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PSYCHOACTIVE BOTANICALS IN RITUAL, RELIGION, AND SHAMANISM

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Summary

Psychoactive plants have played an important role in medicine, religion, ritual life, and recreation since ancient times. In shamanic religions, which appear to have dominated throughout much of human pre-history, trance induced by psychoactive plants and other techniques permits direct contact with the divine. For this reason, plant hallucinogens and other psychoactive botanicals have been considered by cultures throughout history as "plants of the gods": sacred substances that bring knowledge, power, healing, and mystical insight, but that must be used with utmost respect and caution. With the spread of Christianity, and especially since the Inquisition and Conquest of the New World, the religious use of psychoactive plants has been severely and sometimes violently suppressed. Western scientific and popular interest in psychoactive plants enjoyed a resurgence in the mid-twentieth century, though the excesses of the 1960s "psychedelic era" provoked a backlash, exacerbating existing biases within the scientific, medical, and law-enforcement establishments. Psychoactive compounds produce their peculiar effects on consciousness by mimicking the chemical structures of neurotransmitters or otherwise altering the transmission of nerve impulses. Over the past two hundred years, chemical and physiological studies of natural psychoactive compounds and their synthetic derivatives have resulted in major contributions to medicine and neuroscience. This chapter presents an overview of twenty-two important psychoactive plants used in religious or ritual settings throughout the world, with supplementary information on ten additional species. The cultural and

historical background for each plant is presented alongside pertinent botanical, chemical, and pharmacological information. An appendix provides a summary of the names, traditional and biomedical uses, and active components of plants discussed in the text. A general introduction and concluding discussion help set the topic of psychoactive plant use within the intertwined historical, social, philosophical, scientific, and contemporary legal contexts.

1. Introduction



Anyone who remembers as a child spinning gleefully towards a dizzy collapse, or experimenting with hyperventilation to attain a brief, disjointed oblivion, has partaken in the simplest and most innocent form of what may be a universal human instinct: the desire to attain altered states of consciousness. It is one of the great ironies of the human brain—this most intricately evolved, astronomically complex organ of reason—that people around the world and throughout history have used these very faculties to seek out and discover myriad ways of intentionally interrupting the brain's normal functions to achieve euphoric pleasure, ritual bonding, medical and philosophical insights, and religious ecstasy.

Since the beginnings of the spice trade, and especially since Columbus' accidental "discovery" of the Americas, European explorers, traders, missionaries, and scientists have taken a particular interest in the food, drug, and medicinal plants of the exotic peoples they encountered, ultimately giving rise in the 1890s to the modern field of ethnobotany. With Louis Lewin's classic 1924 book, *Phantastica, Narcotica, and Stimulating Drugs*, the study of psychoactive plants and drugs became a subfield of its own. Beginning in the 1930s, Harvard ethnobotanist Richard Evans Schultes carried out pioneering research, documenting the botanical identities, chemical components, and cultural uses of psychoactive plants worldwide. Growing awareness of natural and synthetic psychoactives through the 1950s inspired the work of a diverse and influential group of writers and philosophers including Jean-Paul Sartre, Aldous Huxley, Allan Watts, Alan Ginsberg, and William Burroughs. The so-called psychedelic revolution culminated in the late 1960s under the aegis of such pop-culture figures as Timothy Leary, Ken Kesey, and the Beatles. Interest in psychoactive plants and shamanism has continued to grow and evolve, as exemplified in the broad popular appeal of authors such as Carlos Castañeda, Michael Harner, Andrew Weil, Wade Davis, and Terence McKenna.

More so than any other subfield of ethnobotany, pharmacology, or anthropology, the topic of ritually used psychoactive plants enjoys a wide readership beyond academic and scientific circles. In a globalizing world, where information about traditionally used psychoactive plants is widely disseminated in publications and on the internet; where seeds, seedlings, and extracts are sold or distributed, sometimes at the margins of the law; where indigenous practitioners interact ever more directly with tourists, consumers, and New Age spiritualists; and where a global "war on drugs" has blurred the distinction between dangerous narcotics and ritually used plants, harrowing issues have emerged surrounding the authenticity of traditional and not-so-traditional practices, the legality and safety of drug use, intellectual property rights over

traditionally used psychoactives and their derivatives, and the right to the free practice of religion.

1.1. Definitions and Scope

"In all things there is a poison, and there is nothing without a poison. It depends only upon the dose whether a poison is poison or not." – Paracelsus.

Dosage is crucial in determining whether psychoactive plants have merely medicinal, mildly stimulating, mood-altering, powerfully consciousness-altering, or dangerously toxic effects. A dizzying profusion of terms has emerged to describe various types of natural and synthetic psychoactive substances and their effects on the human nervous system: intoxicants (producing intoxication), narcotics (literally, "to benumb," i.e. resulting in a depressive state of the central nervous system), hallucinogens (generating hallucinations), psychotomimetics (chemically imitating the effects of psychosis), psychedelics (an etymologically flawed neologism supposed to mean "manifesting the psyche"), and others. The term entheogen ("generating the God within") has gained popularity among scholars-cum-advocates of the religious and recreational uses of psychoactive plants. Drawing on traditional beliefs, some authors use the terms "plants of power" or "plants of the gods." In any event, none of the terms fully describes the broad range of effects that psychoactive plants have on the human mind and body, including visual and auditory hallucinations, other sensory distortions, mood alterations, enhanced social interactions, personal and spiritual insights, bodily purging, physical and psychological healing, and in some cases, mystical or ecstatic religious experience.

Psychoactive plants and substances can be divided into three broad classes, corresponding to their general effects on the central nervous system: stimulants such as cocaine, caffeine, and nicotine, which excite the nervous system; depressants such as opium, alcohol, and kava-kava, which produce sedation; and hallucinogens such as ayahuasca, peyote, and LSD, which induce profound alterations in consciousness, perception, and experience. These categories are not mutually exclusive, since some plants and drugs produce different effects depending on dosage, phase of intoxication, and mode of use: alcohol initially seems to act as a stimulant (by depressing behavioral inhibitory pathways), but the depressant activity sets in at higher doses and at later stages in inebriation; cocaine is a powerful stimulant, but can also be used topically as an anesthetic, a characteristic generally associated with depressants; though considered a stimulant, nicotine at high doses can produce trance and visions, effects characteristic of the hallucinogens; likewise, hallucinogens often have stimulating or depressant activity, depending on the specific drug, dose, and phase of intoxication.

Given the large number of known psychoactive plants and compounds, only a selection of the most important and representative examples is included. The main focus of this chapter is plant-based hallucinogens with long-established patterns of ritual use, however important plants belonging to other categories will also be considered. Synthetic compounds are not addressed here, except insofar as these are relevant to the traditional psychoactive plants under discussion. For the major plants under discussion, an appendix is provided summarizing botanical names (including species authors), botanical families, region and mode of traditional use, principal active components, and

modern biomedical uses (see Appendix 1). For clarity and ease of reference, species authors are omitted in the main text, except for those plants that are mentioned only in passing and not included in the appendix.

The most widespread mind-altering drug in human history is ethyl alcohol or ethanol, produced during the fermentation of plant sugars by naturally occurring airborne yeasts. Alcohol has played an important role in diverse religious and social contexts throughout human history and across the globe, for example, in initiation rites, religious rituals, social celebrations, courtship practices, preparation for warfare, and sealing economic or political contracts. However cultural uses and attitudes towards alcohol vary tremendously. In some cultures, religions, and historical moments, alcohol use has been strictly prohibited and severely punished. Depending on the cultural setting, excessive use of alcohol may result in debilitating psychological, social, and economic consequences. Since the Middle Ages, state societies have attempted to regulate alcohol production and consumption through taxes, quality control legislation, restrictions, or outright prohibition. The temperance movement in USA flourished in the late nineteenth century, when widespread recognition of alcohol abuse as a serious problem synergized with moralistic Protestant religious fervor. The Prohibition Era was enacted in 1920 as the 18th Amendment of the Constitution, banning the production, distribution, and sale of alcoholic beverages. Ironically, Prohibition did little to diminish the nation's thirst for alcohol, though it did contribute to the phenomenal rise of bootleg liquor and organized crime. Prohibition failed miserably and was repealed in 1933, but Prohibition Era moralistic attitudes were quickly transferred to other drugs, notably cannabis, cocaine, and opium, associated with immigrant and minority populations such as Mexicans, urban blacks, and Chinese. Alcohol remains the sanctioned social drug of the West, despite considerable evidence that alcohol may be equally, if not more, addictive and deleterious to health and society than many illegal drugs. The cross-cultural study of alcohol use and abuse represents a complex topic worthy of a treatise unto itself, and is beyond the scope of this survey.

1.2. Cross-Disciplinary Perspectives

The use of psychoactive plants in ritual, religion, and shamanism is of interest to a wide range of scientific disciplines, including botany, chemistry, pharmacology, anthropology, psychology, religious history, human geography, and folklore. Each approach contributes complementary perspectives to this complex, interdisciplinary subject. Prior to more rigorous botanical studies beginning especially in the nineteenth century, knowledge about psychoactive plants was often relegated to the realm of myth, folklore, and superstition. By the mid twentieth century, ethnobotanists had established the scientific identities of most of the significant psychoactive plants used by the world's cultures. More than 400 psychoactive plant species have been so far documented and identified. However the botanical identities of several psychoactive plants remain elusive, especially those of remote, poorly known regions (for example, the New Guinea highlands) or those that are known only from ancient or historical sources.

Since 1806, when pure morphine was first extracted from opium poppies, chemists have made tremendous advances in isolating, identifying, elucidating, and synthesizing the

chemical structures of psychoactive plants. Numerous novel compounds have been synthesized based on natural structures, yielding important contributions to Western medicine, for example: benzocaine, an important anesthetic based on the structure of cocaine; meperidine (Demerol), a synthetic opiate pain reliever; and a number of semi-synthetic ergot derivatives such as ergonovine, used for post-partum hemorrhages, methysergide, for migraine headaches, bromo-ergokryptine, a female fertility enhancer and lactation inhibitor, as well as the infamous hallucinogen LSD. Though psychoactive principles are found in a wide range of botanical families and species, they belong to a relatively limited number of classes of chemical compounds. Many psychoactive substances belong to the chemical class of alkaloids, alkali (basic) compounds containing nitrogen that are usually bitter.

Psychoactive compounds mimic the structure of specific brain substances known as neurotransmitters, responsible for chemical communication across the junctions (synapses) between neurons. Three general classes of neurotransmitters are recognized: amino acids such as glutamate and gamma-amino butyric acid (GABA); monoamines such as dopamine, histamine, serotonin (an indolamine), adrenaline, and acetylcholine; and peptides such as insulin and the endorphins. In response to electrical impulses along the first (pre-synaptic) nerve axon, specialized structures known as terminal buttons release neurotransmitters into the synapse. Crossing the synapse, neurotransmitters bond with specialized receptor sites on the surface of the second (post-synaptic) neuron, which responds by relaying electrical impulses along its own axons. Due to their compatible though not identical chemical structures, psychoactive compounds bond with specific neurotransmitter receptor sites, magnifying, suppressing, or otherwise altering their activity. For example, mescaline, the active alkaloid of peyote cactus, is structurally similar to the neurotransmitter noradrenaline (also known as norepinephrine), as both are derivatives of the compound phenylethylamine (see Figure 1). The essential amino acid phenylalanine (C₉H₁₁O₂N) serves as a precursor in the body's synthesis of phenylethylamine-derived hormones and neurotransmitters such as adrenaline (or epinephrine), noradrenaline, and dopamine. The synthetic psychoactive drugs amphetamine, methamphetamine ("crystal meth"), and MDMA ("ecstasy") are also phenylethylamine derivatives that act on noradrenaline and dopamine receptor sites.



Figure 1. Comparison of the chemical structures of noradrenaline and mescaline.

Source: Schultes, R. E., & Hoffman, A. (1992). *Plants of the Gods: Their Sacred, Healing and Hallucinogenic Powers*. Rochester, Vermont: Healing Arts Press.

Psilocine, found in hallucinogenic "magic mushrooms," is a tryptamine derivative that mimics the structure of 5-hydroxytryptamine (5-HT), the chemical name for the neurotransmitter serotonin (see Figure 2). Serotonin, melatonin, and other tryptamine-derived hormones and neurotransmitters are synthesized by the body from the amino

acid tryptophan (C₁₁H₁₂O₂N₂). Psilocine, ibogaine, dimethyltryptamine (DMT), LSD, and other hallucinogens belong to a class of compounds known as indole alkaloids, all derived from the same basic tryptamine structure.



Figure 2. Comparison of the chemical structures of serotonin and psilocine.

Source: Schultes, R. E., & Hoffman, A. (1992).

Chemical and pharmacological studies of psychoactive plant compounds have resulted in major contributions to the field of neuroscience. For example, opiate narcotics such as morphine and codeine were found to interact directly with a specific class of "opioid" receptors responsible for pain regulation. This research led to the discovery of endorphins ("the morphine within"), pain-blocking compounds that occur naturally in the nervous system. In their interactions with specific receptor sites, psychoactive and other toxic compounds may act as *agonists*, magnifying neurotransmitter functions, or as *antagonists*, blocking their functions. For example, nicotine (from tobacco) acts as an agonist at specific acetylcholine receptor sites, now known as the nicotinic receptors. Likewise, muscarine (first isolated from *Amanita muscaria*) acts as an agonist at specific acetylcholine sites now known as muscarinic receptors. Muscarine was the first cholinergic (acetylcholine-enhancing) chemical agent to be studied, and served as an important tool for researching the acetylcholine-mediated parasympathetic nervous system. The tropane alkaloid atropine (from belladonna and other nightshades) is an anti-cholinergic agent, working in contrary fashion as a specific *antagonist* at muscarinic acetylcholine receptor sites; for this reason, muscarine and atropine are antidotes for one another. In other cases, psychoactive compounds affect the activity of enzymes or other cellular mechanisms normally involved in the reuptake or removal of neurotransmitters from synapses or receptor sites. For example, cocaine produces euphoria by inhibiting the reuptake of dopamine (and norepinephrine), causing synapses to become flooded with this neurotransmitter associated with pleasure and reward. Beta-carbolines such as harmine and harmaline potentiate the *ayahuasca* brew by inhibiting the activity of monoamine oxidase (MAO), an enzyme widely distributed in the body that breaks down and inactivates serotonin and other monoamines. Without such MAO-inhibiting ingredients, the hallucinogenic DMT component (also a monoamine) of the *ayahuasca* brew would be inactive by oral administration. Prior to the discovery of specific serotonin reuptake inhibitor (SRI) anti-depressants such as Prozac, MAO inhibitors (MAOIs) were commonly used as antidepressants, since they also increase the synaptic availability of serotonin, a neurotransmitter associated with mood and well-being.



Figure 3. Yora shaman of the Peruvian Amazon with a bundle of *ayahuasca* vine (*Banisteriopsis caapi*). The vine contains beta-carbolines that act as monoamine oxidase inhibitors, potentiating the psychoactive effects of DMT-containing admixtures in the *ayahuasca* brew.

With some types of psychoactive compounds, repeated use alters metabolic or synaptic functions in such a way that larger doses are required to achieve the same effect (tolerance). Physical dependence occurs when the body so alters its equilibrium state that removal of the drug causes physical discomfort, or so-called withdrawal symptoms. However psychological, social, and cultural factors play a crucial role in drug dependence and its consequences.

Though a fair amount is now known about *how* psychoactive plants and compounds produce their peculiar effects on the human mind, it is still largely a mystery as to *why* certain plants produce such compounds. Alkaloids and other physiologically active compounds do not appear to be directly involved in the primary metabolic activities of plants. For this reason, they are sometimes referred to as secondary plant compounds. Because they contain nitrogen, a limiting element in plant growth, alkaloids are produced at a significant metabolic cost. Hence, it is presumed, these compounds must have some evolutionary function. Some have theorized that toxic compounds in plants evolved as chemical defenses to deter animals from eating their leaves, stems, roots, fruits, or seeds during particular life cycle phases. However such theories are still hard-pressed to explain why the opium poppy produces a chemical that exactly mimics the body's own pain-reducing mechanism, or why such widely distinctive organisms as ergot fungus and morning glories produce nearly identical lysergic acid alkaloids that can induce profound mystical experiences when ingested.

Complementing the work of ethnobotanists and plant chemists, anthropologists have described the rich cultural and religious life that surrounds psychoactive plants as used by different societies, while also documenting the conflicts that emerge when such religious traditions are subjected to missionary activity and other outside influence. Almost universally, traditional societies consider psychoactive plants to be divine entities, "plants of the gods" that allow humans to contact spirits or deities to obtain knowledge, power, and control over natural phenomena. More than mere sources of chemical substances, psychoactive plants are central sacred symbols in many religious rituals, imbued with important spiritual and social functions. In the global expansion of Western cultural dominance through colonialism and missionary activity, indigenous religions (and especially those that use psychoactive plants) have often been violently suppressed. Nonetheless, traditional religious use of psychoactive plants has survived in many parts of the world, adapting itself to new religious and cultural influences in fascinating ways.

Cross-cultural psychological and psychiatric studies have identified certain universal features of trance states and religious experiences that transcend the particular cultural context. Studies of folklore, artistic iconography, and ancient civilizations suggest an important role for psychoactive plants in the history of world religions. Cross-cultural works and studies of social history have emphasized how dominant attitudes toward particular psychoactive plants and drugs vary and evolve between cultures, religions, world regions, and historical periods.

2. Shamanism, psychoactive plants, and the origins of religion

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2. Shamanism, Psychoactive Plants, and the Origins of Religion



Shamanism is considered an extremely ancient, perhaps the oldest, religion, associated particularly with nomadic hunting societies such as those that predominated throughout most of human prehistory. Only recently have scholars come to appreciate the fundamental role of psychoactive plants in many shamanic religions. The word *shaman* comes originally from the Tungus language family of Siberia, referring to tribal specialists who enter trance states during rituals for purposes of healing and divination. Similar trance specialists, some of whom consume hallucinogenic plants or mushrooms, have been documented throughout Siberia and among linguistically related Ugrian-Altaic groups (Mongols, Ainu, Turko-Tatars, Finnish Lapps, and others) as well as in China, Tibet, Korea, Indonesia, Malaysia, and other parts of Asia. These diverse traditions appear to be historically connected by way of ancient routes of migration and cultural diffusion. Likewise, the Asiatic peoples who migrated to the Americas during the Ice Ages appear to have brought with them a ritual complex that integrated religious and medical functions, centered around trance states, and likely involved the use of psychoactive plants. Almost universally, native societies throughout North, Central, and South America distinguish ritual specialists who consume narcotic or hallucinogenic plants or otherwise enter trance to travel to the spirit world and commune with the spirits. Recognizing these ancient cultural ties, scholars now use the term shaman to refer generally to trance specialists throughout Asia and the Americas,

known locally by a myriad specific terms such as pajé, curandero, seripigari, bomoh, yuta, and others. Outside this historically connected geographical range, trance specialists, and in some cases psychoactive plants, are found in religious and medical traditions of New Guinea, aboriginal Australia, the Middle East, sub-Saharan Africa, and Afro-Caribbean peoples. Nonetheless, some scholars are hesitant to include these other traditions under the label of shamanism.

Early accounts by explorers and missionaries concerning shamans, trance rituals, and exotic psychoactive plants are dominated by intolerance and an Inquisition-Era fervor for stamping out such "pagan customs," "idolatrous rites," "evil vices" and "Devil-worship". Travelers, naturalists, and early anthropologists of the eighteenth and nineteenth centuries show similar condescension and cultural bias, judging shamans to be either imposters and charlatans, or else marginal, perhaps mentally ill individuals. Cross-cultural psychologists and anthropologists throughout the twentieth century suggested that the shaman's ecstatic visions might have their basis in psychopathology such as neurosis, schizophrenia, or the recently proposed "Trance and Possession Disorder." While some shamans indeed experience involuntary bouts of madness, illness, visions, or seizures, especially during their initial "calling" to the profession, contemporary studies have demonstrated that many trance specialists voluntarily induce altered states of consciousness (ASC) through a variety of techniques such as fasting, meditation, breath control, sensory deprivation, chanting, prayer, drumming or other rhythmic music, and especially the consumption of plant-based psychoactive drugs.



Figure 4. Yanomami shaman in trance induced by hallucinogenic *Virola* snuff.

2.1. Trance and Altered States of Consciousness

Trance, ASC, and religious ecstasy appear to be endogenous to the human brain, and can be induced by various conscious manipulations, psychoactive substances, and culturally variable psychological states or conditions (for example, spirit possession). When induced or manipulated in ritual settings, ASC appear to serve important healing, psychological, social, and other adaptive functions. Cross-cultural research has demonstrated universal neurological, physiological, and phenomenological aspects of trance states. The induction of ASC through various means elicits a physiological relaxation response and produces theta wave synchronization across multiple levels of brain activity. This distinctive physiological state is conducive to healing, for example, through relaxation, psychological integration, hypnotic openness to suggestion, and activity on opioid and serotonin-mediated receptor sites associated with pain relief and sense of well-being. Trance states are often characterized by symbolic visual imagery and non-linear thought processes that can result in revelatory insights or intuitions

about self, others, nature, and the cosmos. Common themes found in trance states worldwide include: time distortion, timelessness, or immortality; synesthesia, the blending of the senses; exaggerated emotional states; heightened aesthetic sensitivity; terrifying experiences of psychic suffering or physical death, sometimes followed by a miraculous rebirth; magical flight to distant realms, occupied by spirits or magical beings; the reception of esoteric knowledge, telepathic communications, or important messages; a sense of mystery (the "numinous") and awe; a profound sense of identification with other people or with the natural world; and a sense of illumination or oneness with the universe or with God. Trance and ASC appear to be near universal in human societies, play a fundamental role in rites of healing and social cohesion, and often represent the basis for the personal experience of the sacred. For these reasons, some consider ASC fundamental in the origin of human religion.



Figure 5. Yora (Nahua) Shaman of the Peruvian Amazon Chanting over a Patient

Anthropologist and cross-cultural psychologist Gregory Bateson's cybernetic theory of mind sheds light on the observed adaptive functions of trance and ASC. In a reformulation of Sigmund Freud's concepts, Bateson considers the subconscious to be not a dark cellar of repressed memories, but rather a repository of habitual thoughts, actions, and emotions. For reasons of sheer economy, the brain cannot consciously monitor all available sensory input, thought processes, and behavioral responses. Mental processes that are repetitive, habitual, or deeply ingrained become "sunk" into the subconscious, sparing consciousness for matters that require more immediate attention. The price of this economy of mind is that subconscious thoughts, feelings, and motivations are no longer available for conscious inspection or control. For Bateson, the mind functions in complex circuits of input and feedback that go beyond the bounded, individual self: felling a tree encompasses a larger mind that includes the person, the axe, and the tree. However, the conscious, individual mind is only aware of short, incomplete arcs of these larger circuits. The rest of the mental process—for example, minute, subconscious adjustments of the axe's angle; the fact that the tree is an active member of this holistic mind—remains hidden from view like the submerged mass of an iceberg.

Bateson views art and certain kinds of religious beliefs as serving a corrective function, allowing integration of the narrow, individual consciousness with the larger circuits of mind. For example, in discussing the success of Alcoholics Anonymous, Bateson notes that the famous "Twelve Steps" involve admitting that the individual (i.e. the limited individual consciousness) has no control over the drug addiction; help is obtained only by appealing to the higher power of God (i.e. the larger circuits of mind). (Note that traditionally-used psychoactive plants come with the "Twelve Steps" already built in: because they are considered "plants of the gods," their use is automatically surrounded

by reverence, awe, protective taboo, and ritual prohibitions, greatly limiting their potential for abuse). In the light of Batesonian theory, ASC and psychoactive plants can be seen as means of loosening up mental processes, blurring ego boundaries between individuals and their larger social and ecological context, while allowing the conscious mind greater access to the intuitive, symbolic thought processes of the subconscious. By amplifying the unexpected, non-linear associations of the subconscious, this "ecstatic mode" of consciousness allows for the perception of new patterns and relations among things, experiences, and events. This new-found patterning suggests the existence of a hidden order behind the mundane appearances of daily life: a divine purpose or Cosmic Order that provides meaning in a chaotic universe.

Although trance states emerge, for the individual, through a set of apparently universal alterations in brain function, these personal experiences are always framed and imbued with meaning by the social group, often in a ritual context. For anthropologist Victor Turner, ritual represents an exceptional event that is marked and separated, both in space and time, from ordinary social life. People participating in rituals occupy a *liminal* or transitional social state, "neither here nor there." During this liminal state, ordinary social rules and hierarchies break down. Social structure is temporarily eliminated, and replaced instead by "Comunitas," an undifferentiated community of equal individuals who share a mutual sense of camaraderie, identity, and belonging to a cohesive whole. The social distinctiveness of ritual is accompanied by a distinctive cognitive state from that found in daily life. In rituals, ordinary logic is suspended and replaced by the non-linear, inductive, combinatorial logic of symbols. Later in his work, Turner became interested in neurobiology and came to associate Comunitas with the holistic, integrative, symbolic thought processes of the right cerebral hemisphere, functioning in opposition to the left hemisphere where structure, logic, hierarchy, and deductive reasoning dominate. Thus, ritual itself represents a kind of altered state of consciousness, apart from mundane social activities and thought processes. Indeed, ASC attained through various techniques (chanting, incense burning, meditation, prayer, psychoactive plant use) is fundamental to many if not all religious rituals. The cognitive distinctiveness of ASC reinforces the social, spatial, and temporal distinctiveness of ritual states. This separate reality, in cognitive and social terms, is represented in cosmological terms as the spirit world that shamans and ecstatic priests visit while in trance.

Yet just as ASC provide a distinctive cognitive frame within which rituals take place, rituals also serve to frame, delimit, bound, and rein in the potentially dangerous, anti-structural forces unleashed by Comunitas and ASC. When the ritual or trance is over, people return to the accustomed social order and cognitive rules, and are able to interpret these extraordinary events, insights, or visions and incorporate them in productive ways into their life, renewing or reaffirming their sense of belonging to society. Herein lies the true danger of removing ritually used psychoactive plants from their traditional contexts. Plants and plant-based compounds (for example coca, cannabis, mescaline, "magic mushrooms"), many of which have been used safely for centuries in ritual contexts, enter the world of street drugs and are then blamed for individual and social ills ranging from psychosis to family disintegration and urban decay. It is perhaps not the drugs themselves that produce the destructive effects on health, personality, and society observed in the modern context of recreational drug

use. Rather, it is the lack of appropriate framing of these drugs within a socially delimited or sacred ritual context. Once divine substances, treated with awe and respect and imbued with profound meanings, psychoactive drugs have become increasingly profane and meaningless commodities, sold for profit and consumed for pleasure or escape. To state this in somewhat vulgar terms, the market does to traditionally-used psychoactive substances what prostitution does to love-making.

2.2. Evidence from Ancient Art

Some authors have suggested that the origin of religion in human history is intimately related to ASC (including dreams) and, possibly, psychoactive plant use. Concrete evidence for psychoactive plant use and other forms of ASC in ancient times is scant and highly speculative. Some consider the geometric designs, zoomorphic (part animal, part human) figures, and other abstract or fantastic motifs of Paleolithic rock art of South America and elsewhere to represent visions induced by hallucinogenic plants. Cave paintings in France and Spain depict bison, bear, and other animals associated with human figures in prone or other unusual postures. Noting the widespread role of shamans as animal-charmers in contemporary hunting societies, some scholars suggest that such cave paintings were associated with Stone Age shamanism or trance rituals. Widespread artistic representations and folklore concerning the "tree of life" or *axis mundi*, a central axis connecting the earth with the heavens, have been interpreted as reflecting visions induced by hallucinogenic plants in Stone Age shamanism.

With the advent of agriculture and the rise of ancient civilizations, ecstatic tribal shamans were presumably supplanted by priests, religious hierarchies, and state-sanctioned religious rites. However, evidence from ancient art and symbolism suggests that psychoactive plants remained significant in many early civilizations. Gordon Wasson's controversial theories have implicated psychoactive mushrooms in the religious traditions of ancient India and Greece (see discussion below). The importance of sacred lotus (*Nelumbo nucifera*) and blue water lily (*Nymphaea caerulea*) in ancient Egyptian, Buddhist, and other Eastern religious iconography has likewise been attributed, in part, to the presence of isoquinoline alkaloids such as nuciferine and aporphine, chemical relatives of morphine that could induce dreams, hallucinations, or trance. Lotus and other perfumes appear to have been used in ancient Egyptian religious ceremonies to induce altered states of consciousness. Artistic representations of water lilies, mandrake (*Mandragora officinalis*), and opium poppies (*Papaver somniferum*) have led to speculations about the role of psychoactive plants in ancient Egyptian cosmology and concepts of the soul's after-life journey.

These and other accounts associating ancient art and religious symbolism with psychoactive plants are certainly important and suggestive. However multiple lines of evidence (archeological, historical, ethnobotanical) are required to establish such speculations on more solid grounds. In many cases, it is nearly impossible to prove or disprove the hypothesis. Even when the evidence is more conclusive, it is important to avoid a kind of "entheogenic reductionism," whereby hallucinogenic (entheogenic) plants are assumed to explain away all rituals, artistic motifs, and belief systems, without sufficient consideration of the total cultural setting.



Figure 6. Ancient rock art of the Upper Rio Negro, Brazil.

More concrete evidence for psychoactive plant use in ancient times is found in the art of pre-Columbian civilizations from South and Central America. Spectacular decorative and religious iconography at Chavín, cradle of Andean civilization, includes representations of the hallucinogenic San Pedro cactus, used through the present day by coastal Peruvian shamans. Snuff kits and tablets containing hallucinogenic plants have been found at archeological sites throughout South America. Pre-Columbian artwork and early colonial manuscripts from Mexico depict clearly identifiable hallucinogenic mushrooms, morning glories, and other psychoactive plant species in ritual and mythological contexts. *Bufo* toads are an important element in Aztec and Mayan art and religion, leading some authors to speculate that hallucinogenic toad toxins may have been used ritually. Artwork and hieroglyphic writings of the ancient Maya describe trance states induced by fasting, bloodletting, and perhaps psychoactive preparations.

1. Introduction

3. Psychoactive botanicals: A world overview

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3. Psychoactive Botanicals: A World Overview



The cultural use of hallucinogenic and other psychoactive plants is not distributed evenly throughout the globe. For example, of approximately 150 plants known to be used as hallucinogens, 130 are found in the New World (North, South America) while only 20 are found in the Old World (Africa, Europe, Asia, Oceania). Considering that the New World was only recently populated by humans, it seems more likely that cultural, rather than ecological or biochemical, differences account for this disparity in plant use. To highlight such disparities in the human geography of psychoactive plant use, the following discussion is organized according to major geographical areas.

3.1. Africa

Africa is the cradle of the human species and thus, presumably, the continent where the first human or perhaps even pre-human hominid religions emerged. Many studies of African religions have noted the prevalence of trance and possession cults as well as witchcraft, sorcery, and healing mediated by witch doctors. The terms "shaman" and "shamanism" are rarely if ever noted in studies of African religions and healing systems. Shamanic trance, in its strict sense, has been defined as an ascent into the heavens, where the shaman gains control over the spirits. Possession trance, on the other hand, has been defined as a descent into the underworld, where the spirits take control of the possessed person. Possession has been associated with agricultural and

pastoral societies, and is widespread in Africa; by contrast shamanic trance has been associated with nomadic hunting societies, notably those that use psychoactive plant preparations. Compared with other world regions of comparable size, especially the tropical Americas, Africa has provided a relatively small number of the world's known psychoactive and hallucinogenic plant species. It is unclear what combination of cultural, historical, ecological, or botanical factors, and perhaps also research bias, contributes to this phenomenon.

3.1.1. *Coffea arabica*: The Wine of Islam

Legend has it that an Arab goat herder in Ethiopia named Kaldi went out to search for his wayward goats one night, and came upon them dancing around a small shrub with red berries. He tried the berries himself, and soon joined the goats in their dancing, and so were the stimulating properties of the coffee berry discovered. Since at least the first millennium BC, tribes of southern Ethiopia cultivated the shrub *Coffea arabica*, belonging to the alkaloid-rich Rubiaceae family, and ate the beans mixed with animal fat as a stimulating and appetite-suppressing food. The related species *Coffea robusta* was discovered only later in the Congo region, and has been used as an alternative, hardier, cultivated variety of coffee throughout tropical Africa and Asia. Prior to the widespread cultivation of coffee, *qat* (*Catha edulis*; Celastraceae) was used for similar purposes throughout the Arabian Peninsula and eastern Africa. *Qat* contains strongly stimulating and habit-forming alkaloids similar to amphetamine, and remains a favorite national pastime and agricultural product of Yemen and neighboring countries. During a severe shortage of *qat*, Sufi Muslims are said to have adopted coffee as its substitute in preparing the ritual beverage known as *qahwa* ("sleep-preventer").

By about 1100 AD, Arab traders had transplanted coffee trees to the Arabian peninsula. At first, coffee was used only for medicinal and religious purposes, for example, helping Sufis, Dervishes, and other religious adepts remain awake during long sessions of nocturnal prayer and study. Coffee (and in some countries, *qat*) is also used to suppress hunger for the month-long fast during the Ramadan holiday. With the spread of Islam, the boiled coffee infusion became the social beverage of choice among Muslims, for whom wine was strictly forbidden. As the secular use of coffee spread in the sixteenth century throughout Arabia and the Ottoman Empire, Islamic clerics and local rulers made various unsuccessful attempts to ban the beverage. Coffee consumption spread to Europe in the sixteenth century through trade and contact with the Ottoman Empire. In the late 1500s, Pope Clemente VIII was asked to ban coffee, known as the "wine of Islam." Instead, he declared that the beverage was so delicious; it would be a sin to allow only the infidels to enjoy it.

Even with the Pope's blessing, the spread of coffee houses throughout Europe and eventually America provoked moral outrage among traditionalist segments of society. As the *Women's Petition Against Coffee* (drawn up in London in 1674) declaims:

"Certainly our Countrymen's pallates are become as Fanatical as their Brains: how else is't possible they should Apostatize from the good old primitive way of ale-drinking, to run a Whoreing after such variety of destructive Foreign Liquors, to trifle away their time, scald their Chops, and spend their Money, all for a little base, black, thick, nasty

bitter stinking, nauseous Puddle water: Yet (as all Witches have their Charms) so this ugly Turkish Enchantress by certain Invisible Wyres attracts both Rich and Poor."

Coffee imports contributed to foreign trade deficits in eighteenth century Prussia, leading to a highly unpopular but short-lived royal ban. In 1732, Johann Sebastian Bach composed his "Coffee Cantata" to protest against a movement to ban coffee consumption. In England and colonial America, coffee competed economically with the staple social drug of beer. Prompted by such economic concerns, as well as by fears of loose morals and rebellious talk in coffee houses, several European leaders attempted to restrict or ban coffee consumption, but were met with ferocious local protest. Coffee houses were associated with literary and political movements in England, France, and fledgling America in the seventeenth and eighteenth centuries: Voltaire is said to have drunk up to fifty cups a day! Important political discussions in both Revolutionary America and France took place in coffee houses. The American Revolution began officially with the Boston Tea party in 1773, when colonists protesting against British tea taxes dumped shiploads of tea in Boston harbor. As a result, coffee became the quintessential American stimulant. Today, coffee may be the most widely consumed psychoactive plant preparation in the world.

The main active ingredient of coffee, caffeine, or related xanthine alkaloids are also found in a number of unrelated plant species used as stimulants in other parts of the world: tea, *Camellia sinensis* (L.) Kuntze (Theaceae), originally from Asia; chocolate, *Theobroma cacao* L. (Sterculiaceae) originally from tropical America; kola nut, *Cola acuminata* (P. Beauv.) Schott & Endl. (also Sterculiaceae) from West Africa; *Ilex guayusa* Loes., *I. paraguariensis* St. Hilaire, and other holly relatives (Aquifoliaceae), used in stimulating beverages of the Ecuadorian and Peruvian Amazon (*guayusa*) and Argentina and southern Brazil (*yerba mate*); and *Paullinia cupana* Kunth (Sapindaceae) or *guaraná* of the Brazilian Amazon. Caffeine appears to act by blocking the adenosine receptor sites which normally dampen nerve activity. In addition to its social use as a stimulant, caffeine is used in Western pharmaceutical preparations as an appetite suppressant and in the treatment of migraine headaches.

3.1.2. *Tabernanthe iboga*: Way to the Ancestors

Iboga, a shrub of the dogbane (Apocynaceae) family, is restricted to tropical areas of West Africa. Early ethnobotanical reports mentioned iboga as a favorite stimulant of hunters and warriors to prevent fatigue and increase muscular endurance. Iboga also figures prominently as a hallucinogen in the Bwiti cult and other secret religious societies of Cameroon, Gabon, and Congo (Zaire). Bwiti initiates are not considered full members until they have consumed a large dose of the powdered iboga root and experienced direct contact with the gods and ancestor spirits. Initiation culminates in a comatose state during which the initiate's soul is said to leave the body and visit the land of the dead. Bwiti cult leaders as well as some sorcerers consume iboga to receive information from the spirit world or to seek advice from the ancestors. Seasoned Bwiti initiates take smaller doses at regular cult ceremonies. The resulting strong stimulation and alterations in time perception permit cult members to spend long hours dancing and performing ceremonial music without fatigue, transported to the mythical time of the ancestors. The Bwiti cult spread rapidly in West Africa beginning in the middle of the

twentieth century as a reaction against European colonialism and Christian and Islamic missionary activity.

The main active ingredient is ibogaine, a novel indole alkaloid first isolated from the plant in 1901. An iboga extract was marketed from 1939 through 1966 under the name Lambarene as a treatment for fatigue and depression. Western users of ibogaine describe a unique and powerful experience, replete with profound personal and spiritual insights and striking metaphorical imagery. The acute visionary experience lasts eight hours or longer, and users feel the physical and psychological after-effects of the drug for several days. Rather than visiting the ancestors, Westerners claim ibogaine allows them to visit the inner workings of their psyche: some note that an iboga session is "like going through ten years of psychotherapy in three days." In particular, some users mention an experience like sitting in a movie theater and watching scenes from their subconscious or personal past play on the screen. Fears or images concerning death are also frequent.

In 1962, Howard Lotsoff, a college dropout and drug addict, took ibogaine expecting just another thrilling trip. Instead, he discovered that a single dose had erased his heroin and cocaine dependency. He eventually aroused the interest of researchers and drug treatment groups, and in 1985 filed a use patent on ibogaine as a treatment for heroin addiction. The pharmacology of ibogaine is not fully understood, though it appears to induce long-lasting alterations in multiple receptor sites relevant to drug addiction. Addicts who have cured themselves with ibogaine insist that the psychological and spiritual insights revealed in iboga visions are also crucial to recovery. A post-1960s medical bias against hallucinogenic agents has hampered more widespread research or acceptance, and ibogaine remains classified by the FDA as a Schedule 1 narcotic, the most restrictive category of illegal drugs. Further, patent conflicts among researchers and questions concerning possible toxicity have brought ibogaine research in USA to a standstill.

3.2. Europe and Asia

3.2.1. *Amanita muscaria*: Divine Mushroom of Immortality?

In a remarkable work combining linguistics, folklore, cultural history, and learned speculation, retired banker and mushroom enthusiast Gordon Wasson investigated the origins of mycophobia and mycophilia—culturally variable fear or adoration of mushrooms—in European and Asian civilizations. He came to a stunning, though controversial, conclusion: a hallucinogenic mushroom may lie at the origins not only of contradictory cultural attitudes toward fungus, but of Eurasian religion itself. For Wasson, Eurasians' current love/hate relationship with mushrooms might be explained if some mushroom species had been treated with both awe and reverence at some early point in the region's cultural history. Wasson found evidence for such mushroom reverence in the Soma cult of the ancient Indo-Iranians.

Aryan peoples originating in the Caucasus mountain region between the Black and Caspian Seas (modern Armenia) swept into the Indian sub-continent some 1500 years before Christ, giving rise to the Indus Valley civilization and the Sanskrit language, a

key early representative of the Indo-European language family that now dominates the globe. The original Aryan peoples were nomadic horsemen who practiced a form of shamanic religion that centered around an enigmatic, sacred substance called Soma, which permitted contact with the gods and conferred immortality. The Rg Veda is a collection of 1028 hymns, composed and transmitted orally by the Indo-Aryans for a thousand years before being set down in written Sanskrit in about 500 BC. These sacred texts form the religious and philosophical basis for Hinduism and Buddhism. About 120 hymns in the Rg Veda are dedicated to Soma, clearly some form of hallucinogenic plant consumed in ritual settings by a caste of high-ranking priests known as Brahmins. However as reported in the later Vedic verses, Soma became scarce as the cult spread from its mountainous homeland to the Indus Valley lowlands. Eventually, the original plant was abandoned in the Soma rituals, replaced by various symbolic substitutes, and the botanical identity of Soma was forgotten.

Citing Vedic verses that relate Soma to flies, and others that mention white spots or studs (likened to sparkles of divine light), reddish color, and a pillar-like structure, Wasson identified Soma as fly agaric *Amanita muscaria* (Figure 7), the "red mushroom with white spots" that is ubiquitous in European and Asian folklore. Milk soaked in the sweet-tasting fly agaric has been used for centuries as a home brew for poisoning fruit flies; hence the common and scientific names. Yet the mushroom is also associated in folklore with gnomes and other magical beings. Even the mundane use of the mushroom as a fly trap may reflect ancient practices: in Vedic mythology, the Soma plant was brought to earth by a fly; also, Brahmin priests originally consumed Soma pressed in milk. For Wasson, the Soma cult was an elaboration of a much more ancient and widespread practice. According to his theory, the fly agaric cult was possibly universal in prehistoric northern Eurasia, and may have been the original shamanic religion. Echoes of fly agaric lore are found to this day throughout Europe, Asia, and the Americas. Even the Christian celebration of the Eucharist bears curious similarities to the ancient Aryan cult: Soma was originally a god-king who sacrificed himself, spilling his blood, so that humans could consume his body and attain divine union. The Greek word for body, *soma*, is borrowed from the Sanskrit name of this ancient god-plant, and is still found in modern medical usage referring to bodily ("somatic") processes or symptoms.



Figure 7. Fly agaric (*Amanita muscaria*) growing in the pine forests of Finland.

Fly agaric use has been documented since the 1700s in accounts of various European travelers to Siberia. Some noted details of fly agaric usage that are remarkably similar to Vedic verses concerning Soma composed three thousand years prior: for example, the tradition of having a woman moisten dried fly agaric caps in her mouth before passing them on to a guest. Historically, and in some cases through the present,

nomadic reindeer herders in Finnish Lapland and Siberia have practiced a form of shamanism focusing on fly agaric consumption. The reindeer themselves are reported to relish the hallucinogenic effects of fly agaric. Siberian shamans describe visions of tiny, mushroom-sized people or magical dwarves who personify the fly agaric during trance. Though its religious use survived through modern times only among these remote, nomadic peoples, fly agaric grows throughout virtually all of northern Europe, Asia, and western North America, and it may have been much more widely used in the distant past. The folklore of Ireland and the British Isles includes forest priests (druids), wizards, and tiny magical beings such as leprechauns and fairies, which may reflect the use of fly agaric in ancient Celtic religions. Wasson proposes that the Santa Claus folklore—including flying reindeer, magical dwarves, and Saint Nick himself, dressed in the *Amanita*'s distinctive white-on-red coloration—represents a tenacious cultural memory of pre-Christian shamanic religions involving fly agaric.

The main psychoactive component of *A. muscaria* is muscimol, an isoxazole alkaloid that acts on GABA receptors. The more toxic ibotenic acid, which causes unpleasant effects such as twitching and nausea, is present in higher concentrations in the fresh mushrooms, but is converted to muscimol as the mushroom dries. The toxic alkaloid muscarine, found in *A. muscaria* in trace amounts, stimulates the so-called muscarinic class of acetylcholine receptors, activating the parasympathetic nervous system. Unusual among psychoactive plants, these active principles are not metabolized by the body, but rather passed in the urine. Ethnographers noted how Siberian and Finnish Laplanders, as well as their reindeer, consumed the urine of other fly agaric drinkers to become intoxicated themselves. This was one important clue in Gordon Wasson's identity of Soma as *Amanita muscaria*, since consumption of urine is mentioned in verses of the Rg Veda. Ritual urine consumption noted in later mystical religious traditions of Iran (Zoroastrianism, Mithraism, Manichaeism) may also derive from this ancient practice. Associations between fly agaric and thunderbolts, first mentioned in the ancient Vedic hymns of India, are also found in the folklore of modern Mayan peoples of Mexico and Guatemala. Fly agaric itself was documented as a ritual hallucinogen among Algonquian tribes of eastern North America, and is used through the present day by the Ojibway tribe of the Great Lakes region. In this regard, the widespread use of psychoactive plants among North and South American Indians may derive from the cultural diffusion of *Amanita*-based shamanism during ancient migrations from Siberia.

3.2.2. *Claviceps paspali*: Key to the Eleusinian Mysteries?

Speculation has surrounded possible psychoactive components of the *kykeon*, a beverage made of barley and pennyroyal (*Mentha pulegium* L.) that was drunk in ancient Greece by initiates in the cult of Demeter, goddess of fertility and agriculture. The cult's temple was located in the town of Eleusis, northwest of Athens, and its practice revolved around the myth of Persephone, Demeter's beloved daughter who was kidnapped by Hades and taken to the underworld. The cult practiced its rites, known as the Eleusinian mysteries, twice a year: the Lesser Mysteries in the spring, celebrating Persephone's return, and the Greater Mysteries in the autumn. Initiates into the Greater Mysteries, during which the *kykeon* was consumed, were sworn to utmost secrecy under penalty of death. Therefore, very little is known about the ritual or the effects of

the brew. During the secret night-time ceremony, priestesses of the_cult apparently showed sacred objects to initiates and revealed visions associated with the fate of the dead and the immortality of the soul.

Like the Indo-Iranians who brought the Soma cult to ancient India, the ancestors of the ancient Greeks were also Indo-European invaders originating from the Caucasus region. Thus the Eleusinian Mysteries and other ecstatic cults in ancient Greece (for example, the orgiastic cult of Dionysius and the oracles to Apollo at Delphi) may trace their origins to the shamanic religions of ancient Eurasia. Influential classical Athenians including Socrates and Plato, founding fathers of Western philosophy and mathematics, could likely have been initiates in the Eleusinian mysteries. During one chapter in a long series of scandals that culminated in Socrates's infamous execution by hemlock, several of his prominent students were accused of desecrating the Eleusinian mysteries by revealing the secrets of the *kykeon* beverage to dinner guests at their homes. Accounts by Plato, his most famous student, suggested that Socrates sometimes fell into trance states, contributing to his contemporary image as a sorcerer and mystic. Some have suggested that Plato's own influential philosophy of ideal types—perfect examples of forms and concepts existing in an eternal plane independent from their imperfect reflections in the mundane world—may reflect his experience of altered states of consciousness during the Eleusinian rites. After some 2000 years of continual practice, the rites were banned by the Roman Emperor Theodosius in the late fourth century AD. The sacred sites were desecrated by invading Christian Goths, and the mysteries of Eleusis and the *kykeon* were lost.

The awe, wonder, and profound transformative powers associated with the Eleusinian initiation strongly suggest some kind of psychoactive preparation. Gordon Wasson (ever the mushroom enthusiast), in collaboration with Albert Hoffman (discoverer of LSD), suggested that a fungus could have contributed hallucinogenic components to the *kykeon* brew: in this case, ergot (Claviceptaceae), a group of pathogenic fungi that infest cereal plants, and that gave origin to the powerful synthetic hallucinogen, LSD. The most infamous of these is *Claviceps purpurea*, the ergot that occurs on rye. In medieval times, ergot infestations in rye caused the devastating scourge known as Saint Anthony's Fire, characterized by a burning sensation in the hands and feet, festering blisters that turned gangrenous, spontaneous abortions in pregnant women, and convulsions or fits sometimes accompanied by delirium and hallucinations. Ergot infestations produced terrifying, lethal epidemics throughout Europe from the eleventh through the late seventeenth centuries, when its cause was finally discovered. Some suggest that the Salem witch hunts in Colonial America may have been linked with outbreaks of ergot intoxication. European midwives learned to use ergot in careful doses as a medicine to ease difficult childbirth. Today, ergot compounds are used medically as vasoconstrictors, for example in treating migraines, post-partum bleeding, and to improve memory and alertness in the elderly.

Rye ergot contains a number of indole alkaloids related to LSD including ergotamine and ergotoxine—strong vasoconstrictors that induce contractions of involuntary muscles. In large doses, for example in the chronic consumption of ergot-infested rye flour, these compounds cause convulsions, abortions, and severe constriction of the blood vessels, leading to the gangrenous form of ergot intoxication. The delirium and

hallucinations associated with ergotism were probably produced by trace amounts of lysergic acid amides (LSA), psychoactive precursors to lysergic acid diethylamide (LSD). Indeed, LSD was first synthesized by Hoffman in 1938 during his chemical studies of ergot derivatives. Curiously, identical LSA compounds are also found in the seeds of morning glory species *Ipomoea violaceae* L. and *Turbina corymbosa* (L.) Raf., almost certainly the enigmatic Ololiuqui plant used as a sacred hallucinogen by the ancient Aztecs.

The ancient Greeks did not consume rye, which they regarded as an inferior grain associated with barbarian enemies of Thrace and Macedonia. For this reason, as well as for its highly toxic nature, *Claviceps purpurea* is an unlikely candidate as a component of the *kykeon* brew. However the related species *Claviceps paspali* is found in cereal grasses of Greece. Unlike rye ergot, *C. paspali* contains significant amounts of psychoactive LSA compounds without the toxic ergoline alkaloids that cause Saint Anthony's Fire. Wild and cultivated grains were closely associated with the cults of Demeter and Persephone, the goddesses of fertility and agriculture, respectively. Persephone's journey to the underworld and the visions revealed to the Eleusinian initiates strongly suggest some kind of psychoactive component in the *kykeon* brew. Taken together, these factors led Wasson and Hoffman to suggest that this, or perhaps some other native Grecian ergot, provides the key to unlocking the ongoing mystery of Eleusis.

3.2.3. *Atropa belladonna*, *Datura metel*, *Hyoscyamus niger*: Nightshades for Oracles, Witches, and Beautiful Ladies.

The Solanaceae or Nightshade family, which includes potatoes, tomatoes, and tobacco, is the botanical group that has been most consistently and widely used for psychoactive properties by different peoples throughout history. The solanaceous narcotics owe their diverse medicinal, analgesic, and hallucinogenic properties to a group of closely related tropane alkaloids, notably scopolamine, atropine, and hyoscyamine that are present in different concentrations in many nightshade species. These compounds are known as anticholinergic agents, since they block the effects of the neurotransmitter acetylcholine which is involved in the control of skeletal muscles and activation of the parasympathetic nervous system. (Muscarine, a toxic alkaloid found in *Amanita muscaria* and other mushrooms, works in exactly the opposite manner, enhancing acetylcholine effects; for this reason, atropine has been used as an antidote for mushroom intoxication, and muscarine as an antidote for nightshade poisoning). The dreamlike hallucinations and amnesia associated with nightshade intoxication are due mostly to scopolamine, a sedative and antispasmodic drug in Western medicine formerly used to induce an oblivious "twilight sleep" during childbirth. Atropine causes muscle relaxation, analgesia, drying of secretions, increased heart rate, and dilation of the pupils. It is widely used in various surgical and ophthalmological procedures and as a pharmaceutical remedy for colds and asthma. Because they are readily absorbed through the skin, scopolamine and atropine are applied externally in medicated patches to treat motion sickness.

The most widespread psychoactive nightshade is the genus *Datura*, which, along with the closely related cultivated genus *Brugmansia*, has been used extensively as a ritual

hallucinogen by indigenous peoples of North, Central, and South America (see below). Various Old World *Datura* species (notably *D. metel*, Figure 8) have been noted as hallucinogens, narcotics, poisons, medicines, and sacred plants throughout Africa, Europe, and especially Asia. *Datura* flowers are found in myths and artistic motifs associated with Buddha and the ecstatic Hindu god Shiva. Ancient superstitions surrounding mandrake *Mandragora officinalis* are probably associated with the presence of psychoactive tropane alkaloids in this nightshade relative: medieval herbalists once believed that the plant would shriek horribly, causing insanity or death, if uprooted without proper precautions. Medieval alchemists, searching for the philosopher's stone and the elixir of immortality, produced potions and panaceas which included various nightshades as possible hallucinogenic ingredients.



Figure 8. *Datura metel*, an Old World nightshade widely used for its medicinal and narcotic properties.

The psychoactive nightshades henbane and belladonna were particularly important in Europe from ancient through medieval times, associated with magic, witchcraft, and sorcery. Henbane (*Hyoscyamus niger*) has been long used as an anesthetic as well as a psychoactive plant, and was recorded in an ancient Egyptian manuscript dating to 1500 BC. Homer described magic potions in ancient Greece that probably contained henbane. It has been suggested that the priestesses at the Oracle in Delphi made their prophecies during henbane intoxication. Henbane was employed by medieval necromancers to conjure demons, and appears to have been an ingredient in potions consumed by medieval witchcraft societies in order to experience visions during ecstatic Sabbat rituals. In some parts of Asia and the Middle East, henbane is still smoked with cannabis to produce a stronger form of intoxication.

Belladonna (*Atropa belladonna*) means literally "beautiful lady." Its high concentration of atropine causes dilation of the pupils, an effect used by fashionable young ladies from ancient Greek times through the Renaissance to induce a dreamy, wide-eyed gaze cherished by courtiers and artists: indeed, belladonna may be the secret behind Mona Lisa's enigmatic smile. Belladonna and other nightshades appeared as ingredients in hallucinogenic "flying ointments" applied by medieval witches to the armpits and genitals by means of a wooden baton: hence, the familiar Halloween image of witches flying on broomsticks. Although it is difficult to separate fact from fantasy in the hysterical accounts of medieval inquisitors, some appear to provide accurate descriptions of psychoactive paraphernalia employed by midwives, herbalists, and pagan priestesses on trial for witchcraft. These heretic practices may have represented the last vestiges of ancient, pre-Christian ("pagan") shamanistic religious systems that involved psychoactive plant use.

3.2.4. *Cannabis sativa*: Hemp for Fiber, Medicine, and Delight

Cannabis (or hemp) is one of the world's oldest cultivated plants, first domesticated in central Asia perhaps 10 000 years ago. In addition to its more notorious psychoactive use, cannabis has been used widely since ancient times as a medicine and a source of hemp fiber for making rope and cloth. Cannabis fruits (or akenes) have been used as food and a source of vegetable oil. The three recognized species of *Cannabis* belong to a small and enigmatic botanical family, the Cannabaceae, closely allied to the nettles (Urticaceae) and figs (Moraceae). The Cannabaceae includes only one other member, *Humulus*, the genus of hops, used since ancient times for brewing beer. The main psychoactive ingredient of cannabis is tetrahydrocannabinol (THC), almost unique among psychoactive compounds in lacking the element nitrogen, the fundamental building block of all alkaloids. In addition to THC, some fifty other compounds have been isolated from cannabis, some of which have promising medicinal applications.

Records of the medicinal use of cannabis date back more than 4000 years to the famous Pen Tsao herbal of China, set down in writing in 100 AD but attributed to the emperor-herbalist Shen Nung of the second millennium BC. While recommending hemp as a medicine for malaria, beri-beri, constipation, pain relief, absent-mindedness, and various "female disorders," Shen Nung also noted that larger doses produced hallucinations (literally, "seeing devils") and facilitated contact with the spirits. Thus, medicinal and hallucinogenic uses have been intimately related since the earliest times. Other ancient Chinese herbalists noted hemp resin mixed with wine as a surgical anesthetic, while a fifth century BC Taoist priest described necromancers who used cannabis to look into the future.

Religious and medicinal use of cannabis has been especially rich and varied in India from ancient times through to the present. Cannabis is mentioned in the Vedic hymns as a divine nectar, dripped to the earth by the gods as a delight to relieve human suffering. Bhang, a paste made from cannabis leaves pounded with flowers and spices, has long been mixed with candies or drunk in beverages, and was considered the favorite drink of the Hindu sky-god Indra. The more potent Ganja is made by pressing resin-rich female flower tops into a compact mass that is smoked. Various cannabis preparations are important in facilitating deep meditation among Hindu sadhus (ascetic priests) and Tibetan Buddhists. The Buddha himself was supposed to have survived on one hemp seed a day throughout the steps of asceticism leading up to his enlightenment. Medicinal uses in various Indian medical traditions range from quickening the mind, prolonging life, curing dysentery and leprosy, to relieving venereal disease, whooping cough, earaches, tuberculosis, and dandruff. Cannabis is still widely used for medicinal, religious, and recreational purposes throughout India and Pakistan.

Cannabis use spread from India to Persia, and thence throughout the Arabic world, by the sixth century AD. In the thirteenth century, Marco Polo brought back tales of the secret order of the *ashishin*, fierce warriors loyal to the Persian nobleman Al-Hasan ibn al-Sabbah. The *ashishin* consumed large amounts of cannabis in order to increase their courage in warfare and experience first-hand the rewards awaiting them in the afterlife. The modern words assassin and hashish are both derived from this term. At first

prohibited by Islamic authorities, hemp use spread quickly among Muslims throughout the Arabic world. Known regionally as Kif or Dagga, hemp was also adopted in social and ritual contexts throughout Africa, from north and east African Islamic peoples to pygmies of the Congo to Bushmen of South Africa.

Cannabis was brought to Europe by the Scythians, barbarian horsemen who swept westward out of Central Asia in the first millennium BC. The Greek historian Herodotus in 500 BC mentions a marvelous steam bath of the Scythians in which hemp seeds were added to produce a vapor that caused joy and delight. Hemp was cultivated in Europe for rope production from Roman times, and was used to a limited extent as a medicine during the medieval period. Western scientific and popular interest in cannabis as a medicine and euphoric drug increased greatly in the mid nineteenth century as a result of Napoleon's conquest of Egypt, where cannabis was used much more extensively. French doctors wrote scientific accounts of its medicinal, analgesic, and psychoactive effects, while French writers and artists such as Charles Baudelaire, Alexander Dumas, and others experimented with hashish and opium as agents for intellectual and artistic inspiration.

Hemp was introduced to the New World by English and Spanish colonists in the early sixteenth century, cultivated mostly for the production of fiber, rope, and clothes. A few indigenous groups of Mexico and Central America, as well as the messianic Afro-Jamaican Rastafaria movement, incorporated cannabis smoking into their religious ceremonies.

Hemp was firmly established as a medicine and anesthetic in the United States pharmacopoeia by the mid-nineteenth century. However the introduction of newer, more effective surgical anesthetics (notably morphine and cocaine) coupled with the growing use of cannabis as an intoxicant led to a rapid decline in the medical and public reputation of cannabis in the early twentieth century. The recreational smoking of cannabis (or marijuana) spread quickly in the southern states among Mexican immigrants and other poor, minority populations, and was well established in urban areas by the 1920s. Concern over the rapid spread of marijuana smoking overshadowed the long-established use of hemp as a herbal medicine. This historical moment coincides with the Prohibition Era (1920-1933). After the repeal of Prohibition, the same organized crime syndicates that had dealt in bootleg liquor at such great profit quickly diversified into narcotics, among other activities. In 1937, perhaps not coincidentally a mere four years after the repeal of Prohibition, marijuana was banned by federal law. It was perhaps politically expedient to decriminalize alcohol, a well-established "white" social drug used by both upper and lower classes, while criminalizing a drug associated with lower classes and minority populations. Scientific and governmental commissions spread negative publicity about the purported social and psychological dangers of marijuana use. Since the 1960s, medical researchers and recreational cannabis enthusiasts have questioned the scientific validity of much anti-marijuana propaganda, while criticizing the social problems (notably prison overpopulation) resulting from excessively harsh criminal prosecution of marijuana possession. In some parts of USA, marijuana can be used legally for medicinal purposes, notably in relieving glaucoma and treating the nausea and appetite loss associated with chemotherapy for cancer and AIDS.

2. Shamanism, psychoactive plants, and the origins of religion

3.3 Oceania

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Encyclopedia of Life Support Systems

PSYCHOACTIVE BOTANICALS IN RITUAL, RELIGION, AND SHAMANISM

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3.3. Oceania

Oceania, comprising Australia, New Guinea, New Zealand, and the Pacific islands of Micronesia, Melanesia, and Polynesia, is a region of high biological and cultural diversity. For reasons that are unclear, however, relatively few psychoactive plants with well-established cultural uses are native to the region. The pituri bush, *Duboisia hopwoodii* F. Muell. and other nicotine-containing tobacco relatives (Solanaceae) were chewed or smoked by Australian Aborigines as a social stimulant, sacred narcotic, trade item, and anesthetic for male circumcision initiation rites. Traditional use was mostly lost as Aborigine groups were settled and westernized, and commercial tobacco was introduced. Several species of psychoactive mushrooms (notably *Psilocybe* spp.) grow in Australia, but they do not appear to have played a role in aboriginal religion, spirituality, or "dream time" concepts. Similar species also grow in New Zealand, but there is little conclusive evidence for traditional native use. The cultivation and chewing of the stimulant mixture betel palm nut (*Areca catechu* L.) and betel leaf (*Piper betel* L.), originating in southeast Asia, spread widely throughout much of Melanesia during the original human colonization of the region.

3.3.1. *Piper methysticum*: Kava-kava

Piper methysticum belongs to Piperaceae, the family of black pepper (*P. nigrum*) and betel leaf (*P. betel*). Known locally as kava-kava, it is the only psychoactive plant of major cultural significance that is native to the Pacific island region. It appears to have been first domesticated in eastern Melanesia within the past 3000 years, and its use

spread to New Guinea, Micronesia, and Polynesia. Kava roots are pounded, ground, or chewed and mixed with cold water. Drinking the infusion produces a unique state of hypnotic euphoria, relaxation, and well-being that is particularly conducive to group conversation. Higher doses produce a more profound inebriation followed by sedation and sleep. However kava users never lose their self-control or break out in violence or rage as among those inebriated by alcohol. Kava has been widely used for centuries in official ceremonies as well as in the informal social context of the "kava circle." Native Hawaiian priests known as *kahuna* use kava to contact ancestors and spirits. European colonizers made a few initial attempts to prohibit or control kava use, but these did not succeed. Indeed, today kava cultivation and use is promoted by some Pacific island governments as both an economic option and a preferred alternative to alcohol consumption.

Unusual among psychoactive plants, kava contains no alkaloids, but rather a number of lactones (oxygen-containing compounds) known collectively as kavalactones. More than 200 different cultivated varieties of kava-kava have been described, and some authors suggest that each variety contains a slightly different cocktail of kavalactones in different concentrations. The precise nature of kava's activity is little known, though it appears to produce sedation, pain relief, and relaxation by means of a completely unique mechanism, free from the problems of habituation and addiction associated with most other sedative drugs. Kava became popular in the West in the late 1980s as an herbal supplement to relieve anxiety, insomnia, and depression. Kava production in Polynesia boomed as the international demand grew. However the kava industry crashed in 2002 after reports from Germany and Switzerland documented severe liver toxicity (in some cases requiring liver transplant) in several dozen users of kava-containing herbal products. Governments in Europe and North America warned consumers and in some cases banned kava pending further investigation. The "kava backlash" even reached its place of origin, where some Pacific island authorities questioned the ongoing safety (and morality) of kava use. Kava advocates note that no reports of liver toxicity have been documented among traditional users of the kava root beverage. Indeed, the ensuing research suggests that intoxication among European users was a rare and idiosyncratic response that may have involved pre-existing conditions or unexpected interactions with other medications. One study suggests that toxic alkaloids from kava leaf or bark shavings may have been responsible for the noted liver toxicity. While traditional use involves only the kava root, carelessness during industrial production may have introduced contaminants from other plant parts. Nonetheless, the impact on local producers and international distributors of kava has been devastating. The kava case is an important reminder of the multiple dangers of commercial production and distribution of psychoactive plants outside their traditional context and region of use.

3.3.2. *Boletus manicus*: Kuma Mushroom Madness

Scattered reports from New Guinea have mentioned a few poorly documented, apparently psychoactive plants, including ginger (*Zingiber*) and some Araceae species. Missionary reports noted that some western highland groups of Papua New Guinea went into a temporary battle frenzy upon consuming certain mushroom species. Mysterious, sporadic bouts of temporary insanity ("mushroom madness") among the Kuma people were also attributed to the consumption of mushrooms. Ethnomycological investigations in the region by Gordon Wasson and mycologist Robert Heim documented a number of species of *Boletus* (the genus of the edible *porcini* mushroom)

thought to be involved in the mushroom madness. Of these, the newly described species *Boletus manicus* was found to contain trace amounts of potentially psychoactive indole alkaloids, though the evidence is not conclusive. During these investigations, Wasson and Heim discovered a new species of mushroom, *Psilocybe kumaenorum* Heim, related to the hallucinogenic "magic mushrooms" of Mexico. However the Kuma people did not consume it, nor were they aware of its psychoactive properties. Such examples highlight the tremendously variable cultural attitudes toward and knowledge about the psychoactive plant species that are present in the local environment.

3.4. The Americas

Though the last major continental region to be occupied by humans, the Americas have provided a remarkable proportion of the world's known psychoactive plants. Of some 150 hallucinogenic plant species on record, about 130 are native to Central and South America. It remains unclear what combination of ecological, evolutionary, historical, or cultural factors, or perhaps scientific research bias, contributes to this situation. Historically and in some cases through the present, indigenous societies of North, South and Central America have used a tremendous diversity of psychoactive plants and plant mixtures, containing some of the most potent hallucinogenic compounds known in nature. A variety of hallucinogens, stimulants, narcotics, and other psychoactive substances are used by Amerindian shamans for entering into contact with the spirit world.

3.4.1. *Nicotiana tabacum*: Magical Breath of Shamans

The most widespread psychoactive plant in Amerindian ritual is tobacco (*Nicotiana tabacum*, *N. rustica*), a nightshade relative of the Solanaceae family. Tobacco was among the first plants to be domesticated in the ancient Americas. Tobacco is mentioned in historical and modern accounts of Amerindian religion and ritual in a myriad of forms, preparations, and modes of ingestion: snuffed, chewed, drunk, inhaled or swallowed as smoke, dripped in the nose, eaten as a concentrated paste, and even taken as an enema.



Figure 9. Grinding, sifting, and consumption of tobacco snuff among the Matsigenka of Peru,

Tobacco is especially important in the initiation of the novice shaman, who may consume huge doses in order to obtain an initiatory vision involving a spirit guide or helper. For the Matsigenka Indians of Amazonian Peru, tobacco and shamanism are synonymous: the word for shaman, *seripigari*, means literally, "the one intoxicated by tobacco". The dedicated Amerindian shaman comes to crave tobacco as much as food, and may become so involved in the relationship with spirits that he withdraws from social affairs, eats little, and loses interest in sex. Tobacco smoke is intimately associated with the notion of the shaman's magical breath, blown on patients to heal them or at enemies to kill them.

Tobacco leaves were among the first offerings made by the native people of the West

Indies to Christopher Columbus on his historic landing in 1492. Tobacco cultivation and consumption spread quickly from Amerindians to European colonists. The tobacco trade became an economic mainstay of the southern American colonies by the late 1500s, and by the early 1600s, tobacco consumption and cultivation had spread across Europe, Africa, the Middle East, and Asia all the way to Japan. Tobacco was initially praised by European doctors for its diverse medicinal values. However addictive and deleterious health consequences were soon noted. Rulers and governments throughout Europe, the Middle East, and Asia made numerous, independent attempts to ban tobacco cultivation and consumption, but all were met, ultimately, with failure.

Tobacco continues to be an important agricultural crop as well as the subject of a growing controversy over its status as an addictive and harmful drug, sold at great profit by transnational tobacco companies. Nicotine, the main psychoactive ingredient of tobacco, is a tropane alkaloid that binds with a specific class of acetylcholine-mediated sites known as nicotinic receptors. Nicotine has a wide range of effects on the brain, including stimulation, heightened memory and awareness, anxiety relief, and euphoria. Habitual users develop nicotine tolerance, can undergo withdrawal symptoms, and become subject to powerful cravings that constitute a combined psychological and physiological addiction. Though the mechanism of nicotine addiction is not fully understood, it appears to involve similar neural pathways as found in heroin and cocaine addiction, specifically, pleasure and reward circuits mediated by dopamine, serotonin, and opioid receptors. Some researchers consider nicotine to be among the most addictive drugs known.

3.4.2. *Datura*, *Brugmansia*, *Brunfelsia*: Nightshades for Visions, Healing, and Divination

Closely related to their counterparts in Asia, *Datura* species (Solanaceae) were once used widely by indigenous peoples of North and Central America to induce profound, sometimes death-like states of trance in rituals of initiation, divining, and healing. *Datura stramonium* ("jimson weed" or "thornapple") was apparently used as a ceremonial hallucinogen in rites of initiation among the Algonquians and other peoples of eastern America. The modern name of jimson weed is attributed to a Revolutionary War incident in which some of Washington's troops at Jamestown unknowingly cooked and ate the plant and underwent a hallucinatory frenzy. Zuñi, Navajo, and other Native Americans of the southwest have used *Datura innoxia* (also known as *D. meteloides* Dunal) to obtain visions, commune with spirits or ghosts, predict the future, and diagnose illness. Known in Mexico as *toloache*, *D. innoxia* and other species have been documented from the time of the Conquest through the present for hallucinogenic, religious, divinatory, medicinal, and even recreational uses. *Datura* species are likewise used in Afro-Brazilian trance religions such as Umbanda and Candomblé.



Figure 10. Two cultivated species of *Brugmansia*: *B. aurea* in southern Mexico (left) and *B. suaveolens* in the Peruvian Amazon.

Brugmansia is essentially a domesticated *Datura*, and numerous species and varieties

are cultivated through the present by indigenous populations in Central and South America for medicinal, narcotic, and hallucinogenic properties. Like *Datura*, *Brugmansia* contains potent psychoactive tropane alkaloids including atropine and scopolamine. The Matsigenka of the Peruvian Amazon cultivate *Brugmansia suaveolens*, and consider it to be one of their most important and powerful medicines. They propagate the plant by cuttings rather than by seed, a process that ensures genetic homogeneity. *Brugmansia* plants that have gone to seed in old gardens or along river courses are considered to be extremely dangerous when ingested, leading to soul loss or death. Known in Matsigenka as *jayapa*, *saaro* ("warm bath"), or simply *kepigari* ("intoxicant"), the plant can be applied as an external plaster for broken bones, stomach aches, arthritic pains, swelling and other conditions. A small dose may be given orally to a woman suffering from difficult childbirth, a practice that recalls the medical use of scopolamine to induce "twilight sleep" during childbirth. A larger, vision-inducing dose may be given orally as a last resort to treat people suffering from intractable illnesses, witchcraft, snakebite, or severe accidents. These medical uses are largely concordant with Western medical uses of atropine and scopolamine as sedatives, analgesics, muscle relaxants, to dry secretions, and so on. Matsigenka shamans sometimes take a large dose of *Brugmansia* to establish contact with the guardian spirits, obtain esoteric knowledge, and retrieve new crop varieties from the spirit world. The visions may also indicate the location of lost or stolen objects, or establish the identity of a suspected sorcerer. After falling into a deep sleep, the user of *Brugmansia* wakes up in a world in which reality and hallucination are indistinguishable. With eyes open and hypersensitive to light, a person in *Brugmansia* trance may walk great distances before emerging from the dream-like visions, often with little memory of the experience. Depending on the dose, the narcotic effects may last for a few hours, several days, or many weeks. *Brugmansia* is considered to be the most intoxicating (*kepigari*) and strongest of all medicines, and is used with the utmost caution and respect. Frequent use is considered to be dangerous, leading to the acquisition of witchcraft powers, insanity, or death. Several fatalities caused directly or indirectly by *Brugmansia* overdose have been documented among the Matsigenka. *Brugmansia* is the open heart surgery of the Matsigenka: a final resort to the highest medical authority, reserved only for the most drastic cases.



Figure 11. *Brunfelsia grandiflora* and related species are used widely by indigenous and mestizo populations of the Peruvian Amazon for their medicinal and intoxicating properties.

Brunfelsia grandiflora is a wild nightshade shrub of Amazonia known in Peruvian Spanish as *chirisanango* ("cold medicine") due to the unusual form of intoxication it produces: shivering, numbness, prickling sensations in the extremities, and, at higher doses, stupor, visions, and coma. The Matsigenka call this plant *pakitsapari*, "harpy eagle root," and ingest an infusion to improve their hunting abilities. The prickling sensations are a sign that the spirit of the harpy eagle has infused the hunter with its keen hunting abilities. This and other *Brunfelsia* species are used throughout the

Amazon for treating a variety of conditions, especially arthritic pains, fevers, syphilis, and female conditions, as well as for obtaining healing visions and for improving the aim of hunters. Chemical studies have identified a number of active ingredients in the genus *Brunfelsia*, including manacine, an alkaloid thought to stimulate the lymphatic system, and scopoletin, a coumarin with proven analgesic, anti-inflammatory, and anti-spasmodic activity.

3.4.3. *Psilocybe mexicana*: Flesh of the Gods

The Aztecs described a certain category of hallucinogenic mushrooms as "little flowers," and knew them as *teonanacatl*, "flesh of the gods." These small mushrooms were used only in the holiest of ceremonies. Their use in religious ceremonies was documented in pre-Colombian Mexican art as well as Conquest-era documents. Mushroom stones dating as far back as 1000 BC attest to the ancient roots of the hallucinogenic mushroom cult. Spanish missionaries made intense efforts to stamp out the use of these and other important ritual hallucinogens (peyote cactus, morning glories) in the state religions of the Aztec, Zapotec, and other Mexican kingdoms. Their attempts seem to have met with relative success, since references to hallucinogenic mushrooms disappear from the historical records for centuries. Largely unnoticed by Christian missionaries and scholars, however, sacred mushroom use continued in secret for centuries in remote, mountainous areas. The most intensive area of current use is in Oaxaca among Mazatec, Mixtec, Zapotec, and Chinantec Indians. The sacred mushrooms are known by a number of different indigenous names, but are commonly referred to as *derrumbes* ("landslides") in regional Spanish. Maria Sabina, a female Mazatec shaman of Oaxaca, initiated American banker and mushroom enthusiast Gordon Wasson into the mysteries of the divine mushroom in the mid 1950s. His highly popular *Time* magazine article about that experience, and his later research into hallucinogenic mushrooms worldwide, contributed to the psychedelic revolution of the 1960s.

Ethnomycological studies established the scientific identity of more than a dozen hallucinogenic mushroom species, including the genera *Conocybe*, *Panaeolus*, and especially *Psilocybe*. Among the most important of these is *P. mexicana*. Albert Hoffman identified the psychoactive components as psilocine and psilocybine, two novel indole alkaloids related structurally to LSD and other tryptamines. Psychoactive species of *Psilocybe* have been found throughout the world as far away as New Guinea and Australia, but traditional ritual use appears to be restricted to Mexico. The most widespread of these is *P. cubensis* (Earle) Singer (also known as *Stropharia cubensis* Earle), often found growing on cow dung. Known as *San Isidro* in Mexico and considered inferior by some shamans of Oaxaca, the so-called "magic mushroom" is nonetheless quite potent. It is gathered and cultivated by Western hallucinogen enthusiasts the world over.

3.4.4. *Lophophora williamsii*, *Trichocereus pachanoi*: hallucinogenic cacti of Mexico and Peru

The peyote cactus (*Lophophora williamsii*) is native to the deserts of Chihuahua, in northern Mexico, and southern Texas. The plant contains dozens of alkaloids, including the powerful hallucinogen mescaline. The religious use of peyote as a sacred hallucinogen appears to be very ancient: archeological excavations in a cave in Texas revealed a cache of peyote buttons some 7000 years old. Early Spanish observers documented peyote use, and efforts were made by Catholic missionaries to stamp out

the ritual use of peyote and other native hallucinogens. Peyote use has continued through the present, principally among the Huichol and Tarahumara of Northern Mexico. For the Huichol in particular, not only the cactus itself but also the mythical landscape of the peyote desert in San Luis Potosi stand at the center of religion, cosmology and spirituality. Huichol shamans, known as *mara'akate*, participate in an annual pilgrimage and peyote-gathering expedition to the sacred peyote desert, some 200 miles away. During the pilgrimage, the peyote hunters act out Huichol mythology and personify Huichol gods. Back in their home communities, Huichol shamans use peyote buttons as well as dreams, tobacco, and other psychoactive plants to commune with Huichol gods, Catholic saints and a variety of animal and plant spirits for purposes of divination and healing. Huichol shamans are also responsible for guiding the spirits of the dead to the sky above the sacred landscape of the peyote desert. Tarahumara shamans of the Copper Canyon also use peyote, however they have traditionally traded for peyote buttons from the Huichol, who live closer to the peyote desert.

In the mid 1800s, peyote use spread from northern Mexico to a number of tribes in the American southwest, notably the Kiowa and Comanche. Like the "ghost dance" cult, the peyote movement sought to reaffirm Indian identity against the destructive spiritual and cultural forces of acculturation to "white" civilization. The Native American Church, a hybrid religion incorporating Christian elements, Native American spirituality, and peyote consumption, was established in 1918. Eventually banned under evolving narcotics laws, peyote use was later legalized under the American Indian Religious Freedom Act of 1978. Recent estimates place membership in the Native American Church at more than 250 000. Increasing interest among non-Indians in the Church and peyote use has led to complex legal struggles. Laws regulating the legal consumption of peyote vary. Some states prohibit it entirely, others require Indian ancestry or formal Church membership, while some require only that peyote be used in a sincere religious setting. While highlighting the penchant for modern governments, and the U.S. in particular, to define, regulate, and legislate psychoactive plant use after millennia of unhampered and safe traditional use, the legalization of peyote for religious use represents an important victory for Native Americans, and more generally for the free practice of religion.



Figure 12. The mescaline-containing San Pedro cactus, native to northern Peru, has been used as a sacred hallucinogen for at least three millennia.

Like peyote, the San Pedro cactus (*Trichocereus pachanoi*) of highland and coastal Peru also contains mescaline and other alkaloids. Known in Quechua as *huachuma*, "cactus of the four winds," this hallucinogenic plant is found in the art and religious symbolism of ancient Andean civilizations beginning with Chavín in the 2nd millennium BC, and continuing through Nazca, Moche, and Chimú reigns until shortly before the Spanish conquest. Little is known about how San Pedro was used in ancient

religious or shamanistic practice. Writing in the mid sixteenth century, Spanish priest Bernabé Cobo describes San Pedro as being "the plant with which the devil deceived the Indians of Peru in their paganism...Transported by this drink, the Indians dreamed a thousand absurdities and believed them as if they were true." Despite the extinction or cultural assimilation of coastal native civilizations and five centuries of persecution by the Catholic Church, vestiges of the ancient cult have survived in the practice of urban shaman-healers or *curanderos* in northern Peru. The *curandero* ingests an infusion of San Pedro, sometimes mixed with tobacco, *Brugmansia*, and other ingredients, in order to carry out nocturnal ceremonies for healing, divination, and good fortune (Peruvian politicians and soccer teams sometimes turn to *curanderos* for supernatural assistance in their competitive endeavors). Throughout the ceremony, the *curandero* manipulates ritual objects arranged on altars or *mesas*. The *mesas* may include Catholic saints, crosses, swords, pre-Columbian artifacts, animal or human bones, cologne water, medicinal and magical herbs, and other objects that reflect vividly five hundred years of hybridization between indigenous and Christian beliefs. The common Peruvian name of the cactus, San Pedro, itself reflects this hybrid process: for it is Saint Peter who holds the keys to the Celestial Gates.

3.4.5. *Virola theiodora*, *Anadenanthera peregrina*: hallucinogenic snuffs of the Northwest Amazon



Figure 13. DMT-containing *Virola theiodora* bark is used to prepare the hallucinogenic snuff known locally as *epena* or *paricá*.

Shamans of the northwest Amazon use the red resin of *Virola theiodora* and other *Virola* species (nutmeg family, Myristicaceae) to prepare hallucinogenic powders for purposes of healing and divination. Known locally as *paricá* or *epena*, *Virola* snuff is used by Barasana, Cubeo, Kuripako, Baniwa, Tukano, Yanomami, and other tribes of the northwest Amazon and Orinoco (Colombia, Venezuela, Brazil). The active ingredients include dimethyltryptamine (DMT), 5-methoxy-N, N-DMT, and related indole alkaloids. Shamans among the Baniwa of the Upper Rio Negro use *paricá* snuff to ascend to the highest levels of the cosmos, entering into contact with the immortal gods of creation. In fact, the Baniwa gods themselves first gained their transformative powers by obtaining this and other psychoactive plants (tobacco, *Banisteriopsis*). As such, Baniwa shamans in *paricá* trance become like gods themselves, transported in time to the mythical beginnings of the world, and able to partake of the same creative, transformative powers that first allowed the world to come into being. The Baniwa describe *paricá* as the "blood of Kuwai," Kuwai being the divine son of the creator-god, likened to Christ. For the Tukano of the Rio Vaupés, the word *epena* means literally "semen of the sun." Shamans and laymen alike among the Yanomami of Brazil and Venezuela take *Virola* and *Anadenanthera* (see below) snuff at frequent rituals and feasts. During trance, a succession of spirits (*hekura*) enter the chest and take possession of the snuff user, causing him to dance and gesticulate in ways specific to the possessing spirit.



Figure 14. A frequent scene in the Yanomami *shabono* (circular village enclosure): shamans gather to consume hallucinogenic snuff made from *Virola theiodora* or *Anadenanthera peregrina*.

Anadenanthera peregrina (also known as *Piptadenia peregrina* [L.] Benth.) is a tree in the legume family whose seeds contain tryptamine-based indole alkaloids much like those found in *Virola* resin. For many years, the botanical identities of *Virola* and *Anadenanthera* were confused, since they were both used in snuff form, and have similar effects. Like *Virola*, *Anadenanthera* is used to prepare a hallucinogenic snuff known as *yopo*, made from the fermented or roasted beans of the *Anadenanthera* seed pod. *A. peregrina* is restricted in its natural habitat to open grasslands, savannas, and dry forests of the Orinoco basin (Venezuela). However the cultivation and use of *yopo* spread in pre-Hispanic times far as the Colombian Andes and perhaps to the West Indies, where early historical documents described an enigmatic, hallucinogenic snuff known as *cohoba*. The closely related species *Anadenanthera colubrina* (Vell.) Brenan which occurs further south in South America, may have been an ingredient in hallucinogenic snuff kits found in pre-Colombian archeological sites. Inca priests appear to have mixed this plant (known as *villca*) with fermented maize beverage (*chicha*) to achieve a strong intoxication for purposes of divination. Modern use of *A. colubrina* has been documented among one indigenous group in northern Argentina.

3.4.6. *Banisteriopsis caapi*: Vine of the Soul



Figure 15. More than a dozen varieties of *ayahuasca* vine are cultivated by the Matsigenka of Peru

Banisteriopsis caapi is a liana used in the preparation of a hallucinogenic beverage used widely throughout Amazonian Peru, Colombia, Ecuador, Bolivia, and western Brazil, known by various local and indigenous names: *ayahuasca* ("vine of the soul" in Quechua), *caapi*, *yagé*, *natema*, *kamarampi*, *vegetal*, *hoasca*, and others. In most accounts, the pounded liana is boiled with the leaves of one or more species of *Psychotria*, a shrub in the coffee family. In some cases, however, *Banisteriopsis* is used alone or with admixtures other than *Psychotria*. Curiously, it is not *Banisteriopsis* itself but rather *Psychotria* that provides the main hallucinogenic component to the brew: DMT, the same potent indole hallucinogen found in both *Virola* and *Anadenanthera* snuff mixtures. Beta-carbolines including harmine and harmaline in *Banisteriopsis* act as monoamine oxidase (MAO) inhibitors, greatly enhancing the effects of DMT, which would otherwise be quickly broken down by MAO and remain inactive by oral administration. Curiously, harmine and harmaline are also found in Syrian rue, *Peganum harmala* L., an unrelated medicinal, magical, and incense plant of the Middle

East. Ethnobotanists have been as much intrigued by the vision-inducing qualities of the *ayahuasca* beverage as by the mystery of how tribal peoples with no knowledge of organic chemistry managed to identify, among the tens of thousands of available species, the powerful synergistic properties of these two unrelated plants.

The DMT component of ayahuasca can provoke complex visual hallucination images including fractal-like geometric patterns of light, animals, images of snakes or twisted ladders, cosmic imagery of stars and divine light. The mixed-blooded artist Pablo Amaringo and others of the Usko-Ayar school have created fantastic paintings that represent the visual aspects of the ayahuasca experience. The MAO-inhibiting component of the brew has been found to induce a prolonged, antidepressant effect much like that provided by the serotonin re-uptake inhibitor (SRI) class of antidepressants (e.g. Prozac).



Figure 16. DMT-containing *Psychotria* species are the principal psychoactive admixture in the *ayahuasca* brew.

During the ayahuasca ceremony, songs and other auditory cues also play an important role in guiding initiates or patients and manipulating the content of personal and collective trance experience. Rattles or packets of rustling leaves are widely used as a percussive accompaniment to the singing and as an auditory signal of the comings and goings of the shaman's soul. The Yaminahua of Amazonian Peru and Brazil consider songs to be the shaman's most prized possessions and the essence of his power, knowledge, and ability to heal. Yaminahua songs employ "twisted," metaphorical language to build complex narratives that act like paths, guiding the shaman safely through the trance experience and the ambiguous, dangerous spirit world. Shamanic songs of the Matsigenka of southeast Peru come directly from the spirits, and are difficult to translate or interpret, as they contain much onomatopoeic, archaic, and other non-ordinary language. Most songs are not rehearsed, remembered, or fully intelligible in ordinary states of consciousness, and seem to derive their power largely from their acoustic properties augmented by hallucinogenic trance. Among the Shipibo of the Ucayali River, shamanic songs in conjunction with hallucinogens generate a multifaceted synesthesia, or mixing of the senses. Shipibo shamans in trance are able to perceive people's auras, lace-like patterns of interlocking geometric designs that become visually distorted and malodorous during illness. The shaman sings, smells, and visualizes geometrically patterned, "fragrant songs" to correct the deformed aura and thereby restore health. The geometric designs found in Shipibo and other Amazon Indian decorative arts are apparently inspired by ayahuasca visions.



Figure 17. This Matsigenka shaman painted his *cushma*, a hand-woven cotton tunic, with geometric designs derived from *ayahuasca* visions.

During the "rubber boom" at the turn of the twentieth century, migrants from northeastern Brazil came to the Amazon region to tap rubber trees. In the racially mixed rubber camps, some migrants were introduced to the use of ayahuasca by indigenous shamans. Out of this cultural melting pot emerged a number of novel, ayahuasca-based religions that blend Christian, African, and Amerindian elements. The most popular of these are União do Vegetal, Santo Daime, and Barquinho, all which have thousands of adepts in urban areas throughout Brazil. The religious use of ayahuasca by these and other groups is protected by Brazilian law. The Brazilian ayahuasca religions have also sought converts in USA and Europe, but have run afoul of narcotics laws banning DMT, the active ingredient in the hallucinogenic brew. At least one ayahuasca religion is seeking legal recognition under U.S. legislation surrounding peyote use in the Native American Church. Members of the União do Vegetal in particular have collaborated with U.S. researchers to facilitate research into the physiology, pharmacology, and long-term health and psychological effects of ayahuasca use. So far, positive results from this research have supported the church in its efforts to justify the ceremonial consumption of ayahuasca as legitimate, safe, and legal.

In 1986, American natural products entrepreneur Loren Miller filed a use patent on the ayahuasca mixture, based on his ethnobotanical research in the Ecuadorian Amazon. Indigenous organizations from Peru and Ecuador learned of the patent ten years later and mounted a vociferous, international protest. The patent was overturned in a 1999 decision of the U.S. Patent and Trademark Office. However Miller filed for an appeal, the patent was reinstated in 2001, and then lapsed permanently in 2003 after the 17-year term of the original use patent expired.

3.4.7. *Cyperus*: Ergot-Infested Sedges

The sedge, a grass-like herb of the genus *Cyperus*, is perhaps the most widely cultivated native medicinal plant among indigenous peoples of lowland Amazonia, known variably as *piri-piri*, *priprioka*, *ivenkiki*, and other local names. Diverse indigenous societies throughout Brazil, Venezuela, Colombia, Ecuador, Peru, and Bolivia grow dozens of sedge varieties in their house gardens. Each sedge variety has a highly specific medicinal or magical use. Depending on the indigenous group, specific sedge varieties may be used:

- to treat wounds or snake bite;
- to stimulate or inhibit female fertility;
- to facilitate childbirth or induce abortions;
- to treat headaches, diarrhea, cramps, and post-partum hemorrhages;
- to improve hunting skills and garden productivity;
- to charm fish and game;
- to become fearless in battle;
- to kill enemies at a distance;
- to control the weather;
- to reinforce positive behaviors or eliminate negative ones;
- to prevent nightmares or resolve family quarrels;
- to soothe angry people, placate hostile tribes, and even pacify guerrilla soldiers, and

- to frighten away demons and dangerous animals.

Some varieties are used to cure insanity or reign in dangerous passions, while other "intoxicating" varieties are said to cause temporary or even permanent insanity. Matsigenka shamans of southern Peru are said to bring new sedge varieties and other agricultural cultivars from the spirit world during trance induced by the hallucinogens ayahuasca and *Brugmansia*.



Figure 18. Wild *Cyperus* species (left) have normal flowers and fruits, while cultivated varieties (right) show flowers and fruits extremely reduced or absent due to whitish-gray fungal infestation.

At first, such a wide and disconnected array of uses, including medicinal as well as apparently magical applications, seems like it could be dismissed as mere superstition. However closer study revealed that cultivated sedges were infected by the ergot-producing fungus *Balansia cyperi* of the Claviceptaceae, the same group of fungi associated with ergotism, implicated in the Eleusinian mysteries, and from which LSD was synthesized. The systemic fungal infestation affects all parts of the plant and often destroys fruits and flowers, which are replaced by a small, grayish-white button. Without fruits and flowers, botanists often find it impossible to distinguish the cultivated varieties. Ergot alkaloids from the fungus, not the host plant itself, appear to be responsible for the medicinal properties ascribed to sedges. Since sedges and their fungal parasites are reproduced by vegetative propagation, it is possible that different sedge-fungus clones contain different concentrations or types of ergot alkaloids. (Some nine novel ergot alkaloids were found in extracts of a single medicinal sedge variety from Ecuador). This would perhaps explain the diverse physiological effects attributed to different varieties. Ergot alkaloids constrict blood vessels and alter uterine contractions, offering an explanation for their use in treating wounds, headaches, reducing postpartum hemorrhaging, and controlling female fertility. The use of sedges to improve hunting skills, to affect dreams and emotional states, and to cure as well as cause insanity, is certainly related to the psychoactive properties of ergot alkaloids.

3.4.8. *Erythroxylum coca*: From Sun King to Drug Lord

The coca plant (*Erythroxylum coca*) has been cultivated and held sacred by peoples of the Andean mountains for some 5000 years. In Andean folklore, coca was considered to be the earthly incarnation or sacrificial gift of a female deity ("Mama Coca") who helped the Andean peoples overcome fatigue, hunger, and misfortune in the rugged mountain climate. Initially, coca was reserved for priests, royalty, and ceremonial occasions. The Inca, whose empire once stretched along the Andes from modern-day Chile to Colombia, considered coca consumption to be their sacred privilege as the ruling class, descended from the sun-god, Inti. Coca cultivation spread from the Andes to some parts of the Amazon basin, where coca has been used by lowland indigenous peoples for ritual and social purposes for centuries. Indians of the upper Amazon at the base of the Andes use the bark of the liana *Mussattia hyacinthina* (Standl.) Sandwith,

called chamayro, as a natural sweetening agent to mix with coca and vegetable ash. Chamayro was highly valued by the Inca, and has been an important item of trade between Amazonian and Andean peoples for centuries.

After defeating the Inca empire, the Spanish initially banned coca consumption among the conquered Inca subjects, the Quechua and Aymara Indians. But the Spanish soon discovered that Indian laborers benefited from the fatigue- and hunger-suppressing properties of the coca leaf, and could better withstand the tough working conditions in mines, plantations, and labor crews. The Catholic Church eventually took up the large-scale cultivation of coca, using the leaves as a form of payment to Indian workers. As it lost some of its sacred power and became an increasingly secular plant drug, coca use spread rapidly among the Indians of Peru.

Still today, Quechua and Aymara Indians chew coca to overcome hunger, fatigue, and cold while working in adverse conditions at high elevations. Shamans of the Andean region chew coca leaves to facilitate meditation or trance when healing and performing other ceremonies. Dried coca leaves are also cast by shamans and priests for purposes of divination. Among the Kogi of Colombia's coastal mountains, *mamas* are priest-like specialists who perform innumerable rituals while constantly dipping coca powder from a small gourd that is laden with cosmological symbolism. Mamas pass through a long initiation period living in darkness and learning to enter trance, and their frequent ritual interventions are believed necessary to ensure the continuity of humankind, nature, and the universe.

Cocaine is a small monoamine alkaloid of relatively low molecular weight. It inhibits the reuptake of the neurotransmitter dopamine (and norepinephrine) from synapses, causing a brief peak of euphoria, strong nervous stimulation, and suppression of appetite. In addition to its alkaloid content, coca leaf also has significant nutritional value. When coca leaves are chewed with alkali substances such as vegetable ash or lime, the cocaine alkaloid is released and absorbed quickly across mucous membranes in the mouth. Like other psychoactive substances that affect the dopamine or "pleasure pathway," cocaine is strongly addictive. Laboratory animals given a choice between food and cocaine have been found to starve themselves to death rather than cease fulfilling the cocaine craving. Pure cocaine was first isolated in 1859, and proved to be a powerful topical anesthetic that helped revolutionize modern surgery, eventually giving rise to a new class of anesthetics such as benzocaine and others. Sigmund Freud extolled the virtues of cocaine for treating depression and other disorders, and was himself a habitual user. During the mid 1800s, cocaine-containing extracts were found as ingredients in a number of popular tonics, patent medicines, and beverages. The most celebrated of these was Vin Mariani, containing a mixture of wine and coca leaf extract. Its virtues as a medicine and life-enhancing elixir were praised throughout Europe by the likes of Jules Verne, Sir Arthur Conan Doyle, Robert Louis Stevenson, Alexander Dumas, Queen Victoria, and Pope Pius X. John Styth Pemberton of Georgia copied the Mariani beverage, but was forced to substitute the wine with sugar syrup during the 1886 Prohibition movement in Atlanta. The alcohol-free, cocaine-laced beverage came to be known as "Coca-Cola: the temperance drink."

The addictive properties of cocaine and an alarming number of cocaine-related deaths came to public attention in the early 1900s. Legal use was restricted to medical purposes, though illicit recreational use continued. Formerly a drug associated with lower classes and minorities, cocaine use exploded in the 1970s and 1980s as it became

a prestige drug among middle and upper class urban youths. The cheaper, more addictive form of crack cocaine spread in the 1980s among urban poor, resulting in an epidemic of crime and addiction. Today, demand for cocaine mobilizes a vast, powerful, and lucrative international criminal network that is capable of corrupting all levels of government and society wherever cocaine production, trafficking, or consumption is endemic. Purified cocaine alkaloid is nearly the perfect capitalist consumer product: pleasurable, individualistic, addictive, instantly consumable, with an extremely high mark-up value and insatiable customer demand. A major target in the "war on drugs," cocaine is nonetheless still readily available, and cocaine use shows little sign of declining. The story of the profanation of "Mama Coca," from sacred, life-sustaining plant of the Incas to spawner of international narco-terrorism and urban blight, is emblematic of the corruption and brutality sometimes unleashed by supposedly rational Western technology, capital, and law.

[3. Psychoactive](#) botanicals: A world overview

[4. Contemporary issues](#)

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PSYCHOACTIVE BOTANICALS IN RITUAL, RELIGION, AND SHAMANISM

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Keywords: Shamanism, ethnobotany, psychopharmacology, ayahuasca, psychoactive plants, psychedelics, drug and alcohol abuse, history of religion.

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4. Contemporary Issues



Pharmacological, ethnobotanical, and ethnographic research carried out throughout the twentieth century has provided a solid body of information on the botany, chemistry, history, and cultural uses of most of the world's important psychoactive plants. Natural hallucinogenic compounds used ritually in Mexican religions became a focus of scientific and popular attention from the 1950s, and many were appropriated for recreational use. The discovery of LSD and the rediscovery of psychoactive plants in Amerindian religions piqued a growing scientific and popular interest in hallucinogens, provoking a revolution in anthropological and psychological understandings of shamanism. However the psychedelic movement of the 1960s resulted in a legal and medical backlash against traditionally used psychoactive substances and their synthetic derivatives, most of which are now included under the most restrictive category of drugs under U.S. narcotics legislation. It is unfortunate that ancient, powerful "plants of the gods" such as peyote, ayahuasca, magic mushrooms, and hemp are sometimes treated by law enforcement as equivalent to dangerous drugs of abuse such as amphetamine, heroin, and crack cocaine. In fact, most natural and synthetic hallucinogens are non-addictive and have extremely low potential for abuse. Ironically, alcohol and tobacco, the quintessential (and legal) social drugs of the West, may prove to be among the most addictive and deleterious drugs in human history.

In addition to providing new insights into native belief, firsthand experience of ritual hallucinogens by Western researchers has sometimes resulted in a paradigm-shifting reassessment of worldview. Some writers view the rediscovery and renewed interest in psychoactive plants in contemporary culture as a kind of "archaic revival": a reaffirmation of ancient spiritual practices, repressed or banished by Christian zealotry, that permitted a more direct experience of the divine. This New Age or "neo-pagan" spiritual movement presents itself as a corrective force to modern ecological and social crises that result from society, technology, and religion that have gone out of balance. Growing numbers of Westerners seek out indigenous shamans and native psychoactive plants for spiritual insights. This phenomenon has generated demand for esoteric or spiritual tourism, setting traditional religious practices in a decidedly non-traditional, commercial context. A nearly endless assortment of growing manuals, dosage guidelines, cautionary tales, seed catalogs, and "legal highs" derived from traditionally used psychoactive plants can be obtained or purchased on the internet. Increasingly, even recreational drug enthusiasts have recognized the importance of creating structured, quasi-religious ritual contexts for psychoactive plant use. This situation raises difficult questions about authenticity and the nature of "tradition." Emergent religions such as the Native American Church and the ayahuasca religions of Brazil demonstrate the flexibility of psychoactive plant use and human spirituality in moments of cultural contact and change. As psychoactive plants are removed from a religious context and enter the realm of recreational use, however, arguments invoking the free practice of religion lose some of their justification. Likewise, a narrow focus on "medicinal marijuana" and other therapeutic uses of psychoactive plants glosses over the fact that many enthusiasts simply enjoy the altered states that these substances provide, regardless of religious or therapeutic value.

Historical and cross-cultural studies have demonstrated that numerous, supposedly addictive or dangerous psychoactive drugs have been used in traditional ritual settings for centuries without the negative health, social, and economic consequences found among modern urban drug users. In part, this phenomenon is due to the highly concentrated form that synthetic or purified psychoactive substances take, many times more potent and addictive than the natural plant preparations from which they are derived. In addition to such chemical considerations, commercial production and distribution alienates such substances from the controls, restrictions, reverence, and religious significance found in the traditional context. Drugs that, in a different context, might have reinforced social or religious values, are instead perceived as representing a threat to the prevailing religion or society. Much initial research on "drug abuse" treated the drug itself as the problem, refusing to acknowledge that there might be any legitimate form of use beyond hedonic substance abuse. Cross-cultural and anthropological studies have pointed out the fundamental importance of the social setting for determining patterns of drug use and abuse. Such understandings may prove crucial in the understanding and treatment of drug addiction. In some cases, traditionally used psychoactive plants such as iboga and ayahuasca have been employed in the treatment of drug or alcohol addiction.

As exemplified in the recent controversy surrounding kava-kava toxicity, commercialization of traditional plants also raises fundamental issues about safety. Plants that appear to have been used safely for centuries in their regions of origin may

present toxicity when prepared in industrial quantities or consumed in new social or medical contexts. Commercial patents on sacred plants such as iboga and ayahuasca are also troubling. Although it is heartening to see such traditional therapies transcend cultural boundaries and bring relief to suffering people around the world, it is also frustrating to see economically marginalized indigenous peoples robbed of the economic benefits and intellectual property rights they deserve for their contributions.

5. Conclusion

We will never know whether human religion emerged when some Stone Age hunter-gather chief, or perhaps even pre-modern hominid ancestor, accidentally ate a psychoactive plant and later awoke from a trance with a new vision of the cosmos, the social order, and human destiny. Altered states of consciousness appear to be endogenous to the human brain, and may have been an important part of religious rituals before psychoactive plants were discovered. Though presumably first encountered by accident, hundreds of psychoactive plant species have been discovered independently by diverse, geographically separated human societies. Many have been adopted as sacraments in myriad religious traditions. The ability of these plants to open the doorways of perception and provide new insights into self, society, and the cosmos leads almost universally to their association with magical powers and divine beings. Even such mundane modern stimulants such as coffee, tobacco, and alcohol were once considered sacred and used primarily in ritual settings. In diverse historical examples, psychoactive plants have spread from religious, ceremonial, medical, or other restricted uses to wider, more secular patterns of use. Governments and religious institutions have often attempted to restrict or ban the popular use of certain psychoactive preparations, evoking morality as well as concerns over public and mental health. In other cases, psychoactive preparations have been used for purposes of social control and economic domination (e.g. "firewater" among Native Americans; the British opium trade in nineteenth century China). In many historical instances, outright bans of psychoactive use have failed, resulting in widespread resistance or disobedience, driving psychoactive use underground, and often spawning lucrative black market enterprises. The social and psychological appeal of psychoactive plants is so overwhelming that, in the end, authorities often eventually admit defeat, resorting to taxes and other regulations to maintain some degree of control. The desire to attain altered states of consciousness appears to be a powerful, nearly universal human instinct. As is the case for sexual urges, people are willing to assume serious risks to fulfill their desires for altered consciousness even when prohibited, repressed, and severely punished by society. Such historical and psychological factors should be taken seriously into account as the human cost and financial burden of the global "war on drugs" spirals out of control, breeding criminality and corruption with no sign of reduction in illegal drug use.

Illegal, supposedly dangerous drugs such as coca and marijuana have been used safely in ritual, religious, and medical contexts in different cultures and historical moments. Ethnopharmacological approaches provide crucial historical, cultural, chemical, and botanical information about traditional uses of psychoactive plants, and suggest innovative ways for understanding and possibly treating drug addiction and abuse.

Some religious denominations have made positive use of published ethnographic, pharmacological, ethnobotanical, and historical data in seeking legal protection of their own ritual uses of psychoactive plants. By the same token, ethnopharmacologists need to become more aware of the ethical implications of their research, respecting the sacred traditions and intellectual property rights of the cultures who still use these plants in ritual settings.

The knowledge that specific chemical compounds, closely related to brain hormones, can induce profound mystical and religious experiences is a discovery of monumental importance for understanding the human mind and appreciating the human spirit. Unfortunately, widespread recreational use combined with ignorance and prejudice on the part of mainstream religion and law-enforcement agencies has led to the suppression and criminalization of some of nature's most spectacular gifts to humanity: the psychoactive botanicals—nectars of delight; portals to the innermost psyche and the outermost realms of the cosmos; objects of reverence and awe, yet also fearsome and destructive if used without wisdom or respect—truly, the plants of the gods.

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Appendix

[Appendix 1: Summary of Plants Discussed in Text](#)

Related Chapters

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Glossary

Acetylcholine	:an important neurotransmitter involved in contraction of muscles and activation of the parasympathetic nervous system; abbreviated ACH.
Agonist	:a chemical agent that acts on receptor sites potentiating specific neurotransmitter effects
Alkaloid	:an alkali (basic), often bitter chemical substance containing the element nitrogen.
ASC	:"altered states of consciousness"; non-ordinary states of perception, cognition, emotion, and self-awareness induced by meditation, sensory deprivation, rhythmic music or dancing,

	psychoactive substances, and other means.
Antagonist	:chemical agent that acts on receptor sites blocking specific neurotransmitter effects
Anticholinergic	:chemical agents that act as antagonists of acetylcholine receptor sites or otherwise suppress acetylcholine-mediated responses.
Atropine	:psychoactive, muscle-relaxing tropane alkaloid found in belladonna (<i>Atropa belladonna</i>) and other nightshades; acts as a specific antagonist of the muscarinic class of acetylcholine receptor sites, and thus as an antidote to muscarine poisoning; by the same token, muscarine can be used as an antidote to atropine poisoning.
Cholinergic	:chemical agents that act as agonists of acetylcholine receptors, enhancing acetylcholine-mediated responses and activating the parasympathetic nervous system.
Comunitas	:according to anthropologist Victor Turner, a sense of bonding, oneness, equality, and camaraderie that emerges among participants of rituals of initiation or transition.
DMT	:dimethyltryptamine; naturally occurring hallucinogenic alkaloid containing the tryptamine unit.
dopamine	:monoamine neurotransmitter that mediates neural processes that are associated with pleasure and reward and are especially implicated in drug dependence.
Endorphins	:"morphine within"; endogenous opioid peptides that regulate pain in the central nervous system.
Entheogen	:"revealing the God within"; recently coined word referring to hallucinogens that induce mystical or religious experiences.
GABA	:gamma-aminobutyric acid; major amino acid neurotransmitter responsible for inhibiting or dampening nerve activity.
Hallucinogen	:"generating hallucinations"; term widely used to refer to psychoactive substances that induce powerful alterations of perception and consciousness.
Indo-European	:a language family originating in the Caucasus mountain region that includes most languages of modern Europe (e.g., English, German, French, Spanish, Slavic tongues) as well as many in south and central Asia (e.g., Hindi, Persian).
Indole	: class of tryptamine-derived psychoactive alkaloids (e.g. psilocine, DMT, LSD) that act especially on serotonin receptor sites.
Kykeon	:beverage of barley and pennyroyal consumed in ancient Greek times during initiation into the Greater Mysteries of the cult of Demeter at Eleusis, hypothesized to have contained psychoactive components.
LSA	:lysergic acid amide; hallucinogenic indole alkaloid found in ergot fungus, morning glories, and other natural sources; precursor in the synthesis of LSD.
LSD, LSD 25	:lysergic acid diethylamide; strongly hallucinogenic indole alkaloid first synthesized by Albert Hoffman in 1938; its psychoactive properties were discovered by Hoffman accidentally five years

	later.
MAO	:monoamine oxidase, an enzyme widely distributed in the body that breaks down and deactivates monoamine neurotransmitters such as serotonin and noradrenaline, thereby dampening nerve activity after initial stimulation.
MDMA	:3,4-methylenedioxymethamphetamine-psychoactive synthetic phenylethylamine alkaloid commonly known as "Ecstasy."
Muscarine	:toxic alkaloid found in <i>Amanita muscaria</i> and other mushrooms that interacts with specific "muscarinic" acetylcholine receptor sites and produces profound activation of the parasympathetic nervous system; initially causes perspiration, salivation, and lacrimation, followed by blurred vision, nausea, labored breathing, and at high enough doses, convulsions, respiratory or cardiac failure; the anticholinergic agent atropine serves as specific antidote.
Muscarinic	:a class of acetylcholine receptor sites upon which the compound muscarine acts as a specific agonist.
Neurotransmitter	:brain hormones that transmit nerve impulses across synapses.
Nightshade	:common name for the botanical family Solanaceae, including potato, tomato, chili peppers, and numerous psychoactive plants such as tobacco, belladonna, henbane, <i>Datura</i> , and others.
Noradrenaline	:important monoamine neurotransmitter, chemically related to adrenaline (epinephrine), involved in the sympathetic division of the autonomic nervous system; also known as norepinephrine.
Parasympathetic nervous system	:one of two main divisions of the autonomic or involuntary nervous system; mediates "rest and recuperation" responses such as slowed heart rate, constriction of pupils, dilation of blood vessels, and activation of glands, digestive, and reproductive organs; acetylcholine is its principle neurotransmitter; acts largely in opposition to the sympathetic nervous system.
Phenylethylamine	:chemical unit found in the neurotransmitter noradrenaline and certain psychoactive alkaloids (mescaline, amphetamine); derivative of the essential amino acid phenylalanine (C ₉ H ₁₁ O ₂ N).
Psychedelic	: "manifesting the psyche"; recently coined word of flawed Greek etymology referring to hallucinogens.
Psychotomimetic	: "mimicking psychosis"; somewhat outdated term for referring to hallucinogens.
Receptor site	:molecular structure on the surface or interior of cells that binds with specific classes of hormones, neurotransmitters, or drugs.
Rg Veda	:sacred hymns of the ancient Indo-Aryan peoples forming the basis of modern Hinduism; composed as early as 3500 years ago and set down in writing about 500 BC.
Scopolamine	:hallucinogenic and sedative tropane alkaloid found in <i>Datura</i> and other nightshades.
Serotonin	:5-hydroxytryptamine (5-HT); important monoamine neurotransmitter involved in many neural processes including sleep, memory, and mood.

- Shaman** :healer, priest, or diviner found especially in tribal societies who enters altered states of consciousness, often through the use of psychoactive plants.
- Shamanism** :religious systems based on direct contact between shamans and the spirit world via altered states of consciousness.
- Soma** :mysterious sacred plant of the ancient Indo Aryans mentioned in the Rg Veda; hypothesized to have been a hallucinogen, possibly *Amanita muscaria*.
- Sympathetic nervous system** :second main division of the autonomic nervous system, responsible for "fight or flight" responses such as increased heart rate, dilation of pupils, constriction of blood vessels, and shunting of blood flow from organs and viscera to skeletal muscles; works in complementary and opposing fashion to the parasympathetic division.
- Synapse** :a junction between a nerve axon and neuron, muscle cell, or gland across which nerve impulses are transmitted.
- Tropane** :class of psychoactive and toxic alkaloids (atropine, scopolamine, nicotine) found especially in the Solanaceae that act on acetylcholine receptor sites either as agonists (nicotine) or as antagonists (atropine).
- Tryptamine** :important chemical unit containing two nitrogen atoms incorporated into a multiple ring structure (C₁₀H₁₂N₂), derived from the amino acid tryptophan (C₁₁H₁₂O₂N₂); found in monoamine neurotransmitters (serotonin, dopamine, noradrenaline) as well as numerous psychoactives (e.g., indole hallucinogens).
- Vedic** :of or relating to the Rg Veda hymns.

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Biographical Sketch

Glenn H. Shepard Jr. completed his undergraduate degree at Princeton in 1987 and his doctorate in Medical Anthropology at the University of California at Berkeley in 1999. He was a post-doctoral fellow in Botany and Ecology at the National Institute of Amazonian Research (INPA) in Manaus, Brazil, from 2000-2004, and currently has a research fellowship from the Leverhulme Trust in collaboration with colleagues in the Department of Biological Sciences at the University of East Anglia, U.K. He is also a senior research associate in the Department of Anthropology at the College of William & Mary. Shepard has conducted extended field research with diverse indigenous societies of Peru (1986-present), Brazil (1999-present), and Mexico (1992-1994), and has also worked among Jordanian Bedouins (1985) and hill tribes of northern Thailand (1993). Research interests include ethnobiology and cultural ecology; medical ethnobotany, ethnomedicine, and shamanism; health, demography, and the effects of Westernization on indigenous societies; and community-based management of natural resources. Recent publications include papers in *American Anthropologist* (2004), *Advances in Economic Botany* (2004), *Medical Anthropology Quarterly* (2002), and *Journal of Ethnobiology* (2001), as well as co-authored papers in *Science* (2004) and *Nature* (1998). He has also participated in the production of a number of ethnographic films and videos, including "Zapatistas: Voices on the Edge of Revolution" (with Thor Anderson; Best Student Film, Society for Visual Anthropology Film Festival, 1995) and the Emmy award-winning Discovery Channel film, "Spirits of the Rainforest" (1993). Shepard was raised in the Tidewater area of Virginia on the shores of the Chesapeake Bay, and currently resides in Manaus, in the heart of the Brazilian Amazon.

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3.3 Oceania
