

# The Neuropsychiatry of Shamanism

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## Abstract

The shamanic state is a human constant, arising from the substrate of the brain. Hunter-gatherer shamanism is based on altered states of consciousness, induced by a variety of means.

This paper examines shamanism from a neuropsychiatric perspective, looking at disorders of self, hallucinations, epilepsy, schizophrenia and other psychoses, lycanthropy, and sleep disorders. While the majority of shamanic individuals are normal in that they do not have neuropsychiatric disorders, examination of these conditions can illustrate the underlying brain mechanisms.

The speciation of *Homo sapiens* led to lateralisation of the brain with significant expansion in the left temporo-occipital region that allowed the use of symbolism. Laterality changes – decreased left/increased right hemisphere dominance – link schizophrenia, schizotypy and increased creativity. From this it was a short step to the phenomena intrinsic to shamanism..

## 1 The neuropsychiatry of shamanism

Shamanism is a cultural adaptation of hunter-gathering societies to the biological potential for altered states of consciousness (ASC) (Dobkin de Rios & Winkelman 1989). The term 'shaman', originating in the Tungus language in Siberia, is used to refer to healers, sorcerers, witch doctors, medicine men, magicians and related figures (Vitebsky 1995).

Shamanism is described as the practice by which its practitioners enter the 'spirit world', purportedly obtaining information that is used to help and to heal members of their social group. This depended on deliberately altering their conscious state to contact spiritual entities in 'upper worlds', 'lower worlds' and 'middle earth' (ie, ordinary reality) (Krippner 2000:96).

Dow (1986) has proposed that shamans not only represent the world's oldest profession, but the world's most versatile specialists. Shamans may have been humanity's first physicians, magicians, artists, storytellers, timekeepers and weather forecasters (Krippner 2002). Shamans, acting on behalf of their communities, contact spirits and other

supernatural entities, heal the sick, control animals, change the weather or foretell the future.

Shamans were thus the first ritual specialists in hunter-gatherer society, and persisted in settled societies where they became integrated with other religions.

This paper stems from the perspective of neuropsychiatry, which is defined as the study and treatment of mental illnesses arising from disorders of the brain. The term is deliberately chosen and a distinction is made from neuropsychology. The disorders examined include schizophrenia, psychomotor (limbic) epilepsy and narcolepsy, in addition to a range of related phenomena. Pathological conditions have been studied in greater detail, providing data from special investigations that help to explain the pathophysiological basis of these phenomena. The intention is not to show that shamanic events are due to neuropsychiatric disorders; it is to show the analogies and similarities and, where necessary, the dissimilarities.

This review is based on the premise that the religious phenomena of hunter-gatherer shamans is a human constant, arising from the substrate of

the brain. A number of studies suggest that religious experiences are common in children and adults across different historical eras, and across all cultures (Saver & Rabin 1997). Mystical experiences are reported in 20 – 40% of the population in any historical era (Prince 1979). The central core of mystical states is the apprehension of an ultimate non-sensuous unity of all things (Stace 1961). Furthermore, a ‘considerable number’ of these experiences cannot be defined as pathological (Bartocci et al 2005:557).

The two strands of mysticism are apophatic and kataphatic. In apophatic mysticism, the emphasis is on reducing sensory stimulation by fasting, meditation, sleep deprivation, sensory deprivation and slow breathing. The reverse applies to kataphatic mysticism where there is increased extraneous sensation by bodily movement, dance, chanting and ritual activities, usually in the presence of other participants.

There is every reason to believe that the majority of shamanic individuals are normal and do not have neuropsychiatric disorders. Shamans among Bhutanese refugees had no more psychiatric disorder than matching non-shamans, and fewer anxiety disorders than the controls (Van Ommeren et al 2002). A study of *déjà vu* experiences in patients with schizophrenia compared to controls found less frequent *déjà vu* events in schizophrenic patients, suggesting these were essentially non-pathological phenomena (Adachi et al 2006).

The phenomena of shamanism attest to the universal tendency of humans to extend the boundary of the self while in an ASC (Bartocci & Dein 2005). ASC can be neurologically demonstrated by EEG and cardiovascular testing; autonomic nervous system functioning; brain neurochemical and hormonal changes; PET and SPECT scans. The behaviour of the human nervous system in certain altered states creates the illusion of dissociation from one’s body, often by flight, passing through a vortex or tunnel, or being submerged under water.

Characteristic EEG changes have been reported in a variety of ASC processes. These involve high-voltage slow-wave activity originating in the limbic system-brain stem connections that drive synchronising patterns into the frontal cortex (Winkelman 2002).

The trajectory of ASC proceeds along a continuum with wakefulness, EEG activation and consciousness at one end of the spectrum extending to EEG synchronisation, sleep and loss of consciousness at the other end (Dement 2005).

More controversially, Lewis-Williams (2002) has proposed a bifurcated path for the spectrum of ASC, proceeding along two related trajectories from a common origin:

- 1 the normal, diurnal spectrum leads from alert states to day-dreaming to dreaming (various subdivisions can be postulated for this spectrum), and
- 2 an ‘intensified’ spectrum triggered by a variety of means including pathological conditions. These intensified states are similar in many ways to dreams, but are generally more vivid, prolonged and ‘real’.

Shamanic trance states can be induced by a variety of means including hyperventilation, audio driving, sensory deprivation, pathological conditions, migraine, pain, fasting, meditation, prolonged rhythmic dancing, flashing lights or drumming.

The use of hallucinogens to induce trance states varies widely. Heinrich Klüver (Klüver 1926) studied the nature of hallucinations and mental changes produced by LSD. Siegel and Jarvik (1975) took this further with volunteers taking hallucinogenic drugs like LSD in the laboratory. Laboratory subjects on hallucinogens pass through several stages to the deepest level of trance, experiencing a range of hallucinations and perceptual changes in the process. The hallucinations followed a consistent pattern as the subjects went deeper into trance, affected by cultural variations.

Initially, entoptic hallucinations stem from the physical structure of the nervous system and can be reproduced by physical pressure on the eyeball (phosphenes) and migraines. Subjects ‘see’ the luminous flickering, geometric forms known as entoptics (alternately, phosphenes or form constants). Entoptic figures include lines, nested curves, circles, clouds of bright dots, undulating or zigzag lines and grids. They include the lunate fortification illusions found in migraines.

The subjects then try to make sense of the geometric percepts; eg, they may interpret a collection of small circles as a flight of bees. Subjects then pass through a vortex or tunnel, often with a bright light at the end. This sensation resembles accounts of near-death experiences during which

the nervous system begins to alter its functioning and to shut down.

In the deepest stage, hallucinations derived from culturally-mediated memories occur independently of the structure of the nervous system. They comprise full-blown hallucinations of monsters, people, animals, buildings and so forth. Subjects no longer observe their hallucinations; they take part in them. An important aspect of the way in which hallucinations are experienced is that they are often projected onto surfaces – perhaps a ceiling or wall – appearing like a slide or film show.

A study by Griffiths et al (2006) is the first well-designed, placebo-controlled study in more than four decades to examine the effects of the hallucinogenic drug psilocybin. Participants were emotionally stable, generally middle-aged, college graduates who received either 30mgs psilocybin or 40mgs methylphenidate (Ritalin®) in two separate sessions. Of 36 subjects who received psilocybin 22 had a 'complete' mystical experience, compared to 4 of the 36 on methylphenidate.

The blinding was so effective that experienced monitors mistook the drug in fully 25% of sessions. Furthermore, subjects were followed up in depth two months later, when 67% of them rated the psilocybin experience as either the single most meaningful experience or among the five most meaningful experiences of their lives. These studies confirm that molecular alterations in the brain can underlie mystical experiences (Snyder 2006).

## 2 Hallucinations

Hallucinations are compelling and involuntary experiences of perception in the absence of appropriate stimuli. Experiences interpreted as perceptions of the world, including our own bodies, can arise exogenously from normally adequate stimuli or exogenously, as hallucinations, through spontaneously or induced physiological activity. When experienced as external events of illusory movement, hallucinations can be experienced in right or left hemispace. There is a wide variation in hallucinations experienced due to individual differences, indicating that constitutional factors predispose some individuals to such experiences.

Hallucinations are common in the general population (Ohayon 2000) and can occur in any modality; auditory, visual, tactile, olfactory and

gustatory. Hallucinations in the latter two modalities occur in temporal lobe epilepsy (TLE), a reflection of the involvement of the uncus in the seizure.

It has long been recognised that hallucinations occur in normal individuals under conditions such as fasting, 'solitary musing' and lack of sleep (Slade 1976:8). Two situations especially conducive to hallucinations, sensory deprivation (Solomon et al 1957) and hallucinogenic drugs, resemble near-death experiences, a universal human phenomenon (Roberts & Owen 1988). In the former, individuals could experience a range of phenomena including flashes of light, spots, simple geometric patterns and complex integrated events (Murphy, Myers & Smith 1963; Brugger et al 1999). Conditions that induce such reactions include hypoxia in mountaineers at high altitude (Brugger et al 1999), near-drowning, test pilots exposed to high G-forces (Forster & Whinnery 1988) and cosmonauts (Ponomarenko 2000).

Near-death experience typically involves intense out-of body experiences, hallucinations, tunnel or vortex travel and a sense of contact with other beings. This is caused by the effect of hypoxia, hence the similarity to some sensory deprivation events (Kellehear 1993). Near-death experiences are associated with left temporal lobe epileptic activity (Britton & Bootzin 2004).

Tactile hallucinations are regarded by some as a form of bodily delusion, rather than a true hallucination (Berrios 1982). They can be associated with a sense (if not a fixed belief) of insects crawling under the skin, in addition to a range of sensations such as tingling, pins and needles, being touched, choked or crushed.

Visual hallucinations can occur without previously recognised pathology or in the context of ongoing neurological, ophthalmic or psychiatric disease. The difference between hallucinations and illusions is not clear cut and the distinction is often difficult, if not pointless. The classic descriptions of epilepsy noted that visual hallucinations varied from simple, recognisable objects (origin in the primary cortex) to complex progressing scenes (secondary visual cortex).

ffytche describes two visual hallucinatory syndromes based on the neurological origin of the perception (ffytche 2004).

1 Hallucinations arising in the visual pathways or

higher visual areas range from simple unformed lines, dots, colours and flashes, through more complex grid patterns and lattices to distorted faces (grotesque or gargoyles-like), unfamiliar figures in bizarre costume and extended landscape scenes. These arise from events such as ophthalmic pathology, TLE, migraine and photic stimulation.

- 2 Hallucinations arising in the brainstem and/or cholinergic system range from isolated animals and figures (often familiar), extracampine hallucinations ('feeling' rather than 'seeing' an object, typically a person watching), to multi-modality hallucinations (eg, hearing the hallucinations talking or feeling them crawl up one's arm) and complex delusional explanations for the experiences. The experiences can last for hours or even days. They are associated with bereavement, schizophrenia, delirium, psychedelic drugs, narcolepsy and Parkinson's disease.

A study of hallucinations in patients with eye disease showed that 37% experienced visions with geometric patterns, including *tesellopsia*, brickwork, hyperchromotapsia and dendropsia. The hallucinations are caused by the spontaneous firing of neural networks in the optical cortex in the absence of external stimuli (ffytche & Howard 1999; Brammer et al 1998).

In the Charles Bonnet Syndrome (CBS), visual hallucinations occur in clear consciousness (ffytche 2005). The original cases were of vivid visual hallucinations in elderly people in hospital wards, often following eye surgery causing sensory deprivation. While CBS could be associated with organic disorder, eg, dementia, it can occur in individuals without brain disease.

Hallucinogen derived hallucinations are predominantly visual, rather than auditory, in contrast to schizophrenia. They range along a continuum from simple unstructured sensations to complex meaningful object and scenes. Klüver (1966) organised these images into four groups known as form constants: (1) tunnels and funnels (2) spirals (3) lattices, including honeycombs and triangles (4) cobwebs. These images are seen with both eyes and move with them. These images are generated in the brain, derived from the form of the retino-cortical map and the architecture of the visual cortex (Bressloff et al 2002).

Geometric visual hallucinations can occur after taking hallucinogens, viewing bright flickering lights, on waking or falling asleep, in 'near-death' experiences, sensory deprivation and migraine.

Of interest in regard to the close relation of

shamanism and rock painting and engraving is a perceptual disorder described by Berrios and Brook (1984), referred to as the 'picture sign': a group of elderly patients in the study treated television images and newspaper photographs as if they existed in three-dimensional space. This phenomenon did not have any association with age, sex or cerebral pathology.

In summary, hallucinatory images, notably visual, reflect the underlying architecture of the nervous system, although they can be induced by a variety of means and are affected by cultural issues. To quote ffytche:

The cortical anatomy of such cells (in the visual cortex) defines the geometry of their associated hallucinations – in a sense, seeing the brain from outside (ffytche 2002:472).

### 3 Disorders of self

The disorders of self are difficult to define and include conditions such as depersonalisation, autoscopy (AS) and out-of-body experiences (OBEs). During an out-of-body experience, the subject seems to be awake and to see his body and the world from a location outside the physical body.

The experience of depersonalisation is a key component of trance states. Depersonalisation refers to the phenomenon of 'an alteration in the perception or experience in the self so that one feels detached from, and as if one is an outside observer of, one's mental processes or body' (eg, feeling like one is in a dream); and 'an alteration in the perception or experience of the external world so that it seems strange or unreal' (eg, people seem unfamiliar or mechanical) – derealisation, the term for the latter, has not been shown to be an independent entity (Sierra & Berrios 1998).

Depersonalisation is frequently associated with *déjà vu*, dizziness, ego-alien intrusions and mystical experiences. The phenomenon arises from a neurological substrate and has been associated with cerebrovascular disease, post-encephalitic states, brain damage, anxiety disorders and temporal lobe epilepsy (TLE), the latter being the most consistent condition. Hughlings Jackson used the term 'dreamy state' to describe the event (Hogan & Kaiboriboon 2003).

From an affective point of view, the subject or patient describes the absence of feelings. This may have evolutionary origins as a protective mechanism

in trauma. Peri-traumatic responses in a study of rape victims included emotional numbing, detachment, feeling like on automatic pilot, self-observation and bodily change (Bryant & Harvey 1997).

Autoscopy (AS, literally, seeing oneself) is a closely-related experience characterised by the experience of seeing one's body in extra-corporeal space. Autoscopy has generated considerable argument over its definition and classification. Brugger et al (1996) found that hallucinations associated with OBEs were biased to the right and involve somaesthetic experiences. They conjecture that certain types of autoscopy involve a projection of postural and kinaesthetic parts of the body scheme into extracorporeal space: the *doppelgänger* experience.

There are three grades of autoscopy (Brugger 2002): simple, or mirror hallucinations; heautoscopy or *doppelgänger* experiences; and autoscopy associated with OBEs – seeing one's body from an external station point. The term 'heautoscopy' means the self-image is seen at a distance, but only seems to confuse the issue (if not the pronunciation) (Denning & Berrios 1994).

Related, if not rare, phenomena of AS include reverse autoscopy, internal autoscopy and near-death experiences. In the rarely described internal autoscopy, subjects can 'see' inside their own bodies with the organs on display like in a butchers rack (Denning & Berrios 1994).

The 'Alice in Wonderland' syndrome is described as the phenomena of micro- or macrosomatognosia, that is, altered perceptions of body image, first described with migraines (Larner 2005). Other conditions causing this include epilepsy, schizophrenia, drug reactions, brain tumours and encephalitis.

OBE and AS are associated with vestibular sensations of floating, flying, elevation or rotation; visual body-part illusions such as illusory shortening, transformation or movement of an extremity; and the experience of seeing one's body only partially.

OBE and AS arise from failure to integrate proprioceptive, tactile, visual and vestibular information regarding one's body causes, as well as disintegration between personal (vestibular) and extrapersonal (visual) space. This occurs during partially and briefly impaired consciousness due to

paroxysmal cerebral dysfunction localised to the temporo-parietal junction. AS are preceded by dizziness, implying that disorders of the vestibular system are involved.

There is a range of neurological or psychiatric causes of AS, with TLE the commonest diagnosis. A study of autoscopy found a significant male predominance, in contrast to hallucinations, in which the reverse applied (Denning & Berrios 1994).

In summary, depersonalisation, AS, out-of-body experiences and related phenomena are neurological events arising in the vestibular-motor system and temporo-limbic system.

#### 4 Epilepsy

The potential for epilepsy, the paroxysmal neuronal discharge, exists as a genetic potential in all humans. Epileptic seizures can be generalised or focal. Generalised epilepsy leads to complete loss of consciousness, most commonly in tonic-clonic *grand mal* convulsion or *petit mal*. Focal epilepsy involves only discreet areas of the brain with varying effects on consciousness. Temporal lobe or limbic epilepsy replicates functions of the areas of the brain producing perceptions, emotions and personality. However, focal activity may trigger a generalised seizure and be unrecognised or unrecalled.

Historically, epilepsy has been linked to religion, ecstatic healing and prophecy (Temkin 1971). So extensively does TLE replicate trance states and religious ecstasy that it attracted the name The Sacred Disease to indicate its connection with metaphysical and religious states. Descriptions go back to Greek writers, such as Hippocrates and the Bible, for example Ezekiel (Riggs & Riggs 2005), and recur in literature up to the present, notably in the works of Dostoevsky and Turgenev. The link between temporal lobe pathology and religious experience is attested to in the works of Waxman and Geschwind (Waxman & Geschwind 1975), Bear and Fedio (Bear & Fedio 1977), Fenwick (Fenwick 1996) and Dewhurst and Beard (Dewhurst & Beard 1970).

Szondi, a long-neglected psychiatrist, gave epilepsy a central role for understanding human nature (Blumer 2000). In the drive factor associated with epilepsy, the tendency to accumulate and discharge angry affect is paired with the tendency to make good, eg, ethical behaviour. The



accumulated affect (rage, hatred, jealousy) is discharged in a paroxysm, followed by a phase of trying to make good, a hyperethical and hyperreligious period.

A study of epilepsy patients found that 51% have an experience of salvation leading to interest in increased religion (Trimble 1990). Patients who have culturally acquired explanatory systems of a religious character tend to interpret any ictal experience (a physiological state or event such as a seizure, stroke or headache) as having religious significance (Saver & Rabin 1997).

Mystical or religious experiences induced by TLE include OBEs, vestibular sensations, time travel, auditory and visual hallucinations (including hearing the voice of God), bright lights, travelling down a tunnel or into a vortex (Persinger 1983). As the subject moves to extreme states of arousal, subjective and objective phenomena increase with blurring of the boundary between observer and observed and changes in the perception of time, which can be either speeded up or slowed (Newberg et al 2001).

TLE is announced by an aura, followed by the ictal event. During this phase, there is partial or total loss of awareness for events. Phenomena experienced include hallucinations of all modalities, altered time sense, depersonalisation, feelings of elation, rage or despair, and out-of-body experiences. They include macropsia or micropsia, distortions of images, a range of sounds including buzzing and humming, and feelings of ecstasy or elation.

Illusions, described as distorted perceptions of sensory input, may be mixed with the hallucinations. Frequent illusions are visual, with objects changing form and/or size (metamorphopsia). Sounds change in intensity and/or rise and fall in pitch. Somatosensory illusions (changed experience of the body image) are also common.

The symptoms of TLE are extremely pleomorphic. The reason is simple. The area that is affected is the basis substrate of the human personality, in particular emotion, cognition and behaviour with significant influence over consciousness. This is the zone of the limbic system, the persisting reptilian brain connecting with the cortex, providing the emotional aspect to cognitions (Ploog 1988).

Much of the limbic system is located in the medial aspect of the temporal lobe, including the hippocampal gyrus, the amygdaloid complex, the parahippocampal gyrus and the uncus. Electrical stimulation of these sites produces a range of intense perceptions or experiences, including visual hallucinations, visceral sensations, feelings of fear or anxiety, *déjà vu*, strangeness and depersonalisation.

A less widely known phenomenon associated with TLE, known as the Geschwind syndrome (Geschwind 1983), stems from changes induced by chronic interictal discharges. These changes largely affect the personality rather than emotions or consciousness. Chronic TLE leads to an intense style of thinking, religiosity, hypergraphia, hyposexuality, irritability and pedantry.

The effect of chronic interictal discharge is exclusionary: the affected person has difficulty making normal relationships. They are obsessive, difficult, rancorous, hypermoralistic, pseudo-pietistic, over-sensitive and easy to take affront. They are constantly preoccupied with metaphysical issues, chiefly religion and may see themselves as responsible for the spiritual well-being of the group, even if their constant hectoring causes resentment. Nevertheless, the aim of these individuals is to promote social cohesion. Many of these changes are seen in religious figures or prophets, raising the possibility that epileptic-induced trance states have a significant role in the origins of religion and creativity (Waxman & Geschwind 1975).

In summary, TLE, acute or chronic, is a perfect analogy for shamanic behaviour and the emergence of an hereditary shamanic class in settled society.

## 5 Sleep

Sleep is the most important human chrono-biological activity. There is a tendency to assess sleep in terms of the changes that only take place during sleep – this is incorrect. Wakefulness is only a period during the diurnal cycle dominated by alertness. In fact, the changes induced by sleep disturbances can present at any point during the 24-hour cycle.

In 1931, psychoanalyst (and former neurologist) Ernest Jones said that an understanding of sleep phenomena would have 'momentous' consequences for the understanding of religion itself. Dream states provide glimpses of what radically altered states are

like – in this sense alone, Freud's 'royal road to the unconscious' was closer to the truth than realised. In the last 50 years, sleep science has led to major developments in understanding sleep, dreams and related events.

The altered levels of consciousness during the prelude to sleep are analogous with the changes in consciousness during the shamanic trance state. Dreams are considered a means of receiving messages from the supernatural. Experiences in religion and mythology of visitations from gods, prophets, devils or angels frequently occur during sleep, eg, the dream of Joseph in the book of Genesis.

Sleep Paralysis (SP) is a transient, conscious state of involuntary immobility occurring immediately prior to falling asleep or upon waking and is classified as a parasomnia associated with REM sleep. Cheyne (2005) has removed SP from the pathological realm. SP can occur in fully 40%, if not more, of normal individuals as well as individuals with physical and mental disorders.

There are a wide range of terms used around the world to describe SP, confirming its ubiquity in history and culture. In Newfoundland, the experience is known as 'old hag', an old English term for witch. Going further back, the Anglo-Saxon term 'merran' (to crush) led to the term for nightmare, the crusher who comes in the night.

The individual awakens suddenly from a deep level of sleep with muscular paralysis, unable to move, pressure on the chest, experiencing a sense of or suffocating. This is associated with a sense of falling, floating, drowning, being held down or throttled. They are able to open their eyes and subsequently report events in their surroundings during the episode.

SP is associated with hypnagogic (sleep onset), hypnopompic (sleep offset) hallucinations and OBEs – a common feature of shamanic states. These experiences include an acute sense of a monitoring 'evil presence', combinations of auditory and visual hallucinations, as well as intense out-of-body sensations, interpreted as time or astral travel.

The combinations of SP-related hallucinations form the basis of diverse worldwide cultural accounts of nocturnal incubus/succubus assaults, spirit possessions, old hag attacks, ghostly visitations, and alien abductions. The subject may not see a

spirit, but experience the sense of being a spirit. SPs and hallucinations frequently occur simultaneously but due to sleep amnesia, only the hallucinations are vaguely recalled by their association with sudden, unpleasant or frightening wakening.

- 1 *Intruder states* consist of a numinous sense of presence, followed by visual, auditory and sometimes tactile hallucinations (Cheyne 2001). Vivid visual hallucinations may include human intruders, witches, demons, monsters, witches and extra-terrestrial abductors, associated with footsteps, whispering, animal sounds, verbal threats as well as being grabbed. These events stem from brainstem induced amygdaloid activation producing a hypervigilant state in which detection thresholds are lowered with a bias towards threat and danger cues. The function of the threat-activated vigilance system (TAVS) is to disambiguate suggestive but inconclusive signs of danger.
- 2 *Incubus states* consists of pressure on the chest, breathing difficulties and pain due to the effect of hyperpolarising motoneurons on perceptions of respiration.
- 3 *Vestibular-motor hallucinations* consist of consist of vestibular sensations of floating, flying, spinning, and falling. These are associated with OBEs, AS, erotic feelings and feelings of bliss, related to physically impossible experiences generated by body position, orientation and movement. The hallucinations arise from activation of the bodily-self neuromatrix (Melzack 1990). Vestibular nuclei in the pontine brainstem are closely associated with sleep-wake centres.

SP creates a state of consciousness onto which cultural loading and personal belief would produce images that conform to the subject's expectations or fears. SP can be translated between languages and discourses, as well as graphically represented. This would convert ordinary experiences from dream, psychoses and mirages into spiritual experiences (Hufford 2005).

For the majority of people, SP is taken as a kind of spiritual experience because of the presence of non-physical 'threatening presence' as part of the event. In others, SP is associated the experience of alien encounters, alien abduction and astral travel. In recent years, this has had sensational forensic consequences as a result of assumed connection with childhood sexual abuse. In a study of reported alien abductees, McNally and Clancy (2005) noted that virtually no psychopathology was present in the subjects and there was a high rate of SP present.

If turning is biased to the right in right-limbed

individuals, then autoscopia will appear in the right visual field. V-M hallucinations (as opposed to Intruder hallucinations) are biased to right hemispace, confirming the involvement of vestibular activation for hallucinations of flying, floating, locomotion, postural adjustment, OBEs and autoscopia. This is consistent with neuro-imaging findings of greater left medial prefrontal and left parietal-temporal-occipital activation during mental body rotation (Cheyne & Girard 2004).

Narcolepsy, described in 1880 by Gelineau, consists of sleep paralysis, hypnagogic and hypnopompic hallucinations, hypersomnia and cataplexy. The latter, the rarest of the four, emotionally-induced muscular weakness, consisting of sudden collapse during emotion, such as anger or laughter. Once again, it is interesting how an event such as cataplexy could be interpreted as being 'struck down' by a supernatural force. The most common clinical feature of narcolepsy, hypersomnia, is also a common component of shamanic states. Narcolepsy has an hereditary basis, again reinforcing the likelihood that it could occur in a shamanic class. However, narcolepsy is relatively rare, incidence approximately 0.7%, while SP is a common event, occurring in 40% of people (Hublin et al 1994).

## 6 Schizophrenia and other psychoses

The belief that all shamanic individuals were psychotic was common in the past (Silverman 1967). However this view was rejected in a comprehensive review by Walsh, who found that shamanic phenomenology, was 'clearly distinct from schizophrenic... states' (Walsh 2001:34). Noll stated that significant phenomenological differences between the two groups made 'the schizophrenic metaphor' untenable (Noll 1983:455.).

Schizophrenia is the most severe psychiatric illness as it affects patients during the reproductive years, the most productive period of life. While schizophrenia is associated with a range of symptoms, hallucinations, perceptual disorders, paranoid delusions, misidentification syndromes and altered states are frequent metaphors for shamanism. Religious beliefs, delusions and experiences are more common in schizophrenics than the general population (Brewerton 1994; Kroll & Sheehan 1989).

Schizophrenic hallucinations occur in all modalities but tend to be complex, rather than simple. Visual hallucinations occur in schizophrenic psychoses but are not as common as phenomena such as auditory hallucinations or paranoid delusions. Schizophrenic patients can show subtle perceptual disturbances including dyschronognosis (disordered perception of time), dysbarognosis (abnormal perception of weight) and dysestereognosis (disordered perception of distance) (Ciprian-Ollivier & Cetkovich-Bakmas 1997).

The similarity of schizophrenic disorder and drug-induced psychoses (in the laboratory 'model psychoses') is well documented, indicating that similar neurotransmitters are involved.

Affective (manic-depressive) psychoses may have similar features to schizophrenic disorders. However, as a rule, the predominantly affective component manifests with grandiosity, increased spiritual concerns and metaphysical preoccupations. It is common for patients to have a sense of spiritual elation, if not bliss; it can progress to the point that they believe they are a god or spirit. In Brewerton's survey (1994), 90% of patients reported religious delusions and hallucinations. Interestingly, visual hallucinations are more common in affective and organic psychoses.

Obsessive-compulsive disorder (OCD) has a well-documented link with religious obsessions (described as scrupulosity in the past). Whether this progresses to a significant relationship with religiosity remains to be seen. OCD is linked with schizophrenia in having a higher incidence (14%) of delusions, hallucinations and related symptoms than the general population (Eisen & Rasmussen 1993).

In summary, schizophrenia, mania, OCD and TLE have genetic, behavioural and structural links. While mania is mostly linked to neurochemical disturbances, TLE is most closely tied to neuroanatomical damage (Previc 2006).

## 7 Lycanthropy

Lycanthropy, the belief that one has been changed into an animal, is usually listed as a sub-category of schizophrenia. While common, it can occur in a wide range of conditions, including psychoses, dissociative states, epilepsy, and hallucinogenic drugs (Kulick et al 1990).



That there is a significant cultural component is not doubted. The best evidence for this are the cases where patients believe they have become a werewolf – itself a cultural construct. In Africa, there are reports of shamans transforming the patient into an animal as an act of healing to protect them from disease or possession. In Asia, animals chosen are the tiger, hyena, crocodile or shark, common but feared creatures.

What is interesting is that a review of lycanthropy shows patients may change to birds, bees and frogs, in addition to a range of trophy animals such as lions, tiger, wolf and horse (Garlipp *et al* 2004).

## 8 Discussion

This review has looked at neuropsychiatric disorders, such as epilepsy, schizophrenia, mania, OCD and narcolepsy, and related phenomena such as depersonalisation, autoscopy, hallucinations, sleep paralysis and lycanthropy as analogues for the pathophysiological changes occurring in shamanism. They all arise in the brain, predominantly from the limbic system, the neuroanatomical substrate of emotion, both experience and expression.

Can we compare the modern mind with that of the hunter-gatherer shaman, whether in the Upper Palaeolithic or the earliest San healers? We, perceive, imagine and dream the world around us in drastically different terms, yet all of this originates from the same material sphere: the brain. While culture influences the content of our thoughts, feelings and perceptions, we have the same brain as the cave painter of Chauvet, the rock engraver of Wildebeestkuil or the rock painter of Apollo 11.

Previously the modern mind was taken to have arisen in Europe around 30,000 years ago with an outpouring of creative activities in the Palaeolithic era producing fine carvings, rock paintings and engraved artefacts. It seemed a logical conclusion that this was associated with the rise of *Homo sapiens*, displacing the lesser-developed Neanderthals in the process (Klein 2003).

However the Upper Palaeolithic triumph has been displaced by work showing that such changes had occurred earlier in Africa, notably in Southern Africa, as demonstrated at sites such as Klasies River and Blombos. Richard Klein postulated that a genetic mutation around 50,000 years ago led to

neurological changes (Henshilwood *et al* 2003), South African workers maintain the change occurred earlier and over a longer period; in the words of Brooks and McBrearty (2000), this is 'the revolution that wasn't'.

How did the neurological changes that permitted this profoundly human activity arise? *Homo sapiens* originated 200,000 years ago (McDougall *et al* 2005). The genetic change that preceded the dispersal of the species is regarded as a speciation event, enabling the species to expand into almost every ecological niche and eliminate other species in the process (Crow 2000). There is no evidence that the brain of *Homo sapiens* has changed since then. From this the only conclusion that can be reached is that the neurological basis for altered perceptions, then and now, arises from the same entity, the substrate of the human brain.

There is an intense debate on the origin of human 'modernity'. Humans were behaviourally modern when they demonstrated 'symbolic storage': the capacity to store symbolic information outside the brain (Wadley 2001). In the debate over what constitutes human modernity there is agreement on only one issue: the capacity for language. This is not only the ability to speak but to transmit and store information beyond the human brain. As a result, artefacts became invested with abstract meanings and symbolic values (Mithen 1996).

The significant changes in the brain that led to language are both conceptually simple and anatomically elegant: the development of laterality. Laterality may have occurred to a limited extent in *Homo erectus* or even *Homo habilis*, but only became significant in *Homo sapiens* (Steele 1997).

Laterality determined hemispheric dominance, handedness, intellectual, verbal and special skills (Barrick *et al* 2005). This was first recognised by Broca, but there was an hiatus for much of the 20<sup>th</sup> century until by Geschwind and Levitsky revived interest in 1968 with their study showing the planum temporale was significantly larger on the dominant left hemisphere (Geschwind & Levitsky 1968). The lateral shift of the brain, with the right-left torque, meant there a significant expansion around the left temporo-occipital region – the speech centre. This was also gender-specific: females more strongly right-handed, acquire words more rapidly and have faster brain growth; men, by contrast, have greater

adult brain size, more asymmetry and better spatial ability (Leask & Crow 2001).

Studies by Crow et al revealed the corollary: schizophrenic brains show a significant loss of laterality (Crow 1990). Schizophrenic brains are more symmetrical and testing of 11-year old students shows that 'hemispheric indecision' is the best predictor for future schizophrenia (Leask & Crow 2001).

A single sex-linked gene is responsible for laterality (Berlim et al 2003). The likely candidate is protocadherin XY, a gene responsible for axonal growth (Crow 2002). The degree of asymmetry that occurs would determine not only such capacities as verbal ability, but would permit wide variations in personality. Marion Annett's genetic model postulates a 'right shift' gene (RS) influencing the direction of handedness (Annett 1985). The RS+ allele will favour academic ability by shifting the distribution away from the point of equality (Crow et al 1998). In contrast, RS- individuals would be most at risk of hemispheric indecision and deficits in academic performance. Those with hemispheric indecision are prone to magical thinking, schizophrenia or psychopathy.

The laterality gene results in a range of profoundly human capabilities. These include intellectual ability, emotional range, psychosis and a range of phenomena variously referred to as schizotypal, eccentric or magical traits. Studies link (a) schizophrenia and schizotypy with increased creativity (b) schizophrenia and schizotypy with decreased left/increased right hemisphere dominance and (c) increased creativity with decreased left/increased right hemisphere dominance (Weinstein & Graves 2001). Brod (1997) speculated that increased creativity and schizotypy resulted from the free-up of right hemisphere processes, allowing their involvement in tasks for which the left hemisphere normally specialised. Leonard and Brugger (1998) suggested that the left hemisphere reduction in dominance with psychotic and creative thought is due to a relative over-reliance on unfocussed right hemispheric semantic processes. A study of 250 students showed that magical ideation rose to a peak at the point of ambilaterality on a scale of hand preference, falling away with increasing right- or left-handedness (Barnett & Corballis 2002).

Studies on patients who had commissurotomy for epilepsy to sever the primary connection between the two hemispheres showed that after an initial period of confusion, normal mental function would resume. This led to a theory of the unintegrated right cerebral hemisphere as alien intruder as a mechanism to explain psychosis (Nasrallah 1985). The two cerebral hemispheres contain two separate and different spheres of consciousness that are fully integrated into one 'self' by the corpus callosum and other interhemispheric connections. In order for the dominant (left) hemisphere to function, it has to be able to ignore signals from the opposing 'alien' hemisphere.

The commissure surgery results in loss of an anatomical 'gate' that keeps the non-dominant hemisphere invisible, as it were. The theory is that conditions like schizophrenia lead to a physiological loss of the gate. As a result, the dominant hemisphere is exposed to a stream of thoughts, feelings and intentions from the right hemisphere that are interpreted as alien; the response to this is the symptoms of psychosis; in less severe conditions, this would lead to increased magical thinking, OBE and AS – the basic phenomena of shamanism.

Factors such as magical thinking must have an advantage through their association with religion, creativity and lateral thinking. Huxley et al (1964) pointed out that despite the dysfunction and reduced fertility, schizophrenia does not breed out, indicating that the biological advantages far outweigh the disadvantages and providing comfort to many who believe that psychosis is associated with creativity and brilliance (Crow 2000). Others have suggested that paranoia might promote defensiveness in threatening environments (Jarvick & Chadwick 1972), or facilitate the splitting of overlapse in hunter-gatherer groups (Stevens & Price 1996), but these ideas remain highly speculative.

A more likely explanation from Wilson and Sober (1994) is that psychological specialisation enables humans to become 'team players'. As a result of varying degrees of cerebral lateralisation, certain individuals would be more likely to display creative or magical thinking, responses to supernatural phenomena and out-of-body reactions. This, in turn, would lead them to initiate and participate in spiritual ceremonies, thereby facilitating group cohesion.

From there, it was a short step to the phenomena intrinsic to shamanism, an activity now revealed as a critical factor in hunter-gatherer life as a prelude to the development of a settled society.

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