Entheogens and the Development of Culture

The Anthropology and Neurobiology of Ecstatic Experience

Essays

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Contents

Chapter 12

Sacred Mushrooms and Man

Diversity and Traditions in the World, with Special Reference to *Psilocybe*

Gastón Guzmán

Gastón Guzmán was born in 1932 in Xalapa, Mexico, and is Emeritus National Research in Mexico and Emeritus Research in the Instituto de Ecologia at Xalapa, and Curator of the Fungus Collection in that Institute. This Fungus Collection was founded by him in 1980, and now it is the second most important in the country. Guzmán started to work as a botanist in 1953 in the jungles of Mexico and Central America in field explorations. Late in 1955, he was assistant to the Botany Laboratory at the Biological School of Polytechnic Institute, where he studied biology, and then Professor of Botany and Mycology during 1956–1982. He founded the Fungus Collection in that institution in 1955, now the biggest in the country. He is a biologist and earned his PhD at the same institution in 1967. He was a fellow in 1965 at the University of Michigan, under the direction of Dr. A.H. Smith, and in 1970 at the Guggenheim Foundation, as well as a visiting researcher in several mycological institutions in South America, USA, Europe and Japan, from 1970 through 1980. He has published more than 350 mycological papers, and fourteen

books, all on mushrooms, among them the first book, in 1977, on the identification of mushrooms published in Mexico, and the first world monographs of the genera *Scleroderma* and *Psilocybe*, in 1970 and 1983, respectively. He collected more than 38,000 fungi in Mexico, South America, USA, Europe, Japan, and Nepal. Dr. Guzmán has described more than 250 new taxa (including two genera) of mushrooms. He is an honorary member of the Colombian Academy of Sciences at Colombia, Mycological Society of America (USA), Latin American Mycological Association, Baracaldo Mycological Society (Spain), Mexican Society of Mycology, and Mexican Association of Medical Mycology.

Introduction

Fungi and man have shared a close relationship since the beginning of civilization, especially with those species that when consumed affect the nervous system by creating impressions of brilliant colors, visions, voices, and noises. These mushrooms are the famous hallucinogens that, since rediscovered to science in the 1950s in Siberia and Mexico, acquired widespread attention in medical circles, but mainly in popular society. An article by Wasson (1957) and the books by Wasson and his wife (Wasson and Wasson 1957) and Heim and Wasson (1958), followed by papers by Heim and Wasson, and Singer and Smith (1958) laid the basis for our current knowledge of the use of sacred mushrooms in Europe, Africa, Papua New Guinea, and North, Central, and South America.

Presented here is a critical review of the importance of these mushrooms from prehistoric times to the present, along with a discussion of the decline in their traditional use in native cultures and their abuse in modern society. The *Psilocybe* species are the most important, but I will also consider other fungi such as *Amanita muscaria*, ergot, and some species of bolets, these latter from China and bolets and russulas from Papua New Guinea. Among the psilocybin I will consider *P. aztecorum*, *P. caerulescens*, *P. cubensis*, *P. hispanica*, *P. hoogshagenii*, *P. kumaenorum*, *P. mairei*,

mexicana, P. moseri, P. muliercula, P. semilanceata, P. subcubensis, P. yungensis, and *P. zapotecorum,* hallucinogenic species that are distributed throughout almost all the world, mainly in Mexico. I will also discuss the confusion with *Panaeolus sphinctrinus,*which was mistakenly recorded as the first narcotic mushroom in Mexico. Although *Cordyceps* and *Elaphomyces* are not included in the present contribution, *Cordyceps capitata* and *Elaphomyces muricatus* were discussed by Heim and Wasson (1958) as mushrooms involved with *Psilocybe muliercula* ceremonies in Mexico, information confirmed by Guzmán (1983). It is also considered in the knowledge of the fungi among the Maya in Guatemala. As an example of the complex diversity and confusion around the hallucinogenic fungi, Heim, Singer, and Guzmán in the 1950s and 1960s discussed as sacred mushrooms species of *Clavaria, Conocybe, Copelandia, Dictyophora, Gomphus, Lycoperdon, Psathyrella,* and *Vascellum,* mushrooms without any ethnomycological importance. I will also attempt to clarify the variation in species of *Psilocybe;* e.g. recently I found that *P. zapotecorum* has sixteen different names (Guzmán 2012). See below, in the almost end of the "teonanácatl" time, the confusion of *P. zapotecorum* with *P. hoogshagenii.* Figures 2–15 show the most important fungi treated here.

The Beginning

The use of neurotropic fungi in shamanistic practices began during the Paleolithic, as can be seen in some petroglyphs in Siberia, and in prehistoric murals in the Sahara Desert and in Spain. The Paleolithic figures in Siberia were studied by Dikov (1971) and reviewed by Samorini (2001). They were found in the Chukotka region of Northeastern Siberia. These are depicted as small humans with what appear to be mushrooms crowning (or growing on) their heads, as if these mushrooms meant some mental possession. About Dikov the mushrooms are probably *Amanita muscaria.* Other petroglyphs in that area depicted figures resembling fat mushrooms, similar to species of bolets (see below). Dikov's (1971) hypothesis that *A.*

muscaria was used in shamanic ceremonies by primitive tribes in northern and northeastern Siberia was developed from information reported by Wasson and Wasson (1957), among others.

Concerning the bolets, there is some interesting information published by Stijve (1997) and Arora (2008) about a trip that Arora made to China. Arora observed some bluing bolets being sold in the markets as food. The sellers told him that it was necessary to stir-fry the mushrooms for ten to twenty minutes before eating because, if the mushrooms were not well cooked, they produced visions and people saw "little men." Using this information, Arora interviewed other people, and a student reported that he had seen a whole regiment of little soldiers marching over the table after consuming insufficiently cooked bolets. Another case was reported by a young woman who told him that she remembered eating some bluing bolets when she was a child and seeing very clearly that walls and shapes were moving. When she stared at a dripping water faucet, each droplet falling into the sink turned into an insect and crawled away. The sensation endured for two days. These cases in China are related to the information reported by Heim (1962) and Heim and Wasson (1965), in which they describe the use of bolets by several tribes in Papua New Guinea, as I will discuss below.

Prehistoric murals discovered in the Sahara Desert in Africa, in the Tassili caves of southern Algeria (Samorini 1992, 2001), depict a line of running human figures each holding a mushroom in the right hand (figures 16–18), appearing to be depositing the mushrooms in the bottom of the cave. In another mural of that place, two shamans are depicted in a state of ecstasy. They are shown wearing masks and their entire bodies, including arms, hands, and legs, are covered with mushrooms. Guzmán (2012) has suggested that the mushrooms depicted are *Psilocybe mairei* (Figure 2), a hallucinogenic mushroom described by Maire (1928) from Algeria and later by Malençon and Bertault (1970) from Morocco. Presumably the Sahara Desert was not as arid as it is today, and there were forests of oaks and conifers at this time like those that grow today in other parts of Algeria and Morocco where *P. mairei* has been found.

A prehistoric mural related with mushrooms (Figures 19 and 20) has also been recently discovered in the Selva Pascuala Region in Cuenca Province, northeast of Spain close to the Pyrenees Mountains. Akers et al (2011), with the assistance of Guzmán, studied that mural and identified the mushrooms depicted as *Psilocybe hispanica* (Figure 3). Guzmán (2000) described this mushroom from the Pyrenees, where it is found growing on dung, and where young people consume it as a form of recreation (Fernández-Sasia 2006). The mural shows a hunting scene with several men, bulls, and deer, and a row of thirteen fruiting mushrooms. It is supposed that these mushrooms are related in a shamanic relationship with the dung of the animals. It is interesting to note that some of the mushrooms depicted are shown with their stems bifurcated at the base, which could have led to an anthropomorphic interpretation as legs. Similar anthropomorphic figures are also found in other Spanish murals, but without any depicted mushrooms.

Amanita muscaria in the Traditions

I present here the most important ethnomycological information on *Amanita muscaria* in order to discuss its important role in the ancient cultures of Eurasia and Mesoamerica. In so doing I hope to avoid duplicating or contradicting the contributions by K. Feeney and E. Klapp in this book. *Amanita muscaria* (Figure 14), which grows in pine and beech forests throughout the world, attracted human attention because of its brilliant color and form and, when ingested, it induced gigantic colored visions (macropsia) and a sensation of euphoria, even though it sometimes also produced gastrointestinal distress. We know that this mushroom was used and still is probably in use by some primitive Siberian tribes (Wasson and Wasson 1957, Schultes and Hofmann 1979). The Siberian tribesmen also drank the urine of those who had eaten the mushrooms in order to achieve the same effects. *Amanita muscaria* is a taxonomic complex of at least four varieties, the most common being the *kamtschatica, americana,* and *flavivolvata,* the latter two occurring only in America (Singer

1986). It is curious that, in addition to the neurotropic effect of this mushroom on men, it was also observed early on that it stupefied flies. It was for this reason that it acquired its common English names of "fly mushroom" and "fly agaric." Linnaeus observed this property and named this mushroom *Agaricus muscarius*.

Amanita muscaria was especially important in the Nordic countries of Europe, where it was used in the early religions (Nichols 2000). A chapel in Plaincourt, France, from the Middle Ages has a mural depicting Adam and Eve in the Garden of Eden. They are on opposite sides of a tall tree in the shape of an *A. muscaria*. A serpent coiled on the long stem of the mushroom offers them the traditional apple. Both Adam and Eve have their hands on their stomachs, as if they have abdominal pain. Here we can see the effect of the macropsia produced by this mushroom, inasmuch as Adam and Eve are of the same stature as the tree. This mural shows how this mushroom was linked with the Church (Ramsbotton 1953, Wasson and Wasson 1957, Gartz 1996, Samorini 1997, 2001). Wasson (1968) claimed that *A. muscaria* was the origin of the enigmatic soma of ancient Indo-Aryan religion. As for the chemistry of the fungus, there is still confusion concerning its chemical composition. The first substance studied was muscarine, a toxic glycoside that produces gastrointestinal distress. Then bufotenin was isolated, an indolic substance first known from the skin of the toad *Bufo*. Somewhat later it was realized that rather than bufotenin, *A. muscaria* contains ibotenic acid, another indolic substance, which produces color visions. Still later, muscimol and muscazone were isolated, both of them derivatives of ibotenic acid (Schultes and Hofmann 1973).

Amanitas and Diffusion

It is generally believed that *A. muscaria* came into use in America during the Ice Age, after people from Siberia crossed the Bering Strait into what is now Canada and the United States. The Ojibwa Indians in the Great Lakes region between Canada and the United States still consumed *A. muscaria* in the traditional way (Wasson

1979, Navet 1988). Emigrating southward, humans reached Mexico and Guatemala, where a number of carved and painted images in the ancient and Spanish Colonial art have recently been identified as representing this mushroom (de Borhegyi 2011). However, in contemporary Indian cultures as well as in their traditions, *A. muscaria* is not used as it once was. In Mexico, at the archaeological place of the Capacha Culture near Nevado de Colima, a clay figure of a little Indian was found, seated under a gigantic *A. muscaria* (Figure 21). Here we see the macropsia effect, as well as an appearance of ecstasy on the countenance of the man. He has his arms raised in front of him and a somniferous smile on his face. This piece is now in the Regional Museum in Guadalajara (Schultes and Hofmann 1979; Wasson, in Kramrisch et al, 1986; Guzmán 2012). Another Mexican example is a small stone in the shape of an *A. muscaria* button (Figures 22–23). This artifact was found at an archeological site near Pátzcuaro, Michoacán, attributed to the Purepecha Indian group. The Indians of the region, who do not eat *A. muscaria* at the present, say that it is poisonous, especially in its button stage (Figure 24). This fact may explain why this small stone carving bears a skull on one side, a possible warning of the danger of eating this fungus in its button stage.

As for the use of *A. muscaria* by the Náhuatl Culture (also named Aztec), two interesting archaeological pieces represent the relationship of this mushroom with the mind (Figures 25–26). A carved stone piece (Figure 25) shows an *A. muscaria* in each eye socket instead of an eye, and the face of the person is distorted. In Figure 26 the right side of the face of this terra-cotta head has a hat and nose in the shape of an *A. muscaria,* while the left side of the face is completely distorted. Both figures show how important this mushroom was in the Aztec culture, and its relationships with the mind.

Art and Amanitas

Lowy (1972) found interesting representations of *A. muscaria* in the Maya culture in Dresden, Galindo, and Madrid codices, and

suggested that they might relate to the sacred mushroom cult among the Maya, an observation first proposed by de Borhegyi (1957). Lowy (1974) also discussed finding a Thunderbolt legend in Guatemala and Mexico (Chiapas) relating lightning and thunder with *A. muscaria*. These two natural phenomena inspired fear, respect, and reverence for the power displayed. The ancient Maya thought this phenomenon was related to a magical alliance with the mushroom. Today the Indians say that *A. muscaria* is born where thunderbolts fall, and that is the reason that mushrooms have such strong power, as discussed also by Guzmán (2003a). There is another legend on the thunderbolt and the *Psilocybe zapotecorum*, which I will discuss below. Nyberg (1992) compared the traditional use of *A. muscaria* in Siberia with the traditional use of the psilocybin among the Mesoamerican cultures. He reported that the Siberians take *Amanita muscaria* as a means of communicating with the spirits, as a treatment for disease, and to relieve dangerous situations, but not for religious reasons, while the Mesoamerican Indians take the psilocybin for religious purposes. However, the Mexican Indians use psilocybin to cure or protect from disease, or to communicate with relatives from the past, as noted by Wasson and Wasson (1957) and verified by the author in his numerous field trips.

The "Teonanácatl" Time

While the Mesoamerican Indians used *Amanita muscaria* as a sacred mushroom for many years (we do not know for how long), they eventually switched to other mushrooms and even to other plants, such as peyote (*Lophophora williamsii*, a narcotic cactus found in desert areas). In the course of this change, they discovered the hallucinogenic properties of several species of psilocybe. This change may have occurred because *Amanita muscaria* is not abundant, and it causes stomach distress. The psilocybin, on the other hand, are found in abundance, as reported by Sahagún in the sixteenth-century in his relation to the mushroom known by the Aztecs as "teonanácatl." Moreover, their ingestion does not result in gastrointestinal troubles

There is much evidence of the pre-Hispanic use of psilocybin as sacred mushrooms, not only in Mexico, but in all Mesoamerica and even in South America. The earliest information comes from the Capacha Culture in the Nevado de Colima region of Mexico, with a piece (Figure 27) found in the same place as Figure 21 and related to *Amanita muscaria*. This piece of Figure 27 was first discussed by Furst (1974), and later commented upon by Schultes and Hofmann (1979), as well as, more recently by Guzmán (2009, 2012). Furst, Schultes, and Hofmann interpreted the figurine as a group of Indians in a mushroom ceremony, or as dancers, respectively. Regarding this mushroom, because of the thick stem, form of the cap, and robustness, Guzmán (2012) identified the species as *Psilocybe zapotecorum* (Figure 15), a common mushroom in the region. Schultes and Hofmann (1979), however, thought it could be *P. mexicana* (Figure 4). As for the Schultes and Hofmann (1979) interpretation of dancing Indians, this is erroneous because the people of the figure appear more likely to be under the neurotropic influence of the mushroom. They are portrayed with their eyeballs out of their sockets, and the mushroom is depicted as gigantic due to the macropsia effect. For this reason the persons cannot remain standing, much less dancing, and so they hold their arms around each other. The most important observation concerning this figure, according to Guzmán (2012), is that both hats and arms of the four Indians are snakes. This observation accords with the fact that snakes were of great importance in the Náhuatl and other Mexican Indian groups; they were considered sacred and represented the important god Quetzalcóatl. Moreover, both Schultes (1939) and Wasson (1980) observed representations of Quetzalcóatl in relation with some mushrooms in the Vindobonensis Codex.

The relationship of Quetzalcóatl in Figure 27 is confirmed by another Capacha piece (Figure 28), also from the Nevado de Colima region of Mexico. In this miniature assemblage, five Indians embrace in a circle surrounding another individual, and all of them also have snake hats and arms. Donitz et al (2001) reported this interesting piece, but without any comment. The two above figures (Figures 27

and 28) are very similar and differ only in that the second, instead of a mushroom, has another person in the center of the circle. This central figure probably represents Quetzalcóatl. We conclude, therefore, that the ingestion of sacred mushrooms such as psilocybe is related to the god Quetzalcóatl.

Náhuatl Culture

Sahagún (1530), in his important treatise on the Náhuatl Culture, described some devilish mushrooms that the Indians ate, which gave them terrible visions. These mushrooms were known as "teonanácatl" (teo=sacred, nanácatl=mushroom). For several centuries both the mushroom and even the word "teonanácatl" were unknown. Then, early in the twentieth-century, Saffor (1915) proposed that "teonanácatl" was the peyote that some Indians consumed as a narcotic (see above). He isolated an indolic substance from this plant, which he named mescaline, because he confused peyote with the fruits of the *Agave*, which is used to produce the Mexican alcoholic drink known as "mezcal." Meanwhile, Reko, who was studying the Indian traditions of Oaxaca, heard about some mushrooms that they ate in nocturnal ceremonies. When this news reached Schultes, who was at Harvard University, he established contact with Reko in order to learn more about these rare mushrooms. Reko and Schultes visited the village of Huautla de Jiménez, where the Indians were supposed to use these mushrooms, and obtained two packages of mushrooms from the Indians. The next day, Reko and Schultes searched for these mushrooms in the field, and placed specimens in a third package. Schultes deposited the three packages at Harvard University for study. However, only the mushroom in the package gathered by Reko and Schultes was identified, because the others were unknown (Guzmán 1983, 2012).

The mushroom identified at Harvard University was *Panaeolus campanulatus* var. *sphinctrinus*. With this information, Schultes (1939) published the first identification of Sahagun's "teonanácatl." Later, in the 1940s, Singer studied the other packages of mushrooms

brought by Schultes to Harvard University. The first package he identified better as *Panaeolus sphinctrinus* (Figure 11), and one of the others as *Psilocybe cubensis* (Figures 7 and 29), an important mushroom considered sacred by the Indians. Singer presented this new and outstanding information in two small paragraphs in his great book of more than 800 pages on the taxonomy of Agaricales (Singer 1949). One paragraph concerned *Panaeolus sphinctrinus*, and the other *Psilocybe cubensis*, both species considered as narcotics among the Indians discussed by Schultes. Later Singer removed the information on *Panaeolus* in subsequent editions of his book (e.g. Singer 1986), after Guzmán informed him in a letter that no species of *Panaeolus* used in Mexico was considered sacred. Nevertheless Schultes continued to insist that Indians used *P. sphinctrinus* (Schultes and Hofmann 1979). This case is similar to the auditory *Lycoperdon* species reported by Heim et al (1966) and rejected by Guzmán (in Ott et al 1975), because those lycoperdaceous mushrooms are a mixture of *Lycoperdon*, *Vascellum*, and *Scleroderma*, all with auditory properties, the two former edible and the latter poisonous. However, Schultes and Hofmann (1979) presented that information as fact. Guzmán showed in several papers that *Panaeolus* and the lycoperdaceous were not used by the Indians at any time (e.g. Guzmán 1983, 2008, 2009, 2012). The problems with *Panaeolus* probably began when Reko and Schultes heard the Indians' descriptions of sacred mushrooms. One is a fungus growing on soil in grasslands (*Psilocybe mexicana*, Figure 4) while the other is a mushroom growing on dung (*P. cubensis*, Figure 29). When Reko and Schultes searched for these mushrooms in the field, they could not find any, but instead found the common *Panaeolus*, easy to find on dung and presenting smaller fructifications as *Psilocybe mexicana*. Concerning the third package of mushrooms at Harvard, Guzmán (1983) identified it as *P. caerulescens*, a common sacred mushroom among the Mazatec (Figure 5).

When Wasson and his wife were in Siberia studying why there are people who eat mushrooms and enjoy them, and others who are afraid to eat any kind of mushroom, a friend sent them a picture of a Maya

mushroom stone and an article published by the Maya archaeologist de Borhegyi (Wasson and Wasson 1957, de Borhegyi 1957). They decided thereupon to look for the origin of that Maya piece, but in so doing came across the paper on "teonanácatl" by Schultes (1939). In 1953, the Wassons went to Guatemala to meet de Borhegyi and went with him to look for evidence of current use of hallucinogenic mushrooms in Guatemala. Finding none, they continued to Mexico and visited Huautla de Jiménez. During several trips to that village in 1954–1956 they came to know María Sabina, a shaman (*curandera*) who used sacred mushrooms in nocturnal ceremonies. Although the Wassons knew the hallucinogenic mushrooms, they required help from Heim for their identification. Later, after Heim and Wasson visited several other parts of Mexico in order to study these mushrooms, they found that the most important species were *Psilocybe* followed by *Stropharia cubensis* (known today as *Psilocybe cubensis*) (Figures 4–9, 13bis, 15, 29), and *Conocybe siligenoides*, and not *Panaeolus* (Wasson 1957, Heim and Wasson 1958). Singer, who had studied several different mushrooms in South America, explored Mexico in 1957 looking for hallucinogenic mushrooms. He and Smith, from the University of Michigan, published the first world taxonomic monograph on hallucinogenic mushrooms, all of them belonging to the genus *Psilocybe* (Singer and Smith 1958). They reported that there were thirteen species of hallucinogenic *Psilocybe* known at that time. However Guzman, who began his study of hallucinogenic mushrooms in 1957, first as assistant of Singer, published later a world monograph on the genus (Guzmán 1983) in which he considered around ninety species.

The Magliabechiano Codex

The Magliabechiano Codex, which Sahagún attributed to the Indians in his great work on Aztec culture, includes a color drawing of an Indian eating the "teonanácatl" (Figure 30). Among the mushrooms which the Indian presumably gathered, are three fruiting bodies with green caps. Moreover, there is a gigantic and frightful personage

standing behind the Indian, which is probably the god of sacred mushrooms, as Guzmán (2012) stated. The frightful personage clutches the Indian to take him to the mushroom world. Since the Catholic Church had forbidden the consumption of these mushrooms, because they were considered to be demonic, Sahagun probably asked the "tlacuiles" (the scribes who drew the codices) to represent the devil. The Indians, who did not know what the devil looked like, painted the mushroom god. From the form and color of fungi shown in this drawing, Guzmán (2012) believes that they belong to *Psilocybe zapotecorum*, which is common in the Tetela del Volcán, a region on the southern slope of the Popocatépetl volcano, close to the ancient Aztec capital Tenochtitlán (the site of modern-day Mexico City). Guzmán (2008) first identified the mushrooms in the Magliabechiano Codex as *P. caerulescens* (Figure 5), but later, after considering that this species is not common, and is unknown in the all surrounding area of Mexico City, identified it as *P. zapotecorum*.

It is confusing that the name "teonanácatl," which Sahagún (1530) assigned to the mushroom, is not used by any ethnic group in Mexico. Neither is it to be found in any Spanish Colonial source other than Motolinia (1541), who seems to have taken the word from Sahagún. Notwithstanding, this word has been extensively cited in the bibliography ever since hallucinogenic mushrooms were rediscovered in Mexico (e.g. Schultes 1939, Wasson and Wasson 1957, Heim and Wasson 1958, Singer and Smith 1958). Although Guzmán has looked in vain for the name "teonanácatl" among the different Mexican ethnic groups, he did find the name "teotlaquilnanácatl" in his explorations in 1959 in the State of Puebla (Guzmán 1960). This word is very similar to the one used by Sahagún, but differs from it only in the prefix "tlaquil," which means paint. Guzmán heard that name in a dialogue with some Indians after showing them some hallucinogenic mushrooms, for example, *Psilocybe caerulescens, P. cubensis*, and *P. zapotecorum*. The Indians were at first quite surprised because, at that time, it was highly unusual for a white man to have sacred mushrooms in his hands. The sacred mushrooms had been kept a secret from the white man

because the Church forbade them. That is probably the reason why Sahagún was unable to report the name correctly. The Indians tried to keep the use and name of such mushrooms a secret. However, the correct word seems to be "teotlacuilnanácatl," because of its relation to "tlacuil," meaning paint or painting. As for the secrecy with which the Indians kept all knowledge of the sacred mushrooms, it is interesting to note that Sahagún did not hear the word "apipíltzin" used in the eastern area around the Popocatépetl volcano, where he was evangelizing the Indians. "Apipíltzin" is the name the Indians give to *P. aztecorum* (Figure 8), a small sacred mushroom that grows in the high pine grasslands on that mountain (Guzmán 1978, 1983).

Two other Indian codices depicting mushrooms are Codex No. 27 (Figure 31) and the Lienzo de Zacatepec No. 1 (Figure 1), in each of which is a glyph of a hill in the shape of a human head with mushrooms on or inside the head. In Codex 27, the glyph depicts a hill with two mushrooms. Caso (1963) identified it as "nanacatépetl." The glyph of the hill in the Lienzo de Zacatepec is shaped like the head of an Indian with four mushrooms above (inside of him?). Wasson (1980) believed that both codices related to the use of hallucinogenic mushrooms. Guzmán (2012) tentatively identified the mushrooms in both codices as either *P. zapotecorum* or *P. muliercula* (Figure 9), both of them common in the regions in which the codices were painted.

Another interesting legend of the sacred mushrooms was obtained by Wasson, who through an interpreter learned that the Indians related hallucinogenic mushrooms to lightning bolts. According to the Zapotec shaman (brujo) named Aristeo Matias, *P. zapotecorum*, which he called "piule," was considered sacred because lightning bolts bred mushrooms and put blood into them (Wasson, in Kramrisch et al 1986). In 1957 Guzmán, while looking for information on the "piule" (mushroom) or "corona de Cristo" (Christ crown), met with Don Aristeo, a wise man who lived alone in an isolated Indian house situated in a field some distance from the town of San Agustín Loxicha. Guzmán asked him, through an interpreter, where the mushroom "corona de Cristo" grew and how it was used

in ceremonies. Guzmán learned many interesting things from Don Aristeo, among them the swampy habitat of *P. zapotecorum,* where Guzmán gathered that mushroom and sent it to Singer for study (Guzmán 1983). Singer identified this mushroom as *P. zapotecorum.* However, sometime later, Guzmán identified that collection from the muddy habitat as *P. hoogshagenii,* which the Indians also considered sacred and identified as "piule" or "corona de Cristo," but different from *P. zapotecorum* (Guzmán 1983, 2012).

Mushroom Secrets

Wasson's claim that the Indians kept the use of the hallucinogenic mushrooms as a secret is not true, as stated in Kramrisch et al (1986), and confirmed several times by Guzmán (1960, 2008, 2009, 2012). The eating of these mushrooms was, however, kept secret from the white man, who did not understand why the Indians ate the "terrible" and sacrilegious mushrooms. The Church followed the problem of the natural mycophobia of the Spanish population when it first opposed the use of these and other mushrooms and began a vigorous persecution of the Indians through the Inquisition. Just as happened in Europe in the Middle Ages (with *Psilocybe semilanceata,* Figure 10, and *Amanita muscaria,* Figure 14, see ahead), the native people in the Spanish Colony in Mexico were forced to conduct their mushroom ceremonies in secret. This is the reason why the Indians live today in the high mountains (e.g. Huautla de Jiménez), to which they escaped in the hope of being left alone by the Spaniards and the Church. Despite these intentions, the friars and missionaries established themselves in all of the Indian towns and gradually changed the Indians' reverence for their own gods and cults to today's worship of the God of the Christian religion. In this connection, it is interesting to note that in one little church in Chignahuapan, Puebla, a mushroom is still venerated. They named this church "El Señor del Honguito" (The Lord of the Mushroom). Guzmán et al (1975) studied this church and found that it was built in honor of the fungus *Ganoderma lobatum,* the cap of which has

on the pore face a sketch of the crucified Christ. The hypothesis is that, because the Indians preferred to worship Christ by eating psilocybin at improvised Christian altars carved into the walls of ravines, where these mushrooms commonly grow, the religious of the church decided to find the mushroom that the Indians would eat, and that would instead persuade them to go to the church. Nevertheless, they could not gather those rare fungi, but found a woody *Ganoderma* and, after making a drawing of Christ on the pore layer of the mushroom cap, left it in the road. When the Indians found it, they declared it to be a miracle, and believed that they must go to the church to worship Christ. After that, the Indians built a special little church to the miraculous mushroom.

Other Central and South American Artifacts Related to the Cult of the Hallucinogenic Mushrooms

In the Maya Culture of Guatemala and El Salvador (both in Central America) many ancient stone artifacts have been found that are carved in the shape of mushrooms (Figures 32 and 33). These are the famous "mushroom stones" first reported by de Borhegyi (1957, 1961). Although de Borhegyi was convinced that they represented mushrooms because of their shape, there has been much debate about their meaning (Wasson and Wasson 1957). In this debate some anthropologists have related these figures with phallic symbols. In this connection some very large mushroom stones have recently been reported from Peru (Torres, C., personal communication). These stand approximately 1.5 meters in height and have a phallic form. Some of them even have an apical fissure. Recently, Trutmann (2012) published a review of the anthropological pieces from Peru, among them these "mushroom stones," in which he supposed they are mushrooms or phallic representations. However, Wasson (1980), based on some pieces found by Lowy and Heim (Figures 34 and 35), which represent individuals with heads held downward and eyes

out of their sockets, stated that it is probable that these pieces depict individuals under the influence of neurotropic mushrooms, because it seems they are positioned head-first, as if they are returning to reality after sensing that they were flying. This sensation is frequent when these kinds of mushrooms are eaten. Also Guzmán (2012) relates these Maya mushroom stones with the cult and use of *Psilocybe zapotecorum*, known for its robustness and form, a species common in Guatemala as well as in Mexico.

Schultes and Bright (1979) illustrated some interesting small gold pectorals that were found originally in the Darién region of Panama and are now housed in the Gold Museum of Bogotá. These anthropomorphic figures (Figures 36, 37, and 38) are depicted with two mushrooms on the head and big round earrings or wings growing from the sides of the head or neck. Schultes and Bright (1979) and Schultes and Hofmann (1979) relate these figures to the use of sacred mushrooms and explained the depiction of wings or large round earrings as indicating that they feel as if they were flying, which is the psychotropic effect of ingesting this kind of mushroom. One of these figures is a woman (Figure 38) sitting with an expression of meditation. Guzmán (2012) suggests that, based on the form and size of the mushrooms and their tropical locality, these mushrooms could be *Psilocybe moseri*, a hallucinogenic species belonging to the group of *P. zapotecorum* that grows in tropical regions. In another case, a metal figure (Figure 39) recently found in Colombia (Torres, C., personal communication) appears to be related to the above-mentioned golden figures from Panama. It represents a woman sitting with a mushroom in each hand. The figure belongs to the Quimbaya culture, and the mushrooms also appear to be *P. moseri*. Another figure, this one found at Lake Titicaca, belongs to the Puccara Culture of Peru (Figure 40). It is an Indian with his eyes out of orbits, where a mushroom is engraved on his hat and he holds another in one of his hands. Guzmán (2012) believes this piece also relates to hallucinogenic mushrooms. Finally, Furst (1974), discussing early Jesuit missionaries, reported that the Yurimagua Indians in Peru ate a tree mushroom to get drunk. Presumably this

mushroom is *Psilocybe yungensis* (Figure 13 bis), a species that grows on rotten wood in temperate forests from Bolivia to Mexico (Heim and Wasson 1958, Guzmán 1983).

Sacred Mushrooms in Europe from Greek Times to the Middle Ages

In addition to the examples cited earlier on the use of *Amanita muscaria* in Europe in the past, there is information of the use of other hallucinogenic fungi in the Middle Ages. However, the earliest use of fungi in relationship to religion began in ancient Greece, where in a city named Eleusis near Athens, a sacramental drink was used in mysterious rites (Kramrisch et al 1986), drunk from special porcelain vessels. On these vessels are depicted tassels of wheat, because of the relationship of the tassels with a hallucinogenic fungus. The nature of the drink remained a puzzle for centuries, until research conducted by Hofmann in the team of Wasson et al (1978) revealed it to be related to the indolic substance LSD (lysergic acid diethylamide), the first psychotropic substance known to science. Hofmann isolated LSD as early as 1937, although its hallucinogenic properties were not recognized until 1943. Hofmann studied the special ceremonies that took place in Eleusis, and based on his chemical and physiological research on the Eleusis drink, Wasson et al (1978) concluded that the Greeks in Eleusis used the sclerotia of the ergot, *Claviceps purpurea* (Figure 12), which is a parasite on the tassels of wheat, rye, or barley.

These sclerotia of the fungus have thirteen alkaloids, which produce contractions on the even musculature and in addition vertigo, trembling, cold perspiration, and visions. Hofmann observed that of these alkaloids, the ergonovine, which is the basis of LSD, is hallucinogenic and a water-soluble indolic substance. Hofmann experimentally drank the water solution and experienced symptoms like those from psilocybin. In this way, Wasson et al (1978) stated, therefore, that the Eleusian secret of why and how the Greeks got drunk in a psychotropic way was from ergot, which

they drank dissolved in water. Moreover, Samorini and Camilla (1994) studied a Greek representation of a mushroom they found in the Louvre museum at Paris. Here Demeter and Persephone are apparently talking about a mushroom, an unknown agaric in the hand of Persephone. This mushroom is an indication of how little we know about the ethnomycology of the Greek culture. We also do know that *Claviceps purpurea,* through its sclerotia, produced great epidemics in Europe during the Middle Ages, when the flour used for baking bread became accidentally mixed with sclerotia. People intoxicated by eating the bread experienced psychedelic hallucinogenic perceptions. It is interesting to note, moreover, that in Europe and North America sclerotia were also used pharmaceutically, as a uterotonic agent in the control of postpartum hemorrhages, because of its action on the uterine musculature (more information on the uses of the ergot is in Ramsbottom 1953, Kramrisch et al 1986, García-Terrés 1994, and Samorini 2001).

As for the Roman culture, in which edible mushrooms were very important (e.g. *Amanita caesarea*), an interesting carved stone mushroom was found in an old market in Algeria (Figure 41, Harshberger 1929). The mushroom is identified as an edible variety, probably *Volvariella volvacea,* which is a common species in tropical regions. On the other hand, two Roman mosaics in Tunisia depicted mushrooms (Samorini, 1998), which appear to be large agarics identified as *Psilocybe mairei.* This hallucinogenic species, which is known only from Algeria and Morocco (see above), produces macropsia, as do all hallucinogenic species. It is probably for this reason that the mushrooms in the mosaics are so very large, and linked with their profane use.

There are several reports of the use of hallucinogenic mushrooms in Europe during the Middle Ages. All relate to the *Amanita muscaria* (Figures 14 and 24) or *Psilocybe semilanceata* (Figure 10) and are linked with either the mushroom-trees of early Christianity, or with colloquial expressions. Nevertheless, some churches contain frescoes of Genesis, depicting Adam and Eve with the tree in the Garden of Eden. The most famous mural is the one discussed here earlier from

Plaincourault in France. Samorini (1998, 2001) studied another mural in the abbey of Saint Savin, France, where a scene from the Old Testament depicts two mushroom-trees, one of them resembling a *Panaeolus,* according to Samorini, or *Psilocybe coprophila,* according to Guzmán. Whichever the case, both mushrooms are poisonous, and their representation in the mural may imply that these mushrooms are dangerous. Additionally, Samorini (2001) and Gartz (1996) discussed the bronze doors of the cathedral in Hildesheim, Germany, which depict Adam and Eve below a mushroom-tree in the form of two tall *Psilocybe semilanceata.* Close by is God shown asking Adam, "Who ate the forbidden fruit?" As if in answer, Adam points to Eve and both cover their genitals with one of their hands. In this scene the macropsia produced by *P. semilanceata* is clearly evident. In another way, Gartz (1996) and Samorini (1998) discussed certain colloquial Catalan expressions such as "estar tocado de bolet" (to be touched by the mushroom) and "bruja picuda" (witch with a point). Both seem to relate to the practice of witchcraft, with the former referring to the effect of the mushrooms, probably *Amanita muscaria,* which when eaten causes a kind of craziness, while the second is related to *Psilocybe semilanceata,* a mushroom with a cone-shaped papillate cap. Samorini (1998) also comments that in Milan, Italy, in the ninth-century, the *Amanita muscaria* was famous for its property of producing pleasure. It was said that this mushroom "makes you sing."

Hallucinogenic Mushrooms in Papua New Guinea

Traditions relating to hallucinogenic mushrooms in Papua New Guinea are poorly known, despite the fact that they were studied many years ago; for example, Ross (1936), Gitlow (1947), Wasson and Wasson (1957), Singer (1958, 1960), Reay (1960), Heim (1962, 1965, 1966), Heim and Wasson (1965), and Heim et al. (1966). Nevertheless, Treu and Adamson (2006) recently presented

a good review. We know that Heim (1962) and Heim et al (1966) described the hallucinogenic *Psilocybe kumaenorum* (Figure 13), but did not relate it to mushrooms in use by the local people. Other hallucinogenic species of psilocybe in Papua New Guinea, such as *P. brunneocystidiata* and *P. papuana*, have been described by Guzmán and Horak (1978), but also without ethnomycological information. As for the use of hallucinogenic mushrooms in Papua New Guinea, there are bibliographical reports of several tribes, namely the Kuma, Mogei, Papus, and Sina-Sina, which use these mushrooms in the Mount Hagen or Waghi Valley, both in the Western Highlands of that country. Among the names given to the mushrooms are "nonda," "ngam ngam," "wonda bingi," and "koobl tourroum." These mushrooms are apparently eaten in ceremonies, where everyone exhibits some madness, sorrow, or excitement. They run about crazily and occasionally individuals are even killed in a collective frenzy. They also attack members or neighboring clans with spears or other weapons.

The mushrooms reported by Heim (1962, 1965, 1966) and Singer (1958, 1960) are listed in Table 1. All belong to the genera *Boletus, Heimiella,* and *Russula,* but not to *Psilocybe.* Hofmann used chromatography to reveal indolic substances in some of the samples of bolets sent to him by Heim. Moreover, when Heim consumed *Boletus manicus* he saw brightly colored visions. Schultes and Hofmann (1979) present a review of the information published by Heim on Papua New Guinea. Similar cases of *Boletus* have been reported in China (see above). Apparently, the people of Papua New Guinea no longer use these narcotic mushrooms. The civilization has brought about deforestation of the woodlands. This in turn has caused a decline in the number of bolets and russulas, which are associated with trees through the mycorrhiza, and is changing the traditions (see the following chapter).

Table 1. Narcotic mushrooms other than the Psilocybe that were used traditionally in Papua New Guinea and produced madness (see text).

Boletus flammeus

B. kumaeus

B. manicus

B. nigerrimus

B. nigroviolaceous

B. reayi

Heimiella anguiformis

Russula agglutinata

R. kirinea

R. maenadum

R. nondorbingi

R. pseudomaenadum

R. wahgiensis

The Present: Loss of the Traditions

Just as the traditional use of intoxicating mushrooms has declined among the indigenous people of Papua New Guinea, so has the traditional use of hallucinogenic mushrooms declined in Mexico. In this latter case it is in large part due to the fame of these

mushrooms, especially among young people, who use them for recreational purposes. Maria Sabina and other shamans (*curanderos* or *brujos*) in Mexico insisted that improper use by white people, who took the mushrooms without any ceremonial respect, caused the sacred mushrooms to lose their power. Young Indians seized the opportunity to sell sacred mushrooms to young white people, and a prosperous trade began in the 1970s. At the same time, when white youth discovered how easy it was to cultivate these hallucinogenic mushrooms at home, they established a good business, which, though primarily in the USA, Europe, and Japan, now extends to almost the whole world. In Indonesia, and in particular in Bali, restaurants commonly offer scrambled eggs mixed with such hallucinogenic mushrooms as *Psilocybe cubensis* or *Copelandia cyanescens* (Allan, personal communication, Schultes and Hofmann 1979, Gartz 1996).

It is truly unfortunate that the wide experience and knowledge of the indigenous people concerning both sacred mushrooms, and edible mushrooms in general, is being lost. Guzmán (2001), in the course of numerous field trips, became acquainted some time ago with this extensive and important knowledge. In 1953, when he first started to study mushrooms, the Musquitias Indians of Honduras showed him *Psilocybe subcubensis* as an important mushroom in their traditions. They called that mushroom "suntiama," but he did not obtain more information about the use. It is very probable that this tradition has now been lost. In 1957 Guzmán established a good friendship with Isauro Nava, an intelligent Mazatec man from the region of Huautla de Jiménez in Mexico, who spoke and wrote well in both Spanish and Mazatec. He explained many important things about mushrooms both to Singer and Guzmán. Figure 42 is an example. One might ask here, who is teaching, the Indian or the scientist? Nocturnal ceremonies in Mexico using sacred mushrooms, which were common when these mushrooms were first reported by Wasson (1957), are either now very rare, or have disappeared entirely in many of the towns. In Huautla de Jiménez, these ceremonies are now conducted for tourists and business has become more important than traditions.

Abuse of Use Without Context

Guzmán (2001, 2003b, 2009) discusses both the traditions related to sacred mushrooms, and their abuse as recreational hallucinogens. He suggests some solutions to combat their trade and recreational use, and warns the public of the dangers of eating these mushrooms without following the wise recommendations of the Indians. Their precautions are very simple. First, the mushrooms should be eaten only at night in order to avoid noises and distractions, in order to concentrate only on the visions, voices, and noises that are the effect of these mushrooms. An experienced person should be present when they are eaten to assure that they are taken properly; never eat these mushrooms alone. However, unnecessary people should be avoided or must remain silent. Alcoholic drinks should be avoided before, during, or after their ingestion, together with any food, medicine, coffee, or smoking. Finally, the person should rest and not attempt to work during the following five days, because the mind needs that amount of time to return to its normal state. With these simple rules, we can understand how shamans such as Maria Sabina and Aristeo Matias lived many years without any mental problems, in spite of their frequent use of the mushrooms.

Corollary

It is hoped that this contribution has revealed something of the complex world of sacred hallucinogenic mushrooms, among which *Amanita muscaria,* many species ofpsilocybe, and some bolets and russulas, among others, are the most important, even though their traditional use is being lost, along with the knowledge of these mushrooms and their proper use, as is the case of the ergot in Greece. It is interesting to observe that in spite of the worldwide distribution of hallucinogenic mushrooms (Guzmán et al 1998), only some tribes from Siberia and Indians in Canada, the USA, and Mexico continue to use these mushrooms in their religious traditions.

The loss of native traditions began with the spread of European civilization throughout the world. The colonization of new lands brought change to the native cultures by introducing new customs and forms of life. Much of the original vegetation was destroyed by the introduction of plantations for agriculture (e.g. banana, citrus, sugar cane) or for cattle. The introduction of new plants, such as *Araucaria, Casuarina, Eucalyptus,* and *Grevillea* trees, changed not only the lifestyle of the natives, but also changed the habitat of the mushrooms, as discussed by Buyck (2008) in Madagascar, and Treu and Adamson (2006) in Papua New Guinea, and observed by the author in Mexïco and Central and South America. On the large tropical island of Madagascar change has been so drastic that, incredibly, despite the numerous mycological explorations made in the past and the studies by Hennings, Patouillard, and Heim, no species of *Psilocybe* or other hallucinogenic mushrooms, which surely grew or grow there, has ever been recorded.

Today, unlike during the 1950s, it is difficult to find a shaman or even a wise older Indian in Mexico who knows about sacred mushrooms. Hallucinogenic mushrooms are now considered a drug in Mexico, as well as in many other countries, despite the fact that these mushrooms are not drugs. Scientific studies on them have been delayed or legally prohibited, also forbidding their remittance to specialists or the exchange of specimens. Barron et al (1964) asked an interesting question: Could not their constructive potential outweigh their admitted hazards?

We have no clear information about the use of hallucinogenic species of psilocybe from the great continent of Africa, despite its thorough exploration in the past. We have only some confused data from Nairobi and Kenya by Cullinan et al (1945), who reported some rare poisoning. The mushroom described by them agrees more or less with *P. cubensis,* although Pegler and Rayner (1969) believe it to be *P. merdaria,* a non-hallucinogenic mushroom. Guzmán (1983) believes that the *Stropharia aquamarina* from Kenya described by Pegler (1977) may be *P. subcubensis,* or *P. aquamarina,* true hallucinogenic mushrooms. However, it is important to note

that Guzmán, with assistance from Nixon and Cortés-Pérez, is studying a new hallucinogenic species of *Psilocybe* from the Republic of the Congo. Nixon, who collected the mushroom, heard from a native that they talk about some old rituals on Mount Thsiaberimu (which means "mountain of the spirits"). However, the mushroom he collected and sent to Guzmán was found in grassland, and it is not familiar to the local people.

In contrast with the few cases where hallucinogenic mushrooms are still used in the traditional way, we have numerous cases of their past use, as is shown in the map in Figure 43. At present the only two ethnic groups that still use *Amanita muscaria* are in Siberia and the Ojibwa Indians of Canada and the USA. Psilocybe is used by only a few ethnic groups in Mexico. The use of some bolets and russulas in Papua New Guinea seems to have been lost. Prehistoric depictions of mushrooms are known only from Siberia, the Sahara Desert, and Spain. The former relate to *Amanita muscaria* and some bolets, and the others with psilocybe. However, in pre-Hispanic Mexico and Central and South America we have evidence of the use of *Amanita muscaria* and several species of psilocybe (Furst 1974, de Borhegyi 2011), although *Amanita muscaria* may have been used only in Mexico and Guatemala. Referring to Europe, we also have references to the use of *Claviceps purpurea*, ergot, in ancient Greece, several references to the use of *Amanita muscaria* before and during the Middle Ages, and references to psilocybin linked to warlocks in the early Christian religion, these latter identified with *Psilocybe semilanceata*.

Given the panorama above, it is obvious that we need many more studies if we wish to understand the past and present use of sacred mushrooms throughout history. We also need to be aware of numerous confusions, for example, Williams (2012), who reported new archaeological gold figures from Panama without any apparent knowledge of other similar figures from Panama described by Schultes and Bright (1979), which were erroneously reported from Colombia. An example of the contradictory nature of the present panorama is in *Champignons Magazine* (No. 56: 2007), in which

a review of studies by Wasson, Heim, Hofmann, and Guzmán is presented in shocking contrast with an article with color illustrations on the use of the hallucinogenic mushrooms for recreation among the young people of France.

In summary, it is interesting to note that neurotropic or hallucinogenic mushrooms, which when eaten affect the central nervous system, have been linked from the beginnings of human existence with warlocks or religious practices. In Mexico, the Nahuátls associated these mushrooms with their great god Quetzalcóatl. After the Spanish Conquest, the Catholic Church, through the Inquisition, prohibited the use of these "devilish" mushrooms. However, it is surprising to find that Indians today eat these mushrooms to honor Christ and to "talk" with Him. Despite the fact that the effects of the mushrooms are simple biochemical reactions in the brain to the mushrooms' indolic substances, humans, worldwide, continue to believe that their effects are linked with religious significance.

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