AN AZTEC NARCOTIC

(Lophophora williamsii).

So-called "Sacred Mushroom," or Teonanacatl, Still in Use by the Indians of Mexico and the United States, Producing Hallucinations of a Remarkable Nature, Is Identified with the Peyotl Zacatecensis, or Devil's Root of Ancient Mexico, and the "Mescal Button" of Texas.¹

W. E. SAFFORD


ACCOUNTS of many early travelers in America and missionaries to the Indians call attention to the veneration of the aborigines for various plants, showing that they attributed to all plants a spirit somewhat like that of animals or even of man himself. To certain plants special honors were paid; others were avoided with dread; while others, with no pronounced virtues or evil properties, were little noticed. An example is given by a Mexican writer of the homage paid to a certain tree cut down in order to form a bridge over a stream in Michoacan. The people of the village were called together by the governor and a religious service was held about a cross erected for the special ceremony, with candles burning before it and choristers assisting. A procession was formed which climbed the mountain, where the tree was growing. When it fell there came an aged Indian woman who, taking a few of its branches, laid them on the trunk where it had been cut, and consoling it with loving words begged that it might not feel humiliated or angry; for they had chosen it on account of its magnificent stature and great strength, and it was destined to span a mighty river, so that all the people of the land of Michoacan might cross over upon it. And before dragging it away they placed upon the place where it had fallen a piece of lighted candle, which had been left over from Holy Thursday; and they repeated in its honor a very solemn litany, sprinkling it with holy water and much pulque.² On the next day, having propitiated the spirit of the tree, they bore away the hewn beam to the bridge with much shouting and jubilation.³

The same author speaks of the veneration paid by the Mexicans to certain medicinal plants and to the narcotics Ololiuhqui, the sacred Nanacatl, the Peyotl, and the Picietl (tobacco), "to which they ascribe deity and with which they practice superstitions."

METHODS OF EXORCISM

The following example is among those given to show the method of exorcism employed by the Aztec tiztills, or herb doctors. In this case the spirit of the Ololiuhqui, is addressed. "Come now, come hither, Green Woman, behold the green heat and the brown heat; remove thou the flaming or scarlet heat, the yellow heat, or by this token I send thee to the seven caves. And, I command thee, put it not off till tomorrow or another day; for sooner or later thou wilt be compelled to do it. Who is the

¹ Based upon a paper entitled "Identification of the Teonanacatl, or 'Sacred Mushroom' of the Aztecs with the narcotic cactus, Lophophora, and an account of its ceremonial use in ancient and modern times," read by the author May 4, 1915, at a meeting of the Botanical Society of Washington. Published by authority of the Secretary of Agriculture.

² Fermented sap of the Century Plant (Agave americana), which also yields the strong distilled spirit called mescal.

THE AZTEC NARCOTIC CACTUS, TEONANACATL

"God's Flesh," or "Sacred Mushroom" of the Aztecs—discs cut from the crown of the cactus *Lophophora williamsii* and dried. Photograph of specimens received by the Bureau of Chemistry, U. S. Department of Agriculture from the Indian Office in 1914. Now widely used as a narcotic by Indians on United States Reservations.—Natural size. (Fig. 1.)
god—the so powerful and superior one—
who can destroy the work of thy hands?
I command it, I, the prince of enchant-
ment." Others using the Hueinacaztli
(“great-ear”), Mecaxochitl (“cord-
flower”), and Coanenepilli (“serpent’s
tongue”), repeat the following: “Come
hither, thou, the yellow and ardent
red one; come and expel the green
pain, the brown pain, which now wishes
to take away the life of the son of the
gods!” And with the herb Atlinan
(“water-weed”), “I invoke thee, my
mother, thou of the precious waters!
Who is the
god
or who
the so powerful
one that wishes to destroy and bum
my enchantment? Ea! Come thou,
sister of the Green Woman, whom I
am about to go and leave in the seven
caves, where the green pain, the brown
pain, will hide itself. Go and rub
with thy hands the entrails of the
bewitched one, so that thou mayst
prove thy power and fall not into
disgrace!”

EARLY HISTORY OF TEONANACATL

Bancroft, in referring to the narcotics
used by the ancient Mexicans, mentions
one, which was believed by the early
Spaniards to be a fungus. In writing
of their ceremonial feasts he says:
“Among the ingredients used to make
their drinks more intoxicating the
most powerful was the
Teonanacatl,
‘flesh of God,’ a kind of mushroom
which excited the passions and caused
the partaker to see snakes and divers
other visions.” This information was
undoubtedly derived from accounts
of the Spanish padres, one of whom,
Bernardino Sahagun, writing before
the year 1569, states that it was the
Chichimeca Indians of the north who
first discovered the properties and made
use of these “evil mushrooms which
intoxicate like wine.”

They were gathered in the territory
now northern Mexico and southern
Texas, preserved by drying, and carried
southward. The inhabitants of the
Valley of Mexico knew them only
in their dry state. It is also very
probable that the early writers who
recorded their use had seen them only
when dry and never knew then: as
living plants. Francisco Hernandez,
the physician sent by Philip II in 1570
to study the resources of Mexico, or
New Spain, describes them under the
heading “De nanacatl seu Fungorum
gener.” From the harmless white-
mushrooms (istacnanacame), red-mush-
rooms (tlapalnanacame), and yellow
orbicular-mushrooms (chimalnanacame),
used for food, he distinguished them as
teyhuinti, which signifies “intoxicating.”

In this connection it is interesting
to note that this Nahuatl word, teyhuinti,
or teyuinti, (from yuinti, to be drunk)
survives, in the form of tejuino or tehuino
in the State of Jalisco, Mexico, and
tesuino or tizwin in the
south-western
United States, as the name of certain
intoxicating drinks, the principal of
which is a kind of beer brewed from
malted maize.

DETERMINATION OF THE DRUG

Three centuries of investigation have
failed to reveal an endemic fungus
used as an intoxicant in Mexico, nor
is such a fungus mentioned either in
works on mycology or pharmacography;
yet the belief prevails even now that
there is a narcotic Mexican fungus,
and it is supported by Siméon in his
monumental dictionary of the Nahuatl
language, in which the following defini-
tions occur:

“Teonanacatl, espèce de petit cham-
pignon qui a mauvais gout, enivre
et cause des hallucinations; il est médical
contre les fièvres et la goutte.”

“Teyuinti, qui enivre quelqu’un, envi-
rant; teyuinti nanacatl, champignon
envivant.”

In connection with his study of the
economic plants of the Mexicans and
the Indians of the south-western United

1 Bancroft, H. H., Native Races, 2: 360. 1875.
3 “Quoniam inebrare solent, Teyhuinti nomine nuncupati sunt, et e fulvo in fuscum vergant
colorem, risum inopportunum concitent, imaginemque citra risum inebriantium possint exhibere.”
4 Siméon, Rémi, Dict. de la langue Nahuatl, p. 436, 1885.
States the writer has sought diligently for a fungus having the properties attributed to the teonanacatl. As this narcotic was used by various tribes of Chichimecas, and the Chichimecas inhabited the territory situated in what is now northern Mexico and the southwestern United States, it was natural to look for the plant in this region. No such fungus, however, was discovered, but in its place a narcotic plant having properties exactly like those attributed to the teonanacatl was encountered; moreover, one form of this plant, when prepared as a drug, resembles a dried mushroom so remarkably that at first glance it will even deceive a trained mycologist. It is discoid in form and apparently peltate when seen from below; but the upper surface bears tufts of silky hairs, and a close inspection reveals the fact that it is the crown of a small fleshy spineless cactus which has been cut off and dried. The cactus in question, Lophophora williamsii, when entire, resembles a carrot or radish rather than a mushroom, and when cut into longitudinal slices or irregular pieces, would never be mistaken for a fungus. For this reason the drug prepared in the latter form was not recognized in southern Mexico as the same as the discoid form, and it was called peyotl by the Aztecs, while the name nanacatl was applied to the latter.

IDENTITY WITH THE NARCOTIC PEYOTL

Sahagun, who described the drugs of the ancient Mexicans from specimens brought to him by Indian herb doctors, failed to recognize the identity of the teonanacatl and peyotl of the Chichimecas, although he attributes similar narcotic properties to each. The latter he describes as follows:

"There is another herb, like tunas of the earth; it is called peyotl; it is white; it is produced in the north country; those who eat or drink it see visions either frightful or laughable; this intoxication lasts two or three days and then ceases; it is a common food of the Chichimecas, for it sustains them and gives them courage to fight and not feel fear nor hunger nor thirst; and they

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* Tuna, the Spanish name for the fruit of the Opuntia, or prickly pear.
say that it protects them from all danger."\textsuperscript{10}

The plant itself was described by Hernandez as follows, under the heading *De Peyotl Zacatecensi, seu radice molli et lanuginosa*.

"The root is of nearly medium size, sending forth no branches nor leaves above ground, but with a certain woolliness adhering to it on account of which it could not be aptly figured by me. Both men and women are said to be harmed by it. It appears to be of a sweetish taste and moderately hot. Ground up and applied to painful joints it is said to give relief. Wonderful properties are attributed to this root (if any faith can be given to what is commonly said among them on this point). It causes those devouring it to be able to foresee and to predict things; such, for instance, as whether on the following day the enemy will make an attack upon them; or whether the weather will continue favorable; or to discern who has stolen from them some utensil or anything else; and other things of like nature which the Chichimecas really believe they have found out. On which account this root scarcely issues forth, but conceals itself in the ground, as if it did not wish to harm those who discover it and eat it."\textsuperscript{11}

From the above description, which applies perfectly to the plant from Zacatecas shown in fig. 2, it follows that the *Peyotl Zacatecensis* of Hernandez is identical with *Lophophora williamsii*. Specimens of the drug collected at Zacatecas by the late Dr. Edward Palmer are shown in fig. 3. They bear little resemblance to the mushroom-like buttons shown in fig. 1, and it is not surprising that they should have been supposed to be distinct from the *teomanacatl* by the early Spanish writers.

**RAIZ DIABOLICA, OR DEVIL'S ROOT**

By this name it was designated by Padre José Ortega, who tells of its use by the Cora Indians in his *Historia del Nayarit*, published anony-


\textsuperscript{11} Hernandez (1514-1578). De Hist. Plant. Nov. Hisp. 3:70. 1790.

\textsuperscript{12} Ortega, Padre José (d. 1700). Hist. del Nayarit, pp. 22-23 (new ed.) 1887.

\textsuperscript{13} García, Fr. Bartholomé. Manual para administrar los Santos Sacramentos etc. p. 15. 1760.
PEYOTE OF ZACATECAS, *Lophophora williamsii*

This form of the narcotic drug was called by the early Spanish missionaries "Raiz diabolica," or Devil's Root. Photograph of material in the Economic Collection, U. S. Department of Agriculture, collected at Zacatecas, Mexico, by the late Edward Palmer. (Fig. 3.)
The name *leoonanacatl* is now obsolete. The drug is called by various names among the Indians using it: *xicori* by the Huicholes of Jalisco; *hikori*, or *hikuli*, by the Tarahumaris of Chihuahua; *huatari* by the Cora Indians of the Tepic mountains; *komaba* by the Tepehuanes of Durango; *ho* by the Mescalero Apaches of New Mexico, who formerly ranged as far south as Coahuila; *seni* by the Kiowas; and *wokowi* by the Comanches, some of whom formerly lived in the state of Chihuahua. The name *peyote* has survived as a general commercial term; and the mushroom-like discs from the Rio Grande region are now widely spread among the northern Indians of the United States under the misleading names of "mescal buttons" or "mescal beans," as well as under the Nahuañ name *peyote*.

This name is of Aztec origin, derived from *peyotl*, the Nahuañ word for "cocoon." That its application to Lophophora was not general in early times is shown by the fact that Dr. Leonardo Oliva, professor of Pharmacology at the University of Guadalajara, declared it a singular thing that the *peyote* was regarded by the Mexicans as a plant having the virtue of giving unusual endurance to those using it, and the power of walking great distances without tiring. The only plant known to him by this name was a yellow-flowered Composite, with velvety tuberous roots, which from their form and indument might easily be likened to the cocoon of a moth. As a matter of fact this name is still commonly applied to several species of Cacalia, the principal one of which, *Cacalia cordifolia*, is common in the vicinity of Guadalajara, Jalisco, in the drug markets of which the root is offered for sale under the name *peyote*.

**Cacalia Also Called Peyotl**

The genus Cacalia belongs to the section Senecioneae, which includes Arnica, Tussilago, and other medicinal plants. To this genus should be referred the *Peyotl* *xochimilensis* and the *Nanacaz* of Hernandez, both of which are composites endemic in the neighborhood of Xochimilco, in the valley of Mexico, having a single stem growing from the middle of a cluster of nut-like tubers, with a terminal cluster of yellow-flowered rayless heads subtended by a scarious involucre. They should not be confused with the narcotic cactus called peyotl or peyote.

The peyote of Guadalajara, *Cacalia cordifolia*, was first described botanically by Kunth from specimens collected by Humboldt and Bonpland at Santa Rosa, Mexico. Its tubers, about the size of walnuts or hickory nuts, are covered with soft woolly hairs. From the center one of the cluster rises a single smooth terete stem bearing alternate, thickish, conspicuously net-veined leaves. The lower leaves are long-petioled, the upper ones, near the terminal inflorescence, are short-stemmed and much smaller. The blades are roundish or broadly ovate, cordate at the base and angled on the margin. The flower heads are arranged in the form of a corymb, with many tubular 5-toothed flowers crowded on a naked flat receptacle, subtended by an involucel cup-shaped in form, composed of many narrow acute teeth. There are no marginal ray-flowers. The disc-flowers have both stamens and pistils, the latter with an exserted forked stigma. The pappus is pilose, somewhat resembling thistle-down when mature.

Fig. 4 shows the woolly tubers, reticulate leaves, and mature inflorescence of *Cacalia cordifolia*, photographed from material in the United States National Herbarium, collected by the writer in February, 1907, in the vicinity of Guadalajara, state of Jalisco, Mexico.

Other specimens in the herbarium are from the Pedregal, or lavabeds, near Tlalpan, in the Federal District of Mexico, corresponding very closely with the descriptions of *Peyotl* *xochimilensis* of Hernandez; and from Alvarez, state of San Luis Potosi, where the tubers, locally known as *cachan*, are offered for sale in the drug-markets as an aphrodisiac and a remedy for sterility.

**The Genus Lophophora**

The genus Lophophora was based by Coulter upon a small plant described in 1845 by Lemaire, in the Allgemeine Garten-Zeitung, under the name *Echinocactus williamsii*. This plant, though suggesting certain echinocacti by its form differs essentially from all species of that genus in its fruit, which is devoid of scales, and resembles the smooth club-shaped "chilitos" of the Mamillarias. The plant is also devoid of spine-bearing areoles. In 1886 it was referred to the genus Anhalonium, which it resembles in its flowers and fruits, but from the type of which it differs in several important features.

The genus Anhalonium, defined by Lemaire in 1839, proved to be identical with the genus Ariocarpus previously established by Scheidweiler, the type of which, *Ariocarpus reusus*, described in 1838, is specifically identical with the plant described the following year by...
PEYOTE OF JALISCO, Cacalia cordifolia, H. B. K.

A member of the Composite, or daisy family, bearing velvety tubers; closely allied to the Peyote Xochimilcensis of Hernandez. The tubers, called peyote ("cocoons"), have medicinal properties, but they are not narcotic. Photograph of specimen in the U. S. National Herbarium collected near Guadalajara in 1907 by W. E. Safford. Photograph natural size. (Fig. 4.)
Lemaire as *Anhalonium prismaticum.* This fact was recognized in 1845, by Salm-Dyck, who, however, adopted the generic name *Anhalonium.* On account of the laws of priority the generic name *Ariocarpus* must be retained and its synonym *Anhalonium* be dropped.

In the genus *Ariocarpus* (Anhalonium) the tubercles are very prominent, usually more or less triangular or pyramidal in shape, and imbricating somewhat like the scales of an artichoke. The lower and upper parts are very different, the former comparatively thin and flat, while the upper exposed triangular part is very thick and hard. The lower surface of the tubercles is smooth and keeled, the upper surface is plane, as in *Ariocarpus retusus*; or convex and irregularly mammilate, with the acuminat apex bearing a woolly pulvillus, as in *Ariocarpus fuscusculus*; or more or less fissured and presenting a warty appearance, as in *Ariocarpus fissuratus.* One of these species is figured by Lhomboltz under the name of *hikori sunami,* and it is said by him to be more powerful than the common *hikori sunami* (*Ariocarpus williamsii*), but he offers no evidence that it has narcotic properties. The Indians declare that if you wear this plant as an amulet the bears cannot harm you nor the deer run away from you. The latter superstition is also held in connection with the closely related *Ariocarpus kotschubeyanus,* commonly called "pezuña de venado," (fig. 5) probably on account of the close resemblance of its tubercles to the hoof of a deer.

In the genus *Lophophora* the tubercles are quite unlike those of *Ariocarpus* (Anhalonium), being devoid of a differentiated upper part and having the lower part broad and rounded. Instead of being developed into pyramidal or triangular projections the tubercles often coalesce into broad continuous vertical or somewhat spiral ribs (fig. 7), and in young specimens the plant appears almost smooth, with the tubercles separated by shallow impressed lines (fig. 9).

**LOPHOPHORA WILLIAMSSII**

*Lophophora williamsii* (Anhalonium williamsii Lemaire) is a succulent spineless cactus, usually shaped like a turnip or carrot with a depressed-globose or hemispherical head bearing low inconspicuous tubercles and a tapering tap root. The tubercles occur normally in longitudinal ribs, but in some forms of the plant they are arranged spirally or irregularly. In the center of each tubercle there is a flower-bearing areole with a dense tuft of erect hairs, from the midst of which the flower issues. When mature the tuft of hairs persists as a pulvillus in the form of a pencil or brush of hairs. Unlike the plants of the genera *Echinocactus* and *Mammillaria* there is no spine-bearing areole. The flower (fig. 6) is very much like that of an *Ariocarpus,* without a well-defined calyx, but with the outer floral leaves sepal-like and the inner ones petal-like and rose-tinted, with a darker median line on the back of each, giving to it a feather-like appearance. The stamens are numerous, with white filaments and bright yellow anthers; and the style bears four pale yellow stigmas projecting above the mass of stamens. The ovary is devoid of scales, in which respect it differs from that of the genus *Echinocactus,* and the smooth crimson or rose-colored club-shaped fruit resembles that of a *Mammillaria.* The plants grow either solitary, or, more frequently, in clusters of several from a common base.

*Lophophora williamsii* is quite variable, sometimes its ribs instead of being vertical are more or less diagonal or spiral, and instead of being separated by straight grooves the latter are sinuous; or the tubercles may be irregularly arranged. One form was described by Hennings as a distinct species under the name *Anhalonium lewini,* but the type plant described and figured by him was a boiled up "mescal-button" obtained from Parke, Davis & Co., of Detroit, Michigan, in all probability gathered in the vicinity of Laredo, Texas. In this form the ribs are usually thirteen in number separated by strongly sinuous grooves (fig. 9). Sometimes there are twelve ribs or even as few as nine; while in the typical *L. williamsii* there are usually eight ribs separated by straight or almost straight lines, or sometimes as many as 10. It has been wrongly asserted that the petals of *L. lewini* are yellow: typical plants of this form now blooming in the cactus house of the United States Department of Agriculture (May, 1915) have rose-tinted flowers in no way distinguishable in form or color from those of *L. williamsii.* Indeed, in specimens collected by Lloyd in Zacatecas typical plants of *L. williamsii* and *L. lewini* are to be found in the same cluster growing from a common base. Another form (fig. 10) departs from the typical *L. williamsii* even more than the plant figured by Hennings. It has the tubercles more or less irregularly arranged and separated into angular areas by intersecting lines. In young plants the surface is smooth, but in older plants (fig. 8) the tubercles are often prominent. At first the writer was inclined to separate this form from both *L. williamsii* and *L. lewini,* but after carefully comparing a number of specimens the three types seem to be connected by intermediate forms, and they cannot, therefore, be specifically distinct. Indeed as they sometimes grow from the same base it would be improper even to designate them as varieties.

**GEOGRAPHICAL DISTRIBUTION**

The general range of the genus *Lophophora* is from southern Texas...
DEER-HOOF CACTUS

*Arriocarpus kotschubeyanus*, a plant with supposed magic properties, highly prized by Indians of northern Mexico, who declare that if the hunter wears this cactus (here shown natural size), the deer can not run away from him. It probably owes this prestige to the resemblance of its tubercles to the hoofs of a deer. (Fig. 5.)

FRUIT AND FLOWER

Flower of *Lophophora williamsii* (at the right) with rose-tinted petals, issuing from a tuft of hairs, while the fruit (shown at the left) is pink or crimson. Drawing natural size. (Fig. 6.)

along the valley of the Rio Grande, from the mouth of the Pecos River south-eastward, to southern Querétaro, Mexico. Definite localities in which plants have been collected are the following:

Texas.—Mouth of the Pecos River, William Lloyd; vicinity of Laredo, *Mrs. Anna B. Nickels* (specimens now growing in the cactus house of the U. S. Department of Agriculture); near Ojuelos, C. Ochoa (dried specimens in the form of "mescal buttons" in the economic collection of the U. S. Department of Agriculture); near Aguilares (specimens sent by parcel post to the Menominee Indians, now in possession of the Bureau of Chemistry).

Tamaulipas.—In the vicinity of Nuevo Laredo, *Mrs. Anna B. Nickels*; near Camargo, south shore of the Rio Grande at the mouth of the Río San Juan, *E. A. Goldman*, of the U. S. Biological Survey.

Nuevo Leon.—Vicinity of Monterrey, *Professor Emilio Rodriguez*, (specimens growing in the cactus garden of the Colegio Civil, at Monterrey). 19

Coahuila.—Cerro del Pueblo, near Saltillo, *Dr. Edward Palmer* (living plants in cactus house, U. S. Department of Agriculture; dried plants in economic collection).

Chihuahua.—Near Jimenez, in the Sierra de Amole (locality in which the Tarahumari Indians collect their supply for ceremonial purposes); near Santa Rosalía de Camargo, in the Sierra de Amargosa (also visited by the collecting expeditions of the Tarahumari Indians, as stated by Lumholtz).

San Luis Potosí.—Vicinity of Real de Catorce as cited by *Diguet* (locality whence the Huichol Indians obtain their supply).

Zacatecas.—Vicinity of Cedros, near Mazapil, near northern boundary, *Professor F. E. Lloyd* and *Dr. E. Chaffey* (living plants in the cactus house of the U. S. Department of Agriculture; also dried specimens from the market of the city of Zacatecas in the economic collection).

Querétaro.—Near Higuerrillos, not far from the city of Querétaro, *Dr. J. N. Rose* (specimen in cactus house of the Department of Agriculture).

CHEMICAL HISTORY OF THE DRUG

Attention was called to the use of this plant as an intoxicant by the Indians by *Mrs. Anna B. Nickels* of Laredo, Texas, who collected material for Parke, Davis and Co., of Detroit, Michigan, and for other wholesale dealers in drugs. *Mrs. Nickels* sug-

suggested that a chemical and therapeutic study of the plant be made, and stated that the plant was also used for "breaking fevers," and that the tops cut off and dried were locally known as "mescal buttons." The accompanying photograph of this veteran cactus-lover and assiduous collector, in her cactus garden at Laredo, was taken by David Griffiths of the U. S. Department of Agriculture.

A serious study of its properties was first begun in 1888, by Dr. L. Lewin of Berlin, who used for the purpose specimens obtained from Parke, Davis, and Company. It was afterwards studied by Dr. Arthur Heffter of the Pharmacological Institute of the University of Leipsic; and, in the United States, by a group of persons at Washington, centering in the Bureau of American Ethnology, and including as associates the Division of Chemistry of the Department of Agriculture for chemical analysis; Drs. D. W. Prentiss and Francis P. Morgan of the department of Materia Medica and Therapeutics of the Columbian University, for the study of its physiological properties; and the Botanical Division of the Department of Agriculture for the settlement of botanical questions. The material for the studies carried on in this country was supplied by James Mooney of the Bureau of American Ethnology. The chemical analysis was made by Ervin E. Ewell, who announced his results in a paper entitled "The Chemistry of the Cactaceae," read before the Washington Section of the American Chemical Society, April 9, 1896.20

Dr. Lewin obtained from the drug an alkaloidal substance which he called anhalonin. This substance was a brown, syrup-like liquid, having an intense alkaline reaction. From it Hefftter obtained three alkaloids; the first, which he called anhalonin, was in the form of brilliant, colorless, needle-shaped crystals; the second was in the form of non-lustrous, white rhombic tables; the third was an amorphous and very poisonous alkaloid left behind by the mother liquor.

Mr. Ewell found, in addition to the alkaloids, at least two resinous bodies, and a wax-like substance insoluble in cold alcohol but soluble in hot alcohol, petroleum ether, and chloroform. The resinous bodies, of a dark brown color and thick consistency, have the characteristic taste and odor of the moistened drug itself. It was suggested that the drug's activity might be due to these resinous bodies rather than to the alkaloids. One marked peculiarity of the plant is that about one-half its ash proved to be potassium chloride—a proportion greater than that hitherto found in any other plant.21

PHYSIOLOGICAL ACTION

Further investigations are about to be made in the Bureau of Chemistry by Dr. Lyman F. Kehler, chief of the division of drugs, and Dr. Francis P. Morgan, whose work in this drug has already been referred to.

The various accounts of the effects of Lophophora differ considerably; but nearly all of those who have experimented with it, including Dr. S. Weir Mitchell, agree in the statement that it produces beautiful color visions. The pupil becomes dilated and remains in this condition for some time, often for twenty-four hours, and at the same time there is a slight loss of the power of accommodation and consequent disturbance of vision. Depression of the muscular system has been observed as one of its effects, either well marked or indicated only by inactivity and lazy contentment; and sometimes this was followed by partial anesthesia of the skin after the effects of the drug began to disappear. Sometimes the patient was seized with nausea and vomiting, caused perhaps by the bitter and unpleasant taste of the drug when first put into the mouth. In some cases there was a marked loss of the sense of time. The effects of the drug have been compared with those of Indian hemp (Cannabis indica), which has found its way from the Eastern Hemisphere to Mexico and the southwest United States, where it is known as marijuana.


but instead of the exciting effect of the latter, Lophophora produces rather a state of ideal content, with no tendency to commit acts of violence.

A detailed account of the experiments of Drs. Prentiss and Morgan was published in the Therapeutic Gazette of September 16, 1895, pp. 580-585.\textsuperscript{22}

\textbf{CEREMONIAL USE BY THE INDIANS}

The first to bring to public notice the ceremonial use of this narcotic by existing tribes of Indians was James Mooney of the Bureau of American Ethnology, in a paper read before the Anthropological Society of Washington on November 3, 1891. His attention had been directed to it while making investigations among the Kiowas, who are descendants of one of the tribes known to the Aztecs by the name of "Chichimecas." Mr. Mooney found that these Indians attribute divine powers to the drug and the ceremony attending its use is of the nature of a religious rite.

\textsuperscript{22}See also Prentiss and Morgan, "Therapeutic uses of Mescal Buttons." Therap. Gazette 20:4. 1896.
ANOTHER TYPE OF LOPHOPHORA

Form described by Hennings as a distinct species, Anhalonium lewinii, but often occurring in the same cluster with the typical form, growing from the same root. Photograph of specimen in the Cactus House of the U. S. Department of Agriculture, collected in the state of Zacatecas, Mexico, in 1908, by F. E. Lloyd. Photograph natural size. (Fig. 8.)

in which all the tribes of the southern plains take part.

The Kiowas and other Indians of Oklahoma receive the greater part of their supply of the drug from traders who bring it from the vicinity of Laredo, Texas, in the form of “mescal buttons,” which are identical with the teonanacatl of the ancient Mexicans. Like the ancient Mexican feasts referred to above, their meetings are nocturnal, usually beginning Saturday night. A summary of Mr. Mooney’s account was published in the Therapeutic Gazette of September 16, 1895. A more detailed description was published by Mr. Mooney the following January, in the same journal, from which the following extracts are taken.

“The ceremony occupies from twelve to fourteen hours, beginning about 9 or 10 o’clock and lasting until nearly noon the next day. Saturday night is now the time usually selected, in deference to the white man’s idea of Sunday as a sacred day and a day of rest. The worshipers sit in a circle around the inside of the sacred tipi, with a fire
blazing in the center. The exercises open with a prayer by the leader, who then hands each man four mescals, which he takes and eats in quick succession, first plucking out the small tuft of down from the center. In eating, the dry mescal is first chewed in the mouth, then rolled into a large pellet between the hands, and swallowed, the man rubbing his breast and the back of his neck at the same time to aid the descent. After this first round the leader takes the rattle, while his assistant takes the drum, and together they sing the first song four times, with full voices, at the same time beating the drum and shaking the rattle with all the strength of their arms. The drum and rattle are then handed to the next couple, and so the song goes on round and round the circle—with only a break for the baptismal ceremony at midnight, and another for the daylight ceremony—until perhaps 9 o'clock the next morning. Then the instruments are passed out of the tipi, the sacred foods are eaten, and the ceremony is at an end.

**AMONG THE TARAHUMARIS**

Lumholtz, in his account of the plant-worship of the Tarahumari Indians of the southwestern Chihuahua, mentions several kinds of cacti which they regard with superstitious veneration; but there is no evidence that any of these have narcotic properties except the "hikori huanami," which is the typical *Lophophora williamsii*. A species of *Ariocarpus* (probably *A. fissuratus*) was sold to him under the name of "hikori sunami," and was declared by the vendor to have certain magical powers; but he did not see it used as an intoxicant. Much that Lumholtz relates in connection with the ceremonial use of the narcotic hikori appears extravagant and fanciful; but it is undoubtedly true that the Tarahumari Indians, like their more southerly neighbors the Coras and Huicholes, have been led by the wonderful visions induced by the plant to attribute to it supernatural powers. Even the Christians among them salute it and make the sign of the cross when approaching it, and it is often carried by them as a charm or amulet. They declare that Hikori sits next to God and is called "uncle," because it is God's brother.

It will be shown later that a similar superstitition is common among some of the Indian tribes of the United States who pay to the plant divine homage. In some of their religious societies there is a ceremony of baptism in which the candidate is sprinkled with an extract of the plant, and also a kind of communion in which the plant is eaten as an incarnation of the Deity, or the flesh of God.

Lumholtz gives an account of the expeditions of the Tarahumaris in quest of hikori, describing their consecration with copal incense before starting out, their ten-days' journey to the land of the Hikori, the erection of a cross on their arrival, the superstitious observances attending the gathering of the plant, which recall the stories of the early European herbalists regarding the mandrake and other magic plants, and the ceremonies attending their return.

The Indians of the village go out with music to welcome the travellers, bearing their precious burden; and at night there is a festival of teswin-drinking and dancing in honor of the plant. The hikori is piled in a heap at the foot of a cross, and is sprinkled with teswin, which is grateful to it; and the next day a sheep or even an ox or two goats are sacrificed in its honor. The wild heathen Indians living in caves or under overhanging cliffs in the barrancas, when they hear of the return of the expedition, come to buy supplies of the hikori for their own use. "One plant," says Lumholtz, "costs a sheep, and the buyer holds a feast in honor of his
purchase, and repeats the feast at the same time every year."

USE BY THE HUICHOLES OF JALISCO

The ceremonies attending the acquisition and use of the drug by the Indians of the Nayarit mountains of Jalisco and Tepic were described by Léon Diguet in 1899. These Indians belong to the tribes known as Huicholes, Coras, Tepehuanes, and Tepecanos. The Coras, whose use of the raiz diabolica, as described by Padre Ortega, has already been noted, now obtain their supply from the Huicholes. The latter send expeditions across the state of Zacatecas to Catorce in San Luis Potosi, where the plant is endemic. The specimens from Zacatecas in the Economic Collection of the Bureau of Plant Industry are not at all mushroom-like, but resemble dry pieces of radishes or carrots sliced longitudinally, or small, terminal fragments covered with silky wool, such as those described by early writers as "peyote de Zacatecas." (See fig. 3.) By the Huicholes the drug is known neither as peyote nor teonanacatl, but as xicoli, or hicuri, which is identical with the name hikori applied to it by the Tarahumari Indians.

According to Diguet the Huicholes collect the plant in October. The expedition lasts about one month, and its return is an occasion for celebration. "Those who take part decorate their hats and their hair with feathers and paint on their faces the distinctive attributes of their caste and of their gods. After having made an offering of peyote upon their altars they distribute pieces of it to all those they meet; a supply of peyote is kept for the feasts which will take place during the course of the year; the rest is sold to those who did not take part in the expedition. . ."

"In eating the peyote the Indians chew the pulp of the plant, which has been cut up into small pieces, and at first spit out the saliva which at the beginning dissolves a bitter principle having a very disagreeable taste, then they absorb the active principle which dissolves little by little in the saliva." According to Diguet the Indians regard the drug as food for the soul, and revere it on account of its miraculous properties. The manifestation of the hallucinations which it produces a little after the absorption of its active principle is held to be a supernatural grace by which men are permitted to communicate with the gods; and, moreover, "in using the drug with moderation the partaker is endowed with...

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energy which permits him to overcome great fatigue and to endure hunger and thirst for five days."  26

PRESENT USE IN THE UNITED STATES

Efforts have been made to prevent the spread of the drug among the Indians of the United States, and action has been taken in the courts to prosecute those who have been instrumental in procuring it and furnishing it. One of the most recent cases is that of the United States versus an Indian named Nah-qua-tah-tuck, alias Mitchell Neck, of the Menominee Indian Reservation, Wisconsin, accused of furnishing intoxicants to certain Indians, in violation of the law. Dr. Francis P. Morgan, of the Bureau of Chemistry, was summoned as a Government expert. The trial developed the following facts:

On March 15, 1914, the accused brought a supply of the drug in a dress suit case to the house of an Indian family named Neconish, situated a short distance north of the village of Phlox, Wisconsin, near the western boundary of the Menominee Reservation, at which place there was a meeting of a religious nature. The drug had been received by parcel post from Aguilares, Texas. The participants first made a line about the house to keep out the evil spirits, and then invoked God, begging him to make all of them good and to keep them from evil. The peyote was next distributed, and when it was eaten caused the partakers to see the evil things they had done and showed them the good things they ought to do.

The ceremony began about 9 o'clock in the evening. One witness testified that shortly after having eaten four buttons he could see pictures of various kinds when his eyes were shut. First he saw God, with a bleeding wound in his side. This vision vanished when he opened his eyes, but reappeared when he closed them again. Then he saw the devil with horns and tail, of the color of a negro. Then he saw bad things which he had done before, bottles of whiskey which he had drunk, a watermelon which he had stolen, and so many other things that it would take all day to tell of them. Then he saw a cross with all kinds of colors about it, white, red, green and blue. He was not made helpless. He stated that he could have walked had he wished to do so, but that he preferred to sit still and look at the pictures.

Another witness testified that he ate the peyote so that his soul might go up to God. The witnesses who testified at this trial declared that the peyote helped them to lead better lives and to forsake alcoholic drinks. The defendant was acquitted on the ground that the meeting was one of a religious nature.

THE PEYOTE SOCIETY

Thomas Prescott of Wittenberg, Wisconsin, testified that there is a regularly organized association among the Indians called the Peyote Society, also known as the Union Church Society, of which he had been a priest for seven years. In the weekly ceremonies of this society the peyote is either eaten or taken in the form of tea. In his opinion the effect of the peyote is to make better men of the Indians. Many of them were formerly common vagabonds, liable to commit all sorts of crimes when under the influence of alcohol. After becoming members of the peyote society, however, they gave up drink, established themselves in regular homes, and lived sober and industrious lives. In relating his personal experience he made the following statements:

"We boys, before we got this peyote, was regular drunkards; so when I was drunk I was lying on the road somewhere sometimes, and I got no home nor nothing. Before I got this I did wrong and everything else. Now, since I got this peyote, it stopped me from drinking, and now, since I used this peyote, I have been sober, and today I am sober yet . . . I see a good and a bad when I eat that peyote. When I eat that peyote then it teaches me my heart; I know anything that is right and what is wrong. That is the way peyote works for good and works for God, and that is how we worship. . . . When

26 Diguet, Léon. loc. cit. p. 621.
I took this peyote I could see myself when I used to be drunk; I could see the bottles which used to have my whiskey and alcohol in; I could see myself lying drunk in the road. That is the way it shows us the bad and teaches us the good. . . . We could have our meetings without this peyote; but we see some more coming—a new person—he wants to use it—when he takes this peyote then he believes God. That is why we use it for. Without this, why, they would not believe anybody. 27

Dr. Morgan gave to the court an account of his experiments bearing upon the physiological action of the drug administered in his presence to several young men who had volunteered for the purpose. The chief effect noticed was the production of visions of various kinds: of moving objects, constantly changing designs and figures of landscapes, friezes, balls of beautiful colors in constant motion. Suggestions of definite objects also brought up visions of that object. These visions were seen only when the eyes were closed. The pupil of the eye was made larger, and this enlargement lasted till the following day; the pulse became slower at first but increased when a greater quantity of the drug was taken; there was evidence of muscular depression with a disinclination to exertion of any kind; and there was a loss of conception of space and time and, in some cases, symptoms of dual personality, not unlike that caused by hashish (Cannabis indica). The after effects, however, were insomnia, while hashish eating is usually followed by sleep. In this respect it also differs from opium and somewhat resembles the active principles of coffee and coca (Erythroxylon coca).

Dr. Morgan further testified that as far as he knew no therapeutic or remedial value of the drug had been established.

At a meeting of the Lake Mohonk Conference in October, 1914, several papers relating to the effects of this drug upon the Indians were read and affidavits from two Omaha Indians were quoted. From one of the latter, I take the following extracts:

AMONG THE OMAHA INDIANS

At the meetings of the Society "before they sing they pass the peyote around. They begin taking this medicine along about dark, and when they pass it, ask you how many you want, and they often try to persuade you to take more than you want. The medicine does not work right away, but after it begins to take effect along toward midnight they begin to cry and sing and pray and stand and shake all over, and some of them just sit and stare. I used to sit in their range right along, and ate some of their medicine, but after I ate it the first time I was kind of afraid of it. It made me feel kind of dizzy and my heart was kind of thumping and I felt like crying. Some of them told me that this was because of my sins. It makes me nervous, and when I shut my eyes I kind of see something like an image or visions, and when my eyes are open I can't see it so plain. One of these fellows took twelve beans, or twelve peyote, sitting with some girls . . .
After I have taken twelve peyote I saw a mountain with roads leading to the top and people dressed in white going up these roads. I got very dizzy and I began to see all kinds of colors, and arrows began to fly all around me. I began to perspire very freely. I asked to be taken out of doors. At that time it was 20° below zero. I felt better when I got out of doors. When I went in again I began to hear voices just like they came from all over the ceiling and I looked around in the other room and thought I heard women singing in there, but the women were not allowed to sing in the meetings usually, and so this was kind of strange. . . . After eating thirty-six of these peyote I got just like drunk, only more so, and I felt kind of good, but more good than when I drink whiskey, and then after that I began to see a big bunch of snakes crawling all around in front of me, and it was a feeling like as if I was cold came over me. The treasurer of the Sacred Peyote Society . . . was sitting near me, and I asked him if he heard young kittens. It sounded as if they were right close to me; and then I sat still for a long time and I saw a big black cat coming toward me, and I felt him just like a tiger walking up on my legs toward me, and when I felt his claws I jumped back and kind of made a sound as if I was afraid, and he asked me to tell him what was the matter, so I told him after a while. I did not care to tell at first; but I made up my mind then, after what I saw, that I would not take another one of these peyotes if they gave me a ten dollar bill. . . . In this Sacred Peyote Society they have a form of baptism and they baptize with the tea made from stewing the peyote, and they baptize 'in the name of the Father, and the Son, and the Holy Ghost,' the Holy Ghost being the peyote. Then you drink some of the tea and they make signs on your forehead with the tea and then take an eagle’s wing and fan you with it. I heard an educated Indian and he said in a meeting on Sunday morning, ‘My friends, I am glad I can be here and worship this medicine with you; and we must organize a new church and have it run like the Mormon Church.’”

USE IN ANCIENT MEXICO

From the preceding description of a meeting of the Sacred Peyote Society held by the Winnebagos and Omahas in 1914 I turn back to the first account we have of the Teonanacatl feasts of the Aztecs, written by Padre Bernardino Sahagun in the sixteenth century—before Sir Francis Drake set out upon his voyage round the world—before tobacco which, under the name of picietl, the Mexicans also worshipped, was first brought to England.

“The first thing eaten at the party was certain black mushrooms which they call nanacatl, which intoxicate and cause visions to be seen, and even provoke sensuousness. These they ate before the break of day, and they also drank cacao (chocolate) before dawn. The mushrooms they ate with syrup (of Maguey sap), and when they began to feel the effect they began to dance; some sang; others wept because they were already intoxicated by the mushrooms; and some did not wish to sing, but seated themselves in their rooms and remained there as though meditating. Some had visions that they were dying and shed tears; others imagined that some wild beast was devouring them; others that they were capturing prisoners in warfare; others that they were rich; others that they had many slaves; others that they had committed adultery and were to have their heads broken as a penalty; others that they had been guilty of a theft, for which they were to be executed; and many other visions were seen by them. After the intoxication of the mushrooms had passed off they conversed with one another about the visions which they had seen.”

The following description of a religious meeting in July, 1626, at which sacred mushrooms were administered in the

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form of communion, is related by Padre Jacinto de la Serna, at that time beneficiary of Tencantzingo.

"To this meeting had come an Indian, native of the pueblo of Tenango (about 25 kilometers from Toluca) and grand master of superstitions, named Juan Chichiton (or "John Little-dog"), who had brought some of the mushrooms that are gathered in the monte, and with these he had performed a great idolatry. But before proceeding with my story I wish to explain the nature of the said mushrooms, which in the Mexican language are called Quauhtlananacatl ("wild mushrooms"). When I asked the licenciado Don Pedro Ponce de Leon what they were like, he said that these mushrooms were small and yellow, and that they were collected by priests and old men, appointed as ministers for these impostures, who would proceed to the place where they grow and remain almost the whole night in prayer and in superstitious conjuring; and at dawn, when a certain little breeze known to them would begin to blow, then they would gather the narcotic, attributing to it deity, with the same properties as ololiuhqui or peyote, since when eaten or drunk, they intoxicate those who partake of them, depriving them of
their senses, and making them believe a thousand absurdities.  

"This man, Juan Chichiton, brought these mushrooms one night to a house where there was a gathering for the celebration of a saint's feast. The saint stood on the altar and below the altar were the mushrooms, with some pulque, and fire. All night long the tepomaztli (wooden drum made from a hollowed log) kept time to the singing, and after the greater part of the night had passed, the said Juan Chichiton, who was the priest of that solemnity, administered to all those congregated at the feast mushrooms and pulque after the manner of communion, winding up the celebration with an abundant quantity of pulque; so that the mushrooms on their part and the pulque on its, took away their reason, which was a pity. The said Juan Chichiton fled soon afterward, nor could I obtain information about the others who took part, in order to chastise them, with the exception of Leonor Maria, whom I kept as a prisoner in my house for having joined in the idolatry which they performed with the mushrooms.

"I asked the said licenciado Don Pedro Ponce de Leon in what manner these creatures perform their acts of witchcraft in working harm to others; and he told me that in making their threats and menaces they strike themselves on the breast as at the Sanctus with the tips of their fingers and then, opening their hand, they make a gesture as if hurling something in the direction of the person whom they are menacing or wish to bewitch, saying: 'You shall pay me for that, as you will see!' But concerning other words and things which they say and do by order of the devil in these embustes, never or scarcely ever could anything be ascertained; though it stands to reason that they must have them as a pact with the devil; and he, who is the author of all, closes their mouths, so that there may be no means of remedying the evil."

SUMMARY

After comparing the preceding accounts of the use of narcotics by the ancient Mexicans and by the Indians of the present day, separated in time by three centuries and in space by thousands of miles, there can remain no doubt that the mushroom-like peyote used by our own Indians in the United States, which we know to be identical with the sacred hikuli, or hicori, of the Sierra Madre Indians, is the same drug which was called teonanacatl, or "sacred mushroom," by the Aztecs. According to the earliest writers, it was endemic in the land of the Chichimecas, the early home of our Apaches, Comanches, and Kiowas, which is also the source of the modern supply. The ancient Mexicans, like the Huicholes and Tarahumaries of the present day, obtained their supply of the drug through the medium of messengers, consecrated for the purpose, who observed certain religious rites in collecting it, and who were received with ceremonial honors on their return. Although the Indians on our northern reservations now receive it through the medium of the parcel post; yet they attribute to it the same divine properties as the ancient Mexicans and like them combine its worship with the religion they have received from Christian missionaries. It is only natural that those who are engaged in the work of Christianizing and uplifting our Indians should try, like the early Spanish missionaries, to stamp out its use. On the other hand many of the Indians who use the narcotic declare that they take it as a kind of sacrament or communion, and that it helps them..."
to turn from wickedness and lead good lives.

A knowledge of botany has been attributed to the Aztecs which they were far from possessing. Their plant names show that their classification of plants was not based upon real affinities, and it is very probable that they had not the slightest notion of the difference between a flowering plant and a fungus. Certainly they applied the names nanacatl and nanacace to both fungi and flowering plants and the name peyotl to both the narcotic cactus, Lophophora, and to the tuber-bearing composite, Cacalia. The botanical knowledge of the early Spanish writers, Sahagun, Hernandez, Ortega, and Jacinto de la Serna, was perhaps not much more extensive: their descriptions were so inadequate that even to the present day the chief narcotic of the Aztecs, Ololiuhqui, which they all mention, remains unidentified. They knew these narcotic drugs only in their dry state; and the general appearance of the peyotl brought from the vicinity of Zacatecas (fig. 3) was so very different from the teonanacatl from the more northerly region inhabited by the Chi­chimecas (fig. 1) that the two forms might easily have been regarded as coming from distinct plants.

As far as the author knows, this is the first time that the identity of the "sacred mushroom" of the Aztecs with the narcotic cactus known botanically as Lophophora williamsii has been pointed out. That it should have been mistaken by the early Spaniards for a mushroom is not surprising when one notices the remarkable resemblance of the dried buttons to peltate fungi, and also bears in mind that the common potato (Solanum tuberosum) on its introduction into Europe was popularly regarded as a kind of truffle, a fact which is recorded by its German name, Kartoffel, or Tartuffel.

H Hernandez describes two plants bearing the name Ololiuhqui: one, which is not narcotic, with a fleshy turnip-like root, leaves like those of a Physalis, and yellow flowers; the other, also called Coaxoxohqui, or "green snake," with highly narcotic seeds. (Op. cit. vol. 3, pp. 264, 241.) Hernandez describes the latter as round like those of Coriander, and says that they are produced by a twining plant called Coaxihuitl, or "snake-weed," which has fibrous roots and longish white flowers (Hern. ed. Recchi, p. 145); while Serna does not describe the plant, which he probably never saw, but compares the form of the seeds to that of lentils: "semilla a modo de lantejas que llaman Ololiuhqui." (Op., cit. p. 163.) Hernandez thought the plant might be the same as the Solanum maniacum of Dioscoreoides. Dr. Manuel Urbina, of the National Museum of Mexico, declared it to be Ipomoea sidaeofolia of Choissy; but this identification, while agreeing with Hernandez's illustration, lacks confirmation through investigation of the chemical properties and physiological action of the seeds of this species; and it is not known that any of the Convolvulaceae are narcotic, though many of the Solanaceae, which have somewhat similar flowers, are highly so. It is very strange that Mexican botanists living in the country of the Ololiuhqui have not solved the mystery of its identity.

Mulattoes in the United States

Elaborate statistics regarding the Negroes in the United States are given by the Bureau of the Census in its recently-issued bulletin 129, compiled by Dr. Joseph A. Hill. "Of the 9,827,763 Negroes enumerated in 1910, 7,777,077 were reported as 'black' and 2,050,686 as 'mulatto.' In 1850 the percentage reported as mulatto was 11.2. It had advanced but little in 1870, being only 12%, but since 1870 the proportion of mulattoes in the Negro population appears to have increased very materially, reaching 15.2% in 1890 and 20.9 in 1910. Considerable uncertainty necessarily attaches to this classification, however, since the accuracy of the distinction made depends largely upon the judgment and care of the enumerators. Moreover, the fact that the definition of the term 'mulatto' adopted at the different censuses has not been entirely uniform may affect the comparability of the figures to some degree. At the census of 1910 the instructions were to report as 'black' all persons who were 'evidently full-blood Negroes' and as 'mulatto' all other persons 'that have some proportion or perceptible trace of Negro blood.'"