Shamanism and Cognitive Evolution

Michael Winkelman

Shamanic referents in Upper Palaeolithic cave art indicate its pivotal role in the Middle–Upper Palaeolithic transition. Etic models of shamanism derived from cross-cultural research help articulate the shamanic paradigm in cave art and explicate the role of shamanism in this transition. Shamanism is found cross-culturally in hunter-gatherer societies, constituting an ecological and psychosociobiological adaptation that reflects the ritual and cosmology of early modern humans. Shamanism played a role in cognitive and social evolution through production of analogical thought processes, visual symbolism and group-bonding rituals. Universals of shamanism are derived from innate modules, particularly the hominid 'mimetic controller' and music and dance. These induced altered states of consciousness, which produce physiological, cognitive, personal and social integration through integrative brain-processing. Shamanic altered states of consciousness have the cross-modal integration characteristic of the emergent features of Palaeolithic thought and facilitated adaptations to the ecological and social changes of the Upper Palaeolithic. Cross-modular integration of innate modules for inferring mental states (mind), and social relations (self/others), and understanding the natural world (classificatory schemas) produced the fundamental forms of trope (metaphor) that underlay analogical representation. These integrations also explain animism (mental and social modules applied to natural domains); totemism (natural module applied to social domain); and guardian spirit relations (natural module applied to self and mental domains).

This article shows that shamanism was a crucial aspect of Upper Palaeolithic cave art, and that shamanism played a central role in managing the cognitive and social consequences of the changes occurring during the Middle–Upper Palaeolithic transition. An understanding of the nature of shamanism derived from cross-cultural research and an identification of the psychobiological basis of shamanic universals extends Clottes & Lewis-Williams' (1998, 79) 'dual approach based on neuropsychology and ethnology'. Lewis-Williams (1991; 1997a,b) has demonstrated the importance and validity of applying ethnographic analogies and neuropsychological models to the interpretation of shamanism in Palaeolithic art. The ethnographic analogy for interpreting Palaeolithic cave art and associated activities is amplified by use of an ethnological (etic) analogy of the shamanism based on cross-cultural research. This approach expands earlier theoretical interpretations offered for the significance of cave art that fail to account for central aspects of cave art material.

Clottes & Lewis-Williams (1998), Smith (1992) and Ryan (1999) concur in the interpretation that neurologically-based shamanic practices were central to cave art (cf. Lewis-Williams 1997a,b). Clottes & Lewis-Williams suggest that, in spite of the temporal distance, we have better access to Upper Palaeolithic peoples' religious experiences than other aspects of their lives because of the neuropsychological basis of those experiences. The commonality in the experiences of shamanism across space and time provides a basis for forming 'some idea of the social and mental context out of which Upper Palaeolithic religion and art came' (Clottes & Lewis-

Cambridge Archaeological Journal 12:1, 71–101 © 2002 McDonald Institute for Archaeological Research
DOI: 10.1017/S0959774302000045 Printed in the United Kingdom

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

Williams 1998). The present article supports and extends these findings with an etic model of shamanism, illustrating the neurophysiological basis for shamanic universals, and demonstrating the functional roles of shamanism in the Middle–Upper Palaeolithic transition.

While a number of researchers have advocated shamanic interpretations of cave art, they have not relied upon systematic cross-cultural ethnological studies for an expanded model of the shaman (but see Lewis-Williams 1997b). Furthermore, those recognizing the neuropsychological basis of shamanism have not specified that basis beyond recognition of the central role of altered states of consciousness (ASC). This article presents a neurological model of altered states of consciousness and the universals of shamanism to delineate its role in cave art and cultural development. A neurological and etic model of shamanism not only provides an understanding of the role of shamanism in Palaeolithic cave art, but also suggests that shamanism had a fundamental role in the Middle–Upper Palaeolithic transition and the emergence of modern human cognition. Recognition of these biologically-based aspects of religious and cultural behaviour can play an important role in the interpretation of prehistoric artefacts and the reconstruction of cultural activities.

Lewis-Williams (1991; 1997a,b; Lewis-Williams & Dowson 1988) has shown the validity of using shamanism to interpret rock-art. The ethnographic data that links shamanism to earlier rock-art validates the use of a shamanic paradigm for interpretation of these productions (cf. Whitley 1992; 1994a,b,c; 1998; Chippindale *et al.* 2000). The basis of this analogy lies in neuropsychology (Lewis-Williams 1991), and is also substantiated by the universals revealed through cross-cultural research (Winkelman 1986a; 1990; 1992). The convergence of neurology and cross-cultural research provides the structure for establishing a 'shamanic paradigm' and applying it to interpretation of prehistory.

Etic characteristics and psychobiological bases of shamanism

Disputes about the definition, distribution and nature of shamanism can be resolved by systematic empirical cross-cultural assessments. Such studies (Winkelman 1984; 1986a; 1990; 1992; Winkelman & White 1987) indicate the etic status of the shaman and confirm as universals many of the characteristics attributed to shamans (e.g. Éliade 1964; Harner 1982). This complex of related beliefs and practices found cross-culturally in hunter-gatherer and some agricultural and pastoral societies is not the result of diffusion (as assessed by autocorrelation analyses: Winkelman 1986a). Rather, these cross-cultural similarities are the consequence of independent inventions, or derivations, from a common neuropsychology.

The neuropsychological basis of shamanism is manifested in cross-cultural similarities in shamans' characteristics. These include visionary experience, soul journey, guardian spirit quest, healing practices, and self-transformation experiences such as death and rebirth. Cross-cultural research reveals that shamans are charismatic social and religious leaders in hunter-gatherer (or simple agricultural and pastoral) societies where political integration and leadership is limited to the level of the local community. Shamans led activities in which the entire local community participated, as well as directing hunting, warfare, and group movement. Ritual activities most frequently involved healing and divination; but shamans were also thought capable of sorcery — malevolent magical acts designed to harm others. The shamanic ritual was typically an all-night ceremony attended by the entire community. The shaman chanted, sang, shouted and danced vigorously to enact a dramatic encounter with the spirit world while the audience chanted, sang and drummed in supportive unison. Through imitation and mimicry, shamans enacted a dramatic emotional struggle with the spirits. Shamans used a variety of induction procedures[2] to enter altered states of consciousness (ASC) for their training and professional service to their communities. Their altered states of consciousness are generally labelled as involving soul flight, journeys to the lower world, and/or transformation into animals, but not possession. Also typical of shaman are identity relationships with and control of spirits, particularly animal spirits; and the provision of hunting magic.

The presence of shamanic practices in hunter-gatherer societies cross-culturally and their striking similarity indicates that shamanism has a psychobiological basis. The universality of shamanistic practices reflects underlying biologically-structured foundations or *modes*[3] of consciousness (Winkelman 2000). The shamanic altered states of consciousness reflects the *integrative* mode of consciousness. This is based on fundamental aspects of systemic organic functioning and balance that produce neurophysiological and psychological integration. Cross-cultural uniformities in shamanic altered states of consciousness reflect the fundamental homeostatic dynamic of the human nervous system and consciousness,

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

with integration across structural and functional units of the brain (Mandell 1980; 1985; Winkelman 1986b; 1992; 1996; 1997; 2000). The integrative mode of consciousness involves production of interhemispheric synchronization in the frontal cortex by high-voltage slow-wave EEG activity. This originates in the circuits linking the brain stem and the hippocampal-septal area of the limbic system. These high-voltage slow-wave limbic discharges intensify connections between the limbic brain and brain stem and impose synchronous slow-wave patterns on the frontal lobes. Many conditions and activities produce: interhemispheric synchronization and coherence; brain stem-limbic and limbic-cortical integration; and integration across the neuraxis, results in the synthesis of emotion, thought and behaviour (Winkelman 1986b; 2000). Music, drumming, dancing, fasting, and austerities, can induce these effects, as also can temporal lobe syndromes (Mandell 1980), hallucinogens (Mandell 1985; Winkelman 1996); hypnosis (McClenon 1994; 1997) and elicitation of endogenous opioid and serotonergic mechanisms (Winkelman 1996; 1997; 2000). Universals of shamanism are manifestations of *neurognostic*[4] structures (Laughlin *et al.* 1992; Laughlin 1997), basic forms of perception, awareness and cognition provided by the biological nature and functions of the organism.

Neurognostic structures: innate modules for religion

The roles of innate modules or neurognostic structures as the basis for religious thought have been proposed by a number of anthropologists (e.g. Boyer 1992; Mithen 1996; Laughlin *et al*. 1992; Winkelman 2000). One of these neurognostic structures characteristic of shamanism is known by a variety of terms — soul flight, soul journey, out-of-body experience and astral projection. These refer to a universal, central and essential feature of shamanism — the experiences of travelling to and/or encountering entities from the spiritual or supernatural world. The psychophysiological basis of the prototype soul flight or journey experiences is indicated by their cross-cultural distribution, manifested in the out-of-the-body experience; near-death or clinical death experiences; and 'astral projection' (see Winkelman 1992; 2000 for review). The similarities with the core shamanic altered states of consciousness experience of soul flight reflect innate psychophysiological structures. This basic neurognostic process of the organism involves homologies across somatic, physiological and symbolic systems (Hunt 1995; Laughlin 1997; Winkelman 2000). Hunt analyzes these experiences in terms of taking the perspective of others in evaluating the characteristics of self — in essence seeing one's self from others' point of view in a visual symbolic modality (presentational symbolism). Laughlin examines these experiences in terms of the use of the body as a universal metaphor of shamanic cultures (cf. Winkelman 2000).

Neurognostic structures for religious cognition are specific types of brain programs or modules,[5] hard-wired input systems that provide for automatic information-processing (e.g. see Fodor 1983; Gardener 1983; cf. Cosmides & Tooby 1992). Children are born with content-rich intuitive knowledge modules which reflect prehistoric hunter-gatherer lifestyles in domains of behaviour involving tool-use, natural history and animal behaviour, language, social relations and 'mind reading' of other's intentions (Mithen 1996). Boyer (1992), in *The Naturalness of Religious Ideas*, argues that religious notions are based upon counter-intuitive contradictions to innate modules. But Mithen points out that these religious ideas are normative rather than exceptions, and instead suggests that it was the integration of innate modules that produced religious ideas.

This article extends Mithen's view in showing shamanic universals to be the product of the cross-modal integration of these different representational systems. The basic forms of cross-modal integration between the modules are manifested in shamanic and religious universals — animism, guardian spirits and totemism. These are produced by the following cross-modal integrations:

Shamanic universal	Signified	Innate representational system
Animism (spirits)	Natural world	Self and mind modules
Guardian spirits	Self, Mind	Natural world
Totemism	Social others	Natural world
Soul journey	Self	Other's perceptions
Imitation	Affective semantics	Mimetic controller
Chanting and singing	Affective semantics	Music

The shamanic integration of consciousness

The evolution of the human brain and its modular structures produced a fragmentation of consciousness, reflecting both the increasing modularity of consciousness and the diversification of self (Laughlin *et al*. 1992). Shamanic traditions institutionalized procedures to overcome the fragmentation of consciousness by synchronizing the divergent aspects of human cognition through traditions using ritual altered states of consciousness to facilitate integrative processes. Shamanism contributed to integrative cognition through systemic psychophysiological effects

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

of altered states of consciousness which produce integrative brain states. This is typified in theta brainwave patterns producing integrative discharges along the neuraxis of the brain, synchronizing information across the distinct evolutionary strata of the brain (Winkelman 1986b; 1992; 1996; 2000). Shamanic thought also involves metaphor, produced by cross-modular predication of innate modules, providing a basis for various forms of abstract thought. The shamanic role in integration of different modules is indicated by shamans' skills in these modularly-based domains:

- natural history — being the master of the game animals;
- mind/self — exemplified in the shifts in identity developed through animal identities and guardian spirits;
- and social intelligence — being the leader of the group and mediator of intergroup relations.

Shamanism's adaptive functions are derived from the roles of animism, totemism, and guardian spirits in self and social development and abstract representations, as well as the functional effects of altered states of consciousness, visionary perceptions, and death and rebirth experiences. Adaptive potentials are derived from the visionary state, a presentational mode (Hunt 1995) of symbolic expression. The imagery provides the basis for shamanic diagnosis, journeying, healing, and the objectification of self. Shamanic processes construct social and personal consciousness through conceptualizations of 'others' as embodied in the spirit world (animism), the socialization of self through internalizing 'sacred others', and the construction and diversification of self as exemplified by the guardian-spirit complex. Potentials derived from the integration of innate processing modules produce cognitive evolution through creating systems of metaphoric expression in animism and totemism. Shamanism's role in this development is illustrated by the ubiquity of shamanic principles in foundational metaphors or tropes, and the production of shamanic universals by metaphors created by integration of innate representational modules.

Analogical thought and metaphor: bases of shamanic universals

The construction of meaning is based upon non-analytical models,[6] particularly analogue processes which map relations between systems (Shore 1996). The fundamental role of shamanic concepts in metaphoric thought is revealed by considering Friedrich's (1991) discussion of analogy and metaphor in the context of the broader concepts of tropes, where something represents something else. He characterizes five types of macrotropes: imagistic, modal, contiguity-based, formal, and analogical. Shamanic universals are exemplified by contiguity, modal and imagistic tropes that reflect underlying psychobiological structures, rather than the culturally-specific forms represented in formal macrotropes.

The body and its ability to act is the most fundamental of analogue schema (Newton 1996; Hunt 1995); it is manifested in mimesis, and exemplified in the shaman's soul journey or 'out-of-body' experience. Contiguity tropes, based principally upon the body and animals, are found throughout shamanic ritual and thought, and exemplified in sympathetic magic, animal identity and transformation, and totemism. Modal tropes are concerned with expressions of mood, as well as their combination and interaction. Modal tropes function as deep organizing principles 'rooted in a speaker's underlying emotions, affects, and feelings' (Friedrich 1991, 30–31). Modal tropes are the basis for the manipulation of emotions that are at the basis of shamanic ritual. The shaman's visionary experience exemplifies the use of imagery tropes. Noll (1985) has characterized 'mental imagery cultivation', the deliberate development of enhanced mental imagery, as the central feature of shamanism, 'which at its core is concerned with the techniques for inducing, maintaining and interpreting the experience of enhanced visual mental imagery' (1985). The continuity of imagery with perception (Baars 1997) reflects imagery's information-processing, involving 'metaphoric predication' between domains of experience and what Shore (1996) refers to as 'primary perceptual modalities'. This imagery is based in a presentational symbolic modality (Hunt 1995), as well as other forms of information-processing involving unconscious, non-volitional, affective, and psychophysiological levels (Noll 1985). Visual images link the somatic and cognitive levels of the organism and play a central role in muscular control, enabling images to drive the unconscious control centres of muscles and arouse the autonomic nervous system (Baars 1997). The following sections examine universals of shamanic thought in terms of their basis in the use of innate representational modules to produce forms of metaphoric thought.

Animism: self, mind and other

Animism is a universal of shamanic and religious thought based on the use of capabilities for repre-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

senting mind, self and others. Animism, attributing an essence with mental qualities like those of humans to imaginary or natural phenomena, is exemplified in anthropomorphism, attributing human-like 'mind' characteristics to gods, spirits, and non-human entities, particularly animals. Religion explains through anthropomorphizing, offering the concept of human-like beings who provide the design and purpose to observed phenomena (Guthrie 1993; 1997). This projection of human characteristics to nature is a ubiquitous human practice. Guthrie suggests the universal tendency for humans to conceive of other beings, events, and objects as being like themselves is based in an effort to ensure that we respond to a human-like actor if necessary. An error in falsely attributing human characteristics is less dangerous than failing to appropriately attribute such characteristics. Attributing animistic and anthropomorphic qualities to the unknown helps make sure we are prepared for the most important contingencies, those with human-like capabilities.

Bird-David (1999) re-interprets animism from the perspectives of environmental and personhood theory as a relational epistemology. Bird-David suggests this relational mode is universal because perception requires that humans be situated in their world and environment, a form of relatedness. The animistic principles inherent in the concept of spirits are constitutive of sharing relationships with the environment. This relationship is 'critical to maintaining . . . identity because it is crucial to maintaining personhood' (Bird-David 1999, 73). These animistic relationships are central to the maintenance of communal affairs and identity. Animism reflects a basic aspect of consciousness, the projected sense of 'other' utilizing one's own self as a model of the unknown other. The recognition of a 'felt presence', the sense of self in the unknown other, is a manifestation of the plural symbolic capabilities of the creature in an attitude of openness towards the environment (Hunt 1995). Spirits reflect human characteristics — mind, intentions, desires and reference with respect to social others.

A social and relational epistemology is derived from innate modules for social intelligence, one based upon social knowledge about conspecifics and the other based upon an ability to infer their mental states. This specialized social intelligence has been referred to as Machiavellian, reflecting 'cunning, deception and the construction of alliances and friendships pervasive in the life of many primates' (Mithen 1996, 81); it constitutes the most complex area of ape's (and human's) natural activities. Such social intelligence reflects adaptations for the specific problems[7] that group living creates for primates, facilitating group interaction by permitting a new level of mental processing based upon a 'theory of mind'. This enables prediction of others' behaviour with an intuitive psychology for attributing mental states to others, based upon the organism's use of their own mind, feelings and behaviours in similar contexts to model other's mental states and likely behaviours. The ability to predict others' behaviour through 'reading their minds' constitutes an essential basis for social cohesion, transmission of social knowledge, and consciousness as 'knowing with' — knowledge shared with others.

Totemism: animals in social representation

The metaphoric relationship between the human and natural-history domains found in animism is reversed in totemism, in which humans and their groups are attributed characteristics derived from the natural world. Totemism utilizes the natural history or intuitive biology module, which has specialized capacities for organizing knowledge about animals and recognizing 'species essence' (e.g. see Atran 1990). Totemism uses natural-history knowledge to build a universal analogical system for creation and extension of meaning. Levi-Strauss' (1962; 1967) analysis of totemism indicates that it involves human thought about one's place in nature and a means of conceptualizing human differences and relations in terms of the models provided by the natural world. Totemic thought involves analogical processes by which a homology is postulated between the differential features existing among species and the differences among human groups; as animal species differ, so do human groups. Differences among human groups are represented through the differences recognized among animals. This social and cognitive modelling by use of the animal world constitutes one of the most fundamental aspects of analogical thought, employing contiguity tropes both to differentiate identity and to create shared identities.

Shamanic transformation of self

Laughlin *et al*. (1992) suggest that shamanism involved the production of more integrated levels of consciousness. They suggest that shamanic practices involve two basic principles — a holistic imperative, a drive toward more integrated levels of consciousness; and shamanic projection, positively projecting a more advanced state of development onto another person, based on the unconscious transference of

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

control of the individual's intentional processes to a powerful individual or 'master'. Shamanism also uses innate processes of self-transformation manifested in the phenomena of death and rebirth. This universal of shamanism reflects processes of self transformation which occur under overwhelming stress (Walsh 1990). The selection and development of shamans involve illness experiences that are interpreted as personal death, reflecting the fragmentation of the conscious ego that results from the intrusion of unassimilated neural structures and underlying conflicts (Laughlin *et al*. 1992). Dismemberment reflects the breakdown of the internal structures experienced in 'autosymbolic images' of the disintegration of one's own psychological structures. Shamanism uses symbols to engage transformative process through entraining neurocognitive structures. This provokes a restructuring of the self at levels below conceptual and operational thought, producing psychodynamic growth, healing, and cognitive integration.

A fundamental role of shamanism is to produce alternate forms of the self for social and cognitive adaptation. The functional and adaptive benefits of such processes are illustrated by Waller (1996) and Scheff (1993), based in the ideas of Mead (1934). Waller suggests the sense of self evolved to maintain problem-solving modules in appropriate orientation to tasks and non-routine problems. These command-control agents vary so as to detect conflict and make decisions, particularly through the mediation of conflict between the different instinctive agents. Self or ego mediates among the demands of different agents through serving as a higher order agent within a hierarchy of goals.[8]

Shamanism developed as a tradition for these associative processes, constructing, manipulating and using a variety of selves for psychological and social integration. This is illustrated in the diverse forms of self and identity found within shamanism. Animism, totemism and anthropomorphism provide symbolic systems within which the self is constituted in interactional symbolic relationships with others. Siikala (1978) analyzes the shamanic seance as a dramatic activity involving processes of self-transformation for the patient through reciprocal communication with the spirit world (cf. Dow 1986 and Kirmayer 1993 on symbolic healing). The shaman's ecstatic role-taking technique creates intrapsychic and psychosocial communication through symbolic representations in the spirit world, altering relationships between self and world to achieve a psychological balance and integration of social, affective and physiological levels.

The 'sacred other' and guardian spirits

One of the most important forms of self representation embodied in shamanistic thought is the 'sacred other' (Pandian 1997), involving the intersection of the spiritual and social world. Pandian analyzes these religious phenomena in terms of cultural processes for identification of the cultural locus of the symbolic self. These systems of belief embodying the 'sacred other' have cognitive and social functions, resolving contradictions in broader systems of cultural meaning and providing models for the development of the self. The beliefs constitute projective systems and norms for personal behaviour and psychosocial relations which structure individual psychodynamics and collective behaviour. Pandian characterizes the 'shamanistic sacred self' as providing protection from stress and anxiety through social models which play a fundamental role in the management of self, emotions and attachments. This analogical predication is at the basis of shamanistic activities of the guardian-spirit complex, involving animals or animal spirits as part of social identity and personal powers, strength, fortitude or good fortune. Guardian spirits play central psychosocial functions in empowering people in the transition to adulthood (Swanson 1973). Guardian spirits guide the individual in personal and social choices in life. This illustrates the role of the natural-history module in self-representation and animal spirits as representing aspects of one's self.

The shamanic paradigm in cave and rock-art

The shamanic context of cave art is attested by a number of features and provides a parsimonious and consistent paradigm for explicating representations, functions and activities (Lewis-Williams 1997a,b; Ryan 1999), particularly the 'puzzling features of Upper Palaeolithic parietal art' (Lewis-Williams 1997a, 812). Many aspects of cave art were centred upon shamanic purposes. The elements of cave art represent many mythological elements found in shamanism around the world. These reflect structures of the mind derived from internal experiences and the innate human need to express these forms. Cave-art sites had other shamanic paraphernalia, including evidence of percussion instruments and bird-bone flutes, and sites with primarily heel marks (as opposed to full foot imprints), suggesting ritual dances. The cave itself represented a movement into the unconsciousness and lower (under) world, a representation of the shaman's inward journey. Natural structures of the caves were used and embellished as

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

initiatory tools, and for altered states of consciousness induction. Structural and graphic features were used to represent the interface of the conscious and unconscious aspects of mind. The salient anthropomorphic characters among the humanoids of cave art represent the human–animal interface exemplified in the shaman's animal spirits and relation to master of the animals. Prominent among human depictions are 'bird-men', representing the shaman's soul flight; the 'wounded man' representing the universal shamanic death and rebirth experiences; and the prostrate or reclining position of human–animal forms, particularly with erect penis and bird symbolism, representing altered states of consciousness. The images illustrate a number of aspects of shamanic practice, including altered states of consciousness visionary experiences, ritual, human–animal identities and animal powers.

Altered states of consciousness

Cave-art images represent shamanic activities and altered states of consciousness (Clottes & Lewis-Williams 1998), and the subterranean rock-art sites were used for shamanic vision questing (Lewis-Williams 1997b). The cave is a physical representation of a primary aspect of shamanism worldwide: the journey to the lower (or under) world (Harner 1982). Symbols of initiatory death, self-transformation and animal empowerment are consistent with the patterns of shamanic cave initiations found in other cultures (Ryan 1999). The harrowing and difficult experiences of entering the caves, combined with the location of shamanic representations in some of the most inaccessible areas of the caves, suggests their use in inducing shamanic rebirth experiences. The conditions within the caves (e.g. sensory deprivation) would alone have induced altered states of consciousness. The art combined into the cave's structures, the organization of the animal motifs, and the sequences of movements through chambers all point to their use in a shamanic initiation into the powers of the lower world and nature, and the shamanic transformation of consciousness (Ryan 1999). Among the prominent 'non-symbolic' representations are those resembling entoptic phenomena associated with autogenous images seen in altered states of consciousness (cf. Lewis-Williams & Dowson 1988; Lewis-Williams 1997b).

Group ritual

Intergroup activities were carried out in the large elaborately decorated chambers. Deliberate ritual use is obvious, with spiritual aspects, emotional qualities and some veneration without doubt a central part of the Palaeolithic cultural context (Hadingham 1979). These activities must have drawn upon the universals of human thought found among pre-state societies around the world. Above all, they entailed interaction with a spiritual world in rituals to find game, increase animal abundance and human fertility, heal individual and community, and maintain balance with nature (Clottes & Lewis-Williams 1998).

Human representations

Depictions of humans are in 'small numbers compared to painted and engraved animals' (Clottes & Lewis-Williams 1998, 44; Lewis-Williams 1997a). The rarity of human depiction in Palaeolithic periods contrast markedly with the profuse human representations in rock-art in other periods. Human characteristics are generally depicted in a manner distinct from animals, lacking of the naturalist characteristic of animal representations. Instead they are depicted in a style which is 'rough, hasty, and caricatural . . . hazy, crude or deformed humans' (Clottes & Lewis-Williams 1998, 46). Human representations are incomplete and often reduced to body parts (e.g. hands, vulvas). The human elements are prominently represented in those which combine human and animal features, often a human torso with an animal head. This combination of human and animal is a characteristic of shamanism found in both the animal-spirit allies and the belief that shamans transform into these animals. The composite creatures depicted in cave art have been called 'anthropozoomorphs, therianthropes, or sorcerers' (Clottes & Lewis-Williams 1998, 46), and include the famed Sorcerer of Les Trois-Frères. These rare naturalistic human representations were placed in very significant positions, such as the Sorcerer's position high above the sanctuary. Smith (1992) suggests that the humanoid forms are shamans, the 'Master of Animals' who are responsible for the representations of human–animal relationships, animal spirits, and life force and breath. The human depictions frequently include the 'wounded man', where prominent features include injury to the human, often speared or knocked down (Lewis-Williams 1997a). These may reflect the death and rebirth experience.

Animal representations

Sympathetic hunting magic finds little support in these representations; fewer than 10 per cent of animals appear to have been 'wounded' or 'killed', and the animals represented were generally not 'economic' or frequently eaten (Clottes & Lewis-Williams

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

1998; Hadingham 1979). Furthermore they indicate 'rare and dangerous animals' (Clottes & Lewis-Williams 1998, 43), which were typically relegated to the depths of the caves. The very different types of animals combined together militates against a totalistic interpretation of the rock-art (Hadingham); the animal spirit ally or guardian spirit typical of shamanism is a more congruent interpretation.

Summary

The shamanic paradigm helps link together and explain disparate aspects of the cave-art representations. For example, the 'wounded man' motif is difficult to explain without reference to the classic shamanic 'death and rebirth'. The cave journeys, depictions and artefacts exemplify shamanic practices, images, powers and concepts. These symbolize the mythological levels of consciousness, the transformation of consciousness, and the expansion of identity associated with shamanism. 'We can now perceive a striking cultural continuity pressing back to the very horizons of modern *Homo sapiens* in a system of practice and belief' (Ryan 1999, 265). The ethnographic and neuropsychological evidence strongly supports Lewis-Williams' argument that the subterranean images are associated with shamanic initiation (Lewis-Williams 1997a).

Shamanism and the Middle–Upper Palaeolithic transition

The central role of shamanic practice in early Upper Palaeolithic cave art indicates that it was a well-established and central feature of these societies. The activities of shamanism were central to cave art because they were central to the cultural activities which led to the production of art — image. The shaman's visionary journey involves a special and intense kind of imaging (cf. Noll 1985); that imaging represented in cave art is a central manifestation of the cognitive advances associated with the Middle–Upper Palaeolithic transition. These cave-art sanctuaries are not the first evidence of shamanic practice: 'the figurative system and the ideology it [cave art] represents had already been in existence for several millennia' (Ryan 1999, 25). A range of evidence indicates that shamanistic elements were already part of the cultural practices of the Middle Palaeolithic. This evidence includes:

1. the hominid basis of chanting, music and psychoemotional group ritual activities based in mimetic capabilities; and
2. the role of shamanic practices in meeting a number of individual and societal needs for shared identity and communication which emerged as a consequence of the changes following the Middle–Upper Palaeolithic transition.

Shamanism was uniquely situated among cultural resources to address the needs of the Upper Palaeolithic context and play a central role in that transition.

Music in human evolution

Music, singing and chanting are universal features of shamanic practice (Winkelman 1992). These are uniquely human skills, reflecting specific biological competencies of the species.[9] Nonetheless, they have progenitors in the vocalizations and calls of other animals, and substantial continuities with capacities and functions of their expressive systems. Activities of chimpanzees indicate that human's hominid ancestors already developed social adaptations involving excited synchronous singing and dancing among members of a territorial group (Merker 2000). Oubré's (1997) consideration of the role of chanting in hominid evolution illustrates a central role of shamanic precursors deep into the hominid lineage. Chanting in group context is an emotional communication system which was part of proto-human behaviour, an ancient communicative production of the mammalian brain that preceded speech. The presence of elements underlying human musical expression in animal songs and calls implies that music predated language (Marler 2000; cf. Merker 2000). Chanting and singing occupy an intermediate step between the expressive vocal call systems of primates and the language of modern humans (Richman 1993). This indicates that chanting would have emerged in human communities prior to speech. But the unique accomplishments of humans in music which are not found in chimpanzees suggests that music played a role in their divergence. Chanting served psychoemotional functions that are illustrated in other primates' expression of emotions and somatic states. This communication promotes social well-being through increased experiences of empathy and group solidarity, enhancing both social and cognitive integration.

Human musical capacities are based in genetic capabilities which humans share with other primates, including the use of these vocalizations to communicate about affective states and external referents (Hauser 2000). Although there is evidence for this independent evolution of singing among primate species, there are structural and behavioural similarities that indicate that loud calls for territorial

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

signalling and alarms were the precursors of human singing and music (Geissmann 2000). Songs and vocalizations of gibbons, chimpanzees and wrens share functional commonalities as 'affective, non-referential displays, given in a state of high arousal, and used especially for achieving and modulating social contact and spacing' (Marler 2000, 44). Brown (2000) sees the precursors of music to lie above all in the referential vocalization calls of animals that serve as communication to conspecifics through an emotive response to classes of environmental stimuli. Animal vocalizations are directly related to the expression of affective states and emotions through non-symbolic means. The expression of these emotional states has motivational effects upon conspecifics.

Gibbon songs are related to mate attraction, pair-bonding, and bond and territorial advertisement (Geissmann 2000). Males' singing bouts are responded to by females with stereotyped calls and ritualized locomotor displays that males may also emulate. Orangutans' long calls are an exclusive male behaviour, and may be accompanied by shaking of branches and piloerection. Gorilla calls often terminate with chest-beating, running through the foliage and breaking of branches. Chimpanzee loud calls are predominantly performed by males, with the pant-hooting peak phase followed by charging displays that include 'slapping the ground with hands, stomping with feet, hitting or stamping at a tree (drumming display), seizing branches and swaying them vigorously from side to side, or showing exaggerated leaps or brachiation in a tree (Goodall 1986)' (Geissmann 2000, 116). Pant-hooting is also done in response to members rejoining the community or when contact is made with strange conspecifics.

Great apes' call episodes share similarities in their functions: interindividual and intergroup communication, particularly regarding location, spacing, food sources and danger; and enhancement of group cohesion and unity (Geissmann 2000). There are also commonalities in their locomotor displays involving kicking, stomping, shaking branches, beating the chest, ground or vegetation, and jumping and running (Geissmann 2000). The great apes share with humans a similar system of facial, postural and tactile communication. This modality is manifested in the acting-out of displays by animals to affect the behaviour of others in the group. These are functions of the limbic system which regulate the visceral, motivational and emotional aspects of expression. Their enactments produce emotional transactions (e.g. elicitation, release) and give expression to protomentation processes and emotiomentation (affective cognitive processes) (MacLean 1990). These behaviours must have been shared by human progenitors as well; given that these behaviours are homologous with shamanic activities, we can validly infer that shamanic precursors were part of the group activities of Palaeolithic peoples, as well as far earlier in the hominid line.

Music is part of a larger set of cultural activities including chanting, singing, poetry, dancing, and play that share origins in common modules that provide rhythm, affective semantics and melody (paraphrase Molino 2000, 65, 173). '[M]usical expression tends to be inextricably linked to movement and gesture in the context of most group rituals. In musical rituals, gesture and vocalization function as coordinated, mutually reinforcing processes at both individual and group levels' (Brown *et al.* 2000, 9–10). Freeman (2000) suggests that music and dance co-evolved as mechanisms for enhancing social bonding and communication of internal states, contributing to the development of technologies for inducing altered states of consciousness to break down existing habits and thought patterns. Music's effects include the induction of slow-wave brain-wave patterns typical of other altered states of consciousness (Winkelman 1992). Music's adaptive roles include its ability to promote group cohesion and coordination, enhancing synchrony and cooperation among group members. The ability to coordinate the group with rhythms has adaptive advantages. Well-coordinated group displays provide evidence of cohesion that could deter attacks (Geissmann 2000). Music strengthens group cohesion by providing mechanisms that promote group identity through enhancing coordination, within-group cooperation, joint action, and mutual cognitive and emotional expression (Brown 2000, 296). Music constitutes a device for coordinating the behaviour of different individuals into synchronized performances (Merker 2000). These would have provided a context for mate attraction and selection.

The effects of music upon human listeners include a compulsion to move with the rhythm, shaking, clapping, stomping, and dancing. Music and dance share the ability to entrain the body to external rhythms such as drumming. Humans alone, however, appear to have the innate ability to keep rhythm with external stimulation, reflecting the operation of the mimetic controller (Donald 1991; see also below). This rhythmic module of the brain underlies mimetic representation and culture, providing an expressive system that predates language. This form

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

of expression or communication engages a '*rhythmo-affective semantics*, which involves the body, its movements, and the fundamental emotions that are associated with them' (Molino 2000, 170). This affective semantics is the foundation for all cognitive semantics because it links the individual to the environment. The mimetic culture expressed through imitation and ritual produced a mythic ethos that was enacted in activities involving collective participation and imitation through vocalization and rhythmic actions. These enactments expanded the expression of intention and transmission of culture. Donald (1991) identifies this episodic culture among early hominids, implicating the presence of a range of mimetic behaviours among Middle Palaeolithic hominids.

Mimesis and cognition

The lateralized visuospatial and verbal cognitive functions characteristic of humans — imagetic and emotional functions as opposed to thinking and talking — are integrated through the visceral somatic system in ritual behaviour. Birdwhistle's (1970) work identified a somatic gestural system based in motor behaviour and the use of the body as a mimetic system which symbolizes through imitation and action. Donald (1991) postulates a 'mimetic controller' as the foundation for this distinct form of cognition found in hominids. Donald (1991, 168–9) characterizes mimetic skill or mimesis as derived from the ability to consciously produce intentional representations of the structure of events through their re-enactment, usually through mimicry and imitation. Mimesis is a form of human symbolic thinking which can operate independently of language through analogy, using episodic memory to epitomize events (Donald 1991). This mimetic representational system is the basis of the first truly human culture according to Donald, and persisted as a fundamental communication and representational system in humans after the development of language. Donald suggests that this pre-linguistic level of cognitive development still forms 'the expressive heart of human social interchange' (Donald 1991, 189) and persists today as a superior form of representation of certain forms of knowledge. Mimesis provides the means to create a common communicative context for modelling and rehearsing others' social roles, in essence expressing social structure, social relations, social roles and other social activities.

Mimesis is exemplified in the shamans' dramatic ritual enactments of interaction with the spirit world. Mimesis is reflected in rhythmic abilities of drumming and dancing, a supramodal capability derived from integration of visual and motor components (Donald 1991). The visuomotor domain, including facial expressions, gestures, postures and movements, provides the principal means through which mimesis is expressed. The mimetic expressions found in basic emotions constitute the fundamental aspects of human non-verbal communication. Donald suggests that mimetic skills involving intentional representations and performed in group context provided the basis for primitive group ritual and dances, where reciprocal mimetic enactments were first performed. Mimetic activities were present long before the advent of the modern human cultural revolution *c.* 40,000 BP. Shamanism too must have been present in these collective activities, which made essential contributions to human survival.

Demographic and social changes of the Upper Palaeolithic

The major demographic transitions associated with the colonization of Australia and Siberia began during the Middle Palaeolithic and 'required the development at this time of even more fundamental human capacities for conceptualization and communication' (Whallon 1989, 433). Adaptations to severe environments required future planning and group communication for decision-making and logistical organization. Increasing the number of decision-makers requires serial or vertical hierarchicization of status differences. Successful adaptation also necessitated information about other groups and the environment, particularly information with a time depth in order to adapt to resource fluctuations. Whallon suggests this was achieved through several mechanisms, including intergroup exchange of information based upon visits and ceremonies and the development of ritual, myth and religion — cultural mechanisms for storage of information about adaptive responses and ranges of variation.

Whallon (1989) indicates that a decline in resources produced a reduction in regional human populations, and smaller groups increased the need for out-group contact to maintain mating viability and to assure access to resources. Severe conditions meant the local communities and groups needed greater assurance that their movements and contacts with other groups would be successful. This increased the need for information regarding contacts, mates and resources, particularly 'more reliable information from beyond the social and geographic bounds

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

of the local group' (Whallon 1989, 435). 'Thus, it will become increasingly risky to rely only on directly perceived and reported knowledge, and there will be a growing advantage to the ability to obtain knowledge indirectly — that is from beyond the limits of direct perception' (Whallon 1989, 437). Shamanic practices utilize intuitive forms of information acquisition and processing and would have enhanced this process of obtaining knowledge indirectly (Winkelman 1982; 1992; 2000).

Locating mates without establishing access produces group stress, conflicts, and tensions. Access is assured through alliance networks (Gamble 1986) which use symbolic communication to establish relationships that allow extension of reciprocal relations with people with whom one has not established face-to-face contact. Such relationships are formed through the use of shared symbolic categories defining associated rights and interpersonal obligations. Hayden (1987) points out that the link among resource stress, community, and intercommunity alliances enabled shamanistic rituals to contribute to human survival through intensification and enhancement of interpersonal bonding, within-group cohesion and interband alliances. The sense of unity and pan-human identity widely associated with shared ritual altered states of consciousness contributed to the development of strong emotional bonds between bands and alliances that were vital for survival in times of resource scarcity.

These interactions provide social relations that induce healing responses that are part of the primate heritage involved in the care of sick and injured conspecifics through altruistic behaviours (Fabrega 1997). The release of endogenous opiates is produced by aspects of community ritual (Frecska & Kulcsar 1989) and by a number of physical activities associated with shamanic altered states of consciousness (see Prince 1982; Winkelman 1986b; 1992; 1997). The brain areas (orbital frontal cortex, the temporal lobe and the amygdala) involved in affiliative interactions, social bonding, multimodal sensory information processing, and selective attention and top-down physiological regulation are also the areas with the highest density of opioid receptors. The cultural symbols cross-conditioned with these ritual activities and their physiological, emotional, and cognitive responses also acquire the ability to stimulate the endocrine and immunological system (Frecska & Kulcsar 1989). Endogenous opioids facilitate social attachment and bonding through opioid action upon psychological processes, which reduces ego boundaries. Frecska & Kulcsar (1989) suggest that shamanism socially and ritually manipulated opioid mechanisms as a means of influencing core biological functions and produced psychobiological synchrony among group members.

The increased importance of alliances increased the need for hierarchical and multiple levels of nested organization. Caporeal (1996) proposes that the interaction between levels of identity, in essence coordination, was an essential aspect of the evolutionary forces acting upon the human gene pool and part of the 'mind's natural environment'. Membership in different groups creates different social identities and a personhood characterized by multiple loci of conscious awareness and multiple interacting selves. Although Caporeal does not address this, shamanism was the central mechanism by which these multiple personal and group identities were mediated and integrated through animistic and totemic practices. Shamanic practices involving the participation of all band members provided the context for the expression and integration of multiple identities.

These changes are manifested in artefacts which reveal an emblematic group membership and an assertive expression of individual personality, individuality or within-group differentiation of roles, status, and identity. The selective pressures creating these prominent social characteristics were derived from intense competition with conspecifics, combined with the need to cooperate. Alexander (1989, 469) suggests that the dominance of humans on the one hand, and 'runaway social competition' on the other, led to unique mental characteristics as a result of humans being 'their own principal hostile forces of nature'. Human ecological dominance minimized the importance of the physical environment in selection, making conspecifics the most important aspect of (and threat from) the environment. This produced selection for sociality and group living as a necessary adaptation. The social aspects were the most unpredictable and demanding aspects of the human environment, leading to further selection of human mental abilities, supporting cooperation and reciprocity.

Caporeal (1996) provides a perspective on the forces involved in this social interdependence. The human reliance upon increasing interdependence requires a broadening of social interaction, reciprocity, and sociability and the coordination of face-to-face social interaction as part of the 'mind's natural environment'. This natural environment comprised of conspecifics, and the structures they provide as a group, affects human adaptation. Caporeal points out that the mental systems that produce face-to-face interdependency underlie large-scale social co-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

ordination. 'Fitness should have been correlated with the evolution of perceptual, affective, and cognitive processes that support the development and maintenance of group membership [and] develop, maintain, and negotiate face-to-face group membership' (Caporeal 1996, 266). This sociability produces a group identity. Central to these processes is the self. Caporeal points out that the definition of self is in relationship to shared group memberships which are constructed in a hierarchical organization. Membership in different groups creates different social identities. The social-organizational and cognitive 'evolutionary landscape' for humans involved dynamic psychological shifts in identity levels depending on group size and intergroup dynamics. This created a personal identity with multiple selves which are interacting and dynamic.

Ethnographic and ethnological analogy suggests that shamanic practices were central to the coordination that occurs within bands and macro-band levels. The practices of shamanism, which require the participation of all present, and which provide the context for the expression of multiple identities, was the social activity and mechanism by which these multiple personal identities and multiple group identities were mediated and integrated. Shamanism achieved this integration through relations with spirit allies and guardians and through animistic and totem beliefs and practices which constituted procedures for developing shared social identities.

The coordination of emotions was a central factor in successful cooperative intergroup aggression, particularly conflicts and raids (Alexander 1989). Emotions are a principal aspect of the psyche. While these expressions and feelings were initially the incidental effects of the associated physical activities, they also provided information that could be used by others. This led to the ability to perceive these events in others, and to hide them when experienced in one's self. Humans evolved to hide these events in ways which positively affected their interests by manipulating others: concealing experiences, conveying experiences different from those actually felt, or altering expression of the intensity of feelings. Expression of actual feelings among companions could also be adaptive when their interests were coincident — when emotions reveal common dangers, enable cooperation, or prime for appropriate behaviour.

The human psyche and self-deception

Alexander (1989, 480) suggests that the aspects of the human psyche — 'every mental, emotional, cognitive, communicative or manipulative capacity of humans' are part of the capacity for social-intellectual-physical scenario-building to manipulate relations of social cooperation and competition. The human psyche (including consciousness, cognition, language, emotions and personality traits) provided the basis for sociality and humans' special ability to learn and differentiate their behaviour across settings (Alexander 1989). The functional aspects of the psyche from an evolutionary perspective 'is that consciousness represents a system of: 1) building scenarios or building possible (imagined) alternatives; 2) testing and adjusting them according to different projected circumstances; and 3) eventually using them according to whatever circumstances actually arise . . . [T]he function of consciousness is to provide a uniquely effective foresight, originally functional . . . in social matters [and] . . . all manner of life circumstances ' (Alexander 1989, 477). 'Part of the game of human social competition involves concealing how it is played, and some of that concealing is from one's self (*self-deception*)' (Alexander 1989, 459); consequently, natural selection has kept some aspects of social motivation relatively inaccessible to consciousness. This suggests that one of the functions of the psyche was to provide symbol systems which hide psychosocial realities.

It is not in our best interest continually to act in a self-conscious and deliberate way to serve one's own interest. This has produced a human psyche that is not aware of all aspects of our motivations and behaviour. This contributes to a self-interested self-deception. The best way to deal with competitors is to achieve sincerity through the deception of self and others. Subconscious self-deception evolved as a system for deceiving others about our pursuit of self-interest. This evolution of procedures for manipulating competitors involved the use and expression of emotions and personality traits. This function of the human psyche to study others in relationship to our self, however, remained largely unconscious. Alexander considers that self-deception is central to the role of the human psyche in maintaining group unity, and is achieved through 'familial, tribal, ethnic, racial or regional myths, including organized religion' (Alexander 1989, 493).

Social competition, both within group and between groups, also selected for social cooperation. Reciprocity, or 'cooperation to compete' made the ability to construct alternative scenarios, or 'surrogate scenario building' central to human sociality. 'Once scenario building has become widely useful, status and livelihood can be secured by intellectual-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

social as well as other forms of occupational specialization . . . by using unusual abilities and experiences to develop and build scenarios for others — hence actors, artists, musicians, writers, comedians, orators, *shamans* [emphasis added]' (Alexander 1989, 481). This scenario-building, involving 'modelling and testing activity with respect to possible later events' (Alexander 1989, 499), is evidenced in dreaming. Dreaming is a form of social-intellectual play that is extended in humans in communication of representational ability (paraphrase Alexander 1989, 484). Winkelman (2000) shows the fundamental similarity of neurophysiological and cognitive functions of dreaming and shamanic altered states of consciousness, which were typically induced during nighttime rituals to incorporate dream episodes.

Shamanism is central to hunter-gatherer communities' efforts to construct alternative or surrogate social scenarios based upon the principles of animism and the spirit world. The forms of displacement involved in scenario-building are fundamental aspects of shamanism. Shamanism was central in these human developments for several reasons. The shamanic ritual has been characterized as a form of 'role playing' (Siikala 1978) and the role of shamanic spirits is best understood as the development of alternative aspects of self and identity (Winkelman 2000). The human psyche evidently evolved to enable us to 'see ourselves as other see us, so as to cause them to see us as we would like them to rather than as they would like to' (Alexander 1989, 491). The shamanic journey or 'out-of-body' experience exemplifies this ability to see one's self from the perspective of others (Hunt 1995) and to manipulate one's own and other's selves through ritual enactments. This shamanic journey involves enactments in the mind and would have been fundamental to the development of modern human consciousness. 'Observing in the mind implies *consciousness* and scenario-building' (Alexander 1989, 482). 'To observe (involve) one's self in scenarios in the mind is, I think, what is called *self-awareness*. To practise by observing one's self in the mind must in some sense be a description of the source of *foresight, purpose, planning, intent and deliberateness*' (Alexander 1989, 483).

The integration of brain modules in cognitive evolution

Hunt (1995) has shown that consciousness derives from cross-modal integration of different processing capacities. Mithen (1996) points out that how the specialized brain modules were integrated in evolution is problematic because artefacts evidencing *extensive* cross-modular integration are relatively recent (40–50,000 BP), long after the emergence of anatomically modern humans. This integration of thinking from different modules was found earlier in religious practices that dramatically expanded beginning 60,000 BP in the Middle–Upper Palaeolithic transition. Some 40,000 years after the appearance of anatomically modern *Homo sapiens*, a fundamentally new mentality was widely manifested in the carving of many kinds of figures, the use of jewellery, and the dramatic evolution of art and culture. A key feature of this modern mind was the capability to produce art based on visual representation and a symbolic code[10] through integrated functioning of different mental modules.

Mithen suggests this cognitive fluidity was based upon forms of meta representation derived from the integration of the specialized modules. The production of early art depended upon the ability to integrate tool-making skills, social intelligence and natural-history intelligence, producing anthropomorphic and zoomorphic thinking — understanding animals and nature in terms of human capabilities, and human characteristics in terms of animal knowledge. The capacity to cross domains, to develop concepts about concepts, is a normal condition of human thought, and is manifest in integrated representations of natural, social and physical environments. Hunter-gatherers think about the world in a highly integrated fashion, with an interpenetration of the natural and social in a single integrated environment, and an ideology encompassing humans, animals, and plants in a living nature.

Mithen thinks that the first step in the evolution of cognitive fluidity involved the integration of social intelligence and natural-history intelligence in early modern humans *c.* 100,000 BP. This integration would have provided the basis for universals of religious thought — animism, anthropomorphism, totemism, and guardian-spirit beliefs — through the interpenetration of these modules: anthropomorphic thinking from attributing human mental, self and social characteristics to animals; animism, applying mental and social models to animals, nature and the unknown; totemism, applying natural history (animal species) models to the social domain; and guardian spirits, applying animal and other natural-history models to interpretation and differentiation of self.

Mithen proposes that the Middle–Upper Palaeolithic transition was based on the dramatic expansion of the integration of different modules by the

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

transformation of the *social* language of early humans. As language-use about the non-social world began to infiltrate social discourse, this invasion of non-social information into social intelligence expanded meta-representation capabilities. A greater recombination of thought was achieved by the application of social consciousness to the non-social world through language. But Mithen's proposed integration of the social language module into other domains of intelligence was preceded by the emergence of music, art and religious behaviour tens of thousands of years prior to the cultural explosion which began around 40,000 BP. Artistic productions are not dependent upon language, or ideas expressed through spoken language (cf. Humphrey 1998). Rather, art represents an imagetic presentational (Hunt 1995) modality, which can function in highly-developed ways independent of language abilities. This suggests that the earliest art and religious artefacts and practices reflect the foundations of shamanism in a visual or presentational symbolism prior to a modern human language. Religious behaviour, music and art were produced by integration across modules through the imagetic modality and mimesis. Shamanism's central role in image (visionary experience), chanting, and mimesis (ritual enactment) suggest that it must have had an essential role in the emergence of modern cognition.

Evidence for symbolic behaviour in the Middle or early Upper Palaeolithic is disputed (Lindly & Clark 1990), but shamanism appears to be a core aspect of the cultures of this period and the emerging traditions of the Upper Palaeolithic. Ritual behaviour was present in earlier periods (Clark & Willermet 1997). Furthermore, the manifestations of shamanism are evidenced in an 'image-making' symbolic capacity, and the universals of shamanism associate it with the foundational tropes involved in analogical representation. Shamanism exemplified the changes which emerge in the Upper Palaeolithic, and must have been involved in producing those changes.

The emergence of art has been viewed as a form of symbolic behaviour that increased through cultural selection because it enhanced the successful replication of the group (Clark *et al.* 1996; Barton *et al.* 1994). The informational approach to art regards it as involving the transfer of information about group affiliation and status, serving a role in the management of contexts of interaction. The modelling of variation in cave (parietal) art within the context of climatic and social variation suggests that it had an emblematic style, associated with group boundaries, particularly economic territories. Increased cave art could thus be a reflection of closure in social networks and a response to increasing population density. This aggregation required more effective intergroup communication and further alliances to amplify ecological knowledge under conditions of resource pressure. Shamanism provided a number of mechanisms for meeting these goals.

Thus shamanism became particularly important in the context of increased aggregation and interdependence during the Middle–Upper Palaeolithic transition. The mythic cultures of this era found themselves thrust into interaction with groups with different mythic systems. The practices of shamanism were used to integrate mythic systems at the prior level of episodic and mimetic culture.[11] By forcing attention and awareness to these earlier phylogenetic levels of the brain, shamanic practices were able to subsume and supersede the mythic modes of thought. Shamanic practice was a form of play and enactment that enabled participation and understanding in spite of cultural differences.

Conclusions

Animism, totemism, the guardian-spirit complex and other aspects of shamanism are derived from ritual and psychophysiological integration of information in the brain and enhanced metaphoric representation through the cross-modal analogic and mimetic integration of specialized brain modules. Shamanism utilizes, through metaphoric extension, the innate modules which provide for social perceptions of 'others', their intentionalities ('mind reading'), animal behaviour, and religious ideas. Concepts of supernatural beings mix properties of the self, natural world, and social worlds, representing cognitive fluidity between distinct intelligences. Shamanic ideologies reflect the integration of different cognitive modules to produce new representations through metaphor. This constituted the basis for a major development in human cognition and helps explain the evolution of cognitively modern humans tens of thousands of years after the emergence of anatomically modern humans. Cross-cultural regularities in shamanic practices provide an *ethnological* analogy for reconstruction and interpretation of prehistoric cultural processes and a universal primordial religion.

The shaman's practices provided an integration of the different modules through ritually accessing biologically-based operations of consciousness, producing integrative brain conditions. Shamanic al-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

tered states of consciousness induce interhemispheric integration, frontal-limbic integration, brain stem-limbic-frontal integration, and integration across the neuraxis. These have numerous adaptive consequences, including enhancement of representation, healing, stress reduction, and information integration. They are especially apparent in visionary experiences and visual imagery. Shamans learned to operate on a number of specialized structures of consciousness, including the innate module domains: in language, through the first sacred languages, including music; in natural history, being the master of the game animals and guiding hunting; in social intelligence, being the leader of the group; and in personal development, providing for individuation and integration of self and identity.

Michael Winkelman
Department of Anthropology
Arizona State University
Main Campus
PO Box 872402
Tempe, AZ 85287–2402
USA
Email: michael.winkelman@asu.edu

Notes

1. I thank David Whitley, Geoff Clark, David Jacobs and Stewart Guthrie for their reading of earlier drafts of this paper and their suggestions for clarifying the ideas presented here.
2. These may include: having had involuntary visions, receiving signs from spirits, serious illness, deliberate vision quests, and the induction of altered states of consciousness through a variety of procedures: hallucinogens, fasting and water deprivation, exposure to temperature extremes, extensive exercise such as prolonged dancing, austerities, sleep deprivation, drumming, chanting, and social and sensory deprivation.
3. The biologically-based modes of consciousness are revealed in the recurrent patterns of systemic neurophysiological functioning and experience and the congruence of the biophysiological and mystical approaches in recognition of four fundamental conditions or modes of consciousness: 1) waking consciousness; 2) deep sleep; 3) REM sleep (dreaming); and 4) transpersonal, mystical or transcendental consciousness, which I refer to as 'integrative consciousness' (see Winkelman 2000).
4. Neurognosis reflects a physiological perspective on knowledge where structure implies function. Neurognosis consists of prepared pathways of neural connections specializing in sensory input, information storage, association and retrieval, and motor output, as well as systemic maintenance and many other functions' (Laughlin *et al*. 1992, 73). '[N]eurognosis canalizes the processes of perceptual discrimination, motor activity, and conceptual and symbolic differentiation and association [and] . . . the type and complexity of cognition of which the individual or the species is capable' (Laughlin *et al*. 1992, 61).
5. These ideas are exemplified in Fodor's *The Modularity of the Mind* and Gardener's *Frames of Mind: the Theory of Multiple Intelligences*. Gardener postulates seven different types of relatively autonomous human capabilities or intelligences: bodily-kinesthetic; spatial; a personal intelligence for looking in at one's own mind; a module for understanding others; linguistic; musical; and logical-mathematical skills.
6. Three basic innate human mental models or forms of representations have been proposed by Johnson-Laird (1983); these include propositional models based upon analytical logic; and images and mental models based upon analogical representation. The mental models represent structural analogues of the world, with images as perceptual correlates. Shore (1996) proposes that there are four levels of analogy formation: primary analogies based upon direct perceptual analogies and involving pattern-seeking and recognition behaviour; cross-modality sensorimotor associations based upon attribute similarity, relational similarity, synesthesia, and iconicity; relationships based upon self-conscious associations; and a structural metaphor isomorphic with content or thought which schematizes relationships between complex models.
7. These social processes include a balance of competitive and cooperative relations, mate and food competition, spatial and sleeping locations within the group, and a wide range of alliance, playing, and grooming behaviours. This produces a need for cognitive skills for cooperation and successful competition within one's social group.
8. Intelligent behaviour depends upon a combination of the serial analytical processes and the intuitive parallel ones. Agents may act in a number of different relations to one another, including serial and parallel or simultaneous actions. The ability for a number of agents to act simultaneously provides the basis for intuitive solutions to problems. Scheff (1993) suggests that intelligent behaviour requires the use of a wide range of associations that are contingent, providing the basis for the mind. This contingency provides the base for total association, moving from a closed to an open system. Humans require an open system because human interaction and inter-relationships are inherently ambiguous because meaning is contextually dependent.
9. Molino (2000) illustrates that music is not based on a single module but several — temporal, including meter and rhythm; and melodic components of pitch, contour and interval. The melodic components are features that are shared with language. Basic features of the respiratory, nasal and vocal systems necessary for music were present before the advent of language, perhaps as

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

long as 1.5 million years ago (Frayer & Nicolay 2000).

10. The central role of image in visual symbols reflects its importance in the evolution of thought. Mithen points out that visual symbols have specific properties (e.g. execution of preconceived mental template, intentional communication, and meaning attribution) which were present in early humans; however, they did not produce art with these capabilities because these distinctive cognitive domains were not integrated. The interpretation of animal marks as a basis for inference about behaviour indicates the presence of cognitive processes similar to those by which modern humans interpret meaning from other humans' signals or marks. However, early humans did not leave evidence of using this capability, as manifested in the art of modern humans. These early representations of animals by modern humans illustrate the ability to integrate a high degree of technical expertise with a highly developed and intricate knowledge of the natural world, specifically animal anatomies. These artistic tools for thinking about the natural world provided important storage of information, particularly relevant to long term and seasonal variations in animal behaviour and teaching and devising hunting plans (Mithen 1996).
11. I thank David Jacobs for expressing these ideas in response to my paper.

Comments

From David Lewis-Williams, Rock Art Research Institute, University of the Witwatersrand, Johannesburg 2050, South Africa.

Michael Winkelman is well-known for his work on shamanism; his interest in the Middle to Upper Palaeolithic Transition is therefore welcome. As his citations of my work suggest, I am in substantial agreement with him. Nevertheless, I add a couple of comments.

Winkelman's argument (and mine; Lewis-Williams 1997b; 2002) can be seen as comprising three components:

a) parallels and differences between cross-cultural (shamanistic) behaviours worldwide;
b) the role of universal human neurology in explaining the parallels, and human culture in accounting for the differences;
c) the actual configuration and functioning of the underlying human neurology.

We must be clear about what parts of Winkelman's argument we may or may not wish to dispute. Points (a) and (b) stand (the first founded on empirical observation, the second on the only viable inference), even if we disagree on the specifics of (c). We may therefore dispute, say, the cognitive modules proposed by evolutionary psychologists without doubting some sort of neurological foundation for observable cross-cultural similarities in shamanistic belief and behaviour.

It seems to me that evolutionary psychology, for all its attractiveness, has placed too much emphasis on intelligence as opposed to consciousness: it claims that modern consciousness resulted from connections between modules and implies that consciousness is a single, unchanging state (Lewis-Williams 2002). But it is not so much the combination of intelligence modules that leads to shamanic experience as the *shifting* nature of consciousness itself. Daily, all people move in and out of alert and introverted states; they also move through hypnagogic states into dreaming and eventual deep sleep. In addition, they have the capacity to move along an intensified spectrum through stages of altered consciousness into deep hallucinations (Lewis-Williams & Dowson 1988; Lewis-Williams 1991); such changes in consciousness may result from a wide range of means of induction, as Winkelman allows. This consciousness-shifting is what lies at the foundation of shamanism (and, of course, other religions as well).

In focusing on modular intelligence it is easy to think, as Winkelman does, in terms of adaptation and functionalism. Such reasoning misses one of the implications of adaptation: as the concept is often invoked, it implies too sharp a distinction between environment and human responses. It reduces active, intelligent human beings to reactors and sees human behaviours as fully explicable as ways of coming to terms with the environment, material or social. Winkelman writes, 'This aggregation required more effective intergroup communication and further alliances to amplify ecological knowledge under conditions of resource pressure. Shamanism provided a number of mechanisms for meeting these goals.'

The functionalist error here is to assume that shamanistic practices and beliefs integrate communities and thus contribute to successful adaptations. But integration, co-operation and forms of communication constitute only half the story. Integration of a social group is achieved by marking it off from other groups. All communities have to make sense of the shifting spectrum of human consciousness, and they do so by dividing the spectrum into evaluated segments; access to the 'far end' of the spectrum becomes socially divisive because not everybody achieves, or is permitted to achieve, the fullness of overwhelming, socially enhancing altered states of consciousness (Lewis-Williams 1997a). In short, sha-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

manism is divisive as well as integrating (as is all religion). It was this divisiveness that, in part, propelled the increasing social and technological diversity of the Upper Palaeolithic.

From Paul G. Bahn, 428 Anlaby Road, Hull, HU3 6QP,UK.

I disagree with some aspects of this article so profoundly that it is difficult to know where to begin. I shall limit myself, however, to comments on its radical misuse of cave-art data. Here the most crucial problem is that the author has based himself firmly on the claims put forward by Clottes & Lewis-Williams (1998) as if these were proven facts and gospel truth ('cave-art images represent shamanic activities and ASCs . . . and the subterranean rock-art sites were used for shamanic vision questing'). On the contrary, however, their theory is based on highly questionable and often erroneous premises (see numerous papers in Hamayon & Francfort 2001), in particular their assertions about African ethnography and about neuropsychology, which simply do not stand up to close scrutiny (see Bahn 2001). Indeed, their claims about cave art are widely seen as a great leap backwards to the simplistic misuse of ethnography in the early twentieth century, and I know of no specialist on Ice Age art who takes them seriously.

Winkelman's article contains many of the usual assumptions and distortions that one associates with this particular school of thought. Why, for example, should percussion instruments and bird-bone flutes necessarily have the slightest connection with 'shamanism', and why should heelmarks — known in a single cave, the Tuc d'Audoubert! — be a ritual dance, when these traces are associated with evidence for children playing and doodling in the clay floor? How on earth does he know that any kind of initiation took place in the caves, let alone that caves were used 'for altered states of consciousness induction'??

Even more outrageous is his claim that humanoids in cave art represent the 'human–animal interface', when in fact true therianthropes are incredibly rare — indeed they can be counted on the fingers of one hand — and are thus hardly representative of the tens of thousands of images in this art corpus. Winkelman later seems to get confused, referring to the 'Sorcerer' of Les Trois Frères (the best-known therianthrope) as a 'naturalistic human' — he claims that these rare naturalistic humans 'were placed in very significant positions', but the 'Sorcerer' is the only example of this that comes to mind.

And he goes on to claim that 'human depictions frequently include the "wounded man"', which is simply untrue; and that 'prominent among human depictions are "bird-men" [only a couple of examples, in fact], the "wounded man" [ditto] and the prostrate or reclining position of human–animal forms, with erect penis and bird symbolism' (one example?). How can one possibly take seriously a theory that relies so overwhelmingly on a carefully selected and tiny handful of utterly abnormal figures, and thus ignores the vast majority of the art's imagery? It is ironic that he (rightly) dismisses hunting magic as an explanation because fewer than 10 per cent of the animal figures were 'killed' or 'wounded' — this theory nevertheless explains a far higher percentage of the art than do the examples used by Winkelman to support these fantasies.

His flagrant conjectures then conclude with 'the images illustrate a number of aspects of shamanic practice, including ASCs, visionary experiences, ritual, human–animal identities . . .' and he is certain that 'intergroup activities were carried out in the large elaborately decorated chambers'. This is simply wishful thinking which is completely rejected by all cave-art specialists outside the select band of those obsessed with shamanism. Some of the ideas presented in the article may have some merit — e.g. there may indeed have been initiations in some caves — but we have absolutely no way of knowing this, on present evidence, and it is irresponsible to publish such speculations about the past as if they were proven facts. In short, I fear that this article will prolong and extend the damage that this deeply flawed and largely groundless theory has already inflicted on the world of rock-art, and on Ice Age art in particular.

From David S. Whitley, ICOMOS-CAR, 447 Third Street, Fillmore CA 93015, USA.

Michael Winkelman has provided us with a welcome antidote to recent postmodernist plaints contending that (1) all forms of shamanism are different, if (2) indeed there even is any widespread phenomenon that can be called 'shamanism,' and that (3) anyone who employs this generic term is by its use racist anyway. Instead of academic debate reduced to character assassination, Winkelman generalizes about the nature and origin of shamanism and, in so doing, contributes to our understanding of human evolutionary processes.

The hypothesis that shamanism was the first religion is an old one in anthropology and the history of religions; hence it is not this issue that is most interesting in Winkelman's discussion. There are in-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

stead two sub-texts that, I believe, are most relevant to archaeologists. The first, implied above, involves his argument's evolutionary implications, best seen in contrast to a doctrinaire processual archaeological view. This last perspective ignores cognitive and emotional phenomena but, because these are human universals, they must be taken as givens. Yet this results in an unresolved and unnoticed contradiction inasmuch as it is human mind more than DNA that separates us from our closest animal kin. In essence then a processual view of human evolution must resort to pre-Darwinian creationism to explain the totality of the human condition: if mind and psyche were not integral parts of human biological evolution — if they are disembodied, in other words — where then do they come from? By outlining the process by which shamanism may have been linked to human mental and psychological development, Winkelman provides us with a more complete and usable view of human evolutionary processes.

The second implication concerns the place of religion in society. Winkelman's argument implies that religion may have developed not to satisfy some (functionalist) group purpose, but instead to accommodate individual and personal psychological needs. This perspective may finally resolve the functionalist explanatory impasse: while religions indeed may promote group solidarity, this functional outcome may be understood as a result of processes operating at the level of self, rather than as a social consequence confused with cause. Put another way, it may be the psychological rather than ecological adaptation to our world that first promoted the initial forms of human social organization.

From Bruno David, Department Geography and Environmental Science, Monash University, PO Box 11A, Clayton, Victoria 3800, Australia.

I thank Michael Winkelman for the opportunity to debate these important aspects of cognition and cultural practice. Although I do not share his views on many of the points discussed here, he has raised several stimulating issues, some of which I wish to take up though others, because of space and time limitations, are unfortunately beyond my immediate concerns. I limit my comments to broad issues.

There are two generally accepted definitions of shamanism. The first (and earliest) relates to the religious beliefs and practices of the Ural-Altaic peoples of Siberia. In this first definition, shamanism relates to regionally- and historically-specific cultural beliefs and practices.

The second definition is broader and relates directly to the concerns enunciated by Winkelman. Shamans in this instance refer to a general, non-regionally-specific category of individuals who mediate between the earthly and spiritual worlds. They are medical practitioners and priests — spiritual leaders — who often exercise their knowledge, roles and powers in variously induced altered states of consciousness (ASC), often in a context of structured ritual activity. Shamans have particular views that link and in some contexts enable communication and even transformation or metamorphoses between the human and non-human worlds. Animism and totemism are common shamanistic traits.

Although Winkelman identifies shamanism as being close to universal in hunting and gathering societies, in truth the shamanistic characteristics he identifies are found in all societies, including industrial ones (take for instance Christian faith healers, or drug-related 1980s warehouse parties in the UK: cf. Rainbird in press). Indeed, if the traits of shamanism are as universal and biologically-based as Winkelman suggests, why is not every individual in all societies during all historical periods a shaman, or at least a member of a shamanistic society (where a nominated shaman directs the desired tasks, in which all community members partake)? In this broadest sense, shamanism relates not to an evolutionary stage of cognitive experience and cultural practice, but to the general observation that peoples of all cultures are social animals that periodically congregate (for whatever reason) and actively engage in the production of collective consciousness through mediators or leaders of various kinds. If all peoples have beliefs about their relationships with the broader world (including notions of transformation, and religious beliefs about souls); believe in transference and outer-worldly communication (e.g. through the Holy Spirit); practise rituals (e.g. the Christian mass); communicate and perceive the world through metaphoric processes (e.g. the Eucharist as the body of Christ); engage in ASC (through stress, drugs, late nights, dancing or whatever); have visionary experiences (e.g. Paul on the road to Damascus; visions of Saint Bridgid); have spiritual beliefs (which sometimes lead to communication with 'supernatural' beings such as through prayer); and represent these perceptions through art (e.g. halos, winged angels), what does it mean to say that shamanism (in its broadest definition) — which also has these characteristics — is a 'universal primordial religion' and responsible for Upper Palaeolithic cave art? The problem lies: when shamanism is taken in this broadest sense, cultural specificity is withdrawn

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

or silenced, begging the question whether the concept of shamanism is at all useful. In asking the 'big' evolutionary questions, would we be better served by focusing on what constitutes religious experience itself, and the concomitant emergence of spiritual leaders in cognitive and in human evolution, rather than focusing on specific kinds of spiritual leaders, such as shamans, that then take the place of religious experience in discussions of spiritual awareness and practice? One of the grave dangers of concentrating on shamanism as a catch-all explanation for spiritually-inspired cultural practice is the silencing of ontology, the silencing of culturally- and historically-specific world views and practices. Stage-based evolutionary models come to replace an understanding of specific *modern* cultural practices (which include the shamanism of ethnography), inhibiting a social and historical understanding of such practices in the process.

In light of the above, let us not forget that shamanism has never been demonstrated for Upper Palaeolithic Europe. A number of authors (Lewis-Williams now amongst many) have suggested shamanistic interpretations, but these are suggestions, not logically necessary demonstrations. At issue here is the logic involved: while shamanistic-inspired rock-art may contain certain properties — e.g. entoptic-like images, among others — abstract art, therianthropes, and other features are often produced without shamanism. A (shamanism) may lead to B (particular kinds of images), but as many other things can also lead to B (schematization, particular cultural beliefs and conventions, even art produced in ASC outside shamanistic frames of reference), B's presence does not necessarily imply A. The challenge then is to determine when shamanism is involved, and when it is not. This key question of distinctiveness has not been addressed in this or, to my knowledge, in any other publication, and therefore we have not yet determined or even deemed likely whether or not Upper Palaeolithic rock-art was produced via shamanistic belief and practice. With notable exceptions such as some cases in the western US and a few cases in southern Africa, there is little evidence that much rock-art elsewhere in the world was created through shamanism. For one, it is possible that some rock-art in some places at some periods of time was created as a (direct or indirect) result of experiences of altered states of consciousness, as the shamanism model dictates. But not all altered states of consciousness or 'vision quests' imply shamanism. Indeed, few do: getting stoned does not necessarily mean shamanism. Is it a 'vision quest'? And does religious art imply shamanism? The presence of neuropsychological processes does not mean shamanism. And the fact that drug- and/or ritual-mediated altered states of consciousness (can) produce 'entoptics' — dots and other patterned imagery — does not mean that dots and other shapes, mental or pictorial, imply entoptics or altered states of consciousness.

In short, Winkelman raises many interesting issues worthy of debate, but I question whether 'shamanism' is the road for such discussions. I suspect a more fruitful avenue would be to disentangle the various traits that constitute 'shamanism' (as in parts of his article) and address those for what they are, rather than through the catch-all entangled web and uniforming representation of shamanism.

From Chris Knight, School of Social Sciences, University of East London, Longbridge Road, Dagenham, Essex RM8 2AS, UK.

It is this kind of thing which gives modularity theory a bad name. Cognitive scientists have become acquainted with invisible entities such as the 'language module' or 'cheat detection' module (Tooby & Cosmides 1992). Now Winkelman (p. 73) offers us the 'soul flight, soul journey, out-of-body experience and astral projection' module. It reminds me of those eighteenth-century phlogiston theorists who explained that fire comes from fire-substance. Without seeing the joke, Winkelman in this article solemnly explains that shamanism comes from the shamanism module.

Winkelman is correct to see in shamanism a challenge to Darwinian theory. Why on earth would an evolving bipedal primate enhance its reproductive fitness by cramming its brain with vivid hallucinations? No primatologist to my knowledge has suggested that chimpanzees, for example, might benefit from 'astral projection'. So, yes, we do need a theory. Somebody needs to make a synthesis of some kind, integrating Darwinian sexual selection and signal evolution theory with, for example, Lewis-Williams' (1981) ground-breaking work on hunter-gatherer rock-art, trance-dance and culture. If humans are innately gullible (Dawkins 1993), it must be the case that hallucinating *under specified circumstances* can confer fitness benefits. But what about the rather more obvious costs? A gene which influences social behaviour will spread only when the fitness costs are outweighed by corresponding benefits (Hamilton 1964). Winkelman seems unaware of the costs, focusing only on postulated benefits — which he treats as unconditional. This methodology has no obvious connection with modern Darwinian theory.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

To hallucinate during a ritual performance is to render oneself helpless and defenceless. Not being aware of 'costly signaling theory' (Zahavi & Zahavi 1997), Winkelman is unable to theorize this as an example of status-seeking through public self-handicapping. Consequently, in seeking to explain how the 'innate module for shamanism' evolved, he is forced into group-selectionist reasoning — apparently unaware of the theoretical problem here. Turning to the 'survival value' of shamanism, Winkelman writes (p. 81):

> The sense of unity and pan-human identity widely associated with shared ritual altered states of consciousness contributed to the development of strong emotional bonds between bands and alliances that were vital for survival in times of resource scarcity.

But when local resources are scarce, isn't fighting an alternative possibility? Don't *war-dances* (e.g. La Barre 1972) feature recurrently in the ethnographic record as contexts for self-induced collective hallucination? I would not wish to dispute that our species is indeed susceptible to 'pan-human' visions of brotherly love. But until the costs of such biologically anomalous modes of cognition are factored in, we just haven't got a theory.

In short, while we need a synthesis on the interesting topics Winkelman covers, this article is unfortunately not up to the job. It does not give us an original integrative perspective, does not clarify the issues and leaves the field in a worse muddle than it was in before.

From Merlin Donald, Department of Psychology, Queen's University, Kingston, Ontario, K7L 4P9, Canada.

Winkelman concludes that the patterns of shamanic culture confirm the existence of an innate mimetic capacity in its practitioners. I agree with this, but I wish to question his use of terms. Specifically, I will comment on the use of 'module' to characterize mimesis.

Mimesis is an innate capacity, but that does not necessarily imply that it is housed in a mental 'module'. This term has been treated rather casually in some quarters, and it is important not to use it so loosely that it loses its meaning. In their classic definition (Fodor 1983), modules are 'informationally encapsulated' that is, relatively self-contained cognitive systems with built-in design features that optimize their functions, and have an automatic or 'mandatory' mode of operation that precludes conscious regulation. Strictly speaking, this means that modules are inaccessible to consciousness, as in the case of the subsystems of vision. Above all, modules are domain-specific, that is, restricted to a narrow range of function. They are not domain-general or 'supra-modal'. Capacities with the latter properties are labelled as 'nonmodular' precisely because unlike modules, they are open, integrative, and accessible to conscious regulation.

A good example of a modular capacity is birdsong, which is restricted to one sensory modality, with a number of rigid, unalterable design features. In contrast, human mimetic action is flexible and supramodal, involving the whole body. Mimesis involves, as Winkelman has noted, the integration of many different sensory and motor modalities in unpredictable and flexible combinations. This is surely a perfect example of nonmodular or supramodal cognition. The use of the term 'module' to characterize mimesis is therefore inappropriate. Mimesis is the opposite of a narrow module; it is a nonmodular capacity, fully accessible to conscious regulation.

Mimetic action includes re-enactive mime, imitation, gesture, and skilled rehearsal, as well as role-playing and imaginary games. It constitutes a very remarkable human adaptation, and we are beginning to realize that it is one of the most complex capacities of the human brain. Mimetic action involves the deliberate matching of a motor act to a perceived event. This is difficult for the brain to achieve, because the *perception* of an event rarely resembles its *reproduction*. For example, from the vantage point of the observer/actor, the actions of others seldom resemble one's own attempts to imitate them. We cannot see our own face or bodies during the performance of a ritual, yet we might be quite successful in reproducing its rhythms and patterns. How can the brain achieve this, when it cannot see the self in action? There is no simple mapping principle by which a perceptual image of an event, such as a ritual, could be used as a template for generating an appropriate action. The only way such a map can be constructed is by building a 'kinematic' image of one's own actions in imagination. In terms of abstraction and complexity, this is possibly the most advanced function of the mammalian brain, other than language itself.

Although its neural source is not yet fully understood, mimesis seems to have evolved, not in an informationally-isolated neural module, but rather in the nonmodular areas of the hominid 'executive' brain (Donald 1995; 1998; 1999; 2001). This system evolved out of a complex of anatomical structures that regulate voluntary or conscious action, and are found in most social mammals. Hominids have greatly added to this complex system, which is cen-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

tred on the prefrontal cortex. Comparative studies of primate prefrontal cortex show that it has more than tripled in hominids, invading motor regions that were formerly beyond its influence. As a result, it plays a more direct role in regulating action in human beings than in apes or monkeys (Deacon 1997). Related structures that are closely interconnected with prefrontal cortex, such as parts of the temporal lobes and the lateral cerebellum, have also expanded greatly, in some cases by a factor of six or eight times. In fact, most of the expansion of the hominid brain can be accounted for by this remarkable enlargement of the nonmodular, or 'executive' brain system.

The recent discovery of 'mirror neurons' (Rizzolati *et al.* 1996) in the premotor and temporal cortex further emphasizes the importance of these wide integrative networks. Mirror neurons represent abstract classes of action, whether performed by the self or others. The same mirror neurons that fire when I pick up a pen will also fire when I see you pick up the pen. They seem to track the objective or intention driving a movement. Since such neurons seem to exist in all primates, they provide us a very credible starting point for the evolution of mimetic capacities. Anatomically, mirror neuron circuits are positioned just where we would predict, at the junction of the major perceptual and action systems of the brain, ideally located for flexible nonmodular integration. The location and function of these circuits, and their close linkages with the prefrontal cortex, argue against the notion of an encapsulated module.

I have recently suggested that in evolving mimesis, hominids became supremely conscious creatures, extending the influence of conscious regulation to include the embodied self. Other primates are much less physically self-conscious than humans (for this reason they do not deliberately refine skills, such as throwing). Humans are uniquely capable of focusing our awareness on the internal world of the actor. This is where human culture begins, in the deliberate self-regulation of action. Before we were speakers or writers, we were self-conscious mimetic actors. But this capacity was evolved, not by evolving a new mental module, but by refining and expanding existing primate capacities for conscious self-regulation.

From Nicholas Humphrey, Centre for Philosophy of Natural and Social Science, London School of Economics, Houghton Street, London, WC2A 2AE, UK.

'The shamanic context of cave art is attested by a number of features', Michael Winkelman writes (p. 76); and, scarcely pausing for breath, he proceeds to reel off as if they were matters of established fact a list of conjectures about the authorship and meaning of Ice-Age cave paintings. We are to conclude, without question apparently, that 'cave-art images represent shamanic activities and altered states of consciousness, and the subterranean rock-art sites were used for shamanic vision questing' (p. 77). Well, may be. The shaman hypothesis is certainly an intriguing one; and David Lewis-Williams, in particular, has made a plausible case for it. Yet my own first reaction is: not so fast. For one thing, I myself, in the pages of this journal a few years ago, presented evidence which — to begin with, anyway — suggests that any such interpretation has to be completely mistaken.

In 'Cave Art, Autism and the Evolution of the Human Mind' (Humphrey 1998), I compared the style and content of Ice-Age art (in particular the paintings at Chauvet) with the drawings of a four-year-old autistic savant, Nadia — a severely retarded girl who had virtually no language and no ability to think conceptually. I pointed to remarkable resemblances in style and content between the cave paintings and Nadia's. I noted the surprising fact that drawings of this quality are never produced by untrained artists today *unless* they are autistic, and indeed that the precondition for the 'release' of this artistic ability in modern human beings seems to be the lack of interference from 'higher-level' cognitive elaboration. And on this basis I tentatively suggested that the Ice-Age artists themselves may have been operating at a pre-linguistic non-conceptual level.

Now, at first sight, there might seem to be little room for negotiation here, between Winkelman's grandiose view of the significance of cave art as the work of shamans and my deflationary view of it as the work of individuals who, at least compared to modern-day humans, were cognitively backward. If the cave artists were shamans then presumably they had the capacity for quite sophisticated conceptual thought.

Yet, even before reading Winkelman's paper, I had begun to wonder whether this way of putting things, as a simple either/or antithesis, might be obscuring a more complex and interesting truth. What if shamans resembled autistic savants *some of the time*? What if the very activity of shamanizing rendered these people in some respects *functionally autistic*, so that at the time they made the drawings they were *temporarily* in a non-conceptualizing state of mind? Given new ideas about the origins of savant skills, I think there is reason to take this possibility seriously.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

The key work is that of psychologist Alan Snyder (1997; 1999; see also Birbaumer 1999; Humphrey 2002). Snyder has pointed out (as indeed have others before him) that the human brain normally acts like a filter, passing into conscious awareness only a highly edited and constructed picture of the world. In order to arrive at this picture the brain must take account of a mass of raw sensory information, store the details at least transiently, and apply a set of basic computational algorithms to make sense of them. But, in the normal course of events these details and the algorithms are lost to sight, being overshadowed — or even actively suppressed — by the larger picture which supercedes them.

In the case of autistic savants, however, Snyder suggests that the details are *not* overshadowed, for the simple reason that these savants are not capable of constructing the larger picture. Thus the raw information is left, as it were, on open display. 'We believe that artistic savants have direct access to "lower" levels of neural information prior to it being integrated into the holistic picture, the ultimate label. All of us possess this same lower-level information, but we cannot normally access it' (Snyder 1999, 588). So, for example, 'the autistic savant Nadia can directly tap the way in which our brain derives perspective, whereas normal individuals cannot'.

But, if this is right, it raises immediately a tantalizing possibility. If normal people do store low-level information at least transiently, then maybe *by somehow mimicking the non-conceptualizing state* they too could keep this information open to view. As Snyder asks at the end of a recent paper: 'Although we do not normally have access to lower levels of information as do savants, is there nonetheless some artificial means to promote this access, *say via induced altered states of consciousness*?' [my italics] (Snyder 1999, 592).

The relevance to the Winkelman/Lewis-Williams thesis will be apparent. Suppose it is true, as I would still maintain, that only someone with a savant-like mind could possibly have produced cave paintings such as exist at Chauvet. But suppose now it is also true that an otherwise normal person *by entering an altered state of consciousness which suppresses conceptualization* could acquire savant-like skills. Then shamans might indeed have been cave artists.

But this argument depends, of course, on there being independent evidence that altered states really can have the effect that Snyder suggests. I think there is in fact already highly suggestive evidence for it in some of the older literature on psychotropic drugs — and perhaps most tellingly in Aldous Huxley's classic account of his experiments with mescalin, *The Doors of Perception* (Huxley 1954).

As Huxley describes it, one of the effects of mescalin is precisely to remove the 'tyranny' of higher order concepts.

> Visual impressions are greatly intensified and the eye recovers some of the perceptual innocence of childhood, when the sensum was not immediately and automatically subordinated to the concept . . . These effects of mescalin are the sort of effects you could expect to follow the administration of a drug having the power to impair the efficiency of the cerebral reducing valve (Huxley 1954, 25–6).

What is revealed is 'the infinite value and meaningfulness of naked existence, of the given, unconceptualized event' (Huxley 1954, 26).

And Huxley places his mescalin-induced experiences within a context that closely prefigures Snyder's.

> Reflecting on my experience, I find myself agreeing with the eminent Cambridge philosopher, Dr C.D. Broad, 'that we should do well to consider much more seriously than we have hitherto been inclined to do the type of theory which Bergson put forward in connection with memory and sense perception. The suggestion is that the function of the brain and nervous system and sense organs is in the main *eliminative* and not productive. Each person is at each moment capable of remembering all that has ever happened to him and of perceiving everything that is happening everywhere in the universe. The function of the brain and nervous system is to protect us from being overwhelmed and confused by this mass of largely useless and irrelevant knowledge, by shutting out most of what we should otherwise perceive or remember at any moment, and leaving only that very small and special selection which is likely to be practically useful'. According to such a theory, each of one of us is potentially Mind at Large. But . . . Mind at Large has to be funnelled through the reducing valve of the brain and nervous system (Huxley 1954, 22–3).

Now, if mescalin can indeed have the effect of temporarily by-passing the reducing valve and thus opening the door to a savant-like level of raw cognition, then surely other consciousness-altering techniques can do the same. As Huxley suggests (1954, 24), 'Temporary by-passes may be acquired either spontaneously, or as the result of deliberate "spiritual exercises", or through hypnosis, or by means of drugs'. In which case, we may well imagine that some of these techniques were in fact available to those Ice-Age shamans.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

This is of course no more than speculation. Nonetheless I think we can now guess at a scenario that would reconcile Winkelman's views and my own — although only by showing each of us to have been partly wrong in our assumptions. Yes, the cave art was made by human beings with savant-like minds; but not, as my earlier thesis implied, by human beings who were savant-like by nature. Yes, the cave art was made by shamans; but not, as Winkelman believes, by shamans giving expression to high-level symbolic thought. Instead, let's imagine those artists, deep within the caves, suffused with music and dance, inspired by whatever constituted their Ice-Age soma, their memories primed, their senses sharpened, regressing to the state of 'innocent perception' of which Huxley speaks. Perhaps it was in *that* state that they were able to recall in quasi-photographic detail the sightings of wild animals; in *that* state that they were able to trace the outlines of these images as if projected by a lantern onto the cave wall.

Huxley does not write in *The Doors of Perception* about Ice-Age art. But he does compare his mescalin experience to the work of painters. '"The nearest approach to this," I said, "would be a Vermeer." Yes, a Vermeer' (1954, 38). Remarkably enough, it has now been established that Vermeer, in all his later and most famous paintings, used a lens to project an optical image on to a canvas on the wall of his studio and then traced the image (Steadman 2001). Although he used a camera rather than savant imagination, Vermeer himself may have been returning to the visionary roots of human art.

From Jean Clottes, 11 rue du Fourcat, 09000 Foix, France.

Winkelman's paper purports to extend the findings of Lewis-Williams that we tried to apply to European cave art (Clottes & Lewis-Williams 1998). Such an attempt is quite welcome.

My domain of expertise being the painted caves and not shamanism *per se* nor neurophysiology, I shall content myself with a few remarks or observations about three points raised in Winkelman's article, after a more general remark.

From the start Winkelman asserts that the universality of shamanism 'is not the result of diffusion' but rather 'the consequence of independent inventions, or derivations, from a common neuropsychology'. This is obvious when one considers forms of shamanism as various and remote as those found in Asia or in southern Africa, for example, and the deep-seated roots of shamanism in human neuropsychology leave little room for doubt. Half a century ago, however, Mircea Eliade had already remarked upon the resemblances between the forms of shamanism to be found in Siberia, in the Arctic and in the Americas and he had postulated that shamanism might have been brought to America by the first Palaeolithic people who entered the continent via the Bering Strait (Éliade 1951, see 1996 edition, 265–7). The shamanistic elements found in the painted caves would tend to support the idea that shamanism was the basic form of religion during the Upper Palaeolithic. Therefore a spread of those ideas in very early times to the American continent would make a lot of sense. In that case, it would be diffusion rather than independent invention.

Human representations combining human and animal features are regularly quoted in the literature (the so-called 'sorcerers' of Trois-Frères and Gabillou) but are indeed rare. That is also the case with the 'wounded man' theme, contrary to what Winkelman says (Cosquer, Pech-Merle, Cougnac, Lascaux, Sous-Grand-Lac, Gabillou) (Clottes & Courtin 1996, 155–61). In addition to the well-known therianthropes cited, however, there exist a number of what could be called discrete composite creatures. These are either mostly human with some animal characteristics (for example a woman with a 'bestialized' head on a well-known engraved bone from Isturitz), or mostly animal with a human feature (like two bison at Cosquer with their penis in the wrong place for a bovid but in the right place for a man) (Clottes, in press). This observation stresses the ambiguity which must have been prevalent in the Upper Palaeolithic between the animal and the human realms and which is indeed one of the characteristics of shamanism.

Winkelman points out that 'the conditions within the caves (e.g. sensory deprivation) would alone have induced altered states of consciousness'. This can be substantiated by many testimonies from cavers at a time when they did not use modern equipments such as the ones available now, i.e. when they were more vulnerable to the cold, the wet and the weariness that those conditions induced (Clottes & Lewis-Williams 2001). A medical thesis even devoted a chapter — called '*errements sensoriels*' — to the auditory and visual hallucinations testified to by various cavers (Féniès 1965, 39–43). This is all the more significant as altered states of consciousness could be dangerous to cavers and were accidental effects which were most certainly unintended. On the other hand, the attitude of mind of Palaeolithic people voluntarily going into what they thought was a supernatural realm — such a belief about the deep

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

caves is widespread all over the world — must, on the contrary, have been quite favourable to inducing visions.

As to shamanistic practices during the Middle Palaeolithic, i.e. by the Neanderthals, we do not have the support of the art that we have for the Upper Palaeolithic to substantiate them, nor the evidence of their regularly frequenting deep caves for cultural purposes. There is, however, a possible exception in one little-known recent discovery (Rouzaud *et al.* 1996) which is worth mentioning. Several hundred metres inside the Bruniquel cave, in the Tarn-et-Garonne (France), broken stalactites and stalagmites were piled and arranged in a kind of oval measuring roughly 5 × 4 m, with a much smaller round structure next to it. A fire was made nearby, and a burnt bone from it was dated to more than 47,600 BP. If this date also applies to the arrangement of stalagmites, as seems likely, it puts the structures well within the Mousterian. No practical purpose can be suggested for these constructions: the people who made them did not live that far inside the cave, as the absence of the kind of remains so common on habitation sites testifies. The only hypothesis that makes sense is the delimitation of a symbolic or ritual space well inside the subterranean world.

Reply from Michael Winkelman

Does 'Shamanism and Cognitive Evolution' present a 'deeply flawed and largely groundless theory' as Bahn claims, and leave the field 'in a worse muddle' as Knight asserts? Or does it 'contribute to our understanding of human evolutionary processes' (Whitley) and provide a new perspective for interpreting the role of religious beliefs and practices in human cognitive evolution? The answer does not lie somewhere between the two extremes, but depends upon the paradigm one uses. As Clark (1993) points out, archaeologists' tendency to rely upon strict empiricist notions of observations and facts, rather than theories, needs to be 'turned around'. Theories determine what are facts and which facts are the most relevant.

Archaeology has laboured under a worldview that sees religious beliefs and practices as ephemeral. These assumptions have undermined a scientific approach to understanding religion, dismissing its importance rather than recognizing it as a manifestation of basic psychobiological, psychosocial and neurognostic mechanisms (e.g. see Laughlin *et al.* 1992; Winkelman 2000; d'Aquili & Newburg 1999). A scientific approach is embodied in the biogenetic structuralist theories of religion and the derivative shamanic paradigm. A scientific approach involves systematically applying and evaluating the usefulness of these frameworks for explaining cultural behaviour, rather than taking a dogmatic scientistic stance that explaining religious behaviours fall outside of the scope of science or Darwinian selection.

Perspectives that reject an etic paradigm of shamanism, and refuse to consider a psychobiological and evolutionary model of shamanism, cannot account for significant data. Bahn's simplistic empiricist notions fail to recognize that facts are part of a system of interpretation and always subject to a paradigmatic bias (Clark 1993). Those who refuse to consider the evidence for a new paradigm will find distractions to avoid its implications. For instance, nowhere does my article claim, as Knight mockingly attributes, that 'shamanism comes from the shamanism module'. Rather the article claims:

> The neuropsychological basis of shamanism is manifested in cross-cultural similarities in shamans' characteristics (p. 72)
>
> Universals of shamanism are manifestations of *neurognostic* structures (p. 73)
>
> Shamanic thought [is] . . . produced by cross-modular predication of innate modules . . . (p. 74).

Similarly, Bahn's preference for misrepresentation and distortion is illustrated in his statement 'Even more outrageous is [Winkelman's] claim that humanoids in cave art represent the "human–animal interface", when in fact true therianthropes are incredibly rare'. The statement is a *non-sequitur*, with the truth of the claim independent of the rarity of the occurrence. Furthermore, my discussion of human representations begins with 'depictions of humans are in small numbers' (p. 77). The rarity of human depictions makes their presence all the more significant, and the correspondences of their unusual characteristics to shamanic universals make a compelling argument for shamanic interpretation.

The shamanic paradigm as an etic and evolutionary model

My use of shamanism in interpreting Palaeolithic cave art is not an original perspective, but is novel in introducing shamanism as a biologically-based paradigm. This paradigm is in the Darwinian tradition of biogenetic structuralism (Laughlin & d'Aquili 1974; d'Aquili *et al.* 1979; Laughlin *et al.* 1992). This approach identifies the neurological bases underlying human cultural institutions in the confluence of: hu-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

man universals, their relationship to neurological structures, and their homologies with structures and functions found in other animals (d'Aquili *et al.* 1979; Laughlin *et al.* 1992). It is Darwinian in arguing for the continuity of shamanic ritual with ritual behaviours in other animals, and in explaining universals of shamanism with respect to the broader phylogenetic roles of rituals. As Whitley's comment emphasizes, this approach incorporates an understanding of biologically-based human universals of emotional and other cognitive processes. The shamanic paradigm helps explain how individual and collective processes are integrated. Linking intraorganismic and interorganismic processes is the fundamental role of ritual in the animal kingdom (d'Aquili *et al.* 1979), placing the adaptive roles of shamanic ritual within Darwinian traditions.

In Kuhn's (1970) terms, the shamanic paradigm is an 'exemplar' within the 'disciplinary matrix' of biogenetic structuralism. The latter emphasizes the phylogenetic roots and adaptive significance of ritual behaviours. Substantial continuities between non-human and human rituals provide support for inferring the central role of shamanic practices in the Middle/Upper Palaeolithic transition. In addition to the data cited in the article, and the evidence for group chanting in particular, there are several other lines of support. These include the capacity for caring and healing, a part of the primate heritage (Fabrega 1997); ritual in non-human animals and its continuity with human ritual behaviours; activities homologous to shamanic ritual found in chimpanzees' 'dances' (Goodall 1986; Kohler 1927); and the role of hypnotic susceptibility in primate and human evolution (McClenon 2000). These foundations permit logical inference about the necessary role of shamanic-like practices in the Middle/Upper Palaeolithic transition.

Bahn ignores cross-cultural research in dismissing the shamanic paradigm as 'the simplistic misuse of ethnography'. The shamanic paradigm is not based on single ethnographic examples, but on the compelling power of cross-cultural research that establishes etic structures (Winkelman 1984; 1986a; 1990; 1992). The complex of healing practices and beliefs in hunter-gatherer societies around the world demonstrates the empirical nature of shamanism. These universals provide the basis for valid inferences about prehistoric human healing practices. Such cross-cultural data answers Bahn's question of why 'percussion instruments . . . necessarily have the slightest connection with "shamanism"'; the connection is found in the cross-cultural patterns of shamanic practices and their biological effects.

Cross-cultural research clarifies David's misleading claim that instead of a hunter-gatherer shamanism, *shamanistic* characteristics are found in all societies. Cross-cultural research (Winkelman 1986b; 1990; 1992) justifies the distinction between shamans of hunter-gatherer societies and the universal practices of shamanistic healers. At the core of hunter-gatherer shamanism is a cultural universal — entering ecstasy (ASC) to interact with the spirit world on behalf of the community (Winkelman 2000). But the hunter-gatherer shamans also have characteristics not found in other shamanistic healers (e.g. soul flight, animal allies, transformation into animals, capacity for sorcery, hunting magic: see Winkelman 1992). David is right that the term shaman loses its usefulness when extended to the vast array of community-healing practices. The concept of shaman is, however, very useful when it is restricted to a specific complex of empirically-derived characteristics of healers found in hunter-gatherer and simple agricultural and pastoral societies.

Ritual in phylogenetic perspective

Biogenetic Structuralism (Laughlin & d'Aquili 1974) and *The Spectrum of Ritual* (d'Aquili *et al.* 1979) illustrate theoretical and evidentiary frameworks for interpreting human ritual in evolutionary perspective. Biogenetic structuralist approaches reveal the functions of ritual and their related cognitive and social processes through a comparative psychology that connects human behaviours to those of other species. Rituals found in all human societies share variables also found in non-human animals' formalizations, 'fixed action patterns' and displays (Smith 1979). Animal ritual is a mechanism for communicating and coordinating behaviour. Examination of ritual behaviours in non-human animals helps identify the evolutionary origins of rituals, the precursors of human rituals, and their biological functions (d'Aquili *et al.* 1979).

Rituals in non-human animals regulate communication and relations among members of a species. Animal rituals are specialized signalling mechanisms that make internal information available to others. Ritual addresses an adaptive problem encountered by all species: how to coordinate the action of individuals into collective, socially coherent and coordinated patterns. Coordination requires control of the information transmitted between conspecifics. Ritualization and displays are stereotyped behaviours selected through evolution to pro-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

vide specialized information that facilitates interaction between members of a species. Smith (1979) characterizes ritual behaviours of animals as exemplifying their most complex forms of communication.

Ritual coordination of behaviour is exemplified in the fixed-action patterns that permit reproductive behaviours. Ritual behaviours often precede cooperative actions and contribute to cooperation. Ritual activities among non-human primates are conspicuously directed toward ritualized aggression, exemplified in behaviours that maintain dominance hierarchies without violent conflict. The increasing divisiveness and conflict of the Upper Palaeolithic noted by Lewis-Williams may have been exacerbated by aspects of shamanism, but more likely conflict in itself made shamanic ritual adaptive. Animal rituals reduce actual aggression and injury. The evolutionary continuity in animal and human ritual implicates shamanic ritual as a mechanism for reducing conflict and enhancing harmonious coordination within and between groups.

Ritual involves formalized behaviours that link members of a species in structured repetitive reciprocal communication patterns that coordinate members' action (d'Aquili *et al.* 1979, 29). Ritual has a primary biological function in facilitating the flow of information to synchronize individual behaviours into corporate action. This requires a coordination of internal responses among conspecifics; ritualized responses to stimuli are a fundamental mechanism through which such synchronization is achieved.

> Ritual operates to facilitate both intraorganismic and interorganismic coordination . . . [R]itual, inclusive of ceremonial ritual, is an evolutionary, ancient channel of communication that operates by virtue of homologous biological functions (i.e. synchronization, integration, tuning, etc.) in man and other vertebrates . . . (Laughlin *et al.* 1979, 33, 40–41).

Chimpanzee activities indicate that early hominids developed social adaptations involving excited synchronous singing and dancing among members of a territorial group (Merker 2000). Precursors of shamanic ritual may be found in chimpanzee 'dances' (Goodall 1986; Kohler 1927). In response to heavy rain, and a thunder burst, big males stagger rhythmically, swaying from one foot to the other and producing pant-hoots. Pant-hooting is also a response to members rejoining the community or contact with strange conspecifics. The pant-hooting peak phase may be followed by charging displays that include seizing and shaking branches, slapping the ground, stomping rhythmically, hitting and stomping on trees in 'drumming displays', and swaying, jumping vigorously and making exaggerated leaps (Goodall 1986). The 'primitive dancing' observed by Kohler (1927, 314–15) in captive chimps included foot stomping, springing clumsily from foot to foot, and circling like a 'spinning top', occasionally with arms extended. Sometimes a pair would begin playing around a post, eventually moving around the post. Others would join in, marching in a single file around the post with a gait and a rhythm to which they would wag their heads in time. These behaviours were expressions of a friendly and amicable climax and were engaged in by the chimps with an eager enjoyment.

Human rituals differ in complexity from homologous behaviours found in other animals. But the formalized communication displays are still found in human 'nonverbal displays' or prosemantic communication processes (MacLean 1990; Smith 1979). Many different forms of everyday interpersonal rituals and religious and ceremonial actions of humans have their analogues (and presumably origins) in other animals. Behaviours for greeting and challenging others that are prominent in non-human animals persist in humans. Animal uses of ritual to establish, maintain and recognize differences in social status are still prevalent in humans, where ritual is essential to asserting and maintaining public roles or 'face' (Laughlin *et al.* 1979). Human ritual forms that have the greatest continuity with animal rituals largely operate outside awareness because they are based in non-linguistic brain processes (see below).

The most visible human rituals are ceremonies and communal activities that provide guidelines for behaviour and create community bonding. Ritualized behaviours convey to participants a consistent and shared message about expected behaviours in a particular context. Human ceremonial ritual is embedded in a cognitive matrix of meanings, particularly through myth that provides conceptual integration for events that humans find unpredictable and unexplained by the evidence at hand. Myth satisfies humans' need to understand, the *cognitive imperative*, 'the drive in man, other mammals, and birds to order their world by differentiation of adaptively significant sensory elements and events, and the unification of these elements into a systematic, cognitive whole' (Laughlin *et al.* 1979, 10). Ritual plays a fundamental role in generating meaningful explanations by linking neural, affective, social and cognitive levels within and across individuals. Rituals link innate structures of knowledge and experi-

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

ence with socially and culturally relevant meanings and associations.

The heritable basis of the shamanic capacity: hypnotic susceptibility and ASC

David questions if shamans' capabilities are derived from human biology, why isn't everyone a shaman? In hunter-gatherer societies it is often the case that everyone undergoes shamanic training as a part of an adult transition vision or guardian-spirit quest. Those who are particularly suited pursue further training and become practising shamans. This is exemplified among the !Kung Bushmen described by Katz (1982). The !Kung healers (*num kausi*) are shamans (Winkelman 1986a; 1992). 'Practically all of them [young boys] will eventually seek *num*' (Katz 1982, 141), the 'energy' or 'medicine power' that enable shamanic practice. Some stop seeking *num*, and those who continue may not achieve this *num* until age 35 or 40. The majority of !Kung men may achieve the experiences necessary to become healers, but a smaller percentage become healing masters, or shamans.

This suggests that the biological capacities underlying shamanic potentials are differentially distributed and variable in strength. McClenon (2000) identifies a mechanism for shamanic healing capacity in hypnotic susceptibility, a variably and differentially distributed genetic tendency with adaptive potentials. Hypnotic susceptibility involves focused attention with reduced peripheral awareness and critical mentation. Hypnosis focuses upon internal imagetic representations to produce perceptual, biological, behavioural and mental changes. McClenon reviews evidence that the mechanisms underlying hypnotic susceptibility operate at the level of individual inheritance, and shows the widespread presence of rudimentary hypnotic capacities in other animals, including primates. The repetitive movements found in animal rituals facilitate hypnotic induction through fixation of attention. The repetitive and stereotyped behaviours of animal rituals produce intragroup cohesion that humans experience as 'union' or 'oneness', a classic aspect of religious experience.

McClenon suggests that shamanic healing practices evolved from primates' rudimentary hypnotic capacities, as reflected in the 'startle' response and responses to repetitive stimulation. Chimpanzee ritual behaviours provide a foundation for identifying the biological and adaptive aspects of shamanic ritual, since chimpanzees experience hypnotic susceptibility similar to that of humans. McClenon reviews evidence that chimpanzee rituals are stress-reduction mechanisms that are directly analogous to shamanistic healing rituals.

The repetitive stimulation that induces hypnotic responses in animals also induces human hypnotic responses, and mirrors the rhythmic stimulation used in shamanic healing rituals. McClenon postulates that human hypnotic susceptibility derives from capacities selected among primates for coping with stresses of group life, providing a basic mechanism for shamanic ritual healing. McClenon reviews evidence that hypnotic susceptibility has direct relevance to shamanic healing practices. This is shown by the nature of the illnesses most frequently treated in these traditions, which are conditions often resolved by hypnotic treatments. Hypnotic susceptibility is positively correlated with many healing responses, including the relaxation response, placebo responses, and resolution of fertility, pregnancy and childbirth complications. Hypnotic susceptibility is also associated with the tendency to enter ASC and other anomalous experiences.

Lewis-Williams and Humphrey point to ASC as a significant feature of shamanism in their discussions of consciousness and Ice-Age graphic depictions, respectively. ASC reflect a human capacity often neglected in the focus upon intelligence and representational symbolism. As Hunt (1995) has detailed, humans possess a *presentational* symbolic capacity manifested in image-based structures; *contra* Hunt, I argue (Winkelman 2000) that these symbolic capacities necessarily preceded the representational capacities of spoken language. This visual symbolic system is intimately related to the innate mimetic capacity which Donald correctly emphasizes is not modular, but a supramodal cognitive capacity; similar qualifications apply to the capacity for musical expression (Molino 2000). Humphrey emphasizes the characteristics of Ice-Age cave paintings and shamanic ASC reveal human capacities released from higher-level cognitive processes. But rather than the 'non-conceptualizing state of mind' that Humphrey suggests, we need to recognize other forms of conceptualization distinct from the representational capacities of language. This is the presentational symbolic capacity that Hunt (1995) discusses as the basic medium of mystical experiences. These levels of conceptualization are experienced, as Humphrey suggests (citing Snyder), through ASC. But *contra* Knight, these perceptions are adaptive because they represent integration of information across sensory modules (see Hunt 1995). Shamanism's use of ASC to

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

focus upon the visual experiences of soul flight, and shamans' use of imitation through song and dance, reflect access to these pre-linguistic capacities. The work of Dow (1986) and Kirmayer (1993) helps explain how ritual activity can produce healing through linkages across the physiological, emotional and psychological levels of information-processing.

Conclusions

No one will ever talk with or observe a Palaeolithic shaman. We will never have the 'proven facts and gospel truth' for which Bahn hungers. Referring to my claims about the role of shamanism in the Middle/Upper Palaeolithic transition, Bahn claims that 'we have absolutely no way of knowing this, on present evidence', and we might add for clarification, within his paradigm. Within the paradigm of biogenetic structuralism, however, we have different frameworks for interpreting the facts, and consequently different facts. These are the cross-cultural patterns of shamanism, their relationships to neurological foundations in brain structures and processes, and the deep phylogenetic roots as illustrated in the displays and formalizations of other species. This evidence provides a framework for inferring the presence of shamanism from the evidence we have about the Middle/Upper Palaeolithic transition.

As Clark (in press) points out, archaeologists have not effectively incorporated Darwinian and neo-Darwinian concepts. The biogenetic structuralist approach offers a framework for incorporating Darwinian perspectives in addressing the nature and significance of spiritual beliefs and practices within a materialist perspective. The emerging neo-Darwinian metaphysical paradigm within archaeology will find conceptual agreement with the frameworks of biogenetic structuralism and the shamanic paradigm. Rather than reducing their beliefs in a materialistic dismissal, however, a scientific approach would include a recognition of their different ontological status in the symbolic system used to construe humans' cognized environments, their culturally-derived maps. While non-material in their ontological basis, these spiritual concepts can be as useful in explaining human behaviour as other non-material constructs such as alliances and kinship relationships.

References

Alexander, R., 1989. Evolution of the human psyche, in Mellars & Stringer (eds.), 455–513.

Atran, S., 1990. *Cognitive Foundations of Natural History*. New York (NY): Cambridge University Press.

Baars, B., 1997. *In the Theater of Consciousness*. New York (NY): Oxford University Press.

Bahn, P.G., 2001. Save the last trance for me: an assessment of the misuse of shamanism in rock art studies, in Hamayon & Francfort (eds.).

Barkow, J., L. Cosmides & J. Tooby (eds.), 1992. *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. New York (NY) & Oxford: Oxford University Press.

Barton, C.M., G.A. Clark & A. Cohen, 1994. Art as information: explaining Upper Palaeolithic art in western Europe. *World Archaeology* 26(2), 185–207.

Birbaumer, N., 1999. Rain Man's revelations. *Nature* 399, 211–12.

Bird-David, N., 1999. 'Animism' revisited personhood, environment, and relational epistemology. *Current Anthropology* 40, 67–91

Birdwhistle, R., 1970. *Kinesics and Context*. Pennsylvania (PA): Philadelphia University Press.

Boyer, P., 1992. *The Naturalness of Religious Ideas*. Berkeley (CA): University of California Press.

Brown, S., 2000. The 'musilanguage model of music, in Wallin *et al.* (eds.), 271–300.

Brown, S., B. Merker & N. Wallin, 2000. An introduction to evolutionary musicology, in Wallin *et al.* (eds.), 3–24.

Caporeal, L., 1996. Coordinating bodies, minds and groups: evolution and human social cognition. *Journal of Social and Evolutionary Systems* 19(3), 261–275.

Chippindale, C., B. Smith & P.S.C. Taçon, 2000. Visions of dynamic power: archaic rock-paintings, altered states of consciousness and 'clever men' in Western Arnhem Land (NT) Australia. *Cambridge Archaeological Journal* 10(1), 63–101.

Clark, G., 1993. Paradigms in science and archaeology. *Journal of Archaeological Research* 1(3), 203–34.

Clark, G., in press. American archeology's uncertain future, in *Archeology is Anthropology*, eds. S. Gillespie, D. Nichols & R. Joyce. (Archaeological Papers of the American Anthropological Association 12.)

Clark, G. & C. Willermet (eds.), 1997. *Conceptual Issues in Modern Human Origins Research*. New York (NY): Aldine de Gruyter.

Clark, G., C. Barton & A. Cohen, 1996. Explaining art in the Franco-Cantabrian *refugium*: an information exchange model, in *Debating Complexity: Proceeedings of the 26th Annual Chacmool Conference*, eds. D. Meyer, P. Dawson & D. Hanna. Calgary: The Archaeological Association of the University of Calgary, 241–53.

Clottes, J., in press. *Créatures composites discrètes*.

Clottes, J. & J. Courtin, 1996. *The Cave Beneath the Sea. Paleolithic Images at Cosquer*. New York (NY): Harry N. Abrams.

Clottes, J. & D. Lewis-Williams, 1998. *The Shamans of Prehistory: Trance and Magic in the Painted Caves*. New York (NY): Harry Abrams.

Clottes, J. & D. Lewis-Williams, 2001. *Les Chamanes de la Préhistoire. Texte intégral, polémique et réponses*. Paris:

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

La maison des roches.
Cosmides, L. & J. Tooby, 1992. Cognitive adaptations for social exchange, in Barkow *et al.* (eds.).
d'Aquili, E. & A. Newburg, 1999. *The Mystical Mind: Probing the Biology of Religious Experience*. Minneapolis (MN): Fortress Press.
d'Aquili, E., C. Laughlin & J. McManus (eds.), 1979. *The Spectrum of Ritual*. New York (NY): Columbia University Press.
Dawkins, R., 1993. Viruses of the mind, in *Dennett and his Critics*, ed. B. Dahlbom. Oxford: Blackwell, 13–27.
Deacon, T.W., 1997. *The Symbolic Species: the Co-evolution of Language and the Brain*. New York (NY): W.W. Norton & Company.
Donald, M., 1991. *Origins of the Modern Mind*. Cambridge (MA): Harvard University Press.
Donald, M., 1995. The neurobiology of human consciousness: an evolutionary approach. *Neuropsychologia* 33, 1087–102.
Donald, M., 1998. Mimesis and the executive suite: missing links in language evolution, in *Approaches to the Evolution of Language: Social and Cognitive Bases*, eds. J.R. Hurford, M. Studdert-Kennedy & C. Knight. Cambridge: Cambridge University Press, 44–67.
Donald, M., 1999. Preconditions for the evolution of protolanguages, in *The Descent of Mind*, eds. M.C. Corballis & I. Lea. Oxford: Oxford University Press, 138–54.
Donald, M., 2001. *A Mind so Rare: the Evolution of Human Consciousness.* New York (NY): W.W. Norton & Company.
Dow, J.W., 1986. Universal aspects of symbolic healing: a theoretical synthesis. *American Anthropologist* 88, 56–69.
Duff, A., G. Clark & T. Chadderdon, 1992. Symbolism in the Early Palaeolithic: a conceptual odyssey. *Cambridge Archaeological Journal* 2(2), 211–29.
Éliade, M., 1951. *Le Chamanisme et les techniques archaïques de l'extase*. (Latest edition 1996.) Paris: Payot.
Éliade, M., 1964. *Shamanism: Archaic Techniques of Ecstasy*. New York (NY): Pantheon Books.
Fabrega, H., 1997. *Evolution of Sickness and Healing*. Berkeley (CA): University of California Press.
Fodor, J.A., 1983. *Modularity of Mind: an Essay on Faculty Psychology*. Cambridge (MA): MIT Press.
Frayer, D. & C. Nicolay, 2000. Fossil evidence for the origin of speech sounds, in Wallin *et al.* (eds.), 217–34.
Frecska, E. & Z. Kulcsar, 1989. Social bonding in the modulation of the physiology of ritual trance. *Ethos* 17(1), 70–87.
Freeman, W., 2000. A neurobiological role of music in social bonding, in Wallin *et al.* (eds.), 411–24.
Friedrich, P., 1991. Polytrophy, in *Beyond Metaphor: the Theory of Tropes in Anthropology*, ed. J.W. Fernandez. Stanford (CA): Stanford University Press, 17–55.
Gamble, C., 1986. *The Palaeolithic Settlement of Europe.* Cambridge: Cambridge University Press.
Gardener, H., 1983. *Frames of Mind: the Theory of Multiple Intelligences*. New York (NY): Basic Books.
Geissmann, T., 2000. Gibon songs and human music from an evolutionary perspective, in Wallin *et al.* (eds.), 103–23.
Glazier, S. (ed.), 1997. *Anthropology of Religion*. Westport (CT): Greenwood Press.
Goodall, J., 1986. *The Chimpanzees of the Gombe: Patterns of Behaviour*. Cambridge (MA) & London: Bellknap Press of Harvard University.
Guthrie, S., 1993. *Faces in the Clouds: a New Theory Of Religion*. Oxford: Oxford University Press.
Guthrie, S., 1997. The origin of an illusion, in *Anthropology of Religion: a Handbook,* ed. S. Glazier. Westport (CT): Greenwood Press.
Hadingham, E., 1979. *Secrets of the Ice Age*. New York (NY): Walker and Company.
Hamayon, R. & H-P. Francfort (eds.), 2001. *The Concept of Shamanism: Uses and Abuses*. (Bibliotheca Shamanistica 10.). Budapest: Akadémiai Kiadó.
Hamilton, W.D., 1964. The genetic evolution of social behaviour. I, II. *Journal of Theoretical Biology* 7, 1–52.
Harner, M., 1982. *The Way of the Shaman*. New York (NY): Bantam.
Hauser, M., 2000. The sound and the fury: primate vocalizations as reflections of emotions and thought, in Wallin *et al.* (eds.), 77–102.
Hayden, B., 1987. Alliances and ritual ecstacy: human responses to resource stress. *Journal for the Scientific Study of Religion* 26(1), 81–91.
Humphrey, N., 1992. *A History of the Mind*. London: Chatto & Windus.
Humphrey, N., 1998. Cave art, autism, and the evolution of the human mind. *Cambridge Archaeological Journal* 8(2), 165–91.
Humphrey, N., 2002. The deformed transformed, in *The Mind Made Flesh: Essays from the Frontiers of Psychology and Evolution.* Oxford: Oxford University Press.
Hunt, H.T., 1995. *On the Nature of Consciousness*. New Haven (CT): Yale University Press.
Huxley, A., 1954. *The Doors of Perception*. New York (NY): Harper & Row.
Johnson-Laird, P., 1983. *Mental Models*. Cambridge (MA): Harvard University Press.
Katz, R., 1982. *Boiling Energy Community Healing among the Kalahari !Kung*. Cambridge (MA): Harvard University Press.
Kirmayer, L.J., 1993. Healing and the invention of metaphor: the effectiveness of symbols revisited. *Culture, Medicine, and Psychiatry* 17, 161–95.
Kohler, W., 1927. *The Mentality of Apes*. New York (NY): Harcourt Brace.
Kuhn, T., 1970. *The Structure of Scientific Revolutions*. Chicago (IL): University of Chicago Press.
La Barre, W., 1972. *The Ghost Dance: the Origins of Religion*. London: Allen and Unwin.
Laughlin, C., 1997. Body, brain, and behaviour: the neuroanthropology of the body image. *Anthropology of Consciousness* 8(2–3), 49–68.
Laughlin, C. & E. d'Aquili, 1974. *Biogenetic Structuralism*. New York (NY): Columbia University Press.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

Laughlin, C. & J. McManus, 1979. Mammalian ritual, in d'Aquili *et al.* (eds.), 80–116.
Laughlin, C., J. McManus & E. d'Aquili, 1979. Introduction, in d'Aquili *et al.* (eds.), 1–50.
Laughlin, C., J. McManus & E. d'Aquili, 1992. *Brain, Symbol and Experience: Toward a Neurophenomenology of Consciousness*. Boston (MA): Shambhala. [1992 reprint by Columbia University Press.]
Levi-Strauss, C., 1962. *Totemism*. Boston (MA): Beacon.
Levi-Strauss, C., 1967. *The Savage Mind*. Chicago (IL): University of Chicago Press.
Lewis-Williams, J.D., 1981. *Believing and Seeing: Symbolic Meanings in Southern San Rock Paintings*. London: Academic Press.
Lewis-Williams, J.D., 1991. Wrestling with analogy: a methodological dilemma in Upper Palaeolithic art research. *Proceedings of the Prehistoric Society* 57(1), 149–62.
Lewis-Williams, J.D., 1995. Modelling the production and consumption of rock art. *South African Archaeological Bulletin* 50, 143–54.
Lewis-Williams, J.D., 1997a. Agency, art and altered consciousness: a motif in French (Quercy) Upper Palaeolithic parietal art. *Antiquity* 71, 810–30.
Lewis-Williams, J.D., 1997b. Harnessing the brain: visions and shamanism in Upper Palaeolithic Western Europe, in *Beyond Art: Pleistocene Image and Symbol*, eds. M. Conkey, O. Soffer, D. Stratmann & N. Jablonski. (Memoirs of the California Academy of Sciences 23.) San Francisco (CA): California Academy of Sciences, 321–42.
Lewis-Williams, J.D., 2002. *The Mind in the Cave: Exploring Consciousness and Prehistoric Art*. London: Thames & Hudson.
Lewis-Williams, J.D. & T. Dowson, 1988. The signs of all times: entoptic phenomena in Upper Palaeolithic art. *Current Anthropology* 29, 201–45.
Lindly, J.M. & G.A. Clark, 1990. Symbolism and modern human origins. *Current Anthropology* 31(3), 233–61.
McClenon, J., 1994. *Wondrous Events: Foundations of Religious Belief*. Philadelphia (PA): University of Pennsylvania Press.
McClenon, J., 1997. Shamanic healing, human evolution, and the origin of religion. *Journal for the Scientific Study of Religion* 36(3), 345–54.
McClenon, J., 2000. *Wondrous Healing Shamanism, Human Evolution and the Origin of Religion*. Dekalb (IL): Northern Illinois University Press.
MacLean, P., 1990. *The Triune Brain in Evolution*. New York (NY): Plenum Press.
McManus, J., C. Laughlin & E. d'Aquili, 1979. Concepts, methods, and conclusions, in d'Aquili *et al.* (eds.), 342–62.
Mandell, A., 1980. Toward a psychobiology of transcendence: God in the brain, in *The Psychobiology of Consciousness*, ed. D. Davidson & R. Davidson. New York (NY): Plenum, 319–464.
Mandell, A., 1985. Interhemispheric fusion. *Journal of Psychoactive Drugs* 17(4), 257–66.
Marler, P., 2000. Origins of music and speech: insights from animals, in Wallin *et al.* (eds.), 31–48.
Mead, G.H., 1934. *Mind, Self, and Society*. Chicago (IL): University of Chicago Press.
Mellars, P., 1989. Technological changes across the Middle–Upper Palaeolithic transition: economic, social and cognitive perspectives, in Mellars & Stringer (eds.), 338–65.
Mellars, P. & C. Stringer (eds.), 1989. *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans*. Edinburgh: Edinburgh University Press.
Merker, B., 2000. Synchronous chorusing and human origins, in Wallin *et al.* (eds.), 315–27.
Minsky, M., 1985. *The Society of Mind*. New York (NY): Simon and Schuster.
Mithen, S., 1996. *The Prehistory of the Mind: a Search for the Origins of Art, Religion and Science*. London: Thames & Hudson.
Newton, N., 1996. *Foundations of Understanding*. Philadelphia (PA): John Benjamin's Publishing Co.
Molino, J., 2000. Toward an evolutionary theory of music, in Wallin *et al.* (eds.), 165–76.
Noll, R., 1985. Mental imagery cultivation as a cultural phenomenon: the role of visions in shamanism. *Current Anthropology* 26, 443–51.
Oubré, A., 1997. *Instinct and Revelation: Reflections on the Origin of Numinous Perception*. Australia: Gordon and Breach.
Pandian, J., 1997. The sacred integration of the cultural self: an anthropological approach to the study of religion, in Glazier (ed.), 305–516.
Prince, R., 1982. The endorphins: a review for psychological anthropologists. *Ethos* 10(4), 299–302.
Rainbird, P., in press. Making sense of petroglyphs: the sound of rock-art, in *Inscribed Landscapes: Marking and Making Place*, eds. B. David & M. Wilson. Honolulu (HI): University of Hawaii Press, 93–103.
Richman, B., 1993. On the evolution of speech: singing as the middle term. *Current Anthropology* 34(5), 721–2.
Rouzaud, F., M. Soulier & Y. Lignereux, 1996. La Grotte de Bruniquel. *Spélunca* 60, 28–34.
Ryan, R., 1999. *The Strong Eye of Shamanism: a Journey into the Caves of Consciousness*. Rochester (VT): Inner Traditions.
Scheff, T.J., 1993. Toward a social psychological theory of mind and consciousness. *Social Research* 60(1), 171–95.
Shore, B., 1996. *Culture in Mind Cognition, Culture and the Problem of Meaning*. New York (NY): Oxford University Press.
Siikala, A., 1978. *The Rite Technique of Siberian Shaman*. (Folklore Fellows Communication 220.) Helsinki: Soumalainen Tiedeskaremia Academia.
Smith, N., 1992. *An Analysis of Ice Age Art*. New York (NY): Peter Lang.
Smith, W., 1979. Ritual and the ethology of communicating, in d'Aquili *et al.* (eds.), 51–79.
Snyder, A., 1997. Autistic artists give clues to cognition. *Perception* 26, 93–6.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press

Snyder, A., 1999. Is integer arithmetic fundamental to mental processing?: the mind's secret arithmetic. *Proceedings of the Royal Society of London* Series B 266, 587–92.

Steadman, P., 2001. *Vermeer's Camera*. Oxford: Oxford University Press.

Swanson, G., 1973. The search for a guardian spirit: a process of empowerment in simpler societies. *Ethnology* 12, 359–78.

Tooby, J. & L. Cosmides, 1992. The psychological foundations of culture, in Barkow *et al.* (eds.), 19–136.

Waller, M., 1996. Organization theory and the origins of consciousness. *Journal of Social and Evolutionary Systems* 19(1), 17–30.

Wallin, N., B. Merker & S. Brown (eds.), 2000. *The Origins of Music*. Cambridge (MA): MIT Press.

Walsh, R., 1990. *The Spirit of Shamanism*. Los Angeles (CA): Tarcher.

Whallon, R., 1989. Elements of cultural change in the later Palaeolithic, in Mellars & Stringer (eds.), 433–54.

Whitley, D., 1992. Shamanism and rock art in far Western North America. *Cambridge Archaeological Journal* 2(1), 89–113.

Whitley, D., 1994a. Shamanism, natural modeling and the rock art of Far Western North American hunter-gatherers, in *Shamanism and Rock Art in North America*, ed. S. Turpin. San Antonio (TX): Rock Art Foundation, 1–44.

Whitley, D., 1994b. By the hunter, for the gatherer: art, social relations and subsistence change in the prehistoric Great Basin. *World Archaeology* 25(3), 356–77.

Whitley, D., 1994c. Ethnography and rock art in the far West: some archaeological implications, in *New Light on Old Art*, eds. D. Whitley & L. Loendorf. Los Angeles (CA): Institute of Archaeology University of California, 81–93.

Whitley, D., 1998. Cognitive neuroscience, shamanism, and the rock art of native California. *Anthropology of Consciousness* 9(1), 22–37.

Winkelman, M., 1982. Magic: a theoretical reassessment. *Current Anthropology* 23, 37–44, 59–66.

Winkelman, M., 1984. *A Cross-cultural Study of Magico-Religious Practitioners.* PhD Dissertation, University of California, Irvine. Ann Arbor: University Microfilms.

Winkelman, M., 1986a. Magico-religious practitioner types and socioeconomic conditions. *Behaviour Science Research* 20(1–4), 17–46.

Winkelman, M., 1986b. Trance states: a theoretical model and cross-cultural analysis. *Ethos* 14, 76–105.

Winkelman, M., 1990. Shaman and other 'magico-religious healers': a cross-cultural study of their origins, nature and social transformation. *Ethos* 18(3), 308–52.

Winkelman, M., 1992. *Shamans, Priests and Witches: a Cross-Cultural Study of Magico-religious Practitioners*. (Anthropological Research Papers 44.) Tempe (AZ): Arizona State University.

Winkelman, M., 1996. Psychointegrator plants: their roles in human culture and health, in *Sacred Plants, Consciousness and Healing: Cross-Cultural and Interdisciplinary Perspectives,* eds. M. Winkelman & W. Andritzky. (Yearbook of Cross-cultural Medicine and Psychotherapy 6.) Berlin: Verlag und Vertrieb.

Winkelman, M., 1997. Altered states of consciousness and religious behaviour, in Glazier (ed.), 393–428.

Winkelman, M., 2000. *Shamanism: the Neural Ecology of Consciousness and Healing*. Westport (CT): Bergin `7 Garvey.

Winkelman, M. & D. White, 1987. A cross-cultural study of magico-religious practitioners and trance states: Data Base, in *Human Relations Area Files Research Series in Quantitative Cross-cultural Data*, vol. 3, eds. D. Levinson & R. Wagner. New Haven (CT): HRAF Press.

Zahavi, A. & A. Zahavi 1997. *The Handicap Principle: a Missing Piece in Darwin's Puzzle*. Oxford: Oxford University Press.

https://doi.org/10.1017/S0959774302000045 Published online by Cambridge University Press