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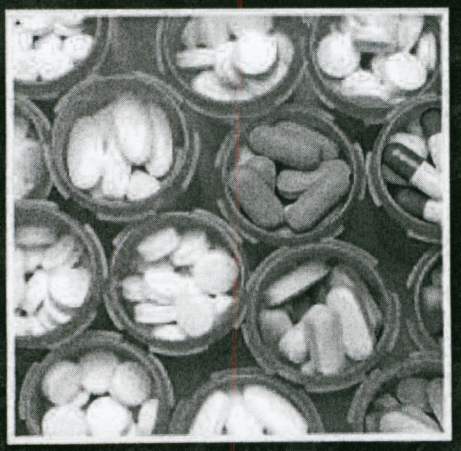
General Processes and Mechanisms, Prescription Medications, Caffeine and Areca, Polydrug Misuse, Emerging Addictions and Non-Drug Addictions



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VOLUME 3

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Chapter 2

Psychoactive Plants Used during Religious Rituals

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INTRODUCTION

Accumulating archeological and anthropological evidence made it clear that in many ancient religious rituals some psychoactive plants were consumed. Psychoactive plants, which induce a certain form of altered states of consciousness (hallucinogen-induced ASC (H-ASC)) have been used for various spiritual and religious purposes for many centuries (Lewis-Williams & Clottes, 1998; Lewis-Williams & Pearce, 2005; Merlin, 2003; Metzner, 1999, 2002; Popik, Layer, & Skolnick, 1995; Ruck, 2006, 2013; Ruck, Hoffman, & González Celdrán, 2009; Ruck, Staples, Celdrán, & Hoffman, 2006; Sayin, 2010, 2011, 2012a, 2012b, 2014a, 2014b, 2014c, 2014d; Stafford, 1978; Wasson, 1980; Wasson, Hofmann, & Ruck, 1978). Most of the shamanic and pagan cultures used these plants for different intentions such as:

- To contact with spirits and the spiritual world (psilocybin, mescaline, ibogaine, ayahuasca–dimethyltryptamine (DMT), etc.).
- To contact the souls of ancestors to get philosophical advice (particularly ibogaine and ayahuasca–DMT, etc.).
- To ponder deeply religious and philosophical subjects related with their tribe and/or society (cannabis, psilocybin, mescaline, *Artemisia absinthium*, etc.).
- To contact with gods, goddesses (*A. absinthium*, ibogaine, etc.).
- To heal psychologically "diseased" patients (many shamanic psychoactive plants).
- To reach a form of so-called enlightenment (Nirvana or Satori) (ibogaine, psilocybin, mescaline, cannabis, ayahuasca–DMT).
- To unravel some unknown facts and realms of the human mind and subconscious (psilocybin, cannabis, *Salvia divinorum*, mescaline, ibogaine, morning glory seeds, blue star lotus, opium, *A. absinthium*, ayahuasca brew, DMT-containing plants with *Peganum harmala*, etc.).
- To become a master shaman or a master pagan (numerous psychoactive plants used in shamanic trance states and rituals).
- To experience aphrodisiac effects during rituals and/or orgia (ephedra, cannabis, *A. absinthium*, ibogaine, etc.).
- To use the plants as medicine and also in psychological disorders for medical treatment.

Whether psychoactive plants and substances fulfill any of the previously mentioned purposes is very questionable and unlikely; however, the important point is that psychedelic (mind-expanding) plants, which are today totally banned in most of the regions of the globe, were actually an important part of the ancient religious rituals and medical treatment methods. ASC induced by these herbs and plants were essential to fulfill those religious purposes while most of them were used as medicines (2002; Blainey, 2005; Merlin, 2003; Nichols, 2004; Ruck, 2006, 2008, 2013; Ruck & Heinrich, 2001; Ruck et al., 2009; Ruck et al., 2006; Ruck, Staples, & Heinrich, 2000; Sayin, 2012a, 2012b, 2014a, 2014b, 2014c, 2014d; Schultz & Hofmann, 1992; Stafford, 1978; Wasson, 1980; Wasson et al., 1978).

According to Carl Gustav Jung, a common collective unconscious existed in many different cultures, which had no contact with each other and lived in different centuries; the common symbols, which are called "the archetypal images," such as the swastika, may have been used by many different cultures (Jung, 1968). Jung proposed some common images and symbols in his book *Man and His Symbols*, as evidence of this common collective unconscious. Some of the works of Carl Ruck, David Lewis-Williams, and J.L. Kent today have raised some insights to explain how these common language items, common archetypes, and similar symbols were used in different cultures (Fantegrossi, Murnane, & Reissig, 2008; Kent, 2010; Lewis-Williams & Clottes, 1998; Lewis-Williams & Pearce, 2005; Ruck, 2006, 2008, 2013; Ruck & Heinrich, 2001; Ruck et al., 2009; Ruck et al., 2006; Schultz & Hofmann, 1992).

The main hypotheses we have proposed in our former publications and taken for this chapter are (Sayin, 2011, 2012a, 2012b, 2014a, 2014b, 2014d):

- Many ancient cultures used some kind of psychoactive plants during some of their religious rites since the Neolithic ages.
- Most of the mythological figures and characters that exist in tribal religions, in ancient religions, and also in the institutionalized modern religions, such as demons, angels, Satan, semi-human animals, gods, goddesses, spirits, ghosts, jinns, and many others, originate from the illusions and hallucinations of ancient "ritual people" who had used psychoactive plants during their religious rituals and who had been very "high" on psychedelic plants.

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EVIDENCES AND FINDINGS

An overall review of the literature of psychoactive plants, archeology, anthropology, and psychedelic substances reveals that some of the psychoactive plants were used since Neolithic times, some 40,000 years ago. The psychoactive plants that were used in those rituals are summarized in Table 1.

SUMMARY OF THE PSYCHOLOGICAL EFFECTS OF THE PSYCHOACTIVE PLANTS USED IN ANCIENT RELIGIOUS RITUALS

Lysergic Acid Diethylamide (LSD) and LSD-like Effects (in Mescaline, Psilocybin, DMT, Central Nervous System (CNS) Stimulants, in d-Lysergic Acid Amide Found in Morning Glory Seeds)

(Aghajanian & Marek, 1999; Brunton, Chabner, & Bjorn Knollman, 2010; Fantegrossi et al., 2008; Goodman & Alfred, 1980; Gray, 2010; Hardman, Limbird, & Gilman, 2001; Henderson & Glass, 1994; Lilly, 1972; Passie, Halpern, Stichtenoth, Emrich, & Hintzen, 2008; Pletscher & Ladewig, 1993; Sayin, 2010, 2011, 2012a, 2012b, 2014a, 2014b, 2014c, 2014d; Stafford, 1978 and personal communications).

Visual phenomena: One hour after the ingestion of 80–150 μg of LSD, colors may become very vivid. This much LSD takes the human brain and mind into an inexplicable ASC for 7–8 h. Bright forms of green, red, and violet are distinguished. Colors are heard as sound, while sound is identified as colors; this is also known as the phenomenon "synesthesia." The colors and animated images may have profound psychological and philosophical meanings according to the set, setting, and the mood of the individual. The brightness of light increases. When looking at a two-dimensional picture it becomes three-dimensional, and there is always movement and animation in the picture. When the eyes are closed different geometric images and geometrical self-repeating figures of colored fractals are perceived. Kaleidoscopic images are very common during LSD use.

Acoustic phenomena: Sounds seem to be more profound and amplified. Music may become unbelievably deep and philosophical. Music generally becomes the forms of light and a touchable object. Very quiet sounds are amplified.

Tactile phenomena: Touching and feeling may become an amplified sensation; tactile sensations may become extremely vivid. Tactile perception may be altered overwhelmingly.

Changes in body perception: Body perceptions may generally become altered to different degrees. Body parts may become distorted or enlarged just as in *macropsia* and *micropsia*, which can be seen during the auras of epilepsy. Sometimes there is no distortion or change in the perception of the body of the self or others, and the whole "LSD trip" may be perceived as philosophical guidance without any distortional perception of the body or the environment.

The meaning of images may change, becoming more mystical and being converted into more elongated, enlarged forms, according to what the person thinks and imagines at that very moment. The body may become enlarged as well, and one feels a part of the universe or a form of a state of consciousness, which some have defined as "cosmic consciousness," an unrealistic and uncertain form of the perception of the self's identification with the environment and the universe.

Sexual pleasure: Sexual pleasure, arousal, and orgasm are generally enhanced. For both male and female, orgasms may be perceived as lasting a couple of minutes or may be perceived as lasting longer than usual. Most of the sexual arousal stimuli, such as fondling, touching, kissing, and intercourse, have a totally different format and effect, which the person realizes that he or she has never experienced in his or her life before. For this reason, not only LSD, but also psilocybin, tetrahydrocannabinol (THC), ibogaine, and CNS stimulants (methamphetamine) are powerful aphrodisiacs, some of which have also been used in tribal sex rituals for centuries. LSD has been used to treat sexual dysfunctions and anorgasmia.

Synesthesias: The perceptions of color, sound, taste, and touching may turn into each other. The subject may hear colors, see sound, touch the colors, taste the colors or sound, and touch certain kinds of visual or acoustic perceptions.

Hypersuggestibility: Subjects may become very suggestible to different stimuli and certain orders can be followed without question under the effects of LSD.

Judgment of time, weight, size, and spatial relationships: Judgment of time is generally impaired. The person may not perceive how many minutes or hours have passed since the beginning of the trip. Most of the time other comparisons of weight, size, and space, and three-dimensional relationships are impaired too; it is generally difficult to judge the weight and size of objects.

Changes in spatial and temporal perception: Flow of time changes generally and the expansion or contraction of time is perceived; 5 min may be perceived as 1 h, or the whole "trip" may be perceived to last only a couple of minutes. The space may expand and unify with the universe.

Thought disorders: Reasoning may become impaired, but sometimes there is no impairment according to the course, set, and setting of the "LSD trip." In some sessions, there may be paranoid thoughts, while in others, no paranoia occurs. Logical thinking and reasoning may or may not be impaired. Some LSD users stated that they can even solve problems much faster and in a more philosophical and profound way. The associations are generally.

Memory: Childhood experiences and traumas that have been forgotten for years may be suddenly remembered. Short-term memory may or may not be impaired. Usually, the person remembers many details of what he or she experienced during the trip. For this reason LSD has been used for the purposes of psychotherapy. Many forms of hypermnesias may occur.

Changes of affectivity: Affection may change intensely. Affection is one of the most influenced psychological changes. It is reported that empathy between people, just like in 3,4-methylenedioxy-methamphetamine (MDMA), is enhanced. LSD users proclaim that they built deeper relations and understanding with their spouses or friends during a mutual "LSD trip."

Alterations in ego: The perception of the ego alters profoundly. The subject may have a feeling of losing the ego and a feeling of unification, which is generally described as feeling the universe within or perceiving the universe within the borders of the self and space–time of the present; similar to the consciousness state of ancient mystics, such as Sufis, Zen Buddhists, and shamans.

TABLE 1 The Overall Summary of Psychoactive Plants Consumed by Ancient Cultures during the Religious Rituals

Psychoactive Plant	Active Hallucinogenic Ingredient/Receptor System	The Regions/Cultures Used The Centuries Used	Used for	References
Opium *Papaver somniferum*	**Morphine (12%)** **Codeine** **Papaverine** **Noscapine** Opioid receptors	Nearly everywhere—Old World 5700 BC–until the nineteenth century Used since the Neolithic age	Narcotic analgesic **Not hallucinogen** Partial hallucinations Used in rituals Anesthesia–analgesia	Stafford (1978) and Merlin (2003)
Cannabis *Cannabis sativa*	**THC** Other active metabolites Cannabinoid receptors	Nearly everywhere—Old World 10,000 BC–until nineteenth century Central America/Mexico South America	CNS stimulant hallucinogenic Religious–shamanic rituals/trance states	Stafford (1978), Merlin (2003), Nichols (2004), and Ruck et al. (2009)
Ephedra *Ephedra sinica*	**Ephedrine** Noradrenergic receptors	Mesopotamia 60,000 BC–until the twentieth century China (ma huang, 3000 BC.)	CNS stimulant/ **Not hallucinogen** With hallucinogens/aphrodisiac Religious–shamanic rituals/trance states	Stafford (1978) and Merlin (2003)
Mandragora *Mandragora officinarum*	**Atropine** **Scopolamine** **Apoatropine** Cholinergic acetylcholine receptors (antagonism)	Egypt/Middle East/Europe 1500 BC	Hallucinogen inducing delirium Religious–shamanic rituals/trance states Magic	Stafford (1978) and Merlin (2003)
Blue water lily Star lotus *Nymphaea nouchali*	**Apomorphine**	Egypt (2500–3000 BC) India (2500 BC)	CNS depressant/sedative/mild hallucinogen Religious–shamanic rituals/trance states	Stafford (1978) and Merlin (2003)
Harmala *Peganum harmala*	**Harmine** **Harmaline** **Harmane** MAO inhibition	Caucasus (4800–3200 BC) Anatolia—Middle East India	MAO inhibitor **Not hallucinogen** With DMT-containing plants	Stafford (1978), Merlin (2003) and Ruck et al. (2009)
Ayahuasca *Banisteriopsis caapi* vine	**Harmine** **Harmaline** MAO inhibition	South America and the Amazon Time unknown Possibly 2000–3000 BC	MAO inhibitor **Not hallucinogen** With DMT-containing plants	Stafford (1978), Merlin (2003) and Nichols (2004)
Ayahuasca–DMT *Psychotria viridis/* *Diplopterys cabrerana/* *Psychotria carthagenensis*	**DMT** Serotonin–dopamine–adrenergic receptors	South America The Amazon Time unknown Possibly 2000–3000 BC	DMT-containing plants Powerful hallucinogen Religious–shamanic rituals/trance states/shamanic purposes	Stafford (1978), Merlin (2003), Nichols (2004) and Ruck et al. (2009)
Phalaris–DMT *Phalaris aquatica/* *Phalaris arundinacea/* *Phalaris brachystachys/* *Phalaris canariensis*	**DMT** Serotonin–dopamine–adrenergic receptors	Anatolia Greek–Hellenic–Roman 2500–2000 BC	DMT-containing plants Powerful hallucinogen Dionysus rituals–orgia Paganic purposes	Sayin (2014a, 2014b, 2014c, 2014d)

Continued

TABLE 1 The Overall Summary of Psychoactive Plants Consumed by Ancient Cultures during the Religious Rituals—cont'd

Psychoactive Plant	Active Hallucinogenic Ingredient/Receptor System	The Regions/Cultures Used The Centuries Used	Used for	References
Magic mushrooms *Psilocybe cubensis* *Copelandia, Galerina, Gymnopilus, Inocybe, Mycena, Panaeolus, Pholiotina, Pluteus,* and *Psilocybe* species; *Psilocybe strophoria, Panaeolus, Copelandia,* and *Conocybe*	**Psilocybin** **Psilocin** Serotonin–dopamine receptors	Maya-Aztec/Mexico-American Indians/ Middle East/Asia/ Europe/Africa 2500 BC–until fifteenth century	Powerful hallucinogen Religious–shamanic rituals/trance states	Stafford (1978), Wasson (1980), Nichols (2004), Blainey (2005), and Ruck et al., 2009
Magic mushroom *Amanita muscaria*	**Muscarine** Cholinergic system	Europe–Central America South America Time unknown	Powerful hallucinogen inducing delirium Shamanic tool	Stafford (1978), and Nichols (2004)
Ibogaine *Tabernanthe iboga*	**Ibogaine** NMDA receptors Kappa opioid receptor agonist	Gabon-Africa-Bwiti Cult Time unknown	CNS stimulant Powerful hallucinogen Aphrodisiac/religious–shamanic rituals/ trance states to contact ancestors	Stafford (1978), Popik et al. (1995), Alper, Lotsof, Frenken, Luciana, and Bastiaans, (1999), and Sayin (2012a, 2012b)
Salvia divinorum	**Salvinorin A** Kappa opioid receptor agonist	Aztecs/Mazetecs Mexico Fourteenth century	Short-acting powerful hallucinogen inducing delirium Shamanic purposes	Nichols (2004)
Morning glory seed *Turbina corymbosa*	**Lysergic acid** (similar to LSD) Serotonin–dopamine–receptors	**Ololiuhqui** by the Aztecs Central America Caribbean-Mexico Fourteenth to sixteenth centuries	LSD-like effect Powerful hallucinogen Religious–shamanic rituals/trance	Stafford (1978), Wasson (1980), Nichols (2004), Blainey (2005), and Ruck et al. (2009)
Wormwood *Arthemisia absinthium*	**Thujone** Cannabinoid receptors	Anatolia–Greece–Europe Dionysus rituals–orgia 1500 BC–400 AD	Hallucinogen Aphrodisiac In absinthe Religious–shamanic rituals/trance	Stafford (1978), Nichols (2004), and Sayin (2014a, 2014b, 2014c, 2014d)
Peyote *Lophophora williamsii*	**Mescaline** Serotonin–adrenergic receptors	Mexico–Yaqui Indians Central America Indians 8000 BC	Powerful hallucinogen Religious–shamanic rituals/trance LSD/psilocybin-like effects	Stafford (1978), Nichols (2004) and Ruck et al. (2009)
Bufotenin Toad toxin *Bufo alvarius*	**5-Hydroxy DMT** (bufotenin) Used with MAO inhibiting entheogen plants	Meso-American cultures 2000 BC	Powerful hallucinogen Religious purposes	Davis and Weil (1992), Blainey (2005), and Ruck et al. (2009)

THC, tetrahydrocannabinol; CNS, central nervous system; DMT, dimethyltryptamine; MAO, monoamine oxidase; NMDA, *N*-methyl-D-aspartate; LSD, lysergic acid diethylamide.

Mysticomimetic effects: In most of the sessions, the meaning of life is questioned depending upon the depth of perceptions, set, and setting. The perception of the events, meaning of life, and certain philosophical issues are contemplated in a mystical perception of the universe. The subjects may have very subjective and overwhelming mystical experiences of diverse types.

Perception of dimensions: Generally dimensions are distorted; however, some LSD users state that they can perceive other dimensions as well, while the perception of the three-dimensional continuum alters profoundly.

Unfolding of the subconscious and collective subconscious: In most of the "philosophical trips" many elements of the subconscious become unconcealed and explicit onto the surface of consciousness and awareness. Many archetypal images, symbols, and figures can be seen during the course of the trip, unfolding the collective subconscious. Many ancient religious symbols, such as mandalas, crosses, churches, demons, angels, stars of David, ying-yang, chakras, etc., and scenery can be perceived.

Controversial effects: LSD may induce extreme euphoria and happiness as well as dysphoria. It may have anxiolytic effects, while it may induce different levels of anxiety. It may induce feelings of laughter, and the user may laugh for hours with or without any obvious reasons; or he or she may also cry for hours without any obvious reasons. It may induce extreme happiness or grief at the same time. Many different controversial feelings may precede each other gradually; or only one of them is predominant.

Other symptoms: Dryness of mouth, midriasis, metallic taste, diarrhea, nystagmus, dizziness, symptoms of paralysis, feelings of anxiety, lethargy, headache, and other autonomic symptoms. It should not be forgotten that LSD is a very dangerous drug, which may easily induce mental disorders, acute psychosis, and schizophrenia, and it should never be used for recreational purposes, just like other hallucinogens mentioned in this chapter.

Opium (Narcotic Analgesics, Morphine)

Opium (*Papaver somniferum*) is a CNS depressant and narcotic analgesic; it is not a hallucinogen. It exerts its effects through specific opiate receptors (ORs) (such as mu (MOR), delta (DOR), kappa (KOR), nociceptin receptor (NOP)). Opium smoking was a very ancient, traditional, and recreational habit all over the world. Opium contains morphine, codeine, and thebaine (the phenanthrenes), and also papaverine and noscapine (isoquinolines). Although opium smoking does not induce sharp hallucinations, it has sedating, analgesic, hypotensive, and antidiarrhea effects; it may also induce a dreamy state (Brunton et al., 2010; Goodman & Alfred, 1980).

Cannabis sativa (THC)

(Brunton et al., 2010; Goodman & Alfred, 1980; Hardman et al., 2001; Katzung, Masters, & Trevor, 2012)

Hallucinogenic effects of THC: Marijuana is the buds and leaves of the *C. sativa* plant. This plant contains more than 400 chemicals, including THC, the plant's main psychoactive chemical. After the ingestion of THC, acute effects include lowered skin temperature; increased heart rate and blood pressure; analgesia; sedation; drowsiness; slowed speech; slow reaction time and poor coordination; concentration and memory problems; enhanced tendency to remember events that happened in the past; feelings of extreme pleasure; giggling and laughter; hearing, seeing, and feeling things differently (music may seem more distinct and/or subtle, colors may seem to be brighter, emotions can be experienced more intensely); a strong desire for food; a feeling that time is passing slowly; a feeling of being separated from reality, and sometimes delusional seeing or hearing things that are not really there; panic feelings, anxiety, attacks, or paranoia (a feeling of being scared or suspicious for no reason); depersonalization; dizziness or fainting with large, repetitive doses. At higher doses, vivid hallucinations of colors and images dancing in the air may be commonly perceived. Long-term effects include short-term memory impairment; difficulty in learning and problem solving; breathing problems; reproductive system problems, such as low sperm counts, impotence in men, irregular menstrual cycles in women; fearfulness and anxiety, which are common after high doses; decreased motivation; low energy; and loss of interest in life. The main reason people use cannabis is to get "high," that is, to experience euphoria, relaxation, and perceptual alterations, and the intensification of ordinary sensory experiences, such as eating, watching films, and listening to music. The "high states" may be accompanied by excessive laughter and talkativeness. Cognitive effects include impaired short-term memory and a loosening of associations. Motor skills and reaction time are also impaired. Since THC lowers the psychological inhibitions, just like alcohol, it may be perceived that libido is increased. The perception of senses (touch, smell, hearing, taste, etc.) is sharpened, and hence the sexual stimulants that lead to sexual arousal can be perceived to be enhanced. Cannabis is also used for aphrodisiac-like effects. It has been used in many shamanic and pagan cultures because of these effects.

Ephedra (Ephedrine)

Ephedra (ephedrine, ma huang) is a CNS stimulant; it is not a hallucinogen. It induces the release of the neurotransmitter norepinephrine (similar to amphetamines) and stimulates the consciousness. It is sometimes used with hallucinogens to enhance the CNS stimulating effects (Merlin, 2003; Nichols, 2004; Sayin, 2012a, 2012b)

Mandragora, Blue Water Lily (Atropine, Scopolamine), and Muscarine (*Amanita Muscaria*, Magic Mushrooms)

Drugs that antagonize muscarinic receptors, such as atropine and scopolamine, induce visual and tactile hallucinations and reduce the level of consciousness, while the nicotinic receptor is implicated as being involved in the mechanism of action of general (inhalational) anesthetics. The hallucinogenic effects of antimuscarinic agents are very dissimilar to the other psychoactive plant hallucinogens. Confusion, amnesia, blurred vision, and visual hallucinations are predominant (Goodman & Alfred, 1980).

Monoamine Oxidase Inhibitors (*Peganum harmala*; Harmine, Harmaline; *Banisteriopsis caapi* Vine)

Monoamine oxidase (MAO) inhibitors inhibit the DMT degrading enzyme MAO in the body and in the brain (Sayin, 2012a, 2014a, 2014b), thus inducing DMT to stay in the extracellular fluid of the CNS longer, resulting in ASC for nearly 3–4 h. In ayahuasca and *Phalaris* brews, old shamanic traditions had discovered the importance of harmine and harmaline, major MAO inhibitors of plant origin, extracted from *P. harmala* and *B. caapi* vine by means of boiling them in drinking water. They have CNS stimulant effects, as well as potentiating the effects of DMT-containing plants (Brunton et al., 2010).

DMT (Ayahuasca Plants; *Phalaris* Species)

(Brunton et al., 2010; Goodman & Alfred, 1980; Krippner & Sulla, 2011; Sayin, 2012a, 2012b, 2014a, 2014b; Stafford, 1978; Strassman, 2000 and personal communications)

DMT is contained in many plants all over the world, such as *Phalaris* species, Cohoba, epena snuffs, ayahuasca, etc., and has been used in many cultures' tribal rituals for centuries (Krippner & Sulla, 2011; Sayin, 2014a, 2014b; Stafford, 1978). DMT-containing plants have been used by medicine men and shamans of primitive cultures, such as those in the Amazon. It is also hypothesized that DMT-like endogenous chemicals are secreted from the brain, particularly the pineal gland. The duration of "DMT trips" is less than LSD, mescaline, psilocybin, etc., lasting for 2–4 h. Visual hallucinations are common when the eyes are open or closed, and may start with colorful, vivid LSD-like visual hallucinations and kaleidoscopic figures, which may later build up into scenery hallucinations. Auditory hallucinations are not uncommon. The mysticomimetic effects of DMT are very powerful. DMT trips may give a number of insights into a person's life, philosophy, space, universe, religious thoughts, celestial entities, aliens, gods, etc. The subconscious and collective subconscious are generally revealed. Depersonalization, paranoia, both euphoria and dysphoria, anxiety, tremor, ecstatic feelings, extreme happiness, peak experience, oceanic bliss, feelings of self-fulfillment, melting of temporal/spatial continuum, and alterations in time perceptions are all common psychological effects.

5-Hydroxy DMT (Bufotenin)

Bufotenin has DMT-like and LSD-like effects. It is extracted from the salivary gland of a special species of toad (*Bufo alvarius*) (Davis & Weil, 1992).

Psilocybin (Magic Mushrooms)

(Fantegrossi et al., 2008; Goodman & Alfred, 1980; Griffiths, Richards, Mc Can, & Jesse, 2006; Hardman et al., 2001; Hasler, Grimberg, Benz, Huber, & Vollenweider, 2004; Sayin, 2012a, 2012b, 2014a, 2014b; Stafford, 1978; Tart, 1990; Vollenweider, 2001 and personal communications)

For centuries psilocybin (magic mushrooms) has also been used in many shamanic rituals to transcend temporal–spatial dimensions and to contact an imaginary, unreal world of demons, ghosts, and spirits. It induces visual hallucinations of colorful images, dancing, and psychedelic, green–red–violet geometric shapes very similar to those produced by using LSD. In some particular ingestions, or "good trips," users declare that they have contacted the Great Spirit, who gave philosophical insights to the traveler. As in LSD and other hallucinogens, psilocybin also unfolds the unconsciousness, and many archetypal images and thoughts are perceived. Mysticomimetic hallucinations are very common with the use of psilocybin, and it is asserted that "psilocybin journeys" induce sharp changes in the philosophical thinking and the ideology of the individual (Sayin, 2014a, 2014b). In some studies, some of the effects of psilocybin were summarized as positive and negative experience of derealization, depersonalization, changed sense of time, change in the temporal and spatial continuum, euphoria, happiness, mania, laughter, both decreased and increased anxiety, thought disorder, an increase in associations, paranoia, loss of thought and body control, synesthesia, changed meaning of perceptions, life, and philosophy, in-depth philosophical thinking, LSD-like vivid color and visual hallucinations, facilitated recollection and imagination, increased creative and artistic abilities, and a feeling of unification with the environment, nature, and the cosmos (Vollenweider, 2001). In another study, using different psychometric scales, the following classifications of the psychedelic effects of psilocybin were investigated (Hasler et al., 2004): oceanic boundlessness, anxious ego dissolution, visionary restructuralization, auditory alterations, and reduction of vigilance. Psilocybin made alterations in all scales in a dose-dependent manner compared to the controls; inducing slight drowsiness, increased sensitivity and intensification of preexisting mood states, colorful visual illusions, complex scenic hallucinations and synesthesia, euphoria, dysphoria, fear of losing control, anxiety, a feeling of "touching and unifying with a higher reality," auditory hallucinations, a dreamy state, "switching between the worlds," insightfulness, etc.

Ibogaine (Tabernanthe iboga)

(Alper et al., 1999; Glick & Maisonneuve, 1998; Maciulaitis, Kontrimaviciute, Bressolle, & Briedis, 2008; Popik et al., 1995; Sayin, 2012a, 2014a, 2014b; Stafford, 1978 and personal communications)

Ibogaine is a very powerful hallucinogen, inducing a long-term ASC, lasting from 24 to 48 h. It has also been tried for the treatment and autopsychoanalysis of heroin addicts with success. This treatment method was also studied and reported by the National Institute on Drug Abuse (NIDA). Its effects start with LSD-like hallucinations; however, not very many psychotomimetic actions are observed. It induces a couple of distinct ASC states transiently. "Oneirophrenic state," a term coined by Naranjo (Stafford, 1978), is a conscious dreamy state, where the individual is very open to psychotherapy and remembers all his or her conscious dreams (rapid eye movement state). Ibogaine induces fantasies and images like a "slide show" or "a movie run at high speed." Visual hallucinations happen in the dark, consisting of blue disks dancing up and down the wall. Symptoms like drowsiness, disturbance by sound, insomnia, dysesthesia, feeling of light-weightedness, and hyperacusis may occur along with continuous hallucinations of different forms and formats. Autonomic signs such as dryness of mouth,

increased perspiration, midriasis, increased pulse rate, as well as extrapyramidal symptoms (ataxia, tremor, enhanced reflexes, and clonus) may occur. Hypermnesias of different kinds usually happen. One of the interesting effects of ibogaine is that the ability for autopsychoanalysis increases; the person may find the thought pathways in his or her brain, and feels an ingenious ability to analyze the events, behaviors, the self, and the people related with his or her life and organize his or her thoughts into imaginary folders in his or her brain. Heroin addicts who were treated with ibogaine, which also successfully stops the withdrawal syndrome, stated that they were able find the personal reasons, memories, or psychological clues as to why they used drugs, analyze themselves during the "ibogaine trip," and were then able to establish a new identity and personal attitude. Similar autopsychoanalysis phenomena can also be observed—to some degree—under the effects LSD, MDMA, psilocybin, and DMT (ayahuasca). Ibogaine was also reported to be a very powerful aphrodisiac, for example, males and females in Gabon, Africa, engage in a ritualistic sexual activity that may last from 6 to 17 h under the effect of ibogaine in their subcultures or in the practices of Bwiti cult (Popik et al., 1995). For centuries ibogaine has been used in shamanic initiation rituals of the shaman candidates to transcend temporal–spatial dimensions and "to contact the souls of the ancestors" for philosophical and personal development purposes in the subcultures in Gabon. Most of its hallucinogenic effects have similarities to psilocybin, LSD, and mescaline; however, it induces a completely different H-ASC.

Salvia divinorum

S. divinorum, of which the active ingredient is salvinorin A, is a short-acting hallucinogen that may sometimes induce dysphoria and unpleasant psychedelic effects; it may induce creative dream-like states, panic, fear, and terror (Siebert, 1994).

Thujone (Wormwood; *Artemisia absinthium*)

Thujone binds to CB1 and CB2 receptors and shows its effects through cannabinoid receptors. It has similar effects to THC (cannabis).

Mescaline (Peyote)

(Brunton et al., 2010; Fantegrossi et al., 2008; Goodman & Alfred, 1980; Hardman et al., 2001; Klüver, 1966; Sayin, 2012a, 2012b, 2014a, 2014b; Stafford, 1978 and personal communications)

Peyote cactus extracts, which contain mescaline, have been used widely by many cultures for centuries, such as Indians and Mexicans for spiritual development and shamanic and philosophical purposes. It is reported that mescaline's spiritual and philosophical mysticomimetic effects are much more profound than other hallucinogens. Heinrich Klüver described the mescaline images as "geometrical images of spirals, funnels, alley, cone, vessel, tunnel and grating, lattice, fretwork, filigree, honeycomb or chessboard mathematical designs happening in the mind automatically just like the ones in the computer programs" (Klüver, 1966). Most of the trips are accompanied by auditory hallucinations, such as a voice that is described as a leading guru or a teacher. In "mescaline journeys," time and space are transcended just like in LSD; time becomes *limitless*, space becomes *infinite*. Flying, out-of-body experience, bodies becoming luminescent or transparent, and extrasensory perception are some of the common psychological effects of mescaline on the psyche. Like LSD, mescaline also induces kaleidoscopic images. Artistic creative potentials are said to be increased in both mescaline and LSD. Some users also claim that their creative potentials in scientific thinking, logical and analytical reasoning, and philosophical, religious, and mystical insights are also enhanced as an after effect of some of the hallucinogens, such as LSD, mescaline, MDMA, and psilocybin during or sometimes after the "mescaline–LSD–psilocybin journeys."

DISCUSSION

When we look at the overall effects of psychoactive plants and their ingredients, some of the common effects can be summarized as follows:

- mysticomimetic effects and enhanced mystical and spiritual thinking
- synesthesia
- distorted perception of time and space
- distorted perception of the self, objects, and space
- thought disorders
- loss of inhibitions; decreased influence of social norms and dogmas
- questioning the taboos and the norms of society; scrutinizing the meaning of life and people as well as the environment and universe
- euphoria, happiness, anxiolysis, and sedation, or dysphoria, unhappiness, anxiety, and irritation
- amnesia or hypermnesia
- enhanced empathy
- enhanced sexual pleasure and orgasms; aphrodisiac effects
- altered philosophical thinking and alterations in the perception of meaning of life, nature, environment, people, and the universe
- affective changes, altered mood
- alterations in the ego
- unraveling of the subconsciousness; collective subunconscious
- emergence of many archetypal images, entoptic images, phosphenes, symbols, and archetypal information
- emergence of many religious images, symbols, archetypes, and thoughts
- emergence of the distorted images of people and objects
- hearing sounds and communicating with nonexistent creatures and beings

The psychological effects of many of the psychoactive plants mimic some forms of psychosis; however, most of the time the "tripper" is aware that they are the effects of the plant he or she is using. The overall effects of all of the psychoactive plants, which have been used for many centuries since the Neolithic times, are actually a form of the religious experience. This is why they were consumed during the ancient religious rituals of the shamans and pagans. First of all, they were not used for recreational purposes during the old wisdom times. In ancient times psychoactive plants were used in secretive religious rituals only by the people who

were ready for them; not everyone had used to consume them, other than the master shamans. Psychoactive substances are (and *were*) not for everyone. Only those who were prepared, conversant, cultured, philosophical, educated, and ready, who had a healthy psychological and neurological unity, used them in shamanic history and should be able to try them on the contrary of how psychoactive plants are randomly used today.

Psychoactive Plants, H-ASCs, and Mystical Experience

In an LSD study, 96% of the subjects had religious imagery of some kind; 91% had images of religious architecture, temples, and churches; 43% had images of religious sculpture, painting, and stained glass windows; 58% had religious symbols (cross, ying-yang, star of David); 49% had visions of devils and demons; 7% had seen angels; 10% had images of scenes from contemporary Christian, Jewish, or Muslim rites; and 31% had images of primitive rites (Stafford, 1978, p. 89). This study clearly shows that the religious imagery is very common during a psychedelic experience. Ayahuasca–DMT, magic mushroom, and peyote users often depict such occurrences (Sayin, 2012a, 2014a, 2014b). It is obvious that there is some religion-based information coded and kept in the depths of the subconsciousness and collective subunconsciousness (Jung, 1968; Ruck, 2006, 2013; Ruck & Heinrich, 2001; Ruck et al., 2009; Ruck et al., 2006; Ruck et al., 2000; Wasson et al., 1978).

Some research has found that administering psychedelic drugs in a supportive and ideal setting can induce profound mystical experiences; for instance, one study found that about 60% of volunteers in an experiment on the effects of psilocybin, who had never used psychedelic drugs before, had a "complete mystical experience" characterized by episodes such as unity with all things, transcendence of time and space, a sense of insight into the ultimate nature of reality, and feelings of ineffability, awe, and profound positive emotions such as joy, peace, and love (Griffiths et al., 2006).

Another study by Lerner and Lyvers (2006) compared people who used high doses of classic psychedelic drugs (eg, LSD, mescaline, and psilocybin) with people who used other mind-altering drugs who had never tried psychedelic drugs, and people who had never used any of them. Psychedelic drug users endorsed more mystical beliefs (such as in a universal soul, no fear of death, unity of all things, existence of a transcendent reality, and oneness with God, nature, and the universe). Psychedelic drug users also said they placed greater value on *spirituality* and *concern for others*, and *less value on financial prosperity*, than the other two groups. These findings are in accordance with other findings from another study (Móró, Simon, Bárd, & Rácz, 2011) that found that psychedelic drug users "regarded spirituality as more personally important" compared to users of other drugs and nondrug users. These findings suggest that people who use psychedelic drugs consider themselves *more spiritual* than people who prefer other drugs or who do not consume any of these drugs.

It seems that psychedelic drug use and having spiritual and mystical beliefs and/or experiences have a correlation. Another study on psilocybin found that people who had never used psychedelic drugs before reported long-term increases in "death transcendence," which meant that subjects expressed an enhanced belief system that there is continuity after death (MacLean, Johnson, & Griffiths, 2011). In addition, Griffiths et al. found that 14 months after ingestion of psilocybin for the first time, two-thirds of the volunteers graded the experience as in the top five for both "most personally meaningful" and "most spiritually significant experience" in their entire lives. About 64% reported the experience had increased their personal "well-being" and "satisfaction from life" over the 14-month period. Additionally, volunteers said that they experienced positive changes in their attitudes toward life, to other people, and to the self, as well as *increased positive mood, peace with other people, increased feeling of well-being, and empathy and a sense of greater altruism* (Griffiths et al., 2006). These results show a correlation of psychedelic experience and an increased tendency to mysticism and spiritual approach to other people, the environment, nature, and the universe. However, another skeptical explanation could be that mystical experiences could actually inflate the volunteers' egos leading to some kind of grandiose false beliefs and delusional thinking about their superiority to others and also perceiving themselves as "they are more 'enlightened' than other people," like prophets (Mirante & Kobrin, 2007).

What Can Be the Basis of Psychedelic Religious Experience?

An important point is that LSD, of which the plasma half-life is around 160 min, was reported to stay in the brain for only 20–40 min, after which it is cleared up (Stafford, 1978; Hintzen & Passie, 2010; www.erowid.org) long before its major effects start in a couple of hours, but the LSD-induced hallucinogenic trip starts 1 h after the ingestion and lasts for 6–8 h; this means that there is substantially no LSD (or very little) in the brain while a person is tripping on LSD; thus, it cannot be only the molecular resemblance of LSD, which acts as a powerful hallucinogen even after 50 μg of an oral dose, to serotonin (5-HT), to bind 5-HT receptors as an agonist. So how does LSD exert an agonistic effect on 5-HT_{2A} and 5-HT_{2C} receptors during an 8-h trip, after it is totally cleared up from the brain? Moreover, many psychiatric antipsychotic and anxiolytic medications, such as dopamine antagonist chlorpromazine and powerful $GABA_A$ agonist alprazolam (Xanax), stop the LSD trip without having much antagonistic effect on 5-HT receptors. Thus, serotoninergic mechanisms may play an important modulating role in the formation of psychedelic consciousness, but it is not likely that the 5-HT system is the only mechanism to explain H-ASCs.

The effects of hallucinogens can also be explained by an alternative hypothesis, such as the "gateway hypothesis." It may be possible that certain circuitries and loops in the brain have a capacity to experience psychedelic consciousness; however, it is normally under the control of and inhibited by other hypothetical areas and circuits in the brain during normal daily life; some hallucinogens may be disinhibiting this gating mechanism, through an action that has not yet been discovered. Thus, some hallucinogens may trigger an innate mechanism in the brain, which already exists but becomes explicit during hyperexcitation states (probably a couple different receptor systems and different pathways), to experience H-ASCs. Such a system does exist in the brain; DMT is a natural neurotransmitter that is secreted from the pineal gland (Strassman, 2000). The brain also has its own cannabinoid

receptor system (CB1, CB2), to which THC binds, and there are endogenous cannabinoid ligands of these receptors, anandamide (arachidonoylethanolamide) and 2-arachidonoylglycerol, which exert hallucinogenic effects and were hypothesized to take part in the mechanism of psychosis (Koethe, Hoyer, & Leweke, 2009; Sayin, 2012a, 2014a, 2014b). There may be other endogenous hallucinogens that may be responsible for the formation of dreams and ASCs (as in the case of hypnosis), along with DMT and endogenous cannabinoids. This hypothesis claims that the brain itself has a discrete autoactivation system to experience ASCs, as in many mystical and religious experiences, and this is a means to recollect archaic and ancestral information, which is recorded and coded in the limbic system and becomes overt during religious rituals induced by psychoactive plants and/or shamanic methods (such as by shamanic drumming, by music, through deep meditation, etc.).

In summary, in the limbic system there can be a splendid source of archaic information and a religious symbolic and thought pool, which may have surfaced during the influence of psychoactive plants in the old shamanic religious rituals. This shamanic archaic information may have been important for the evolution and existence of the *Homo sapiens* species once upon a time. Thus, the entoptic images, phosphenes, mythological figures, such as demons, spirits, gods, goddesses, angels, supranatural creatures, mythical creatures (such as Pan, satyrs, nymphs, dragons, trolls, etc.) in folk tales, or the figures and characters of the modern institutionalized religions (such as angels, Satan, Jinns, many other religious thoughts, ideas and figures, etc.), most probably had been envisioned under the influence of these psychoactive plants during those religious ceremonies and rituals (Ruck, 2006, 2008, 2013; Ruck & Heinrich, 2001; Ruck et al., 2009; Ruck et al., 2000; Sayin, 2012a, 2014a, 2014b). Therefore, many ancient polytheistic pagan religious figures and/or some of the modern monotheistic religious characters, figures, or images may have close relationships with the ASCs experienced during psychoactive plant ingestions since the dawn of *H. sapiens*. *As a further step, some of the figures and characters of modern contemporary religions, as well as old religions, might have been experienced in and derived from very ancient religious–psychedelic rituals, where different kinds of psychoactive plants had been used* (Figure 1).

APPLICATIONS TO OTHER ADDICTIONS AND SUBSTANCE MISUSE

- Some hallucinogens, for example, ibogaine, have been used as a remedy to control and treat the abstinence syndrome in opiate dependence, as accepted and approved by NIDA; thus, some psychoactive plants can be a cure for the human psyche and drug dependence, as it had been many centuries ago.
- The research in discovered or undiscovered effects and/or mechanisms of psychoactive plants may reveal many facts in neuroscience and in the area of substance misuse. New medicines and remedies can be discovered and synthesized.
- If the hypothesis that an area in the brain (designated the area tempestas), which induces a kind of ASC when the disinhibition on this circuitry is overcome, is true and a reality, then this information may be an important factor in the treatment of drug abuse and dependence, because such a circuitry in the brain, for example, area tempestas, may also be activated without drugs of abuse, for example, by electrical stimulation or by other means, such as meditation and lucid dreaming; while some of shamans are said to induce similar consciousness levels by other methods, such as using music, meditation, dancing, and drumming. If the basic mechanisms of the action of some psychoactive drugs are revealed, this information can be used to overcome and treat the abuse of some of the hallucinogens and other drugs of abuse.

DEFINITION OF TERMS

Psychoactive plant Plants that may induce altered states of consciousness and may change perceptions.

Opium A plant widely used for medicine in history; it has painkilling effects and is a narcotic analgesic.

Cannabis Also called marijuana or THC; it is a smoked mild hallucinogen. It may reveal the subconscious and may remind the user of many old memories. It was commonly used by shamans.

Wormwood A very ancient hallucinogen weed used in many cultures. The drink absinthe is made of wormwood; however, its use was forbidden in the twentieth century.

Peyote A cactus, its active ingredient *mescaline*, that induces very powerful, visual, and mystical hallucinations.

Ibogaine A very powerful hallucinogen found in Gabon in Africa. The Bwiti cult used to consume ibogaine to contact the spirits of ancestors during religious rituals.

Ayahuasca A very old Amazonian psychoactive plant brew, which contained DMT and MAO (mono amine oxidase inhibitors). The ayahuasca ritual is a night long ritual with its own characteristics. Many Amazon natives in Peru, Bolivia, Brazil, etc., used ayahuasca as a part of religious enlightening.

Entoptic images The images occurring during psychoactive plant use, which are thought to be a form of an innate and hidden language of the nervous system.

Area tempestas A hypothetical area in the brain that may become active during psychoactive plant use.

KEY FACTS

- Psychoactive plants are spread all over the globe and men or women have used them for centuries.
- Some of the psychoactive plants, which are banned today by industrialized societies, were cannabis, opium, magic mushrooms, ibogaine, ephedra, mandragora, *S. divinorum*, etc.
- During religious rituals, for centuries shamans and pagans used psychoactive plants for many different philosophical purposes.
- The chemicals in psychoactive plants may change human perception profoundly.
- Religious rituals, which were induced by psychoactive plants, might have influenced the religions.

SUMMARY POINTS

- Psychoactive plants are widespread and have been used by many cultures on the globe for centuries; they induce a kind of unusual, unexpected consciousness perception in human beings.
- Some of the psychoactive plants, which are banned today by industrialized societies, were cannabis, opium, psilocybin

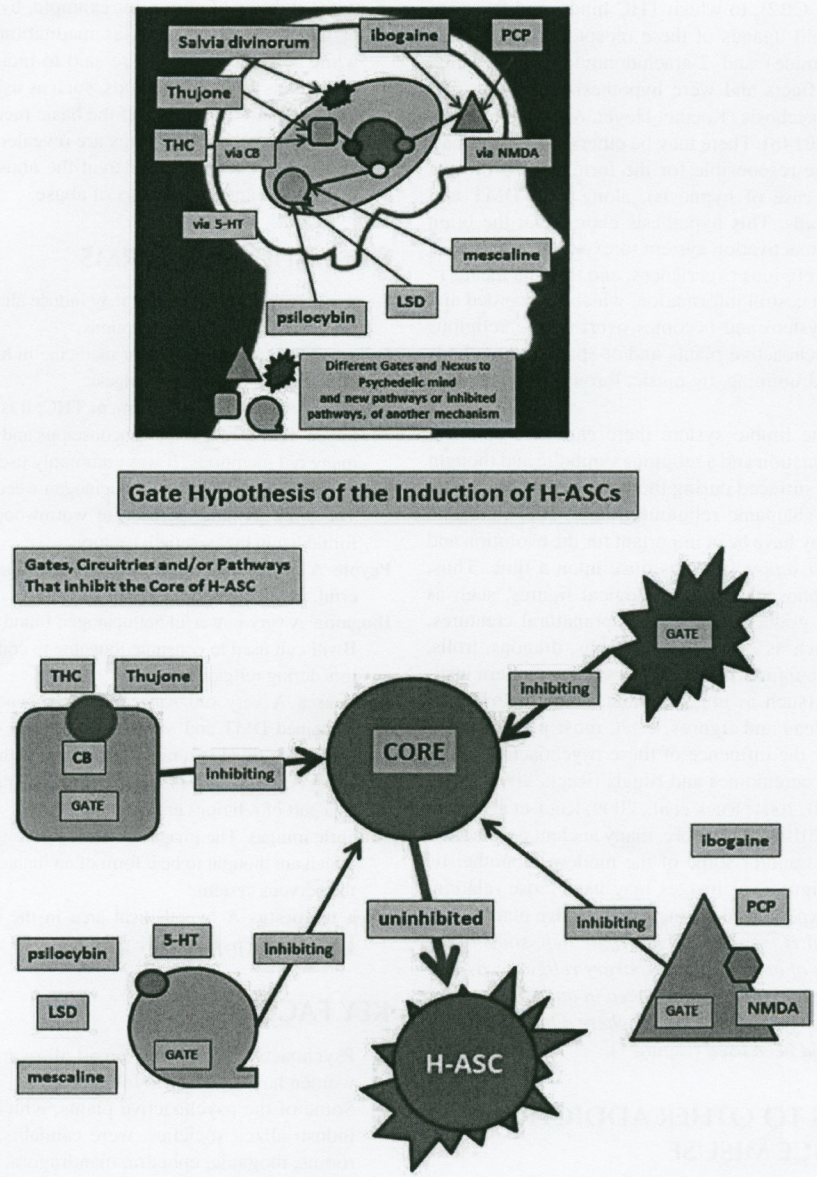

FIGURE 1 An alternative gateway hypothesis during the induction of hallucinogen-induced ASCs (H-ASCs). *From Sayin (2014b).*

(magic mushrooms), ibogaine, DMT-containing plants, *P. harmala*, harmine–harmaline-containing plants, bufotenin (toad toxin), muscimol (magic mushroom), thujone (*A. absinthium*), ephedra, mandragora, *S. divinorum*, etc.

- Psychoactive plants might also be capable of unraveling archaic information and the subconsciousness.
- The chemicals in psychoactive plants may change human perception profoundly.
- Most of the figures, characters, and myths in the old or new religions might have been created under the influence of altered states during religious rituals using psychoactive plants.

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REFERENCES

Aghajanian, G. K., & Marek, G. J. (1999). Serotonin and hallucinogens. *Neuropsychopharmacogy, 21*, 16S–23S.

Alper, K. R. A., Lotsof, H. S., Frenken, G. M. N., Luciana, D. J., & Bastiaans, J. (1999). Treatment of acute opioid withdrawal with ibogaine. *The American Journal on Addictions, 8*(3), 234–242.

Blainey, M. (2005). *Evidence for ritual use of entheogens in ancient mesoamerica and the implications for the approach to religion and worldview.*

Brunton, L., Chabner, B., & Bjorn Knollman, B. (2010). *Goodman and Gilman's the pharmacological basis of therapeutics* (12th ed.). New York: Mc Graw Hill.

Davis, W., & Weil, A. (1992). Identity of a new world psychoactive toad. *Ancient Mesoamerica, 3*, 51–59.

Fantegrossi, W. E., Murnane, A. C., & Reissig, C. J. (2008). The behavioral pharmacology of hallucinogens. *Biochemical Pharmacology, 75*(1), 17–33.

Glick, S. D., & Maisonneuve, I. S. (1998). Mechanisms of anti-addictive actions of ibogaine. *Annals of New York Academy of Sciences, 844*, 214–226.

Goodman, L. S., & Alfred, G. A. (1980). *Goodman and Gilman's the pharmacological basis of therapeutics* (6th ed. (Revised)). New York: Harcourt Publishers.

Gray, C. (2010). *The acid diaries: A psychonats guide to the history and uses of LSD*. New York: Park Street Press.

Griffiths, R. R., Richards, W. A., Mc Can, U., & Jesse, R. (2006). Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology, 187*, 268–283.

Hardman, J. F., Limbird, L. E., & Gilman, A. G. (2001). *Goodman & Gilman's the pharmacological basis of therapeutics* (10th ed.). New York: Mc Graw Hill.

Hasler, F., Grimberg, U., Benz, M. A., Huber, T., & Vollenweider, F. X. (2004). Acute psychological and physiological effects of psilocybin in healthy humans: a double-blind, placebo controlled dose-effect study. *Psychopharmacology, 172*, 145–156.

Henderson, L. A., & Glass, W. J. (1994). *LSD: Still with us after all these years*. New York: Lexington Books.

Hintzen, A., & Passie, T. (2010). *The pharmacology of LSD: A critical review*. Oxford: Oxford University Press.

Jung, K. G. (1968). *Man and his symbols*. New York: Dell Publications.

Katzung, B., Masters, S. B., & Trevor, A. J. (2012). *Basic and clinical pharmacology*. New York: Mc Graw Hill, Lange Publications.

Kent, J. L. (2010). *Psychedelic information theory: Shamanism in the age of reason*. Seattle: PIT Press.

Klüver, H. (1966). *Mescal and mechanisms of hallucinations*. Chicago: Phoenix Books, The University of Chicago Press.

Koethe, D., Hoyer, C., & Leweke, F. M. (2009). The endocannabinoid system as a target for modelling psychosis. *Psychopharmacology, 206*, 551–561.

Krippner, S., & Sulla, J. (2011). Spiritual content in experimental reports from Ayahuasca sessions. *Neuroquantology, 9*(2), 333–350.

Lerner, M., & Lyvers, M. (2006). Values and beliefs of psychedelic drug users: a cross-cultural study. *Journal of Psychoactive Drugs, 38*(2), 143–147.

Lewis-Williams, D. J., & Clottes, J. (1998). *The shamans of prehistory: Trance magic and the painted caves*. New York: Abrams.

Lewis-Williams, D. J., & Pearce, D. G. (2005). *Inside the neolithic mind: Consciousness, cosmos, and the realm of the gods*. London: Thames & Hudson.

Lilly, J. (1972). *The center of the cyclone: An autobiography of inner space*. New York: Bantam Books.

Maciulaitis, R., Kontrimaviciute, V., Bressolle, F. M., & Briedis, V. (2008). Ibogaine, an anti-addictive drug: pharmacology and time to go further in development, A narrative review. *Human Experimental Toxicology, 27*(3), 181–194.

MacLean, K. A., Johnson, M. W., & Griffiths, R. R. (2011). Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Psychopharmacology, 25*(11), 1453–1461. http://dx.doi.org/10.1177/0269881111420188.

Merlin, M. D. (2003). Archaeological evidence for the tradition of psychoactive plant use in the old world. *Economic Botany, 57*(3), 295–323.

Metzner, R. (Ed.). (1999). *Ayahuasca – Human consciousness and the spirits of nature*. New York: Thunder's Mouth Press.

Metzner, R. (2002). The role of psychoactive plant medicines. In C. S. Grob (Ed.), *Hallucinogens – A reader* (pp. 23–37). New York: Jeremy P. Tarcher/Putnam.

Mirante, D., & Kobrin, J. (2007). *Trance states and metaphor generation by Bricoleur*. http://lila.info/trance-states-and-metaphor-generation-by-bricoleur.

Móró, L., Simon, K., Bárd, I., & Rácz, J. (2011). Voice of the psychonauts: coping, life purpose, and spirituality in psychedelic drug users. *Journal of Psychoactive Drugs, 43*(3), 188–198. http://dx.doi.org/10.1080/02791072.2011.605661.

Nichols, D. E. (2004). Hallucinogens. *Pharmacology & Therapeutics, 101*, 131–181.

Passie, T., Halpern, J. H., Stichtenoth, O., Emrich, H. M., & Hintzen, A. (2008). Pharmacology of lysergic acid diethylaminde: a review. *CNS Neuroscience & Therapeutics, 14*, 295–314.

Pletscher, A., & Ladewig, D. (Eds.). (1993). *50 years of LSD: Current status and perspectives of hallucinogens*. New York: Parhenon Publishing Group.

Popik, P., Layer, R. T., & Skolnick, P. (1995). 100 years of ibogaine: neurochemical and pharmacological actions of a putative anti-addictive drug. *Pharmacological Reviews, 47*(2), 235–253.

Ruck, C. A. P. (2006). *Sacred mushrooms of the goddess: Secrets of Eleusis*. Berkeley, CA: Ronin Publishing.

Ruck, C. A. P. (2008). "Documentation", 85–136. In R. Gordon Wasson, A. Hofmann, & C. A. P. Ruck (Eds.), *The road to Eleusis: unveiling the secret of the mysteries*. New York, NY, and London: Harcourt Brace Jovanovich, Inc., 1978, reprinted expanded editions 1998.

Ruck, C. A. P. (2013). "Democracy and the dionysian agenda": 343–385. In J. A. Rush (Ed.), *Entheogens and the development of culture: The anthropology and neurobiology of ecstatic experience*. Berkeley, CA: Atlantic Books.

Ruck, C. A. P., & Heinrich, C. (2001). Old gods in new bottles: alchemical pharmacopoeia, 55–78, in Entheos. *Journal of Psychedelic Spirituality, 1*(1).

Ruck, C. A. P., Hoffman, M. A., & González Celdrán, J. A. G. (2009). *Mushrooms, myth and mithras the drug cult that civilized Europe*. California: City Light Books.

Ruck, C. A. P., Staples, B. D., Celdrán, J. A. G., & Hoffman, M. A. (2006). *The hidden world: Survival of pagan shamanic themes in European fairytales*. North Carolina: Caroline Academic Press.

Ruck, C. A. P., Staples, B. D., & Heinrich, C. (2000). *The apples of Apollo: Pagan and Christian mysteries of the Eucharist*. Durham, NC: Carolina Academic Press.

Sayin, H. U. (2010). *Expanded sexual response: ESR; ultra orgasm in women (Artırılmış Cinsel Doyum: ESR; Kadınlarda Ultra Orgazm)*. İstanbul: Tantra Akademi/Onur Publications.

Sayin, H. U. (2011). Altered states of consciousness occurring during expanded sexual response in the human female: preliminary definitions. *Neuroquantology, 9*(4), 882–891.

Sayin, H. U. (2012a). A comparative review of the neuropharmacology of hallucinogen-induced altered states of consciousness: the uniqueness of some hallucinogens. *NeuroQuantology*, *10*(2), 316–340.

Sayin, H. U. (2012b). Doors of female orgasmic consciousness: new theories on the peak experience and mechanisms of female orgasm and expanded sexual response. *NeuroQuantology*, *10*(4), 692–714.

Sayin, H. U. (2014a). The consumption of psychoactive plants during religious rituals: the roots of common symbols and figures in religions and myths, (research and review). *Neuroquantology*, *12*(2), 276–296.

Sayin, H. U. (2014b). Does the nervous system have an intrinsic archaic language? Entoptic images and phosphenes (research and review). *NeuroQuantology*, *12*(3), 427–445.

Sayin, H. U. (2014c). *The psychology of orgasm in women*. İstanbul: Tantra Akademi-Onur Publications.

Sayin, H. U. (2014d). (2nd ed. (Expanded)). *Different dimensions of sexuality: Deep sex (Cinsellikte Farklı Boyutlar: Derin Seks)* (2 Vols. İstanbul: Tantra Akademi/Onur Publications, 755–767 (880 pages), (Chapter 25).

Schultes, R. E., & Hofmann, A. (1992). *Plants of the gods: Their sacred, healing and hallucinogenic powers*. Rochester, VT: Healing Arts Press.

Siebert, D. J. (1994). Salvia divinorum and salvinorin A: new pharmacologic findings. *Journal of Ethnopharmacology*, *43*, 53–56.

Stafford, P. (1978). *Psychedelics encyclopedia*. Berkeley, CA: Ronin Publishing Inc.

Strassman, R. (2000). *DMT: The spirit molecule*. Rochester, Vermont: Park Street Press.

Tart, C. (1990). *Altered states of consciousness* (3rd ed.). New York: Harpercollins.

Vollenweider, F. X. (2001). Acute psychological and neurophysiological effects of MDMA in humans. *Heffter Review of Psychedelic Research*, *2*, 53–63.

Wasson, R. G. (1980). *The wondrous mushroom: Mycolatry in Mesoamerica*. New York: McGraw Hill.

Wasson, R. G., Hofmann, A., & Ruck, C. A. P. (1978). *The road to Eleusis: Unveiling the secret of the mysteries*. New York: Harcourt Brace Jovanovich.