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Psychoactive Substances in Prehistoric Times: Examining the Archaeological Evidence

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The relationship between humans and psychoactive substances can be traced back over millennia. This paper aims to provide a comprehensive overview of the consumption of drug plants and fermented beverages in prehistoric times by drawing upon some archaeological examples worldwide that illustrate the early use of these substances. The archaeological evidence of psychoactive substances is assessed in the light of some indicators that should be taken into consideration when examining this type of data.

Keywords: psychoactive substances; prehistory; methodology; contexts; ritual

Introduction

If the doors of perception were cleansed every thing would appear to man as it is, Infinite. For man has closed himself up, till he sees all things thro' narrow chinks of his cavern.

This quote, taken from William Blake's poem *The Marriage of Heaven*

and Hell (1790), inspired the title of the book *The Doors of Perception* (1954) by Aldous Huxley, which describes his experiences when taking mescaline, the active principle of the hallucinogenic peyote cactus. Huxley was one of the first modern authors to discuss the relationship between religious experiences and drugs,¹ which he further explored in

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others of his works. At that time, during the late 1950s and throughout the 1960s, extensive research and experimentation was being conducted on many hallucinogenic drugs, mainly LSD and psilocybin as well as mescaline (Escobedo 1998), and a number of researchers from different fields, for the most part psychiatrists and scholars of religious studies, started to assess the mystical potential of psychedelic drugs (Braden 1967; Clark 1968, 1969, 1970; Kellenberger 1978; Leary and Clark 1963; Pahnke 1963, 1966, 1970; Watts 1968, 1970). A conference was even held to examine this issue (Salman and Prince 1967).

Once the initial rejection of those claiming that drug-induced experiences are not the same as religious mystical experiences (for instance, Zaehner 1957, 1972) was overcome, attention was drawn to the study of the role of mind-altering substances in the origins of some religions (La Barre 1970, [1972] 1990; Smith 1964). All this provided the basis for recognizing the profound impact that hallucinogenic drugs have made on religions around the world and throughout history (Allegro 1970; Wasson 1961, 1968; Wasson, Hofmann, and Ruck 1978; Wasson et al. 1986), something that is firmly supported today by an increasing number of psychologists, philosophers, theologians, scholars of religious studies, and anthropologists, among other professionals (Forte 1997; Harris 2001; Nichols and Chemels 2006; Roberts 2001, 2006, 2012; Roberts and Hruby n.d.; Shannon 2002; Smith 2000). Thus, the ritual use of these substances within religious contexts in the past is widely accepted today.

All over the world, traditional societies continue to use mind-altering agents for magico-spiritual and healing purposes;

the archaeological evidence indicates that the origins of such use might be traced back to prehistory (Devereux [1997] 2008). The aim of this paper is precisely to explore the consumption of these substances in prehistoric times. Obviously this brief paper cannot provide an exhaustive description of drug plants and fermented beverages in World Prehistory. Rather, by drawing upon a number of examples from different regions worldwide, it seeks to illustrate, first, the early date at which humans began to use psychoactive substances; and second, the connection between these substances and the earliest religious experiences, based on the contexts of deposition.

Tracing the Origins of the Use of Psychoactive Substances in Traditional Societies: The Archaeological Evidence

The deliberate induction of altered states of consciousness (ASC) plays a key role in the belief systems of traditional societies all over the world.² This became more evident after the cross-cultural surveys carried out by the anthropologist Erika Bourguignon, who studied 488 societies (57% of the world's ethnographic societies) and discovered that 437 (90%), were reported to have incorporated ASC into fundamental belief systems. She concluded that the capacity to experience an ASC seems to be a basic psychobiological competence of human beings (Bourguignon 1973). It has even been claimed that ASC were likely involved in facilitating the social development of more symbolic forms of life and mind (Froese, Woodward, and Ikegami 2014).

These practices, which seem to be central in human evolution, may be

accomplished in many different ways, such as auditory stimulation, exposure to extreme temperatures, food restrictions, dehydration, sleep deprivation, breathing techniques, extreme physical exercise, meditation, or through the consumption of psychoactive agents (Winkelman 2010; Morris 2006, 20). Not all experiences of transcendence are, therefore, attained via the use of psychoactive substances, as in many societies, people enter ASC without the aid of these substances (such as the Plains and Columbia Plateau Indians, who spend considerable time in isolation with no food). But also for many other societies drug plants are the preferred means to enter ASC.

Psychoactive substances act primarily upon the central nervous system, where they affect brain function, resulting in temporary changes in perception, mood, consciousness, cognition, and behavior. They include many substances with different physiological effects, such as hallucinogens, alcohol, or stimulants, among others.

Among all world regions, the Americas rank first in terms of the abundance and variety of psychoactive plants (Schultes [1972] 1990). It was there, initially in Mesoamerica and the Amazonas basin where, from the early twentieth century, anthropologists and ethnobotanists started to conduct fieldwork in rural areas in order to study the consumption of mind-altering products within their native cultural contexts (Furst [1972] 1990b). Several centuries earlier, when the Spanish first arrived in America, they were astounded to find such a wide variety of plants being used for both medicinal and religious purposes. Some accounts of the Spanish chroniclers in the fifteenth and sixteenth centuries already mention these practices.

During the Second Voyage (1493–1496), Christopher Columbus himself observed that the Taino, the aboriginal inhabitants of the island of Hispaniola (Haiti and the Dominican Republic), inhaled a hallucinogenic powder through the nostrils by means of a bifurcated tube. Although the original account is lost, Columbus' son Ferdinand recorded the very words of the Admiral:

I was able to discover neither idolatry nor any other sect among them, although all their kings, who are many, not only in Española but also in all the other islands and on the mainland, each have a house apart from the village, in which there is nothing except some wooden images carved in relief which are called *cemis*; nor is there anything done in such a house for any other object or service except for these *cemis*, by means of a kind of ceremony and prayer which they go to make in it as we go to churches. In this house they have a finely wrought table, round like a wooden dish in which is some powder which is placed by them on the heads of these *cemis* in performing a certain ceremony; then with a cane that has two branches which they place in their nostrils, they snuff up this dust. The words that they say none of our people understand. With this powder they lose consciousness and become like drunken men. (Boume's translation, as quoted in Wassen 1967, 235).

During the same Second Voyage the Admiral Columbus commissioned Friar Ramón Pané to investigate the religious beliefs of the Taino Indians. On various occasions in his *Relación Acerca de las Antigüedades de los Indios* (*An Account of the Antiquities of the Indians*) (Pané 1999), this priest details the inhalation of this snuff, called *cohoba* – which, we know now, was prepared from the seeds of the tree *Anadenanthera peregrina* – in connection with religious ceremonies and

medical practices. Similarly, Bishop Bartolomé de las Casas, who eye-witnessed several ceremonies of the cohoba at the beginning of the sixteenth century, offers vivid accounts of the snuff itself and the paraphernalia relating to its preparation and inhalation in *Apologética historia summaria de las gentes destas Indias* (*Apologetic Summary History of the People of These Indies*) (Oliver 2009; Wassen 1967).

Among the earliest writers to mention peyote was Friar Bernardino de Sahagún, at the end of the sixteenth century. In several chapters of his *Historia General de las Cosas de Nueva España* (*General History of the Things of New Spain*), he described the peyote use among the Chichimeca, a native group inhabiting the north of Mexico:

There is another herb like tunas of the earth. It is called Peiotl. It is white. It is found in the north country. Those who eat or drink it see visions either frightful or laughable. This intoxication lasts two or three days and then ceases. It is a common food of the Chichimeca, for it sustains them and gives them courage to fight and not feel fear nor hunger nor thirst. And they say that it protects them from all danger. Book 11, Ch. 7 (in Schultes, and Hofmann 1980, 194).

Sahagún also witnessed and recorded “magic mushroom” ceremonies in Mexico (that is, rituals centered on the use of psilocybin mushrooms), and reported about these ceremonies in several chapters of his book (Wasson 1961). Likewise other early chroniclers of America also refer to coca, tobacco, morning glory seeds, and mescal beans, among other psychoactive plants (Ott 1993). These accounts, written from the outsider’s point of view, often apply the same pejorative thinking with

respect to these mysterious substances. As Ripinsky-Naxon (1993, 163) pointed out in relation to the descriptions of fly agaric by early travelers to Siberia in the seventeenth century:

Unfortunately, having no proper frame of reference, very few of the early travelers were in a position to recognize the difference between intoxication and hallucination or a visionary experience, and consequently many of the early narratives, informing on the use of hallucinogens, describe this practice in a rather degenerate light.

Although they do demonstrate that these indigenous groups were using psychoactive plants, these ethnographic accounts do not permit an accurate assessment of how long they had been doing so. However, archaeology may shed some light on this issue. Four different categories of archaeological data can potentially be used to trace the origins of the consumption of inebriating substances within societies lacking written records, as I have put forward elsewhere (Guerra-Doce 2014):

- Macrofossil remains (desiccated, burned or waterlogged wood, leaves, fruits, or seeds) of psychoactive plants
- Psychoactive alkaloids in archaeological artefacts and skeletal remains from prehistoric times
- Residues suggestive of alcoholic beverages
- Artistic depictions of mood-altering plant species and drinking scenes/ artistic depictions inspired by ASC

Generally speaking, it is most likely that the use of psychoactive plants pre-dates the use of fermented beverages, since

many of the former are consumed in raw form. The production of alcoholic drinks in traditional societies is based on the fermentation of sugar-rich fruits, since the concentration of the naturally-occurring ethanol increases throughout the ripening process. It is interesting to note that there are reports of wild animals showing signs of inebriation after the intentional consumption of over-ripe fruits (Siegel 1989). Similar behaviors have been documented among many primates and early hominids in search of the mood-altering properties of ethanol (Dudley 2004). Therefore the attraction to alcohol among humans may be rooted in the evolutionary history of primates (Stephens and Dudley 2004). The production of alcoholic drinks on even a small scale, however, seems to have required certain technological developments. At the present time, there is no direct evidence of the production of fermented beverages before the invention of pottery during the Neolithic, although the technological and technical prerequisites of brewing were well established in the Natufian of the Near East (Hayden, Canuel, and Shanse 2013).

Direct evidence of alcoholic drinks in the past is based on the identification of certain residues in the inner walls of archaeological vessels. Traces of the original contents of ancient pottery, which are invisible to the naked eye, may have been absorbed within the porous ceramic matrix of the vessels and may be detected and chemically identified by the use of a wide range of analytical techniques, principally the combination of chromatographic procedures (gas chromatography or liquid chromatography) with mass spectrometry (GC/MS and LC/MS). While it is not always possible to accurately identify the original

contents, some biomarkers are highly suggestive of fermented beverages, mainly beer, fruit wines, and mead (Guerra Doce 2014; McGovern 2009).

The earliest chemically confirmed alcoholic drink in the world to date was made of wild fruits. Residues adhering to some potsherds found at the Early Neolithic village of Jiahu, in the Yellow River Valley of China (Henan Province), ca. 7000–6600 BC point to a mixed fermented beverage of wild grapes or hawthorn fruit (*Crataegus* sp.), rice (possibly a domesticated variety), and honey (McGovern et al. 2004). A number of prehistoric sites throughout Eurasia, mainly tombs, have provided traces highly suggestive of alcoholic drinks (Figure 1). Pottery vessels containing traces interpreted as fermented beverages become more abundant in the archaeological record from the third millennium BC onwards; however, there is no evidence of large-scale production until the Bronze Age (Guerra Doce 2014). It is not known exactly when the natives of Africa started to produce the wide variety of fermented drinks that are consumed today, such as the Ethiopian tej, the great diversity of beers, or palm wine, but beer brewing is well documented in Predynastic Egypt by the fourth millennium BC (McGovern 2009).

In the New World, archaeologists used to depend on indirect methods to defend the antiquity of the production and consumption of fermented beverages in the Americas: historical accounts, depictions of drinking scenes, isotopic ratios of carbon on human bones as an indication of maize consumption, and the occurrence of vessels for making, serving, and drinking liquids, similar to those used for chicha in Inca times (Jennings 2014; Moore 1989).



Figure 1. Grave goods from the Beaker tomb of Perro Alto, at Fuente Olmedo, Valladolid, Spain, dated to the late third millennium BC. Residues suggestive of wheat beer have been found in the carinated bowl (Delibes, Guerra, and Tresserras 2009). Photo: Courtesy of Museo Arqueológico de Valladolid.

However, it has just been reported at the time of this writing that the earliest direct chemical evidence for the production of the alcoholic beverage pulque in Mesoamerica, based on organic residues recovered from pottery vessels from Teotihuacan, dates to c. AD 200–550 (Correa-Ascencio et al. 2014).

Taking into account that all the world's staple cereals (barley, wheat, maize, rice, sorghum, millet) are suitable for brewing, a question that arises is whether the motivation for the domestication of cereals in the first place was beer-brewing rather than bread-making (Braidwood et al. 1953; Katz and Voigt 1986; McGovern 2009). For the time being, there is no conclusive archaeological evidence in support of this argument; it is therefore most likely that fermented beverages made with products not resulting from the farming economy pre-date beer (Guerra Doce 2014; Homsey 2003). Be that as it may, apart from the peoples in the Arctic, those in

Tierra del Fuego in South America, the Native American Indians in North America, and probably the Australian Aborigines, almost every known culture has produced its own alcoholic beverage, and these were quickly integrated into a number of rituals (McGovern 2009).

As far as psychoactive plants are concerned, we have already noted that their use by humans may have had a greater antiquity than that of alcohol. In their search for food, early hominids may have come across certain plants and mushrooms with peculiar effects. Some scholars have even suggested that humans have shared a co-evolutionary relationship with psychotropic plant substances that is millions of years old, indicated by both the chemical-ecological adaptations that have evolved in mammals to metabolize psychotropic plant substances and the structure of plant defensive chemicals that have evolved to mimic the structure, and interfere with the function, of mammalian

neurotransmitters (Sullivan and Hagen 2002). From this perspective, the search for intoxication should be better understood as a biological need common to humans and animals, a basic drive similar to the need for food, water, and sex (Siegel 1989).

For most psychoactive plants that are so deeply-rooted in native communities, we lack chronological precision about their earliest exploitation. However, despite the lack of direct evidence, the antiquity of their use is often taken for granted. Pituri (*Duboisia hopwoodii*), a nicotine-containing plant traditionally exploited by the Australian Aborigines, offers a good example: "As Aborigines had lived in Australia for at least 40,000 years before the arrival of colonists, the antiquity of the exploitation of these native plants may be considerable" (Sullivan and Hagen 2002, 390). A similar argument has been made in relation to the fly agaric mushroom (*Amanita muscaria*) among the Finno-Ugrian tribes of Siberia: "In the land of 'classic shamanism' the obvious candidate for being a hallucinogenic agent is a mushroom: the fly-agaric, probably known to the inhabitants of that region from time immemorial" (Czigány 1980, 213).

One of the earliest potential documents of the occurrence of mood-altering plants so far is that of a Middle Palaeolithic burial cave at Shanidar, northern Iraq, ca. 60,000 BC. Around the skeleton of an adult male aged between 30 and 45 years, known as Shanidar IV or the "flower burial", palynological studies revealed the presence of a number of medicinal plant species including ephedra, a natural stimulant (Leroi-Gourhan 1975). Consequently, this Neanderthal grave was considered to be that of a shaman (Solecki 1975). Other scholars,

however, dispute the idea that these plants were the result of a ritual deposition, suggesting that the plant material was subsequently introduced into the cave by the activity of the Persian jird (*Meriones persicus*), as many bones of this gerbil-like rodent were found during the excavation of Shanidar (Sommer 1999).

Thus, for the time being at least, direct evidence of the use of psychoactive plants is lacking throughout the Palaeolithic. This circumstance does not alter the fact that certain signs in Upper Palaeolithic art from Europe have been explained as resulting from ASC induced by shamanic trances, possibly involving the use of drugs. This theory, put forward by Lewis-Williams and Dowson (1988), is based on the principle that the neurological structure of the brain of our species (*Homo sapiens*) has remained unchanged since the Palaeolithic; consequently, the abstract patterns and visual hallucinations created under ASC are universal, since they are effects of the central nervous system. Certainly, geometric patterns and visual hallucinations are experienced during all kinds of ASC (Sacks 2012). However, a systematic review of that model claims that the only trance states that are consistent with those described by Lewis-Williams and Dowson are drug-induced trances caused by plants containing mescaline, LSD, or psilocybine. Of these three hallucinogens, only LSD (or more precisely the ergot fungus)³ was found in Europe, but evidence for its deliberate ingestion during the Palaeolithic is non-existent. No other hallucinogenic plant or fungus found in Europe at that time provides a suitable candidate, as any visions these may produce are inconsistent with Lewis-Williams' and Dowson's model

(Helveston and Bahn, 2002; Helveston et al. 2003).

In any case, there is also accurate and direct evidence of the antiquity of some drug plants:

- *Betel chewing*: although some archaeobotanical data suggest that this habit might date as far back as 13000 BP in Southeast Asia, the oldest dental remains with the distinctive reddish-brown “betel stains” come from a burial pit in the Duyong Cave on Palawan island in the southern Philippines dating to 2660 cal BC (Zumbroich 2007–2008). Betel stains can be confused with teeth blackening, a custom consisting of the intentional staining of the teeth for aesthetic reasons that has been documented in many betel chewing cultures of Southeast Asia and the Pacific Islands (Linh 1998). Chemical analyses on some of these distinctive reddish stains in the dentitions of individuals excavated from the Bronze Age site Nui Nap, Thanh Hoa province, Vietnam indicate that these teeth were stained by way of betel nut. This suggests that residues of betel nut were deliberately applied to the teeth; however, it cannot be ruled out that this was done for aesthetic reasons (Oxenham et al. 2002).
- *San Pedro cactus*: today this hallucinogenic cactus is consumed in Andean South America, principally in northern Peru, in the course of healing ceremonies. The earliest evidence of its use is found in Guitarrero Cave, in the Callejón de Huaylas valley of Perú. Pollen

and macrofossil remains of the cactus were found in the oldest occupation levels dated between 8600 and 5600 BC, and a sample of the cactus itself was dated to 6800–6200 BC (Lynch 1980). San Pedro was also a frequently depicted motif in religious scenes of a number of Preincaic cultures (Feldman Gracia 2006; Glass-Coffin 2010).

- *Mescal bean*: ceremonial caches of seeds of *Sophora secundiflora* have been found in all occupational levels of the Desert Culture rock-shelters and caves in southern Texas and northern Mexico, from the end of the ninth millennium BC to AD 1000 (Adovasio and Fry 1976). Apart from its use as a hallucinogenic drug, mescal beans have been used extensively for ornamental purposes (Memill 1977); however, its association with the peyote cactus in those archaeological sites and its ethnographically documented use in vision-seeking ceremonies practiced by a number of Indian tribes provide a strong argument for its early use as a drug (Schultes 1998).
- *Peyote*: besides the above mentioned data, in Shumla Cave No. 5 on the Rio Grande, Texas, peyote remains are associated with items of material culture similar to paraphernalia used in peyote ceremonies by various aboriginal groups, include rasping sticks made from either bone or wood, a rattle made from deer scapula, a pouch and reed tubes containing cedar incense, and feather plumes (Boyd and Dering 1996). Although it has been reported that this

context has been radiocarbon dated to 7000 BP, this information has been questioned; two recent radiocarbon dates of peyote buttons from this site correspond to the interval 3780–3660 BC (EL-Seedi et al. 2005).

- *Opium poppy*: Among the psychoactive flora of the Old World, opium poppy stands out for the abundance of data concerning its use in the past (Merlin 1984). The Neolithic site of La Marmotta, Italy, dating to the mid-sixth millennium BC, has provided the oldest archaeobotanical remains so far (Merlin 2003). Its domestication is thought to have started during the sixth millennium BC in the Western Mediterranean (Bakels 1982), from where it spread to the rest of the continent to reach north-west Europe by the end of the sixth millennium BC (Salavert 2010) (Figure 2). A large amount of archaeological sites from prehistoric Europe have provided capsules and seeds of opium poppy (Guerra-Doce 2006). Apart from its use as a food plant, there is also uncontested evidence for the exploitation of its narcotic properties. Not only were remains of a capsule found in the dental calculus of a male burial at the variscite mines of Gavá, Barcelona, Spain, dating to the fourth millennium BC, but traces of opiates were also detected in his skeleton as well as in the bones of another male adult (Juan-Tresserras and Villalba 1999). Most of the evidence for the ritual use of the opium poppy is found in the Eastern Mediterranean during the Bronze Age, mainly in the form of artistic depictions of religious scenes

including unequivocal representations of the poppy heads (Askitopoulou, Ramoutsaki, and Konsolaki 2002; Gabra 1956; Kritikos and Papadaki 1967a, 1967b). At that time opium preparations were traded in juglets corresponding to the Base-ring ware from Cyprus to Egypt and the Levant (Merrillees 1962), as confirmed by residue analysis on some of these vessels (Bisset, Bruhn, and Zenk 1996; Koschel 1996; Merrillees 1968).

- *Coca*: Chewing coca in South America began by at least 8000 cal BP as evidenced by the discovery of coca leaves and pieces of calcite – which is used by chewers to bring out the alkaloids from the leaves – in house floors in the Nanchoc Valley, Peru, at about the same time as systematic farming was taking off in the region (Dillehay et al. 2010). Direct evidence for coca chewing in Prehistoric South America is also found in dental remains (Indriati and Buikstra 2001) and human-mummy hair (Cartmell et al. 1994; Rivera et al. 2005) of individuals from different pre-hispanic cultures.
- *Cannabis*: the earliest human use of cannabis appears to have occurred in the steppe regions of Central Asia (Merlin 2003). Neolithic farming communities of China cultivated hemp from the late 5th millennium BC for a variety of uses: textile plant, rope and cordage confection, food crop, oil extraction, medicinal plant, and hallucinogenic drug (Li 1973). In Eastern Europe and Russia, there

is evidence of the use of hemp in the burial rites from the third millennium BC, as indicated by the occurrence of charred seeds (Sherratt 1991) or phytoliths of *Cannabis* in pottery vessels (Shishlina et al. 2007).

- *Hallucinogenic nightshade plants*: a great number of Solanaceae plants have been (and still are) traditionally exploited as folk medicines and hallucinogens all around the world (Ott 1993). In the Americas they were used by a number of tribes in prehispanic times, mainly in ritual ceremonies aimed to communicate with the spirit world; in the Old World *Datura metel* has been ceremonially used in China and India for many centuries (Schultes and Hofmann 1979, 1980). Certain species were connected to European witchcraft in Medieval and Early Modern times (Hamer 1973b). Archaeobotanical remains of hallucinogenic nightshade plants (including *Datura stramonium*, often considered to be native to the New World) have been reported in Prehistoric Europe (Guerra Doce 2006), and there is direct evidence of their use as drugs. The detection of the alkaloid hyoscyamine and traces suggestive of barley beer in a Bell Beaker from a burial cave in Calvari d'Amposta, Tarragona, Spain, dated to the third millennium BC, have been interpreted as a hallucinogenic beer that was consumed during the mortuary ceremonies (Fábregas 2001). The same residues have been found in a vessel deposited in a Vaccean tomb, second century BC, at the

cemetery of Las Ruedas, Valladolid, corresponding to a male adult (Sanz and Velasco 2003).

- *Tobacco*: the question of the origins of tobacco use in the Americas is complicated by a lack of archaeobotanical evidence. It is assumed that the tobacco plant was native to South America, from where it spread to the rest of the continents. Smoking pipes have been found in northwestern Argentina in archaeological sites dated as far back as 2100 BC; chemical analyses of residues found on some of them suggest that they were used to consume either tobacco or some other hallucinogenic plants. Nicotine has been found in the hair of prehispanic mummies from different cultural periods (Echeverría and Niemeyer 2013). In North America, the oldest smoking pipes date to the second millennium BC (Rafferty and Mann 2004), although they could have served for the consumption of other native plants. Indeed, the earliest detection of nicotine decay products in a pipe dates to 300 BC (Rafferty 2006).
- *Hallucinogenic snuffs*: Yopo, a snuff prepared from the seeds of *Anadenanthera peregrina*, was widely used in much of the Caribbean (where it was known as cohoba) at the time of the Spanish Conquest. Today, its use persists only in the Orinoco basin (Schultes 1998, 5). The oldest implements related to the inhalation of the powder are ceramic inhaling bowls; luminescence dating (TL and OSL) of some of the pieces recovered at a number of sites in the Caribbean

have been dated to 500 BC (Fitzpatrick et al. 2009). In South America, a similar drug is prepared from *Anadenanthera colubrina*. Smoking pipes from NW Argentina and associated *Anadenanthera* seeds, dated to c. 2130 BC, represent the most ancient use of this snuff in South America, as confirmed by chemical analysis of the pipe material which indicated the presence of dimethyltryptamine, an alkaloid present in the genus *Anadenanthera* (Torres 1996, 1998).

- *Hallucinogenic mushrooms*: the antiquity of sacred mushroom cults in Mesoamerica is now widely accepted thanks to iconographic data, among which the so-called mushroom stones stand out for their abundance. These are small stone sculptures crowned with an umbrella-shaped top, found at a number of prehispanic sites in Guatemala, Mexico, Honduras, and El Salvador, which have been dated between 500 BC and AD 900 (De Borhegyi 1963; Schultes 1998). In the Old World, data on the use of hallucinogenic mushrooms in prehistoric times are more elusive and are mainly based on iconographic evidence (for references, see Guerra Doce 2014). Apart from the traditional use of *Amanita muscaria* among a number of Siberian tribes, there is also evidence for its use in Europe in the past (Fericglá 1994b; Samorini 2001). As for indications of psilocybin-containing fungi in prehistoric Europe, the mushroom-like pictographs depicted in the Selva Pascuala mural paintings, at Villar del Humo (Cuenca, Spain),

corresponding to the Iberian schematic tradition, may represent *Psilocybe hispanica* (Akers et al. 2011).

All this illustrates how early native peoples exploited the psychoactive plants locally available. Even though some data may be



Figure 2. A prehispanic mushroom stone from Guatemala depicting a girl or goddess emerging from the stipe holding a metate or grinding stone. (Drawing: Paul Devereux.)

subject to interpretation, since the mere occurrence of remains of a drug or its vegetal source does not definitely prove the use as drugs, some evidence strongly supports this point. In any case, as soon as the above mentioned and other drug plants were first consumed, there is uninterrupted evidence for such use over centuries, and occasionally, the relationship that began in prehistoric times has continued into the present day.

Ethnographic studies have long been exploring the place of fermented beverages (beer, fruit wines, rice wine, mead, koumiss, pulque, chicha, among many others) and psychoactive plants, not only hallucinogenic but also narcotic and stimulant (peyote cactus, morning glories seeds, sacred mushrooms, ayahuasca or yaje brew, cohoba, *Virola* snuffs, coca, tobacco, mescal beans, San Pedro cactus, iboga, betel, kat, pituri, cannabis, nightshade plants, opium poppy, and ephedra, just to offer a few examples) within traditional societies in every corner of the planet, above all in the Americas. A detailed list of the publications on these substances would go beyond the scope of this paper. We therefore address the interested reader to some works that have made a considerable effort to show a comprehensive picture of the consumption of these psychoactive agents from an anthropological perspective, either drug plants (Dobkin De Ríos 1984; Fericglá 1994a; Furst 1976, [1972] 1990a; Goodman, Lovejoy, and Sherratt 1995; Hamer 1973a; Merlin 1984; Ott 1993; Rättsch 2005; Rudgley 1993, 1998; Schultes and Hofmann 1979; Wasson 1961; Wasson and Wasson 1957) or alcohol (De Garine and De Garine 2001; Dietler 2006; Douglas 1987; Everett, Waddell, and Heath 1976; Heath 1995, 2000; Sherratt 1987).

One aspect that all these studies underline is that native communities have integrated these substances into their social, religious, and medicinal practices, making their use beneficial to the society.⁴

For this reason, hallucinogenic drug plants in traditional societies are treated with the greatest respect, often becoming sacred. Not only are they used as sacraments in many cultures, but they are also the object of direct worship, as they are frequently considered to be a vegetal incarnation of the deities: the *Plants of the Gods*, as R. E. Schultes and A. Hofmann (1979) referred to them, or the *Flesh of the Gods*, quoting the title of a book edited by P. T. Furst ([1972] 1990a). Thus, it seemed inappropriate to refer to these plants using certain terms with pejorative connotations or others that are also applied to the synthetic substances associated with the counterculture of the 1960s. In 1979, a group of ethnobotanists and scholars of religion therefore coined the neologism *entheogen* to refer to those vision-producing drugs that figure in shamanic or religious rites, although in a looser sense the term can also be applied to other drugs, both natural and artificial, that induce alterations of consciousness similar to those documented for ritual ingestion of traditional entheogens (Ruck et al. 1979). The objections and misinterpretations of this neologism compelled J. Ott, one of the coiners, to explain it at length: entheogen thus means literally “becoming divine within”, not “generating the divine within” (Ott 1996, 205).

But in prehistoric times it is more difficult to assess the role that these substances played. In the next section, we will look at certain indications that can help clarify the occurrence of drug plants in archaeological sites, in absence of the advice of coetaneous consumers.

Assessing the Archaeological Evidence

Tracing the origins of psychoactive plants within prehistoric societies constitutes a challenge. This type of study frequently draws upon the examination of as many sources of information as possible from a multidisciplinary approach, such as archaeological data, iconographic evidence, ethnographic accounts, ethnobotany, folk tradition, and chemical analysis, among others (Devereux [1997] 2008; Guerra Doce 2006, 2014; Kritikos and Papadaki 1967a, 1967b; Li 1973; Merlin 1984, 2003; Schultes 1998; Schultes and Hofmann 1979; Sherratt 1991, 1995; Rudgley 1993, 1995, 1998; Torres 1996; Zumbroich 2007–2008). However, all these sources of information are not always available to archaeologists, who most often rely solely on archaeobotanical data and chemical analyses.

Archaeobotanical reports can note the occurrence of certain species with psychoactive properties among the plant assemblages of archaeological sites, but inaccurate interpretations can result in erroneous claims about the use of these plants as drugs. When examining this type of evidence, it is necessary to bear in mind the following points: first, the very presence of a plant with psychoactive properties is not, on its own, an indicator of the exploitation of those properties; second, additional explanations must also be taken into consideration (humans may have used the plant for other purposes, it may have served as animal fodder, or it may represent unintentionally harvested weeds); finally, the circumstances of deposition can clarify whether we are dealing with an undisturbed context (Guerra-Doce and López Sáez 2006).

We tentatively suggest here a series of indicators that should be taken into consideration when interpreting the presence of psychoactive plants in prehistoric sites:

Circumstances of deposition. The case of the Middle Palaeolithic site of Shanidar, previously mentioned, illustrates the importance of verifying whether one is dealing with a disturbed context.

Accurate botanical identification. In the Neolithic ceremonial centre at Balfarg/Balbirnie, near Glenrothes, Fife, Scotland, it was reported that a hallucinogenic beer was consumed; this interpretation was based on the identification of cereal-based residues as well as pollen and seeds of black henbane (*Hyoscyamus niger*) on Late Neolithic pottery intentionally buried in pits excavated at one of the Balfarg Riding School timber structures in the first half of the third millennium BC (Barclay and Russell-White 1993). These structures have been interpreted as fenced enclosures, protecting a mortuary platform where, supposedly, the dead would be laid out to be defleshed before burial. Thus, henbane would have transferred hallucinogenic properties to the porridge-like substance found in that pot, and this substance would have been ingested as part of the burial rites. A re-examination of the potsherds from Balfarg, however, failed to find any traces of henbane or any other poisonous plants (Long et al. 1999, 2000). A similar case can be mentioned in relation to the Bronze Age temples of Gonur south and Togolok 21, located in the Kara Kurum desert of Turkmenistan. Although it has been claimed that pollen and microfossil remains of ephedra and marijuana were found within ceramic vessels deposited in some private rooms, suggesting that psychoactive

drinks were consumed in these religious centers (Sarianidi 1994), a more recent re-examination of the vessels has failed to confirm the occurrence of any psychoactive plant in the pots (Bakels 2003).

Other uses of the psychoactive plants apart from drugs. Other uses of some plant species with psychoactive properties could have occurred during prehistoric times. We have already mentioned this in relation to mescal beans and hemp, but there are other cases as well. For instance, the opium poppy served many purposes. In the Neolithic lake-dwelling site of Robenhausen, Switzerland, a piece of a poppy-seed cake suggests its use as a food plant (Keller 1866); and opium poppy seeds were added as temper to the clay used to produce one of the pots found at the Neolithic site of Vaux-et-Borset, Belgium (Bakels, Constantin, and Hauzeur 1992).

Analysis of the archaeological contexts. The type of context (settlement, tomb, ritual area, etc.) and the associated material culture are decisive when interpreting any archaeological item. Apart from the recovery of the drugs themselves (or their vegetal source) from well-dated archaeological contexts, in the cases in which certain artifacts are required for preparing and consuming them, their occurrence can also be taken as indicators of the use of a specific drug

Confirmed chemical results. The detection of psychoactive components on skeletal remains and drug-related paraphernalia, the so-called "Archaeology of Alkaloids" (Rafferty 2007), constitutes solid support for the consumption of drugs in ancient times. However, the results are sometimes questionable, and subject to interpretation.

Thus, the data supporting the detection of nicotine, cocaine, and THC in Egyptian mummies (Balabanova, Parsche, and Pirsig

1992) should be better understood as modern contaminations due to the use of fungicides and insecticides containing those substances for conservation purposes during the nineteenth century, instead of an indication of the consumption of tobacco, coca, and hemp by Ancient Egyptians (Buckland and Panagiotopulu 2001).

Despite some controversial cases, there are enough data illustrating the use of psychoactive plants among prehistoric societies almost all around the world. If it therefore seems clear that they were used, what were they used for? An excellent review of the social uses of psychoactive substances in pre-industrial cultures can be found in a paper by the late Professor Andrew Sherratt, one of first scholars to study drug plants and alcohol in Prehistoric Europe. Among the main questions that he highlighted are the following (Sherratt 1995, 15–17):

- The use of psychoactive products covers a spectrum of practices (religious, medical, and secular)
- Frequently their use is regulated and even under the control of a minority, defined by gender, status, wealth, or a combination of all three, due to the potential of these substances to accrue symbolic meanings
- Substances causing marked behavioural alteration may be powerful symbols of access to esoteric knowledge and communication with other worlds, mainly in small communities or in societies where political power is in the process of formation
- The psychological experience of these substances is itself culturally constructed to a large extent

Archaeologically, the different uses given to these substances can be inferred from the contexts of deposition and the associated material culture. Not surprisingly most evidence for psychoactive plants in prehistoric times is found in sites linked to ritual activity, such as tombs and ceremonial sites (Guerra Doce 2006).

Concluding Remarks

All around the world, archaeological data concerning psychoactive substances strongly suggest the great antiquity of humankind's ritual use of these substances. It seems, at least in the case of entheogens, that their potent effects, especially the generation of vivid images, may have facilitated the enhancement of our cognitive capacity and played a critical role in the consequent development of symbolic culture by acting as cognitive tools (Tupper 2002). As R. E. Schultes (1998, 6), one of the most reputed scholars in the field of psychoactive ethnobotany, has stated:

When the unearthly and inexplicably weird physical and psychic effects of these few plants were experienced, it did not take long for primitive societies to regard them as sacred elements of the flora, and their use eventually fell into the province of the shamans or medicine men who explained their effects as proof that these species were the home of spirits or spiritual forces enabling man through various hallucinations to communicate with ancestors or with spirits in the outer realms.

Certainly archaeology, ethnographic accounts, early travelers' descriptions, and iconographic evidence confirm the early connection between drug plants and rituals. In prehistoric times entheogens

became so integrated into the beliefs of most societies that their use was institutionalized to the point where communication with the spiritual world for many of them was recurrently attained with the aid of these mind-altering agents (Guerra Doce 2014).

Entheogens have thus played a vital role in the belief systems of many prehistoric communities, and they were also medicinal remedies. Consequently, they were not a menace to society but beneficial to it, as they were used for socially constructive purposes. Today, the ongoing debate about whether psychoactive substances are beneficial or harmful to individuals and society is still a very controversial issue. Considering the failures of the war on drugs, perhaps our modern societies should look into the past and learn something from "the primitive" so that we might find out how to maximize the potential benefits and minimize the potential for harm of substances that humans have been using for millennia.

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Notes

1. The French theologian Philippe de Félice might have been the first scholar to highlight the sacramental use of psychoactive substances, but his ideas did not reach the general public. In his book *Poisons sacrés, ivresses Divines*, which was first published in 1936, he put forward the hypothesis that the use of psychotropic substances is deeply embedded in human culture, and that it

is intrinsically intertwined in a most basic human instinct: The search for transcendence. Thus, he proposed, the use of psychotropic substances is at the roots of perhaps all religions (Shannon 2002, 86).

2. For a deeper insight into ASC, the interested reader is referred to Revonsuo, Kallio, and Sikka 2009; Tart 1990; and Zinberg 1977.
3. Ergot (*Claviceps purpurea*) is a parasitic fungus usually on rye and various grasses. Most of the natural ergot alkaloids are derivatives of lysergic acid, and many possess pronounced psychotomimetic activity (Schultes and Hofmann 1980).
4. "Such usage is in sharp contrast to present-day practice, when drug-taking is an end in itself, often an act of rejection of societal values, a protest against culture, society and its taboos. It is also a rejection of the long history of sanctioned and controlled drug use to achieve recognised cultural objectives" (Michaelis 1990, 101).

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