ceremonial house. The wine baskets are soaking with water to make them more liquid-tight. Note that one has been replaced with a modern pail of about the same size. 8-30-75. Arizona State Museum photograph by Helga Teiwes.

of Papago wine making generally mention only mixing of Saguaro syrup with water. Lumholtz (reprint, 1971: p. 32) discovered that some special water used to prepare the wine apparently was carefully taken from Viikan Shóotak, a pool of water thought by the Papago to have been left by the ocean when it receded. Underhill (1979b: p. 27) understood that to insure successful wine-making the fermentation in later years might be encouraged with store-bought liquor.

Tiswin or tulapai made by the neighboring Apache ordinarily had a number of plant materials added to increase its potency. Underhill (1979b: p. 26) observed Papago wine to be "lumpy" although this does not necessarily indicate additional ingredients. Although a taboo generally prevented the Papago from touching Apache things, an account on the Blackwater Calendar Stick for 1869–70 (reprint, Russell, 1975: p. 53) implies that such a taboo did not effectively extend to the Pima and stop them from utilizing Apache tiswin if the proper circumstance arose.

The accounts for 1890–91 and for 1891–92 on the Gila Crossing Calendar Stick (reprint, Russell, 1975: p. 61–62) mentioned both intentional and accidental poisoning of Pima tiswin. Harvard (1896: p. 39) mentioned Indian use of *Sophora secundiflora*, a "strong irritant-narcotic poison" that in very small quantities could produce "delirious exhilaration" but when a whole bean was used "would kill a man." The bean is commonly called "mescal bean" because of its use in adulterating mescal liquor made from *Agave*. Russell (reprint, 1975: p. 37) believed that some Pima tiswin was made from *Agave*. Although there is no direct evidence that *Sophora* seeds were ever used by the Pima or Papago as an adulterant for their tiswin, the example is given to indicate the ease with which intentional or accidental poisoning of tiswin could occur. Today the San Carlos Apache know of the potency of *Sophora*. San Carlos "medicine bead" amulets each containing a single seed of *Sophora* are in the collection of the author.

Based on his ministry in Sonora from 1756 to

1763, Father Pfefferkorn (1949: p. 176) wrote that the drink of the Indians (probably Pimans) at communal drinking events "is a kind of wine prepared from pitahayas, tunas and maize." Although some Uto-Aztecs (i.e. Tarahumara) today use sprouted maize for producing their *tesguino*, the making of a pot-pourri drink including maize seems today to be an Apache characteristic.

No evidence for using maize in Papago wine-making has been found by the present author and since both a related tribe and a neighboring non-related one have used maize, some comment is in order. Failure of the Papago to use maize in wine making may be due to three factors: 1) traditional Papago wine-drinking was done before maize was planted and two or three months before it was harvested, 2) the desert adapted race of maize cultivated by the Papago was lower in sugar content than types cultivated elsewhere, and 3) the traditional belief that the Saguaro and its wine brought rain could perhaps not be compromised by addition of other material to the *nawait*. In summary, the Papago *nawait* is noteworthy for ordinarily not having been adulterated, its preparation according to long-standing ritual apparently having been preserved within the capabilities of the Papago.

As this article goes to press, Nabhan (1980) reports that some Papago families now prepare raisin wine or fig wine for non-ceremonial drinking in the home following the *nawait* ritual. He reports further that ceremonial *nawait* has sometimes been spiked with raisin wine, but that this has been opposed, sometimes effectively so, by Papago who adhere to traditional customs and beliefs.

The Fermenting Wine. According to observations recorded by Densmore (1929: pp. 152-155) four wine ollas of 5-6 gallons capacity each were positioned in a round house at the four cardinal directions in "shallow holes with straw in them." Waddell (1973: p. 219) published a diagram showing five ollas of fermenting wine positioned to form a line or narrow rectangle in the wine house at Ali Chukson. This might be an arrangement imposed by this particular ceremonial room being rectangular, about twice as long as wide, judging from the diagram. It is doubtful to the present writer that the room was built for ceremonial purposes.

Lumholtz (reprint, 1971: pp. 48-60) was lucky enough to enter the round house at La Noria to study the wine as it was fermenting. He had returned to this ceremonial house in the morning after the first night of singing and found "the leader and other functionaries ... sleeping peacefully on the

ground." The ethnologist took leave of them to enter the sacred house "where large earthenware jars were standing full to overflowing with the precious sahuaro fluid. A slight cavity had been dug in the ground for each jar, serving as receptacle and covered with branches of greasewood upon which the jars rested neatly ... Heavy spume was rising from most of the jars ... A fire was kept up in the lodge in order that the temperature of the air should be even and favorable for fermentation." According to Densmore (1929: p. 153) the wood used for the fire "was mesquite or ironwood, which hold the heat for a long time, giving out a gentle heat."

Haury (1976: p. 156) likened 23 holes in the ground, found in a cluster at the prehistoric Hohokam village of Snaketown, to the depressions or pits used as receptacles for fermentation ollas by the Papago. He was told by Papago informants that they "sometimes built a fire in the pit to warm the earth."

Underhill (1946: p. 45) described some steps of the wine making process. "The liquor maker appointed two or more men to watch the fermentation." If it was too fast they diluted it with water. If too slow, they added more liquor from another jar. There was an official taster known as "Thin Lips." The men guarding the wine worked in shifts to make sure that the drink was never left alone "and subject to evil influences." While the liquid fermented in the ceremonial house, "the people were expected to dance outside in order to assist the process."

According to Densmore (1929: p. 155) "It was expected that the fermenting wine would rise to the top of the olla ... four times ... after it had risen the third time it was tasted and if it were not doing well ... it would bubble up, then die down, and get cold and the people knew it would turn into sour water." The same author thought that "If some fault occurred near the beginning of the process it was possible to begin over, throwing out the wine and making fresh."

Micro-organisms of Fermentation. Re-use of the same ceremonial wine baskets and ollas year after year might assure that certain micro-organisms would be present for fermentation, particularly if a residue was left in the vessels. Although the fermentation takes place in ollas, the mixing of syrup and water in baskets could be significant, since fiber baskets would have abundant recesses to harbor micro-organisms. But such a procedure would not keep the micro-organism culture pure. Without a pure starter culture, fermentation might tend to be bacterial and acetic as opposed to the yeast fer-

Figure 25. Interior of the ceremonial round-house at Santa Rosa showing a depression in the floor for a wine olla. Note the ceiling of Saguaro ribs. 1-13-70. Arizona State Museum photograph by Helga Teiwes.

mentation which is customary in the production of commercial wines. In reference to Seri wine-making, Felger and Moser (1974: p. 272) noted that once an olla had been used for making wine it was never again used as a water container, being "stuck into bushes or otherwise put aside until needed again." Whether this was true of Papago wine-making vessels is not known.

Greene (1936: p. 311) thought that with Papago Saguaro wine, "the fermenting organisms either

occur in the sirup or come from the air." The ritual speeches later in the wine ceremony, probably unknown to Greene, seem to indicate that "a little pot of remains" may have been added to the water and syrup mixture to control the fermentation. If this is so, then the nature of such remains and the location and method of storing would be of interest. Elsewhere in the ritualistic speeches there is reference to burying leftovers of wine under a bed. Whether these were sealed in a little pot and buried

Figure 26. Depression in the floor of the Santa Rosa round-house. A wine olla sits in the hole during the fermentation process. The plant material in the depression is Creosotebush (*Larrea tridentata*), just as described by Carl Lumholtz in 1912. 1-13-70. Arizona State Museum photograph by Helga Teiwes.

to perpetuate a relatively pure culture is not known. However, the location in the earth under a bed would be at a rather uniform temperature and would probably have been ideal for such storage. Use of such a starter culture is either unknown today or has not been revealed by informants.

Could some wine-making secrets have been lost with time? That there may be two types of fermentation possible for cactus wine, one acetic and one otherwise, is suggested by observations by Felger and Moser (1974: p. 262) on the Seri art of wine-making. These authors differentiated between a

watery wine which easily soured and had a low alcohol content, and one made without extra water which did not sour and had a higher alcohol content. Whether the type of fermentation could theoretically be controlled through use of a relatively pure starter culture, regardless of water content, is not known but seems likely.

Palmer (1871: p. 416) wrote that a sample of Papago or Pima Saguaro wine "three years old, in the Smithsonian Institution, has improved with age" and was "in every respect superior to much of the wine on sale." The fact that authors of this century

report Papago Saguaro wine to quickly sour, rather than improving with age, is suggestive of acetic micro-organisms having become dominant in the fermentation. In such a situation a commercial winery would ordinarily replace the yeast culture. This may not have been possible for the Papago to do, particularly if their own social culture had become relatively isolated from old Uto-Aztecan ties to the south.

If such a hypothetical shift from yeast fermentation to acetic fermentation did indeed occur, then the fermentation period of four days and singing for four nights prescribed by legend (Saxton and Saxton, 1973: pp. 333–334) would have to be shortened unless people wanted to drink vinegar in their wine. Substantiation for such a shift comes from authors of this century (except for Joseph, Spicer and Chesky, 1949, who give the fermentation period as four nights) who all now give two nights as the ordinary time required for singing and fermentation. Greene (1936: p. 311) stated that the wine was ordinarily fermented for about 60 hours and when consumed at the end of such period "contains a considerable quantity of carbon dioxide and unfermented sugar" but not too much acid. Greene (op. cit.: p. 312) thought that the reason the wine was consumed before the fermentation had ceased was because "acetic fermentation proceeded rapidly." A sample of the wine he held in cold storage for a year proved to contain 5% acetic acid. This would be even stronger than commercial vinegar (4½%).

Dancing and Singing During Two Nights of Fermentation. Public ceremonies were an inseparable part of the fermentation process. For two nights ritual activities occurred. Waddell (1973: p. 218) reported that the wine maker at Ali Chukson, after the *mamakai* (shamans) and their runners or assistants were seated, made a speech reviewing "the origins and purpose of the custom," extending an invitation to those assembled to do their part in helping the rain shaman divine for rain "and to help the wine to ferment so they could have a good feast." All were asked to cooperate so that rain would come and bless all. Dancing led by men knowing the special songs of the cardinal directions continued through both nights in cycles of four in a counterclockwise direction, moving "just as the clouds do."

Lumholtz (reprint, 1971: p. 48) described the "singing place ... in front of the medicine lodge. In the dim light a long string of eagle plumes ... could be discerned ... a solitary fire was burning." Medicine-men sat "immovable in mystic contemplation of rock crystals and queer objects ... by the

aid of which rain is procured." Around this scene there were men and women holding hands dancing in a circle.

Waddell (1973: p. 213) wrote that the dance circle was prepared by stretching eagle feather trophies of important men on a string from west to east and held up by poles. "A small fire was kindled just to the north of the eagle feathers ... sacred fetishes were displayed on a green canvas close to the fire." Benches were situated in front of the fire at the west of the circle of dance so that *mamakai* could look to the east, considered the most important direction in rain making, "as they conducted the dancing ritual and talked to the rain spirits."

Underhill (1946: pp. 46–47) recorded that "The leader advanced to the dance place, shaking his rattle horizontally to begin the song. Men joined him, clasping hands. Gradually women joined in the circle, each going between two men. "There was burning rivalry among the young men who hoped to be chosen in this way. Tradition tells how they rubbed flower perfume on their hands and carried tiny sacks of fungus ... supposed to be magically attractive to deer and to women." The songs were sung four times or a multiple of four and described the coming of clouds and rain over the local area. If another place was mentioned in the singing, visitors from there had to make a gift to pay for the song. A visitor with nothing else to give would offer a piece of clothing he was wearing, "in recent days, his cowboy hat."

The dancing lasted until dawn with intermissions for smoking, according to Underhill (1946: p. 50). "These pauses were, anciently, a period of license, regarded as fertility magic. No opprobrium attached to the changing of partners by married people at such time, and many young men were famous for their exploits." At dawn the people were told to go home and sleep and to come again and sing on the next night. Sometimes a rabbit hunt of a communal nature took place during this intervening day to provide meat for the village (Underhill, 1979b: p. 25).

During the second evening of dancing, Lumholtz broke into the circle of dancers and participated. Underhill, Bahr, Lopez, Pancho and Lopez (1979: p. 24) discussed typical songs sung during the fermentation. These were called the *gohimeli* songs, named for the scissors dance steps. "To the west of the dancing ground under the *watto* [ramada], sit one or more old people who start and stop each song that is sung." On the second night as the people sang, the wine neared completion and toward dawn was generally well fermented. After the songs were

over but before the people had gone home the second morning, the shamans forecast when rain could be expected.

The Running Speech

When the wine had been fermented and there had been two evenings of dancing, it was time for a special man appointed as "runner" to speed out to the neighboring villages to announce that the time to sit and drink was at hand. In the old days the man ran on foot; later he rode horse-back. An important person in each of the surrounding villages was already expecting the runner and sat in front of the village ceremonial house to carefully listen to the ritual "running speech." When the speaker had finished, the listener provided a reply or "return running" which agreed with most of the particulars which the runner had said.

The running speeches from Santa Rosa presented by Jose Moreno and later by Jose Pancho have been carefully recorded by Underhill (1946: pp. 52–53) and by Underhill, Bahr, Lopez, Pancho and Lopez (1979: pp. 25–26). These speeches are thought to be very old and had been carefully memorized and passed from generation to generation with minimal changes.

The runner first addressed the man to be invited and then began to tell the story of some hero, speaking in the first person. The hero of the speech harkens back to a time when he had no awareness by saying "At first I didn't know." Then the hero lay face down at the base of a tree and the wind stirred dust up from the ground and blew it into his face. Then either "twigs and gravel" or "trash and garbage" were blown along the ground and tangled in his hair. Then he emerged and voiced kinship to his relatives. They gave him sustenance amounting to a little dipper's remains. The hero added water and awaited a physiological process or miracle. He sat "half dead" before it and after two mornings the process had been completed. This allowed the hero to set out on a journey with starts and stops, encountering wind, clouds and rain, finally coming miraculously to the rainhouse of the supernatural, a rainhouse full of winds, clouds and seeds. The man at the rainhouse was addressed by the hero and was spoken to as if he were the supernatural.

The hero observed that the man at the rainhouse controlled the winds, clouds and seeds at will, taking them down and sitting on them if he wished. By joining with the supernatural man, the hero somehow got him to breath on the hero's land to cause it to be soaked with rain. The speech does not indicate

that the hero returned from the trip. Then something came forth from the land and "got nice and ripe." The runner then ceased to speak as the hero and then forecast that what had just been spoken would come true [once more] and invited the listener to come along and drink the wine that had been prepared.

The Sit and Drink Ceremony

About noon people from the surrounding villages began arriving for the annual ceremony. Densmore (1929: p. 156) said that in the old times "there was a special paint for use at this festival, made of white clay and a soft black mud ground together ... Those who were seated at the cardinal points were the leaders and had their faces painted half white and half red ... the man at the north having the left half of his face painted white, and the man at the south having the right side of his face white, while the man at the east had his left cheek and the man at the west had his right cheek white."

People waited at the edge of the village until the same man who had presented the "running speech" delivered a "seating speech" according to long-standing tradition (Underhill, Bahr, Lopez, Pancho and Lopez, 1979: pp. 28–32). This speech covered some of the same events as the running speech, recounting the visit to the rainhouse of the supernatural, but adding that "waterplants" came forth from the rains and were gathered up. When the speaker returned home his round house was now referred to as a rainhouse with clouds and seeds, apparently sent by the supernatural through intervention of the Saguaro. The rainhouse had the "red serving" of communal wine. "I told you to drink it . . . You swallowed it . . . Beautifully drunk, beautifully dizzy [you became], you didn't keep from me the good talk, your good dreams, good songs . . . Come now . . . and drink the water that I have rotted."

As soon as the seating speech had ended, the guests were escorted *running* to their assigned places—east, south or north, the host village taking the position to the west. Lumholtz (reprint, 1971: p. 120) observed the wine feast at Santa Rosa in 1909. At this point in history it was a notable event having some 500 participants coming from "such distant places as Florence on the Gila River and San Pedro in Sonora ... the scene was one of bustling activity that reminded one of a race-track ... only a minority of those present could sit down ... People were in their very best finery, and some of the women were a sight to behold in gaudy colors, not exactly the cheapest

Figure 27. Papago ranchers arriving on horseback to join other guests who have arrived by car or pickup truck. The wine has been fermented and it is nearly time for the seating speech. Ali Chukson. 8-30-75. Arizona State Museum photograph by Helga Teiwes.

stuff, for the present-day Papago is well-to-do and wants the best ... the women folks have been working for two days to get their dresses ready for this occasion. Until midnight the running of the sewing machine [had been] heard from the little house I had at first occupied."

Underhill (1946, p. 57) noted that after the people had been seated "the liquor maker or some influential man" made a speech of admonition to encourage the people to behave. This speech was important since calendar sticks had recorded "many deadly quarrels which arose at such times, and several villages drank their liquor with blood."

Such speeches asked that the people of the host village take good care of the visitors and their possessions and allow them to return home "beautifully drunk." One speech by Pete Jim at Santa Rosa (Underhill, 1946: p. 57) emphasized "Some whom we have seen in other years are not here now. And, when the time comes, some of us, too, will not be among the living. Therefore, this year, while we are together, let us be happy. Let no one misbehave ...

Whoever established this liquor drinking for us, did so that we might ask for rain. That is its purpose. For we have no rivers and therefore we must obtain rain ..."

Lumholtz (1971: pp. 56–60) recorded the "sit and drink" at La Noria in 1909. "... crowds began to assemble, many of the young men on horseback ... Everyone was in his best attire ... The principal men seated themselves on the mats toward north and south; the two medicine-men sat down on the eastern mat, and the Keeper of the Smoke on the western. The multitude surged forward and took their seats, on the ground," with Lumholtz among them. Hardly had the people seated themselves when four young men brought out the vessels of wine, one the traditional liquid-tight basket with artistic designs, the other three having been replaced by "inappropriate looking buckets bought in the white man's store." One wonders if this was due to the previous "house to house canvass" that Lumholtz had made buying baskets! The ethnologist then described how the wine-bearers first offered the vessels to the two

Figure 28. Orator presenting the seating speech at Ali Chukson. The large tree is an ironwood (*Olnya tesota*). 8-30-75. Arizona State Museum photograph by Helga Teiwes.

medicine men in the east who made "slow strokes with the palms of the hands around their vessels ... They also sacrificed a little of the contents to the gods, dipping their hands into the liquor and throwing some of it about. It was done in a desultory fashion, showing, as one man explained to me, that they did not know their business well. The tribe as I have already said, is daily losing its ancient beliefs and customs."

Greene (1936: p. 311) presented a chemical analysis of Papago Saguaro wine, finding it to have 4.9% alcohol, 7.0% sugar and in general composition (except for a lower alcohol content) to be similar to a part, sherry or tokay wine. He noted that it had a ruby-red color and "a very agreeable odor and taste and was not unlike strawberry wine ..." Palmer (1871: p. 416) and Havard (1896: p. 36), however, stated that Saguaro wine had the taste and smell of sour beer, although somewhat stronger.

As the wine was passed around at La Noria,

Lumholtz (reprint, 1971: p. 58) took his turn in drinking and later wrote "I must confess that in this dry and hot climate, the beverage, when well made, and coming cool from the jars, does not taste at all bad ..."

He then recorded the complex ritual of the drinking rounds, his interpretation of the Mockingbird speeches to the four directions, and their significance to rain-making. "The official part of the festival now being over, people repaired to the houses, where the sahuaro wine flowed through the evening and night ... Both men and women became intoxicated on such occasions, and, formerly quarrels of long standing were settled at the feast according to the laws of the vendetta. Murder used to be of frequent occurrence, but, to prevent the possibility of quarrels ending in a fatal way, the chiefs of our time are wise enough to gather up beforehand all the knives, pistols, and rifles. ..."

The "vendetta" concept believed by Lumholtz,

Figure 29. The "sit and drink" ceremony begins at Ali Chukson. The wine-bearers are going first to the people sitting at the eastern quadrant because the rains come from the east in summer. 8-30-75. Arizona State Museum photograph by Helga Teiwes.

whereby grudges were saved for settling at the annual wine ceremony, suggests a quasi-judicial aspect for the event with the presence of the supernatural serving as judge and jury. This is speculative, however.

The speeches of admonition by the leaders of the ceremony would seem to imply that if a "vendetta" concept did indeed exist, it was likely either 1) a heresy, 2) a sacrilege, or 3) a true feature but one where it was not fair to assist the almighty in dispensing absolution or retribution, by introducing guns and knives into the situation.

A heresy could easily have evolved if there were a belief by the Papago that a grudge could not be harbored past the annual wine ceremony. Evidence of premeditated retribution being saved for the wine ceremony comes from the 1859-60 San Xavier Calendar Stick record (Underhill, 1938: p. 26) where persons with a grievance toward "two evil medicine men" intentionally waited until the drinking cere-

mony and until the evil ones fell under the influence of the communal wine and then killed them. It had been "a good medicine man who informed about them."

According to Underhill, Bahr, Lopez, Pancho and Lopez (1979: p. 32) the "sit and drink" consisted of "a complex ceremony which includes sermons, songs, and wine servings as well as two more stages of ritual oratory." After the speech of admonition, a short oration was presented four times to the people sitting at the cardinal points of the compass, first east, then south, north and west. After this speech at Santa Rosa, eight servers from the host village brought forth the wine, two going to each of the four directions to first serve the head men of the village at that direction, then moving around the circle, one of each pair going clockwise, the other counterclockwise. As a coffee can (in recent years) or other container full of wine was extended by a cup-bearer to a drinker, the recipient extended the

kinship term to the bearer, or if not related called him "friend," the kinship of the soul.

Joseph, Spicer and Chesky (1949) thought that the wine was served in a prescribed manner "to each adult," but Waddell (1973: p. 220) in describing the pattern of seating included "children and younger adolescents" and stated (op. cit.: p. 225) that everyone "young and old, male and female" could and did drink. The same author (loc. cit.) noted that a Papago was expected to drink all the wine offered him during the ceremony and thought that this expressed reciprocal goodwill between server and drinker. A person could not drink, however, unless and until someone offered him wine.

Women and youngsters drank much less than the men and generally withdrew after experiencing some of the ceremony. But the elders generally continued until the end. Waddell (op. cit.: pp. 227-228) noted that there recently have been large numbers of Papago present at the sit and drink ceremony who remained marginal to the activities, not knowing the wine songs, and watching rather than participating.

Waddell (op. cit.: p. 221) has published an excellent diagram showing the complicated procedures for distributing the wine during the sit and drink ceremony. His descriptions are vivid: At Ali Chukson the *mamakai* "began to sing repetitive cycles of the rain song of the east as the cup-bearers served wine to others in the circle in the same manner." As the vessels were emptied, the bearers returned to the ceremonial house for more wine and singing and drinking continued for two hours. "By this time the participants were vomiting up quantities of wine ... Before the wine was all gone, people began getting their containers filled and making their way home ..."

Underhill (1946: pp. 66-67) stated that drinking lasted until the wine was all gone, which meant about twenty-four hours, during which time "the men of the village galloped their horses from house to house, wherever there was a supply." She was told that in the old days "dandies were said to prepare for the drinking by reddening the soles of their feet so that when they fell over drunk the pretty color would show." LaBarre (1938: p. 232) stated that no family could drink its own wine, "lest the house burn down."

Since at least the liquor of today has an alcohol content similar to commercial beer, a considerable amount has to be consumed to result in intoxication. The disagreement in the literature as to the dilution factor in mixing syrup with water suggests

that fermentation problems may have resulted in experimentation and that the wine may have had varying potencies. A large quantity consumed acts as an emetic and results in the drinker vomiting. According to Underhill (1946: p. 67) this was recognized as a ceremonial feature and people would say of a person so affected "Look, he is throwing up clouds."

Mockingbird Speeches

The final round of oratory with which the sit and drink ended can be called the "mockingbird speeches." Four such speeches were made, one to each of the cardinal directions. The speeches alluded to the people having drunk the "medicine man's liquid, the rain-maker's liquid" and then referred to the far off eastern rainhouse with a white-feathered mockingbird, a southern rainhouse with a green-feathered mockingbird, a northern rainhouse with a red-feathered mockingbird and a western rainhouse with a black-feathered mockingbird.

These mockingbirds somehow picked up the song sung by the people at the wine ceremony and each echoed it four times to the wind, which heard and responded with white, green, red and black clouds, depending on the direction. Floods occurred in the east, south and north where the "lying earth was beautifully wet" and where something sprouted up, "something seeded, thick was its root, thick was its stalk, wide was its leaf, good were its silks, good was its tassel, well did it ripen." Whereas in the running speech the characterization of the Saguaro was given almost as a riddle, the identity of the plant here mentioned, although not named, is quite obvious: maize, the Indian corn. To the west, instead of a flood, there was a drizzle and instead of corn there "came out various seeded things ... [wild greens and grasses], and every kind of cactus, well did they ripen."

Planting the Seeds and Tending the Crops

After the Saguaro harvest provided food that could be stored and eaten, and after the wine ceremony brought rain, it was time to plant seeds of corn, beans and cucurbits. Underhill (1946: p. 43) stated that in days past crops could not be planted until after the Saguaro wine ceremony. Father Garcés, eighteenth century Catholic priest, was told that the Pima living on the Gila River knew of a supreme power and called on it when they made their planting (Ezell, 1961: p. 87). This likely was a general O'odham trait.

The Papago field was characteristically found at

the mouth of a wash in the flatland where relatively fertile silty soil accumulated from floodwaters. The washes were ordinarily dry but flowed after violent summer thunderstorms. Castetter and Underhill (1935: p. 31) observed that "Most hamlets make some effort to channel the flood water to their fields. Ditches are dug from the wash to the fields situated alongside, the ditch ending in the middle of the field so that the water will flow over it." Preparation of new fields involved levelling, terracing and then channelling the run-off.

As soon as a prepared field had been deeply soaked and was starting to dry on the surface, it was planted. Underhill (1951: p. 61) described preparations for planting: "Grandfather stands at the end of the field with the corn in a little bag of deerskin and sings the corn song. Then he speaks to the corn ... then he gives the bag to Mother."

Holes were made with an ironwood (*Olneya tesota*) planting stick with a sharpened fire-hardened point. These holes were generally three feet apart and six inches deep. Men usually laid out the fields and made the holes. A woman followed behind the man "carrying the seeds in a small basket; she pushed a little loose earth into the hole with her bare toes, dropping in four seeds, covered them with a single foot movement" (Castetter and Underhill, 1935: p. 31).

Aside from the normal crops, a little tobacco would be grown "in secret" away from the usual field to preserve its mystical nature. Although cotton was known in the old days, it is unlikely that a small Papago field with a relatively short wet season yielded much of this fiber. This agricultural limitation of the Papago was not at all seen with the River Pima who practiced irrigation. In fact, early explorers differentiated the Papago who wore animal-skin clothing from the Pima who wore cotton clothing.

In the summer village the women collected wild food plants and did the cooking, boys hunted small game, "while the men attended to what agriculture was possible" (Castetter and Underhill, 1935: p. 4). Through the growing season, the men kept the ditches clean and used a sharp-edged piece of mesquite wood to hoe weeds in the fields.

After a growing season of no more than 100 days, the crops were harvested in October. "After being flailed or winnowed, then thoroughly dehydrated on the roof of the house, they were stored in jars or baskets. The Papago usually hid their food for safekeeping" (Castetter and Underhill, 1935: p. 32).

After European crops were introduced and the government had dug wells in the valleys, some

winter farming eventually became practiced by the Papago. In 1935, Castetter and Underhill (op. cit.: p. 30) thought that the new wells had not affected agriculture to the degree that might be expected, writing "The government wells scattered through the reservation are used for watering stock, and to make it possible for residents to remain the year around, but they do not affect agriculture."

Gradually in the winter the Papago tended to give up the winter home, with a southern exposure in the little mountains, in favor of the flatlands of the valleys where cold air settles at night. They began building sturdier and warmer houses, adopted warm cotton and other clothing bought in stores, and a few began to grow winter wheat. The Papago link with Saguaro through perpetuation of the wine feast preserves a relictual subtropical element of their culture which for many may merely remind them of their older agriculture.

The River Pima

Although the Upper Pima and the Papago spoke a mutually intelligible Uto-Aztecan language and shared similar cultural characteristics, they have traditionally differed from one another in agricultural practices. The chief differences in agriculture seem to have been those resulting from the Pima living in a riverine environment where irrigation was possible.

The Pima did not live in isolation from other O'odham groups, however. Russell (reprint, 1975: p. 23) recorded that the Sobaipuri "are said to have drunk navait or cactus liquor together with a village of Pimas of forgotten name, on the north side of the Gila, near the present Blackwater and the Picacho village of Akütciny, before the time when the Apaches forced them to leave their homes on the San Pedro." The meaning of this statement is not altogether clear but might indicate repeated wine feasts among these villages in a manner similar to those among related Papago villages.

Irrigation Agriculture of the Pima. The following sketch of Pima agriculture is based on Rea's (1979a) interpretation. Visitors to the Pima villages in the eighteenth century were impressed with the "fine irrigating ditches and fields fenced with poles." By means of weirs or brush dams across the Gila River, the Pima diverted water into canals which ran sometimes for miles through level fertile terraces of the floodplains. A succession of fields, canals, ditches and fence rows increased the biological productivity of the land near the river. This enhanced riverine environment not only allowed the farming

of crops on a regular basis but provided habitat for game, encouraged edible wild plants and provided pasture for grazing stock.

The Pima waited until floodwaters turned "half way muddy, half way clear" before using the river's water for irrigation. The water chosen helped renew the fertility of the fields without leaving a muddy deposit of adobe which would have cracked on drying. With the introduction of winter wheat to the Southwest by Father Kino, the agriculture of the River Pima increased and prospered. The river customarily flooded each year from snow-melt in the mountains in late winter and spring, just in time to provide water to crops which had been planted in winter. Pima crops, as opposed to those of the Papago, were customarily harvested in May.

A Visit by Father Garcés to the Pima Villages. In September of 1776, Father Francisco Garcés arrived at the Gila River villages of the Pima ("Pima Gileños") in company with "the governor of the Cocomaricopas" (Garcés, 1900: Vol. II, pp. 438–440). The Pimas were said to have rejoiced because they saw that Garcés had not been killed as had previously been reported. The governor of the Pimas told the Franciscan that the villages wanted to have a feast. Garcés implied in his recounting of it that this was in honor of his coming. The priest recorded that he allowed the feast to occur and that the villagers became drunk, shouting such things as "We are good! We are happy! We know God! We are the fellows to kill Apaches! We are glad the old man has come and not been killed." They variously asked him to stay among them, or to baptize a child, or made the sign of the cross.

Father Garcés apparently received no hint that rain-making was involved in any way with the event. He reported that the day after the wine feast he complained of the drunken disorderliness to the Pima governor and was told that this "only happened a few times and in the season of saguaro ... adding that it made his people vomit yellow and kept them in good health." Garcés was "pleased to see that no woman got drunk; instead of which I saw many of them leading, by the bridle, the horse upon which her husband was mounted ..."

This account combines the Saguaro wine feast with the arrival of Garcés in the Pima villages in September. This is the first indication that use of Saguaro wine in the Gila River Indian community may not have been strongly linked to an annual July or August rainmaking ceremony as it was among the Papago. The explanation by the Pima governor that the drinking "only happened a few times and in the season of saguaro" is at first paradoxical. June or

July, rather than September, is the season of the Saguaro fruit and "only a few times" seems at odds with a strict interpretation of the wine ceremony as an annual event. Notwithstanding the reasoning above, and although September would definitely be late, it is possible that the last wine ceremony of a group of villages which purposefully staggered the timing of their ceremonies, could fall in September. A more likely reason for a September ceremony is given in the following section.

Unique Aspects of the Saguaro Harvest and Wine Ceremony in the Gila River Indian Community. Thackery and Leding (1929: p. 413) wrote "The Pima Indians, living in the Gila River valley in Arizona, do not make such intensive use of the fruit of the Sahuaro as their Papago relatives and neighbors to the south. Contact with the white man and proximity to trading posts, where modern canned foods and baker's bread may readily be obtained, have induced changes in the life and food habits of these people." Due to their use of the water resource provided by the river, the Pima were probably not as pre-occupied with rain-making as were the Papago. Today in 1980 it can be stated that the Pima had apparently had no wine ceremony for fifty years or more. After this long lapse, the ceremony has been re-instituted recently for two seasons through the interest of a Catholic priest (Rea, 1979b). Papago participants may have been brought in for this purpose.

Although Saguaros are not as common in Pima country as in the Papageria, calendar sticks show that the Pima did indeed collect some fruit. Drucker (1941: p. 97) claimed that the Pima used only one cross-piece on the kuipaD, while the Papago used two. Although there are many historic records of Saguaro wine use by the River Pima, there seem to be no clear indications that the wine was associated with rain-making.

Russell (reprint, 1975: pp. 170–171) stated that the Saguaro harvest festivals were of annual occurrence with the Pima and consisted of preparation and drinking of *nawait* or Saguaro wine. Russell felt that although there was an element of sacredness in any ceremony, that in the wine ceremony of the Pima this was at a minimum. Although elsewhere in his lengthy publication, Russell recorded customs and speeches for rain-making, he seems to have discovered no correlation between Pima rain-making and the Saguaro or its wine. On the contrary, cigarette smoke was found to be used in Pima rainmaking.

The Maricopa had been allowed to settle among the Pima and later adopted many of their ways. Drucker's (1941: p. 211) Maricopa informant claimed that "The drinking was for health's sake: the vomit-

Figure 30. Museum specimens relating to the Saguaro harvest of the Papago. A pressed and dried Saguaro fruit cake is on the cloth with some individual dried fruits. The plaited basket with the herringbone weave was used for straining the juice from the cooked pulp. The long stick with the slanting cross-piece is the *kuipaD*. The larger basket with geometric designs was used for gathering the fruit. Arizona State Museum photograph by Helga Teiwes.

ing induced was supposed to have a salubrious effect." This has also been claimed for the Pima (Ezell, 1961: p. 86), following the account by Garcés. This may not represent a difference with Papago use of the wine, however. Fontana, in the succeeding article "Ethnobotany of the Saguaro—an Annotated Bibliography" quotes a Papago elder to the effect

that wine drunk during the ceremony did indeed have some medical effect.

Drucker's Maricopa informant explained that the Maricopa generally drank their Saguaro wine in the fall because they used syrup brought to them by the Papago in trade, usually after the Papago had finished their crop harvest. This syrup trade of the

Figure 31. Museum specimens relating to the Saguaro harvest of the Papago. The larger pot is the type for cooking. It is the size to use for catching the juice at straining time or for preparing a small batch of jam. An even larger olla could be used for the main cooking. The smaller pot is for storing jam or syrup and was usually sealed with a large potsherd and moist clay. Note the individual dried Saguaro fruits. Arizona State Museum photograph by Helga Teiwes.

Figure 32. Etched shell from Hohokam context. Vinegar made from Saguaro wine may have been used to produce the etching effect, according to experiments conducted by Emil Haury. Arizona State Museum photograph by Helga Teiwes.

Papago seems well documented for the Pima by Russell (reprint, 1975: p. 124) as well.

It has also been stated that the ritual drinking among the Pima differed from that of the Papago in that it was done inside the ceremonial house, that the women did not participate, and that the Pima did not have the counterclockwise dance of the Papago (Drucker, 1941: pp. 153–154). The incident for 1886–87 on the Gila Crossing Calendar Stick that “Tizwin was made at Gila Crossing in such quantity that it was passed around in bowl-shaped baskets” implies that there may have occasionally been a less secretive ceremony in the open in something of the traditional Papago style.

A further difference may exist. Although Papago legends always indicate a relatively pure origin for the Saguaro, generally by transformation from a defenseless and innocent child, there is a Pima legend

that Saguaro were created in anger when people were killed and transformed into these cacti (Font, 1930: p. 40).

Possible Use of Saguaro Wine by the Hohokam to Etch Shell

Gladwin, Haury, Sayles and Gladwin (reprint, 1965: pp. 148–151) reported on etched *Cardium* shell found in prehistoric context in the Gila River region of central Arizona. Such shells, though not common, have been found repeatedly in Hohokam excavations and have been dated back to about 1000 A.D. Designs on the shells obviously resulted from removal of shell substance. But careful consideration of the physical evidence showed that the designs had not been cut into the shells with tools. Experimentation by Emil Haury with painting paraffin designs onto *Cardium* shells coupled with treating the

shells with hydrochloric acid gave a result similar to that in the prehistoric specimens. But could the Hohokam have actually been the first persons on earth to invent decoration of shell by means of acid etching? By what technology did they manufacture the acid?

From a prehistoric jar full of Saguaro seeds excavated from the Hohokam village of Snaketown, it was discovered that these ancient people must have utilized Saguaro fruits, perhaps in the manner of the later Pima and Papago. Could Saguaro wine have been allowed to turn to vinegar, a weak acetic acid, and have been used for etching the shells? Woodrow Spires at Tonto National Monument was called on to collect Saguaro fruit and extract the juice. Emil Haury allowed this to ferment and in turn to change to acetic acid. It was discovered that contact of this fluid with *Cardium* shell resulted in etching that in three days time was carried as deeply as the average specimen from the prehistoric excavation.

Final evidence for the supposed etching technique came with later discovery of a prehistoric shell which had been painted with pitch but apparently never placed into the acid bath for etching.

History of Understanding of the Nawait Ritual by Non-Indians

It is likely that the Papago have used the *nawait* ritual to call to the supernatural for rain each year for many centuries. Although early explorers witnessed the wine feast on many occasions, it was not until the present century that non-Indians finally learned of its connection with rain-making and with planting crops. Even our present use of the term "rain-making" demonstrates a carry-over of ignorance, as the Papago did not try to make rain, but rather to call to the supernatural for rain.

Through the years there was a campaign by Catholic priests, Presbyterian ministers and various governments to discourage or suppress the *nawait* ritual. A manuscript by Father Joseph Och dealing with his church travels in Sonora from 1755 to 1767 (translation, Och, 1965) reveals that the Spaniards had already made it illegal for Indians to make cactus wine in the eighteenth century. One author (Anonymous, 1948: p. 32) observed that the religious aspect of the wine ritual "was missed back in 1893 when the Ladies' Union Mission School Association" condemned the practice.

As late as the second decade of this century, Coolidge (1929: p. 300), in a book on rain-making and the Southwestern Indians, was apparently still ignorant of the meaning of the *nawait* ritual and incorrectly stated that among the Papago the

"dances for rain-making have long since died out..."

Many of the spiritually inclined O'odham espoused the doctrines of Christianity. Others adopted the Anglo ways which were heavily influenced by Christianity. The drinking of *nawait* in Anglicized or Christianized communities was sometimes abandoned altogether or left to a rowdy element to pursue with little or no spiritual leadership. During this period calendar stick records tell of many quarrels and killings when "tiswin" was drunk.

As commercial whiskey became available and this Anglo vice was adopted, the calendar sticks show that the rowdy bunch and their violence abruptly transferred to such things as whiskey drinking episodes. The *nawait*, which was obtained from the Saguaro with considerably more toil than buying a bottle of whiskey, may have finally been left for true-believers in Indian religion, Papago who wanted to perpetuate old traditions, to practice a communion of goodwill and to preserve a link to the religion of their ancestors.

Finally the Papago argued in court that the *nawait* ritual should be openly allowed because of its religious nature. But at least for a while, the Anglo court turned a deaf ear. The Phoenix newspaper (Arizona Republican, 1925: p. 1) reported on January 8, 1925 that the federal court had just returned a verdict that the manufacture of *tiswin* by the Papago was illegal, even though the Indians "claimed that they drank the wine to their rain God at tribal rites for the purpose of bringing rains for their crops."

But now the cycle may have turned full course in the other direction. Not only is there considerable toleration today, but there are actually attempts by the Anglo and by the Church to entice the Papago to re-institute the use of *nawait*. A recent article in the Arizona Daily Star (Eberhart-Phillips, 1979: p. A-7) is entitled "Friars battling to revive Papago heritage" and notes that a local priest "has tried to bring back holy uses of saguaro wine, and traditional dance and music at religious festivals..." According to Rea (1979b), another Catholic priest has helped recently to re-institute the wine-feast among the Pima.

Records of Saguaro and of Drinking on Calendar Sticks of the O'odham

A Papago or Pima individual with a flare for recording history would sometimes cut lines, notches and dots on a long stick. Chronological history could be recounted by the keeper of the calendar from memory with the assistance of feeling and looking at the stick. There were never many record keepers and when one died his widow was apt to break the

stick and bury it with his body. Fortunately, a living calendar keeper would usually recite the events recorded on his stick to a willing listener. Records from a number of sticks were published during the first half of this century.

Occasionally the Saguaro harvest or wine ceremony for a particular year may be mentioned because of some notable event. Such records of Saguaro seem to fall naturally into three distinct periods according to the nature of the noteworthy events. *Period I, up to 1878*: During this period, whenever the Pima and Papago became preoccupied with the Saguaro harvest and wine ceremony, the Apache might attack, killing the desert Indians or stealing their women and horses. *Period II, 1878–1892*: The use of Saguaro wine seems to have taken on a more rowdy aspect. Murders during drinking of wine are commonly recorded. *Period III, 1892–1933*: Whiskey-drinking becomes noteworthy and the rowdiness and murders now seem to become associated with it. The annual wine ceremony results in few noteworthy events, but ritual specialists, the Chief or the Keeper of the Smoke were likely to be arrested for wine-making or for advocating the wine ceremony. The following records, without change of wording, are taken from Russell (reprint, 1975), Lumholtz (reprint, 1971), Hall (1907), Kilcrease (1939) and Underhill (1938).

Period I, 1835–1878

Sharlot Hall's Pima Stick, 1835: ... we went over across the Gila River in the Estrella Mountains and camped there to gather giant-cactus fruit to make syrup. The Apaches came and killed some Maricopas. We stayed two weeks and went home. 1836: We went back this summer and the Apaches caught and carried away my little sister ... We had a fight for about half a day. The Apaches finally ran away and left my sister, so we had her back again. 1837: ... a Pima woman went out to gather some cactus fruit and Apaches chased her back. In trying to jump a ditch she fell in and they killed her. Our men ... on the south side of where Mesa now is ... overtook the Apaches and killed five.

Salt River Stick, 1836–37: ... fruit of the giant cactus was gathered and a large quantity of liquor prepared from it. All the men became intoxicated ... Early in the morning a woman ... was overtaken by the Apaches, ... roped and dragged to death. However, they overtook the party of Apaches and killed five of them.

Covered Wells Stick, 1844: ... A Pima woman of Sacaton, with her daughter, was gathering saguaro fruit in the hills across the river when an Apache ...

wantonly killed the woman ... The Pimas ... captured and killed the four Apaches.

San Xavier Stick, 1850–51: ... the Burnt Seeds people ... went home and collected stores of cactus seed ... 1856–57: An old man made a speech and told the Whites: Every stick and stone on this land belongs to us. Everything that grows on it is our food—cholla, prickly pear, giant cactus ... 1859–60: At the drinking ceremony at Burnt Seeds, two evil medicine men were killed.

Covered Wells Stick, 1863: ... the Papagos ... obtain their intoxicating liquors for fiestas, except the wine feast, from Mexico ... at a fiesta at the village of Akchin a free-for-all drunken fight [resulting from Mexican liquor] occurred and three Indians were killed. 1867: ... some of them obtained some bad whiskey from the Mexicans and got drunk. One chief had a fight while intoxicated and was killed with a hammer. [Later a Papago] ... obtained some bad whiskey from Mexico and became intoxicated. While sleeping it off in his house his mattress caught fire and he was burned to death.

San Xavier Stick, 1866–67: The Enemy came ... to ... Mouth of the Gap, where the ... people ... were all calling for rain. While they were calling and busy, the Enemy stole all their horses. 1867–68: The Enemy ... while the people were calling for rain ... took all the horses, even that of the medicine man, who was telling when rain would come. The people chased them but the Enemy ... got away. When the pusuers came back, the cactus liquor which they had made for the rain ceremony had turned to vinegar, for it does not keep.

Covered Well Stick, 1869: In the dim past the Papagos had been led by a miracle to celebrate an occasion that had been changed into a rain festival called "Veeheekita." Prosperity had caused them to neglect this fiesta. It was revived again this year and celebrated with all the splendor of the original. It consisted of feasting, dancing, and drinking the harmless fermented liquor made from the fruit of the Saguaro, called Tizwin.

Blackwater Stick, 1869–70: The Apaches were making tizwin when the soldiers and Pima scouts attacked them; they took the alarm and escaped, leaving the liquor in the hands of the allies.

San Xavier Stick, 1869–70: The people from Dried-and-Burnt and from Saddle Hanging went on the warpath. They found Enemy tracks at Ash Tree Standing; then they found peelings of cactus fruit, still wet and then, on a little hill, they found Enemy moccasins and wicker water bottles ... 1876–77: There had been no prayerstick festival for ten years because there had been no rain, and no crops.

Covered Wells Stick, 1878: At the proper time they celebrated "Veeheekita" or the rain dance.

Period II, 1878-1892

Gila Crossing Stick, 1877-78 A party of Pimas went to the Kwahadk' village to drink tizwin, and in the quarrel which ensued the Casa Blancas killed two men of Santan. Some time afterwards the Gila Crossing people drank tizwin, and one of their number was killed by a man from Salt River.

Sharlot Hall's Pima Stick, 1880: The Pimas had a fight among themselves at Sacaton. They were drunk on tizwin made by letting the giant cactus fruit sour in water.

Gila Crossing Stick, 1881-82: During a tizwin drunk at Salt River two young men killed each other.

Covered Wells Stick, 1882: A Papago got drunk on bad whiskey and lay down to sleep on the railroad track and was killed by a train. 1886: ... a severe earthquake shock was felt ... It was noted that it was very dry and that "Veeheekita," or the rain feast, had not been properly celebrated, due to the fact that the Indians had been made prosperous by work in the mines ... it was decided that if this ceremony should be performed, no more earthquakes would occur and rain would come in abundance ... this was done ...

Gila Crossing Stick, 1886-87: Tizwin was made at Gila Crossing in such quantity that it was passed around in bowl-shaped baskets.

San Xavier Stick, 1886-87: The prayerstick festival was held at the Narrow Place because it had been a good year with rain. In the summer, there was an earthquake. An evil medicine man, named Striped Clothes, was killed. This man had killed two brothers while they were picking cactus on the Crumpled Mountains ...

Gila Crossing Stick, 1887-88: During a tizwin carousal which took place later in the year, two Gila Crossing men killed each other. 1888-89: Tizwin was made at Gila Crossing, but no one was killed ... The Salt River people made tizwin and during the carousal that followed a man was shot and killed. The murderer was sent to Yuma.

Sharlot Hall's Pima Stick, 1889: Two Pimas got drunk and were killed.

Salt River Stick, 1889-90: In a tizwin drunk at Salt River, Santco was killed. Soon afterwards another general debauch resulted in the death of Hitiraki. These events caused the order prohibiting the Pimas from making tizwin.

San Xavier Stick, 1890-91: At the drinking ceremony at the Burnt Dog, there was a man from Mulberry Well visiting. This man's name was Garment

Falling Off ... He was an old man and got very drunk and while he was sitting there, some people from one of the Owl villages came and taunted him ...

Gila Crossing Stick, 1890-91: During a tizwin drunk at Gila Crossing a man put poison into the liquor of an enemy, who died in great agony after drinking it. 1891-92: Two men died at Gila Crossing during the autumn, and it was supposed that they had been poisoned by the tizwin which they had been drinking. In a tizwin drunk on the Salt River reservation a Papago shot a Pima and fled to escape the consequences, leaving his wife at the village.

Period III, 1892-1933

Gila Crossing Stick, 1892-93: Two friends went to Maricopa and got drunk on whiskey. One cut the other's throat ... A dance at Salt River occurred in which two men, drunk with whiskey, killed each other. 1893-94: Tizwin was made secretly at Gila Crossing, but no fatalities occurred ... [later] A man was shot by another, who was drunk with whiskey.

Blackwater Stick, 1894-95: The chief at Gila Crossing favored tizwin drinking and resisted the progress that was beginning to manifest itself. He died in jail at Sacaton.

Gila Crossing Stick, 1895-96: The Gila Crossing chief fell dead in the prisoner's chair while on trial at Sacaton for selling whiskey. [Later] The Kwahadk's indulged in a tizwin drunk at which one man was killed.

Salt River Stick, 1895-96: Two brothers-in-law got drunk together and in the quarrel that ensued one was seriously injured. Soon afterwards Juan made some wine and invited a number of his friends ... Luigi killed a man ...

Gila Crossing Stick, 1897-98: A Papago chief was killed at Maricopa by a companion who was drunk on whiskey.

Baboquivari Stick, 1898: Two nephews [of the calendar keeper] put in prison in Yuma for smuggling mescal brandy.

San Xavier Stick, 1901-02: The father of ... was killed at the Narrow Place during the ceremonial drinking.

Covered Wells Stick, 1904: The long neglected "Veeheekita" or rain feast was celebrated this year and the drought was almost immediately broken. There were copious rains and bountiful crops.

Baboquivari Stick, 1907: [The calendar keeper's] friends put in jail for fighting at a sahuaro feast at Kvitak.

Covered Wells Stick, 1907: ... the Indians obtained their intoxicating liquor (except Tizwin ... from Saguaro fruit and used only once a year at

Figure 33. A calendar stick of the O'odham. Noteworthy Saguaro-related events inscribed on such sticks seem to fall into three periods of history described in the text. Arizona State Museum photograph by Helga Teiwes.

"Veeheekita") from Mexico ... At a dance at Santa Rosa, an Indian got drunk on this [Mexican] liquor to the extent of frenzy and killed his sister and himself. 1908: "Veeheekita" and other celebrations were held this year but there was no drunkenness, because no Mexican liquor was imported. 1919: Nothing happened this year except the usual dances, games and celebrations at Santa Rosa, which village seems to have become the ceremonial center for the reservation.

San Xavier Stick, 1920–21: A man was thrown from a wagon while going to the cactus camp. The Whites took him to the hospital but he died.

Covered Wells Stick, 1922: The wise men decided that neglect to celebrate the rain feast was the cause of ... calamitous happenings and that it must be done this year. It was done and no more disasters have occurred.

San Xavier Stick, 1922–23: The head singer and Smoke Keeper was taken by a man at the new agency. The police took him for making liquor. He died in jail.

Covered Wells Stick, 1924: The rain dance was held at Santa Rosa. It as usual lasted four nights. 1933: Veeheekita, or rain festival, was again held.

The Annual Saguaro Harvest and Crop Cycle and its Ritual Components

The Papago have had two major harvests, 1) harvest of fruit from the wild Saguaro at the peak of summer heat and drought, and 2) harvest of crops of beans, corn and cucurbits just before the cold weather of winter. Food from each of these harvests was stored for use through the unproductive seasons of the year. Most importantly, the Saguaro allowed the people to be sustained with food and drink while they were planting crops and cultivating fields.

Although the Papago have long been skilled masters of the techniques of obtaining food from the Saguaro and of planting and harvesting crops adapted to the desert, there has always been an uncontrollable element imposed by the vagaries of climate. When a harvest was poor or failed, what was the deficiency that caused it to fail? Had not the Papago been proficient at every technical detail as in the past? Couldn't some authoritative person come

forward to explain what had been neglected? As accomplished agriculturists and fruit technologists, the Papago may have had a natural feeling that their ability to control was stronger than any negative force of fate. The Papago lived by the accomplishments of their own hands in the face of an unfavorable environment. If the procedures were only known, perhaps things could be done to insure that the harvests were always good.

The Papago combined ecology and symbolism in an annual Saguaro harvest and crop cycle rich in ritual but nevertheless effective in keeping things on schedule and providing a sense of fulfillment in a harsh environment. The promise of wine from the fruit and an annual ritual may have made it easier to do the hard work of harvesting, processing and storing. The wine was only one product of an integrated technology that yielded 11 other food products.

Rituals which seem to have developed within the annual Saguaro harvest and crop cycle are listed here. 1) (A)—A ritual in March of combining Saguaro seed meal in a basket with pieces of Saguaro skeleton oriented to the cardinal points of the compass. (B)—Eating this Saguaro meal with ritualistic singing. (C)—Predicting the Saguaro harvest. 2) Orating ritual speeches dealing with crops and wild food plants when renewing the children's shrine west of Santa Rosa. 3) Singing "scraping stick" songs when Saguaro first came into bud, when it came into flower, when it first came into fruit and just before the harvest. 4) At the beginning of the Saguaro harvest, taking the first ripe fruit encountered and placing it on the heart. 5) During the Saguaro harvest, leaving the four pieces of Saguaro skeleton from the March ritual at the bases of four Saguaro. 6) During the Saguaro harvest, discarding the fruit husk with the red inner part pointing upward. 7) Accepting the duties of age, gender and ability in ritualistically gathering fruit, carrying it to camp, processing it and performing in the wine ceremony. 8) Cleansing the Saguaro syrup with smoke to enable it to be used in making wine. 9) Mixing the syrup and wine in a complex prescribed manner. 10) Singing, dancing, using fetishes, divining and guarding during the fermentation process. 11) Predicting the rain. 12) Orating the running, return-running and seating speeches. 13) Sitting ritualistically in assigned positions according to the cardinal points of the compass. 14) Dispensing the wine, voicing kinship terms, drinking the wine and singing for power. 15) Orating the mockingbird speeches. 16) Vomiting Saguaro wine onto the ground. 17) Planting crops with ritual song and speech after the wine ceremony brought rain. 18) Sacrificing pinole during a trek to

the ocean for salt; also orating speeches there dealing partially with rains and crops. 19) Purifying the raw crops with ritualistic oratory to make them safe for eating. 20) Sprinkling corn meal in a thanksgiving ceremony.

In the Saguaro and crop cycle of rituals, there are both rituals of words and rituals of actions. Often these combine to reinforce each other. In any event, the rituals themselves are considered by the Papago to represent words or actions originated by the ancients, the people merely repeating them. This idea of repetition is seen at its high point in the mockingbird speeches where even the birds echo the words of the ancients. Throughout the rituals, the words and actions are directed at times to the participants and at other times to the supernatural. At times the Papago have a clear understanding of the meaning of the words and actions. In other cases, however, the orator may himself be reciting a speech as a mockingbird does and there may be subconscious or hidden meanings. Although the rituals themselves are perpetuated through memorization, there is not as great an attempt to memorize or vocalize *explanations* for the rituals. A corollary to this might be that with increasing age of such rituals, conscious recognition of the meaning might decline. Luckily the words sometimes tend to explain the actions. The speeches of explanation and admonition serve particularly well to keep the wine ceremony "on track." That many of the rituals are still fairly well understood could indicate that they may not be of extreme antiquity. That it is necessary to admonish participants at the wine feast that they should not harm one another and that the purpose of the event is to produce rain, could imply that the event has undergone some degree of degeneration, however, which indeed might indicate some antiquity.

The Symbolism of Words

Waddell (1973: p. 224) pointed out that the songs, dances and ritual paraphernalia of the Papago "animate and express many features of their desert homeland—birds, insects and animals; cacti, shrubs and crops; mountains, clouds, winds..."

Bahr (1975) has analyzed Papago ritual speeches. He has found that each one characteristically described a trip by some hero and had five discernible phases, 1) preparations for departure, 2) the journey out, 3) arriving at a place to get something, 4) the journey back, and 5) celebration of the return.

The running, return-running and seating speeches followed this general format. The hero of the running speech set out on a trip just as did the runner

himself, but whereas the runner merely went to the round house of a neighboring village, the hero reached the rainhouse of a supernatural being in which were found winds, clouds and seeds. The hero made physical contact with the supernatural and as a result brought rain to his land which allowed germination of plants, vegetative growth and ripening of fruit.

The identity of the hero is something of a mystery or perhaps a riddle, but his preparation for going out on the journey reads like the early life-cycle of a Saguaro, including the seed falling to the ground below the canopy of a nurse plant, being covered with detritus, germinating, being given liquid and sitting "half-dead" until eventually starting and stopping on several possible growth intervals and finally reaching the rainhouse of a supernatural being where contact was made and rain was sent to the land mobilizing the vegetative forces.

The words made very dramatic mental pictures of contact with the supernatural and consequent bringing of winds, clouds and rains to the land. The Saguaro explanation would be symbolic for rain making since the Saguaro naturally towers toward the sky as it grows older and would have been a natural candidate for contact with the supernatural. The hero of the speech certainly brought the rains. That the rains were indeed brought by the Saguaro as an intermediary is indicated by the circumstances of the entire wine feast. So, even if the running speech did not imply it, we know that the real hero of the Papago Saguaro harvest and wine ceremony was no other than the Saguaro itself.

The seating speech, although similar in a few superficial aspects with the running speech, picked up where the latter left off and eventually pictured the round house of the host village as a rainhouse with winds, clouds, seeds, power and wine. The guests had reached it like reaching the house of the supernatural and they were invited to make contact with the supernatural through the wine and receive a benefit. The words conjured a very powerful image of power and good, winds, rains, clouds and seeds residing with the wine in the round house.

In the transition during the seating speech between the point where the running speech left off and the present *nawait* ritual for agricultural purposes begins to be referred to, there is a significant reference to collecting wild plants brought out by the rains. This might well symbolize a gathering economy that preceded Papago agriculture. If so, the speeches themselves can suddenly be seen as making an epic cycle dealing with history of the Saguaro and the Papago.

In the mockingbird speeches the most notable occurrences were the floods and subsequent "de temporal" growing of corn to the east, north and south, but only drizzles to the west and the growth of wild plants in that quarter. In this regard, it is instructive to note that the Sand Papago who lived to the west were less agriculturally oriented and depended on food from certain wild plants which did not grow elsewhere. The drizzles referred to in the west were realistically stated; moisture for the summer thunderstorms of the Sonoran Desert originated mostly from the Gulf of Mexico and rarely got as far west as Yuma, Arizona. As a result, annual rainfall decreased to the west in what now is southern Arizona. Sivariano Garcia of San Xavier more or less correctly informed Densmore (1929: p. 162) that "In summer the rain came from the east, later from the north, and in winter or spring from the west."

The symbolism of the mockingbirds echoing the words of the Papago is very strong and must have accentuated the fact that the Papago themselves were repeating powerful words of their ancestors. Many words in the speeches bring to mind powerful images. The colors of the mockingbirds and the storm-forming clouds helped the listener to visualize impending rain. The description of the washes running so full with floodwaters and the roots, stalks, silks and tassels of the corn growing so well helped the listener to be assured of a good season and a good harvest.

Growing crops in the desert was hard work, as was obtaining food from processing Saguaro fruits. Bowen (1939: p. 5) considered the legend of formation of the Saguaro, from the sweat of the brow of I'toi, to be symbolic of the honest toil which was necessary for the Papago to survive in the desert.

The Symbolism of Actions

The following statements are based on inference and are not presented as established fact. In the March Saguaro ritual, there was union of life (seed meal) with death (Saguaro skeleton), implying a cycle. The pieces of skeleton drew power from the supernatural at the four cardinal directions with the assistance of ritual singing. Power was instilled into the pieces of skeleton and into the meal. Invoking the supernatural at the cardinal directions could symbolize a belief in four supernatural entities or even more likely the belief in one such entity capable of moving from one sector to another. The consecration of the seed meal and skeletal parts allowed prediction. The seed meal was eaten like a sacramental communion and later the consecrated pieces of Saguaro skeleton were offered to living Saguaros

as if they too could partake of the communion. That the four pieces of skeleton were laid down by four separate people emphasized again the relation of the supernatural to the four quadrants and eliminated or minimized a chance of failure. Although the reported purpose of the entire ritual was to insure a good Saguaro harvest, the actions were powerful symbols of unity of the people with the Saguaro and the supernatural, a cross-communion and a linked life-cycle.

Placing Saguaro pulp on the heart at the beginning of the Saguaro harvest, which incidentally was the beginning of the new year, implied a one-ness with the plant, a spiritual communion, thanks for having lived another year and a prayer to live to the next—perhaps to even live as long as a Saguaro (over 100 years).

Orienting the fruit husk with the inner red part pointing upward allowed its soul to have communion with the skies to hasten the rains. It foretold the role that the Saguaro's "red serving" would play in the rain making ceremony.

Accepting the duties of age, gender and ability in the harvest and subsequent wine ceremony strengthened and symbolized the social fabric of the people, promoting the concept of separation of sex roles and that of giving honor and privilege to elders, incidentally concepts which are increasingly threatened by Anglo influence.

Cleansing the Saguaro syrup before making wine was symbolic of the acceptance of the periodic indisposition of women and a willingness to remedy any negative influence that might result from it. Mixing the water and syrup so ceremoniously that it could take four hours demonstrated that the wine-makers really knew their business.

Singing, dancing, using fetishes, divining and guarding the wine showed that the wine developed not only from the natural process of fermentation but required the good thoughts and actions of the people and the supernatural to consecrate it. Eagle feathers drew moisture from the sky and fetishes were manipulated to see and to symbolize rain. The people danced in a counterclockwise circle imitating the cyclonic movement of storm clouds. The main participants faced east, the direction from which came the summer Sonoran monsoons. The fermentation and consecration of the wine brought a supernatural presence that instilled in the chief communicants an ability to predict rain.

Inviting guests from neighboring villages and sitting them in assigned positions at the cardinal points of the compass not only drew supernatural

power but symbolized that a Papago was not just a member of his own family or village but of an entire tribe of many people who could be called on as friends, relatives and potential spouses.

Waddell (1973: p. 227) thought that the wine ritual "communicates the significance of egalitarianism, of sharing, of meeting reciprocal obligations, and of curbing aggressive behavior toward one's kinsmen that new forms of behavior evoke."

Dispensing the wine began at the east because the eastern storm clouds were the most powerful, were characteristic of summer, and were the most desired. Voicing the kinship term emphasized the social part of the occasion and reminded the Papago of his place in the family and social structure. Drinking the wine was a sacramental communion bringing good and purification to the communicant. It brought a supernatural presence and an ability for every Indian to call for rain. Singing brought power and was a supplication to the supernatural for rain.

Symbolization of rain in other cultures involves union of the forces of heaven and earth. Elsewhere, the "plumed serpent," having partial characteristics of bird and snake, might symbolize union of the rain clouds (like a bird) with the slithering over the ground of run-off from rain (like a snake). Papago wine-drinking filled the participants with liquid from the skyward reaches of the Saguaro which symbolically united with the earth when vomiting occurred.

Vomiting wine on the ground completed the cycle, returning moisture to the ground that had been taken up by the roots of the Saguaro, stored in its body during time of drought, incorporated into the fruit, and made into the wine. Underhill (1946: p. 41) explained the ceremonial wine-drinking as symbolic, the Papago having had the idea "that the saturation of the body with liquor typifies and produces the saturation of the earth with rain." Further, the drunkenness and dizziness supposedly symbolized the pulse of a dizzy storm cloud with impending rain.

Planting the seeds with ritual singing, after the earth had been baptized with wine and the ceremony had brought rain, symbolized consummation, a faith in the supernatural, renewal, a promise for the future and for a full stomach. It showed that everything had been done according to established procedure.

Post-harvest rituals were unfortunately outside of the scope of the area researched for the present paper. That the Saguaro may be involved, however, comes from one of these rituals in which intoxica-

tion by Saguaro wine is apparently feigned. Mason (1920: pp. 17–18) claimed further symbolism: that the ritual *nanawitco* clowns of the viikita ceremony represented Saguaro who wore turkey feathers on their heads to symbolize fruit. This interpretation could be strengthened by recalling that two different Papago versions of Saguaro origin claim quite pointedly that the child who was transformed into a Saguaro did indeed wear a feather in a headband and that the feather was significant in circumstances of the transformation (Wright, 1929: p. 115; Densmore, 1929: p. 149).

Conclusions

The annual Saguaro harvest and crop cycle with its involved symbolism effectively kept the people on schedule in their workaday routine. It kept them occupied and fulfilled in a subsistence economy that demanded much hard work for survival. The promise of a yearly drinking of wine made from the Saguaro fruit may have made easier the hard work of the fruit harvest and the processing of the fruit which resulted in eleven other food products aside from the wine. Incidents of physical violence which sometimes marred the intended purpose of the wine ceremony demonstrated human weakness and shortcomings which have characterized all known human cultures. Such disorderliness at ceremonial occasions may have been fostered by a vendetta-like heresy implied by Lumholtz (reprint, 1971: p. 60) or may have simply been sacrilege. That disorderly incidents were uniformly deplored by the leaders of the ceremony seems exceptionally well documented.

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