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# Psychointegration:

## The Physiological Effects of Entheogens

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by Michael Winkelman



Alex Grey, *Viscera* (detail), 1979.  
Oil on linen (84" x 46")

Vision inducing plants, commonly referred to as entheogens, hallucinogens, and psychedelics, have played important roles in the therapeutic and religious practices of many societies. Cross-cultural research indicates that their common effects include the induction of powerful emotional, cognitive and therapeutic reactions and interpretations, suggesting these are consequences of similar psychophysiological properties of the substances. Neurophysiological studies illustrate the common physiological effects of entheogens involve psychointegrative effects through intervention in the serotonergic neurotransmitter systems. Psychointegration underlies the entheogens' cross-cultural use as sacred and therapeutic agents. The effects of psychointegrators upon neural, sensory, emotional, and cognitive processes illustrate their adaptive effects in the stimulation of integrative information processing and enhancement of access to lower structures of consciousness. Psychointegrative effects derive from the disinhibition of emotional and social processes and the stimulation of systemic integration of brain functions, particularly the integration of limbic system processes with neocortical

processes. Psychointegrators couple nonlinguistic behavioral and social-emotional dynamics with rational processes and functionally integrate different systems of the brain while enhancing spiritual and transcendent experiences by stimulating brain operations supporting basic structures and functions of consciousness (self, other and affect/attachment).

### INTRODUCTION

The plants with entheogenic effects have played important roles cross-culturally and across history. Where used, they generally have been viewed as central sources of spiritual experience and religious participation, providing inspiration for the institutionalization of religious sentiments and activities (e.g. see Dobkin de Rios 1984, Schultes and Hofmann 1979, Winkelman and Andritzky 1996). These plants are important in understanding cultural and religious development. As La Barre (1972) pointed out, understanding the pharmacological effects illuminates their central roles in

many cultures as sources of religious and spiritual inspiration, shamanic ecstasy and visionary experience. An integration of laboratory studies of entheogens' neurophysiological effects and neurotransmitter interactions with ethnographic and cross-cultural studies on their social and therapeutic uses illustrates why they have important personal and cultural functions. Such substances may be also seen as dangerous agents and demonic influences to be prohibited. Understanding why these substances evoke such powerful social reactions requires knowledge of their biophysiological, cognitive and psychosocial effects.

This paper develops a neurophenomenological perspective (e.g. see Laughlin d'Aquilli and McManus 1992; Winkelman 2000) on the institutionalized cultural use of entheogenic plants, addressing their biochemical mechanisms to enhance understandings of their psychodynamic and phenomenal effects upon human experience. This interdisciplinary synthesis provides the rationale for the term "psychointegrator" to refer to the central effects of entheogens, and contributes to a "neurotheological" perspective on the biological mechanisms of sacred experiences (e.g., d'Aquilli and Newberg, 1999; Joseph, 2001; Winkelman, 2000). The cross-cultural social and therapeutic uses of entheogens are based in their neurophysiological effects upon the serotonergic neurotransmitter systems. This is the basis for their characterization as "psychointegrators", enhancing processing of fundamental information regarding self, emotions, social relations, attachments, and the overall integration of information in the brain. The neurological foundations explain the widespread common patterns of use of these plant substances in religious and therapeutic practices. Entheogenic plants are generally used along with other means of inducing altered states of consciousness (ASC) in shamanistic healing practices that reflect the universal institutionalization of the psychobiological potentials of ASC (Winkelman 1986a & b, 1990, 1992). This use of ASC is functional, based upon physiological changes that facilitate healing and cognition through a number of physiological and psychological mechanisms (Winkelman 1992, 2000). Shamanic ASC are the quintessential spiritual experience of "ecstasy", providing a neurological basis for the role of chemical agents as sources of spiritual experience.

### **Cross-Cultural Patterns in Societal Responses to Entheogens**

The cross-cultural use of entheogens is consistently associated with the fundamental principles reflected in the etymology of the term—the belief that they are powerful spiritual forces that provide access to internal sacred worlds and have simultaneous therapeutic applications (see Dobkin de Rios 1984; Emboden 1972, 1989; Furst 1972, 1976; Riedlinger 1990; Schultes 1972; Schultes and Hofmann 1979; Wasson 1980; Wasson et al. 1974, 1986; Winkelman 1996). Entheogens not only dramatically alter experience, shifting self-awareness to an "other-worldly" sacred or spiritual domain; they also have important applications as therapeutic agents. Furthermore, there are ubiquitous interpretations of



Alex Grey, *Ayahuasca Visitation*, 2001. Colored pencil and acrylic on paper (11 3/4" x 16 1/4")

these plants' effects, a universal social psychology that involves: personal relations with an animistic world (especially power animals); participation in a mythical time which reaffirms cultural values and beliefs; contact with a spiritual source of power and self identification; ego dissolution and transformation; healing and divination; and enhancement of social solidarity and identity, and interpersonal and community relations (Winkelman 1996).

Other cross-cultural patterns of entheogen use involve the context of initiation. Grob and Dobkin de Rios (1992) point to the cross-cultural pattern of managed use of these substances in contexts where elders employ them in re-socialization rites. These often constitute collective puberty or initiation rites that channel the individual in transition to adult status. Entheogens are also widely used in the context of shamanic initiation and training (Harner 1973, Furst 1976, Winkelman 2000) and may have contributed to their origins.

The worldwide interpretation of these substances as having simultaneous religious, spiritual and medicinal roles reflects their effects upon basic structures of consciousness. McKenna (1992) documents the worldwide pre-historic practices of using mushrooms as a central part of a cultural ethos relating to the earth and mysteries of nature. He suggests that the mushrooms provoke enhanced self-awareness and a sense of contact with a "Transcendent Other." This reflected an experience of the sentience and intelligence of nature, and an intimate awareness of our interconnectedness with nature, the earth, and the universe.

### **Societal Differences in the Use of Psychointegrative Plants**

Though very widespread, the societal use of entheogens is not universal but varies as a function of social conditions. Different types of societies make varying assessments of their value and potentials. Differences in their use is reflected in the dramatically larger number of hallucinogenic plants used in the New World in comparison to the Old World cultures (LaBarre 1970). This variation has been attributed to cultural factors, since there are many entheogens present but not considered religious in the Old World (Schultes and Hofmann 1979, LaBarre 1970, Furst 1972). Institutional political factors are also responsible for the lack of use of these psychointegrator plants. Hallucinogenic plant use is not typically institutionalized in complex societies (Dobkin de Rios and Smith 1977; Winkelman 1991c). Increasing social and political complexity leads to reduction in the use of psychointegrator plants, with the societal use of hallucinogens negatively correlated with the levels of political integration (Winkelman 1991c). This negative relation to political integration reflects the dynamics of their psychocognitive effects and their inherent conflicts with the political needs of the leadership of hierarchical societies.

The repression of, and restrictions on, the use of entheogens (as a function of

increasing political integration) reflects their patterns of use and their effects upon social relations and personal interpretations of the world. Dobkin de Rios and Smith (1977) suggest that hallucinogenic plants are typically repressed in state level societies because they constitute a potential threat to the religious authority and interpretations of those who hold social and religious power. These substances are typically employed in social settings where local idiosyncratic interpretations derived from the set and setting (personal expectations and the local situational influences) play powerful roles in shaping interpretations of the experiences. Local interpretation of the experiences could pose a threat to the centralized hierarchical control of religious consciousness and political authority, and undermine control in religious, political and social arenas. These conflicts could be expected to result from the typical cross-cultural patterns of use of these plants in small group community settings, where they enhance group cohesion and reaffirm immediate values and beliefs (Dobkin de Rios and Smith 1977). They consequently reinforce a traditional community based mythos and social order rather than hierarchical ideological and political ideologies.

The social contexts associated with the use of entheogens also suggest that they are used to provide means of facilitating psychosocial adaptations to social change. Entheogens appear to be most intensely used under conditions of rapid social change, where they serve as a means of facilitating adaptation to changing psychosocial circumstances (e.g. see Andritzky 1989, Aberle 1966), facilitating mediation between conceptual systems. The widespread use of the *Banisteriopsis* genus (ayahuasca) in the Amazonian basin in collective rituals which strengthen social cohesion and group identity also assist in the management of acculturation problems by mediating between the indigenous world view and the European derived systems (Andritzky 1989). The symbolic synthesis of traditional and new beliefs that facilitate psychosocial adjustment is achieved through the images that appear while under the influence of the plants. Similar dynamics are reported for the selective adoption of the Peyote Religion (Native American Church) among the Navaho (Aberle 1966). The historical development of the Peyote Church illustrates its role in psychosocial adjustment. The early Navajo adherents were primarily those who experienced the greatest relative deprivation due to federally imposed livestock reduction programs. The Native American Church provided a new ethical code that facilitated an adjustment of the Navajo values of collectivism to the broader society's emphasis on individualism. The burgeoning use of hallucinogens in American culture was also associated with periods of rapid social change in the U.S. (i.e., 1960's and 1990's).

### **Botanical, Chemical Experimental, and Neurological Approaches to Entheogens**

The (pre) historical and cross-cultural commonalties in the uses of entheogens, and in particular their similar social and therapeutic utilization patterns, reflect underlying biological mechanisms and require a neurobiological explanation. The specific physiological mechanisms of the general and specific effects of entheogens are derived from the physiological properties of these substances. The commonalties in the experiences induced by entheogens suggest that they should share a common botanical and chemical classification. But there is no single botanical grouping or chemical classification for the diverse plants and substances that produce entheogenic effects, occurring in nearly 100 species and a wide range of genera and families (Schultes and Hofmann 1979). Traditionally, classification of a substance as a hallucinogen was based

in non-toxic subjective effects upon human experience, the ability to produce visions, voices, and alterations of perceptions and mood (Siegel 1984).

Because of the subjective basis of the classification of these substances and their effects, social and cultural factors have dominated the labeling of these substances. This is manifested in the medical definition of hallucinogens, which characterizes them as false perceptions and disturbances of thought, experiences without a basis in reality. Similarly, the early psychiatric term "psychomimetic" implies a psychotic and delusional basis for the experiences, but does not reflect their central phenomenological experiences. The cross-cultural use and interpretations of these substances instead reveals that they invoke perceptions of a spiritual realm, a veridical source of important information, in direct contrast with the implications of delusions emphasized by traditional nomenclature.

Recognition of the shortcomings of the medical terms and traditional definitions has prompted the development of new terminology.

The term "psychedelic" developed mainly in the context of LSD experiences, referring to the extraordinary conceptual ("mind-manifesting") impact upon human experience and understanding. The general connotations associated with the term psychedelic, derived as they are from the closely-associated counter-cultural movement, has made the term undesirable to many. The focus on the mental also fails to capture the significant emotional and therapeutic effects. Grof (1989) proposed the term holotropic to reflect the psychodynamic actions of these substances in forcing an orientation towards wholeness. Holotropic does reflect global effects, but does not explicitly emphasize the salient spiritual, emotional, and cognitive elements central to the experiences induced by psychointegrators.

Shultes and Hofmann (1979) referred to these substances as "plants of the gods," reflecting the referents often embodied in indigenous terms for these plants. Many religions throughout history and prehistory and around the world have viewed their practices as inspired by the indwelling spiritual influences of certain sacred plants. In light of these ubiquitous beliefs, Ruck, Wasson, Staples, Bigwood, and Ott (1979) introduced the term entheogen from the Greek *entheos*, referring to "the god within," and *gen*, "action of becoming." Entheogen reflects many cultural perceptions of these substances and is very appropriate for classification of their beliefs. It can be argued, however, that the concept of entheogen does not reflect other personal and cognitive dynamics of these plants' effects, and implies a strictly spiritual basis that may alienate some who wish to take a more agnostic/scientific approach to the study of these substances.

I have suggested the term psychointegrator as being based both upon the neurological and experimental effects of these substances (Winkelman 1996). Cross-cultural data on traditions utilizing these substances and the neurobiological research on their mechanisms of action concur in seeing these substances as producing psychointegration. Psyche reflects not only the mind, but also the soul and spirit (the broader bases to which psyche once referred), thus it encompasses the spiritual dimensions emphasized in the term entheogen. Psychointegrator implies the stimulation of the mind, emotions, soul and spirit to integrative development (Winkelman 1996) in that they stimulate mental and emotional catalyzing processes, and encourage a holistic developmental integration of the mind, spirit and soul.

The neurotransmitter actions of these substances involve a number of psychointegrative effects and provide a basis for explaining their cross-cultural similarities. Beginning with neurotransmitter processes, and continuing upward, across hierarchical levels of complexity in the brain and mind, psychointegration reflects the effect of entheogens upon processes from neurotransmitter activity, through physiological, behavioral, emotional, cognitive and psychological levels. The basis of an entheogen's activity derives from its intervention in the serotonergic neurotransmitter system, a "neuromodulatory" system whose properties and effects exemplify psychointegration. That is, the modulating effects of serotonin have an overall integrating effect on the dynamics of the neurotransmitter systems.

The introduction of the term psychointegrator is not intended to replace all other terms for sacred plants, nor to preclude further terminological differentiation (e.g., Naranjo 1996, Stafford 1992). Rather, the intent is to supercede inaccurate and value-laden terminology and to provide a neurological basis for explaining the commonalties in the effects of these substances. Such neurological effects can also provide an explanation for the roles of entheogens, activating brain processes that enhance fundamental aspects of sacred experiences. A fundamental aspect of entheogenic and sacred experiences is the generation of a sense of connectedness, oneness and psychological health and healing—perceptions that reflect the effects of psychointegration.

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Alex Grey, *Ohio Song*, 2001. Oil on linen (11" x 14")

## Neurological Perspectives on Psychointegrators

The effects of entheogens upon neurotransmission are responsible for the cross-cultural similarities in physical, emotional, cognitive and sacred experiences and their therapeutic applications. Neurological studies indicate that the major entheogens have common effects upon neurotransmitters (Jacobs 1984a, Mandell 1985). Their effects upon brain function in humans and other animals have been extensively investigated, particularly in the case of LSD (Jacobs 1984a; Mandell 1985). Most of these substances (i.e., indoleamines like psilocybin and LSD, and the phenethylamines like mescaline) have effects that generalize to one another, reflecting similar neurochemical mechanisms of action (Mandell 1985) and global properties involving effects upon serotonin pathways and mechanisms (Jacobs 1984, Aghajanian 1994).

Laboratory studies of LSD effects have provided diverse findings, derived from various procedures, dosages, phase effects, and "set and setting" factors (Freedman 1984). The basic mechanisms of their action, however, are well recognized, and the LSD-like entheogens are well understood in terms of their effects upon brain mechanisms (Mandell 1985). The primary neurotransmitter system affected by LSD-like entheogens is serotonin. The entheogens most similar to serotonin are: LSD and lysergic acid amide (LSA, e.g., morning glories); psilocybin (e.g., from mushrooms of the genera *Psilocybe*, *Conocybe*, *Panaeolus* and *Stropharia*; harmine and harmaline from *Banisteriopsis caapi* and *Peganum harmala*; and DMT (dimethyltryptamine) and similar substances from the *Viola* genus and species of *Anadenanthera*. Mescaline (from peyote) and similar synthetic drugs (STP, DMA, MDMA) resemble norepinephrine, but have end effects similar to the LSD-like substances.

Entheogens' effects upon sensory, behavioral, emotional, cognitive and psychodynamic experience illustrate their stimulation of integrative information processing, providing the rationale for their characterization as psychointegrators. Their systemic effects upon the autonomic nervous system include the induction of limbic system discharge patterns that enhance interhemispheric synchronization and coherence, and limbic-frontal cortex integration (Mandell 1980, 1985; Winkelman 1996). These substances evoke an integration of brain functioning from neurophysiological through cognitive levels, stimulating the integration of pre-linguistic social, emotional and behavioral processes with the frontal cortex's linguistic and egoic functions. The therapeutic roles of psychointegrators derive from the activation of

emotional and personal processes of the limbic system and paleomammalian brain that underlie personal identity, attachment and social bonding, emotion, conviction (in beliefs), and their integration with neocortex processes.

Entheogens stimulate the integration of the brain's behavioral and social-emotional processing output with language based ratiomentation, egoic representations, and personal identity. This activation is reflected in the theta wave linkages between the limbic-emotional and the behavioral brain that send ascending impulses into the frontal cortex. These biochemically based physiological effects may produce awareness of repressed memories, integration of emotional and rational processes, and the resolution of conflicts through integration of various functional systems of the brain. I have introduced the term psychointegrator in order to refer to the systemic integrative effects of these substances.

### **Psychointegrators and Neurotransmitter Functions and the Brain**

Neurotransmitters act through a number of mechanisms, exercising inhibitory or excitatory effects and modulating the effects of other neurotransmitters. Entheogens have these roles in the serotonergic system, substituting for neurotransmitters in some receptor locations, and, in others, functioning as antagonists (or blockers) that prevent the normal response.<sup>1</sup> These actions<sup>2</sup> upon neurotransmission mediate their profound effects upon human experience and consciousness.

There are at least four different types of CNS serotonin receptors with different kinds of effects in different parts of the brain.<sup>3</sup> The LSD-like psychointegrators interact with serotonergic neurotransmitters across all major levels of the brain, generally augmenting normal processes in these structures.

Basic commonalties of the LSD-like indole-based psychointegrators involve the blockage of serotonin re-uptake, enhancing action of the brain's serotonergic systems (Mandell 1985). Another mechanism of psychointegrators' effects upon serotonin action is the decreased action of target neurons in the forebrain; LSD exercises a blocking effect upon these serotonin neurons, resulting in the disinhibition of their typical repression. The limbic system's emotional processing areas and the visual areas of the cortex have the most intense disinhibition and therefore greatest activity, resulting in intense visual and emotional experiences. This disinhibition of the structures of the mesolimbic temporal lobe manifests as synchronous high voltage activity in the hippocampus, and as synchronous discharges in the temporal lobe limbic structures (Mandell 1980, 1989; Fink 1978, Aghajanian 1982; Hoffmeister and Stille 1982). Synchronous brainwave patterns result which drive impulses into the frontal cortex, replacing its characteristic desynchronized fast-wave activity with slower, more coherent wave patterns. In thurn, these coherent systematic discharges produce synchronous, slow-wave patterns (3-6 cps theta) in the frontal lobes, and ultimately interhemispheric synchronization of the cortex (Fairchild, Alles, Jensen and Mickey 1967, Mandell 1980).

Mandell (1980) suggests that the common neurobiochemical pathway is based in biogenic amine-temporal lobe interaction involving high voltage slow wave EEG activity in the hippocampal-septal area of the limbic system. The limbic system discharge pattern induced by entheogens produces inter-hemispheric synchronization and coherence, limbic-cortical integration, and the synthesis, integration and coherence of



thought and emotion (Mandell 1980, 1985; Winkelman 1986a, 1992). Thus the effects of biochemical psychointegration include increases in the coherence of brain discharges, an enhanced integration of feelings and thoughts, and the catalyzation (of often profound) personal-psychological insights. Driven by the underlying limbic functions, entheogens stimulate the brain to process information in this integrated fashion.

Psychointegrative results derive from a range of biochemical mechanisms upon brain function. These effects on neurotransmission enhance brain activity by reducing habitual repressions while simultaneously stimulating processes that are normally dissociated (such as simultaneous dreamlike mentation with ego awareness). Psychointegrators increase activity of the raphe and reticular formations of the brain stem area, the limbic system, (particularly the hippocampus and amygdala), and the visual and auditory areas of the frontal cortex. This results in the stimulation of memory, emotions, motivation, cognitive processes, attention, awareness and environmental orientation.

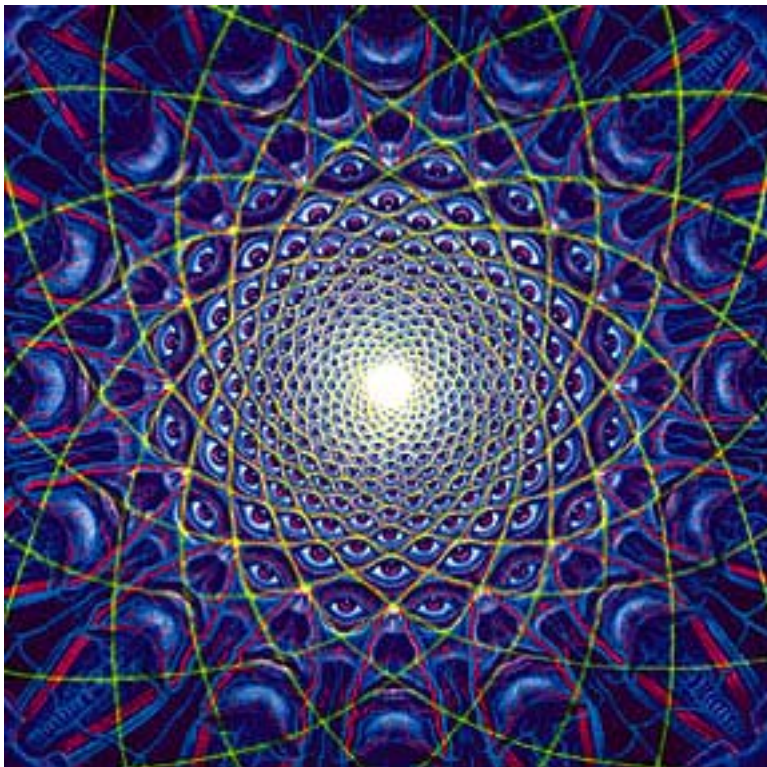
Such synthesis of whole brain function enhances the regulation of the autonomic nervous system and the integration of emotions and visual-cognitive representations (Winkelman 1996, 2000). LSD-like compounds also increase arousal, heightening sensory receptivity and responsiveness, which induce a more thorough and random examination of a given environment. This phenomenon, which is almost universal at lower doses, again demonstrates the reduction of typical response patterns, habituation, which often leads to new behavior patterns and perspectives. High dosages tend to lead to withdrawal (i.e., 'incubate') and a focus upon the internal environment, where limbic activity forces material from the sub- or unconscious into awareness. Elevation of repressed/forgotten memories into consciousness permits catharsis and abreaction, allowing conflicts to be confronted and resolved. The tendency of these substances to elicit distressing personal material (i.e. unresolved conflicts, repressed experiences, and unintegrated aspects of ones psyche) suggests that the stimulation of the limbic system provokes the release of such unresolved issues as it is related to the sense of self and social attachments.

The limbic-frontal driving induced by psychointegrators also produces interhemispheric synchronization, producing integration of unconscious material into the cerebral cortex. This results in an integration of feelings with thoughts, enhancing insight. With an enhanced awareness of repressed memories, personal emotional liability increases, disrupting habitual behavior patterns and dissolving problematic egocentric fixations and repressions. Thus stimulating psyche-dynamic reprogramming by permitting the conscious consideration and expression of repressed aspects of the self.

Psychointegrators primarily enhance the activation of the aspects of the brain that MacLean (1990, 1993) refers to as the R-complex and the paleomammalian brain, or limbic system. The R-complex is a "behavioral" brain that manages motor activities and their routinization, coordinating basic social interaction. The paleomammalian brain manages processes associated with self, identity, species survival, family and social relations, learning and memory, and sexual and aggressive emotions as well as their behavior integration. Entheogens (and ASC in general) enhance systemic integration of the psyche by producing heightened arousal and awareness, and by interfering with habituated behavioral routines. The paleomammalian brain and limbic system provide

the social and emotional mentation and behavior. These fundamental cognitive processes involve nonverbal communication, and forms of mental and social representation that manage processes of emotional and social life.

By inducing experiences through the evocation of these underlying structures of consciousness and brain function, entheogens produce experiences that are interpreted and defined as spiritual. Grof's (1975, 1980, 1992) many years of clinical research with LSD and holotropic procedures has resulted in new models of the nature of human consciousness. Based on these experiences and research, he has identified the transbiological realms: the perinatal domain of (pre-) birth experiences and the transpersonal domain, of archetypal and mystical structures. The transpersonal domain reveals dimensions of human consciousness that lie beyond the easily encapsulated egoic identity, and provide fundamental or 'primary' spiritual experience. Grof's work on the personal biographical level of the perinatal (domains of-OUT) experience has demonstrated the effectiveness of entheogens in bringing the memories and conflicts embedded at this level into consciousness, and permitting their integration. Naranjo's (1996) studies suggest that entheogens activate "Kundalini phenomena," high levels of organismic self-regulation as a consequence of ego suspension and the activation of mental structures.



Alex Grey, *Collective Vision*, 1995. Oil on linen (84" x 46")

The inherent potential of entheogens to induce psychosocial psychointegration is reflected in the wide typology of LSD experiences. These differences result from effects mediated by "set and setting" and the personal, social or transpersonal expectations for the experience. "Set" refers to these beliefs, attitudes, and expectations that one inevitably brings with them, while "setting" refers to the consequences of situational influences upon the experience. Such effects are manifested in the different medical paradigms on the effects of LSD: which include the psychomimetic, psycholytic, and psychedelic (Yensen 1985; Bravo and Grob 1989). The different paradigms of LSD-effects are attributed to extrapharmacological factors derived from expectations and situational

circumstances. It is illustrative at the "psychointegrative" effect that the subjects' experiences are understood to also reflect expectations of the researchers.

## **Psychointegrators, Altered States of Consciousness, and the "Divine Other"**

The disinhibition of the serotonergic neurotransmitters systems and the resulting loss of their inhibitory effects upon the mesolimbic temporal lobe structures underlies the common effects of entheogens in producing altered states of consciousness (ASC) and the associated transcendental or transpersonal experience. Systematic changes in brain processes are common to many means of inducing ASC<sup>2</sup> (Winkelman 1986a, 1992, 2000) or "transcendent state" (Mandell 1980, 1985) and the basis for the universal application of ASC in healing practices (Winkelman 1986b, 2000). The common psychophysiological changes associated with diverse ASC involve the replacement of normal waking EEG by cortical synchronization (produced by high-voltage, slow-wave discharges originating in the limbic system), which links the levels of the brain with coherent synchronized brain wave patterns. ASC generally replace the normal waking physiological patterns, characterized by the external orientation of attention, with an internally oriented parasympathetic dominant state.

Elsewhere I have shown that various ASC constitute different means of accessing a common mode of consciousness that represents an optimized homeostatic balance among different functional systems of the brain, permitting the emergence of integrative psycho-physiological operations. This integrative mode of consciousness is as fundamental to human psychobiology as the dream, deep sleep, and waking, and underlies the universality of shamanic healing practices. Since ASC's exemplify the kinds of experiences produced by entheogens, we must conclude that their dynamics be understood in the broader context of ASC experiences.

The fundamental cultural roles of entheogens are shared with other methods of altering consciousness, being represented in shamanism and related ASC based healing practices found in all cultures (shamanistic healers), a universal institutionalization of the psychobiological potentials of ASC (Winkelman 1986a, 1986b, 1990, 1992). Entheogens often serve as a primary means for inducing ASC in the training of shamanic healers and in community rituals for healing. Most shamanic practices do not use entheogens, although these healers still serve the same cultural goals of healing and providing spiritual experiences. The role of these ASC lies in their functional effects, inducing the physiological changes that facilitate healing and divination through the stimulation of integrative brain functioning from the neurophysiological through cognitive levels. This suggests that the cultural roles of entheogens be understood also in the broader context of institutionalized practices for producing spiritual experiences through ASC.

The primary effects of entheogens and ASC are elucidated in reference to the nature of spontaneous religious experience (Stark 1997) and the brain systems elicited by psychointegrators (Winkelman 1996, 2000). Spontaneous religious experiences involve sensations, perceptions and feelings that include some sense of contact with a 'divine' agency that can provide interactive communication with the subject. Religious experience, as essentially a sense of contact with a "Divine Other," and means of developing an enhanced awareness of the divine aspects of self, is found universally because it results from the function of innate brain structures, operators and modules (Winkelman 2000; cf. D'Aquili and Newberg 1996, Joseph, 2001).

The areas of the brain primarily responsible for managing self and external awareness are based in the paleomammalian brain (MacLean 1990). This "emotional

brain" is also a "social brain," effecting fundamental aspects of attachment with, and reference to, others. The emotional bonding that first emerged with the paleomammalian brain, evolved to include attachment to others—kin, community, and the unknown spiritual "Other". The major effects of psychointegrators on the paleomammalian brain (and its fundamental processes) provide a basis for an enhanced sense of awareness of self and other (i.e. Buber's 'I and Thou'), which is basic to religious and entheogenic experience. Thus neurophenomenological perspective suggests that the properties of entheogens derive from a general enhancement of specific aspects of brain function that have a role in managing self, other, affect and conviction about beliefs.

## **CONCLUSIONS: SYSTEMIC INTEGRATION OF BRAIN FUNCTION**

Spontaneous mystical experiences and those induced by entheogens have similar qualitative and quantitative effects upon both subjective experience and brain functioning. These parallels reflect the manipulation of similar brain processes and aspects of consciousness, indicating that such experiences are endogenous to brain structures and are not dependent on the unique properties of entheogens. Therefore our understanding of entheogens should be placed in the broader context of ASC and integrative mode consciousness models. Conforming to the fact that entheogens derive their characteristic properties from their effectiveness as psychointegrators and from their influences upon the innate structures and modules of the brain (Winkelman 2000, 2002).

The worldwide uniformity of the use of ASC reflects underlying psychobiological potentials. While cross-cultural variation exists in ASC phenomena, this reflects social influences upon the adaptation of these underlying biochemical potentials for ASC (Winkelman, 2000). The psychobiological basis of both shamanic experience and other "natural" ASC derived from the use of entheogens has resulted in the continued re-manifestation of these practices in the contemporary world. This is seen in numerous religio-therapeutic and Neo-shamanic groups active today, as well as the resurgence of indigenous shamanic traditions, the widespread adoption of peyote religion among Native Americans over the past century, most recently the development of a vast international "rave" culture, and the worldwide resurgence in entheogenic religions.

The impact on, and importance of, entheogenic plants in human cultures confirms their important role in facilitating psychointegration, helping to meet needs through the elevation and activation of innate structures, and the stimulation of integrative processes. Humanity's innate drive to seek out ASC's, manifests in a recurrent cycle of "rediscovery" of ASC, within societies. This illustrates a persistent need within all cultures to provide safe and legitimate access to these experiences. The lack of formal societal structures that instruct and accommodate ASC will only assure that the spontaneous discovery and exploration will continue as counter-cultural, (as was seen in the 60's LSD movement and the raves of the 90's).

Cross-cultural patterns of entheogen use illustrate their potential role in meeting a range of psychodynamic needs, in addition to their application for psychointegration. Psychointegration plays a critical therapeutic role in managing the needs of developmental change and crises induced problems that require the integration of conscious, pre-conscious and unconscious processes. This applies particularly to the

integration of behavioral routines and socioemotional dynamics into a new gestalt. The conjunction of healing with spirituality reflects an integration of psychophysiological and psychocultural dynamics and has been a fundamental adaptation found universally within traditional societies in the form of shamanistic healing practice. A recurrent emphasis upon entheogens as an important means of achieving this adaptation reflects the need of modern cultures to dramatically reorient psychocultural dynamics to account for the many changes that have occurred in social and cosmological dynamics, producing new patterns of psychointegration. The use of these substances will continue in the rapidly changing world and requires that societies take informed and rational approaches to their managed use (c.f. Winkelman 2001).

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## NOTES

<sup>1</sup> Serotonin 5-HT<sub>1A</sub> receptors in the raphe system mediate responses of the serotonergic neurons with respect to their own transmitters (Aghajanian 1994: 138). These receptors show a strong sensitivity to LSD-like substances (Aghajanian 1994: 140), inhibiting their firing in the raphe area and depressing neuronal firing in lower areas of the brain (the dorsal hippocampus, hypothalamic suprachiasmatic nucleus, amygdaloid cell, caudate-putamen, substantia nigra, trigeminal nucleus, spinal-cord interneurons, spinothalamic-tract neurons and the mesencephalic reticular formation) (Aghajanian 1981: 165). LSD effects the hippocampus by blocking or suppressing the typical depressant functions of serotonin, creating responses conditions similar to dreaming and contributing to production of the typical visual or hallucinatory experiences by disinhibiting postsynaptic neurons in the limbic and visual areas.

Indoleamine and phenethylamines cause greater activation of 5-HT<sub>2</sub> serotonin receptors relative to other serotonin receptors (Aghajanian 1994). Primary effects of LSD-like psychointegrators are through the action on the 5-HT<sub>2</sub> serotonergic neurons (Glennon 1990: 43). Large concentrations of serotonin 5-HT<sub>2</sub> receptors are in the limbic system in the hypothalamus and basal ganglia; these sensory processing functions are antagonized by LSD (Kruk and Pycock 1991). LSD-like psychointegrators also affect the cerebral cortex and the locus coeruleus 5-HT<sub>2</sub> receptors (Aghajanian 1994). LSD affinity for 5-HT<sub>2A</sub> and 5-HT<sub>2c</sub> receptors facilitates the functioning of the locus coeruleus, which receives numerous somatosensory and visceral inputs and projects diffusely to most of the brain (Miller and Gold 1993). These 5-HT<sub>2</sub> serotonin sites play a role in the control of anxiety and reduction of schizophrenic symptomology (Ribeiro 1991).

LSD-like psychointegrators activate the serotonergic neurons in the locus coeruleus, which serves as a nodal point for convergence of somatosensory and visceral information. The locus coeruleus projections innervate most areas of the neuraxis, principally the thalamus, hypothalamus, cerebellum, basal forebrain, hippocampus and neocortex (Aghajanian 1994, Role and Kelly 1991). LSD-like psychointegrators effect the somatodendritic region of the serotonin autoreceptors in the raphe neuron sites, inducing a selective and potent inhibition of the tonic firing of the dorsal raphe nucleus. This also results in a disinhibition of forebrain targets (Aghajanian 1981, 1982, 1994: 137). LSD-like psychointegrators release the tonic inhibitory serotonin influences upon postsynaptic neurons and increases activity in the lateral geniculate nucleus and amygdala. Jacobs' (1984b) expands the dominant model of presynaptic action of LSD upon serotonergic systems with consideration of the postsynaptic excitatory influences. LSD-like psychointegrators, potentiate serotonin's excitatory effects upon the brain stem and spinal cord (Jacobs 1984b), resulting in excitatory effects on brain stem and spinal cord areas receiving serotonergic input results in excitatory effects at the postsynaptic neurons in the cerebral cortex and brain stem (Jacobs 1984b: 188).

<sup>2</sup> The systemic effects of these substances upon neurotransmitters as discussed here is derived from Aghajanian (1994), Jacobs and Gelperin (1981), Jacobs (1984a), Kruk and Pycock (1991), McKim

(1991), and Ryall (1989).

<sup>3</sup> Derived from Aghajanian (1981, 1993), Glennon (1990), Kruk and Pycock (1991: 121-122), Ribeiro (1991), and Schmidt and Perovtka (1989).

<sup>4</sup> A wide variety of agents, procedures, and psychophysiological conditions produce this pattern of limbic driven cortical synchronization. In addition to the entheogens, these include: auditory stimulation such as singing, chanting and clapping; extensive running or other motor behavior; hunger, thirst, and sleep loss; intense sensory stimulation such as physical austerities or temperature extremes; sensory deprivation; sleep states and meditation; and a variety of psychophysiological imbalances or sensitivities resulting from hereditarily transmitted nervous system liabilities, or from epileptic-like states resulting from injury, disease, or other trauma to the central nervous system (summarized from Winkelman 1986a, 1992, 1997, 2000).

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