

THE LIMBIC SYSTEM AND THE SOUL: EVOLUTION AND THE NEUROANATOMY OF RELIGIOUS EXPERIENCE

by R. Joseph

Abstract. The evolutionary neurological foundations of religious experience are detailed. Human beings have been burying and preparing their dead for the Hereafter for more than 100,000 years. These behaviors and beliefs are related to activation of the amygdala, hippocampus, and temporal lobe, which are responsible for religious, spiritual, and mystical trancelike states, dreaming, astral projection, near-death and out-of-body experiences, and the hallucination of ghosts, demons, angels, and gods. Abraham, Moses, Muhammad, and Jesus Christ, and others who have communed with angels or gods display limbic system hyperactivity, whereas patients report religious hallucinations or out-of-body experiences when limbic structures are stimulated or excessively activated. It is postulated that limbic and temporal lobe structures account for the sexual and violent aspects of religious behavior and also serve as a “transmitter to God,” and that the evolution of these structures made spiritual experience possible.

Keywords: amygdala; angels; Cro-Magnon; dreams; evolution; frontal lobe; ghosts; God; hippocampus; limbic system; Neanderthals; near death; sex; spirituality; temporal lobe.

A belief in the transmigration of the soul, in an afterlife, in a world beyond the grave, may well have been a human characteristic for at least 100,000 years (Belfer-Cohen and Hovers 1992; Butzer 1982; Joseph 1996; McCown 1937; Rightmire 1984; Schwarcz 1988; Smirnov 1989; Trinkaus 1986). Despite their primitive cognitive capabilities, even archaic *Homo sapiens*

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who wandered the planet more than 120,000 years ago carefully buried their dead (Butzer 1982; Rightmire 1984); and like modern *H. sapiens sapiens*, they prepared the recently departed for the journey to the Great Beyond: across the sea of dreams, to the land of the dead, the realm of the ancestors and the gods.

Throughout the Middle and Upper Paleolithic, it was not uncommon for tools and hunting implements to be placed beside the body, even 100,000 years ago (Belfer-Cohen and Hovers 1992; McCown 1937; Trinkaus 1986). A hunter in life, a man was to be a hunter in death, for the ethereal world of the Paleolithic was populated by spirits and souls of bear, wolf, deer, bison, and mammoth (e.g., Campbell 1988; Kuhn 1955). Moreover, food and water might be set near the head in case the spirit hungered or experienced thirst on its long journey to the Hereafter. And finally, flowers and red ocher might be sprinkled on their bodies (Solecki 1971) along with the tears of those who loved them.

Given the relative paucity of cognitive and intellectual development among Middle Paleolithic Neanderthal and archaic (as compared to modern) human beings, and the likelihood that they had not yet acquired modern human speech (Joseph 1996; 2000a), evidence of spiritual concerns among archaic and other Middle Paleolithic peoples (i.e., archaic, early moderns, Neanderthals) may be somewhat surprising if not unbelievable (Gargett 1989). However, it appears, on the basis of a gross photographic analysis of Neanderthal and Cro-Magnon endocasts (Joseph 1996) as well as the evidence reviewed below, that archaic, early modern, and Neanderthal men and women possessed a well-developed inferior temporal lobe and limbic system—brain areas directly implicated in the generation of religious experience.

As detailed below, the amygdala, hippocampus, and inferior temporal lobe appear to subserve and provide the foundations for mystical, spiritual, and religious experience and the perception, or perhaps the hallucination, of ghosts, demons, spirits, and sprites and belief in demonic or angelic possession (Bear 1979; d'Aquili and Newberg 1993; Joseph 2000b; Mesulam 1981; Saver and Rabin 1997; Schenk and Bear 1981). When these nuclei are excessively activated (hyperactivated), spiritual experiences and "religious" hallucinations, although unusual, are not uncommon.

The limbic system is common to all peoples; this might explain why belief in souls, spirits, haunted houses, angels or demons, and the capacity to have mystical experiences, including the sensation of being possessed by gods or devils or hearing their voices, is worldwide (Budge 1994; Campbell 1988; Frazier 1950; Godwin 1990; Harris 1993; James [1902] 1958; Jaynes 1976; O'Keefe 1982; Malinowski 1954; Smart 1969; Wilson 1951). That is, because all human beings possess a limbic system and a brain that evolved, develops, and is organized in a similar manner (Joseph 1996; 1999a, b; 2000b), they have similar religious experiences—what Carl G. Jung

(1964) referred to as “archetypes”: inborn tendencies to create, dream of, and respond with mystical awe to specific images and symbols. This commonality in religious or archetypal experience includes the capacity to experience God or the Great Spirit and the many vestiges or incarnations of what has been referred to as “the personal soul” or “ghost.” Indeed, it could be argued that the essence of “God” and of our living soul may be slumbering within the depths of the ancient limbic lobe that is buried within the belly of the brain. And not just the soul or the Great Spirit of the Lord God, for in the Upanishads and Tao it is said, and as Buddha, Lao-tzu, Chuang Tzu, Jesus (Luke 17:21), the Sufis, and many Sumerian, Babylonian, Jewish, Arabic, Aryan, Egyptian, Greek, Roman, Indian, Muslim, and Gnostic mystics have proclaimed, “The kingdom of God is within you.”

THE ANTIQUITY OF THE SOUL:
MIDDLE PALEOLITHIC SPIRITUALITY

When human beings first became aware of a “God” cannot be determined. Nevertheless, it has been well established that Neanderthals and other *H. sapiens* of the Middle Paleolithic (e.g., 150,000 to 35,000 B.P.) and Upper Paleolithic (35,000 B.P. to 10,000 B.P.) engaged in complex religious rituals. For example, Middle Paleolithic Neanderthals (a people who lived in Europe, Africa, and the Middle East) were buried in sleeping positions with the body lying on its side, surrounded by goat horns placed in a circle, with reindeer vertebrae, animal skins, stone tools, red ocher, and flowers, and with bovine bones or limestone blocks placed on top of the head and shoulders, or beneath the head like a pillow, and with heads severed; there is also evidence of ritual decapitation, facial bone removal, and cannibalism (Belfer-Cohen and Hovers 1992; Binford 1968; Harold 1980; Smirnov 1989; Solecki 1971).

Of course, the fact that Neanderthals engaged in mortuary practices does not necessarily imply that they held a belief in “God.” It is apparent, however, that they had strong feelings for the deceased and had prepared them for a journey to the Hereafter or the land of dreams—hence the presence of stone tools, the sleeping position, and stone pillows. Throughout the ages, and as repeatedly stated in the Old Testament, dreams have been viewed as the primary medium in which gods, ghosts, and human beings interact (Campbell 1988; Freud 1900; Jung 1945; 1964); and, as detailed below, dreams are produced by the limbic system.

Insofar as the ancients were concerned, dreams served as a doorway, a portal of entry to the spirit world through which “God,” angels, demons, or ghosts could make their intentions known. Indeed, that Paleolithic human beings believed in ghosts and believed that the dead (or their souls) might return and cause harm is also suggested by the evidence of ritual decapitation and the placement of heavy stones upon the body. Archaic

H. sapiens took precautions to prevent the dead or their souls from returning from the grave to cause mischief among the living. There thus seems to be good reason to assume that Neanderthals had spiritual and mystical beliefs involving perhaps the transmigration of the soul and the horrors, fears, and hopes that accompany such feelings.

The Neanderthals, however, were not the only species of early humanity to practice mortuary rites. Early modern and other archaic *H. sapiens* buried infants, children, and adults with tools, grave offerings, and animal bones. Archaic *H. sapiens* and early moderns were carefully buried in Qafzeh, near Nazareth, and in the Mount Carmel Mugharettes-Skhul caves on the Israeli coast more than 98,000 years ago (McCown 1937; Smirnov 1989; Trinkaus 1986). The remains include a Qafzeh mother and child who were buried together and an infant who was buried holding the antlers of a fallow deer across his chest. In Skhul, yet another was buried with the mandible of a boar held in his hands, whereas an adult had stone tools placed by his side (Belfer-Cohen and Hovers 1992; McCown 1937). Hence, human beings have been burying and presumably weeping over their dead, and preparing them for a journey to the Hereafter, for 100,000 years.

However, it is with the Upper Paleolithic and the emergence of the Cro-Magnon and Asian moderns that the quality and quantity of grave goods undergo a creative and symbolic explosion. Cro-Magnon dead were buried with jewelry, weapons, clothing, pendants, rings, necklaces, multifaceted tools, head bands, and bracelets, all intricately fashioned with care and talent equal to that of most modern artisans. Beginning 35,000 years ago, the Cro-Magnon painted, drew, and etched bear, mammoth, deer, horse, and even pregnant females in the recesses of dark and dusky caverns (Bandi 1961; Chauvet, Deschamps, and Hillaire 1996; Leroi-Gourhan 1964; 1982; Prideaux 1973). The pregnant females include Venus statuettes, some of which may have been fertility and sex symbols or perhaps representations of various goddesses. In order to view these Cro-Magnon paintings and religious objects, one had to enter a cave and crawl a considerable distance, sometimes hundreds of yards, through a twisting, narrowing, pitch-black tunnel before reaching these Upper Paleolithic underground cathedrals. This is significant, for in the Egyptian and Tibetan Books of the Dead, and as reported among those who have undergone a near-death experience, being enveloped in a dark tunnel is commonly experienced after "death" and prior to entering the light of heaven or paradise, at which point "the recently dead" may be greeted by relatives, friends, or radiant human- or animal-like entities (Eadie 1992; Rawlings 1978; Ring 1980).

As is evident from Upper Paleolithic cave art and symbolic accomplishments, the nether world of the Cro-Magnon and other Upper Paleolithic peoples was haunted by the spirits and souls of the living, the dead, and those yet to be born, both animal and human (Brandon 1967; Campbell 1988; Kuhn 1955; Prideaux 1973). Upper Paleolithic peoples apparently

believed that these spirits could be charmed and controlled by hunting magic and through the spells of sorcerers. Indeed, hundreds of feet beneath the earth, the likeness of one ancient shaman attired in animal skins and stag antlers graces the upper wall deep within and directly above the final entrance to the 20,000–25,000-year-old grand gallery at Les Trois-Frères in southern France (Prideaux 1973). Galloping and swirling about this ancient sorcerer are bison, stag, horse, and deer, and presumably their souls. Images of an almost identical sorcerer appear again in ancient Sumerian inscriptions fashioned six thousand years ago.

THE AMYGDALA, THE TEMPORAL LOBE,
AND THE SIGN OF THE CROSS

The fact that Middle and Upper Paleolithic peoples buried their dead with grave offerings and placed them in sleeping positions indicates that they were capable of experiencing love, fear, and mystical and religious awe. Like moderns, Paleolithic peoples also shared a commonality in regard to that region of the brain implicated in the generation of fear, love, intense emotions, and religious and spiritual beliefs: the limbic system (amygdala and hippocampus) and inferior temporal lobe (Bear 1979; d'Aquili and Newberg 1993; Joseph 1992a; 1996; 2000b; Mesulam 1981; Saver and Rabin 1997; Schenk and Bear 1981; Subirana and Oller-Daurelia 1953; Williams 1956). It is the evolution of these structures that made it possible to experience and attribute spiritual significance to events, actions, and geometric stimuli.

For example, in addition to burial and mortuary practices, one of the first signs of exceedingly ancient religious symbolism is the discovery of an engraved "cross" that is perhaps 60,000 to 100,000 years old (Vertes, cited in Mellars 1989). Likewise, the final underground entrance to the Chauvet cathedral, in France, is marked by a red cross painted 35,000 years ago (Chauvet, Deschamps, and Hillaire 1996). Regardless of time and culture, among the Aztecs, Mayans, American Indians, Romans, Greeks, Africans, Christians, Cro-Magnons, and Egyptians (the key of life), the cross consistently appears in a mystical context, or tremendous cosmic or spiritual significance is attributed to it (Budge 1994; Campbell 1988; Joseph 2000b; Jung 1964; Sitchin 1990). For example, like Catholics, the Mayas and Aztecs adorned their temples with the sign of the cross.

Along the neocortical surface of the inferior temporal lobe (and within the amygdala) are dense neuronal fields that contain neurons that fire selectively in response to visual images of faces, hands, eyes, and complex geometric shapes, including crosses (Gross, Rocha-Miranda, and Bender 1972; Hasselmo, Rolls, and Baylis 1989; Morris et al. 1996; Richmond, Wurtz, and Sato 1983; Richmond, Optican, Podell, and Spitzer 1987; Rolls 1984; 1992). The ability to recognize faces, geometric shapes, and social-emotional nuances is dependent on these specialized temporal lobe and

amygdala feature-detecting neurons and neural networks that respond selectively to these stimuli (reviewed in Joseph 1996). However, because neurons in the amygdala and inferior temporal are also multimodally responsive and subserve almost all aspects of emotion, including religious feeling, it is possible for faces and geometric symbols to become infused with (or to stimulate) mystical and religious emotions.

For example, abnormal or heightened activation of the amygdala-temporal lobe is associated with the experience of frightening hallucinations—due to the activation of these feature-detecting neurons coupled with associated limbic emotions; fear is the most common reaction. Thus, heightened emotional activity within these limbic nuclei could result in feelings of fear, foreboding, or religious awe being attributed to perceived objects such as “crosses,” stimuli that might also appear as part of a hallucination if the related feature-detecting neuron were activated. Similar explanations could be offered for the spiritual significance attributed to triangles (i.e., pyramids) and circles. Crosses, triangles, and circles were etched on Cro-Magnon cave walls 35,000 years ago.

Hence, it can be assumed that “cross” neurons as well as “mystical/religious”-feeling neurons (or neural networks) had probably evolved by 35,000 and perhaps 100,000 years ago—possibly in reaction to or association with the perception of crosslike stimuli coupled with feelings of fear or religious awe. One need only raise one’s arms horizontally, or walk in the forest and spy dead trees that take the form of a cross, or look upward to view birds with extended crosslike wings soaring through the skies. The sign of the cross is not uncommon, and staring at a cross activates the temporal lobes.

DREAMS, THE LIMBIC SYSTEM, AND THE SOUL

I the LORD will make Myself known to him in a vision, and will speak with him in a dream. (Numbers 12:6b)¹

Throughout the Upper Paleolithic and the Neolithic and continuing into modern times, many believed that the netherworld was populated with the souls of trees, plants, animals, humans, demons, and all manner of gods (Armstrong 1994; Brandon 1967; Budge 1994; Campbell 1988; Frazier 1950; Harris 1993; Kuhn 1955; Smart 1969; Wilson 1951). Likewise, the souls of the living and the dead, including deer, bison, bear, and human beings, grace the walls of many an ancient underground cathedral. However, these souls could be influenced, their behavior controlled, and a good hunt or a successful battle thereby ensured. These beliefs gave rise to both animal worship and animal sacrifice as well as to the avoidance of certain animals, which were not to be killed or eaten, or were to be killed or eaten only in a certain ritualized manner (Campbell 1988; Frazier 1950; Malinowski 1954; Smart 1969).

The ancients believed that the souls of people and animals wandered about while they dreamed (Brandon 1967; Frazier 1950; Harris 1993; Jung

1945; 1964; Malinowski 1954), presumably escaping the body via the mouth or nostril during sleep. The human soul might appear as a bird, deer, fox, rabbit, or wolf, whereas the souls of animals could hover about in humanlike, ghostly vestiges in the dead of night (Joseph 2000b). Indeed, one need only spend an evening alone in the woods in order to develop the sense that one is being watched by various entities both alive and supernatural, animal and spirit, benevolent and unkind.

Throughout the ages it has been believed that through dreams the gods and spirits speak to women and men, and that dreams served as the portal or entryway that allowed one to gain access to the spirit worlds that existed at the boundaries of reality where day turns to dusk and is enveloped in the darkness of night (Campbell 1988; James [1902] 1958; Jaynes 1976; Jung 1945; 1964; Neihardt and Black Elk 1979). Like modern human beings, the ancients had dreams by which they were transported or exposed to a world of magic that obeyed its own laws of time, space, and motion, a world in which the living could commune with the gods and the souls of loved ones long dead. Hence the tendency to bury the recently departed in a sleeping position, even 100,000 years ago.

The God of the Israelites tells us that it is through dreams and visions that God's will is made known, and just as religious experiences can be secondary to amygdala and temporal lobe activity, dreams are also limbically produced. Indeed, activity within the amygdala may trigger dreaming, that is, rapid eye movement (REM) sleep, which is heralded and then accompanied by pontine-geniculate-occipital (PGO) waves. That is, the amygdala is active during REM, and amygdala activity triggers PGO waves (Calvo, Badillo, and Morales-Ramirez 1987), which lead to dream sleep.

In addition to amygdala activity during REM, the hippocampus (which is immediately adjacent to the amygdala) begins to produce slow wave, theta activity (Jouvet 1967; Olmstead, Best, and Mays 1973; Steriade and McCarley 1990). Presumably during REM, and as these structures are implicated in memory storage and retrieval, the hippocampus and amygdala act as a reservoir from which various images, emotions, words, memories, and ideas are drawn and incorporated into the matrix of dreamlike activity being woven by the right hemisphere (Joseph 1982; 1988; 1996). Indeed, the right hippocampus and amygdala and the right hemisphere in general appear to be directly involved in the production of religious imagery (d'Aquili and Newberg 1993; Joseph 1996), including complex visual hallucinations, dream states as well as REM during sleep (Broughton 1982; Goldstein, Stoltzfus, and Gardocki 1972; Hodoba 1986; Humphrey and Zangwill 1961; Joseph 1988; 1996; 2000b; Kerr and Foulkes 1981). For example, electrophysiologically, the right temporal lobe becomes highly active during REM, whereas the left temporal region becomes more active during non-REM (Goldstein, Stoltzfus, and Gardocki 1972; Hodoba 1986). Similarly, measurements of cerebral blood flow have shown an increase in

the right temporal regions during REM sleep and in subjects who upon awakening report visual, hypnagogic, hallucinatory, and auditory dreaming (Meyer et al. 1987). Interestingly, abnormal and enhanced activity in the right temporal and temporal-occipital area acts to increase dreaming and REM sleep for an atypically long time period (Hodoba 1986).

Conversely, LSD-induced hallucinations are significantly reduced when the right but not the left temporal lobe has been surgically ablated (Serafetinides 1965). Similarly, it has been reported that dreaming is abolished with right but not left temporal lobe destruction (Bakan 1977). Hence, it appears that there is a specific complementary relationship between REM sleep, hallucinations, mystical experiences, and right temporal (and thus right amygdala and hippocampus) electrophysiological activity. That is, dreams, religious imagery, and spiritual experience are directly linked neuroanatomically and neurophysiologically, forming, perhaps, a “neurotransmitter to God”—as unlikely as that may seem.

THE LIMBIC SYSTEM, SEX, EMOTION, AND SPIRITUALITY

The nuclei of the ancient limbic system include the hypothalamus, amygdala, cingulate gyrus, septal nuclei, and hippocampus (Joseph 1982; 1992a; 1996; 1998; 1999b). These limbic system nuclei are primary in regard to memory, the production of visual imagery, and the expression and perception of most aspects of emotion, including love, sadness, grief, depression, fear, aggression, rage, pleasure, happiness, elation, and even sexual and religious ecstasy.

Limbic system nuclei, such as the hypothalamus, are more ancient and more primitive in emotional expression than the more recently evolved amygdala (e.g., Halgren 1992; Joseph 1982; 1992a; 1996; MacLean 1969; 1990; Rolls 1992). For example, the hypothalamus mediates the expression of very intense, rudimentary, and transient motivational states that are common to most creatures, including reptiles, amphibians, and fish, including even sharks (Joseph 1996). The hypothalamus monitors internal homeostasis and mediates the desire to eat, drink, attack, or have sex. Sexuality and pleasure are of the utmost concern to the hypothalamus, which is capable of generating orgasmic sensations of great intensity (Joseph 1992a; Olds and Forbes 1981; MacLean 1969).

The amygdala (which is intimately interconnected with the hypothalamus) enables us to hear sweet sounds, recall bitter memories, or determine if something is spiritually significant, sexually enticing, or good to eat (Gloor 1986; 1992; Halgren 1992; Joseph 1992a; 1996; Kling, Lloyd, and Perryman 1987; O’Keefe and Bouma 1969; Rolls 1992; Ursin and Kaada 1960). The amygdala makes it possible to experience the spiritually sublime (Joseph 1996), is concerned with most aspects of emotion, and allows us to store affective experiences in memory or even to reexperience them when awake or during the course of a dream as in the form of visual,

auditory, or religious or spiritual imagery (Bear 1979; d'Aquili and Newberg 1993; Gloor 1986; 1992; Halgren 1992; Joseph 1996). The amygdala also enables an individual to experience emotions such as love and religious rapture, as well as the ecstasy associated with orgasm and the dread and terror associated with the unknown.

In fact, the amygdala, in conjunction with the hippocampus and temporal lobe, contributes to the production of sexual as well as bizarre, unusual, and fearful mental phenomena including dissociative states and hallucinogenic and dreamlike recollections involving threatening men, naked women, sexual intercourse, and the experience of God, as well as hallucinations of demons and ghosts and pigs walking upright dressed as people (Bear 1979; Daly 1958; d'Aquili and Newberg 1993; Gloor 1986; 1992; Halgren 1992; Horowitz, Adams, and Rutkin 1968; Jaynes 1976; Joseph 1992a, b; 1993; 1996; 1998; 2000b; MacLean 1990; Mesulam 1981; Penfield and Perot 1963; Rolls 1992; Schenk and Bear 1981; Subirana and Oller-Daurelia 1953; Taylor 1972; 1975; Trimble 1991; Weingarten, Cherlow, and Holmgren 1977; Williams 1956). Some individuals report communing with spirits or receiving profound knowledge from the Hereafter, following amygdala/temporal lobe stimulation or abnormal activation (Penfield and Perot 1963; Subirana and Oller-Daurelia 1953; Williams 1956). Moreover, because the medial amygdala is contiguous with and fans out to form the anterior-medial temporal lobe, and because the primary auditory receiving areas and Wernicke's receptive speech area evolved partly from the amygdala and are buttressed by the (amygdaloid) claustrum (Joseph 1996), not surprisingly, activation of the amygdala is also associated with auditory hallucinations—possibly including hearing the voice of “God.”

The amygdala, hippocampus, and temporal lobe are richly interconnected and appear to act in concert in regard to mystical experience, including, as noted, the generation and experience of dream states and complex auditory and visual hallucinations, such as may be induced by LSD. Intense activation of the temporal lobe, hippocampus, and amygdala has been reported to give rise to a host of sexual, religious, and spiritual experiences, and chronic hyperstimulation can induce one to become hyperreligious or to visualize and experience ghosts, demons, angels, and even “God,” as well as to claim demonic and angelic possession or the sensation of having left one's body (Bear 1979; Gloor 1986; 1992; Horowitz, Adams, and Rutkin 1968; MacLean 1990; Mesulam 1981; Penfield and Perot 1963; Schenk and Bear 1981; Weingarten, Cherlow, and Holmgren 1977; Williams 1956). However, because the amygdala and inferior temporal lobes can also generate feelings of intense fear, these hallucinations are often frightening. Moreover, if the hippocampus is also excessively activated, the frightened victim may hallucinate and have the experience of floating outside his or her body.

FEAR, HIPPOCAMPAL HYPERACTIVATION,
AND OUT-OF-BODY EXPERIENCES

The prospect of being terribly injured or killed in an auto accident or fire fight between opposing troops, or even dying during the course of surgery, is often accompanied by feelings of extreme fear. It is also not uncommon for individuals who experience terror to report perceptual and hallucinogenic experiences, including dissociation, depersonalization, and the splitting off of ego functions such that they feel as if they have separated from their bodies and floated away, or were on the ceiling looking down (Campbell 1988; Courtois 1995; Grinker and Spiegel 1945; James [1902] 1958; Neihardt and Black Elk 1979; Noyes and Kletti 1977; Parson 1988; Southard 1919; Terr 1990).

"The next thing I knew I wasn't in the truck anymore; I was looking down from 50 to 100 feet in the air." "I had a clear image of myself . . . as though watching it on a television screen." "I had a sensation of floating. It was almost like stepping out of reality. I seemed to step out of this world." (Noyes and Kletti 1977, 206)

"The Mustang began to slide and spin . . . I felt real terror . . . I was probably going to be killed . . . I was trying to control the Mustang and avoid turning over, or hitting any of the surrounding cars or the guard rail . . . time seemed to slow down and then . . . part of my mind was a few feet outside the car looking all around; zooming above it and then beside it and behind it and in front of it, looking at and analyzing the respective positions of my spinning Mustang and the cars surrounding me. Simultaneously I [was] inside trying to steer and control it in accordance with the multiple perspectives I was suddenly given by that part of my mind that was outside. It was like my mind split and one consciousness was inside the car, while the other was zooming all around outside and giving me visual feedback that enabled me to avoid hitting anyone or destroying my Mustang." (Joseph 1996, 331)

As noted, feelings of fear and terror are mediated by the amygdala. By contrast, the capacity to cognitively map or visualize one's position and other objects and individuals in visual space appears to be dependent on the hippocampus (Nadel 1991; Joseph 1996; 1999b; O'Keefe 1976; Wilson and McNaughton 1993). The hippocampus contains "place" neurons, which encode one's position and movement in space. Apparently the hippocampus can create a cognitive map of an individual's environment and his or her movements within it. Presumably it is via the hippocampus that individuals can visualize themselves as if looking at their body from afar and can remember and thus see themselves engaged in certain actions, as if they were an outside witness (Joseph 1996; 1999b). However, under conditions of hyperactivation (such as in response to extreme fear), the hippocampus may involuntarily create a visual hallucination of that cognitive map such that the individual may "experience" being outside his or her body, observing all that is occurring. That is, the abnormally activated hippocampus transposes and hallucinates one's image and one's surroundings, similar to what occurs during normal remembering.

In fact, it has been repeatedly demonstrated that hyperactivation or electrical stimulation of the amygdala-hippocampus-temporal lobe can cause some individuals to report they have left their bodies and are hovering at the ceiling staring down (Daly 1958; Jackson and Stewart [1899] 1958; Joseph 1996; 1999b; Penfield 1952; Penfield and Perot 1963; Williams 1956). That is, their ego and sense of personal identity appear to split off from their body, such that they may feel as if they were two different people, one watching, the other being observed. As described by Penfield (1952, 187), "it was as though the patient were attending a familiar play and was both the actor and audience."

Penfield and Perot (1963) describe several patients who during a temporal lobe seizure claimed that they could see themselves in different situations. One woman stated that "it was as though I were two persons, one watching, and the other having this happen to me," and that it was she who was doing the watching as if she were completely separated from her body.

D. Williams (1956, 43) describes a patient who during an aura reported that she experienced a feeling of being lifted up out of her body, of "stepping out of this world" and entering a room of vast size, coupled with a very pleasant sensation of elation and the feeling that she was "just about to find out knowledge no one else shares, something to do with the link between life and death."

Subirana and Oller-Daurelia (1953) described two patients who experienced ecstatic feelings of either "extraordinary beatitude" or of paradise as if they had gone to heaven. Their fantastic feelings lasted for hours.

Other patients suffering from temporal lobe seizures have noted that feelings and things suddenly become "crystal clear," or that they had a feeling of clairvoyance, or of having the truth revealed to them, or of having achieved a sense of greater awareness and of a new awareness such that sounds, smells, and visual objects seemed to have a greater meaning and sensibility. Similar claims are made by those who have "died" and returned to tell the tale.

OUT-OF-BODY AND NEAR-DEATH EXPERIENCES

Some children and adults who have been declared clinically dead but who subsequently return to life have reported that after "dying" they left their body and floated above the scene (Eadie 1992; Joseph 1996; Rawlings 1978; Ring 1980). Typically they become increasingly euphoric as they float above their body, after which they may float away, become enveloped in a dark tunnel, and then enter a soothing radiant light. And later, when they come back to life, they may claim to know what occurred around their body while they were dead and floating nearby. Similar experiences are detailed in the Egyptian funerary texts and Book of the Dead, written almost 6,000 years ago (Budge 1994), as well as in the Tibetan Book of the Dead (the Bardo Thodol), which was composed over 1,300 years ago (Evans-Wentz

1960). Approximately 37 percent of patients who are resuscitated report similar out-of-body experiences (Ring 1980).

Consider, for example, the case of Army Specialist J. C. Bayne of the 196th Light Infantry Brigade. Bayne was “killed” in Chu Lai, Vietnam, in 1966. He was simultaneously machine-gunned and struck by a mortar. According to Bayne, when he opened his eyes he was floating in the air, looking down on his crumpled, burnt, and bloody body, and he could see a number of Vietcong who were searching and stripping him:

I could see me . . . it was like looking at a manikin laying there . . . I was burnt up and there was blood all over the place . . . I could see the Vietcong. I could see the guy pull my boots off. I could see the rest of them picking up various things . . . I was like a spectator . . . It was about four or five in the afternoon when our own troops came. I could hear and see them approaching . . . I could see me . . . It was obvious I was burnt up. I looked dead . . . they put me in a bag . . . transferred me to a truck and then to the morgue. And from that point, it was the embalming process. I was on that table and a guy was telling a couple of jokes about those USO girls . . . all I had on was bloody undershorts . . . he placed my leg out and made a slight incision and stopped . . . he checked my pulse and heartbeat again and I could see that too . . . It was about that point I just lost track of what was taking place . . . [until much later] when the chaplain was in there saying everything was going to be all right . . . I was no longer outside. I was part of it at this point. (reported in Wilson 1987, 113–14; Sabom 1982, 81–82)

Other individuals who have “died” not only float above the body but may float away or soar through the heavens, a condition referred to as “astral projection,” which is believed to be secondary to amygdala, hippocampal, temporal lobe hyperactivation (Joseph 1996; 1999b). For example, Betty J. Eadie reports that after dying and then communing with three “ancient” men who appeared at her side and who “glowed,” she suddenly thought of her husband and children whom she wanted to visit. She discovered that “my spiritual body could move through anything. . . . I began moving at tremendous speed . . . and I was aware of trees rushing below me. I just thought of home and knew I was going there . . . I saw my husband sitting in his favorite armchair reading the newspaper. I saw my children running up and down the stairs” (1992, 33–35).

Compare Eadie’s description with that of Black Elk, a Lakota Sioux Medicine Man and spiritual leader born in 1863. During a visit to England (he was part of Buffalo Bill’s Wild West Show), he suddenly fell out of his chair as if dead and then experienced himself being lifted up. In fact, his companions thought he had died. According to Black Elk,

Far down below I could see houses and towns and green land and streams . . . I was very happy now. I kept on going very fast. . . . Then I was right over Pine Ridge. I looked down [and] saw my father’s and mother’s teepee. They went outside, and she was cooking. . . . My mother looked up, and I felt sure she saw me . . . then I started back, going very fast. . . . Then I was lying on my back in bed and the girl and her father and a doctor were looking at me in a queer way. . . . I had been dead three days . . . and they were getting ready to buy my coffin. (Neihardt and Black Elk 1979, 226–28)

Even in childhood, however, Black Elk repeatedly experienced “queer feelings” and heard voices, had visions, and suffered numerous instances of sudden and terrible fear and depression accompanied by weeping, as well as trance states suggestive of temporal lobe epilepsy, in which he would fall to the ground as if dead. During one of these episodes Black Elk reported the following visions: “Twelve men were coming towards me, and they said, ‘Our father, the two-legged chief, you shall see. . . .’ There was a man standing. He was not Wasichu (white) and he was not an Indian. While I was staring at him his body began to change and became very beautiful with all colors of light, and around him there was light” (p. 245).

Similarly, Eadie came upon a man standing in the light, which “radiated all around him. As I got closer the light became brilliant . . . I saw that the light was golden, as if his whole body had a golden halo around it, and I could see that the golden halo burst out from around him and spread into a brilliant, magnificent whiteness that extended out for some distance” (1992, 40–41).

That so many people, regardless of culture or antiquity, have similar experiences (or hallucinations) after “dying” (e.g., the Tibetan and Egyptian Books of the Dead) is presumably because all possess a limbic system and temporal lobe that are organized similarly. Indeed, in addition to fear and out-of-body hallucinations, limbic system structures, including the amygdala, also appear to generate feelings of rapture and euphoria—the latter being a consequence of the large quantities of enkephalins being released and the high concentrations of opiate receptors located throughout the amygdala (Atweh and Kuhar 1977; Uhl, Kuhar, and Snyder 1978). Moreover, because these structures are involved in memory storage and retrieval and also receive visual input and contain neurons sensitive to the fovea and upper visual fields, hyperactivation of this region may also induce the sensation of seeing a radiant light or generate memories of family, friends, loved ones, and so on, thereby giving rise to what has been described as a “life review,” or, as in the cases of Eadie and Black Elk, of floating home and seeing family and friends.

Although ostensibly similar, many of these experiences are colored by the experiencer’s cultural background. As explained in the Tibetan Book of the Dead, “It is quite sufficient for you (the deceased) to know that these apparitions are [the reflections of] your own thought forms . . . emanations of one’s own intellect” (Evans-Wentz 1960, 371).

Hence, presumably cultural expectations coupled with limbic system hyperactivation may produce a feeling of eternal peace and tranquility and a hallucination of floating outside the body and of meeting relatives and other religious figures, like a dream. However, insofar as these common experiences are dreams or hallucinations, it is curious that so many individuals have a very similar dream or hallucination, and only under conditions suggestive of death. How could human beings have evolved the capacity

to hallucinate life after death, given that they are dead and cannot pass on these traits? What is the evolutionary adaptive significance of so many members of the human race having a dream of the Hereafter after they die?

THE LIMBIC SYSTEM, RAGE, MURDER,
AND RELIGIOUS EXPERIENCE

Injuries to and abnormal or heightened activation of the amygdala and temporal lobe are associated with complex emotions and desires, including sexuality (Blumer 1970; Heirons and Saunders 1966; Taylor 1971; Toone, Edem, Nanjee, and Wheeler 1989), fear (Davis, Walker, and Lee 1997; Gloor 1992; Halgren 1992; Rosen and Schulkin 1998; Scott et al. 1997; Williams 1956), and rage (Joseph 1992). Conversely, when a person is sexually aroused, fearful, or enraged, the amygdala and temporal lobe will become activated. However, because these structures are multimodally responsive and generate religious feelings, in some cases religious feelings may also be associated with sexuality, rage or fear. It is thus noteworthy that the "God" Yahweh is inordinately concerned with sexuality, is often enraged, and requires the experience of fear in which to reveal divine presence and power: "The fear of the LORD is the beginning of wisdom" (Proverbs 1:7, 9:10, 15:33). "And now, Israel, what does the LORD your God require of thee, but to fear the LORD your God" (Deuteronomy 10:12). "God has come . . . in order that the fear of Him may be ever with you so that you do not go astray" (Exodus 20:20).

Perhaps it is because activation of the limbic system generates spiritual and religious, as well as fearful and enraged, murderous feelings, that so many of those who claim to be religious, including members of innumerable religious sects, become "righteously" belligerent, hateful, and murderous. Indeed, throughout recorded history, cults and organized religions have employed torture and human or animal sacrifice and have sanctioned if not encouraged the murder of nonbelievers, what could be referred to as limbic-religious blood lust. "Shed man's blood, by man be your blood shed" (Genesis 9:6).

In fact, the "God" Yahweh loved the spectacle of a bloody slaughter and sacrifice and required that the ancient Israelites undergo a blood ritual of submission (e.g., Exodus 24:1-14) and prescribed a ritual of incredible bloodiness for the investiture of priests in which blood was splashed everywhere (Exodus 29:1-46). King Solomon, for example, slaughtered 22,000 oxen and 22,000 sheep as an offering to this God. This God is apparently a meat eater, and this may explain why Cain, a tiller of the soil, had his first harvest offering of vegetable matter rejected (Genesis 4).

For ancient hunters, aggression and the killing of animals (and other human beings) was a way of life (Joseph 2000a). Hunters often employed hunting magic and related religious rituals to ensure success. Religion and murder, like religion and sex, are linked to the limbic system and evolved

accordingly. Consequently, when people are in the throes of religious excitement, torture and murder may even seem to receive God's blessing or to be actively encouraged by one's God.

Throughout history, many of the patriarchal gods have been aggressive, jealous, conquering, angry, enraged, and warlike. Indeed, these warrior gods, including Yahweh ("the Lord of hosts"), were prone to extremely violent and murderous rages. Yahweh would threaten and engage in the slaughter of enemies and believers alike, without mercy or regard for women and children. Similar rage and murderous reactions can be triggered by temporal lobe and amygdala hyperactivation (Joseph 1992a; 1996).

"Terror, and the pit, and the snare are upon you, O inhabitant of earth" (Isaiah 24:17). "And as the LORD took delight in doing you good and multiplying you, so the LORD will take delight in bringing ruin upon you and destroying you" (Deuteronomy 28:63). "The LORD will bring a nation against you from afar, from the end of the earth, which will swoop down like the eagle . . . a ruthless nation, that will show the old no regard and the young no mercy" (Deuteronomy 28:49–50). "It shall devour the offspring . . . you shall eat your own issue, the flesh of your sons and daughters . . . until He has wiped you out . . . leaving you nothing . . . until it has brought ruin unto you" (Deuteronomy 28:50–55). "In the Name of God . . . by the Troops shall the unbelievers be driven towards Hell, until when they reach it, its gates shall be opened . . . for just is the sentence of punishment on the unbelievers" (Qur'an 39). "Behold I send an angel before thee, to keep thee in the way. Beware of him and obey his voice, for I will be an enemy unto thine enemies, and an adversary unto thine adversaries, and I will cut them off. . . . I will send my terror before thee, and will destroy all the people to whom thou shalt come . . . and I will drive them out from before thee, until thou be increased and inherit the land" (Exodus 23:20–30).

Despite the commandment "Thou shall not kill," the ancient Israelites received special permission from their God to murder wayward Jews, non-Jews, and Jewish nonbelievers, including women and children, whom they slaughtered without mercy: "And Moses was wroth . . . and said unto them, 'Have you saved all the women and the little ones alive? . . . Now therefore, kill every male among the little ones, and kill every woman that hath known man by lying with him. But all the women and female children that have not known a man, keep alive for yourselves'" (Numbers 31:14–18; see also vv. 50–53).

In fact, it was a Jewish tradition to kill not only non-Jewish males in general but firstborn Jewish sons (a custom until the time of Moses; see Bergmann 1992). Indeed, the sacrificial murders of firstborn males was originally demanded by this God but later condemned: "A blessing on him who seizes your babies and dashes them against rocks" (Psalm 137:9). "I polluted them with their own offerings, making them sacrifice all their first-born, which was to punish them, so that they would learn that I am

Yahweh” (Ezekiel 20:26). “This very day you defile yourselves in the presentation of your gifts by making your children pass through the fire of all your fetishes” (Ezekiel 20:31).

This God also required that the son of King David be put to death, after which God pardoned King David for repeatedly breaking two commandments, murder (of Bathsheba’s husband) and adultery. David had a fondness for the wives of other men (e.g., Abigail, wife of Nabal, and Michal, wife of Paltiel). However, David the murderer and adulterer was also a fierce warrior who had killed tens of thousands—and this God loved this adulterous, treacherous murderer.

Using these images of the raging, murdering, warrior God, the Lord of Hosts, Pope Urban II proclaimed that war for the sake of God was holy. In fact, the Catholic popes instigated numerous crusades and inquisitions, because they were presumably acting under the religious delusion that they were serving Jesus Christ, when in fact they were following the philosophy of Paul (who spent the first half of his life as Saul, killing Christians) and the dictates of Peter, whom Jesus repeatedly castigated as “Satan”: “But he turned and said unto Peter, ‘Get thee behind me, Satan, thou art an offence unto me; for thou savourest not the things that be of God, but those of men’” (Matthew 16:23; Mark 8:33). On the other hand, these men of God also may have been suffering from amygdala/temporal lobe abnormalities. In consequence, hundreds of thousands of Muslims, Jews, and women and children were sexually tortured, slaughtered, spitted, and roasted alive, and their cities and villages pillaged and set ablaze—all in the name of God.

So intense was their limbic blood lust that even Christians were murdered. For example, in the thirteenth century an army of 30,000 Christian knights and crusaders descended into southern France and attacked the town of Béziers in search of heretics. More than 13,000 Christians flocked to the churches for protection. However, when the bishop, one of the pope’s representatives, was informed that the army was unable to distinguish between true believers and heretics, he replied, “Kill them all. God will recognize his own” (Joseph 2000b, 136).

In order to recruit those worthy of such a glorious undertaking, the pope had to appeal to murderers, rapists, molesters of children, and those who enjoyed the prolonged torture of their victims. “You oppressors of orphans, you robbers of widows, you homicides, you blasphemers, you plunderers of others’ rights . . . If you want to take counsel for your souls you must go forward boldly as knights of Christ.” So proclaimed the pope, who offered indulgences and forgiveness to all those who would commit blasphemies in the name of God and Jesus Christ (Joseph 2000b, 136).

As is well known, the Spanish Catholic missionaries, acting at the behest of the Catholic popes (and their Spanish Catholic sovereigns), continued these satanic practices when they invaded the Americas during the 1500s and up through the nineteenth century. As the Catholic Domini-

can bishop Bartolomé de Las Casas reported to the pope, the Aztec and Indian natives were hung and burned alive “in groups of 13 . . . thus honoring our Savior and the 12 apostles” (Joseph 2000b, 137).

Of course, the Aztecs did not practice a benign form of worship, for they tore the beating hearts from their victims in order to please their god (Carrasco 1990), and they killed thousands if not hundreds of thousands in so doing. Similarly, many Indian tribes of the Mississippi valley practiced human sacrifice, as did the ancient Jews, Europeans, and so on.

MODERN RELIGIOUS MURDERERS

Murder of the innocents and the slaughter of infidels and nonbelievers are not only antiquated religious customs. Cults and religious groups regularly arise in various lands and cultures and frequently indulge in similar practices, for example, Jim Jones and the Jonestown mass suicide, and David Koresh and the fiery death of him and his followers at Waco, Texas. Koresh apparently had sexual relations not only with the wives of his followers but with their children, and in the end he seems to have ordered the death of one and all.

Consider also the Japanese religious cult Aum. Their leader Shoko Asahara and many top cult members were arrested and charged with murder in June 1995 for releasing the nerve gas sarin in five subway cars during rush hour, injuring more than 5,500 Japanese commuters (*New York Times*, 7 June 1995).

Similarly, although the modern Islamic, Christian, and Jewish religions forbid it, many modern-day Middle Eastern and African Islamic, Christian, and Jewish fundamentalists regularly preach murder and hatred. Indeed, it has been reported that militant rabbis in Israel had encouraged and condoned the assassination of Israel's prime minister, Yitzhak Rabin, and had issued a “pursuer's decree,” which in effect morally required that he be killed (*New York Times*, 11 November 1995). He was murdered by a student of religion, Yigal Amir, who claimed that he acted upon God's instructions.

What is the origin of these sadistic religious practices? It is the human limbic system and the same cluster of nuclei that subserves sexuality and spirituality. The limbic system enables human beings to respond with irrational and murderous blood lust in the name of God and religion. As noted, however, the God of the Old Testament repeatedly approved of mass murder and rape and in fact employed these practices against God's own chosen people.

SEX, GOD, AND RELIGION

Sexuality is a major concern of most major religions (Lederer 1968; Parrinder 1980; Smart 1969) as well as of the limbic system. In fact, almost all major religions and their gods act either to promote sexuality or to

suppress it and women in general. This should not be entirely surprising, for religions are very sexual, and many were originally concerned with the fertility of the fields and the abundance of prey (Campbell 1988; Frazier 1950; Harris 1993; Kuhn 1955; Malinowski 1954; Parrinder 1980; Prideaux 1973). Religious rituals evolved accordingly. Many modern mystical and religious practices involve the ritual control over sex and food. This includes many American Indian, Christian, Jewish, and Muslim sects (Campbell 1988; Parrinder 1980; Smart 1969). Thus the commandment “Thou shalt not. . . .” These are limbic taboos, because eating and sexuality, like murder and violence, are under limbic control.

Many limbic taboos, however, promote survival, for example, by proscribing the eating of poisonous plants or “unclean” animals. Similarly, the forbidding of anal or indiscriminate sex spared one the wrath of this God and whatever plagues might be sent in the form of venereal disease or viruses. If we rule out the possibility of an attack with nuclear-armed missiles, mass death due to disease is presumably what became of Sodom and Gomorrah, where the anal sex-crazed mobs attempted to sodomize even the angels sent by the Lord God (Genesis 19).

Sex and food (along with fear, rage, and aggression) are probably the most powerful of all limbic emotions and motivators, and when harnessed or stimulated they can completely overwhelm or control the brain and lead to limbic hyperactivation coupled with religious or spiritual sensations, or at a minimum, complex dreams or hallucinations (Joseph 2000b). Hence, hungry men will dream of food, and those who are sexually aroused will dream of sex. A parched and starving man, however, will not just dream; he will hallucinate food and water and will attempt to slake his desires by consuming a hallucination.

Given that early as well as modern human populations were often concerned with obtaining food and sex partners, many of the earliest religious beliefs and rituals were concerned with increasing the abundance of game animals as well as preserving their own progeny (Armstrong 1994; Campbell 1988; Frazier 1950; Harris 1993; Kuhn 1955; Parrinder 1980; Prideaux 1973). As noted, many an ancient Upper Paleolithic cave was decorated with fertility and sex symbols, including pregnant women (Venus figures) and animals (Bandi 1961; Joseph 2000b; Kuhn 1955; Leroi-Gourhan 1964), whereas Egyptian tombs contain numerous paintings of food.

Thus, given our ancient hunter-gatherer (and then later, farming) heritage, many religions both ancient and relatively modern are highly concerned with fertility and food, or tend to be very sexual and limbic in orientation if not origin. This is also why there have always been gods associated with eating and drinking, especially alcohol (Campbell 1988; Frazier 1950; James [1902] 1958; Joseph 2000b; Parrinder 1980; Smart 1969). This includes Osiris and especially Dionysius, who was, among other things, a sex-crazed dancing god of the vine. One of the first recorded miracles of Jesus involved making wine from water.

Even among the ancient religions of India and China, the gods engaged in sexual activities, and similar sexual activities were promoted among the believers (Campbell 1988; Parrinder 1980). For example, the ancient Vedas were greatly concerned not only with the worship of various nature gods but also with the rituals of sexual union. Ancient Indian religious texts are filled with love charms and instructions about how to win the love of a man or woman or how to protect against demons. Temple prostitutes were quite common throughout India and the Middle East as well as in Rome and Greece, and some temples employed so many girls that they were like giant brothel emporiums (Parrinder 1980). As noted, sexuality and desire, like religious feeling, are directly mediated by the amygdala and hypothalamus.

In fact, sexual intercourse became a religious ritual among Hindus and Buddhists who practiced *tantra*. Those who practiced tantra were inspired by visions of cosmic sex and were highly concerned with sexual energy. It was through tantra that one might be confronted with the cosmic mystery of creation as exemplified by another deity, Shakti, the divine mother. However, there were restrictions on where one could have sexual intercourse (not in public), and certain types of sexual acts such as oral sex were prohibited, as well as sexual relations with strange women or those of a lower caste (Parrinder 1980). Nevertheless the joys of sex were continually emphasized and embraced—hence, the Kama Sutra, the “love text.”

It was believed by some ancient Far Eastern sects, however, that in order to gain power one had to break taboos and, for example, have sexual relations with women while they were menstruating or engage in sexual orgies. This was also a form of tantra, referred to as “left-handed tantra.” Those who followed the way of the left-handed tantra claimed that passion was nirvana, and that adepts should cultivate all sexual pleasures (Parrinder 1980). Moreover, both male and female deities, usually portrayed in the sexual act, were worshiped.

Ancient Chinese and Taoist religions are also quite sexual (Parrinder 1980). Consider the concepts of Yin and Yang, which appeared about 3,000 years ago and which represented the male and female principles of the universe. Sexual intercourse was viewed as a symbolic union of the earth and heaven, which were believed to mate during rainstorms. By having sexual relations, a man and woman achieved harmony by following the example of the gods.

However, 3,000 years or so ago, at about the same time that the Judaic religion became more dominant in the Middle East, there occurred over the following thousand years a tremendous change in sexual thought that continued to grow, enveloping the Roman Empire, and eventually paralleled and coincided with the development of Christianity and Islam.

The Lord of the gods (Genesis) gradually became the Lord God, the only God, and there is no hint of sexual duality in this God’s personage.

Moreover, the God of Abraham, and thus the God of the Israelites, Christians, and Muslims, was not in any manner a sexual being (however, see Proverbs 8:22–31) and in fact required a form of sexual self-mutilation and thus a diminishing of the male's sexual pleasure. As part of God's covenant with Abraham and the Jews, it was ordered that every male child would suffer the amputation of the tip of his penis (which is densely innervated by fibers that yield intense sexual pleasure): "And ye shall circumcise the flesh of your foreskin; and it shall be a token of the covenant betwixt me and you" (Genesis 17:10–11). Nor does this God lust after or engage in sexual relations with women, which had been a common godlike (and sons-of-god) behavior in the past. Rather, in those instances where women became pregnant because of the actions of this God, sex *per se* appears to have been precluded.

On the other hand, this God, when angry, used explicit sexual imagery in condemning the people of Israel, repeatedly threatening to strip them "naked" and referring to them as a "whore" (Hosea 2). Moreover, although this volatile and masculine-seeming God was asexual, sexual behavior was of tremendous concern to "Him," for "He" commands sexual moral obedience and repeatedly tells the people, starting with Adam and Eve, "be fruitful and multiply."

Why the concern about sex, pro or con, in religious thought? As noted, the relationship between fertility, the abundance of prey, and the evolution of hunting magic accounts in part for religious sexuality. In addition, sex, like religious experience or the ability to derive pleasure from eating and drinking, is mediated by the limbic system—the hypothalamus, amygdala, and temporal and frontal lobes (Freemon and Nevis 1969; Joseph 1992a; 1996; MacLean 1969; 1990; Remillard 1983; Robinson and Mishkin 1968).

Unfortunately, not only are sex, aggression, and religion mediated by the limbic system, but an abnormal limbic system may abnormally link sex with murder and religiosity, and, among priests, with the sexual murder or torture of women. For example, during the Middle Ages, and after the men had marched off to Catholic crusades or had been killed, the women were not only left unprotected, but some began to practice their own religion and worship their own female gods. In consequence, the popes and the Catholic Church proclaimed them witches and went to war against women. Hence, in 1252, Pope Innocent IV issued the *Ad Extirpanda*, which authorized the execution of heretics (e.g., wealthy landowners), the seizure of their goods, and the prolonged sexual torture of women who were beautiful, or wealthy, or old, ugly, and eccentric, or who gathered in groups to converse and possibly worship pagan goddesses. Indeed, when the papal fathers and the Dominicans Heinrich Kramer and Johann Sprenger issued the infamous Papal Bull and the *Malleus Maleficarum* (witch's hammer), a blood lust regarding "woman the witch, healer and sorceress" was unleashed, and hundreds of thousands were burned

and/or sexually tortured to death (Achterberg 1991; Gies and Gies 1978; Lederer 1968). “For she is a liar by nature, so in her speech she stings while she delights us . . . for her voice is like the song of the Sirens, who with their sweet melody entice the passerby’s and kill them” (Malleus Maleficarum).

Sometimes whole villages were destroyed, or all the women in a given area were rounded up by the Catholic authorities. These females, particularly those who were exceedingly attractive or ugly, were then hideously tortured and then slaughtered by burning, boiling in oil, crushing, or by means of whatever device the religious authorities thought appropriate or that suited their sick minds. In Germany huge ovens were constructed for the purposes of mass murder of women (Achterberg 1991; Lederer 1968).

Victims included not only beautiful, bewitching females (for they come in a limited supply) but also those who were old, eccentric, and childless, and particularly women who owned property and pets, such as cats. Indeed, the cats would be tortured and murdered alongside the women. The Black Death was in part a consequence of the denunciation and killing of cats, coupled with the sanctification of rats and mice (the proverbial church mouse) by the Catholic authorities (Joseph 2000b).

ETIOLOGICAL AND DIAGNOSTIC SPECULATIONS

Sexuality, Religious Experience, and Temporal Lobe Hyperactivation. Common characteristics of high levels of limbic system and inferior temporal lobe activity include changes in sexuality and a deepening of religious fervor (Bear 1979; Trimble 1991; Taylor 1972; 1975). It is noteworthy that not only modern-day evangelists but many ancient religious leaders, including Abraham, Jacob (Israel) and Muhammad, tended to be highly sexual and had many partners (e.g., Saint Augustine of Hippo: “Give me chastity, O Lord, but just not yet”), shared their wives (Abraham), married women who were harlots (e.g., Hosea), had sexual relations with other men’s wives (Muhammad, King David), killed other men in order to steal their wives (King David), or had sexual relations with their daughters (Lot). King Solomon required the sexual services of 700 wives and 300 concubines. On the other hand, Jesus appears to have been hyposexual.

It is thus noteworthy that hypersexuality (Blumer 1970) as well as hyposexuality (Heirons and Saunders 1966; Taylor 1971; Toone et al. 1989) are associated with abnormal or excessive amygdala/temporal lobe activity. With severe bilateral destruction of these structures, an individual may experience not only major alterations in sexuality but a constellation of disturbances referred to as the Kluver-Bucy syndrome. Given the involvement of these structures in religious experience, not surprisingly, in addition to hyper- or hyposexuality, many of the prophets and other religious figures also displayed evidence of abnormal sexuality, uncontrolled rages,

or the Kluver-Bucy syndrome, such as eating dung (Ezekiel). Indeed, evidence of temporal lobe and limbic hyperactivation and epilepsy (e.g., trance states), coupled with hallucinations, catalepsy, insanity, rages, and language disorders, appear to be characteristic of many of the prophets.

Whereas Moses suffered from a severe speech impediment, Muhammad, God's messenger, was apparently dyslexic and agraphic. Moreover, in order to receive the word of God, Muhammad would typically lose consciousness and enter into trance states (Armstrong 1994; Lings 1983). In fact, he had his first truly spiritual-religious conversion when he was torn from his sleep by the archangel Gabriel, who enveloped him in an terrifying embrace so overpowering that Muhammad's breath was squeezed from his lungs. After squeezing and suffocating him repeatedly, Gabriel ordered Muhammad to speak the word of God, that is, the Qur'an. This was the first of many episodes with the archangel Gabriel, who sometimes appeared to Muhammad in a titanic kaleidoscopic panoramic form.

In accordance with the voice of God or angels, Muhammad not only spoke but began reciting and chanting various themes of God in a random order over the course of the following twenty years, an experience he found quite painful and wrenching (Armstrong 1994; Lings 1983). In addition to his religious zeal, Muhammad was reported to have had the sexual prowess of forty men and to have had at least nine wives and numerous concubines, including a young girl (Lings 1983). On one occasion, after being denied the pleasures of another man's wife, he went into a trance and then claimed that God had commanded that this man's wife become his wife. Women, in fact, tended to be his first and earliest converts (Armstrong 1994).

Although Islam (which means "peace" or "surrender") is an exceedingly tolerant religion, and Muhammad was basically a kind and considerate man, he was also known to fly into extreme rages and to kill (or at least order killed) wealthy infidels and merchants and those who opposed him. These behaviors, when coupled with his strong sexuality, heightened religious fervor, trance states, mood swings, and possible auditory and visual hallucinations of a titanic angel, certainly point to the limbic system and inferior temporal lobe as their possible neurological foundation. Indeed, Muhammad also suffered from extreme depression (also associated with the temporal lobe) and on one occasion sought to throw himself from a cliff—only to be stopped by Gabriel.

Abraham (like his nephew Lot), the patriarch of the Jewish, Christian, and Muslim religions, also experienced what could be considered visual as well as auditory hallucinations, which may have been due to temporal lobe epilepsy. Abraham also engaged in some unusual sex practices. After he left Babylon and before he arrived in Egypt, he told his wife Sarai to pretend that she was his sister, because she was so beautiful and other men might wish to have sexual relations with her (Genesis 12:11–13). "And it

came to pass, that when Abram was come into Egypt, the Egyptians beheld the woman that she was very fair . . . and the woman was taken into Pharaoh's house" (12:14–15). However, the Pharaoh thought that Abram and Sarai were brother and sister, for he gave to Abram, in order to pay for her sexual services, "sheep, and oxen, and he asses and servants and camels" (12:16). When Pharaoh found out she was married, he was so disgusted that he threw them both out of Egypt (12:17–20). According to Abram, he lied because he was "afraid." However, when he arrived at Gerar he repeated the lie and informed the king of the city that Sarah "is my sister" (Genesis 20:2). And again he offered her to those who wished to partake of her charms. "And Abimelech king of Gerar sent and took Sarah. But God came to Abimelech in a dream by night and said to him, 'Behold thou art but a dead man, for the woman which thou has taken; she is a man's wife'" (20:2b–3).

Abraham, of course, also had sexual relations with other women and even banished his firstborn son and the handmaiden who bore him, sending them out into the desert to a certain death. He also attempted to murder his second son, Isaac. However, Abraham believed he was following the orders of God, for he heard a voice that instructed him to "Take now thy son, thine only son Isaac, whom thou lovest, and offer him for a burnt offering upon one of the mountains which I will tell thee of." But, after binding his son, laying him upon an altar, and picking up his knife, Abraham suddenly heard the voice of an angel who ordered him to let the boy go free (Genesis 22).

Abraham therefore heard voices, engaged in unusual sex practices, and was capable of extreme cruelty, including repeated instances of attempted murder. Is it possible that he suffered from excessive limbic system activity or even temporal lobe epilepsy? Consider that, after hearing the voice of "God," Abraham leaves ancient Babylon (automatic traveling) forgets his identity, and changes his name (from Abram to Abraham)—as if he is experiencing a fugue state. He travels to a distant land, is no longer Abram, and no longer recognizes Sarah as his wife. He tells the pharaoh, "she is my sister." Temporary fugue states are associated with abnormal temporal lobe activity, including temporal lobe epilepsy.

Epilepsy can be the result of a number of different causes, such as head injury, heat stroke during infancy, and tumors. However, the predisposition to develop epilepsy can also be inherited. Like his uncle Abraham, Lot saw angels and talked to God. It was God's angels who warned Lot to leave Sodom, the most sexually corrupt city on earth. Once Lot escaped, however, he celebrated by getting drunk and impregnating both of his daughters, who willingly came to his bed on two separate nights (Genesis 20:33–38). Even before he left Sodom, Lot had offered his daughters to some of the men of the city to do with as they pleased (Genesis 19:8). Although we do not know whether Lot followed Abraham's example and

also let other men have sexual relations with his wife, both Abraham and Lot clearly demonstrated signs of temporal lobe and limbic hyperactivation.

Religion, Limbic System Hyperactivation, and Temporal Lobe Seizures. Under conditions of deprivation, abuse, isolation, or drug use, or following a head injury, the nuclei of the limbic system may become abnormally activated and possibly hyperactivated such that subclinical seizure activity (kindling) develops. In consequence, some of those afflicted may suddenly become hyperreligious and spend hours reading and talking about the Bible or about other religious matters. Many modern-day religious writers who also happen to suffer from epilepsy are in fact exceedingly prolific, whereas conversely, those who feel impelled to preach tend to do just that. In part this is a consequence of amygdala activation of Wernicke's area, the adjacent inferior parietal lobe, and Broca's area, which gives rise to "voices," or strange thoughts, and/or a desire to write or to speak.

There is some evidence that many religious and spiritual leaders have had similar temporal lobe-, limbic system-induced religious experiences. For example, Moses may have suffered from temporal lobe seizures. Presumably this was a consequence of having been left for days to bake in the sun after his mother abandoned him in a basket on the Nile. His infant brain could have become overheated and damaged by the scorching Egyptian sun.

If Moses subsequently developed temporal lobe epilepsy, this could explain his hyperreligious fervor, his rages, and the numerous murders he committed or ordered. Similarly, his speech impediment, hypergraphia, and hallucinations, such as hearing the voice of God, are not uncommonly associated with temporal lobe seizures and limbic hyperactivation.

Jesus also was known to fly into violent and destructive rages, such as when he yelled, cursed, overturned the tables, and struck and chased the moneylenders from the temple (John 2:14–15). He also frequently appeared irritable, sullen, gloomy, depressed, distrustful, and angry with his disciples. Jesus was also not beyond behaving in a petulant and sadistic manner, such as when he repeatedly refused the request of "a woman of Canaan" who "came and cried unto him, saying, 'Have mercy on me, O Lord; my daughter is grievously vexed with a devil.'" In his answer he referred to her as a dog: "It is not meet to take the children's bread and cast it to dogs" (Matthew 15:22–26). He even cursed a fig tree for lacking fruit when he was hungry: "Let no fruit grow on thee henceforward for ever" (Matthew 21:19). However, his behavior in this respect was little different from that of his "Father."

Jesus was also apparently hyposexual. Although surrounded by unmarried female followers, many of whom had been prostitutes, he apparently never succumbed to temptation, though he certainly enjoyed having women kiss and wash his feet or rub expensive oil on his body.

Depression, mood swings, episodic violence, and hyposexuality (as well as hypersexuality) are also associated with temporal lobe and amygdala hyperactivation. As for hallucinations, Jesus did go alone into the wilderness for forty days, and there he saw and spoke with "Satan." Jesus frequently sought solitude and isolation. Many religious figures have done likewise.

ISOLATION, LIMBIC HYPERACTIVATION, AND HALLUCINATIONS

It has been well established that even short-term social and sensory isolation can induce emotionally and visually profound and complex hallucinations. Even after just a few days these isolation-induced hallucinations may become so emotionally charged and personally distressing that volunteers will refuse to discuss them (Bexton, Heron, and Scott 1954).

John C. Lilly (1972) combined LSD with prolonged water immersion and social and sensory isolation (for about seven hours) on several occasions. Lilly reported that he experienced and observed the presence of spiritual, godlike beings who beckoned to him (see also Eadie's similar description of "three men" noted above).

Isolation, food and water deprivation, increased or decreased sexual activity, pain, drug use, self-mutilation, prayer, and meditation are common methods of attaining mystical states of religious and spiritual awareness and have been employed worldwide, across time and cultures (d'Aquili and Newberg 1993; de Ropp 1993; Frazier 1950; James [1902] 1958; Lehmann and Myers 1993; Malinowski 1954; Neihardt and Black Elk 1979; Smart 1969). These conditions also activate the limbic system as well as the overlying temporal lobe (Joseph 1998; 1999a, b; 2000b), thereby giving rise to hallucinations and the secretion of opiate-like enkephalins.

The amygdala is capable of processing visual, tactile, auditory, gustatory, olfactory, and emotional stimuli simultaneously, and many single amygdaloid neurons are multimodally responsive. Normally many of these data are suppressed and filtered so as to prevent the tasting of colors, the visualization of sound, and so on. Deprivation and isolation are exceedingly stressful, however, and can result in the depletion of serotonin and other transmitters, which normally act to inhibit sensory reception within the amygdala. Hence, when the limbic system is stressed or denied normal modes of input, be they sensory, emotional, social, or nutritional, it may become hyperactive such that stimuli normally deleted or subject to sensory filtering are instead processed and perceived (Joseph 1982; 1988; 1992a). That is, limbic sensory acuity is increased, and in many respects what is perceived is not necessarily a hallucination but instead represents the perception of overlapping sensory qualities that are normally filtered out. "If the doors of perception were cleansed everything would appear . . . as it is, infinite" (William Blake).

THE BIRTH OF GOD, FUGUE STATES, ISRAEL,
HITLER, AND LIMBIC HYPERACTIVATION

Throughout the Neolithic and continuing into modern times, some believed that the earth was ruled by all manner of gods (Armstrong 1994; Brandon 1967; Budge 1994; Campbell 1988; Frazier 1950; Harris 1993; Kuhn 1955; Smart 1969; Wilson 1951). There were forest gods and gods of the river, the sky, the clouds, the seasons, the day and the night; planetary gods, moon gods, sun gods, personal gods, and eventually Lord Gods who created the heavens and the earth, gods who created man and woman in the image of the gods; and finally, at least among some peoples, a single God who gave of God's own soul and spirit, thus awakening men and women to their own spirituality through the breath of life. So claimed the ancients. However, although the heavens were thought to be the domain of the gods, some believed that the abode of God, like that of the spirit and the soul, was within each individual woman and man.

In ancient Sumer (in southern Iraq around 6,000 years ago), it was believed that the universe was ruled by a pantheon of gods (Armstrong 1994; Kramer 1956; Wooley 1965), perhaps the same pantheon alluded to in the first chapter of Genesis. However, the Sumerian people also worshiped household gods, including a personal god, which in some respects could be likened to a guardian angel or a spirit (totem) helper, as was common among the Plains Indians.

With the fall of Sumer and the rise of Babylon, many of these same gods, including these individual, personal gods, continued to be worshiped (Kramer 1956; Wooley 1965). This personal god served almost as a conscience and as a mediator between the head of the household and the great gods that ruled the cosmos (Joseph 1992b). Because this was a private, personal god, it was not uncommon for believers to engage in prolonged and daily discussions with their deity (Kramer 1956; Wooley 1965). To this god they could bare their heart and soul regarding sins, injustice, personal shortcomings, and hopes for the future. Hence, this god was indeed a personal god with whom they could "talk" and maintain a special personal relationship.

One day, something revolutionary occurred in the city of Ur of the Chaldees, in ancient Babylon, birthplace of Abram, a rich Babylonian prince. Abram began to hear a voice. The voice was coming from his personal god, and it later gave him a command: "Get thee out of thy country . . . and I will make of thee a great nation . . . and in thee shall all the families of the earth be blessed" (Genesis 12:1-2).

And Abram and his personal God walked and talked, as people and God had not done since the time of Adam and Eve. And then one day this personal god came to a decision and said to Abram, "Thy name shall be Abraham, for a father of many nations have I made thee. And I will make

thee exceedingly fruitful . . . and I will make thee the father of many nations . . . and I will be their God” (Genesis 17:5–8).

Abraham both saw and heard his God on numerous occasions, both awake and dreaming, often falling on his face as God appeared. However, they walked and spoke together during the heat of the day and during the darkest hours of the night, his God making all types of grandiose promises and predictions, all of which came to pass.

Is it possible that Abraham was dreaming? Could this personal God from ancient Ur have been but a hallucination and (given Abraham’s odd sexuality and murderous actions) a product of temporal lobe epilepsy or subclinical seizure activity? When we consider that this is the same God (at least in religious theory) who today is worshiped by Jews, Christians, and Muslims, the possibility of hallucinations, although quite plausible, seems unlikely.

Likewise, when we consider how many other prophecies were fulfilled, including the destruction and then later the recreation of Israel in 1948—the aftermath of a world war led by an Austrian Jew, Adolf Hitler—as well as the more than 1 billion people who worship a Jew (Jesus) as “God,” it borders on the irrational to dismiss these events as hallucination or coincidence. Consider that more than 2,000 years ago God repeatedly warned the ancient Jews of their destruction and of those who would “swoop down like an eagle” (Deuteronomy 28:49). And the final dispersal and destruction of Israel and the Second Temple was at the hands of Roman legions, whose symbols included the eagle and the swastika.

IN SEARCH OF THE GOD NEURON: THE GOD WITHIN

Mystical, spiritual, and religious feelings, experiences, and beliefs are world-wide and have been in evidence for more than 100,000 years. These beliefs, including the capacity to dream and to experience the spiritual world through fasting, isolation, pain, drugs, dreams, and hallucinations, are dependent on specific and specialized neurons located in the limbic system and temporal lobe. That there are neurons and neural networks that make it possible to perceive geometric patterns, crosses, people, and faces explains why hyperactivation of the limbic system and temporal lobe might result in dreams and hallucinations of spirits, souls, gods, angels, and demons. During a dream or because of temporal lobe and limbic system seizures or abnormalities, neurons subserving the perception of various visual and auditory stimuli become activated. The brain believes it is seeing a face or a demon, because “face” and “demon” neurons have been activated and infused with intense emotion; the brain begins to hallucinate and dream, and this is interpreted as a religious experience.

It may be that the neural basis for the perception or hallucination of a ghost or demon is composed of input from a variety of different neurons, each of which contributes some feature to the resulting visual/auditory

hallucinogenic mosaic. That is, there are no “demon” (or, for that matter, “God”) neurons but rather neural assemblies that interact under certain conditions to produce hallucinations and feelings of God and the spiritual Hereafter. Thus, the source is within the brain. The brain is “wired” for God. According to the Bardo Thodol (Tibetan Book of the Dead), “These realms are not come from somewhere outside thyself. They come from within . . . they exist from eternity within the faculties of thine own intellect . . . issuing from within thine own brain . . . reflections of thine own thought-forms” (p. 338).

On the other hand, why are these spiritual states most likely to be experienced under conditions involving extreme fear (which may induce even a committed atheist to pray to God for help) or following a near-death experience, or where the yoke of sensory inhibition and filtering has been removed? Some experiences are, even under LSD, not hallucinations per se but the result of disinhibition and multisensory neurons processing signals from divergent sources simultaneously. In consequence, one can see sound, feel colors, and so on: real stimuli that the brain can perceive but are normally filtered out. Is it possible that gods, demons, or angels are filtered out?

If religious and mystical experiences are hallucinations or silly superstitions, and if there is no Hereafter or spirit world, then why has our brain become adapted for perceiving and dreaming about what supposedly does not exist? Why would the limbic system evolve specialized neurons or neural networks that subserve the capacity to experience or hallucinate spirits, angels, and the souls of the living and the departed if these entities had no basis in reality? We can hear because there are sounds that can be perceived and because we evolved specialized brain tissue (e.g., auditory cortex) that analyzes this information. First came sounds, and then later, specialized nerve cells evolved that could analyze vibrations and then later, sounds. Likewise, if there were nothing to contemplate visually we would not have evolved eyes or visual cortex, which analyzes this information. Visual stimuli existed before the neurons that evolved in order to process these signals. Should not the same evolutionary principles apply to the limbic system and religious experience?

Indeed, it could be argued that the evolution of this neuronal spiritual, mystical, religious capacity is the consequence of repeated and exceedingly intense perceptual and emotional experiences with “God” and the spiritually sublime over many generations. Perhaps under the guiding influence of “God,” or perhaps after repeated experiences with gods, spirits, demons, angels, and lost souls, *Homo sapiens* evolved these neurons, which enabled them to better cope with the unknown as well as to perceive and respond to spiritual messages that increased the likelihood of survival. A true scientist would not rule out such a possibility.

Regardless of how or why, it is clear that there is in fact a scientific and neurological foundation for religious and spiritual experience. The reason for this is yet to be determined. Indeed, given the obvious role of the

temporal lobe and limbic system in the generation and perception of myriad spiritual states, it also appears (at least at the level of metaphor) that the limbic system may well be the seat of the soul or may serve as the neural transmitter to God. If that is the case, then Buddha, Lao-tzu, Chuang Tzu, the Taoists, Sufis, and Jesus (like so many other Jewish, Arabic, Muslim, Indian, Babylonian, Sumerian, Egyptian, Greek, Roman, and Gnostic mystics) were correct when they proclaimed, "The kingdom of God is within you."

NOTE

1. Unless otherwise indicated, all biblical quotations are from the King James translation.

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