

Shamanism and psychedelics: A biogenetic structuralist paradigm of ecopsychology

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Abstract

Shamanism and psychedelics are central to understanding the evolutionary roots of ecopsychology and its basic principles. The ancient ritual roots of shamanism constituted the context within which psychedelic experiences contributed selective influences to the evolution of human neuropsychology. Both shamanic psychology and ecopsychology involve a neuroepistemology that reflects the neurotransmitter effects of psychedelics on cognition. Shamanism contributed to the development of our ecopsychology through influences on psychological, social and cognitive evolution. Shamanism embodies the concept of animism, the notion of the spiritual essence of all nature which is recognized as the core of the oldest of humanity's religious beliefs. Shamanism provided the context within which this animistic attitude and the sense of the sentience of the many entities of the world were developed, especially in the relationship to animals. Animal species and their variant qualities provided a natural metaphoric system to structure psychological development and the evolution of social organization. Within the context of shamanism, the worlds of animal species and spirits intertwined in the creation of symbolic potentials for the differentiation of self - embodied in animal spirit powers - and the collective identity of society - embodied in totemic animals. This incorporation of the elements of nature into personal powers and social identity made shamanic ecopsychology a basic feature of human nature and culture.

Keywords: shaman, ecopsychology, animism, psychedelic, evolution, totemism

Introduction

The natural or evolved psychology of human consciousness, including its natural and social ecopsychology - is founded on principles intrinsic to shamanism. Shamanic ideology, psychology and manifestations of consciousness are based in biological structuring of humanity's evolved psychology and its consciousness of nature. Key biological contributions to both shamanic psychology and ecopsychology are the effects of substances called psychedelics, hallucinogens, entheogens, and other terms, including psychointegrators (Winkelman, 2007). These substances have key effects on the world view and principles of shamanic consciousness and ecopsychology because their effects on neural transmission produce a neuroepistemology and worldview that reflects neurophenomenological principles related to integration, connection, identity and unity with nature.

The ancient ritual capacities of the hominids, the common ancestors of humans and the great apes, share commonalities that provide a baseline from which we can infer and assess the evolution of the ritual practices of hominins (our uniquely human lineage) (Winkelman, 2009, 2010c). These commonalities reveal the ancient ritual roots of shamanism and the social context within which psychedelic experiences contributed selective influences to the evolution of human ecopsychology. Evidence for their influences on human evolution is found in the greater sensitivity of psychedelics for bonding with the human serotonergic system than is the case of other hominids (Pregenzer *et al*, 2007). This indicates that advantages conferred by the ability to benefit from these experiences were selective forces shaping the evolution of uniquely human cognitive capacities. The effects exerted by psychedelics on cognitive evolution are reflected in the common world view found in psychedelic traditions worldwide and their similarities to the basic ideologies of shamanism - such as the roles of plant and animal spirit powers and their healing potentials.

Shamanic ritual was a context for the development of our ecopsychology because of the fundamental contribution of shamanic neuropsychology to human relations with nature in general and human psychological, social and cognitive evolution in particular (Winkelman 2002, 2010a). Shamanism embodies the concept of animism, the notion of the spiritual essence of all nature which is recognized as the core of the oldest of humanity's religious beliefs. This ancient animistic awareness of some sentience and purpose of nature was developed in the context of a more ancient ritual core revealed in the direct similarities of shamanism with rituals of the great apes. Shamanic ritual practice, experiences and ideology were the foundations from which humanity's ancestors and early societies developed their understandings of nature and its relationship to self and other.

Shamanism provided the context within which this general expression of an animistic attitude, the sense of the sentience of the natural world, underwent a special development in relationship to animals. Animal species and their variant qualities were the natural tapestry within which human psychological development occurred and contributed to the emergence of more complex social evolution. Animal features and relations were the framework used to conceptualize our individual qualities and potentials and the collective identities that produce society. Within the context of shamanism, the world of real animal species was used as symbolic tools for the differentiation of self - embodied in animal spirit powers - and the formation of collective identities of society - embodied in totemic animals. These practices were cognitive adaptations that extended human cognitive capacities through metaphoric modeling, an extension of innate capacities for representing significant variations in nature to produce the symbolic. In this sense, a shamanic biopsychology was involved in the origins of the symbolic, producing a differentiation of human individual identities and human social collectivities which constituted the social other, the most basic reference for consciousness.

These arguments are supported in the following sections of this article which demonstrate:

- The basic nature of shamanism found in pre-modern foraging societies worldwide;
- Evidence for the antiquity of shamanism as a psychological, social and ecological adaptation derived from hominid ritual capacities;
- The role of psychedelics in human evolution and in stimulation of our ancient "animal brains";
- The rationale for a necessary relationship of shamanism to psychedelics and ecopsychology in the homologies of shamanic ideology and practices with the effects reported for psychedelics;
- A neurophenomenological model of psychedelics as producing the psychointegration that exemplifies

ecopsychological assumptions; and

- The roles of nature relations in the fundamental principles of shamanism, exemplified in animal spirit powers and totemism.

Shamanic universals and their evolutionary origins

The existence of remarkably similar spiritual healing practices world-wide was noted long before the modern comparative research of Eliade (1964) who popularized the notion of the shaman. There was a widespread recognition in comparative religion and deep in human history and prehistory of shamanism as a common spiritual heritage of humanity found in pre-modern societies worldwide. These intuitions about strikingly similar spiritual healers was supported by cross-cultural research (Winkelman, 1986, 1990, 1992) which empirically established the cross-cultural presence of shamanism in the pre-modern world by showing these common patterns of behavior and belief were virtually universal in foraging societies.

These features associated with shamanism in pre-modern societies worldwide include:

- The shaman as the preeminent social, political and spiritual leader and healer of the group.
- The shaman's nighttime charismatic performance with all of the community in attendance.
- Alterations of consciousness produced through physical austerities, fasting and sexual abstinence and ritual activities involving prolonged dancing, chanting and singing, extensive drumming, and frequently psychedelics.
- A period of physical collapse while experiencing an alteration of consciousness conceptualized as magical flight, soul flight, or in modern terms as astral projection.
- Activities of healing and of protecting from spirits and malevolent shamans focused on the recovery of lost souls, extraction of sorcery-causing objects and removal of the negative influences of spirits.
- Selection of the neophyte shaman involving premonitory illness and dreams.
- Shamanic training through a vision quest that involved prolonged periods of solitude in the wilderness.
- A formative initiatory experience involving the experience of death by animals and rebirth in which the animals reconstructed a new person, incorporating themselves into the shaman.
- Special relations with animals, including power relations with animal spirits, the ability to control animals and to transform into an animal.
- The belief the shaman can harm and kill magically.
- Special abilities, including the reputed ability to control weather, to physically fly, and to have immunity to fire.

Shamans and shamanistic healers

Two different concepts of shamanism were offered by Eliade, contributing to confusion regarding just what ought to be considered a shaman. The most general characterizations of the shaman were someone who entered into ecstatic states in order to interact with the spirits on behalf of the community. This conceptualization is true of shamans, but insufficiently specific because such practices constitute a cultural universal - all societies have practices involving the alteration of consciousness to engage spirits in rituals for healing and divination (Winkelman, 1992). In order to distinguish this broader group of spiritual healers from the shamans of hunter-gatherer societies, the term *shamanistic healers* was proposed (Winkelman, 1990, 1992) to refer those healers which share features with shamans, but which are distinguished from shamans, who have the additional features specified above. Eliade included many of these additional features of shamans, such as death and rebirth experiences, soul travel and animal familiars.

The worldwide distribution of shamanic healers in the pre-modern world establishes that shamanism is based in an innate biopsychology, a neurological foundation for an ancient natural religion. This ethnological analogy provides a shamanic paradigm, a biogenetic structuralist framework that helps to identify evidence of the central presence of shamanic activities at the origins of the Homo genus (Winkelman, 2010b) and at the dawn of culturally modern humans during the Upper/Middle Paleolithic revolution more than 40,000 years ago (Clottes & Lewis-Williams, 1998; Whitley, 2009; Winkelman, 2002).

Shamanism provided ritual technologies for integrating a variety of capacities - biological, social, and cognitive

- that contributed to human evolution, adaptation, and survival. These features included the differentiation of personal identity, the integration of social identities, the enhancement of extrapersonal cognition and production of symbolic thought (Winkelman, 2009, 2010a). Shamanism arguably constitute the most ancient of all human neurotheologies (Winkelman, 2004a), a biological structuring of perception, cognition and action that involved intimate relations with nature for understanding the qualities of humans. The origins of the underlying principles of shamanic psychology as well as ecopsychology are derived from basic aspects of the human mind and ancient adaptations to nature. Shamanism is indispensable to ecopsychology because shamanic practices and world view provided the context for the evolution of modern humans and human consciousness (Winkelman, 2010a). A wide range of shamanic features involve fundamental ecopsychological relations, such as perceptions of the sentience of nature, isolation in nature as part of shamanic development, and the roles of animals in the formation of self-concept and society. Shamanism contributed to cognitive, social and psychological evolution through symbolic exploitation of innate aspect of relations with nature. Elements of nature provided a natural metaphoric system for the extension of meaning in developing understandings of our individual qualities and the collectivities that produce society. These symbolic referents are typified in animals which express aspects of shamanic power and in tribal totems where animal species and their relations provide a conceptual system for social organization.

Nonetheless the concept of shamanism remains contentious for some, with the view that it is merely a modern creation or myth often used to discount any need for serious investigation. Empirical studies (Winkelman, 1990, 1992), however, show that there is a cross-cultural phenomenon that closely corresponds to the classic notions regarding shamanism. These cross-cultural similarities in shamanic practices provide the basis for establishing an ethnological analogy (Winkelman, 2010a & b), a shamanic paradigm derived from the empirical features associated with shamanism worldwide. These features provide a basis for inferring evidence of shamanic practices in the deep past and establishing a central role of shamanic ritual in human cognitive evolution. The inference of shamanism in the past is as reliable as inferring the presence of families, foraging lifestyles and other features of hunter-gatherers derived from analogies based on near-modern groups.

Furthermore, the basic dynamics of shamanism revealed by this cross-cultural research shares substantial similarities with the rituals of our closest extant primate cousins, the chimpanzees, pointing to a deep biological basis for shamanic rituals. Homologies of chimpanzee rituals with shamanism include features such as: the most significant community ritual, community-wide participation, night-time activities, performance by alpha male, use of drumming, presence of bipedal displays ("dance"), community integration activities, etc. (Winkelman, 2009, 2010a, 2010c). These similarities further substantiate the inference of shamanism in the human past and provide a bridge for inference regarding the nature of ritual activities over the course of human evolution.

The ritual antecedents of shamanism

The ritual capacities that Davis (1998) proposes as basic to ecopsychology have their foundations in ancient evolutionary adaptations that gave rise to shamanism. Shamanism must be considered to have a central role in humanity's ritual origins because of the evidence for the universality of shamanism in hunter-gatherer societies worldwide. This universality implies shamanism's intrinsic relation to humanity's ritual origins. Shamanic ritual and world views not only provided the most significant spiritual traditions of the foragers of the pre-modern world but also a bridge from pre-modern hominid ancestors to the ancient modern humans as well.

Animal displays, often called rituals, point to a deeply embedded ancient phylogenetic system of social communication which provided the biogenetic structural foundations of shamanic ritual (Winkelman, 2010a: Chapter 6). The biological bases and adaptive functions of shamanic rituals are illustrated by the nature of animal ritual (e.g., see Winkelman & Baker, 2008), and their homologies with human behaviors. Ritual provides the most evolved mechanisms for communication and social coordination in the animal world (d'Aquili, Laughlin & McManus, 1979; Laughlin & d'Aquili, 1974). Animal rituals use behaviors, particularly the initial steps of behavioral sequences, to signal a disposition for social behaviors, providing social communication that functions to facilitate interactions and coordination among members of a group. (For example a bird might raise its wings in response to perception of a threat, signaling a readiness to fly). Ritual behaviors make internal dispositions publicly available, providing information that helps produce socially

coordinated responses.

Converging evidence indicates that shamanic rituals have deep evolutionary origins that predate the evolution of modern humans (*Homo sapiens*). The similarities in hominid rituals, revealed in the commonalities across great apes, and the homologies of these with basic aspects of shamanic rituals, attest to the latter's ancient roots in behaviors shared more widely with primates (Winkelman, 2009; 2010a: Chapter 6). The commonalities involve: the most dramatic of rituals, an inclusive community ritual dominated by aggressive alpha male displays; a focus on night-time activities; the use of drumming, including use of hands and sticks; emotional vocalizations; and bipedal displays, or "dancing". The similarities of shamanic rituals with the rituals of community integration used by the great apes illustrate the *a priori* role of shamanism in the evolution of human ecopsychology. These ancient hominid roots of shamanism were the ritual context within which psychedelic and animistic experiences were interpreted. Subsequently, the evolution of capacities for dancing, rhythm and enactment, which derive from a common mimetic core, provided the foundations for uniquely human culture (Donald, 1991). These communicative systems were expanded by the evolution of the musical capacity, as well as vocalizations involving chanting and singing, which extended the ritual core of shamanic practices derived from our hominid heritage.

Psychedelics and shamanic ecopsychology: drugs and human evolution

Central ecological influences on the evolution of shamanic consciousness involve psychedelics, also called "entheogens" - meaning that they elicit the divine within the self. These plants known by names such as the food of the gods and sacred medicines are recorded in the cosmologies of societies worldwide as inspiring the origins of culture, religion and spirituality (e.g., see Rättsch, 2005; Schultes, Hofmann & Rättsch, 1992) before becoming degraded as "hallucinogens" in the modern world. The use of psychedelics in shamanistic practices around the world illustrates these substances and their biological effects are central to understanding the nature of shamanism.

The essential role of psychedelics in humans' evolved psychology and ecopsychology is established by Prezenger et al's (2007) findings of significantly higher binding of psychedelics to human versus chimpanzee serotonergic receptor sites. This difference illustrates that selection for an enhanced capacity for use of these substances as neurotransmitter analogues was a part of human evolution. Humanity's evolved psychology must be understood in light of the specific effects caused by these substances, exemplified in the effects of psilocybin-containing mushrooms. There is a range of specific cognitive, social and emotional experiences caused by these substances, independent of expectation, which illustrates that they have an intrinsic neuropsychology and neurophenomenology which has direct implications for understanding features of ecopsychology.

The role of psilocybin-containing mushrooms in the evolution of neural capacities that are central to the perspectives of shamanism and ecopsychology reflects their ancient role as environmental mechanisms exerting a selective influence on members of our ancestral species who were able to utilize these exogenous neurotransmitter sources of neurotransmitter substances and their adaptive effects. Species containing psilocybin have been found around the world, providing an exposure to humans for millions of years. Guzmán, Allen and Gartz (1998) illustrate the worldwide distribution of indigenous (local) species of neurotropic fungi across most ecozones, not only the psilocybin-containing species, but also others used as sacraments. Adaptation to the fungi in their environment was a significant feature affecting hominid and hominin evolution. Many mushroom species have toxic effects; some are useful food sources; and still others produce mystical experiences.

The role of psychedelics in human's evolved ecopsychology has deep evolutionary roots in the relationship of our nervous system to environmental chemicals. Sullivan, Hagen, and Hammerstein (2008) provide evidence of ancient environmental exposures to these substance that stimulated human evolution in order to make use of these exogenous substances as sources of neurotransmitters analogues. The long-term evolutionary relationship between psychotropic plant substances and humans' cognitive capacities reflects selective benefits of substance use (Sullivan & Hagen, 2002). In contrast to the debilitating cognitive effects often

attributed to drugs, Smith (1999) illustrates a variety of fitness consequences associated with the use of substances often disparaged as drugs. Across the diverse classes of plant drugs there are effects of enhanced vigilance, the ability to ignore pain in the interest of survival activities, increased access to mating opportunities, reduction of apprehension and stress, feelings of euphoria, increased endurance and self-confidence, enhanced sensory and mental acuity, reduction of defensiveness, and reduction of depression and self-defeating activities. Evolutionary paradigms suggest that fitness benefits accrued to our ancestors as a consequence of their ability to utilize psychoactive substances to enhance operation of neurotransmitter systems. The effects of these environmental sources of neural transmitters display hallmark features of natural adaptations (Smith & Tasnadi, 2007).

Psychedelics and shamanic phenomenology

Our very psychology as human beings was shaped by the experiences induced by the psychedelics and their intrinsically religious effects, as well as a range of other cognitive, social and personal dispositions they produced (Roberts & Winkelman, 2013). Shamanic practices in general and the healing traditions in particular were centrally shaped by these experiences and the powers released within the person by the pharmacological effects of the active ingredients of these plants. A review of literature from around the world illustrate that the effects of psychedelics, and psilocybin-containing mushrooms in particular, produce a range of experiences that are directly related to shamanism, including (Winkelman 2010; see also de Rios, 1984; Hoffman, Carl & Ruck, 2004):

- providing access to a spiritual world, the supernatural, bringing the mythical world to life;
- producing an experience of the separation of one's soul or spirit from the body and its travel to the supernatural world;
- activating powers within and outside of the person, including the sense of the presence of spirits and their incorporation into one's body;
- establishing relationships with animals, particularly carnivores;
- inducing an experience of transformation into an animal;
- provoking a death of the ego and its transformation or rebirth, providing a source of self transformation;
- providing information through visions;
- providing healing, especially through the emotional experiences and release (catharsis); and
- inducing an integration of the group and enhancement of social cohesion reflected in their use in community rituals.

The hypothesis that these psychedelic-induced experiences are intrinsic effects of these substances is supported by their objective ability to produce a variety of mystical experiences in contemporary people. Griffiths *et al.* (2006) carefully-designed double blind study showed that psilocybin induces mystical experiences and has effects on participants' attitudes, moods, and their own experience of spirituality that persisted for months. The comparison with control periods showed psilocybin produced significantly higher ratings on the scales used to assess mysticism and altered states of consciousness, including introvertive mysticism, extrovertive mysticism, internal and external unity, sacredness, intuitive knowledge, transcendence of time and space, ineffability, positive mood, and experiences of oceanic boundlessness. Psilocybin sessions had significantly higher levels of peace, harmony, joy, and intense happiness. In addition, there were persisting effects noted for the psilocybin sessions, including an enhanced positive attitude about life accompanied by a positive mood changes and positive altruistic social behaviors confirmed by third-party observers.

While the emergence of the suite of practices associated with pre-modern shamanism involved other selective influences (e.g., dancing and music, Winkelman, 2010a), psychedelics were central selective influences on the evolution of the human nervous system for the kinds of experiences directly related to ecopsychology and shamanic ideologies. The extrovertive mystical experiences typical of psychedelics embrace the connection with the external world and nature in particular, but in a different way, with the perceiver transformed in such a way that the perception of the ordinary world of plants and rocks is transfigured into a consciousness of Unity with all of nature, rather than some sense of separateness.

These experiences are principally deistic experiences, as embodied in the concept entheogen - generating

experiences of the god within one's self. A core aspect of the psychedelics experience is what Hoffman, Carl and Ruck (2004) characterized as the "entheogenic epiphany... commonly described as a state where all distinctions and boundaries between the individual and the metaphysical realm dissolve into a mystical and consubstantial communion with the Divine. This ecstatic experience is interpreted as a pure and primal Consciousness, which brings the individual into direct contact with the root of being..." (p. 112). These and other common effects resulting from ingestion of the entheogens must be understood in terms of neurophenomenology (Laughlin, McManus & d'Aquili, 1992), where physiological actions on the neurological system are responsible for the phenomenological experiences.

Psychointegrators as a neurophenomenological paradigm

The psychedelics had central roles in the evolution of human cognitive capacities, particularly symbolism, abstract thought and reasoning and the religious and spiritual capacities which characterize the human species. These effects derive from the action of psychoactive plants on the serotonergic and dopaminergic nervous systems. Entheogenic substances primarily derive their effects from chemical compounds known as indoleamines which have direct and indirect effects on the brain's neurotransmitter systems. The major classes of indoleamines are tryptamines (e.g., DMT, LSD, psilocin, and psilocybin) and phenylethylamines (e.g., mescaline, MDMA ['ecstasy'], 2C-B) and exert similar influences on serotonergic neurons (Nichols 2004; Nichols & Chemel, 2006; also see Fantegrossi, Mernane & Reissig, 2008) and produce similar experiential effects (for reviews see Passie *et al*, 2008; Hintzen & Passie, 2010). These effects on serotonin receptors are responsible for the overall changes in brain processes, which are reflected in high-voltage brain wave discharges of a slow wave frequency: typically theta, 3-6 cycles per second (cps).

These biochemically based physiological dynamics are primarily based in serotonin disinhibition and the consequent loss of its inhibitory effects on dopamine and the mesolimbic structures, enhancing the activity of lower brain structures, particularly the thalamic area that gates information ascending from the peripheral nervous system. Serotonin-like entheogens and many other substances have end-effects that alter consciousness through a common mechanism - production of high-voltage slowwave (theta) brain wave activity (Mandell, 1980; Winkelman, 2010a). While there are many additional effects found within and across species, typical effects on serotonin receptors provide the basis for a neurophenomenological paradigm of psychedelics and shamanic altered states of consciousness as involving psychointegration produced by an enhanced integration of lower brain processes into the frontal cortex (Winkelman, 2001, 2007).

The neurognostic structuring produced by psychedelics reflects macro-level effects involving both the activation and selective deactivation of the serotonin system, which has multiple regulatory roles reflected in its special characterization as neuromodulator of many neurotransmitter systems. Psychointegration is derived from both stimulating the serotonergic system, as well as inhibitory effects on serotonin transmission (through resistance to reuptake), with consequences involving disinhibition or release of the dopaminergic system (Passie *et al*, 2008; Nichols, 2004). Nichols concluded psychedelics amplify incoming stimuli, enhancing the sensitivity of the phylogenetic older brain structures and the excitability of limbic and cortical structures.

Serotonin as a modulator

Serotonin is a neurotransmitter that acts as a modulator across all levels of the brain, from the brain stem and limbic system to the frontal cortex. Serotonin has a wide range of functions in: sensory processing and perception, motor activity and behavior, hunger and feeding, thermoregulation and pain, release of growth hormones, sleep cycles, learning and memory, moods and modulating the sympathetic nervous system (see Kruk & Pycoc, 1991: 122-3; Role & Kelly, 1991). Serotonin circuitry is primarily ascending, concentrated along the midline area and the raphe nuclei and projecting upward into the limbic system and frontal cortex, with widespread and diffuse influences over vast neuronal populations. Serotonin neurons innervate structures directly responsible for a range of human capabilities central to consciousness: attention, alertness, and maintenance of waking/sleep cycles; integration of emotional and motivational processes; synthesis of information from the entire brain; and visual conceptualization and representation.

Psychointegrators' primary neurophenomenological effects reflect activation of synchronized hyperactivity in serotonin circuitry across the neuraxis, the main nerve bundle linking the structural levels of the brain from

the brain stem to the frontal cortex. This hyperactivity produces synchronization of theta (3-6 cps) brain waves across the levels of the brain and between the hemispheres (Mandell, 1980; see Winkelman, 2011 for review). The theta effects begin in the midbrain hippocampal region which activate serotonin circuitry in the lower levels of the brain (locus coeruleus and thalamus), which in turn stimulate the limbic structures and frontal cortex, especially the right hemisphere (Mandell, 1980). Mandell proposes this is the basis of the cognitive of transcendent states, increasing the ascending flow of information, improving integration of information exchange between the two hemispheres and their specialized functions in cognition and affect, producing interhemispheric coherence and fusion that results in insight. These synchronizing effects in the brain contribute neurological causes of the integrative experiences of connection and oneness produced by these substances, and the rationale for the concept of psychointegrators.

A central feature of serotonergic systemic functions includes inhibitory or repressing activity. Psychedelics' selective effects result in disinhibition of serotonergic regulation of the thalamus and limbic areas which function as "gatekeepers" in the basic filtering of information from the environment and body. Psychointegrators disinhibit the mesolimbic temporal lobe structures, reversing the habitual effect of serotonin in depressing the action of target neurons in the forebrain. Disinhibition of mesolimbic temporal lobe structures produces key features of psychointegrator-induced changes in overall brain function - high voltage synchronous discharges in the hippocampus and other temporal lobe limbic structures manifested in theta (3-6 cps) brain wave patterns. This model of psychointegration is confirmed by research (Vollenweider & Geyer, 2001) which found the principal effects of psychedelics involve the cortico-striato-thalamocortical loops which reduce the sensory gating systems of the lower brain structures, leading to a flood of information on the higher levels of the brain.

The release of the dopamine system caused by the psychointegrator's blocking of the serotonin system produces characteristic features of altered consciousness and the ecophilic attitude of shamanism (Previc, 2009). Virtually all classes of drugs effect dopamine transmission in the limbic system, as well as on serotonergic transmission (Smith & Tasnadi, 2007) and result in increases in dopaminergic activity. Effects on dopamine receptors typically produce unconditioned pleasurable responses and elicit intrinsic feelings of well-being. While high levels of dopamine lead to emotional detachment, the human dopamine system is part of our mammalian heritage, with similar effects across mammalian species in social bonding, from mother-infant attachment to broader social groups. Psychointegrator's ecophilic effects must be seen as in part resulting from activation of our basic bonding neurochemistry, core functions in the mammalian brain's emotional, social and self systems. Previc (2009) reviews evidence that dopamine is also vital for all of the key functions of advanced intelligence and cognition and linked to the brain's ability to deal with objects and events distant in space and time. This provides context independent cognition, exemplified in the capacities for mental time travel, the ability to experience and think about things other than those in the here and now. Winkelman (2010a) shows how these abilities for extrapersonal projection are key to understanding central aspects of the shamanic soul flight or out-of-body experience, which exemplifies the ability to have a context-independent consciousness of people and places far removed from the physical body.

These combined stimulatory and inhibitory serotonergic effects of psychointegrators result in the increase in information from the environment, body and memory; the enhanced experience and recall of emotions; the stimulation of basic motivations and cognitive processes; and increases in awareness and internal attention. These produce the neurophenomenological dynamic exemplified in the concept of psychointegration, reflecting the heightened integration of hierarchically-ordered brain functions. As Nichols (2004) concluded, psychedelics enhance the sensitivity of cortical processing of ancient phylogenetic brain structures.

Psychointegration as the general dynamic of alterations of consciousness

This psychointegrative model of consciousness derived from psychedelics is characteristic of shamanic alterations of consciousness in general (Winkelman, 2010a, 2011). The biological effects of the psychedelics are mimicked by a variety of other agents and behaviors, including other drugs, long-distance running, hunger, thirst, sleep loss, auditory stimuli such as drumming and chanting, sensory deprivation, dream states, meditation, and a variety of psychophysiological imbalances or sensitivities resulting from injury, trauma, disease, or hereditarily transmitted nervous system conditions (see Mandell, 1980; Winkelman, 2010a). Similar

production of alterations of consciousness through disruption of the processes of the frontal cortex occurs from the effects of endurance running, dreaming, hypnosis, drug induced states, and meditation (Dietrich, 2003).

The all-night dancing of the shaman exploits another capacity which contributes to alterations of consciousness, mystical experiences and biophilia; the uniquely human capacity of endurance running (Bramble & Lieberman, 2004). Emerging a million years ago in *Homo erectus*, these capacities for running for hours to days provided a natural basis for inducing alterations of consciousness, which also has as a side effect of the induction of mystical experiences (Jones, 2005). This effect from endurance running goes beyond the widely noted "runner's high" and includes typical features of mystical experiences such as:

- positive emotions such as happiness, joy and elation;
- a sense of inner peacefulness and harmony;
- a sense of timelessness and cosmic unity; and
- a connection of oneself with nature and the Universe (Dietrich 2003)

Sands and Sands (2009) proposed that the selection for long-distance running in *Homo* subsequently selected for a form of spirituality, a "horizontal awareness" or *biophilia* that operated through existing neurobiological reward systems. The "high" associated with long distance running situated our ancestors within a dynamic environment within which they felt an intimate connection with nature. They review evidence showing that the neurochemicals released during endurance running are tied into a variety of pre-existing reward pathways, including monoamines (serotonin, dopamine, and norepinephrine), endorphins, and endocannabinoids. Thus a side effect of the acquisition of the capacity for long distance running was a variety of mystical experiences, as well as the physical basis for dance. Dance and other shamanic practices of fasting, sexual abstinence, social isolation, drumming, chanting and austerities all contribute to this altered state characterized by theta wave synchronization. These entrainments may occur at a variety of frequencies, but two predominant patterns are synchronized slow wave theta bands (3-6 cps) and the high frequency gamma oscillations (40+ cps) (see Winkelman, 2010a for primary references).

Disruption of highly-integrated aspects of neural information processing and higher cognitive functions characteristic of the frontal lobes and prefrontal cortex allows for the manifestation of other brain structures usually repressed by frontal activities. The overall brain response to many different activities that alter conscious is characterized by brain synchronization with slow wave discharges that produces overall coherence and a linkage across the evolutionary strata of the brain, integrating information from the lower brain systems into the frontal cortex. Deregulation of the prefrontal cortex allows for the emergence of aspects of identity related to our more ancient brain functions.

The effects of psychedelics and the shamanic alterations of consciousness involve stimulating the linkages across the evolutionary strata of the brain. MacLean (1990, 1993) proposed that the brain involves three anatomically distinct yet interconnected systems - the reptilian brain, paleomammalian brain, and neomammalian brain. These three brain systems provide the basis for behavioral, emotional, and informational functions that MacLean (1993, p. 39) called "protomentation", "emotiomentation", and "ratiomentation" respectively. Interactions across levels of the brain are mediated through non-verbal communication forms that utilize behavioral, social, affective, and presentational (visual symbolic) information. Psychointegrators elevate these communication systems of the ancient strata of the brain. In the reptilian brain they release the activity of the raphe and reticular formations and thalamic structures of the brain stem area that normally restrict information received by the higher levels of the brain. And in the paleomammalian brain they stimulate limbic system functions that provide emotional information, a sense of personal relations and bonding.

The development of the serotonergic system across phylogenetic evolution illustrates how psychedelics can have such a central role in these integrative processes. The effects of psychointegrators on the serotonergic system and dopamine relate to MacLean's model of the evolution of the brain, functioning as the most central and powerful system of integration and coordination among the three brain subsystems. In the reptilian part of the brain, serotonin functions as a regulator system within the R-complex. Serotonergic functions in the paleomammalian brain involve control over the R-complex, inhibiting limbic brain emotional functions, and distributing information through connections with the prefrontal and neocortex.

Global effects of psychointegrators on the serotonergic system enhance reptilian and paleomammalian brain activities. Psychointegrators produce systemic brain integration through liberating our ancient animal brains, imposing the reptilian brain's ritual systems of communication and the paleomammalian brain's analogical processes and material of an emotional, social, and personal nature into the self-conscious processes of the frontal cortex. Consequently our experience of connection with nature, the ecophilia associated with psychedelics, emerges as a neurophenomenological effect. These stimulations of our ancient brain systems must also be seen as central to the animistic features of psychedelics, shamanism and ecopsychology.

Nature and animal relations in shamanism: The origins of ecopsychology

The self-identifications with the broader universe, particularly personification of the sentient cosmos which is a hallmark of ecopsychology, is also a fundamental aspect of the shamanism. This cosmic identity with nature has many roots in shamanism, such as those experiences induced by entheogenic plants generally personified as gods. The out-of-body experiences associated with shamanism, psychedelics and long-distance running all reflect a capacity to dislocate personal identity from body, a capacity which likely facilitates an identity with nature, where personal identity is often relocated.

Davis (2006) notes that central aspects of ecopsychology involve a nature-oriented awareness practices which are basic tools of shamanic development, such as the vision quest alone in nature. Shamanic development focused on intensified contact with the natural world as a fundamental tool of personal growth. Novices spend months or even years isolated from community, largely alone in the wilderness, which was key for developing relations with power animals. These extraordinary experiences were provoked by prolonged and direct contact with nature, exemplified in visions of spirit beings, especially the animals.

The shaman was known for having special relations with animals and animal spirits, being able to control them and believed to personally transform into an animal to accomplish feats. Relationships with actual animals also characterized shamans. Shamans often adopted a variety of wild animals that might live with them or visit them, especially when called by the shaman for some task. This personal relationship with animals must be seen as a precursor to domestication, a complex human relationship with transformed nature.

Shamans had special relationships to hunting animals as well, particularly leading hunts and making sacrifices to the spirits of the animals killed. Shamanism's relationships to the animals included calling them to the waiting hunters, campsites and the shore. The shaman made soul journeys to the spirit world to seek the release of the animal spirits for the hunters to kill. The killing of the animal was also accompanied by sacrifices to the animal's spirits to atone for their loss, giving thanks for the sustenance that they provided for the humans.

Shamanic ritual activities relating the group to the environment reflect a deep synchronization with ecological principles. Found within many shamanic traditions is the belief that certain animals have periods of taboo in which they may not be hunted or eaten. Winkelman and Baker (2008) discuss how the practices of hunting taboos among the pre-modern Tukano in the Amazonian region of Columbia illustrate the roles of shamans in ecoregulation. The shamanic ideology dictates what animals may be hunted and when. Beliefs about the relationship between human sexual energy and the fecundity of nature also regulate hunting and reproduction. Sexual activity is restricted before hunting and rituals performed to determine the cause of unsuccessful hunting; consequently, limited availability of game animals results in sexual restrictions and reduced human reproduction. The role of the shaman in deciding to taboo certain animals plays a direct role in regulating the community's environmental relations and the well-being of the local species, limiting exploitation so that local food species will not fall below reproduction levels.

Imitation of animals in shamanism: Hunting and human evolution

Relations with animals through hunting and imitation of them played a variety of roles in the evolution of a capacity for symbolic representation through behavior. Human evolution in relationship to nature involves enhanced skills for using culture to change from being prey into being a hunter. Key elements of hunting

involve adoption of behaviors of animals and eventually involved imitation and disguise. Hunting activities became conceptualized in terms of the ability to acquire power over animals, based in knowledge of its habits, behaviors, and powers. This power was likely manifested through deception and imitation, mimicking of the vocal calls of animals to attract them or to cover one's own noise. This imitative practice of hunters is another feature of shamanism, the master of the animals. This also provided a basis for representation through mimicry.

Donald (1991) proposes that a major cognitive evolution of humans involved mimesis, the ability to intentionally represent through enactment, and that among the first of human mimetic activities were ritual group dances performed with vocalizations to imitate the sounds of animals. He suggests the mimetic capability resulted in a form of body-based awareness, a physical self-consciousness that enhanced our awareness of self-in-environment. The use of bodily movements as symbolic communication embodied in mimesis made it possible to increase group coordination because it built upon one of the most basic types of animal ritual behavior - isopraxis - in which animals automatically imitate each other's behavior.

Hunting animals likely engaged and selected for the mimetic capacity because the ability to imitate would have directly enhanced hunting success through the ability to engage in deception through imitation. Imitation also played a role in teaching about hunting and animal behaviors. Imitation used for the purposes of hunting likely produced a greater sense of identification with the animal, a hallmark feature of shamanism. This enactment of the 'other as animal' likely played a role in the evolution of shamanic practices. Mime and dancing are central features of shamanic activities, for they are the basis of the ritual enactments of struggles with spirits combined with chanting, singing, and imitative vocalization. The shamanic roots of ecopsychology involve an impulse to understand the environment in human and animal terms, and conversely the self in terms of animals and their powers. Imitation of the behavior of some of the most significant features of the environment - animals - provided a template for broader representation skills.

Animism as ecopsychological identification

One of the most fundamental features of shamanism, religion, spirituality and the concept of entheogens is the notion of the spirit world. Animism refers to the notion that nature is in essence embodied with spirit entities, and encompasses the core of the oldest and most basic of humanity's religious beliefs. Shamanism has been characterized as an animistic practice, where animism constitutes a perception of nature not as inert matter but rather as a living entity. This humanized nature is exemplified in the shamanic relations with plant spirits embodied in the entheogenic practices so frequently associated with shamanism. Shamanism personified the influences experienced from these plants, exemplified in the intimate relations they maintained with these environmentally-based entities conceptualized as plant spirits. These relations with the plant spirit others were fundamental to concepts of self, other and universe that are characteristic of ecopsychology - a perception of nature as a person, intelligent, spiritual and infinite.

Bird-David (1999) portrays animism not merely as a sense of spirits within nature, but moreover as powerful presences that must be understood as super-persons. The relationships established with the animistic super persons are reciprocal, in which one both receives benefits and privileges and to whom one has obligations met through ritual. Shamanic rituals are the primary mechanism through which these relationships are recognized and reciprocity engaged with these super-persons. Shamanic performances ritually enact these persons, bringing them to life in a heightened ecstatic state that enhances relatedness not only within community, but also in relationship to the spiritual kindred of nature. These relationships give rise to a greater sense of the interconnectivity among local community, the ecosystem and the cosmos.

One of the most fundamental shamanic relations with nature is in the conceptualization of the self and its powers, typified in the concept of animal powers that constitute basic aspects of the self. Nature itself becomes our template for society in the ancient practices of totemism where animal species and their natural relations became an innate template for conceptualizations of our lineages and tribes, the building blocks that take society into transfamilial dimensions. Shamanism provided the evolved psychological context - our neuro-psycho-social structuring as sentient beings in relationship to physical nature and its powers, animals and plants. Our natural ecopsychology is inextricably tied up in our relationships with the physical world - the animistic essence of nature as a sentient, aware spiritual power, of the animals as actors that can give us

power and identity and affect our well-being.

These basic relations to the animistic principles of the universe and their manifestations in animals are deeply rooted in the structure of the human psyche, a neurophenomenological system in which the common brain structures we share with other animals (i.e., the reptilian complex and paleomammalian brain) produce an awareness of self in relationship to other animals. While this postulation of spirits which is fundamental to animism has been attributed to cognition regarding anomalous psychological phenomena (i.e., dreams, spontaneous out-of-body experiences), animism is best understood in terms of the consequence of innate processing modules. Animacy is a universal human tendency because it is an adaptive feature of human cognition based in "animacy detection". Atran (2002) illustrates how animacy detection - being hyper-sensitive to the presence of an animate agent - has adaptive benefits.

The universal human tendency for animistic thinking is a consequence of the adaptive tendency to attribute human mental, personal and social qualities to the unknown and natural phenomena. This tendency to assume the presence of an agent is combined with other innate faculties for self and other representation to produce the broad range of features typically associated with concepts of spirits (Mithen, 1996; Winkelman, 2004b; Winkelman & Baker, 2008: chapter 7). The projection of humans' self qualities to the unseen, as well as nature, is an inevitable consequence of our psychological and social development; spirits are a natural epistemology involving the inevitable projection of human models of the self.

Hubbard (2002) characterized shamanic cognition as involving extension of special attributes of human consciousness to new domains, especially the natural world which is imbued with elements of meaning and intentionality derived from humans. This reflects an innate human tendency to attribute the causes of observed actions to an object's internal dispositional factors, extending the assumptions we make about humans to unknown dynamics, assuming that other things operate as do humans. The natural tendency of humans to attribute mind states, internal dispositions and rational purpose to others is unavoidably attributed to nature as well. The universality of spiritual beliefs reflects this adaptive tendency, which was expanded into population of nature with spirit beings who operated with the same features as humans.

Spirit assumptions are reinforced by humans' innate capacities for social intelligence, our ability to infer the mental states of other members of the species and to use that information as a basis to predict others' behavior. This intuitive "theory of mind" involves the attribution of mental states to others, modeling others' thoughts and behaviors through the use of one's own mental states and feelings. Such attributions are fundamental to animism and the world of spirits. Whatever qualities of cognition, personality, intentionality and other personified qualities that nature may have intrinsically, they are modeled on the perceptual templates of those same qualities that are found universally in humans and are intrinsic to our perceptions. Our self-knowledge is necessarily the template through which we experience the other in the social as well as natural world. Nature is inherently personified via human nature.

Nature as self: Animal powers and guardian spirits

Shamanism was the original context for the spiritual perceptions that Davis (1998) see as an essential component of ecopsychology, the perspective of "nature as self". This self-identification with the world and Gaia is one of the most basic metaphors which ecopsychology provides for representing the relationship between humans and nature. A prominent aspect of spirit relations in shamanism involves an engagement of self-development processes by using symbolic representations derived from nature, and animals in particular. Animal species and their variant qualities are the natural tapestry within which human psychological and social development evolved.

The personification of nature embodied in animism facilitates the reciprocal process, the naturalization of the person. The projective processes underlying animism are used to reciprocally internalize the qualities found in nature into the person. Shamanic practices involving animal allies and guardian spirits reflect aspects of self-development and self-representation that involve the capacity to incorporate other's perceptions into the self, internalizing the qualities of others into our own self-identity. Shamanistic relations with nature engage humans' capacity for personal incorporation of others, using animals as the other.

Evolutionary psychologists recognize that humans have an innate natural history module, an intrinsic ability to

recognize and categorize species of animals (see Mithen, 1996). Shamanic practices engage this specialized innate capacity for organizing knowledge about animal species and recognizing "species essence". Animal species - a highly important part of nature - provide a universal analogical system for creation of meaning. This ability to recognize intrinsic features of species and to transfer this knowledge to other domains is exemplified in the shamanic animal guardian spirit powers, which involve representations of self.

Animal powers incorporated as aspects of the self are exemplified in the guardian spirit complex typical of shamanism (Swanson, 1973). This involves ritual activities, generally prolonged isolation in nature, during which the person acquires a special relationship with a specific animal species that serves as a model for self-development. This self-development is based in the incorporation of animal properties within identity and personal powers. Swanson characterized the guardian spirit complex as a form of empowerment in which adult role development and personal and social choices are guided by the qualities of animal species. Animal spirits' characteristics provide ideals that structure individual psychodynamics and model social behavior through the natural symbols provided by animal attributes. These animal qualities provide diverse self-representations, different acquired selves that can mediate hierarchies of personal and social goals.

Animal spirits provide natural symbolic systems derived from relations with nature that serve vital functions in self and social representation within which the self is internally differentiated and socialized in relationships to others. These aspects of shamanism reflect an intrinsic neurophenomenological ecopsychology. Animal species and their qualities and behaviors provide a natural template for differentiating self with respect to others. Animal species identities provide psychosocial functions in visual icons, making publically available forms of social self-representation that facilitate personal differentiation.

Totemism: Nature relations and group identity

Shamanism exemplifies the symbolic application of nature to group relations in the practice of totemism. These group-oriented religious practices use animal species for social representations, as manifested in ancestor worship where group deities are represented by an animal species referred to in anthropology as a totem. Totemism involves establishing a metaphoric relationship between the natural history domains of animals and domain of social groups, conceptualizing humans's social organization through models provided by the animal world.

This view of totemism derives from the work of French research Emile Durkheim, the father of sociology, and Claude Levi-Strauss, an anthropologist. Durkheim (1915) investigated the widespread practices in which an animal species was used to represent a clan, a descent-based kinship group. Central worship activities of the clan consisted in ceremonies aimed at promoting the growth and well-being of the totem. During these rites for enhancing the fecundity of the totem, normal prohibitions on the consumption of the totem are suspended. During the ritual the totem animal is ceremonially killed and consumed in a sacred meal that allows the individual to incorporate the power of the totem.

While noting a variety of different phenomena called "totemism", Levi-Strauss (1962) identified commonalities underlying the many different systems and beliefs in which human clans are associated with specific animal species. In totemism, humans are identified with an animal (or plant) species unique to their kinship groups. This animal identification, a "connection between *the relation of man to nature* and the *characterization of social group* ... postulates a homology ... between differential features existing, on the one hand, between species *x* and *y*, and on the other, between clan *a* and *b*" (Levi-Strauss, 1962: 13). Levi-Strauss characterized totemic thought as involving analogical processes, establishing a homology between animal species and human groups. Animal species represent the distinctive qualities and membership of different social groups, constituting natural symbols for representing less distinctly featured human groups. The group identity animal species identifies the clan, and by extension, its members.

Totemism and guardian spirit relations exemplify innate nature relations that function to distinguish among humans and their groups through the attribution of characteristics derived from the natural world. Personal and group identity and intergroup differences are conceptualized through models provided by animal species. Totemism is a natural product of human thought, reflecting concepts of the natural world that are structured by the human brain, the innate intelligence for classifying the natural world. Our deeply rooted capacity to

classify the animal world makes it a natural metaphoric system that can be extended to many other domains of human thought. The use of animals in social and cognitive modeling is one of the most fundamental aspects of metaphoric and analogical thought (Friedrich, 1991), a universal human system for expression of meaning and creation of social and personal identity through the use of the innate module for animal species categorization. The less perceptible differences among humans and groups are made visible with the representations derived from the more apparent differences in animal species.

Conclusions

Common features of shamanism, psychedelic metaphysics and ecopsychology illustrate that they involve common origins. Their commonalities point to a biologically based ecopsychology, one that is the product of human evolution and evolutionary adaptations. These biological bases suggest that shamanic ecopsychology and psychedelic therapies still have relevance for humans today. Our very health and survival as a species may depend on our ability to re-establish these relations with nature.

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