Flesh of the Gods

THE RITUAL USE OF HALLUCINOGENS

EDITED BY

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Cover: Ceramic figurine of a a man inhaling intoxicating snuff from a bottle-gourd nose pipe, from a shaft-and-chamber tomb in Colima, Mexico, ca. 100 B.C.—A.D. 200. Kurt Stavenhagen Collection, Mexico City, 11'' high. Photo by Peter T. Furst.

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1

RICHARD EVANS SCHULTES

An Overview of Hallucinogens in the Western Hemisphere

> The savage in the jungle beneath a sheltering roof of leaves and the native of the storm-swept island secures through these drugs a greater intensity of life. . . . Various are the motives which induce civilized men to seek a transient sensation of pleasure. The potent influence of these substances leads us on the one hand into the darkest depths of human passion, ending in mental instability, physical misery and degeneration, and on the other to hours of ecstasy and happiness or a tranquil and meditative state of mind.
>
> —LEWIS LEWIN, 1964

> The use of hallucinogens has been described as one of the major advances of this century . . . they have had a massive impact upon psychiatry, and may produce marked changes in our society. The violent reaction for and against the hallucinogens suggests that even if these compounds are not universally understood and approved of, they will neither be forgotten nor neglected.
>
> —A. HOFFER and H. OSMOND, 1967

There can be little doubt that the second half of the twentieth century will be remembered as a time when "mind-altering," or hallucinogenic, substances came into increasing use, serious as well as frivolous, in sophisticated Western societies. Yet Western civilization's new-found ways of attaining the "mystic experience" by altering the chemical homeostasis of the body represents nothing new; for thousands of years, primitive societies the world over have used psychotomimetic plants for purposes of religious ritual, divination, or magic. Along with the current resurgence of interest in astrology, the occult, and extrasensory perception, this development in Western

society may be a temporary phenomenon, but it is nevertheless very real; here and there it recalls, at least superficially, the so-called primitive use of hallucinogenic substances. A knowledge of how primitive societies have employed these agents in their long experience with them may help us to understand their role in our own culture.

As is true in any fast-developing field of research, an extensive nomenclature has grown up for narcotics that are capable of inducing various kinds of hallucination. Lewin called them the *phantastica,* although he recognized that this term "does not cover all that I should wish to convey." These agents have also been referred to as *eidetics, hallucinogens, phantasticants, psychodelics, psychelytics, psychotica, psychoticents, psychogens, psychotomimetics, psychodysleptics,* and *schizogens.* The most widely used term in the United States is the etymologically unsound and biologically inaccurate word *psychodelic,* which, through popular usage, has now acquired secondary and tertiary meanings (e.g., "psychodelic music," "psychodelic colors," etc.). Although no single word is wholly satisfactory, I prefer the term *hallucinogen,* which applies, it seems to me, more widely and descriptively than most of the others.

Unlike psychotropic drugs that act normally only to calm or to stimulate (tranquilizers, caffeine, alcohol, etc.), the hallucinogens act on the central nervous system to bring about a dreamlike state, marked, as Hofmann has noted, by extreme alteration in the sphere of experience, in the perception of reality, changes even of space and time and in consciousness of self. They invariably induce a series of visual hallucinations, often in kaleidoscopic movement, usually in brilliant and rich colors, and frequently accompanied by auditory, tactile, olfactory, and gustatory hallucinations and a variety of concomitant sensations (synesthesia). Then there are other plants, put to special uses in primitive societies, that apparently induce only auditory hallucinations. One of the difficulties in delimiting these hallucinogens results from the often cloudy distinction in the terminology of psychologists between *hallucination* and *illusion.** In any event, I believe that Hofmann's definition of *psychotomimetic* aptly covers, for our general purposes, both *psychotomimetic* and *hallucinogen:*

> a substance which produces changes in thought, perception and mood, occurring alone or in conjunction with each other, without causing major disturbances of the autonomic nervous system—i.e., clouding of consciousness or other serious disability. High doses generally elicit hallucinations. Disorientation, memory disturbance, hyperexcitation or stupor, and even narcosis

* From the point of view of the indigenous culture, such distinctions are of course meaningless, since the drug-induced experience is regarded as neither "hallucination" nor "illusion" but as another form of reality—indeed, often the ultimate reality.—Ed.

occur only when excess dosages are administered and are, therefore, not characteristic.

The effects of many hallucinogens are so extraordinary that most of these plants early acquired an exalted place in primitive society, often becoming sacred and the object of direct worship. In almost all primitive cultures, sickness and death are believed to be due to interference from supernatural spheres. For this reason, the psychic effects of drugs are often far more important in primitive medical practice than the purely physical ones. Consequently, hallucinogens above all other plants are found to be closely connected with magic and sorcery in the treatment of disease and the struggle against death, and in related religious observances.

We now know that the divinity residing in these special plants is chemical in nature, but the ethnobotanist investigating the use of narcotics in primitive cultures must never lose sight of the native's interpretation of his "magical" or "sacred" plants. To ignore or deprecate his views may doom the most meticulously planned scientific inquiry to failure.*

Since most hallucinogens are of plant origin, the first approach to any study of these "mind-altering" substances must obviously be botanical. A sound understanding of their value and effectiveness, their toxicity or innocuousness, requires, first, evaluation of their botanical identity. Concomitantly, their chemical composition and physiological effects must be clarified before behavioral study can yield significant results.

To begin with, it should be noted that of the vast number of plant species—variously estimated at from 200,000 to 800,000—only a few have ever been utilized as hallucinogens. There are many more species with hallucinogenic properties than primitive societies have used to alter the mind. Some may not have been discovered by even the most thoroughly inquisitive man living in close association with his vegetal environment. Some may have proved too toxic for safe employment. Whatever the reason, it is interesting that, although psychoactive species are scattered widely throughout the plant kingdom, those species that are employed purposefully as hallucinogens appear to be concentrated among the fungi and the angiosperms, while the bacteria, algae, lichens, bryophytes, ferns,

* In this connection, John Harshberger, who first employed the term *ethnobotany*, wrote more than seventy years ago: "It is of importance . . . to seek out these primitive races and ascertain the plants which they have found available in their economic life, in order that perchance the valuable properties they have utilized in their wild life may fill some vacant niche in our own." Although a number of native "folk medicines" have been found to be highly effective and have been adopted by Western medicine, clearly much more remains to be done in this field.

and gymnosperms have been conspicuously poor or lacking in hallucinogenically utilized species.

Another interesting phenomenon is that for some reason the New World cultures have employed many more species of plants hallucinogenically than the Old World. The reason certainly cannot be botanical, for there is no evidence to suggest that the floras of the Eastern Hemisphere are poorer (or richer) in plants possessing hallucinogenic constituents than those of the Western half of the globe.

La Barre, in the concluding chapter of this volume, explains the interesting disparity between the two hemispheres on a cultural basis. The American Indians, he believes, basically preserved as their religion the shamanistic ideology of ancient hunting peoples, whose "epistemological touchstone for reality was direct psychic experience of the forces of nature." Substantial portions of this old shamanism survived even in societies that turned to sedentary agriculture and civilization. They sought to ensure this state of union with the natural and supernatural environment by means of psychotropic or hallucinogenic plants. In the Old World, on the other hand, the plants became progressively less important as the old shamanistic religion of the hunters became submerged and suppressed by new religious systems adapted to the demands of agricultural, feudal, and urban society, until today these formerly sacred substances are but dimly recognizable (for example, in fairy tales and folklore) as "psychedelic vehicles of divinity." That, at least in part, helps to explain the relative abundance of known botanical agents employed for ecstasy in the Americas.

Hallucinogenically active plant principles may be grouped roughly into two general sections: the *non-nitrogenous* and the *nitrogen-containing* constituents.

The nitrogen-containing compounds include the most important and the largest number of hallucinogenic agents. Most of them are alkaloids or related substances and the majority are biogenetically derived from the indolic amino acid tryptophane. They may be subdivided into several important groups: (1) β-carbolines, (2) ergolines, (3) indoles, (4) isoquinolines, (5) isoxazoles, (6) β-phenylethylamines, (7) quinolizidines, (8) tropanes, and (9) tryptamines.

The non-nitrogenous compounds are much fewer and play a lesser role, but they are the active principles in at least two well-known hallucinogens: dibenzopyrans and phenylpropenes. Other compounds, such as catechols and alcohols, may be responsible for hallucinogenic or similarly psychoactive effects in some minor and still poorly understood plants.

It must also be borne in mind that there are hallucinogenic plants utilized in primitive societies which have not yet been identified botanically and that there are others, botanically known, for which we have no knowledge concerning the chemical identity of the active principle.

The major New World hallucinogens may be discussed according to a botanical, chemical, ethnological, or geographical classification. For the present purpose, it may be most advantageous to group them together under plant families arranged in strict alphabetic order without consideration of their phylogenetic relationships.

AGARICACEAE (AGARIC FAMILY)

Conocybe, Panaeolus, Psilocybe, Stropharia

The Spanish conquerors of Mexico found the Indians practicing several religious cults in which deities were worshiped with the aid of hallucinogenic plants. One of the most important—and to the Spaniards perhaps the most loathsome—was the cult of *teonanacatl,* the Nahuatl name for mushrooms, meaning "flesh of the gods." There is no doubt that the mushrooms were used or about how they were employed, since the Spanish chroniclers railed against this pagan ritual vehemently and frequently. To the Indian mind, nothing that Christianity offered was comparable to this revered form of plant life, with its hallucinatory powers, so the mushrooms represented a great obstacle to the spread of the newly arrived European religion.

The mushroom cult appears to have deep roots in native tradition. Frescoes have been found in central Mexico dating back to *ca.* A.D. 300 with designs that seem to put mushroom worship in this part of Mesoamerica back at least that far. Much more ancient—at least as far back as 300–500 B.C.—are the remarkable archaeological artifacts now known as "mushroom stones" that have been unearthed in considerable numbers from Late Formative sites in highland Guatemala and southeastern Mexico. Some types may date even to 1000 B.C. These effigies comprise an upright stem with a manlike or animal face (often that of the jaguar), crowned with an umbrella-shaped top.

One of the first European reports of the sacred Mexican mushrooms —in the monumental *Historia de las cosas de Nueva España,* also known as the Florentine Codex, by Fray Bernardino de Sahagún, a Spanish cleric who wrote between 1547 and 1569—refers to *nanacatl* in several places. According to Sahagún, there are mushrooms "which are harmful and intoxicate like wine" so that those who eat them "see visions, feel a faintness of heart and are provoked to lust." The natives ate the mushrooms with honey, and when

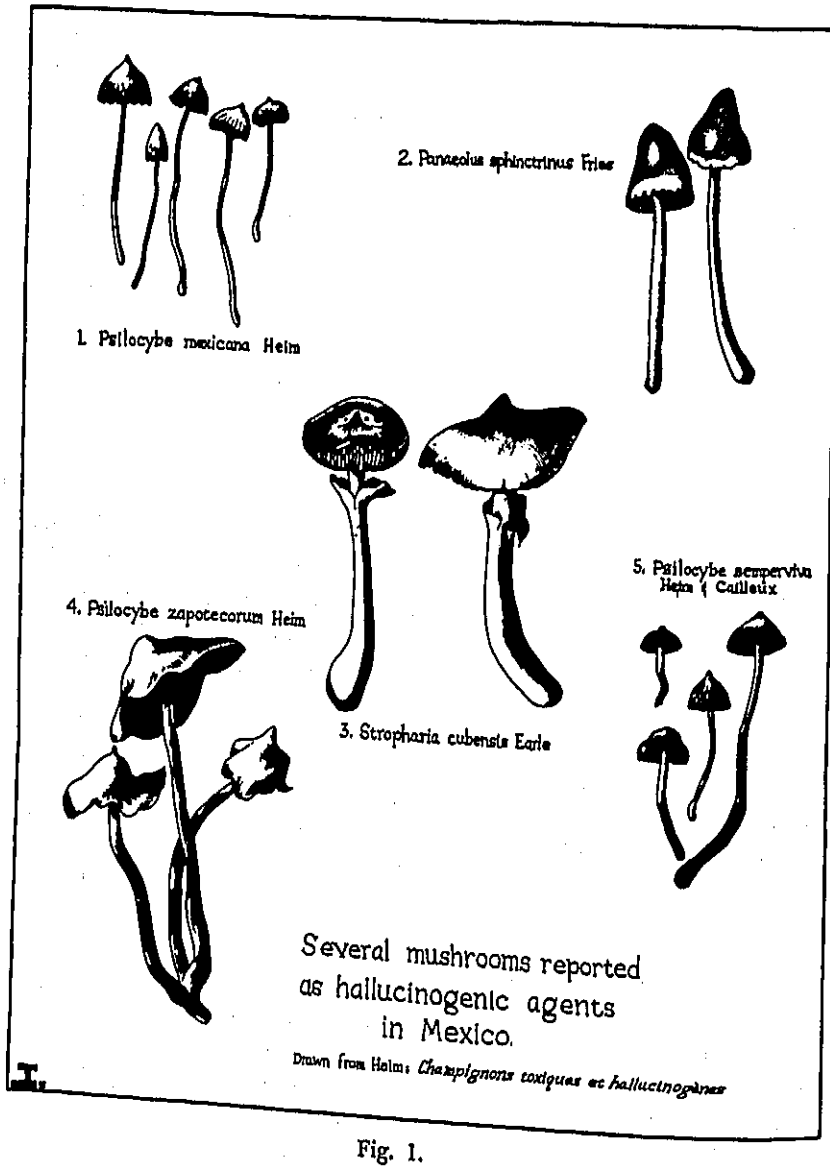


Fig. 1.

. . . they begin to be excited by them, start dancing, singing, weeping. Some do not want to eat but sit down . . . and see themselves dying in a vision; others see themselves being eaten by a wild beast, others imagine that they are capturing prisoners of war, that they are rich, that they possess many slaves, that they had committed adultery and were to have their heads crushed for the offense . . . and when the intoxication has passed, they talk over amongst themselves the visions which they have seen.

Several reports from the early years after the Conquest tell of the deep importance of the intoxicating mushrooms to Mexican religion and life. For example, these sacred fungi were served at the coronation feast of Moctezuma in 1502. That the use of the hallucinogenic mushrooms survived all attempts by the Spanish friars to suppress the indigenous cults is clear from the writings of such seventeenth-century clerics as Jacinto de la Serna, Hernando Ruíz de Alarcón, and others, who composed long treatises deploring the use of mushrooms and other hallucinogenic plants in pagan rites and "idolatries."

By far the most trustworthy early record of hallucinogenic mushrooms is that of Dr. Francisco Hernández (1651), physician to the King of Spain, who spent a number of years in the field studying the medicinal lore of the Mexican Indians. He wrote of three kinds of intoxicating mushrooms that were worshiped. Those known as *teyhuintli,* he reported, caused

> not death but a madness that on occasion is lasting, of which the symptom is a kind of uncontrolled laughter . . . these are deep yellow, acrid, and of a not displeasing freshness. There are others again which, without inducing laughter, bring before the eye all sorts of things, such as wars and the likeness of demons. Yet others there are not less desired by princes for their festivals and banquets, and these fetch a high price. With night-long vigils are they sought, awesome and terrifying. This kind is tawny and somewhat acrid.

Notwithstanding these very specific historical references, no mushrooms utilized as a hallucinogen in magico-religious rites were found and identified botanically in the first four centuries after the Conquest of Mexico. In 1915, Safford suggested that *teonanacatl* was actually not a mushroom at all but the peyote cactus. A dried mushroom and a dried peyote, the argument went, shriveled up and looked alike. It was presumed that the botanical knowledge of both Indians and Spanish chroniclers—including a medical doctor fully trained in botany—was deficient, and that the natives had misled the Spaniards.

This "identification" was widely accepted, despite several objections that *teonanacatl* was a dung-fungus still revered by the Indians of Oaxaca. Actual specimens associated with divinatory rites were collected in the late 1930's, first by Roberto Weitlaner and later by B. P. Reko and myself. These proved to be *Panaeolus sphinctrinus.* Another mushroom that I collected as hallucinogenic was later identified and reported as *Stropharia cubensis.* Both were found in use among the Mazatec of northeastern Oaxaca.

Later intensive studies by well-qualified teams of specialists, especially

the Wassons, Heim, Singer, and Guzmán, have uncovered the use, mainly in Oaxaca, of a number of species of *Psilocybe, Conocybe,* and *Stropharia.* Species of *Psilocybe* and *Stropharia* are the most important, and the most significant of the many hallucinogenic species are apparently *Psilocybe mexicana, P. caerulescens* var. *mazatecorum, P. caerulescens* var. *nigripes, P. yungensis, P. mixaeensis, P. Hoogshagenii, P. aztecorum, P. muriercula,* and *Stropharia cubensis.* Recent investigators have failed to find *Panaeolus sphinctrinus* employed, but it must be remembered not only that different practitioners of the cult of the sacred mushroom have their own favorite species but that they tend to vary the species they use according to seasonal availability and the precise purpose for which the narcotic is to be taken.

Psilocybe mexicana is probably the most important species utilized hallucinogenically in Mexico. It is a small, tawny inhabitant of wet pastures. *Psilocybe aztecorum,* of lesser importance, is known by the Indians as "child of the waters." *Psilocybe zapotecorum,* found in marshy ground, is called "crown of thorn"; *P. caerulescens* var. *mazatecorum* is called "landslide" mushroom; and *P. caerulescens* var. *nigripes* has a native epithet meaning "mushroom of superior reason." The strongest species hallucinogenically appears to be *Stropharia cubensis.*

Field work has now established the hallucinogenic use of mushrooms in divinatory and other magico-religious ceremonies in at least nine tribes of modern Mexico, probably centered among the Mazatecs in northeastern Oaxaca. Among the Mazatecs, the mushroom ritual comprises an all-night ceremony with prayers and long repetitive chants incorporating ancient pagan and Christian elements. The shaman is often a woman. There is not infrequently an elaborate curing ritual during the ceremony.

The phytochemistry of the sacred mushrooms has been of extraordinary significance. A white crystalline substance, psilocybine, isolated from several species and proved to be highly active as a hallucinogen, is an acidic phosphoric acid ester of 4-hydroxydimethyltryptamine. An unstable derivative, psilocine, is usually also present in trace amounts. Allied to other naturally occurring organic compounds such as bufotenine and serotonine, psilocybine has greatly interested biochemists because it is the first compound of this curious structure that has been found in plant tissue. Psilocybine, a hydroxy indole alkylamine with a phosphoric acid radical, is probably biogenetically derived from tryptophane. Psilocybine has been isolated from a number of species of *Psilocybe* as well as from *Conocybe, Panaeolus,* and *Stropharia.* These constituents have also been found in several North American and European species of mushrooms that are not employed for narcotic purposes.

Aside from the hallucinogenic effects of the psilocybine-containing mushrooms of Mexico, the most obvious symptoms of the intoxication are muscular relaxation, flaccidity, and dilation of the pupil of the eye, followed by emotional disturbances such as extreme hilarity and difficulty in concentration. Auditory as well as visual hallucinations appear at this period, eventually followed by lassitude, mental and physical depression, and serious alteration of time perception. The subject, without a loss of consciousness, is rendered completely indifferent to his environment, which becomes unreal to him as his dreamlike state becomes real.

Early missionaries to Amazonian Peru reported a "tree fungus" as the source of an intoxicating beverage of the Yurimagua Indians. No evidence exists that mushrooms are employed hallucinogenically in South America at the present time, but *Psilocybe yungensis,* a species which is known to contain hallucinatory principles and which has been found in the region, has been suggested as the possible identification of this elusive narcotic.

Cactaceae (Cactus Family)

Ariocarpus, Epithelantha, Lophophora, Neoraimondia, Pachycereus, Trichocereus

Since the Cactus family offers some of the most bizarre shapes and forms that evolution has produced in the plant kingdom, it is perhaps understandable that some of the species have become closely connected with native beliefs and ritual practices. But this interesting family contains in the tissues of a number of its species unusual psychoactive constituents even more attractive than outer form to medicinal, religious, and magical aspects of native culture. Undoubtedly the most important of these species is *Lophophora Williamsii,* the peyote cactus.*

Peyote was first fully described by Hernández (1651), who called it *Peyotl zacatecensis:*

> The root is nearly medium size, sending forth no branches or leaves above the ground, but with a certain woolliness adhering to it on account of which it could not be aptly figured by me. . . . It appears to have a sweetish and moderately hot taste. Ground up and applied to painful joints, it is said to give relief. . . . This root . . . causes those devouring it to foresee and predict things . . . or to discern who has stolen from them some utensil or anything else; and other things of like nature. . . . On which account, this root scarcely issues forth, as if it did not wish to harm those who discover it and eat it.

Sahagún, the first European to discuss peyote seriously, suggested that

* See Peter T. Furst, below.

the Toltecas and Chichimecas had employed it for many hundreds of years and that it was a "common food of the Chichimecas," who used it to give them courage to fight and enable them to transcend thirst, hunger, and fear; it was thought to protect them from all danger, and those who ingested it saw "visions either frightful or laughable."

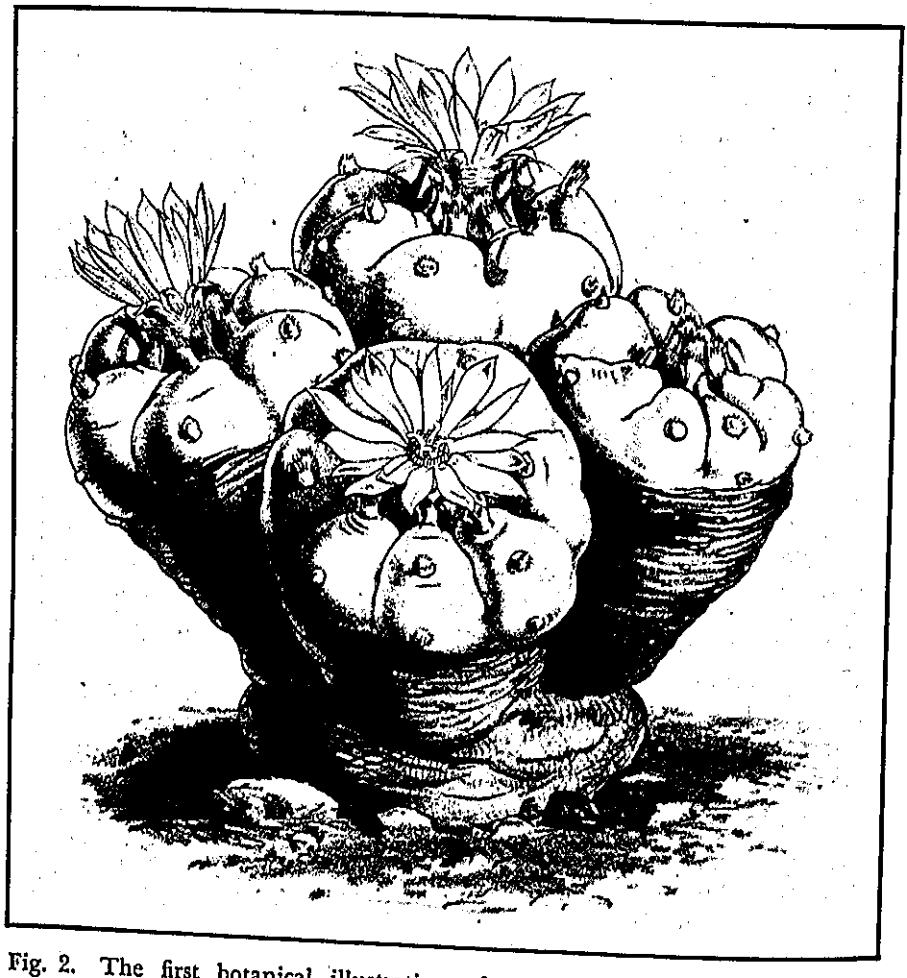


Fig. 2. The first botanical illustration of peyote (*Lophophora Williamsii*), published as *Echinocactus Williamsii*. From *Botanical* Magazine, LXXIII (1847), t. 4296.

In spite of the virulence of early Spanish attempts to stamp out the pagan religion in which peyote figured so prominently, the sacred cactus ritual survived in more or less pure form in the more remote deserts and mountains, while elsewhere it came to be intertwined with Christian

ritual and belief. So strongly entrenched in aboriginal thought was this sacred cactus that even certain Christianized Indians of Mexico held that a patron saint—El Santo Niño de Peyotl—used to appear among the plants on the hillsides, a belief that still survives in Mexican folklore. As early as 1591 a chronicler denounced peyote as "satanic trickery." All through the seventeenth century and into the eighteenth, ecclesiastical opposition raged furiously. An eighteenth-century description referred to the cactus as the "diabolic root." In 1720, peyote was prohibited throughout Mexico, and all Indians within reach of the law and church were forced to practice their rituals in secret. The ecclesiastics went so far as to incorporate in a religious manual of 1760 questions in the form of a catechism that equated the eating of peyote with cannibalism! Today the use of peyote by the Huichol, Cora, Tarahumara, and other Indians in their religious ceremonies is no longer illegal; indeed, peyote is freely available in Mexican herb markets as a valued medicinal plant.

The earliest undoubted record of the use of peyote in what is now the territory of the United States dates from 1760 in Texas. The cactus was certainly known to American Indians during the Civil War, but it did not come strongly to public attention until about 1880, when the Kiowa and Comanche tribes began actively to practice and spread a new kind of peyote ceremony, quite different from the peyote rituals of the tribes of northwestern Mexico.

The exact route of the introduction of the peyote religion* from Mexico into the United States is not known, and there may have been several routes at different periods. Raids into the Mescalero country may have been the principal method of acquainting Plains Indians with the plant and its cult. Slow and gradual diffusion northward almost certainly took place as well. At any rate, the cult was well established among the Kiowas and Comanches between 1880 and 1885 and was being spread with missionary zeal. By the late 1920's, the cult had been forced, by the strong hostility and outright untruthful propaganda of many organized Christian missionary groups, to incorporate itself into the Native American Church—a legally constituted religious sect due the protection and respect enjoyed by any other religious group. In 1920 there were some 13,300 adherents in about thirty tribes. At present, an estimated 250,000 Indians in tribes as far north as Saskatchewan, Canada, practice this religion, which advocates brotherly love, high moral principle, abstention from alcohol, and other admirable teachings.

There is still disagreement about the reasons peyote use spread so fast,

* *Cf.* La Barre, 1938, 1969; Aberle, 1966.

edging out other well-established Indian "nativistic" movements, such as the famous Ghost Dance.* According to Slotkin (1956) an anthropologist who himself became an adherent of the peyote church,

> The Peyote Religion was nativistic but not militant. Culturally, it permitted the Indians to achieve a cultural organization in which they took pride. Socially, it provided a supernatural means of accommodation to the existing domination-subordination relation. . . . The Peyote Religion's program of accommodation, as opposed to the Ghost Dance's program of opposition, was the basic reason for the former's success and the latter's failure.

The fact that it could induce visual hallucinations undoubtedly contributed to the rapid spread of peyote through the culture of the Plains region.† However, the awe and respect in which the Indians of Mexico and the United States have long held this cactus as supernatural medicine and stimulant—quite apart from its vision-inducing qualities—have probably not been sufficiently appreciated.

The tribes of northern Mexico have long ascribed divine origin to peyote. According to the Tarahumara, when Father Sun departed from earth to dwell on high, he left peyote behind to cure all man's ills and woes. Its medicinal powers were so great—and its psychoactive effects, of course, are to the Indians the epitome of "medicinal power"—that it was considered a vegetal incarnation of a deity. The legends of its effectiveness as a supernatural medicine have kept peyote from being used hedonistically as a narcotic and have helped to maintain its exalted role as a near-divinity—a place it holds to this day, even among highly acculturated Indian groups in the United States.

In the United States, the Kiowa-Comanche peyote ceremony established during the last century is still followed today, with minor alterations. It usually consists of an all-night meeting with the worshipers sitting in a circle around a peyote altar, led in prayer, chants, and meditation by a "road man." The meeting ends in the morning with a

* The Ghost Dance religion, which first arose in 1870 among the Indians of the Western Plains, and which ended in 1890 in the tragic massacre of 300 unarmed Sioux at Wounded Knee Creek, was based on the vision . . . that a great mass of mud and water would soon roll over the earth, destroying the white men and all their gear. The Indians should dance the old round dance and, as they danced, the flood would roll over them. When it was over, the earth would be green again, animals and plants would be as in the old days, and the ancestral dead would come back (Underhill, 1965). See also La Barre, *The Ghost Dance* (1970).—Ed.

† Among North American Indians, especially hunting and gathering tribes, not only shamans but also ordinary men had the capacity to experience visions and obtain the aid of supernatural spirits. This could be achieved only through a strenuous "vision quest," involving fasting, thirsting, purification, exposure—even self-mutilation and torture. "The result would be a trance or a vivid dream in which the visionary made contact with his future guardian spirit and perhaps even received some visible token to prove the fact" (Underhill, 1965).—Ed.

communal meal. This contrasts strongly with the ancient ritual still practiced in northern Mexico, usually a longer ceremony of which dancing is a major part.

North of Mexico, it is usually the dried, discoidal top or crown of the cactus—the "mescal button"—that is chewed and swallowed during the ceremony. In Mexico, the plants are still more or less ceremonially collected where they grow. In many parts of the United States, the Indian peyotists have to purchase the buttons, which, since they are well-nigh indestructible, can be shipped long distances and stored indefinitely.

Lophophora Williamsii represents a veritable factory of alkaloids. More than thirty alkaloids and their amine derivatives—many of them, to be sure, in minute concentrations—have been isolated from the plant. Although most, if not all, of them are in some way or other biodynamically active, their effects are not well understood. They belong mainly to the phenylethylamine and biogenetically related simple isoquinolines. The phenylethylamine mescaline is the vision-inducing alkaloid, and experimental psychology has found mescaline to be of extreme interest as a tool. Other alkaloids are undoubtedly responsible for the tactile, auditory, and occasionally other hallucinations of the peyote intoxication.

Peyote intoxication, among the most complex and variable effects of all hallucinogenic plants, is characterized by brilliantly colored visions in kaleidoscopic movement, often accompanied by auditory, gustatory, olfactory, and tactile hallucinations. Sensations of weightlessness, macroscopia, depersonalization, and alteration or loss of time perception are normally experienced.

There are very real differences between peyote intoxication and mescaline intoxication. Among aboriginal users, it is the fresh or dried head of the cactus, with its total alkaloid content, that is ingested; mescaline is ingested only experimentally and then produces the effects of but one of the alkaloids, without the physiological interaction of the others that are present in the crude plant material. As a consequence, descriptions of the visual hallucinations of mescaline found in such writings as those of Aldous Huxley should not be equated too closely with the visual effects experienced by Indian peyotists.

Doses vary greatly among Indian users, who may ingest anywhere from four mescal buttons to more than thirty. Peyote intoxication characteristically has two phases: a period of contentment and hypersensitivity followed by calm and muscular sluggishness, often accompanied by hypercerebrality and colored visions. Before visual hallucinations appear, usually within three hours after ingestion of the drug, the subject sees flashes of color across the field of vision, the depth and saturation of the colors (which always precede the visions) defying description.

There seems to be a sequence frequently followed in the visions: from geometric figures to familiar scenes and faces to unfamiliar scenes and faces and in some cases objects. The literature is rich in detailed descriptions of visual hallucinations from both peyote and mescaline intoxication, and they provide a wealth of data for psychological and psychiatric research.

Although the visual hallucinations are important in native peyote cults, peyote, as we have said, is revered in large part because of its usefulness as a "medicine." Its medicinal powers, in turn, derive from its ability, through the visions, to put a man into contact with the spirit world, from which, according to aboriginal belief, come illness and even death, and to which the medicine men turn for their diagnoses.

The magico-therapeutic powers of *Lophophora Williamsii* have such wide repute in Mexico that many plants have been confused with or related to it by vernacular terms. They are not all in the cactus family, although a number of cactus species in seven genera, popularly classed as peyotes, are related to *Lophophora* in folklore and folk medicine: *Ariocarpus, Astrophytum, Aztekium, Dolichothele, Obregonia, Pelecyphora,* and *Solisia.* They may have similar toxic effects, may superficially resemble *Lophophora,* or may be used together with *Lophophora.* Non-cactaceous plants similarly associated by name or folk use with *Lophophora* belong to genera in the Compositae, Orchidaceae, Solanaceae, Crassulaceae, and Leguminosae.

In this connection, it should be pointed out that in northern Mexico Indians have valued other cactus species, variously equating them with peyote. The Tarahumara, for example, esteem several of them very highly. According to Lumholtz (1902),

> . . . high mental qualities are ascribed especially to all species of *Mammillaria* and *Echinocactus,* small cacti, for which a regular cult is instituted. The Tarahumara designate several as *hikuli,* though the name belongs properly only to the kind most commonly used by them. These plants live for months after they have been rooted up, and the eating of them causes a state of ecstasy. They are, therefore, considered demi-gods who have to be treated with great reverence. . . . The principal kinds thus distinguished are known to science as *Lophophora Williamsii* and *Lophophora Williamsii* var. *Lewinii* . . . The Tarahumara speak of them as the superior hikuli *(hikuli wanamé)* or simply hikuli, they being hikuli *par excellence.* . . . Besides hikuli wanamé . . . the Tarahumara know and worship the following varieties: (i) Mulato *(Mammillaria micromeris)* [now known as *Epithelantha micromeris*]. This is believed to make the eyes large and clear to see sorcerers, to prolong life and to give speed to runners. (ii) *Rosparia.* This is only a more advanced vegetative stage of the preceding species—though it looks quite different, being white and spiny. . . . (iii) *Sunami (Mammillaria fissurata)* [now known as *Ariocarpus fissuratus*]. It is rare, but it is believed to be even

> more powerful than wanamé and is used in the same way as the latter; the drink produced from it is also strongly intoxicating. Robbers are powerless to steal anything where Sunami calls soldiers to its aid. (iv) *Hikuli walula saeliami.* This is the greatest of all, and the name means "hikuli great authority." It is extremely rare among the Tarahumaras, . . . growing in clusters of from eight to twelve inches in diameter . . . with young ones around it. All these various species are considered good, as coming from Tata Dios and well disposed toward the people. But there are some kinds of hikuli believed to come from the Devil. One of these, with long white spines, is called *ocoyome.* It is very rarely used, and only for evil purposes. If anyone should happen to touch it with the foot, it would cause the offending leg to break.

Even in the modern Tarahumara culture, narcotic cacti play a role in festivals: hikuri, *Lophophora Williamsii;* peyote cimarrón, *Ariocarpus fissuratus;* and *Epithelantha micromeris.* All these species grow far from present-day Tarahumara country. Another cactus—čawé *(Pachycereus pecten-aboriginum)*—is still found in territory inhabited by the Tarahumara and is employed by them as a narcotic. Several of these Tarahumara narcotic cacti contain alkaloids capable of inducing visual hallucinations.

Certain species of the tall columnar cactus plants of the high and dry Andes in South America are likewise known to contain alkaloids, including, especially, mescaline. It is, therefore, not suprising that Peruvian Indians have discovered the vision-inducing properties of *Trichocereus* and prepare a hallucinogenic drink from *T. Pachanoi,* known locally as *San Pedro,** which mestizo *curanderos,* or curers, administer to their patients or ingest themselves for purposes of diagnosis, divination, and confrontation with the hostile spirits causing the illness. It also enters an intoxicating drink called *cimora,* which is said to contain extracts of another cactus, the tall, columnar *Neoraimonda macrostibas,* as well as *Isotoma longiflora* (Campanulaceae), *Pedilanthus titimoloides* (Euphorbiaceae), and a species of *Datura* (Solanaceae). Several of these admixtures are alkaloidal and may themselves contain hallucinogenic constituents.

Convolvulaceae (Morning-glory Family)

Ipomoea, Rivea

One of the most important sacred hallucinogens among Mexican Indians at the time of the Conquest was *ololiuqui,* the small, round, lentil-like seed of a vine with cordate leaves known in the Nahuatl language as *coaxihuitl,* or "snake plant." Persecution by ecclesiastical

* See Dougles Sharon, below.

Fig. 8.

authorities drove it into the hinterlands, where its hallucinogenic use still persists. Still, although it represents one of the major Mexican divinatory plants to this day, it is perhaps one of the least well known; until recently, even its identity was in doubt.

Sahagún enumerated three plants called *ololiuqui*, one of which was an "herb called *coatl-xoxouhqui* (green snake plant), [which] bears a seed called ololiuqui." Another early account, dated 1629, reported that "when it is drunk, this seed deprives of his senses him who has taken it, for it is very powerful." Yet another reads that

> these seeds . . . are held in great veneration. . . . They place offerings to the seeds . . . in secret places so that the offerings cannot be found if a search be made. They also place these seeds among the idols of their ancestors. . . . They do not wish to offend ololiuqui with demonstrations before the judges [of the Inquisition] of the use of the seeds and with public destruction of the seed by burning.

The most reliable discussions of the hallucinogenic effects and uses of ololiuqui appear to be those of Hernández, who, after describing in great detail its many presumed medicinal virtues, stated that

> . . . when the priests wanted to commune with their gods and to receive messages from them, they ate this plant to induce a delirium. A thousand visions and satanic hallucinations appeared to them.

Christian persecution drove the native cult of ololiuqui into hiding, and corroboration of the identity of the plant waited for more than 400 years. All evidence from the literature and several early drawings, especially the excellent illustrations provided by Hernández, indicate that the plant must be a morning-glory.

In Mexico, the attribution of ololiuqui to the Convolvulaceae was rather generally accepted as early as 1854. Urbina identified it as *Ipomoea sidaefolia* (*Rivea corymbosa*) some seventy years ago. In 1919, B. P. Reko defined *ololuc* as the round lentil-like seed of *Rivea corymbosa* and, in 1934, published a historical review of the use of ololiuqui. Narcotic seeds which he sent to Safford were determined as representing this convolvulaceous species.

It was apparently Hartwich who, in 1911, first stated that ololiuqui might be a member of the Solanaceae, a suggestion supported by Safford in 1915, when he mistakenly identified ololiuqui as *Datura meteloides*. His identification, still widely accepted, was based on several arguments. Many Indian groups in Mexico use *Datura* as a hallucinogen, but, although this genus certainly was well provided with psychoactive compounds, no convolvulaceous genus was known to possess any principles affecting the central nervous system. The flowers of the morning-glories were tubular and superficially resembled those of *Datura*, and

the Indians could easily have misled the early Spanish writers by substituting the former for the latter—at least that was the theory. Furthermore, the symptoms described for ololiuqui intoxication coincided well with those known for *Datura* intoxication. Underlying Safford's arguments was his belief that

> . . . a knowledge of botany has been attributed to the Aztecs which they were far from possessing. . . . The botanical knowledge of the early Spanish writers . . . was perhaps not much more extensive: their descriptions were so inadequate that, even to the present day, the chief narcotic of the Aztecs, *ololiuchqui*, which they all mention, remains unidentified.

Unjustified as was Safford's lack of faith in the botanical knowledge of the Aztecs and of such early writers as Hernández, it was probably very influential in his dismissal of the Convolvulaceae as a source of ololiuqui.

It was only in 1939 that unquestionably identifiable voucher specimens of *Rivea corymbosa* were collected. In northeastern Oaxaca, Reko and I encountered a cultivated plant in the dooryard of a Zapotec *curandero* who employed the seeds in his divinatory rituals. I reported these seeds from several other tribes of Oaxaca: Chinantecs, Mazatecs, Mixtecs, and sundry groups of Zapotecs. In 1941, I published a summary of what was then known of ololiuqui and *Rivea corymbosa*, and the identification of the ancient and modern hallucinogen appeared finally to have been clarified.

The notion that the Convolvulaceae as a family is devoid of intoxicating principles was dispelled in 1937, when Santesson reported psychoactive substances in the seeds of *Rivea corymbosa*. He was not able to investigate thoroughly the nature of the active constituent, but he suggested that it might be a glycoside linked with an alkaloid. His pharmacological experiments indicated that an extract induced in animals a "partial deadening of the mind, a kind of semi-narcosis."

There was little interest in *Rivea corymbosa* as a hallucinogen until 1955, when a psychiatrist, Humphrey Osmond, first described an intoxication from seeds of this morning-glory. Chemists immediately became interested, but no psychoactive constituents were isolated until Hofmann, discoverer of the most powerful hallucinogen known, lysergic acid diethylamide (LSD 25), announced to the unbelieving scientific world that the seeds contained lysergic acid derivatives. It was difficult to accept such a discovery at first, since this class of compounds—in fact, some of the very compounds that Hofmann attributed to this morning-glory—were known in the plant kingdom only from the entirely unrelated genus of lower fungi *Claviceps*, the ergot parasite of rye and other grasses. Chemotaxonomically, such an occurrence would be highly unlikely. Furthermore, it was early suspected that the spores

of the fungus had invaded tissues of the morning-glory. Later chemical analyses and pathological studies of the morning-glory seeds, however, fully substantiated Hofmann's work.

The principal psychotomimetic compound is ergine or *d*-lysergic acid amide. There is an alkaloid of secondary importance, isoergine or *d*-isolysergic acid amide. Several other ergoline alkaloids are present but seem not to be psychoactive. According to Hofmann (1966), in tests which he and a laboratory assistant conducted on themselves, two milligrams of an indolic extract from the seeds of *Rivea corymbosa* sufficed to bring about "clear-cut psychic effects: a dream-like state resulted with drowsiness and alteration in the perception of objects and colors. This showed that the indole fraction of the *Rivea* extract contained the psychic active principle."

The classification and botanical nomenclature of the Convolvulaceae are confused. *Rivea corymbosa* has many synonyms. *Ipomoea sidaefolia* and *Turbina corymbosa* are frequently employed. Since *Rivea corymbosa* has become firmly established in the literature, however, it would seem wise to continue using it until a thorough study of this family of plants determines more clearly which binomial should be adopted.

A second vital step in the story of the sacred Mexican morning-glories was made in 1960, when MacDougall published his report of the hallucinogenic use of the seeds of *Ipomoea violacea* among the Zapotecs of Oaxaca. This species is sometimes known—especially in horticultural circles—as *Ipomoea tricolor*. Parsons first reported from Zapotecs of Mitla, Oaxaca, the use of *badoh negro*, and I originally thought that this was also referable to *Rivea corymbosa*. The seeds of the two species are quite different, however, although they are employed for the same purpose: *Rivea corymbosa* seeds are brown and round; those of *Ipomoea violacea* are black, long, and angular. Furthermore, it appeared that the seeds of the latter morning-glory were more potent than those of the former.

Chemical studies of *Ipomoea violacea* indeed confirm ethnobotanical suspicions about the potency of the seeds. *Ipomoea violacea* contains the same or similar psychoactive lysergic acid derivatives, but the psychotomimetic alkaloids are present in heavier concentrations.

Wasson has suggested that *Ipomoea violacea* may be the elusive Aztec narcotic mentioned in the chronicles as *tlitliltzin*, a Nahuatl term derived from the word for "black," with a reverential suffix. An early chronicler, for example, spoke of "ololiuqui, peyotl, and tlitliltzin," ascribing similar properties to them.

To sum up, then, until very recently—the 1950's—no intoxicating principles were known in the Morning-glory family. Now, thanks to preliminary phytochemical surveys, we realize that indole derivatives

Fig. 4*a*.

Fig. 4*b*. Capsules and seeds of *Rivea Corymbosa*.

are not uncommon in *Argyreia, Convolvulus, Ipomoea,* and *Stictocardia* and that they will probably be found elsewhere in the Convolvulaceae.

Labiatae (Mint Family)

Salvia

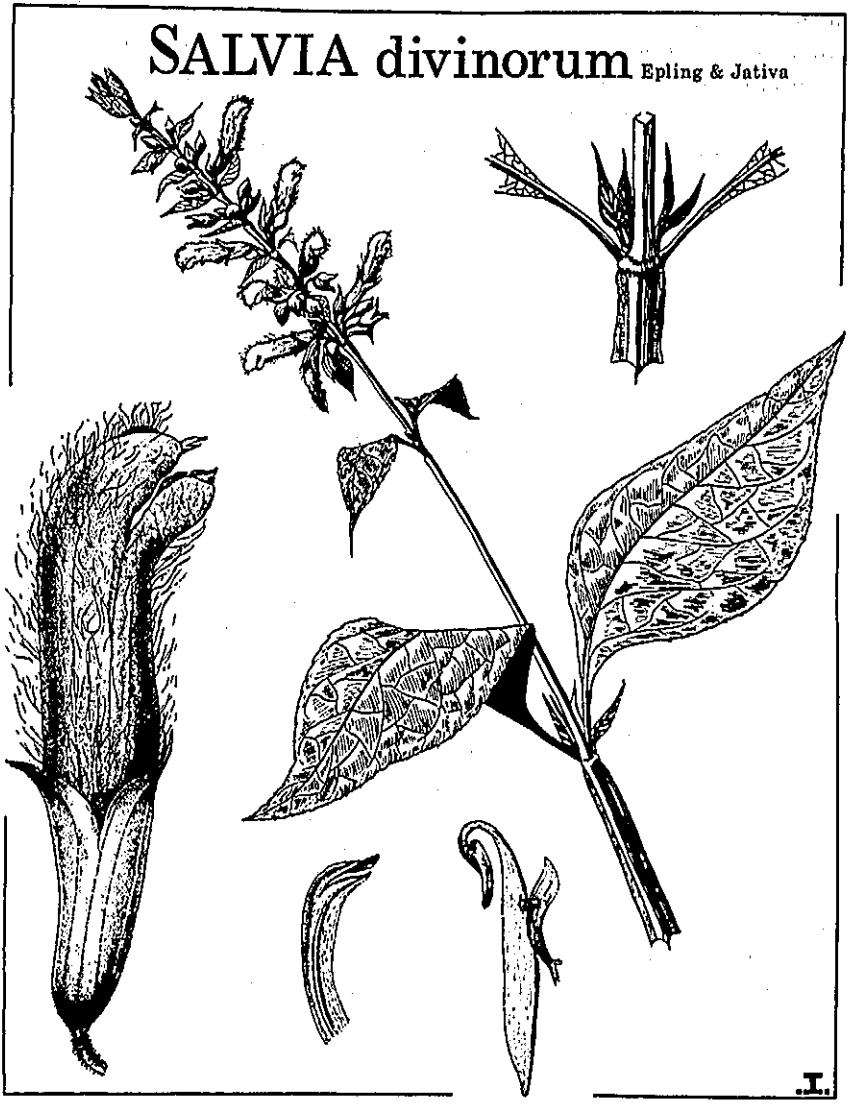
Until recently, no mints have been known to be employed as sacred hallucinogens in the New World, even though such use should not have come as a surprise. The family is rich in essential oils of complex composition, some components of which are thought to have psychoactive properties.

An interesting *Salvia* was reported as a hallucinogen of the Mazatec Indians of Oaxaca by Wasson in 1962. It was a new species, named *Salvia divinorum* because of its use by shamans and curers practicing divination. The plant has psychotomimetic effects that resemble those

of the mushroom but are of shorter duration and not so striking. Kaleidoscopic movement and three-dimensional designs characterize the intoxication induced by the ingestion of the juice of sixty-eight leaves. To date, however, no hallucinogenic principle has been isolated.

The plant is familiar to all Mazatec Indians. Many, if not most, families grow a supply. The plants are vegetatively reproduced from a shoot inserted into wet ground. The natives usually choose isolated mountain ravines for planting it, far from daily occupations. *Salvia divinorum* does not often flower, and seeds are unknown—an indication

Fig. 5.



that it may possibly represent a cultigen of considerable age which perhaps no longer occurs in a wild state.

The Mazatecs call *Salvia divinorum hojas de la Pastora* ("leaves of the Shepherdess") or *hojas de María Pastora* ("leaves of Mary the Shepherdess") in Spanish, or *ska-Pastora* in Mazatec-Spanish.

Wasson has suggested that *Salvia divinorum* may represent an ancient Aztec narcotic known by the Nahuatl name *pipilzintzintli*. This species may also represent the "magic plant" reported by B. P. Reko in 1945, "whose leaves produce visions and which the Cuicatecs and Mazatecs call 'divination leaf'." Furthermore, it is probably the plant reported by Weitlaner as *yerba María*, collected only after the native medicine man kneels and prays to it, and employed in medical divination in northeastern Oaxaca.

In Oaxaca, *Salvia divinorum* seems to be utilized only when supplies of the mushrooms and morning-glory seeds are short. The Indians may chew the leaves fresh but more commonly crush them in a metate, dilute the plant materials in water, and strain the mixture. Formerly, according to native informants, the whole plant was employed, but the Mazatec now prefer only the leaves.

Leguminosae (Pea Family)

Anadenanthera, Mimosa, Sophora

The Leguminosae are one of the most alkaloid-rich families of plants and consequently the potential source of a number of potent hallucinogens. Thus it is surprising that man has not found and bent to his magical uses more of the leguminous species.

One of the most famous of the New World hallucinogens is the snuff prepared from a tree of northern South America called *Anadenanthera peregrina* or *Piptadenia peregrina*. This potent snuff was so widely known in anthropological circles that until recently almost all narcotic snuffs of South America were attributed to this tree, even in regions where the species does not occur.

Probably the earliest report of snuff prepared from *Anadenanthera peregrina* dates from 1496, when Europeans first saw it in use among the Taino Indians of Hispaniola. Friar Ramón Pané, commissioned by Columbus "to collect all ceremonies and antiquities," wrote in detail concerning this drug and its place in Indian society. His reports were first published in 1511 in Martyr's compilations about the New World. "This *kohobba* powder," which Martyr described as "an intoxicating herb," "is so strong that those who take it lose consciousness; when the stupefying action begins to wane, the arms and legs become loose and the head droops." Taking it with a cane about a foot long, they "put

one end in the nose and the other in the powder and . . . draw it into themselves through the nose." Its action was rapid, for "almost immediately, they believe they see the room turn upside-down and men walking with their heads downwards." The "sorcerer" took the drug with his patients, and it "intoxicates them so that they do not know what to do and . . . speak of many things incoherently," believing all the time that they are in communication with spirits.

Snuff from *Anadenanthera* is apparently no longer employed in the Antilles, where, of course, few aboriginal groups still exist. In 1916, Safford, noting the similarities between the current use of yopo snuff in the Orinoco and the reported effects of cohoba, identified the cohoba as *Anadenanthera peregrina*. Up to that time, there had been much confusion in the literature, and the snuff called *cohoba* was commonly

Fig. 6. *Anadenanthera perigrina*. Bôa Vista, Brazil.

considered to have been tobacco. Years earlier, however, in 1898, Uhle had concluded that "the extreme strength of the powder described by Petrus Martyr, exceeding that of tobacco, decides its different nature and its *Piptadenia* character."

The center of the use of *Anadenanthera* snuff is, and probably always has been, the Orinoco basin, where it is widely known as *yopo*. The West Indian tribes are generally thought to have been invaders from northern South America. If this is true, then the snuffing of *Anadenanthera* powder in the West Indies could be regarded as a culture trait imported from South America. *Anadenanthera peregrina* occurs wild—that is, free from any hint of present or past cultivation—only in South America.

An early report of yopo among the Otomac Indians of the Orinoco basin is found in Gumilla's famous *El Orinoco Ilustrado*, first published in 1741:

> They have another most evil habit of intoxicating themselves through the nostrils, with certain malignant powders which they call *yupa*, which quite takes away their reason, and furious, they grasp their weapons. . . . They prepare this powder from certain pods of the *yupa* . . . but the powder itself has the odor of strong tobacco. That which they add to it, through the ingenuity of the devil, is what causes the intoxication and fury . . . they put their shells [large snails] into the fire and burn them to quicklime . . . [which] they mix with the yupa . . . and after reducing the whole to the finest powder, there results a mixture of diabolic strength, so great that in touching this powder with the tip of the finger, the most confirmed devotee of snuff cannot accustom himself to it, for in simply putting his finger which touched the yupa near his nose he bursts forth into a whirlwind of sneezes. The Saliva Indians and other tribes . . . also use the yupa, but as they are gentle, benign, and timid, they do not become maddened like our Otomacs who . . . before a battle . . . would throw themselves into a frenzy with yupa, wound themselves, and, full of blood and rage, go forth to battle like rabid tigers.

A number of other missionary reports from the Orinoco area of Colombia and Venezuela reiterate the details offered by Gumilla. The earliest scientific report on this narcotic appears to be that of Alexander von Humboldt, who botanically identified the plant as *Acacia Niopo*, stating that the Maypure Indians of the Orinoco break the long pods of this tree, moisten them, and allow them to ferment; after the softened beans turn black, they are kneaded into small cakes with *Manihot* flour and lime from snail shells. These cakes are powdered when a supply of snuff is desired.

Like Gumilla, von Humboldt felt that the biodynamic activity of the snuff was attributable to the lime admixture. "It is not to be believed

that the niopo acacia pods are the chief cause of the stimulating effects of the snuff used by the Otomac Indians. These effects are due to the freshly calcined lime."

The earliest detailed scientific report is that given by the British botanical explorer Richard Spruce, who encountered the drug in the mid-nineteenth century among the Guahibo Indians of the Orinoco basin of Colombia and Venezuela.

The literature concerning the snuffing of narcotic powders has become extraordinarily confused. There is no doubt that sundry wholly unrelated plants enter into South American snuffs. Undoubtedly the most important snuffing material was and still is tobacco, mainly from *Nicotiana tabacum,* and snuffing may well be the most widespread method of using it, especially in the wet, tropical lowlands areas. In certain areas of the northwest Amazon—e.g., among Indians of the Reo Miritiparaná of Colombia—coca-powder (*Erythroxylon Coca*) is snuffed. Recent studies have shown the importance and widespread employment of intoxicating snuffs made from *Virola* bark. Yet the literature —especially the anthropological—has exaggerated the importance and distribution of the leguminous snuffs from *Anadenanthera.*

Many ascribe the sources of Amazon snuffs to various leguminous trees, and the British botanist Bentham concluded that "all South American trees . . . referred to as the source of narcotic snuffs were probably one species and were identical with Linnaeus' *Mimosa peregrina.*"

It seems that one of the most extraordinarily mistaken generalizations in ethnobotany—that all the intoxicating snuffs of the Amazon that were not obviously tobacco must have been prepared from *Anadenanthera peregrina*—has stemmed from Bentham's conclusion. Recent literature and maps showing the distribution of snuffs made presumably from *Anadenanthera* include the entire Orinoco basin and adjacent areas of southern Venezuela to the east; westward across the northern Colombian Andes; much of the Magdalena Valley; down the Andes through Colombia, Ecuador, Peru, and Bolivia; the coastal region of Peru; scattered isolated areas in northern Argentina; and the central and western Amazon Valley. One must remember that not one species—*Anadenanthera peregrina*—is involved but that there have been suggestions that other species of this genus have entered the South American snuff-making picture.

Anadenanthera peregrina, a beautiful, medium-sized tree with a thick, corky bark and a graceful crown with dark green, acacia-like foliage, is a species that occurs both naturally and cultivated in the open plains or *llanos* region of the Orinoco basin of Colombia and Venezuela, in savannahs and light forests of what was British Guiana, and in Brazil

in the open grasslands or *campos* of the Rio Branco region and locally in savannah-like areas in the lower Rio Madeira basin. If *Anadenanthera peregrina* occurs elsewhere in South America, it would have to be a rare tree or two brought in and cultivated by recently migrated Indian tribes.

Even within the local range of *Anadenanthera peregrina*, it is not safe to assume that all narcotic snuffs are referable to this genus or species. For example, a number of erroneous identifications of narcotic snuff have attributed powders prepared from *Virola* bark to *Anadenanthera peregrina*. One reason for this confusion may be the fact that in many parts of the Amazon—especially in the Rio Negro basin—the term *paricá*, which often does refer to leguminous trees, has been applied indiscriminately to narcotic snuff from *Anadenanthera* and *Virola*.

Until recently, there has been much uncertainty concerning the active hallucinogenic principles of *Anadenanthera peregrina*. At one time, it was felt that the central nervous activity produced by yopo-snuff was due mainly, if not wholly, to 5-hydroxy-N,N-dimethyltryptamine, or bufotenine.* Recent analyses of carefully authenticated and identified material, however, have shown that other tryptamine derivatives are present in the seeds of *Anadenanthera peregrina:* N,N-dimethyltryptamine, N-monomethyltryptamine, 5-methoxy-N, 5-methoxy-N-monomethyltryptamine, N,N-dimethyltryptamine-N-oxide, 5-hydroxy-N, N-dimethyltryptamine-N-oxide.

It was Safford who apparently first suggested that species of *Anadenanthera* other than *A. peregrina* may be the source of narcotic snuffs

* This hallucinogenic drug is present also in the skin of poisonous toads, e.g., *Bufo marinus*. Such toads have long played an important role in mythology and ritual art, not only in Mesoamerica (especially among the Maya) but in Central and South America, a circumstance that I suggested in a discussion at the International Congress of Americanists in Stuttgart, Germany, in 1968, might possibly be related to the hallucinogenic properties in toad and frog poisons. A number of South American tropical-forest tribes are known to use frog or toad poison to induce ecstatic trance states akin to those resulting from the various botanical hallucinogens; in these cases, however, the drug is introduced directly into the bloodstream through self-inflicted burns or wounds rather than ingested orally. M.D. Coe (personal communication) found large quantities of *Bufo* remains in the important Olmec ceremonial site of San Lorenzo, Veracruz (1200–900 B.C.); these might have served as food but it is equally possible that the Olmec used poisonous toads as additives or "fortifiers" for fermented ritual beverages. This practice, first reported after the Spanish Conquest from the Maya highlands by Thomas Gage in the early 1600's, survives to the present day among the Quiché-Maya of Guatemala (Robert M. Carmack, personal communication). It should be noted that the action of bufotenine on the human brain is not as yet well understood—for example, it appears, that unlike other hallucinogens, bufotenine does not fully penetrate the blood-brain barrier—nor is it known whether there might not be some special effects from the combination of alcohol and toad poison, with its relatively high content of serotonine (a substance also found in the human brain), as well as bufotenine, in the ritual beverages of Mesoamerica.—ED.

in South America. He identified the *vilca* or *huilca* of southern Peru and Bolivia and the *cébil* of northern Argentina with seeds of what he called *Piptadenia macrocarpa,* now referred to as *Anadenanthera colubrina* var. *Cebil.*

The term *vilca* in modern Peru sometimes refers to *Anadenanthera colubrina,* although this or similar names may signify a number of different plants in South America. An early report, dating from *ca.* 1571, stated that Inca "sorcerers" prophesied by contacting the devil through an intoxication induced by drinking *chicha* (maize beer) and an herb called vilca. Even earlier records mentioned a medicinal plant of this name, some of them emphasizing its laxative and emetic properties. The cébil snuff used in northern Argentina at the time of the arrival of the Spaniards appears to "have been *Anadenanthera*-derived," although the use of this genus "further south beyond its natural distribution is less likely. Yet there, further south, the Comechingon Indians took something called *Sebil* through the nose. . . , and the Huarpe Indians chewed a substance called *Cibil* for endurance."

However weak and circumstantial the evidence that vilca and cébil were prepared from *Anadenanthera,* there would seem to be no phytochemical reason why this could not be so. *Anadenanthera colubrina* has been shown by Altschul to be morphologically very closely related to *A. peregrina.* Furthermore, some of the same hallucinogenic tryptamines found in varying proportions in *Anadenanthera peregrina* have been located in material said to be referable to *A. colubrina.* It is obvious that extensive research must be done on South American hallucinogenic snuffs in general and on the use of *Anadenanthera* in particular before we can approach understanding.

In eastern Brazil another legume—*Mimosa hostilis*—forms the basis of the famous *ajuca* or *vinho de jurema,* a "miraculous drink" taken in ceremony among the Kariri, Pankarurú, Tusha, and Fulnio Indians of Pernambuco and Paraiba. The source of vinho de jurema was identified as recently as 1946 by Gonçalves de Lima.

The roots of this small tree or large shrub of the dry scrubby *caatingas* are prepared in a potently hallucinogenic beverage taken by priests, strong young men, warriors, and old women, who kneel with bowed heads to partake of it. The ceremony was formerly performed before battle, and all participants would then see

> . . . glorious visions of the spirit world, with flowers and birds. They might catch a glimpse of the clashing rocks that destroy souls of the dead journeying to their goal or see the Thunder Bird shooting lightning from a huge tuft on his head and producing claps of thunder by running about.

The jurema cult is ancient and formerly was practiced by many more tribes, including the Guegue, Acroa, Pimenteira, Atanaye, and others

Fig. 7.

now extinct. An early report dates from 1788; another from 1843. The latter asserted that jurema was taken in order to "pass the night navigating through the depths of slumber."

Several species of *Mimosa*—a genus closely related to *Anadenanthera*—may be involved, since they are generically referred to as jurema in northeastern Brazil. One of several kinds is *jurema prêta*, believed to be

Mimosa hostilis, but *jurema branca* may refer also to *M. verrucosa,* from the bark of which a stupefacient is said to be derived.

In 1946, an alkaloid named *nigerine* was reported from the roots of *Mimosa hostilis,* but later chemical studies have shown that this base is identical with N, N-dimethyltryptamine, the same constituent responsible for the hallucinogenic effects produced by *Anadenanthera* seeds.

Sophora secundiflora

One of the most interesting New World narcotics is the *mescal bean* or *red bean,* the seed of a small tree of the American Southwest and Mexico, known botanically as *Sophora secundiflora. S. secundiflora* is a beautiful shrub—today often planted as an ornamental—with leathery, glossy, evergreen leaflets and large clusters of violet or violet-blue flowers and woody pods containing usually three or four bright red beans.

These seeds formerly were basic to a vision-seeking cult. They contain the alkaloid cytisine, which is characteristic of a number of species of the family. Cytisine is capable in overdoses of causing nausea, convulsions, hallucinations, and even death from respiratory failure. A number of the other twenty-five species of *Sophora* contain cytisine or a related alkaloid, but no species other than *S. secundiflora* seems to have been employed for its narcotic properties.

The use of *Sophora secundiflora* goes back to archaeological times. The seeds have been found in sites dated before A.D. 1000, often with evidence that they were used ritualistically. From at least twelve sites in caves and rock shelters in southwestern Texas finds of Sophora beans have been recorded; their dating is uncertain, but radiocarbon dates for material from evidently related sites in northern Mexico range all the way from 7500 B.C. to A.D. 200. According to the archaeologist Campbell (1958), although the presence of mescal beans in cave and rock shelters, "even when included in containers holding utilitarian as well as non-utilitarian objects," does not necessarily prove the existence of a mescal-bean cult, there "is additional archaeological evidence which does suggest the presence of a prehistoric cult that may have involved the use of the mescal bean."

The Spanish explorer of the Texas coast, Cabeza de Vaca, mentioned mescal beans as an article of trade among the Indians in 1539. The Stephen Long Expedition in 1820 reported the Arapaho and Iowa using large red beans as a medicine and narcotic. A well-developed mescal-bean cult was known among the Apache, Comanche, Delaware, Iowa, Kansa, Omaha, Oto, Osage, Pawnee, Ponca, Tonkawa, and Wichita; other tribes of the central and northwestern Plains groups valued the bean as a medicine or fetish, although they apparently failed to develop a distinct cult surrounding its use. The cult has various names: Wichita

Dance, Deer Dance, Whistle Dance, Red Bean Dance, and Red Medicine Society. In all these ceremonies, the seeds were employed as an oracular or divinatory medicine for inducing visions in initiatory rites and as a ceremonial emetic and stimulant.

The many parallels and similarities between the peyote ceremony among the Plains tribes and the Red Bean Dance and their obvious southern origin, in Texas and northern Mexico, suggest that the much safer hallucinogen peyote more or less took the place of the dangerously toxic mescal bean. Even today, the "road man" or peyote leader in certain Plains tribes—Kiowa and Comanche, for example—wears as part of his ornamental dress a necklace of *Sophora secundiflora* beans and often has mescal beans sewn on his leggings.

It is reported that on occasion the Comanche, Oto, and Tonkawa tribes mixed peyote and the mescal bean in a narcotic drink. This mixture is of special interest pharmacologically, for it must have been extraordinarily potent. Ethnobotanically, it is of interest because it was apparently practiced in transitional periods between the dying out of the Red Bean Dance and the establishment of the peyote ceremony that later led to the Native American Church.

Lythraceae

Heimia

The small lythraceous genus *Heimia*, with three poorly defined species occurring from the southern United States to Argentina, has provided one of the most interesting hallucinogens of the New World, yet little is known about its use. *Sinicuichi* (the Mexican name for *Heimia salicifolia*) does not induce visions but is a wholly auditory hallucinogen. The leaves of this shrub, slightly wilted, are crushed in water, and the juice is set out to ferment in the sun. The resulting drink is slightly intoxicating, causing giddiness, a drowsy euphoria, a darkening of the surroundings, a shrinking of the world around, altered perception of time and space, forgetfulness, removal from a state of reality, and auditory hallucinations. Sounds appear to come from a great distance and are distorted.

The natives consider *sinicuichi* sacred and endowed with supernatural powers. It helps them, they assert, to recall vividly events of many years earlier, even to remember prenatal events.

Despite recent chemical studies of *Heimia salicifolia*, the total picture of *sinicuichi* intoxication is far from clear. Five quinolizidine alkaloids have been isolated, one of which—cryogenine—has been shown experimentally to mimic qualitatively and semiqualitatively the action of the total alkaloid extract of the plant.

MALPIGHIACEAE

Banisteriopsis, Tetrapteris

Thousands of South American Indians—in the western Amazon, the Orinoco, and on the slopes of the Pacific coast of Colombia and Ecuador —use an extraordinary hallucinogen elaborated basically from jungle

Fig. 8.

Fig. 9.

lianas: *Banisteriopsis Caapi,** or the closely related *B. inebrians.* The narcotic drink prepared from the bark of either of these plants is variously known as *caapi, ayahuasca, yajé, natema,* or *pinde,* according to the area and group of Indians. In some regions—especially in the very westernmost part of its Amazon range—the bark is prepared in a cold-water infusion; in other localities, the bark or stems are subjected to long boiling. In parts of the Orinoco, the fresh bark may be chewed, and there are indications that it may also be taken in the form of a snuff.

There are herbarium collections of another species of *Banisteriopsis*—*B. muricata*—which, because of the vernacular name *ayahuasca* assigned to them by the collector, suggest that this species may also occasionally be employed as the source of the narcotic in eastern Peru.

This narcotic enters deeply into almost all aspects of the life of the peoples who take it to an extent reached by hardly any other hallucinogen. As *ayahuasca,* its Peruvian name, it is known as the "vine of the souls," and partakers often "experience" death and the separation of body and soul. To some Colombian Indians the drinking of this preparation represents a return to the maternal womb, the source of all creation; the partakers see all the gods, the first human beings and animals, and understand the establishment of their social order. Those who take yajé "die" only to be reborn in a state of greater wisdom. In the northwest Amazon, caapi serves the Indian for prophetic, divinatory, and other magic purposes and to fortify the bravery of male adolescents who must undergo the painful *yurupari* initiation ceremony.

The narcotic effects may be violent and with unpleasant aftereffects, especially when the drink is made by boiling the bark and most certainly when some other toxic plants enter the preparation as admixtures. Nausea and vomiting are almost always early characteristics of the effects of the drink. This is followed by a pleasant euphoria, then by visual hallucinations, initially tinged with blue or purple. Excessive doses bring on frighteningly nightmarish visions—often of jaguars and snakes—and a feeling of extremely reckless abandon, although consciousness is usually not lost nor is the use of the limbs unduly affected.

This bizarre intoxicant was discovered in 1851 by Richard Spruce, an English plant explorer on the upper Rio Negro of the Brazilian Amazon, where it was called caapi. Spruce identified the drug as a new species of the Malpighiaceae, and he named it *Banisteria Caapi.* Later studies have shown that it is more correctly called *Banisteriopsis Caapi.* Several years later, in the Ecuadorian Amazon, he encountered a narcotic drink locally known as ayahuasca and correctly surmised that it was the same plant he had described from the Rio Negro. At about the same time,

* See G. Reichel-Dolmatoff, below.

an Ecuadorian geographer wrote that ayahuasca was used among the Zaparos, Angateros, Mazanes, and other Indians of Amazonian Ecuador to foresee the future; discover the truth; help deliberations on war, attack, and defense; learn the source of malevolent magic; welcome visitors from other clans; and ascertain the faithfulness of their women.

Probably no other hallucinogenic preparation has been so fraught with confusion. Careless research and even active imaginations and outright guesswork have bedeviled studies of the malpighiaceous narcotics for a century. This confusion characterizes not only the anthropological reports about its use but also the botanical and chemical studies that have been published.

One of the most troublesome points of confusion concerns the identification of yajé as the apocynaceous vine *Prestonia amazonica (Haemadictyon amazonicum)* and the inference that yajé was a different narcotic from ayahuasca and caapi. Although this identification is very widely established in the literature, recent studies have conclusively shown that it is a serious error. These narcotic drinks have also been confused with *Datura* beverages among the Jívaros. Yajé has even been identified as a species of *Aristolochia.* The malpighiaceous vine *Mascagnia psilophylla* var. *antifebrilis* has been reported as the basic plant employed, but this identification appears to be an error.

Perhaps the greatest uncertainty concerns the identification of the admixtures utilized locally in the preparation of ayahuasca, caapi, or yajé. That many different plants are added to the basic drink made from the bark of *Banisteriopsis Caapi* or *B. inebrians* is well recognized. The exact identity of few is known, however. Much ethnobotanical field work remains to be done, especially in the Amazon, on this problem. It is complicated because many of the admixtures are very localized, restricted in some instances even to a single shaman.

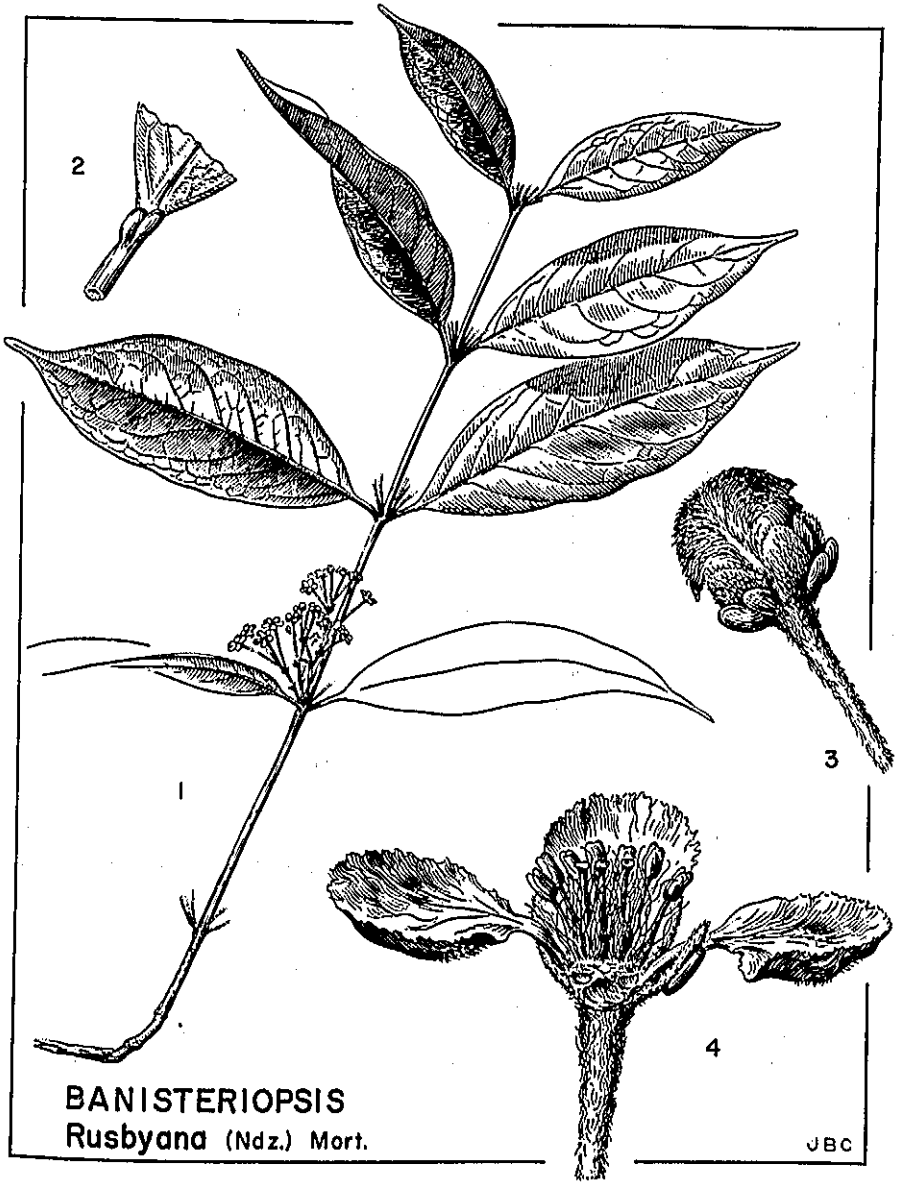
The Sionas of Colombia add what is probably *Datura suaveolens* to their yajé drink to strengthen its effects. Their neighbors, the Inganos of Mocoa, are said to employ *Alternanthera Lehmannii* for the same purpose. In parts of the Vaupés of Colombia, a few leaves of the apocynaceous *Malouetia Tamaquarina* are sometimes added to caapi. Tobacco may occasionally constitute one of the additives. It is reported that the Tukanos of the boundary region between Brazil and Colombia employ five vines as admixtures with caapi, but they are known only by native names. A species of the solanaceous *Brunsfelsia*—probably *B. bonadora*—itself hallucinogenic, is used as an additive in Ecuador and unquestionably also in adjacent parts of Colombia.

Undoubtedly, the most interesting plants added are a species of *Psychotria* and *Banisteriopsis Rusbyana.* The reason for the extraordi-

nary significance of these two plants will be clear when the chemistry of the narcotic preparations has been considered.

The chemistry of the narcotic species of *Banisteriopsis* has probably been more extensively studied than their botany. Nonetheless, failure to

Fig. 10.



insist, until recently, upon strictly vouchered material for analysis has been the chief cause of the chaotic state of our understanding.

The earliest chemical studies made were carried out probably on *Banisteriopsis Caapi*. A number of alkaloids were described under names such as *telepathine, yageine, banisterine*; all of them eventually were identified as harmine, an alkaloid long known and isolated from Syrian rue (*Peganum Harmala*), an Asiatic plant of the Zygophyllaceae. More recent and carefully vouchered studies indicate that the bark (and sometimes the leaves) of *Banisteriopsis Caapi* and *B. inebrians* contain harmine and often lesser concentrations of harmaline and d-tetrahydroharmine. Recently, pieces of the stems of the type material of *Banisteriopsis Caapi*, collected by Spruce in Brazil over 115 years ago, have shown the presence of harmine in amounts roughly equivalent to that in freshly collected material! Harmine has been isolated from *Cabi paraensis*, an endemic malpighiaceous genus of the lower Amazon of Brazil. It has sundry uses in folk medicine, but it is apparently never employed as a hallucinogen.

Little indeed is known of the chemistry of additives of ayahuasca, caapi, and yajé. There is no question in the minds of field scientists, however, that many of these added ingredients greatly alter or heighten the narcotic effects of the drink. In the case of the *Datura* and the *Brunfelsia*, the addition to the β-carboline harmala alkaloids of tropane alkaloids—themselves highly hallucinogenic—is assumed.

One of the most significant recent advances in this field has been the discovery of alkaloids of the tryptamine type in several additive plants. In the westernmost Amazon—in Colombia and Ecuador—the admixture put into the drink basically prepared from the bark of *Banisteriopsis inebrians* commonly includes leaves of *B. Rusbyana*, known locally as *oco-yajé*. The bark of oco-yajé is apparently never employed—always the leaves. Recent studies have shown that the leaves and stem do not have the β-carboline alkaloids so characteristic of *B. Caapi* and *B. inebrians* but that they contain a very large amount of N, N-dimethyltryptamine. It is this alkaloid that increases the strength and duration of the visions. In addition, they contain as minor components N-methyltryptamine, 5-methoxy-N, N-dimethyltryptamine, 5-hydroxy-N, N-dimethyltryptamine, and Nβ-methyltetrahydro-β-carboline. The tryptamines are ineffective in the human body unless they are taken with some monoamine oxidase inhibitor. The β-carbolines act as this inhibitor, allowing the tryptamine to have its hallucinogenic effect in man. One wonders how peoples in primitive societies, with no knowledge of chemistry or physiology, ever hit upon a solution to the activation of an alkaloid by a monoamine oxidase inhibitor. Pure experimentation? Perhaps not. The

examples are too numerous and may become even more numerous with future research.

Another additive utilized in several widely separated localities of the Amazon are leaves of *Psychotria viridis.* This species has been shown to contain N, N-dimethyltryptamine.

An interesting report of yajé intoxication by a botanical collector in the Colombian Putumayo stated that, after preparing the concentrated drink by long boiling of stems or bark of *Banisteriopsis inebrians,*

> . . . they add to the yagé the leaves and the young shoots of the branches of the *oco-yagé* or *chagro panga.* . . . The addition of this plant . . . produces the "bluish aureole" of their visions. These are cinematographic views, and occur after about half a liter of the drink has been consumed in portions an eighth of a liter each at intervals of half an hour. Thereafter, the Indian falls into a profound sleep, during which he is in a state of complete insensibility and anaesthesia. During this period, the subconscious activity acquires enormous intensity. The dreams follow each other with extraordinary precision and clearness, giving to the intoxicated person . . . the power of double vision and of seeing things at a distance, like certain mediums in their trances. Upon awakening, he retains clearly the hallucinations and fantastic visions which he experienced in unknown regions. . . .

The foregoing report described the effects of a preparation containing presumably harmine, or harmine and harmaline, fortified with N, N-dimethyltryptamine. The effects of the drug without the admixture of tryptamine, though different, are startlingly narcotic. In addition to the mode of preparing the drug, these effects depend in large measure on the social and physical environment in which the drug is taken, as well as upon the age, health, and mental state of the partaker. Commonly reported aspects of harmine intoxication in sophisticated subjects of Western cultures are nausea and vomiting, brachycardia, hypotension, tremor of the extremities and body vibrations, noises such as humming and buzzing, waviness of the environment, numbness, a feeling of sinking together with the sensation of flight, mental confusion, drowsiness, some amnesia, euphoria, and visual hallucinations, often of frightening objects such as jaguars, birds, and reptiles.

Ceremonial use of ayahuasca, caapi, and yajé differs greatly from tribe to tribe, but one early account will suffice as a general illustration. The discoverer of *Banisteriopsis Caapi,* the explorer Spruce, wrote in 1852 that the Tukanoan peoples of the Vaupés of northwestern Brazil prepared their caapi by beating part of the lower portion of the stem in a mortar with water, sometimes adding the slender roots of a vine called *caapi-pinima,* the identification of which still remains problematical.

When sufficiently triturated, it is passed through a sieve, which separates the woody fibre, and to the residue enough water is added to render it drinkable. Thus prepared, its color is brownish green and its taste bitter and disagreeable. . . . In the course of the night, the young men partook of caapi five or six times, in the intervals between the dances. . . . The cup-bearer—who must be a man, for no woman can touch or taste caapi—starts at a short run from the opposite end of the house, with a small calabash containing about a teacupful of caapi in each hand, muttering "Mo-mo-mo-mo-mo" as he runs, and gradually sinking down until at last his chin nearly touches his knees, when he reaches out one of his cups to the man who stands ready to receive it. . . . In two minutes or less after drinking it, its effects begin to be apparent. The Indian turns deadly pale, trembles in every limb, and horror is in his aspect. Suddenly contrary symptoms succeed: he bursts into a perspiration, and seems possessed with reckless fury, seizes whatever arms are at hand, his murucu bow and arrows or cutlass, and rushes to the doorway, where he inflicts violent blows on the ground or the doorposts, calling out all the while, "Thus would I do to mine enemy . . . were this he!" In about ten minutes, the excitement has passed off, and the Indian grows calm but appears exhausted. Were he at home in his hut, he would sleep off the remaining fumes, but now he must shake off his drowsiness by renewing the dance.

Spruce, Koch-Grünberg, and others have written about "other kinds" of caapi. Spruce, for example, mentioned *caapi-pinima* or "painted caapi" and suggested that it might be an apocynaceous plant that had reddish veins and blotches in the green leaves—the reason for its name. This apocynaceous plant, identified with reservations by Spruce as *Haemadictyon amazonicum* (now *Prestonia amazonica*), was thought to have been an additive with the *Banisteriopsis.*

In 1948, a hundred years after Spruce's sojourn in the same area, I discovered that the Makú Indians of the Rio Tikié, a Brazilian affluent of the Amazon, prepared an intoxicating drink from the malpighiaceous genus *Tetrapteris:* from a species called *T. methystica.* It is an extensive forest liana, the bark of which is utilized, with no admixtures, to make a bitter drink. The drink was yellowish, not brown, the usual color of caapi. I learned by experiment that it had strong hallucinogenic properties, very similar to those of *Banisteriopsis Caapi* itself. One wonders whether or not the "painted caapi" reported by Spruce could have referred to the kind of caapi that makes this unusual yellowish drink. More field work must be done before we understand the full significance of this "other kind" of caapi—*Tetrapteris methystica.* No chemical analysis has as yet been possible, but the chances are good that the hallucinogenic principles are the same as or similar to those in *Banistériopsis Caapi.*

Myristicaceae

One of the most fascinating hallucinogens—and one of the most recently discovered—is a snuff prepared in the northwest Amazon from the bark-resin of several species of *Virola*.

What appears to be the earliest report of this narcotic is by Koch-Grünberg (1909), who stated that the Yecuana Indians of the headwaters of the Orinoco had a very toxic snuff:

> Of an especial magical importance are cures during which the medicine man inhales *hak-ú-dufha*. This is a magical snuff used exclusively by medicine men and prepared from the bark of a certain tree which, pounded up, is boiled in a small earthenware pot, until all the water has evaporated and a sediment remains at the bottom of the pot. This sediment is toasted in the pot over a slight fire and is then finely powdered with the blade of a knife. Then the medicine man blows a little of the powder through a reed . . . into the air. Next, he snuffs, whilst, with the same reed, he absorbs the powder into each nostril successively. The *hak-ú-dufha* obviously has a strongly stimulating effect, for immediately the medicine man begins singing and yelling wildly, all the while pitching the upper part of his body backwards and forwards.

In 1938, the botanist Adolpho Ducke associated an intoxicating snuff with the leaves of *Virola theidora* and *V. cuspidata*. The snuff was called *paricá* in the Rio Negro basin. In 1939 he reiterated that, according to information he received "from natives in two localities in the upper Rio Negro, the paricá powder comes from the leaves of certain species of *Virola*. . . ." We now know that leaves are probably not employed to prepare the snuff, but this report represents the earliest association of a narcotic snuff with *Virola*.

In 1954, I reported the preparation and utilization of a snuff made from *Virola calophylla* and *V. calophylloidea* among sundry tribes of the Vaupés area of Colombia. In this westernmost region of its use, the snuff is taken only by medicine men or shamans, never generally and hedonistically by the male population as a whole, as in the case of *Anadenanthera* snuff among certain Orinoco groups today. This snuff—called *ydkee* by the Puinave, *yató* by the Kuripako—is employed by at least a half dozen tribes in the Colombian Amazon.

It gradually became evident from sparse and scattered reports that *Virola*-snuff might be much more widely used in the Orinoco headwaters in Venezuela and on the northern tributaries of the Rio Negro of Brazil. This suspicion has now been fully substantiated through the collection of voucher specimens from numerous far-separated localities and tribes, but the complete picture of the utilization of this in-

Fig. 11.

teresting myristicaceous resin across the vast area of its use will require many more years of careful field studies.

In 1967, Holmstedt and I were able to study the manufacture and employment of *Virola*-snuff among several groups of Waiká Indians north of the Rio Negro in Brazil. The species used is *Virola theidora*,

although reports—apparently without voucher specimens—indicate that several other species may also be employed.

There are a number of methods of preparing the snuff, which is called *epená* or *nyakwana* by the many "tribes" which I include under the generic term *Waiká*. Some scrape the soft inner layer of the bark of the tree, dry the shavings by gentle roasting over a fire, and store them until they are needed for making the snuff. They are then crushed and pulverized, triturated and sifted. The resultant powder is fine, homogeneous, chocolate-brown, and highly pungent. Then, when the Indians desire it (but not always), a dust of the powdered dry leaves of the aromatic acanthaceous weed *Justicia pectoralis* var. *stenophylla* is added in equal amounts. The third, and invariable, ingredient is the ash of the bark of a rare leguminous tree, *Elizabetha princeps*. This tree is known as *amá* or *amasita* by the Waiká. These ashes are mixed in approximately equal amounts with the resin, or resin and *Justicia* powder, to give a brownish-gray snuff.

Other Waikás follow a different procedure, at least when they are preparing the snuff for ceremonial purposes. The bark is stripped from the *Virola* tree, the strips laid over a gentle fire in the forest, and the copious blood-red resin is scraped into an earthenware pot. It is boiled down and allowed to sun-dry. Then, alone or mixed with the powdered *Justicia* leaves, it is sifted and is ready for use.

The surprisingly high content of tryptamines in the resin of *Virola theidora* is responsible for the excessively rapid and strong intoxication of epená snuff. The Waikás snuff prepared from the resin alone, with no admixtures, possesses high concentrations of 5-methoxy N, N-dimethyltryptamine in addition to small amounts of other related tryptamines.

There are suspicions, still unconfirmed, that *Justicia pectoralis* var. *stenophylla*, often an admixture of *Virola*-snuff, may itself contain tryptamines and, consequently, be active. Tribes of the upper Orinoco basin may possibly use this weedy plant alone in preparing a hallucinogenic snuff.

Epená or nyakwana snuff is employed occasionally in what appears to be a nonritualistic or purely recreational context. Many tribal groups, however, utilize it only in ceremony. Often the shamans take it to induce a trance in connection with the diagnosis or treatment of disease. The ritual commemoration of death or, in some tribes, the annual endocannibalistic memorial of the dead of the preceding year, always requires considerable snuffing of epená. Dancing, chest-beating, and occasional fighting are characteristic before the onset of a long period of stupor during which, with visual and auditory hallucinations, the Indians commune with the spirit world, the *hekula*.

Intoxication by *Virola*-snuff sets in with extreme rapidity—within minutes after a large dose of the powder is blown into the nostrils through the bamboo or bird-bone tubes or is self-administered. Numbness and tingling of the limbs, twitching of the facial muscles, inability to coordinate muscular activity, nausea, visual hallucinations, and a deep stupor are characteristic. Macroscopia is frequent, entering into Waiká belief about the spirits that dwell within the plant. Levitation, or a sensation of floating in air or flying, is often reported.

My own experiences with snuff prepared from *Virola calophylla* may illustrate several points of interest:

> The dose was snuffed at five o'clock. Within fifteen minutes a drawing sensation was felt over the eyes, followed very shortly by a strong tingling in fingers and toes. The drawing sensation in the forehead gave way to a strong and constant headache. Within a half hour, the feet and hands were numb and sensitivity of the fingertips had disappeared; walking was possible with difficulty, as with beri-beri. I felt nauseated until eight o'clock and experienced lassitude and uneasiness. Shortly after eight, I lay down in my hammock, overcome with drowsiness, which, however, seemed to be accompanied by a muscular excitation except in the hands and feet. At about nine-thirty, I fell into a fitful sleep which continued, with frequent awakenings, until morning. The strong headache lasted until noon. A profuse sweating and what was probably a slight fever persisted throughout the night. The pupils were strongly dilated during the first few hours of the intoxication. No visual hallucinations nor color sensations were experienced.

Among the Witotos, Boras, and other tribes of the Putumayo drainage areas of Colombia, the resin of *Virola theidora* is ingested in the form of small pellets when shamans desire to "talk with the little people" and to work charms against malevolent magic from distant medicine men. The soft inner bark is gently scraped and kneaded in cool water to remove the brownish "resin." The water is then set to a slow boil until only a thick syrup remains. This syrup is then formed into small pill-shaped portions which are coated with an alkaline powder prepared by boiling down water that has been allowed to leach through the ashes of any of several plants, commonly the bark of a species of *Gustavia*. The resin thus prepared is active because of the presence of β-carboline alkaloids (in addition to the tryptamines) which act as monoamine oxidase inhibitors.

Certain nomadic Makús on the Rio Pira-Paraná in the Colombian Vaupés prepare a snuff from the resin of *Virola elongata*. These very primitive Indians are said sometimes to take the crude resin orally when time is short for its proper preparation.

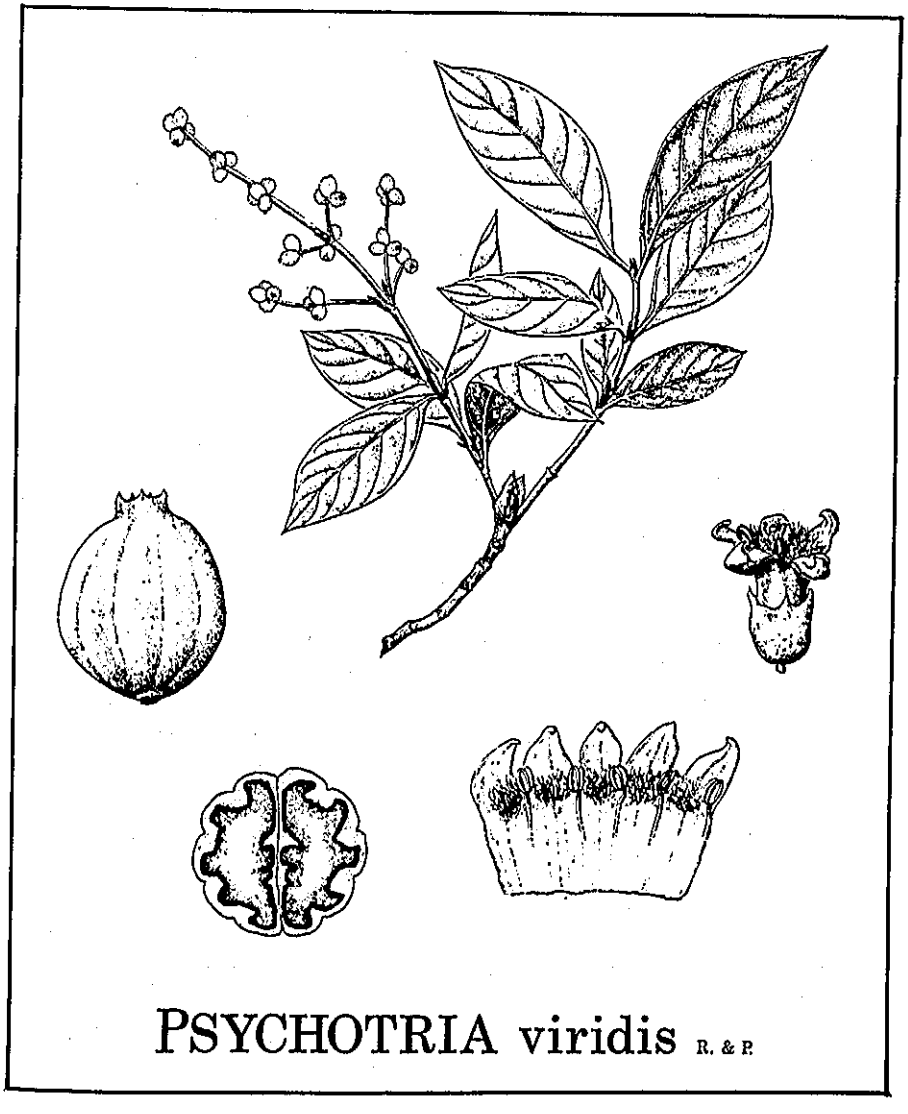
There are indirect indications that Venezuelan Indians may smoke the bark of *Virola sebifera* as an intoxicant.

Rubiaceae

Psychotria

No rubiaceous plant is known to be employed alone as a narcotic in the New World. *Psychotria viridis* plays an important role, however, as an additive to the hallucinogenic drink prepared from *Banisteriopsis*

Fig. 12.



Caapi. Its utilization as an admixture has been reported from widely separated localities in the Amazon of Ecuador and adjacent Colombia, in Peru and in Brazil. This wide range indicates that its use is a long-established culture trait.

The report that *Psychotria psychotriaefolia* was similarly used was based on a misidentification of botanical material, but the possibility does exist that other species of *Psychotria*—or even closely related rubiaceous genera—may also be so employed.

Recent chemical research has discovered the presence in *Psychotria viridis* of N, N-dimethyltryptamine—the first time this compound has been found in the family. It is curious that the same tryptamine has been found in another additive to the ayahuasca-caapi-yajé drink —the leaves of *Banisteriopsis Rusbyana*.

Psychotria viridis apparently is not employed alone to prepare a hallucinogenic drink. The tryptamine would not be active when taken orally without a monoamine oxidase inhibitor, which is supplied in the β-carboline alkaloids that occur in *Banisteriopsis Caapi* and *B. inebrians*.

Solanaceae

Datura, Latua, Methysticodendron

Datura has long been one of the most widely employed hallucinogens. Species have been used in both hemispheres, but the New World can boast the greater number of species valued for their psychotomimetic properties and for the intensity of their role in aboriginal societies. For in North, Central, and South America, this well-known genus has long played a major role in divination, prophecy, sorcery, diagnosis, and curing, as well as in adolescent initiation rituals.

The New World representatives of this genus are classified botanically into four subgenera or sections: Section I, *Stramonium*, in which *Datura stramonium* is placed; II, *Dutra*, with *D. inoxia;* III, *Ceratocaulis*, containing one species, *D. ceratocaulis;* and IV, *Brugmansia*, comprising all of the South American tree species. Species in all four sections have been utilized for their narcotic properties.

Probably most tribes in North America north of Mexico esteemed *Datura* for its strong psychotropic and narcotic characteristics. The Algonkian Indians of eastern North America administered *wysoccan*, an intoxicating medicine containing Jimson weed, or *Datura stramonium*, to youths about to undergo initiation into manhood. The boys experienced a kind of violent madness for twenty days, lost all memory, unliving their former lives and starting adulthood by forgetting that they had ever been children. California and Southwestern tribes similarly em-

ployed *Datura inoxia (D. meteloides)* or *toloache* in initiation rites. The Yumas took this drug to gain occult powers during these rituals, and the Yokuts valued it in a spring ceremony to ensure future good health and long life to adolescent initiates. The Luiseño gave it to youths who danced, screaming wildly "like animals," and finally fell into a stupor to find their adult life.

The Zuñis call *Datura inoxia a-neg-la-kya* and utilize it extensively as a medicine, narcotic, anaesthetic, and, in the form of a poultice, for treating wounds and bruises. The rain priests, who are the only ones permitted to collect the plant, put the powdered root into their eyes to see at night, to commune with the feathered kingdom, and to commune with the spirits of the dead to intercede for rain. The Zuñis ascribe a divine origin to the plant.

Several species of *Datura,* especially *D. inoxia,* played and still play very important magic roles in the life of many Mexican Indians. Its utilization goes far back into pre-Conquest history, when it was valued as both a medicine and a narcotic. Hernández reported that *toloatzin* was a major native medicine among the Aztecs, employed as an anodyne. He warned that excessive use could drive the patient to madness and "various and vain imaginations." The plant is still highly esteemed in Mexico. The modern Tarahumara, for example, add *Datura inoxia* or *tikuwari* to *tesgüino* (a fermented drink prepared from sprouted maize) to strengthen its effects, and the roots, leaves, and seeds of this species are the basis of a beverage employed ceremonially to induce visual hallucinations, which the medicine man values in diagnosing disease.

One of the most interesting Mexican species is *Datura ceratocaula,* a fleshy plant, with thick, forking stems that grows in shallow waters or swamps. Ancient Mexican Indians invoked the spirits of this plant in treating certain diseases.

All the native South American *Daturas* are arborescent and belong to the subgenus *Brugmansia,* sometimes treated as a distinct genus. They are all native to the Andean highlands—*D. arborea, D. aurea, D. candida, D. dolichocarpa, D. sanguinea, D. vulcanicola*—or to the warmer lowlands—*D. suaveolens.* They are handsome trees, well known in horticulture, but they appear to be chromosomally aberrant cultigens unknown as wild plants. Their classification has long been and still remains uncertain: usually considered to represent six or seven species, the tree *Daturas* have recently been thought to comprise three or four species and a number of cultivars.

In South America, the preparation and use of *Datura* differ widely. It is most frequently taken in the form of pulverized seeds, sometimes dropped into beverages. The intoxication, fraught with grave dangers because of the extreme toxicity of the alkaloids, is marked by an initial

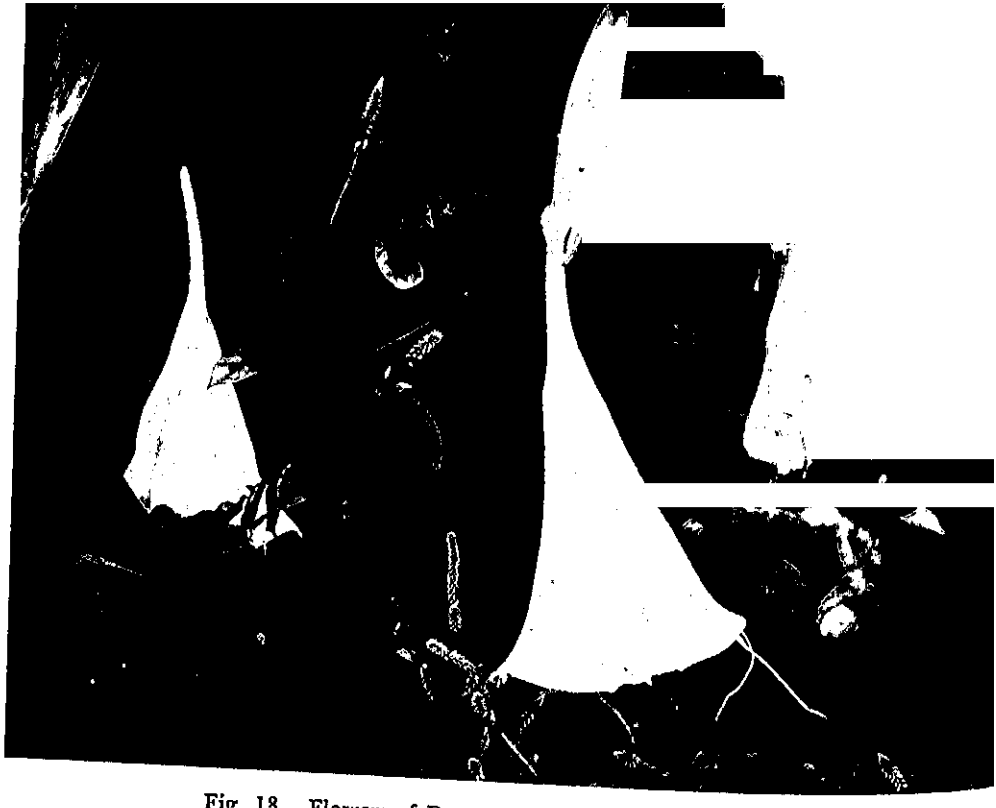


Fig. 13. Flowers of *Datura suaveolens*. Mocoa, Colombia.

state of violence so furious that the partaker must be restrained until a deep, disturbed sleep overtakes him. The visual hallucinations are interpreted as spirit visitations.

Among the Ecuadorian Jívaro, for example, *Datura* is employed to correct refractory children in the belief that ancestral spirits carry out the admonishing. The ancient Chibcha of Colombia gave women and slaves potions of *D. aurea* to induce stupor prior to being buried alive with their deceased husbands or masters. The Inca are also known to have valued *Datura* as an intoxicant. It is still important in many areas from Colombia to Chile, along the Pacific coast of northern South America, and in certain parts of the Amazon.

There is a report that *curanderos* of the Ecuadorian highlands were recently taking lessons from Jívaro medicine men to reintroduce

the use of *Datura* into the populous and now civilized Andean tribes.

The Kamsá and Ingano tribes of Sibundoy in the southern Colombia highlands use *Datura* extensively. They employ *Datura candida, D. dolichocarpa,* and *D. sanguinea* and even preserve for use and propagate vegetatively several highly atrophied named clones of *D. candida.* These clones are propagated merely by planting a piece of stem of the parent plant in wet soil. Some of these clones or "races" —representing possibly incipient "varieties" as the result of mutations— are such monstrosities that their parent species has, until recently, not been known. The natives have names for them and employ them for different purposes, since they apparently vary in chemical composition and produce slightly different effects one from another.

Identification of the species used by the tribes for special purposes leaves much to be desired in the way of accuracy, but since most species are known to contain similar tropane alkaloids—hyoscyamine, nor-hyoscyamine, and scopolamine, usually varying only in relative concentrations—this problem is not so serious as in the case of certain other narcotics.

Latua

Latua pubiflora is a spiny shrub or small tree found only in the coastal mountains of central Chile. A very strict endemic, known locally as *latué* or *árbol de los brujos* ("sorcerers' tree"), it was employed formerly by sorcerers in the Province of Valdivia for nefarious purposes. It is a virulent poison capable of producing a state of delirium and visual hallucinations, leading often to permanent insanity. Whether or not any cult or ritual surrounded its use is not known, but it was widely recognized and feared by the native population. A madness of any duration might be induced at the will of the practitioner, and dosages were a closely guarded secret. Many accidental poisonings were reported, partly because the shrub resembled closely a shrub known as *tayu (Flotowia diacanthoides)* which was a commonly employed medicinal plant of the region.

Known also, and probably more widely, under the synonym *Latua venenosa,* it is apparently nowhere abundant. Chemical studies of *Latua pubiflora* have reported alkaloids, presumably of the tropane series, but analyses with modern techniques, which are now underway with carefully vouchered collections, may provide a better understanding of the composition of this highly toxic hallucinogen.

Methysticodendron

Closely related to the genus *Datura*—and possibly an extraordinarily atrophied clone of a *Datura* instead of a distinct genus—*Methysticoden-*

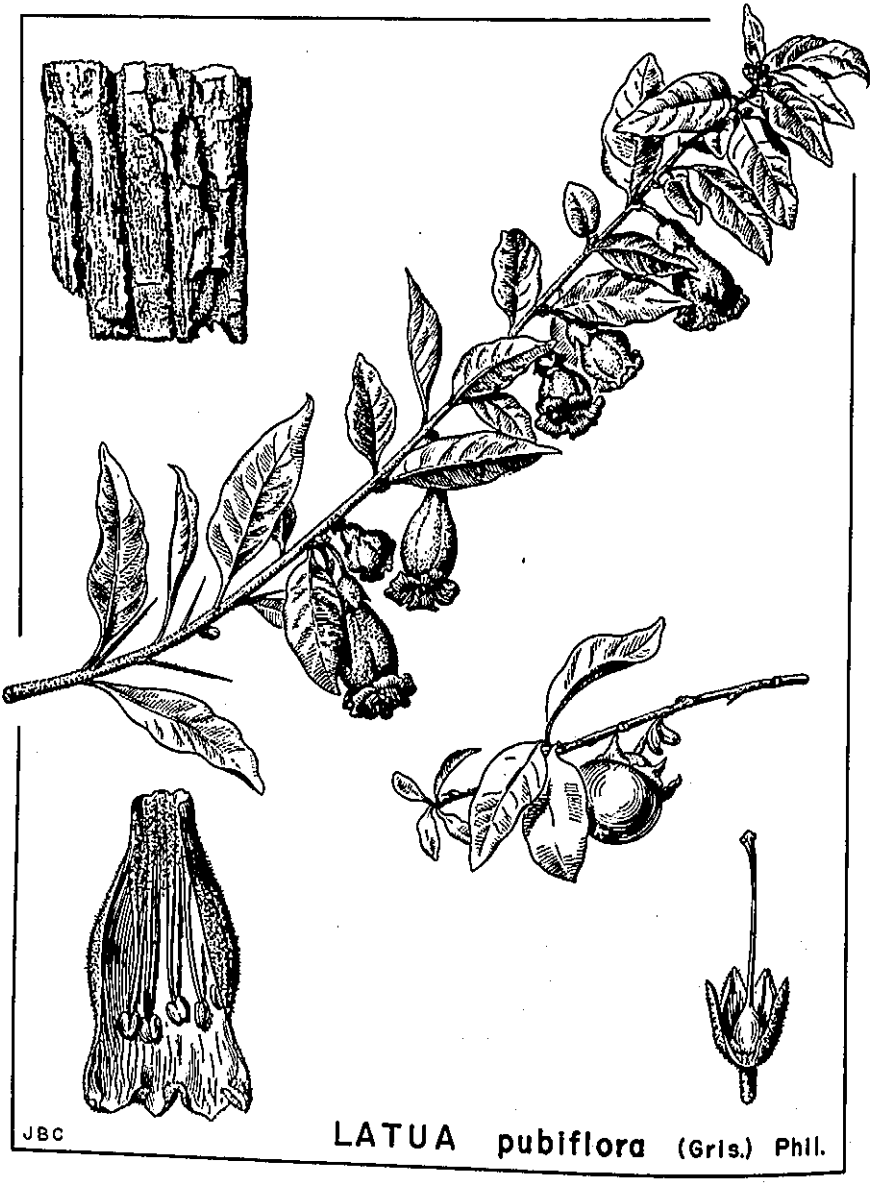


Fig. 14.

dron Amesianum represents a cultigen known only from the high Andean valley of Sibundoy in southern Colombia.

The Indians of the valley—Kamsá- and Ingano-speaking tribes—assert that this plant, known as *culebra borrachera,* is more potently hallucinogenic than *Datura* and more dangerous to use. It is taken in infusion

by medicine men for divination, prophecy, and the practice of sorcery, and plays a role in native medicine as well.

The chemical constitution of *Methysticodendron Amesianum* supports the Indians' contention of the potency of the drug: it contains l-scopolamine and hyoscyamine with minor amounts of other bases, but up to 80 per cent of the total alkaloid content is scopolamine.

Some Remaining Problems

Finally, there are a number of little-known psychotomimetics the chemistry and cultural uses of which urgently require further study before the societies that employ them disappear forever—and with them, much useful knowledge. Space does not permit more than brief mention of some of these:

Canada. Certain Indians chew the root of sweet calomel, *Acorus Calamus,* for its medicinal and stimulant effects. In large doses, this root can induce strong visual hallucinations.

Mexico. Yaqui medicine men in Sonora smoke the blossoms of *Genista canariensis,* a post-Conquest import from the Canary Islands. Its effects indicate possible borderline hallucinogenic characteristics. The plant is rich in cytisine, a toxic alkaloid also found in the hallucinogenic *Sophora secundiflora* of the Red Bean Cult. In southern Mexico the Mixtecs of Oaxaca employ two puffballs, *Lycoperdon mixtecorum* (*gi-i-wa* = "fungus of the first quality"), and *Lycoperdon marginatum* (*gi-i-sa-wa* = "fungus of the second quality") as hallucinatory divinatory agents. What makes these two gastromycetes unusual is the fact that they seem to produce auditory rather than visual hallucinations. As Furst (1970) has noted, a potentially very fruitful subject for ethnohistorical, ethnobotanical, and ethnographic study is *Erythrina,* the reddish seeds of which, known as *colorines,* are often sold in Mexican herb markets together with the red beans of the hallucinogenic *Sophora secundiflora.* The *Erythrina* is the legendary divinatory *tsité* tree of the *Popol Vuh;* its beans were also employed in the ritual *patolli* game of central Mexico. Some species of *Erythrina* contain indole or isoquinoline derivatives, but their possible use as a narcotic is not well known. The ancient Mexicans may also have valued two species of *Rhynchosia*—*R. pyramidalis* and *R. longeracemosa*—as narcotics. Oaxacan Indians today sometimes refer to *Rhynchosia* seeds as *piule,* a term they also occasionally apply to the seeds of the hallucinogenic morning-glories.

A recently discovered Mexican hallucinogen is the composite *Calea Zacatechichi,* widely used in folk medicine. The Chontal of Oaxaca take it to "clarify the senses."

Along with the curious hallucinogenic mint *Salvia divinorum,* which was evidently used also in prehispanic times, the Mazatec of Oaxaca are said to value two species of *Coleus* for their psychotomimetic properties. The Indians recognize all these mints as members of the same "family." *El macho* ("the male") is *Coleus pumilus. El nene* ("the child") and *el ahijado* ("the godson") are two forms of *Coleus Blumei.* Both are actually imports from the Old World and so could not have been used before the Conquest.

South America. In Ecuador, the fruits of the well-known toxic *Coriaria thymifolia,* called *shanshi,* were recently reported to have hallucinogenic effects. They are eaten to induce inebriation, with the sensation of flight. Also in the north, the solanaceous *Iochroma umbratica,* known in southern Colombia as *borrachero,* is said to be employed as a hallucinogenic narcotic by the Indians of Sibundoy. Farther south, *keule* or *hualhual (Gomortega Keule)* was formerly utilized as a narcotic by the Mapuche of Chile. Several species of the genus *Pernettya* have toxic fruits which induce hallucinations and other psychic and motor alterations—some, indeed, are said to cause permanent insanity. The best-known are *Pernettya furiens,* the *hierba loca* ("crazy herb") of Chile, and *P. parvifolia* of Ecuador. The leaves of a very restricted Chilean endemic, *Desfontainia spinosa* var. *Hookeri,* are also employed narcotically. *Brunsfelsia,* a solanaceous genus with many uses in folk medicine and apparently containing tropane alkaloids, has been employed as a narcotic in Amazonian Ecuador and Bolivia, either to strengthen the effects of ayahuasca or as the principal basis of a hallucinogenic drink. An interesting problem is the highly aromatic *Justicia pectoralis* var. *sphenophylla,* the dried and pulverized leaves of which are occasionally added to the snuff prepared from resin of the *Virola* tree. They may be employed alone as the source of a hallucinogenic snuff. There are suspicions, still unconfirmed, that *Justicia* possesses tryptamines. The Mapuche Indians of Chile reputedly smoke the leaves of *Lobelia Tupa,* known locally as *tupa* or *tabaco del diablo,* for their narcotic effects. This species has numerous uses in folk medicine—Chilean peasants, for example, use the juice of the leaves to relieve toothache—but whether the narcotic effects are truly hallucinogenic is still not certain.

In addition to these plants, the botanical identity of which is known, there are still a number of New World hallucinogens for which we have only Indian names. What, for example, was the source of the Mexican hallucinogen mentioned by several chroniclers as *popomatli* or *poyomate?* What is the *guayusa* taken by Jívaro to have "small dreams" in connection with hunting or warfare? Might this be the caffeine-containing *Ilex Guayusa,* taken alone, or in combination with other plants?

Another enigma is the narcotic known among the Arawakan Mojo Indians of Bolivia as *mariri,* taken by shamans to communicate with the spirits. Metraux reported that it looked like "our verbena" *(Verbena officinalis?).* The Tanimuka Indians of Amazonian Colombia employ an as-yet unidentified liana to brew a hallucinogenic drink for boys in an adolescent initiation ritual. The effects are said to be similar to yajé, but the liana is not the well-known *Banisteriopsis Caapi.* Clearly, much more field work is required to solve these problems of botanical identification and chemistry.

Fig. 15. An early European view of tobacco smoking and fire making among the Tupinamba, on the east coast of Brazil. From a woodcut by A. Thevet, *Les Singularités de la France Antarctique, autrement nommée Amerique,* Paris, 1558.

Tobacco as a Psychotomimetic

All discussion of tobacco (*Nicotiana* spp.) has been purposely omitted from this overview of New World hallucinogens. There are some forty-

five extratropical species indigenous to North and South America. While there are hundreds of references to the use of tobacco by American Indians in religious, magic, curing, and intoxicating practices, writers of the past have hardly begun to explore the real role and significance of the tobaccos in belief and ritual. Nevertheless, the literature from 1492 to the present leaves no doubt about the supreme ritualistic and mythological status accorded to these plants by the indigenous peoples of nearly all parts of the New World. There is also ample evidence that in many areas tobacco has been employed to trigger ecstatic states very similar, perhaps even identical, to those induced by the "true hallucinogens."

Whether or not some species of *Nicotiana* have chemical constituents with real hallucinogenic activity remains to be seen. The possibility exists, of course, that the solanaceous *Nicotiana,* belonging to a family rich in hallucinogenic principles, may, when fully investigated, yield interesting phytochemical data, supporting the ethnobotanical literature that ascribes "hallucinogenic" effects to certain tobacco preparations. In any event, the genus *Nicotiana* must be counted among the most important native psychotropic plants of the Western Hemisphere. At the present time, however, I prefer to leave it to qualified ethnographic investigators to assess its significance in the intellectual cultures of the New World.* On the basis of such comprehensive studies, it will be easier and more meaningful to evaluate and direct research in the botanical and chemical fields.

* See the following chapter, by Johannes Wilbert.