Part IV

The Neurology of Reason and Spirituality

The prior three parts of this book were devoted to providing a review of some of the basic aspects of evolution and cosmology. While the wondrous complexity of life and of the universe might suggest design, the scientific knowledge that has accumulated in the past 150 years has provided us with an understanding of how life and the universe can be created without divine intervention. This is especially true since our very human desire is to know all there is to know and understand all there is to understand. If we assumed there was a creator we would still need to know and understand who created the creator. We now have the knowledge to avoid that added level of unsolved mystery.

Some would conclude that individuals who take this view would automatically be driven to shut down the spiritual part of their brain, would automatically be atheists or agnostics, would automatically be anti-religion, and would automatically assume that God is dead and probably never was alive in the first place. This ignores the simple fact that the vast majority of humans, including many scientists, revel in and are rewarded by spirituality of one type or another. Simply because our rational brain denies the need for a creator of life and a creator of the universe does not mean that our spiritual brain has to atrophy or die. Spirituality is such an integral part of being human that it is very likely to have been hardwired into our brain, and no amount of scientific knowledge will silence it. If this is the case, there would be three questions about this hardwiring to explore—What parts of the brain are involved? What genes are involved? And, in the evolution of man, what selective forces are involved? Part IV explores the first of these—what parts of the brain are involved in consciousness, planning, and other executive functions, pleasure, social interactions, rational thought, spirituality, meditation, happiness, self-healing, and how faith can bypass our thinking or rational brain. One of the fundamental principles of neuroscience is that all experiences are the result of brain activity. The scope of knowledge about this neural basis of behavior is immense and many aspects of it cannot be covered here. My focus will be on those behaviors that are relevant to the theme of this book. Since consciousness is a core trait, that is addressed first.

Consciousness is an awareness, a thinking, a knowing, a focusing of attention, a planning of action, an interpreting of present experience, a perceiving. These words are descriptive, but they hardly constitute a satisfactory description.

Penfield and Roberts
Speech and Brain Mechanisms [1]

Chapter 25

Consciousness, the Spirit, and the Soul

Consciousness, the spirit, and the soul are all related concepts. Consciousness is a scientific term, while the spirit and the soul are philosophical, theological and religious concepts. I will explore the scientific term first.

The essence of consciousness is being alive and being aware that we are alive. It is a sense of self-awareness. Consciousness is more than emotions and more than feelings. It is an awareness of our emotions and awareness that we are feeling our feelings. Consciousness resides at the nexus of the mind-body problem. A poetic description of consciousness was given by Julian Jaynes. [2]

> O, What a world of unseen visions and heard silences, this insubstantial country of the mind! What ineffable essences, these touchless rememberings and unshowable reveries! And the privacy of it all! A secret theater of speechless monologues and prevenient counsel, an invisible mansion of all moods, musings, and mysteries, an infinite resort of disappointment and discoveries. A whole kingdom where each of us reigns reclusively alone, questioning what we will, commanding what we can. A hidden hermitage where we may study out the troubled book of what we have done and yet may do. An introcosm that is more myself than anything I can find in a mirror. This consciousness that is myself of selves, that is everything, and yet nothing at all—what is it? And where did it come from? And Why?

These are not easy questions. Here I address the first two: What is it? Where [in the brain] did it come from? For many years the subject of consciousness was primarily the purview of philosophers and psychologists. [3] It was considered so difficult for neuroscientists to study scientifically that many who attempted it commented that they risked doing so only after they had academic tenure, or better. Thus, two of the three scientists whose views I will discuss, and who have written extensively about consciousness, did so only after they had received the Nobel Prize

for other work. These individuals were Gerald Edelman, who received the prize for his pioneering work in immunology, and Sir Francis Crick, the co-discoverer of the structure of DNA. Despite the impressive credentials of Edelman and Crick, I will start with the work of a third scientist, Antonio Damasio, M.D., since he is a neurologist and has gained extensive first-hand clinical experience with patients with impaired consciousness, and cover the studies of Edelman and Crick later.

Damasio and Consciousness

Based on his clinical studies, Damasio [4p16] proposed that there were two levels of consciousness: *core consciousness* and *extended consciousness.*

"Core consciousness provides the organism with a sense about one moment — now — and about one place — here. The scope of core consciousness is the here and now." It is like the knife blade of current existence, no past, no future, only now. It is constantly viewing, hearing, smelling, touching, feeling, and and being aware of the immediate environment, minute by minute, second by second. It is like remembering the present.

Extended consciousness. The more-complex *extended consciousness* provides the organism with an elaborate sense of self — an identity and a person, you or me, no less — and places that person at a point in individual historical time, richly aware of the lived past and of the anticipated future and keenly aware of the world beside it.…Consciousness is the critical biological function that allows us to know sorrow or know joy, to know suffering or to know pleasure, to sense embarrassment or pride, to grieve for lost love or lost life. One of the realms of consciousness difficult to understand is how we get a "movie-in-the-brain," a metaphor for the many sensory tracts that provide us with an interface between the brain and sight, sounds, taste, smell and touch.

"Core consciousness is a simple biological phenomenon; it has one single level of organization; it is stable across the lifetime of the organisms; it is not exclusively human; and it is not dependent upon conventional memory, working memory, reasoning or language." By contrast, "extended consciousness is a complex biological phenomenon; it has several levels of organization; and it evolves across the lifetime of an organism." Damasio felt that extended consciousness was present at simple levels in some non-human organisms but it attained its highest level in humans. It depended on conventional memory and working memory and was enhanced by language. Human creativity is a level of knowing that is only allowed by the domain of extended consciousness. Neurological diseases that impair extended consciousness can leave core consciousness intact, but diseases that impair core consciousness destroy extended consciousness. Attention is necessary for some aspects of consciousness, but it is not sufficient for consciousness and is not the same as consciousness. Emotions and consciousness are also present or absent together.

For some, consciousness, mind, conscience, spirit, and soul are virtually indistinguishable. However, the mind has a broader scope than consciousness, per se. Conscience is a distinct concept with a flavor of morality and is discussed in a later

chapter. The spirit and the soul are discussed at the end of this chapter.

Damasio also proposed the presence of three types of self: the *proto-self,* the *core self* and the *autobiographical self.* The *proto-self* is the unconscious self that monitors the internal awareness of the body. The *core self* is transient and is constantly re-created for each and every object with which the brain interacts. It monitors the external environment and produces a fleeting feeling of knowing that is reconstructed with each interaction. The *autobiographical self* is not transient. It is who we think we are. It is a collection of unique facts and ways of being that characterize us, as opposed to someone who is not us. These characteristics include our name, who our parents are, where we were born, the country, culture, and religion in which we were raised, our likes and dislikes, and many other features that identify us. The autobiographical self monitors our self-identify. These three types of self and the proposed parts of the brain responsible for them are shown in Figure 1.

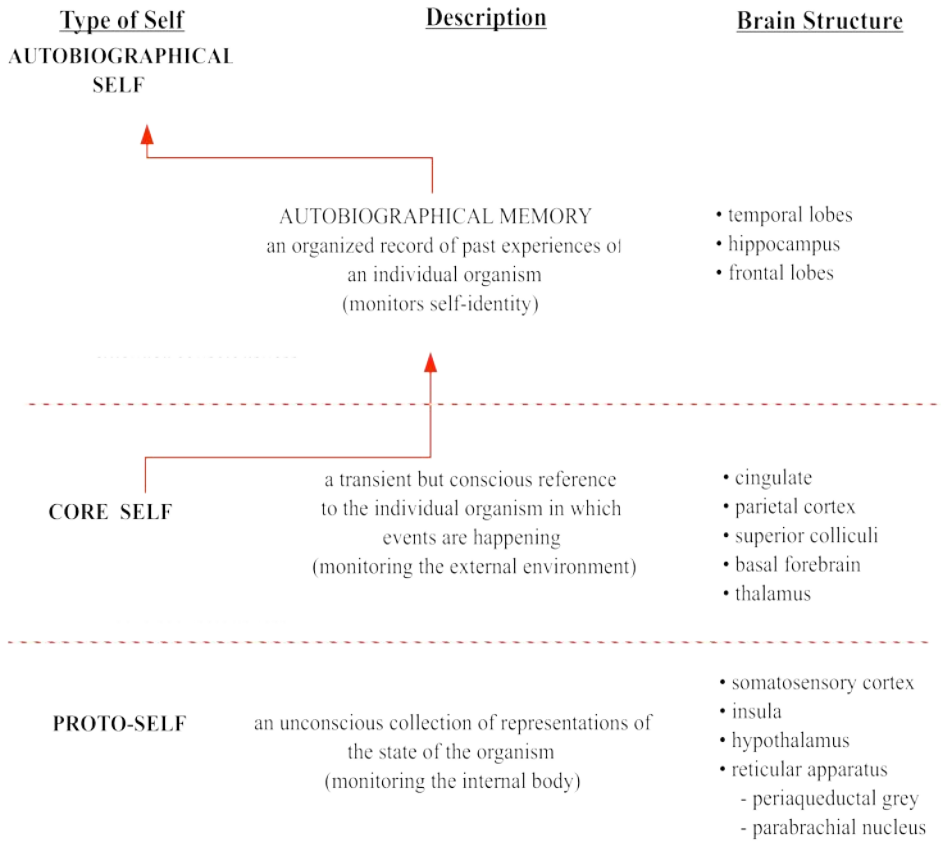

Figure 1. Summary of Damasio's three types of self and two types of consciousness.

The Neuroanatomy of Consciousness

A number of clinical disorders have helped to understand the parts of the brain involved in the proto-self, core self and autobiographical self, and for the latter two

the corresponding core and extended consciousness. The structures involved in core consciousness, and to some extent those involved in the proto-self are characterized by being in a central position in the brain, that is, near the mid-line. These are regions of old evolutionary vintage.

Proto-self. The unconscious proto-self monitors the feelings and status of the body itself. One of the structures involved is the insula (Figure 2). It is part of the cortex of the brain but is buried behind the temporal and parietal lobes which have to be pulled to one side to see it.

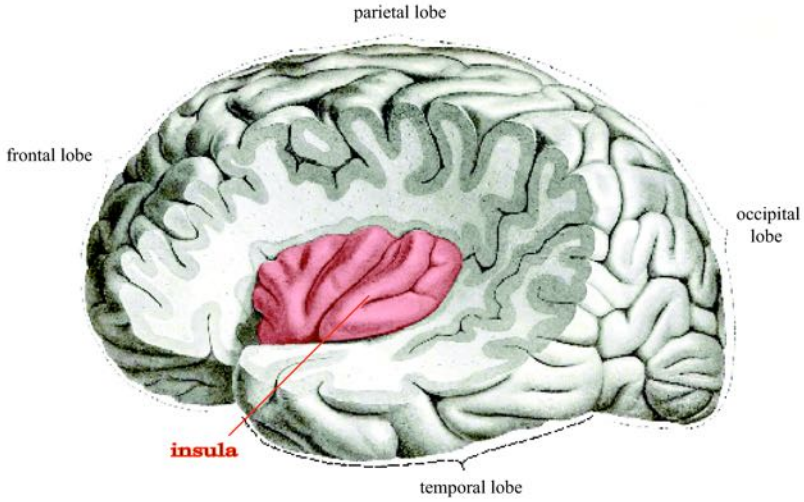

Figure 2. Insula. Modified from Sobotta. [5]

The insula monitors feelings and sensations from the internal organs and thus plays a role in emotional sensitivity. [6] Functional MRI studies show that indices of negative emotional experience correlate with activity in the right insula. [7] The somatosensory cortex (Figure 3) of the partietal lobe also plays a role in monitoring the internal body.

The hypothalamus and basal forebrain are also involved in the proto-self. The reticular apparatus or the ascending activating system wakes up or arouses the brain. This especially involves two areas called the *periaqueductal grey* and the *parabrachial nucleus.* Thus, as shown in Figure 1, these are the structures involved in the proto-self.

The core self and core consciousness. Akinetic mutism is one of the neurological disorders that Damasio studied to provide information on the parts of the brain associated with core consciousness. Akinetic refers to lack of motion and mutism to lack of speech. He described a woman with akinetic mutism due to a stroke that affected her cingulate cortex (see Figure 4). Her body and face never expressed any emotion. She was awake but remained silent when spoken to. She was there but not there. One could attribute this state to either total muscle paralysis in the presence of an active and alert mind, like "locked in syndrome," or to a loss of core consciousness. When talking to her six months later, after she had emerged from this state, it was apparent that it was the latter. During this period she did not have a mind at all. She

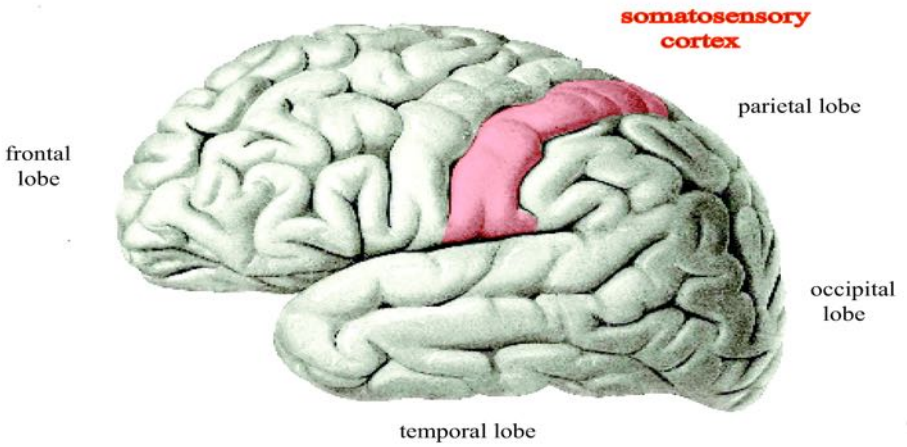

Figure 3. Somatosensory cortex. Modified from Sobotta. [5]

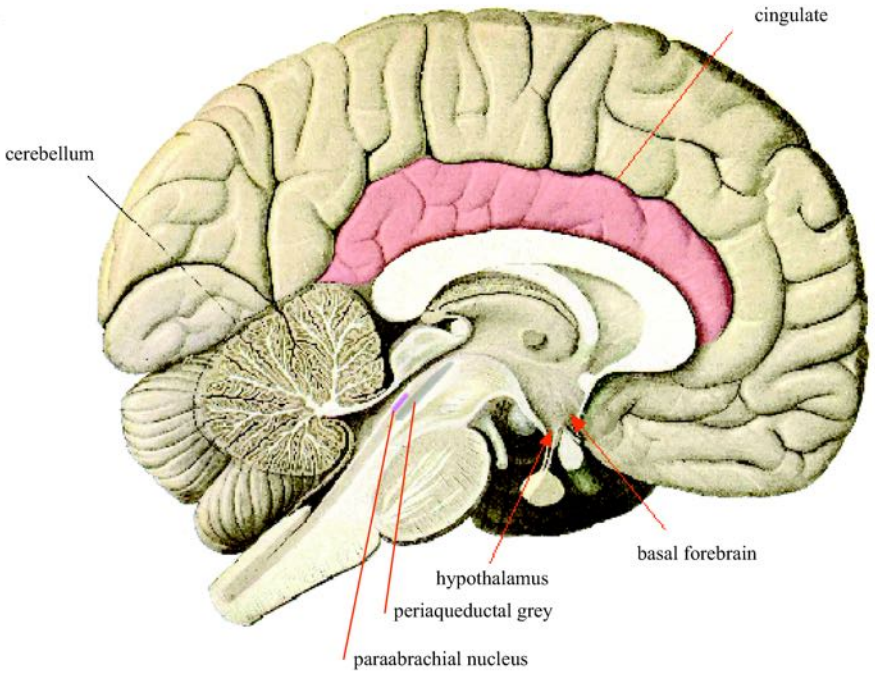

Figure 4. Hypothalamus, basal forebrain and cingulate cortex. Modified from Sobotta. [5]

had no recall of any experience. She felt no fear or anxiety and never wished to communicate.

The cingulate cortex is a large midline structure with many functions that involve both sensory and motor functions. It receives inputs from all of the somatosensory system and is thus involved in monitoring the internal body. It also monitors inputs from the musculo-skeletal system, which explains why it is involved in a large variety

of complex movements. Not surprisingly, given its many internal sensory and motor connections, the cingulate is also involved in emotions. In this regard it is considered to be part of the emotional brain or limbic system. The cingulate may make a critical contribution to the "feeling of knowing," the special, high-order feeling that defines core consciousness. The superior colliculi also receive a multiplicity of sensory inputs from the retina, the visual and auditory cortex, thalamus, and somatosensory system. Because of the many interconnections Damasio suggested that these neural structures contributed to second-order patterns of consciousness.

The autobiographical self and extended consciousness. Since extended consciousness monitors the autobiographical self, it requires an intact working memory. This occurs in the hippocampus. These are structures with a unique snail-like shape that are part of the temporal lobe on both sides of the brain (see Figure 5). When they are destroyed by tumor or other pathology, all recent memory is lost.

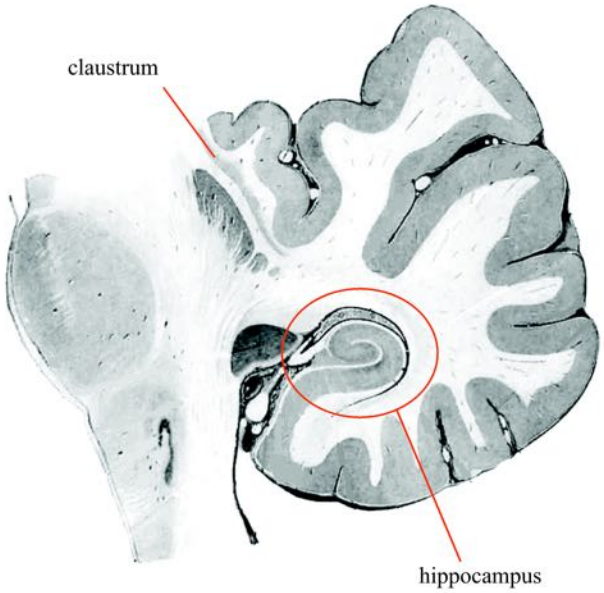

Figure 5. The hippocampus part of the temporal lobes. Modified from Sobotta. [5]

Other structures, including the different sensory cortexes for sight, smell, hearing, and touch, are involved in extended consciousness, since this form of consciousness involves an integration of all of the senses.

In summary, based on a number of different disease states that comprise different types of consciousness, Damasio identified a number of brain structures that appear to play a role in core and extended consciousness. There is a tendency for core consciousness to involve the central midline structures that are evolutionarily old, and for extended consciousness to involve lateral structures that are evolutionarily more recent.

Edelman and Consciousness

The following is a description of the Edelman and Tononi[8] model of consciousness. For brevity I will refer to it as the Edelman model. For them, consciousness posed a special problem that was not encountered in other domains of science. Normal science involves connecting a physical entity such as an atom, with a law or principle such as quantum mechanics. By contrast, studies of consciousness involve connecting a physical entity such as the brain with a personal individual experience. Edelman adopted three working assumptions. First, there is no dualism. *Physical processes are all that are required to explain consciousness.*

Second, *consciousness evolved during natural selection in the animal kingdom.* This avoids attempting to characterize consciousness as a by-product of computational science or applying exotic scientific explanations like Penrose's notion of quantum gravity and consciousness while ignoring neurology.

The third relates to *qualia,* the private, subjective experience of sensations and perceptions. Examples include the subjective pleasure of seeing a beautiful face, hearing a bird sing, smelling the flowers, and the redness of a rose. No objective scientific description can adequately measure or quantify these sensations or take the place of the individual subjective experience of conscious qualia. This does not mean that the necessary and sufficient conditions for consciousness cannot be described, only that *describing them is not the same as experiencing them.* This strategy expands on William James's[9] prescient notion of consciousness as a process — one that is private, selective, and continuous yet continually changing. Edelman proposed an approach that differed somewhat from that of Damasio and of Crick. He stated: [8p19]

> As we shall see in a number of cases, it is likely that the workings of each structure may contribute to consciousness, but it is a mistake to expect that pinpointing particular locations in the brain or understanding intrinsic properties or particular neurons will, in itself, explain why their activity does or does not contribute to conscious experience. Such an expectation is a prime example of a category error, in the specific sense of ascribing to things properties they cannot have. We believe instead that what is practical is to concentrate on the processes, not just the brain areas, that support consciousness and, more specifically, to focus on those neural processes that can actually account for the most fundamental properties of consciousness.

Thus, their strategy was to focus on the properties of conscious experience that were the most general and are shared by every conscious state. They assumed that conscious experience would be associated with neural activity that was distributed simultaneously across neuronal groups in many different regions of the brain. Consciousness was neither a single thing nor a simple property. To support consciousness a large number of neurons must interact rapidly and reciprocally. They use the term *re-entry* for the reciprocal interaction between neurons. The more

neuronal activity along certain pathways, the stronger those pathways become. "Neurons that fire together, wire together."

The two types of consciousness proposed by Edelman are similar to those of Damasio. They describe *primary consciousness,* which is comparable to *core consciousness,* and *higher-order consciousness*, which is comparable to *extended consciousness.* Primary consciousness is also present in animals and consists of constructing an immediate mental scene without using symbolism or language. It directs present or immediate behavior. It is the remembered present. It is the ongoing event-driven rush of consciousness. Higher-order consciousness is especially human and is accompanied by a sense of self (like autobiographical self) and the ability in the waking state to explicitly construct past and future scenes. It requires, at a minimum, a semantic capability and, in its most developed form, a linguistic capability. It is the state toward which mystics aim their devotions. Only organisms with higher-order consciousness are conscious of being conscious.

Edelman proposed that consciousness emerged in evolution when, through the appearance of new circuits mediating cross-talk or re-entry, the sensory cortex (sight, hearing, touch, taste, smell) occupying the back half of the brain became dynamically linked to the frontal cortex at the front part of the brain responsible for value-based memory. With this in place an animal would be able to build a remembered present — a scene that adaptively linked immediate or imagined contingencies to that of the animal's previous history of value-driven behavior. In Edelman's model consciousness is a result of the activation of the long nerve tracts connecting different parts of the cerebral cortex and thalamus.

The models of Damasio and of Edelman have much in common. The core consciousness and extended consciousness of Damasio is the primary and higher-order consciousness of Edelman. In both models the core or primary consciousness is for the present, while the extended or higher-order consciousness incorporates the past, present, future and knowledge of the self. Both recognize the need for cross-talk, integration or re-entry to allow communication between different neurons and regions of the brain. *This integration and interaction is the key to consciousness.*

The greatest difference between the Damasio and Edelman models is in the localization of the brain structures most involved in consciousness. While as stated above, Edelman cautioned against attempting to assign consciousness to a specific brain structure, he nevertheless suggested that the thalamo-cortical system (Figure 6) and other interconnections between different cortical regions played the major role.

The thalamus is reciprocally connected to the cerebral cortex. The six layers of the cortex each send and receive signals from specific sets of inputs and outputs. Edelman was confident that the activity of the cerebral cortex and thalamus was more important for primary or core consciousness than other brain regions. It formed a major part of a system of interacting neurons they referred to as the dynamical core. De Duve [11p222,] another Nobel Laureate, also proposed that the neural substrate of consciousness lay in the connections of the six layers of the cerebral cortex. These

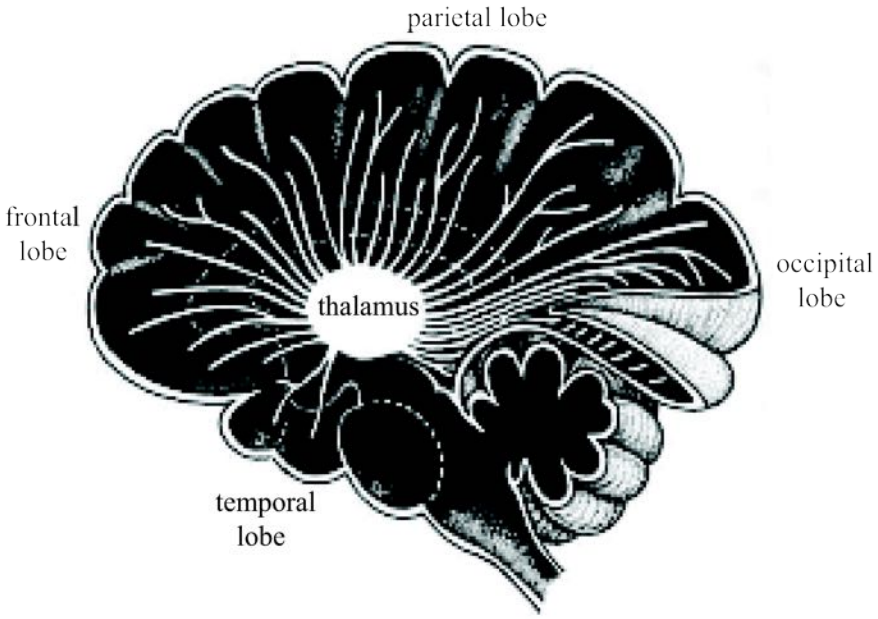

Figure 6. The thalamo-cortical system. Modified from Krieg, W. J. S. Functional Neuroanatomy. *The Blakiston Company, New York, 1942.*

proposals contrast with Damasio, who pointed out that even extensive lesions of the cerebral cortex had no effect on core consciousness, while lesions of a number of midline structures (see Figure 1) abolished core consciousness. The part of the cortex that was involved in consciousness was the cingulate, but this is also a midline structure. While the thalamus is a midline structure, the majority of the cerebral cortex clearly is not. They would both agree that certain cortical structures are critical for higher-order or extended consciousness. The thalmo-cortical system produces gamma waves.[12] These 40 Hz brain waves have been implicated in a range of cognitive events and in consciousness.[13]

Crick and Consciousness

Sir Francis Crick first wrote about consciousness in book form in 1994. The book was entitled, *The Astonishing Hypothesis: The Scientific Search for the Soul.*[10] Here his emphasis was on visual consciousness, one aspect of consciousness. The details of this work have been presented more recently by his colleague Christof Koch.[14]

In 2005, just after Crick's death, Crick and Koch published an article entitled, "What is the function of the claustrum?" This presented a broader concept of consciousness and proposed that the claustrum played a major role as the neurological substrate for consciousness. In agreement with Damasio, Edelman, and others,[15,16], they assumed that the core characteristic of a neural site for consciousness would be a massive degree of integration, interconnection, or cross-talk with many other parts of the brain.

The claustrum is a thin, irregular, sheet-like neuronal structure hidden beneath

the inner surface of the neocortex. Its reach is so extensive that it shows up in cross-sections of many parts of the brain. It is shown in Figure 5 running beneath the neocortex of the temporal lobe in the region of the hippocampus. It is also visible in frontal sections at the other end of the brain (Figure 7).

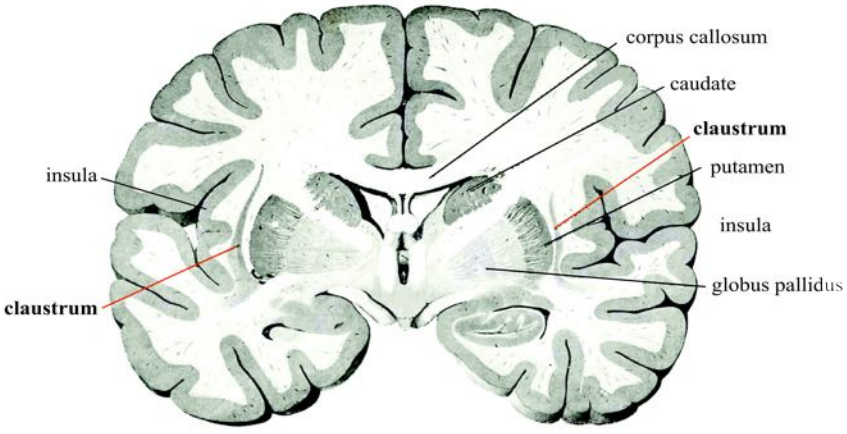

Figure 7. Frontal section of the brain showing the claustrum. Modified from Sobotta. [5]

It is most prominent in sections at the middle level of the brain, sandwiched between the insula and the caudate nucleus (Figure 8). Although it stretches throughout the brain, it is only a few millimeters thick.

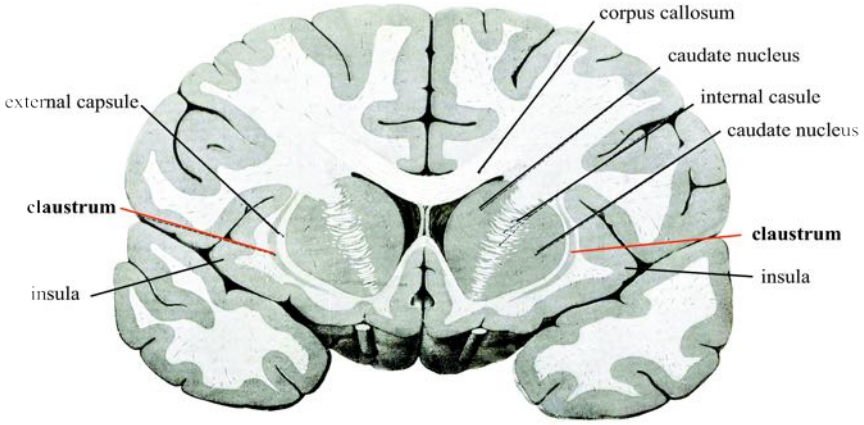

Figure 8. Middle section of the brain showing the claustrum. Modified from Sobotta. [5]

The claustrum appeared to be in an ideal position to integrate the most diverse kinds of information that underlie conscious perception. The claustrum has a relatively uniform architecture and its primary neurons are able to both receive and send signals from and to the cerebral cortex. These cells predominantly project to the

same side of the brain, but some project to the opposite side. Most parts of the cerebral cortex show projections to and from the claustrum. These areas include the frontal, prefrontal, temporal, parietal, occipital (visual), motor, and cingulate cortex. Of relevance to a later chapter, the orbital frontal cortex projects to the entire claustrum except for the visual part.

Based on its extensive anatomical scope, uniform structure, and reciprocal connections to all the major parts of the brain involved in consciousness, Crick and Koch proposed that the claustrum would be an ideal neurological substrate for consciousness. Because of its unusual shape, lesioning the claustrum in experimental animals, and imaging it in humans would be difficult. As a result, proving that the claustrum plays a major role in consciousness will be a challenging task.

Imaging Studies of Subjects in a Persistent Vegetative State

Further support for a central role of the cerebral cortex in consciousness comes from brain imaging studies of normal conscious individuals compared to those with a persistent vegetative state (PVS) and with a minimally conscious state (MCS). Persistent vegetative state is a comatose, unconscious state typified by Terri Schiavo, the Florida woman who in 2005 generated so many headlines and so much political angst. Her PVS lasted 15 years before she was allowed to die.

MCS represents a level of consciousness between that of PVS and normal alertness. When subjects in PVS are spoken to, their brains are activated in the same regions as for normal alert subjects, indicating they can hear and process sound. Nonsense words and phrases involve higher levels of speech comprehension and tap into consciousness in a way that simple words do not. When PVS subjects were exposed to nonsense words and sentences, the cortical areas did not light up like they do in normal subjects. However, they did light up in subjects with MCS.[17-19] As shown in Figure 9, instead of simply being inactive, these higher associative areas are actually underactive in subjects with PCS.

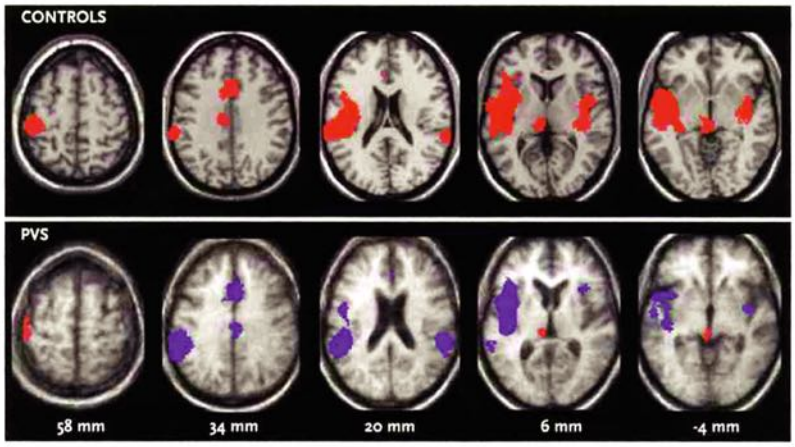

Figure 9. See text. Reprinted from Laureys, et al.: Cortical processing of noxious somatosensory stimuli in the persistent vegetative state. Neuroimage. *17:32-41, 2002. By permission from Elsevier.*

In these studies,[15a] normal conscious controls were exposed to one minute of electrical stimulation delivered to the wrists. PET scans showed the activation of the thalamus and somatosensory cortex (in red). Fifteen patients in PVS were exposed to the same stimulus. PET scans showed the cortical areas were underactivated (in blue). These indicate that the difference between the conscious and unconscious state involves the activation of higher association areas of the cerebral cortex.[15-19]

Information Integration and Consciousness

Giulio Tononi has proposed that the critical element in consciousness is the capacity to integrate information.[20] This allows the consciousness to "see" or experience certain images as an integrated whole that cannot be subdivided into component images. For example, no matter how hard one tries, one cannot experience colors independently of shapes, and one cannot see the left half of a visual image independently of the right half. In addition, consciousness has a spatial-time scale. It flows at a characteristic speed. Consciousness has to do with the ability to integrate large amounts of information at a characteristic space-time scale.

We all experience loss of consciousness on a daily basis, each time we go to sleep. It was initially thought that we lose consciousness when we sleep because the whole cerebral cortex shuts down. That has been shown not to be the case. During sleep the electrical chatter and neuronal metabolism is unchanged.[21] When the motor area of the brain is simulated by transcranial magnetic stimulation (TMS), and monitored with high-resolution EEG, it is possible to track the spread of nerve transmission across the brain.[22] This examines the type of nerve connections involved in the integration of information. Tononi and colleagues[23] used this technique to determine if these tracts shut down during the loss of consciousness associated with sleep. As shown in Figure 10, they did.

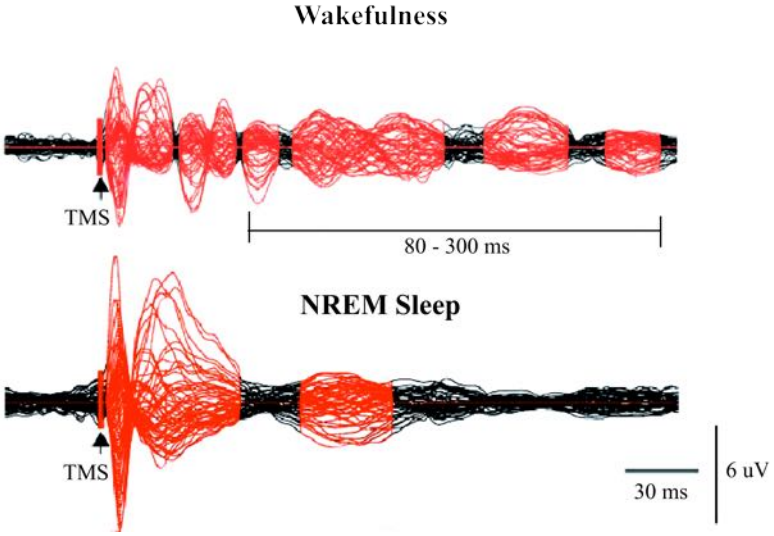

Figure 10. Response to TMS during wakefulness and NREM sleep. From Massimini et al.: Breakdown of Cortical Effective Connectivity During Sleep. Science. *309:2228-2232, 2005. By permission.*

During non-REM (NREM) sleep, the initial brain waves after TMS increased in magnitude (amplitude) and duration. Between 80 to 300 ms after TMS there was only a brief period of a significant response (in red) over background (in black). By contrast, in the wakeful state a significant response was seen throughout the 80 to 300 ms period. This indicates that during the loss of consciousness that occurs with NREM sleep there is a shutdown of the communication between the right and left hemispheres and a *shutdown of long-range connectivity.*

The master, or tertiary, association areas of the prefrontal lobes connect with virtually every other part of the brain. As described in the next chapter, they are also impressive candidates for a neurological location of consciousness. Combined, all of these studies are consistent with a *model of higher levels of consciousness that involves the long nerve tracts that connect and integrate disparate regions of the brain.* [24,25] This makes inherent sense when we realize that the concept of consciousness as that inner observing sense of self most likely comes from talk between the frontal lobes and all aspects of sensory input. To do this requires long and extensive lines of communication.

Consciousness is a self-awareness of feelings and awareness that we are feeling our feelings. It has only recently been considered a valid object of scientific inquiry. Two investigators who have independently written much about consciousness agree there are two types. The first is a core or primary consciousness representing an ongoing event-driven rush of consciousness operating in the here and now. The second is an extended or higher-order consciousness that provides the organism with an elaborate sense of self and provides us with the ability to explicitly construct past and future scenes. Studies of a range of diseases suggest core consciousness involves midline structures of the brain, while extended consciousness involves the cerebral cortex, the thalamus, and possibly the claustrum.

A critical aspect of the neuronal structures involved in consciousness is a massive degree of information integration, interconnection and cross-talk between many different parts of the brain.

The Spirit and the Soul

Consciousness, the spirit, and the soul are all interrelated concepts. The consciousness described above can exist independently of the soul. The concept of a soul as an entity that represents the essence of a person and that lives on after death, plays a prominent and central role in many religions. Plato is widely credited with the concept of a person as an immortal soul imprisoned in a mortal body. He also proposed that ideas have a real existence independent of the body and are eternal. Galen, the first-century Greek physician, divided the soul into several functions. He proposed that all of our motor and sensory abilities could be attributed to the soul

along with rational functions such as imagination, reason and memory. These views were subsequently absorbed into the New Testament and form the basis of the classical Roman Catholic doctrine of a soul. [14] One of the catechisms of the Roman Catholic church poses the question, "What is the soul?" and suggests that, "The soul is a living being without a body, having reason and free will."

The French philosopher, Rene Descartes, proposed that the body was simply a machine composed of blood, bones, muscles, nerves, skin, and the other organs. The soul, by contrast, was present only in humans and was unique, ethereal, and immortal. It lived on after the death of the body. This theory was called *dualism.*

Julien de la Mettrie, a French doctor practicing and writing at the time of the Enlightenment, challenged this idea. In *L'Homme Machine (Man a Machine)* he proposed that humans are nothing more than complex machines. There was no need for souls or other mysteries to provide our vital spark. [26] In 1747 he wisely published the book anonymously. The implication that God was redundant was to much for the current French Establishment to tolerate, and when he was identified as the author he was banished and fled to Prussia. In Prussia he was treated as a *wunderkind,* received a pension, but died of a fever at age 43. In reality, the concept of man as just a machine was first espoused over 2,000 years ago by the ancient Greeks Leucippus, Democritus, and Epicurus.

In contrast to dualism, in the introduction to *The Astonishing Hypothesis,* [27p3] Crick states:

> The Astonishing Hypothesis is that "You," your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll's Alice might have phrased it: "You're nothing but a pack of neurons." This hypothesis is so alien to the ideas of most people alive today that it can truly be called astonishing.

If consciousness is a prerequisite for the soul, and consciousness is extinguished when brain damage causes the loss of core consciousness, it would also cause the loss of the soul. When the person dies, their consciousness, spirit, and soul also die. For those that criticize this as being a "reductionist approach" Crick responds: [27p8]

> There have been a number of attempts to show that reductionism cannot work. They usually take the form of a rather formal definition, followed by an argument that reductionism of this type cannot be true. What is ignored is that reductionism is not the rigid set of ideas at a lower level, but a dynamic, interactive process that modifies the concepts at both levels as knowledge develops. After all, "reductionism" is the main theoretical method that has driven the development of physics, chemistry, and molecular biology. It is largely responsible for the spectacular

> developments of modern science. It is the only sensible way to proceed until and unless we are confronted with strong experimental evidence that demands we modify our attitude. General philosophical arguments against reductionism will not do.

Based on the above, our rational mind should be highly skeptical of the popular concept of a soul espoused by so many religions. Without a living, functioning brain there is no soul. If there is no soul, there is no afterlife, no hell, no purgatory, no reincarnation, no cosmic consciousness, and no reward in heaven for good behavior. The essence of many religions is lost without a soul. If there is no soul, is there also no obvious reason for moral behavior during life? Is the concept of a soul something simply conjured up by many religions to keep the flock in line by promising paradise after death? Is it just another aspect of the probability that man created God? Whether the existence of, or at least a belief in, the existence of a soul is an essential ingredient for morality is discussed in later chapters.

> **While the concept of a soul representing the essence of an individual and living on after death is central to many religions its existence is not supported by modern neuroscience which states that consciousness, the spirit and the soul are the product of neuronal activity and die when the person dies. This has major consequences for religion since without a soul there is no cosmic consciousness, no afterlife, no hell, no heaven and thus no reward in heaven for good behavior. In the same sense that some have said "evolution is real, accept it," we must also say that "the neuronal basis of the soul is real, accept it."**

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Chapter 26

The Frontal Lobes

To understand the neurological basis of human behavior is to know the function of the prefrontal lobes. Where are the prefrontal lobes? The frontal lobes consist of three major parts, the motor cortex responsible for movement, the pre-motor cortex responsible for the regulation of movement, and the prefrontal lobes (Figure 1).

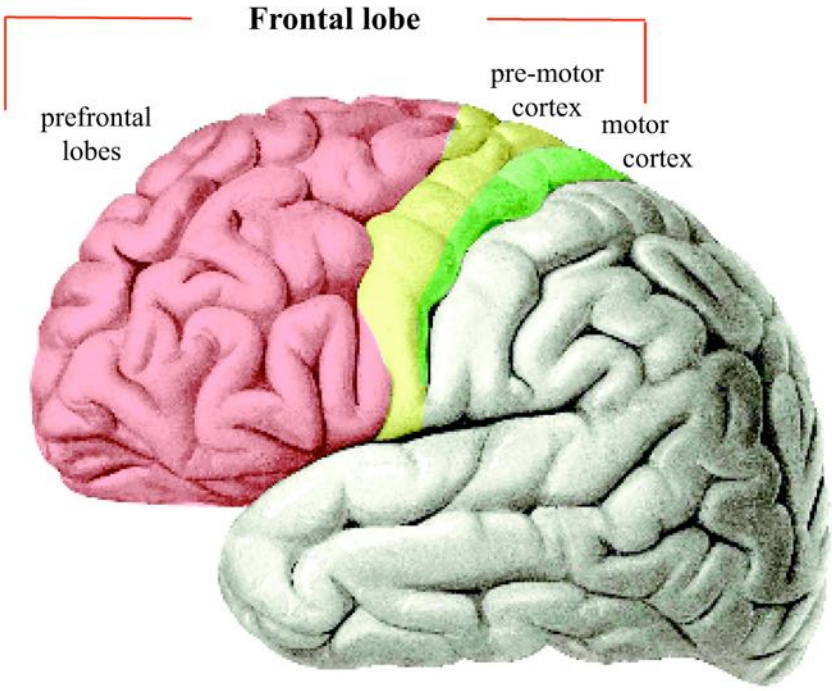

Figure 1. Frontal lobes consisting of the motor cortex (green) pre-motor association cortex (yellow) and the prefrontal lobes (pink).

Brodmann divided the surface of the brain into 52 areas that differ by structure and function. These are called the *Brodmann areas* (Figures 2 and 3).

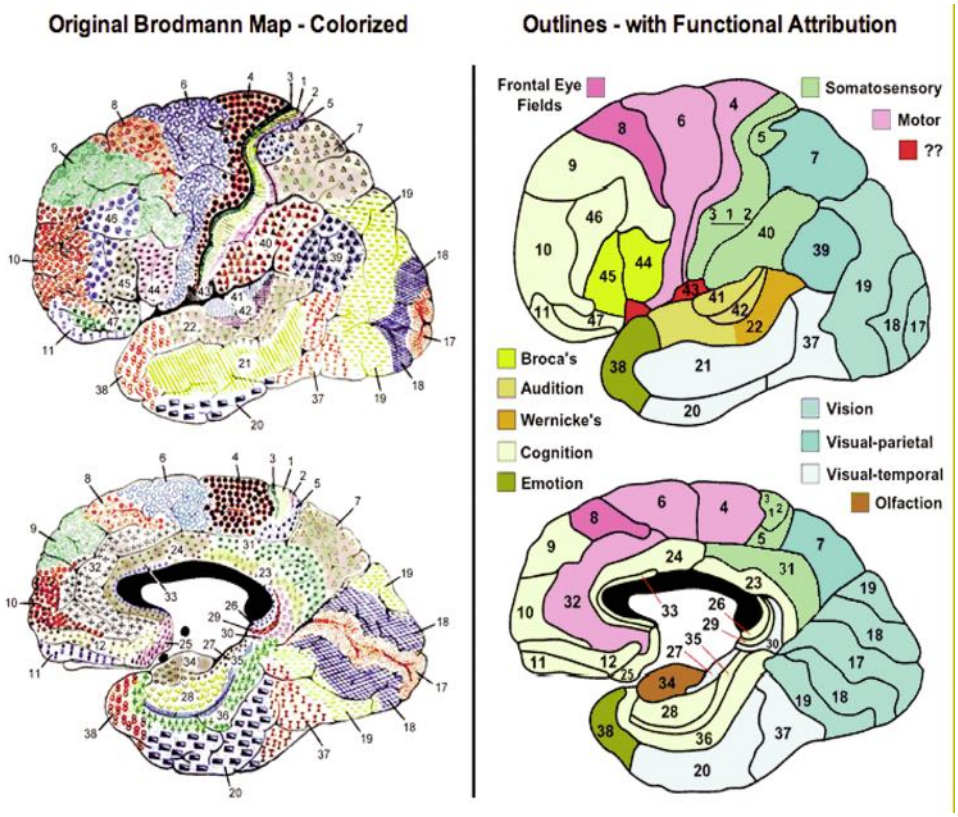

Figure 2. The Brodmann area of the brain (left) *and the functions of the different Brodmann areas* (right). [1a]

The prefrontal cortex consists of areas 8–13 and 44–47. These areas are characterized by the predominance of granular neural cells in cortical layer IV. The prefrontal cortex can also be defined by its neural connections. Thus, with regard to cortico-thalamic circuits, it receives projections from the dorsomedial thalamic nucleus, the highest station of neural integration in the thalamus. In terms of neurotransmitter circuits it receives projections from the dopamine system in the brain stem. The prefrontal cortex itself is divided into several areas including the *dorsolateral* and the *orbitofrontal.* The dorsolateral area consists of Brodmann areas 9 and 44–46. Area 10 is termed the frontal pole. It shares some functions with the dorsolateral prefrontal cortex. The orbitofrontal area consists of Brodmann areas 11 and 47.

Since the frontal lobes increased in size so rapidly during evolution they were once thought to be the site of intelligence but this proved not to be the case. Because their function was then unknown, they were often termed "the silent lobes." It turns out they were overwhelmingly important and anything but silent. Oliver Sacks [1] said of the frontal lobes:

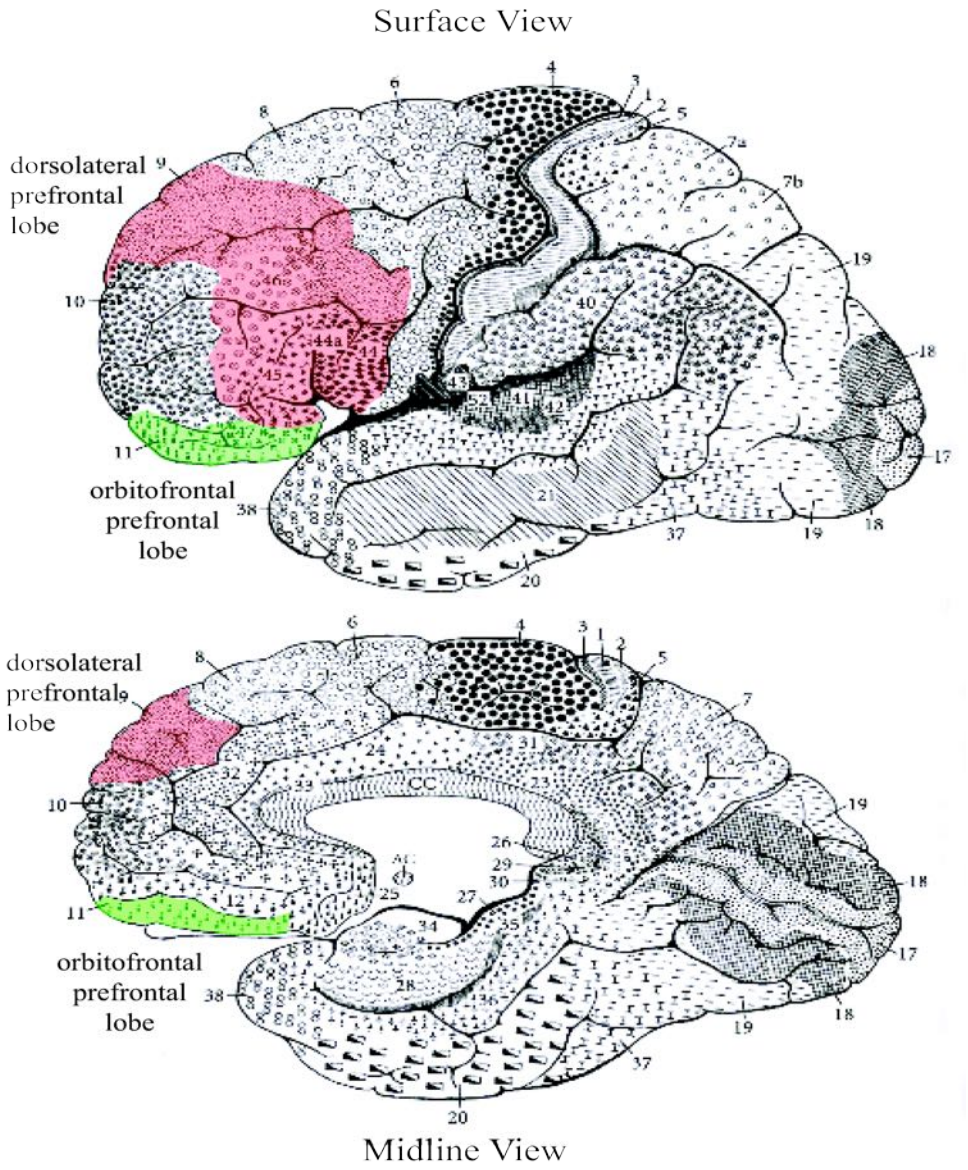

Figure 3. Brodmann's map of the human cortex with the dorsolateral *and* orbitofrontal *prefrontal cortex in color.*

They are crucial for all higher-order purposeful behavior—identifying the objective, projecting the goal, forging the plans to reach it, organizing the means by which such plans can be carried out, monitoring and judging the consequences to see that all is accomplished as intended.

This is the central role of the frontal lobes, one which releases the organism from fixed repertoires and reactions and allows the mental representation of alternatives, imagination, freedom. Thus the metaphors…are of the frontal lobes as the brain's CEO, capable of taking

> "an aerial view" of all the other functions of the brain and coordinating them; the frontal lobes as the brain's conductor; the frontal lobes as the brain's leader, leading the individuals into the novelty, the innovations, the adventures of life. Without the great development of the frontal lobes in the human brain (coupled with the development of the language areas) civilization could never have arisen.
>
> The intentionality of the individual is invested in the frontal lobes, and these are critical for higher consciousness, for judgment, for imagination, for empathy, for identity, for "soul."

How do we know this? We know this because of studies of individuals with various types of injury to the frontal lobes. The first thing that was clear from this work was that general intelligence was not affected and the frontal lobes were not directly the site of human intelligence. The real function was the executive control of the brain. In the days prior to MRIs and PET scans, what we knew about the function of the prefrontal lobes in humans came from brain injury cases. In 1868 J.M. Harlow [2] reported the most famous of them all. His patient was Phineas Gage. Harlow described what happened as follows:

> He was a shrewd and smart businessman, very energetic and persistent in executing all his plans of operation. One day while blasting a new roadway, an iron-tamping bar shot completely through the front part of his head.
>
> He gave a few convulsive motions of his extremities but spoke in a few minutes. He got out of the cart himself, with little assistance from his men…walked up a long flight of stairs and got into bed.…After a prolonged and stormy course he eventually recovered. Although all of his motor functions were intact his friends stated that he was no longer Gage. He was fitful, irreverent, indulging at times in the grossest profanity, (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans for future operation, which are no sooner arranged than they are abandoned in turn for others appearing more feasible.

War Injuries. These findings were validated in studies of soldiers with war injuries affecting the prefrontal lobes. [3] These soldiers showed behavioral changes consisting of childish excitement, impatience, slowing and apathy, mood swings from euphoria to depression, short attention span, and some deterioration of intellectual capacity.

Surgical removal. Surgical removal of the prefrontal lobes for the treatment of tumors produced similar behavioral changes consisting of a loss of inhibitions, talkativeness, a tendency to joke, socially inappropriate behavior, loss of motivation, and concrete thinking with an impaired ability to make generalizations and to do

abstract thinking. [4]

Lobotomy. Prefrontal lobotomy is a surgical procedure for the treatment of schizophrenia and other psychiatric diseases. With the advent of effective antipsychotic medication it has fallen out of favor. In addition to relieving psychotic symptoms surgically treated individuals showed a loss of motivation; socially inappropriate, rude and tactless behavior with a tendency to say the first thing that came into their mind; laziness; and carelessness. A prominent symptom was being "stimulus-bound" in the sense that they showed an overresponsiveness to immediate impressions and a decrease in the regulation of behavior that normally comes from learned past experience. The normal bond between immediate stimuli and the maturity of past experience seemed to have been broken. [5,6]

Luria and the Frontal Lobes

One of the richest sources of information on the function of the prefrontal lobes, especially for dorsolateral prefrontal lobes, comes from the famous Russian neuropsychologist Aleksandr Romanovich Luria. [7,8] The following are some of his observations. [9p348-350]

Consciousness, attention, and the initiation of programs. The prefrontal cortex serves as a tertiary association area of the brain. That is, it receives information from virtually every other area of the brain for final processing before a decision to elicit a motor response or act is made. Luria stated that the prefrontal lobes play "a decisive role in the formation of intentions and programs, and in the regulation of the most complex forms of human behavior." For a mental task to take place, a certain level of cortical tone is necessary and the prefrontal lobes regulate this activity. A critical task for this process is paying attention, and the prefrontal lobes are critical for sustained attention. He concluded that in man the frontal lobes participate directly in the state of increased activation which accompanies all forms of conscious activity. It is the prefrontal lobes that evoke this activation and enable the complex programming, control, and verification of human conscious activity.

Persevervation. Persevervation refers to the inability to change a course of action with the result that the same movement, behavior, or words are done over and over. Luria gave an example of a patient with frontal lobe damage who was asked to first draw a square and then a circle. The individual continued to draw squares. These patients are also able to recognize when others make mistakes but are *incapable of recognizing their own mistakes.*

Problems with complex programs. While lying in bed, one patient with frontal lobe damage was asked to raise her hand, which she did without problem. However, when the hand was placed under a blanket she could not carry out the more-complex program of removing the blanket first.

Memory. Normal subjects were able to memorize an average of six words. With practice this increased to ten words. Individuals with frontal lobe damage were only able to memorize an average of four words and this did not improve with practice. This damage also affected their ability to perform math problems other than simple

addition and subtraction. When asked to perform more complex arithmetic that required holding a number in their head, they could not.

Animal Studies of the Frontal Lobes

Animal studies of the function of the frontal lobes have been particularly valuable since they allow an examination of the effect of the removal of specific brain regions and the direct measurement of electrical activity in specific brain areas. [9p352-355]

Lack of goal-directed behavior. Pavlov, the Russian physiologist famous for his studies of conditioned reflexes in dogs, also studied the function of the frontal lobes in dogs. [10] Dogs with their frontal lobes removed did not recognize their masters and responded to irrelevant stimuli in the environment. Since the animals' goal-directed behaviors were interrupted by senseless repetition of stereotyped behaviors, Pavlov concluded that the frontal lobes played an essential role in goal-directed behavior.

Inability to visualize information in working memory. In his early studies of the effects of the removal of the frontal lobes in primates, Jacobsen [11] noted that such animals could respond correctly to simple commands but could not synthesize and store information arriving from a variety of sensory inputs. This was tested using an approach called *delayed response.* Here the monkey was allowed to watch as food was placed under one of two or more cups on a table. An opaque screen was then lowered in front of the cups for one or two minutes. The screen was then raised and the monkey had to pick up the cup under which the food was placed. This part was easy, indicating memory was intact. However, when the food was placed under a different cup, the monkeys without frontal lobes perseverated, constantly looking under the cup where they had seen the food being placed. It was as though they could not *visualize in their minds* the possibility that the food might have been moved to the other cup.

Stimulus-bound and poor attention span. In related experiments [12-14], when different-shaped cups were used, the monkeys preferred the novel shapes over the familiar shapes, even if the novel-shaped cups never contained any food. As with Pavlov's dogs and humans with frontal lobe damage, these monkeys were stimulus-bound, reacting to novel aspects of the environment. As such, it was *very difficult for such animals to maintain focused attention* on a task.

Lack of awareness of the future. Karl Pribram carried out a range of studies with monkeys whose frontal lobes had been removed. [14,15] Such monkeys could not tolerate long pauses while awaiting certain experimental stimuli. They were also *unable to assess and correct their own errors.* From these and related studies Pribram concluded that the frontal lobes were necessary for orienting an animal not only in the present but *in the future.*

Hyperactivity. Monkeys without frontal lobes display driven motor hyperactivity as well as distractibility. [16] Dopamine has an inhibitory effect on the activity of the frontal lobes. When that inhibition is removed by the selective destruction of dopamine neurons, it results in motor hyperactivity. [17]

Orientation in space. The Morris water maze [18] is a clever way to test for spatial orientation in mice. This consists of a pan of water with a platform hidden

somewhere under the surface. Once they have found the platform by random swimming, mice that have good spatial memory can quickly find the platform when placed in the water again. However, mice with their prefrontal lobes removed had much greater difficulty relocating the platform after each new trial.

In summary, these human and animal studies indicate that the frontal lobes represent the site for many of the actions of our rational brain, including abstract thought, orientation in space, judgment, focused attention, and planning complex actions for current and future goals.

The frontal lobes are critical for many of the most complex cognitive functions of humans, including paying attention, abstract thinking, spatial orientation, working memory, motivation, judgment, recognizing and correcting errors, the careful analysis of the information coming in from the senses before any action is taken, and planning complex behaviors for current and future goals.

The Prefrontal Lobes, Consciousness, and Civilization

In the previous chapter on consciousness, it was clear that the neural structures most likely to be involved in consciousness were those that had the greatest number of reciprocal connections with most or all of the other parts of the brain. The cingulate, the superior colliculi, the cortico-thalamic tracts, and the claustrum were all considered as reasonable candidates. However, while all of these may be involved, the most impressive candidate is the prefrontal cortex. As the final or tertiary association area of the brain, it receives the connections from all of the above and every other functional part of the brain. Of all the structures of the brain, only the prefrontal cortex is endowed with such a richly networked pattern of neural pathways. In 1928 the neurologist Tilney [19] suggested that the entire human evolution should be considered the "age of the frontal lobe." Luria called the frontal lobes "the organ of civilization." [20p2] Why? One the most important of human traits that allowed civilization to occur was the ability to move out of living only in the present and to both understand the concept of the future and to make and execute plans for the future. Goldberg [20p25] explains this as follows:

> To conjure up an internal representation of the future, the brain must have an ability to take certain elements of prior experiences and reconfigure them in a way that in its totality does not correspond to any actual past experience. To accomplish this, the organism must go beyond the mere ability to form internal representations and models of the world outside. It must acquire the ability to manipulate and transform these models…It must go beyond the *ability to see the world through mental representations;* it must acquire the ability to work with mental representations. One of the fundamentally distinguishing features of

> human cognition, systematic tool making may be said to depend on this ability, since a tool does not exist in a ready-made form in the natural environment and has to be conjured in order to be made. To go even further, the development of the neural machinery capable of creating and holding images of the future, the frontal lobes, may be seen as a necessary prerequisite for tool making, and thus for the ascent of man and the launching of human civilization.
>
> Of all the mental processes, goal formation is the most actor-centered activity. Goal formation is about "I need" and not about "it is." So the emergence of the ability to formulate goals must have been inexorably linked to the emergence of the mental representation of "self." It should come as no surprise that the emergence of self-consciousness is also intricately linked to the evolution of the frontal lobes.

Seen in this perspective, the advent of the use of tools may have both contributed to the rapid evolution of the human brain and to the development of consciousness. Consciousness was necessary to provide an image of the self that needs to do things for itself, both in the present and in the future. The enlarged prefrontal lobes in turn allow the further development of even more-complex use of tools, thinking, and rational thought. Consciousness, tool making, language, rational thought, and civilization are thus all intertwined.

> **Of all the structures of the brain, only the prefrontal cortex is endowed with such a richly networked pattern of neural pathways. This may be a critical prerequisite for the development of the "inner perception" characteristic of consciousness that was a necessary evolutionary advance to provide a sense of self around which plans could be made. This ability to plan for present and future events was an essential ingredient for the development of human civilization.**

The Frontal Lobes and ADHD

The prefrontal lobes were the last part of the brain to evolve. In this regard it is of interest that they are involved in a wider range of behavioral disorders than any other part of the brain. It is as though the "last part to be added is the most likely to break." An analogy could be made to a computer program. A simple program with tight coding tends to run without making errors. If the code becomes very complex, despite its many new capabilities, it is more likely to break down. The disorders that involve malfunction of the prefrontal lobes include schizophrenia, autism, Pick's dementia, Alzheimer's disease, obsessive compulsive disorder, Tourette syndrome, conduct disorder, antisocial personality disorder, Attention Deficit Hyperactivity Disorder (ADHD), and others. Discussing most of these is outside the scope of this book. Antisocial personality disorder will be discussed in a later chapter. Since ADHD is especially relevant to the funcion of the frontal lobes, I will discuss it in

more detail.

ADHD is a common, genetic disorder affecting approximately eight percent of school age boys and four percent of school-age girls. It is characterized by problems with impulsivity, inattention, and short attention span. The following is a list of symptoms common in ADHD children that are also common in individuals with prefrontal lobe lesions.

concrete thinkers
difficulty in carrying out complex tasks
difficulty in changing plans
difficulty in executing a sequence of complex behaviors
difficulty in making plans for the future
distractible
do poorly on tests of frontal lobe function
easily bored
hyperactive
impaired sequencing
impatient
impulsive
learning disorders
lie easily
normal IQ
poor abstract thinking
poor judgment
poor motivation
poor planning
poor spatial perception
short attention span
stimulus-bound
unable to foresee the consequences of their behavior

Understanding the function of the prefrontal lobes provides us with great insight into the cause of ADHD. Understanding ADHD provides us with great insight about the importance of the evoluton of the prefrontal lobes to allow humans to develop an advanced civilization. Instead of being due to physical damage, ADHD is strongly genetic and caused by inheriting the wrong set of genes. The role of genes in human behavior will be discussed later.

The Dorsolateral Versus Orbitofrontal Areas

Separating the realms of the dorsolateral area and the orbitofrontal areas facilitates our understanding of the role of the prefrontal lobes in behavior. These differences are summarized and compared in Table 1.

Table 1. Behaviors Associated with Lesions of the Dorsolateral and Orbitofrontal Prefrontal Lobes.

Dorsolateral	**Orbitofrontal**
disinhibition	affective disorders
distractability	aggressive
impaired planning	poor self-control
impulsive	emotional outbursts
inattention	lack of guilt
no motivation	lack of remorse
poor abstract reasoning	lack of empathy
poor executive function	hypersexuality
poor organization	obsessive compulsive
	psychopathic

The dorsolateral cortex is especially involved in attention, motivation, organization, and rational thought, while the orbitofrontal area is more involved in empathy, antisocial, and amoral behavior.

The Dorsolateral Syndrome

One of the major characteristics of specific damage to the dorsolateral area is "pseudo-depression." Affected individuals appear to be depressed in that they tend to be apathetic, indifferent, sad, and uninterested in their environment. They find it hard to get out of bed and don't eat well or attend to other essential functions. However, the core feature is not depression in its usual sense but simply extreme inertia due to the inability to initiate behavior. That inertia is illustrated by Goldberg [20p119-122] who described the case of Vladimir, a patient with severe damage to the dorsolateral area.

> Vladimir spent most of his time in bed staring blankly into space. He ignored most attempts to engage him in any kind of activity…Asked to draw a cross, he would first ignore the instruction. I have to lift his hand with mine, place it on the page, and give it a little push, and only then would he start drawing. But having started, he could not stop and continued to draw little crosses until I took his hand in mine and lifted it off the page.…When the task was to listen to a story and then recall it, Vladimir would start slowly and then carry on in a monotonous voice. He would go on and on and when asked to finish, he would say "Not yet." The never-ending monologue was an expression of "reverse inertia," an inability to terminate activity.

This example illustrates one of the ways in which the frontal lobes qualify as the "organ of civilization." Drive is a central requirement in a competitive, success-driven society. A normal functioning dorsolateral area is necessary for that trait. In the reverse sense, for a person to be successful, knowing what to not spend one's energies on is just as important as knowing what to spend it on. The dorsolateral area is as critical to stopping an activity as it is to initiating one. In a sense, it serves as both *the accelerator and the brake in daily activities.*

Imaging studies using PET or functional MRI have verified the role of the dorsolateral area in a range of functions including attention; [21-23,24] working, episodic and spatial memory; [25-30] the mental manipulation of information; [31,32] decision making; [33,34] motivation; planning; impulse control; [35] and initiation of action. [36] The symptoms of damage to the orbitofrontal area are relevant to morality and antisocial behavior. This and the role of both areas in decision-making are discussed in subsequent chapters.

Two important structures of the prefrontal cortex are the dorsolateral and the orbitofrontal areas. The dorsolateral area is especially important for the planning, starting and stopping of new motor programs, attention, decision-making, impulse control, motivation, organization, planning, working and spatial memory. The orbitofrontal area is especially important for socialization and moral behavior.

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Chapter 27

The Pleasure Brain

Understanding the capacity to experience pleasure is central to understanding the full dimensionality of the human brain. Why are humans so susceptible to becoming addicted to tobacco, alcohol, drugs, or gambling? The answer is simple. Nothing happens in a vacuum. If we want to keep from starving, we have to eat. To ensure we do, the brain possesses many mechanisms for allowing us to feel hunger, thus signaling when it is time to eat. To further ensure that we take in food, eating was made pleasurable. In addition, if we want our species to survive, we must reproduce. To ensure that happens, the process has also been made pleasurable. Eating, sex and love are called natural rewards and are critical to the survival of the species. Natural rewards stimulate the brain's reward pathways. These nerve pathways are rich in dopamine. The reason we become easily addicted to drugs, alcohol, gambling, and other activities is that these substances and activies also stimulate the same pleasure-producing dopamine reward pathways.

The Reward Pathways

How do we know that reward pathways exist? In 1953 Drs. James Olds and Peter Milner [1] placed wires into the brains of rats so they could stimulate different brain regions to study arousal mechanisms. They noticed that the animals kept returning to the part of the cage where they had received the stimulation. They seemed to "like" this area. This phenomenon became known as *place preference.* Animals liked a certain place because when they were there, something pleasurable happened.

Olds and Milner modified their apparatus so the animals could press a lever and stimulate themselves. This was so effective and so pleasurable that if left alone the animals would rather stimulate their own brains than eat, and they would soon starve to death. This study was a milestone in brain-behavior research. Using this technique they were able to map the pleasure pathways of the brain. These were subsequently shown to be dopamine-rich neurons. The reward pathways in the human brain are shown in Figure 1.

The two major dopamine pathways are shown in blue. The upper one starts in a part of the brain called the *substantia nigra,* and nerve fibers pass to the striatum or basal ganglia. The lower one starts in the *ventral tegmental* area, and fibers pass to the

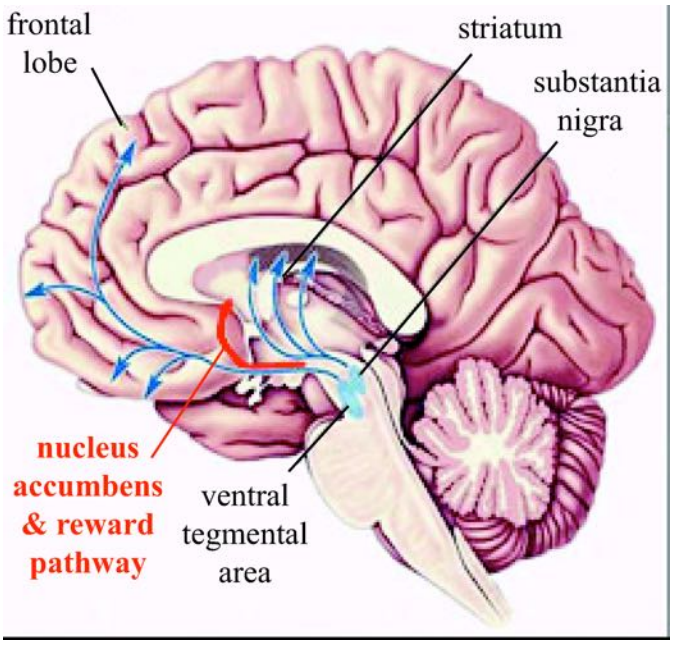

Figure 1. The dopamine pathways in the human brain (blue) and the reward pathways (red). [8]

frontal lobes. The red arrow points to the site of a large number of dopamine-rich nerve cells called the *nucleus accumbens,* and the red line represents other parts of the human reward pathway. The ventral tegmental area, or VTA, is the site of the cell bodies for the dopamine neurons that pass to the reward pathway and the frontal lobes.

In another classic study, DiChiara and Imperato [2] examined the effect of the administration of a number of drugs of abuse on dopamine levels in the nucleus

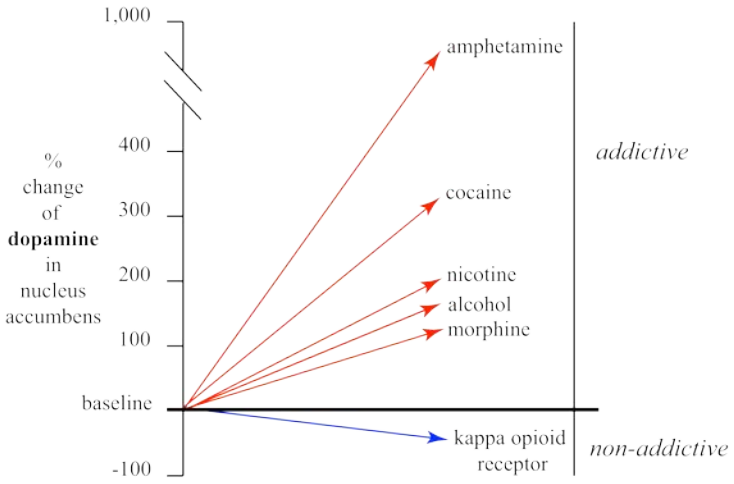

Figure 2. Effect of various drugs of abuse on dopamine in the nucleus accumbens of rats. Based on DiChiara and Imperato. Proc Nat Acad Sci USA. *85:5274-5278, 1988.* [2]

accumbens of rats. These results are shown in Figure 2.

Amphetamine, or speed, resulted in the greatest release of dopamine in the nucleus accumbens. However, other common drugs of abuse such as cocaine, nicotine, alcohol and morphine also produced a significant release of dopamine in the same area. Morphine produced a release of dopamine by stimulating *mu* opioid receptors. As shown in the figure, the stimulation of a different opioid receptor *(kappa)* does not result in the release of dopamine, indicating the release is specific to dopamine and *mu* receptors. As a result of these and other studies, dopamine has become known as the "pleasure molecule." In addition to pleasure these pathways contribute to a general improvement in mood.

Pathological gambling. Pathological gambling is defined as gambling to such a degree as to interfere in a negative and major way with an individual's life. An addiction to gambling, or to sex, is a pure form of addiction in that no foreign substances are involved. As a result, brain imaging studies of gamblers are not complicated by the presence of drugs. In such a study, gambling was in the form of playing a video poker game.[3] PET scanning with ^{11}C-raclopride was used. The more dopamine released, the lower the RAC binding. The basal ganglia were examined because they are large and particularly rich in dopamine, thus easy to image. The combined results for four different regions of the basal ganglia are shown in Figure 3.

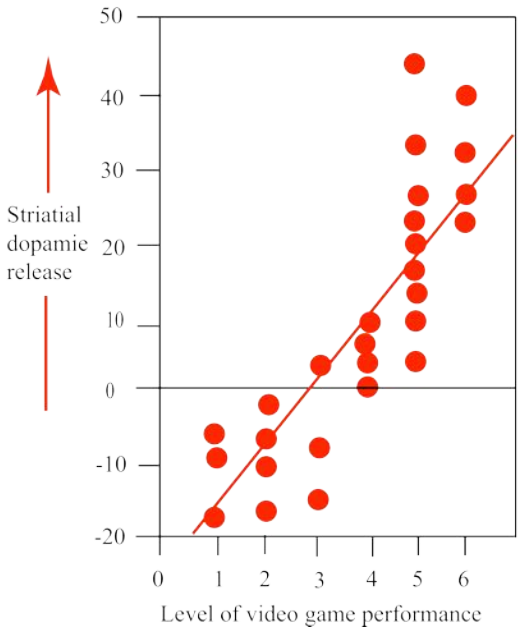

Figure 3. The effect of video gambling on the release of dopamine in the basal ganglia. More negative values of ^{11}C RAC binding represent greater amounts of dopamine release. From Koepp et al.: Evidence for striatal dopamine release during a video game. Reprinted by permission of Macmillan Publishers, Ltd. Nature. *393:266-268, 1998.*[3]

There was a significant linear relationship between the level of video game performance and the release of dopamine in the basal ganglia. This provides a direct, objective demonstration of the role of dopamine release as an addicting reward in gambling.

Reward Deficiency Syndrome. While the fact that drugs of abuse such as alcohol, cocaine, speed, and tobacco stimulate the release of dopamine explains part of the question of why humans become addicted to these things, this does not explain why some people have serious problems with addictions, while others seem to be immune. While environmental factors play a role there is a significant variation in addictive potential among individuals exposed to the same environment. My colleagues and I proposed the existence of a reward deficiency

syndrome (RDS).[4-6] This disorder is due to genetic defects in the dopamine reward pathways. As a result of such defects the natural rewards are no longer sufficient to improve mood and provide pleasure, and affected individuals turn to "unnatural rewards" such as alcohol, tobacco, drugs, gambling, and risk taking in the form of dangerous sports such as bungie and base jumping, sky diving, extreme skiing, race car driving, and others to stimulate their reward pathways.

One of the most innovative tests of this hypothesis was carried out by Nora Volkow and colleagues.[7] Dr. Volkow subsequently became the director of the National Institute of Drug Abuse (NIDA). They used two strains of mice. One strain liked drinking alcohol more than drinking water (alcohol-preferring), the other strain did not. If the preference for alcohol was due to a defect in the dopamine D_2 receptor, then increasing the level of the D_2 receptor in the reward pathways should eliminate the alcohol preference. This was done by injecting copies of the D_2 receptor gene directly into the nucleus accumbens. This resulted in a temporary overexpression of the D_2 receptor that lasted several days. The effect on the rats' drinking habits is shown in Figure 4.

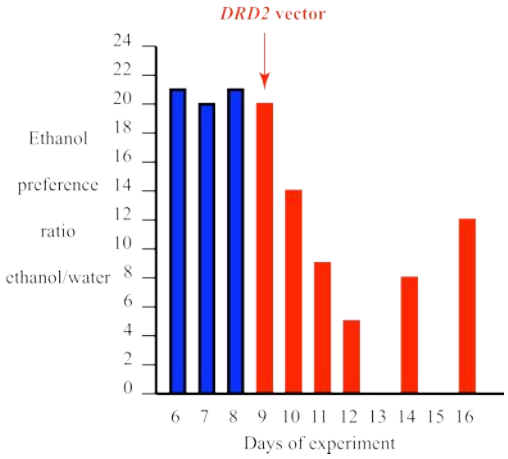

Figure 4. Effect of the injection of the D_2 receptor gene into the nucleus accumbens of alcohol-preferring rats. From Thanos et al.: Overexpression of dopamine D^2 receptors reduces alcohol self-administration. J Neurochemistry. *78:1094-1103, 2001.*[7] *By permission.*

When DNA without the D_2 receptor gene was injected (dark blue) there was no decrease in alcohol preference. When DNA with the D_2 gene was injected (red), over the next four days there was a dramatic decrease in alcohol intake by 64 percent. As the D_2 gene began to decay, the preference for alcohol began to increase again. The authors concluded that over expression of the D_2 receptor gene reduces alcohol intake and that high levels of the D_2 receptor gene are protective against alcohol abuse.

The literature on the dopamine reward pathways is vast. The above discussion was just a small sampling to show that these pathways play a major role in survival by encouraging us to eat and reproduce, and when genetically defective they play a major role in susceptibility to addictive behaviors.

Dopamine-rich reward pathways are responsible for making eating, sex, and love pleasurable. These activities are essential for the survival of the species and are called *natural rewards.* Unfortunately a number of substances, including alcohol, amphetamine, cocaine, morphine, tobacco, other drugs, and a number of activities such as gambling and extreme sports stimulate the same pleasure pathways.

As a result, some people become addicted to these non-natural rewards. Individuals with a genetic defect in their dopamine reward pathways are particularly susceptible to these addictions.

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Chapter 28

The Social Brain

Appropriate social interactions between two or more people were critical for the development of human civilization. These include interactions between a mother and her child, a father and his child, between the mother and the father in a family setting, between individuals in daily work and play, between larger groups of individuals, and with society in general. These interactions include positive prosocial features such as caring, affection and love, bonding between a parent and a child or between parents, and a trust that allows personal interactions in the absence of fear. When these prosocial features are broken, antisocial behaviors such as aggression, rage, physical abuse, rape, robbing, stealing, and murder may occur.

To understand whether humans can have inherent morality without the threat of secular laws or divine damnation, it is necessary to understand why some people behave badly while others do not. Psychologists and geneticists have argued for years about whether such antisocial behavior is due to influences from a bad environment or bad genes, the classic question of nurture versus nature. In a word, the answer is clear—it is both. What is surprising to many is the degree to which genes play a role. This will be discussed in a later chapter.

Good social behavior is not just the absence of bad social behavior. Understanding the neurological defects that lead some people to behave badly is only one aspect of understanding why most people are well behaved and form loving, caring, bonding, and trusting relationships with spouses, children, friends, and larger social groups. Until recently it was largely a mystery why people spontaneously engaged in these prosocial behaviors. However, recent years have seen remarkable advances in this area, especially in relation to the prosocial effect of two hormones: oxytocin and vasopressin. The areas covered in this chapter will include the limbic system, the amygdala, the prosocial hormones oxytocin and vasopressin, the orbitofrontal cortex, the areas of the brain involved in "theory of mind" tasks, and the mirror neuron system. Together these structures account for much of our social brain. In terms of the goals of this book it is important to differentiate the realm of the social brain from the spiritual brain. While a well-functioning social brain is a necessary prerequisite for a healthy spirituality, as discussed in subsequent chapters, the spiritual brain is separate and distinct from the social brain.

The Limbic System

The limbic system can be considered the emotional brain. Since emotions are central to both prosocial and antisocial behavior, a brief description of the limbic system is in order.[1p321-332] In 1937 Papez published a paper entitled "A Proposed Mechanism of Emotion."[2] He had noticed that patients who died of rabies often experienced fits of extreme rage and terror in the hours before they died. When he examined the brains of these subjects he found that the virus preferentially affected specific areas of the brain that he called the "emotional brain." He suggested that, "Emotion can be considered as a way of acting and a way of feeling." The former was termed *emotional expression* and the latter *emotional experience.* Papez reasoned that the cerebral cortex had to participate in these activities in order for humans to experience emotional phenomena. He proposed that the cingulate cortex was the "emotional cortex" that could pass information to other parts of the cerebral cortex for "emotional coloring." The synthesis of the two parts of emotion required structures that could receive and integrate sensations and pass these onto higher conscious cortical functions—the psyche. He proposed what has come to be termed the *Papez circuit* (Figure 1).

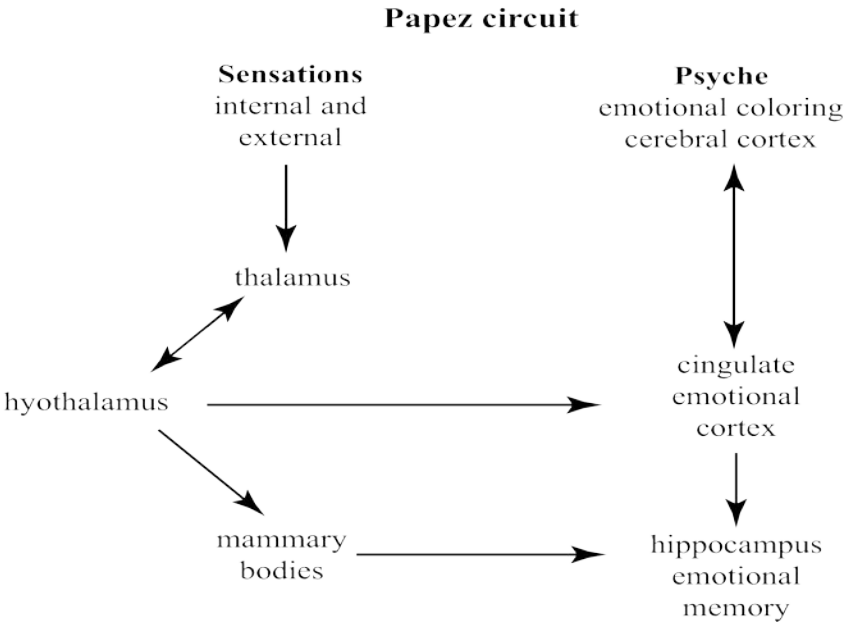

Figure 1. The Papez circuit.

The circuit involved a range of structures including the hippocampus, mammilary bodies, hypothalamus, thalamus, and cingulate and received inputs from various parts of the cerebral cortex. Papez's idea that there was a neurological structure as the basis of emotion was so radical for the time that it cost him his academic post.

Paul MacLean, director of the Laboratory of Evolution and Behavior at the

National Institute of Mental Health, named the structures of Papez's circuit the *limbic system.* [3] This name was derived from the fact that these structures surrounded the middle portions of the brain like an encircling limb. He pointed out that the microscopic structure of these areas was primitive compared to the other parts of the cortex. He also pointed out that there were strong connections to the smells or the olfactory apparatus. Because of this relationship the limbic system has sometimes been called the "smell brain." We all know that smells can elicit strong emotional memories. The structures that make up the limbic system are shown in Figure 2.

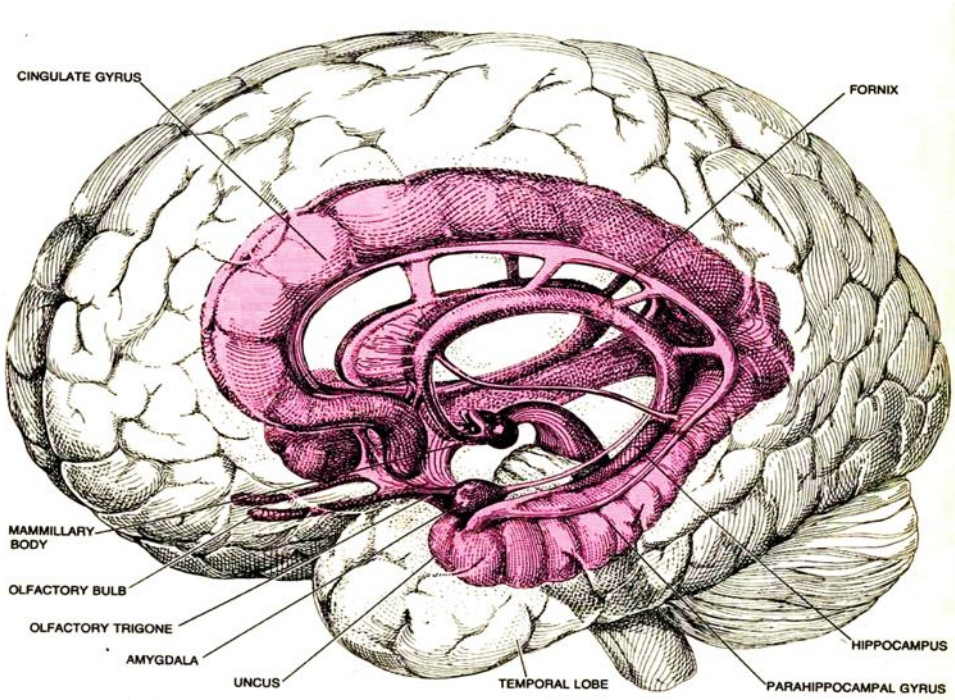

Figure 2. The human limbic system. From S. Snyder. Opiate Receptors and Internal Opiates. In Scientific American. *236:44-56, 1977.* [4]

MacLean also proposed the concept of a triune brain consisting of three evolutionarily distinct parts: the reptilian complex, the limbic system, and the neocortex. The reptilian complex was so named because in reptiles it constituted the major part of the brain. It is composed of the brain stem, midbrain, reticular activating system, and basal ganglia (caudate and putamen). These parts of the brain are involved in rigid, unthinking behaviors triggered by environmental cues. In reptiles, birds, and mammals, these portions are involved in basic survival behaviors such as mating, breeding rituals, imprinting, tracking prey, defense, and social hierarchies. Once triggered, these stereotyped behaviors are played out to completion like a mindless computer program. In his book, *The Dragons of Eden,* Carl Sagan [5] stated that "The reptilian mind is not characterized by powerful passions and wrenching contradictions but rather by a dutiful and stolid acquiescence to whatever

behavior its genes and brain dictate."

The limbic system rescued animals from this robotic and reflexive pattern of behavior and allowed them to have an emotional involvement in life. Love, hate, anger, grief, jealousy, commitment and fear were now possible. The third and final layer of the triune brain—the neocortex—added extended consciousness, inhibitions, reflective and rational control over the raging emotions of the limbic system. One report of the electrical stimulation of the septum portion of the limbic system in a human subject produced feelings of euphoria. [6]

The Amygdala

The amygdala is included in the limbic system because it specifically adds the element of fear to the emotional repertoire. The amygdala is a tertiary association area located in the temporal lobe. It receives inputs from all the major senses: vision, hearing, touch, taste and smell (Figure 3)

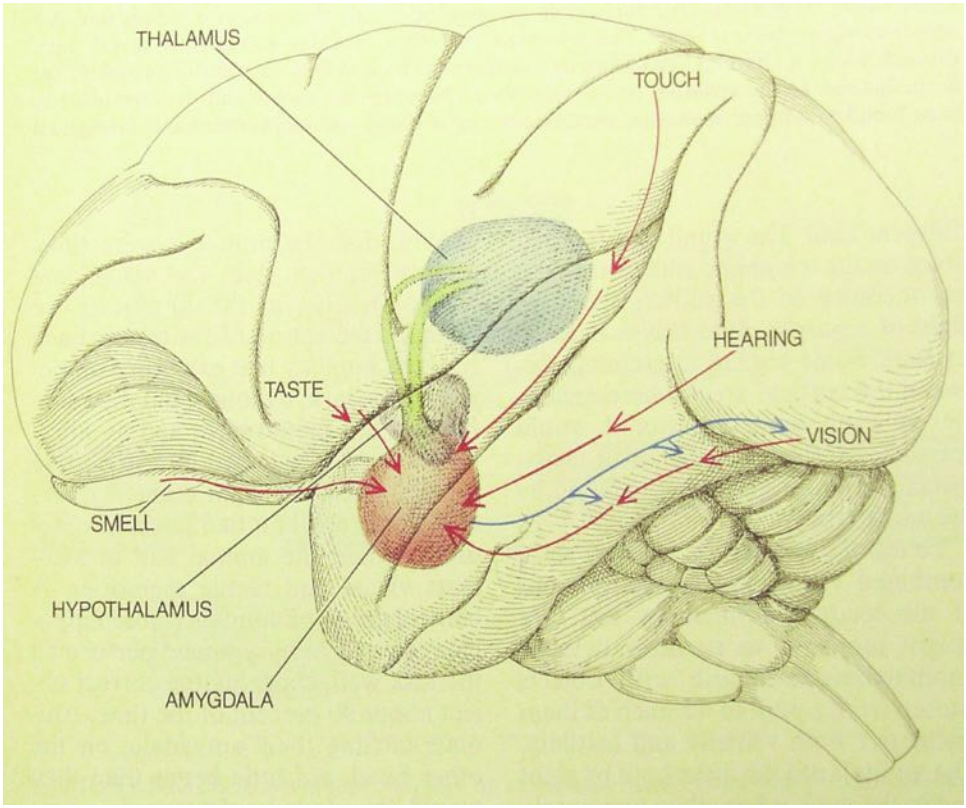

Figure 3. The amygdala showing inputs from the major sensory areas. From Mishkin and Appenzeller. The Anatomy of Memory. In Scientific American. *256:80-89, 1987. By permission.*

Two years after Papez proposed his emotional circuit, Klüver and Bucy [7] described their studies of the effect of removing the temporal lobes, especially the amygdala, in monkeys. They developed what was referred to as *psychic blindness,* or

visual agnosia (not knowing what was seen). The monkeys would approach all objects without hesitation even when they had previously been afraid of them. They would indiscriminately examine every object in sight by putting it in their mouths, rather than examining it by hand. They would also re-examine the same objects many times as if they had never seen it before. Their behavior seemed to be driven by uncontrolled irresistible impulses, but showed none of the usual fear and anger seen in normal monkeys. They were also hypersexual with excessive penile erection and manipulation. There was both homosexual and heterosexual behavior. A lesioned monkey might copulate continuously for 30 minutes, then leave the female, only to immediately mount her again.

The major symptom of humans with lesions of the amygdala is a lack of fear. Damasio [8p62-67] described a woman with bilateral calcification of both amygdala. She was normal in every respect except for her social history. She approached people and situations without fear and with a predominantly positive attitude. She was, in fact, excessively and inappropriately forthcoming and was eager to engage anyone in conversation. She did not shy away from friendly hugging and touching. As one might imagine, she made friends easily and formed romantic attachments without difficulty. "It was as if negative emotions such as fear and anger had been removed from her affective vocabulary, allowing the positive emotions to dominate her life." She was able to recognize facial expressions of all the emotions except fear. She had a gift for drawing but could not draw an angry face. This Pollyanna approach to the world can place such individuals at considerable risk for harmful social situations. Damage of the amygdala results in the loss of an individual's capacity to retrieve memories that contain emotional content. [9] A specific gene coding for a protein called *stathmin* has been found to play a major role in innate and learned fear. [10]

At the opposite extreme, children with severe shyness appear to have a hyperactive amygdala. These children showed increased brain activity in the region of the amygdala and were anxious about any face they could not decipher. [11]

The Prosocial Hormones Oxytocin and Vasopressin

The posterior pituitary gland secretes two hormones called *oxytocin* and *vasopressin.* They are made in the supraoptic and paraventricular nuclei of the hypothalamus and passed to the posterior pituitary [12] (green cells in Figure 4). Specific stimuli such as birth, breastfeeding, and certain types of stress cause them to be released into the blood stream.

Oxytocin has been implicated in many forms of social behavior, including parental care, grooming, nesting, sexual arousal, orgasm, breast-feeding, and birthing. Its important role in parental bonding was first shown in studies of two small mammals called voles. [13] One species, the prairie vole, *Microtus orcrogaster,* forms long-term monogamous relationships, and both sexes show a high level of parental care. In the laboratory they often sit side by side with a mate and attack unfamiliar adults. In early life the young show marked increases in ultrasonic calls and steroid secretion in response to social isolation. The other species, the montane vole, *Microtus*

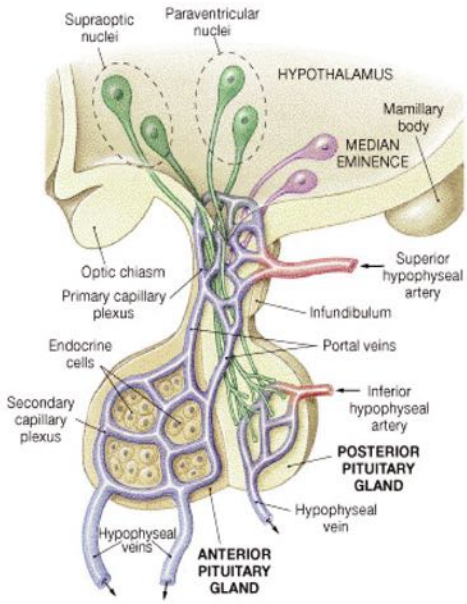

Figure 4. Oxytocin and vasopressin are produced in the hypothalamus and passed to the posterior pituitary where they are released on demand. [13a]

montanus, lives in isolated burrows and shows no evidence of monogamy. In the laboratory they show minimal parental care and spend little time in close contact with each other. The pups show little if any behavioral or physiologic response to being removed from the nest. In a word, the prairie voles are social, while the montane voles are loners.

Because of the prior evidence that oxytocin might play a role in these behaviors, Insel and Shapiro, [13] from the National Institute of Mental Health, examined the distribution of the oxytocin receptor in the brains of these two voles. The prairie vole had much higher levels of oxytocin receptors in several parts of the limbic system, including the nucleus accumbens, ventral globus pallidus, the lateral part of the amygdala and the midline thalamic nuclei. The montane voles had higher levels in the cortical nucleus of the amygdala, the lateral septum, and other but different parts of the limbic system. In the female montane voles, the brain distribution of the oxytocin receptor changed within 24 hours after birth, coinciding with a brief burst of a postpartum period of bonding behavior.

The nucleus accumbens and ventral globus pallidus are parts of the dopamine reward pathway. The increased level of oxytocin receptors in these areas in monogamous voles suggests that one of the rewards for social attachment is the stimulation of the pleasure pathways. [14,15] This concept is strengthened by the observation that blocking the dopamine D_2 receptor, the primary receptor of the reward pathway, also blocks pair bond formation. [16]

An additional feature of monogamy in many animal species is the presence of intense aggression toward strangers for the defense of territory, the nest, and the mate.

In a subsequent study [17] vasopressin was found to play a role in this defensive activity and in mate preference. Further studies from this group showed that the administration of chemicals that blocked the oxytocin receptors in the brains of females, prevented pair bonding without an effect on mating behavior. [18-20] In the opposite vein, when oxytocin was infused into the brain, pair bonding was increased. The effects of oxytocin in females were not seen with the infusion of vasopressin receptor blockers or vasopressin, but these chemicals did affect pair bonding in males. *Thus oxytocin elicits pair bonding in female voles while vasopressin elicits pair bonding in male voles.*

When the oxytocin gene is removed in adult female mice, they do not lactate after giving birth. When the gene is removed in adult male mice the infants offspring are less vocal than when the gene is removed from the mother, and the adults are more aggressive in specific settings. [21] Genes can also be added. In monogamous voles the vasopressin V_1 receptor is expressed at higher levels than in the non-monogamous promiscious voles. Transferring the vasopressin V_1 receptor gene from the monogamous vole into the ventral forebrain of promiscious vole [22] substantially increased partner bonding. *This showed that a change in the expression of a single gene could profoundly alter social behavior.* This provides a potential molecular mechanism for the rapid evolution of complex social behavior.

In rats, the injection of oxytocin exerts potent anti-stress effects. Blood pressure and cortisol levels are decreased and the resistance to heat, the rate of wound healing and insulin levels are increased. [23]

Oxytocin and vasopressin in humans. Is oxytocin and vasopressin involved in human social behavior? A number of studies indicate the answer is yes. There is a particularly sensitive period just after the birth of a child for bonding in women. This coincides with a significant increase in a mother's oxytocin levels in the first hour after birth. [24] Breastfeeding then contributes to the continued secretion of oxytocin [23] and to continued mother-child bonding.

Oxytocin is released in response to social stimuli, [25] and this is likely to contribute to the benefits of positive social experiences. It may also provide the basis for the health-promoting effects of some alternative therapies, especially those that involve touching, talking, and group activities. The observation that oxytocin levels can become conditioned to psychological state or imagery [26] suggests it may in part mediate the benefits attributed to hypnosis and meditation. [23]

Four-year-old children who suffered emotional neglect and isolation in foreign orphanages and were then adopted into families in the United States showed significantly lower vasopressin levels than controls. [27] Following much physical contact with their adopted mothers, the neglected children also showed much less increase in oxytocin level than the control children.

Love. Love is a critical aspect of socialization and forms the basis of family ties. Both romantic and maternal love are highly rewarding experiences. Are these studies of oxytocin and vasopressin relevant to love? Orgasm releases oxytocin in both men and women [28] and contributes to the increased bonding associated with sexual

relations. Brain imaging studies examining both romantic love (people in love viewing pictures of loved ones versus mere acquaintances) and maternal love (mothers viewing pictures of their own children versus children that were mere acquaintances) showed activation of regions of the brain rich in oxytocin, vasopressin, and dopamine receptors, and decreased activity in the amygdala and other regions involved in negative emotions. Thus, there was an enhancement of activity in part of the brain associated with bonding and a decrease in activity in parts of the brain involved in negative social assessments and fear.[29,30] Oxytocin and vasopressin modulate the excitatory inputs to the amygdala in opposite directions.[31] This allows for a fine-tuning of the fear response in social interactions.

Trust. Trust is indispensable in friendship, love, families, and organizations, and plays a key role in economic exchange and politics.[32] Without trust a country's institutions and political interactions would break down. Lack of trust between nations is likely to lead to wars. In a study of personal interactions that required trust, it was found that the intranasal administration of oxytocin produced a substantial increase in trust. In the setting of a trust-requiring investor game, this led to an increase in financial benefits derived from trusting social interactions.[32] In addition to oxytocin, brain imaging studies show that trust also activates the dopamine feel-good reward pathways.[33]

It is clear from these studies of voles, mice, rats, and men that oxytocin and vasopressin are important prosocial hormones and play a central role in many civilizing behaviors, including bonding, parenting, love, faithful monogamy, defending a mate and home, and engaging in trusting relationships. It is likely that unmet needs for social bonding and acceptance in early life might increase the emotional allure of groups such as gangs and religious sects, with violent and authoritarian values and leadership.[34]

The Orbitofrontal Prefrontal Cortex and the Man Who Borrowed Cars

In a one-page article in the medical journal *Lancet,* Cohen described "The Man Who Borrowed Cars."[35] He reported the case of a man whose behavior was normal until he had what seemed to be a mild stroke. He soon went back to work but began to steal cars from a local car dealer. He parked them on his lawn and over many days kept repeating this process. It did not take long for the police to determine who the culprit was. His physician suspected that the stroke may have played a key role in his sudden change in behavior. A SPECT scan was performed. The result is shown in Figure 5.

The scan showed a significant defect in blood flow within the area of the left orbitofrontal prefrontal lobe. This defect changed this man from a law-abiding citizen to one who stole cars without giving it a second thought. He displayed poor social judgment and had no feelings of guilt about his illegal activities.

Eslinger and Damasio[36] described a similar patient called "EVR," who was a successful professional, happily married, 35-year-old father of two. He led an impeccable social life and was a role model to others in his family. Unfortunately, he

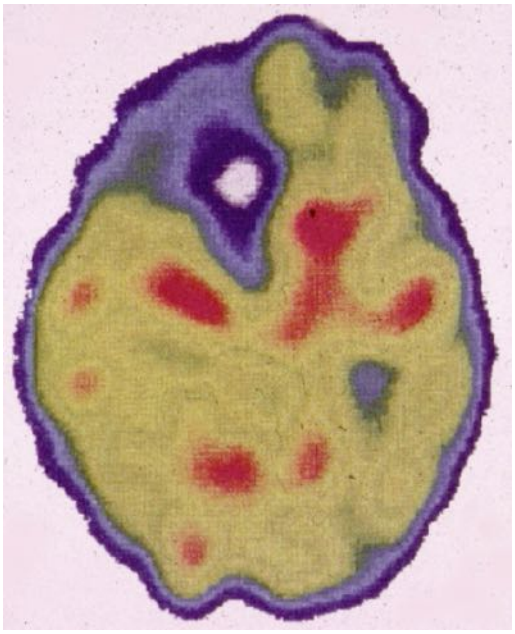

Figure 5. SPECT scan of "The Man Who Borrowed Cars."[35] By permission from Elsevier.

developed a brain tumor located at the site of the orbitofrontal lobes of the prefrontal cortex. After surgery, psychological testing was remarkably normal. His high IQ (129) and memory were not affected, and tests of the dorsolateral portion of the prefrontal lobes were normal. However, his social conduct was profoundly affected. He entered into disastrous business ventures, became bankrupt, and was divorced twice. His second marriage was to a prostitute and lasted only six months. He needed prompting to get started in the morning to go to work and was unable to manage his time properly. He could not hold down any paying job, was unable to learn from his mistakes, unable to support his family, and ended up living in a sheltered environment. In his book, *Descartes' Error,* Damasio[37] commented on EVR as follows:

> I never saw a tinge of emotion in my many hours of conversation with him; no sadness, no impatience, no frustration with my incessant and repetitious questioning…He could sense how topics that once had evoked a strong emotion no longer caused any reaction, positive or negative…His predicament was to know but not to feel.

Damasio and colleagues[38] performed a series of skin conductance studies on EVR and four other patients with similar surgeries. Patients with brain surgery involving other areas of the brain were used as controls. The testing consisted of showing slides to the subjects while recording their skin conductance, an electrical property of the skin that is related to the function of the sweat glands. The slides consisted of emotionally laden target objects depicting social disasters, mutilation, and nudity, along with non-target pictures of neutral scenes. There were two phases of viewing. In a passive phase, the subjects were simply asked to view the slides, while in the active phase they were asked to describe what was being shown in the slide and to give an impression about whether they liked the picture or not. In the subjects with ablation of the orbitofrontal portion of the frontal lobes, there was no skin conductance response during the passive phase but a normal skin conductance response during the active phase. The controls showed a skin conductance response during both the passive and active phases. To illustrate the importance of the body's

reactions to emotion, Damasio [38] quoted from William James [39] as follows:

> What kind of emotion of fear would be left if the feeling neither of quickened heart-beats nor shallow breathing, neither of trembling lips nor of weakened limbs, neither of gooseflesh nor of visceral stirrings, were present. Can one fancy the state of rage and picture no ebullition of the chest, no flushing of the face, no dilation of the nostrils, no clenching of the teeth, no impulse to vigorous action, but in their stead limp muscles, calm breathing, and a placid face?

The implication is that emotions cannot emanate simply from a set of electrical and chemical impulses swirling around in a disconnected fashion in the brain. The color and flavor of emotional reactions, the "quickened pulse" and the "visceral stirrings" are the way the body feels things. This is what produces emotion. The classical phrase, "a gut feeling," or " I felt it in my gut," illustrates the important role that activation of the autonomic nervous system with its connection to the body plays in helping us "decide what to do" in social interactions. Anti-social personality disorder (ASPD) is associated with a disconnect between the brain and the autonomic nervous system. This can occur when the orbitofrontal lobes fail to function because of strokes or surgery. It can also occur when an individual inherits a set of genes that result in a dysfunction of the orbitofrontal area of the prefrontal lobes. This concept is shown in Figure 6.

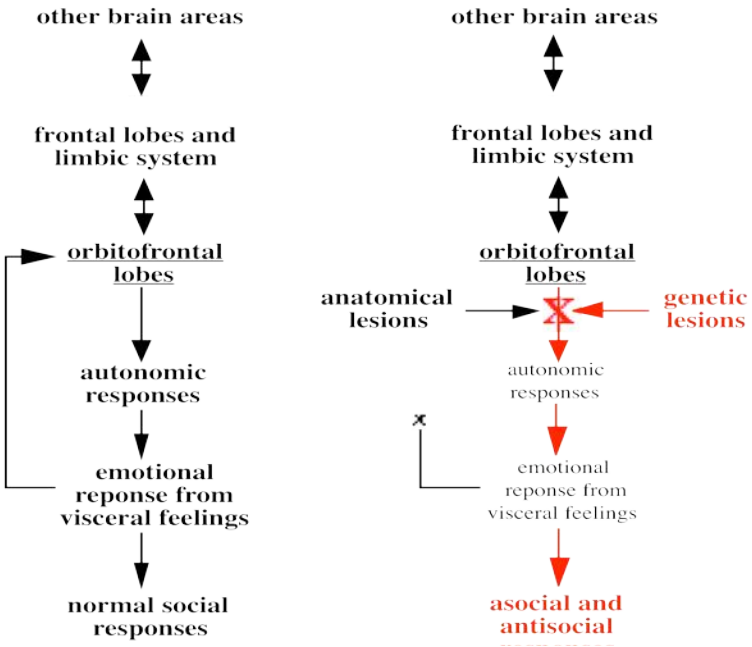

Figure 6. Diagram of the role of the orbitofrontal lobes and the role of the autonomic nervous system in feelings and emotion. See text.

The left pathway shows how the autonomic nervous system produces a visceral feeling of emotion in response to stimuli fed from the orbitofrontal lobes and other parts of the brain. The orbitofrontal lobes are connected with the autonomic nervous system via the hypothalamus.[40] The right pathway shows how this pathway can be broken by traumatic or surgical damage or by genetic damage to the orbitofrontal lobes resulting in a lack of an emotional response and feelings, lack of empathy for the feelings of others, and the development of asocial or antisocial behavior.

Neuropsychological tests specific to the function of the orbitofrontal lobes tend to be abnormal in psychopaths.[41] In addition, we have often heard the term "cold-blooded," or "he had ice in his veins" when referring to psychopathic killers. This is a reference to the hypofunction of the autonomic nervous system in psychopaths. The autonomic nervous system controls basic bodily functions such as the production of saliva, blood pressure, pulse, breathing, sweating, skin conductance, and bowel and bladder function. We can all relate to times of great emotional stress, such as taking an important test, when we had a dry mouth (shut-down of saliva production), felt short of breath, had a rapid pulse, were sweating profusely, and wanted to leave to go to the restroom. Many different studies have verified the fact that psychopaths tend to have minimal autonomic reactions to behaviors that would elicit the above responses in normal people.[38,42-45]

In addition to the cases reported by Damasio, others have confirmed that lesions of the orbitofrontal area, sometimes called the *ventromedial area,* result in aberrant social behavior.[46] In one of these studies Mah and colleagues[47] examined 31 patients with prefrontal cortex lesions of different types and compared them to 31 controls using the Interpersonal Perception Task. In this task subjects viewed videotaped social interactions and relied primarily on nonverbal cues to make interpersonal judgments, such as determining the degree of intimacy between two persons depicted in the videotaped scene. Patients whose lesions involved the orbitofrontal cortex demonstrated impaired social perception. Patients with lesions in the dorsolateral prefrontal cortex also showed deficits in using social cues to make interpersonal judgments. All patients, but especially those with lesions in the dorsolateral prefrontal cortex, showed poor insight into their deficits.

In a study of 23 patients with orbitofrontal dysfunction, 20 patients with other prefrontal lesions, and 39 controls, Berlin and coworkers[48] found that those with orbitofrontal lesions were more impulsive, experienced more subjective anger, reported less subjective happiness, and overestimated the passage of time.

The orbitofrontal cortex differs from the dorsolateral cortex in the type of encoded memories. Memorizing lists of items is a common test for episodic memory. This type of task activates the dorsolateral prefrontal cortex. This, however, is a somewhat artificial situation. In real life autobiographical memory, representing the recall of events in a person's past, is more important. This task utilizes the orbitofrontal lobes and relies on quick intuitive "feeling of rightness" to monitor the veracity and cohesiveness of retrieved memories.[49] Consistent with a strong interaction between the orbitofrontal area with the limbic system and emotions,

autobiographical memories clearly have greater emotional content than dry facts.

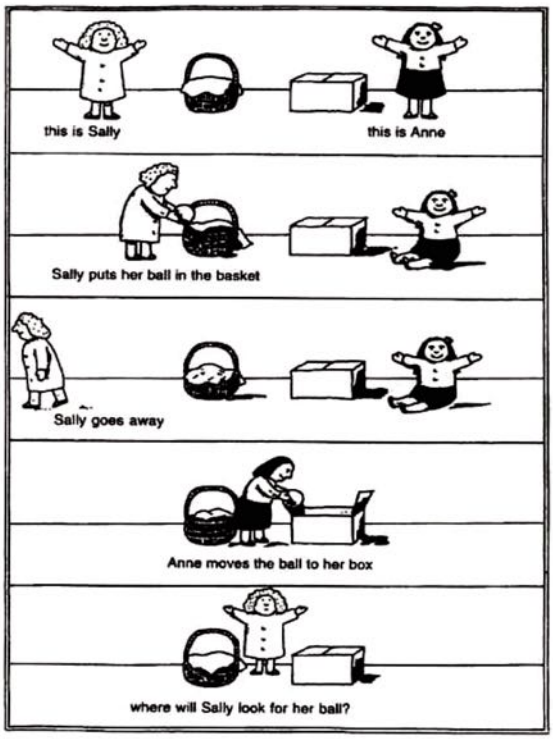

Figure 7. The Sally-Anne task to test for the ability to mentalize. [52]

The "Theory of Mind"

The ability to infer what other people are thinking and feeling is one of the most fundamental aspects of human social interaction. [50] This is often referred to as "mentalizing," or "understanding others' intentions," or having a "Theory of Mind" (TOM). The latter especially refers to the ability to recognize when others have false beliefs. A test of this ability is illustrated in Figure 7.

Here the subject being tested is shown this illustrated scenario which can be enacted by puppets or real people. At the end the subject is asked, "Where will Sally look for her ball?" To answer the question, the subject must realize that Sally has not seen the ball being moved and therefore, Sally would falsely believe that the ball is still in the basket. [51] The ability to mentalize is an important skill of the social brain. As stated by Frith: [52]

> The capacity to understand and manipulate the mental states of other people is necessary in order to understand and alter their behavior.…In everyday life, beliefs rather than reality determine what people do, and false beliefs play an important role. False beliefs can be removed by education and implanted by deception.

Mentalization developed late in evolution. It is not present in monkeys but appears in a primitive form in the great apes. In humans the ability to intuit what is in the mind of others plays an important role in daily conversation, in novels, movies, poetry and plays. The understanding that others may hold and act on false beliefs is widely held to be a cornerstone of social competence. [53]

Developmental psychologists have often addressed the question of when children first develop the ability to understand that others may have false beliefs. This has generally been assumed to begin to develop around four years of age [54] consistent with it being a cultural process tied to the development of language skills. However, one

study using testing that did not depend on the presence of language skills suggested that children as young as 15 months of age may understand false beliefs. [53] This would suggest an evolutionary and innate ability for understanding false beliefs.

Many studies have shown that autistic children have significant difficulty in understanding that others can have false beliefs [55,56] They are especially poor at putting themselves in another person's place and in imaginative or pretend play. In a study of the ability of autistic children to keep an opponent from retrieving a desired object from a box, they were able to do so by physical manipulation such as locking a box containing a desired object. However, they were very poor at using deception by simply telling the opponent a lie such as "the box is locked." [57] This requires putting themselves in the mind of the other person and thus thinking they would believe such a lie.

A number of brain imaging studies using PET and fMRI have been carried out to determine which brain area is involved in mentalizing. These are quite consistent in showing involvement of the medial prefrontal cortex (MPFC, Brodmann areas 32 and 10) especially on the left. [50,52,58-63]

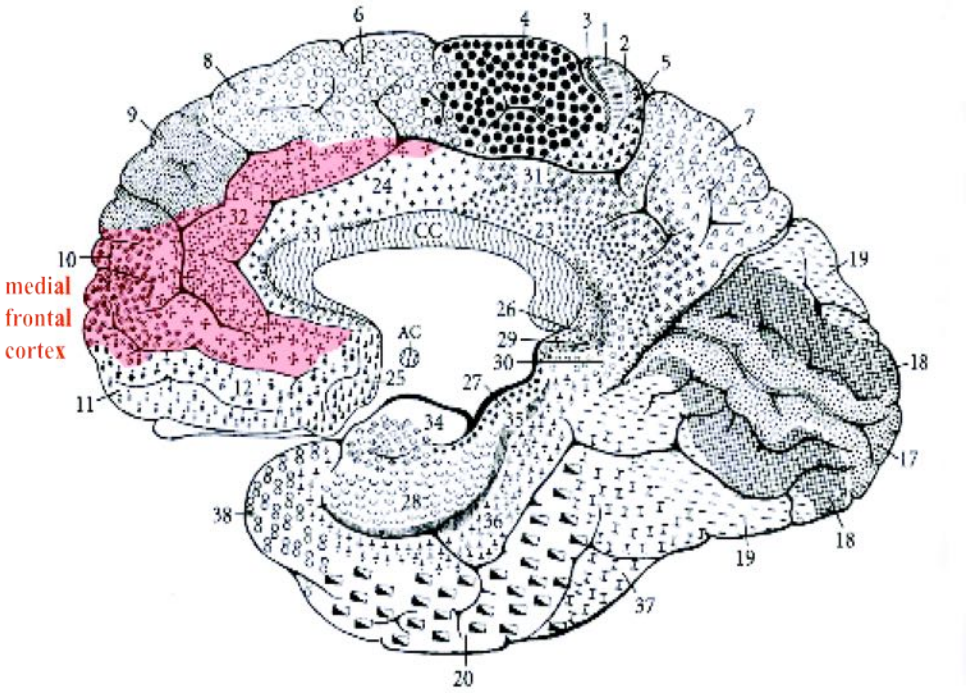

Figure 8. The medial prefrontal cortex (MPFC).

In some studies the anterior cingulate (BA 24) was also activated. [50] The amygdala may also play a role in theory of mind tasks. [64] The medial prefrontal area is activated during feelings of guilt [65] and it has been proposed as the site of self-reference or the self. [66] This is consistent with the important role of the prefrontal

cortex in consciousness. Patients with destructive lesions of the right orbitofrontal prefrontal lobes show some theory of mind defects, suggesting that this social brain area also plays some role in theory of mind tasks. [67]

The Mirror System

Mirror neurons form an additional intriguing aspect of the social brain and mentalization. When Macaque monkeys perform a motor task, a specific set of neurons is activated. When they watch another monkey perform the same task, the same set of neurons is activated. This is referred to as *mirroring* and the neurons involved are called *mirror neurons.* [68] They have also been called the "monkey-see, monkey-do" cells. In monkeys they are located in area 5 and the rear part of the inferior parietal lobule. [69] Area 5 receives inputs from the prefrontal cortex (area 46) and the cingulate, thus producing a specific frontoparietal circuit for hand actions in monkeys.

The mirror neurons are activated both by the action itself and whenever there are enough visual or auditory clues to perceive the meaning of the action. Macaque monkeys are social animals that live in groups characterized by intense social interactions. It is critical to each member to recognize the actions of others and to "understand" the meaning of the observed actions in order to appropriately react to them. [70] This understanding of meaning is thought to result from the fact that an observed action activates the same neurons that are activated when that action is performed by the subject themselves. Thus, when it is observed it is recognized and implicitly understood by the observer.

A similar but somewhat more-extensive system is present in humans. [70] Mouth, hand, and foot motions involve the respective parts of the motor association area. The prefrontal cortex component includes the *pars opercularis,* which is roughly equivalent to Brodmann area 44. As in monkeys, the inferior parietal lobule is involved. These areas are shown in Figure 9.

Similar areas are involved in imitation of the movements of others. This is especially important in learning from the actions of others, learning language, decoding the intentions of others, and empathizing with their pain.

Just as autistic children have difficulty with theory of mind tasks, they also have difficulties empathizing with others, suggesting a defect in mirroring. This can be studied by analyzing EEG data for *mu* rhythm suppression. *Mu* rhythms are suppressed or blocked when the brain is engaged in performing, observing, or imagining action and correlate with the activity of the mirror neuron system. While normal subjects show *mu* rhythm suppression to both their own and to observed movements, autistic children showed *mu* rhythm suppression only to their own movements. [71]

A defect in the mirror system in autistic children has also been demonstrated using fMRI brain scanning. [72] While imitating and observing emotional expressions such as fear, anger, happiness, and sadness, autistic children showed little or no mirror brain activity in the pars opercularis. The level of mirror activity was inversely related to the severity of the social problems. Autistic children typically have difficulty with

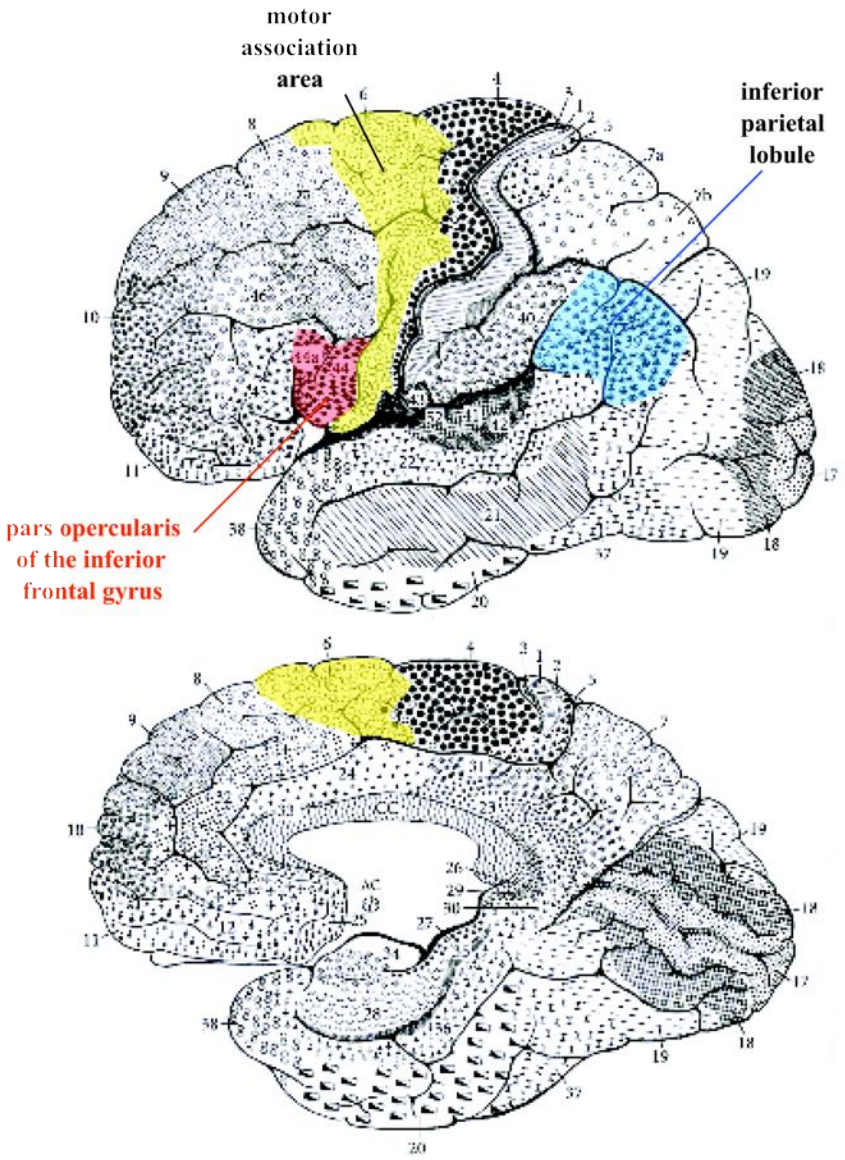

Figure 9. Brain areas involved in mirroring in humans.

metaphors, often interpreting them literally. This problem may be related to a dysfunctional mirror neuron system.

The orbitofrontal cortex and the mirror system provide two important capabilities to the social brain. The mirror system provides a fundamental mechanism for understanding the motor actions and physical intentions of others, while the orbitofrontal system provides a fundamental mechanism for understanding the emotions of others. [73]

These observations show that dysfunctions of specific parts of the social brain can lead to a range of asocial, antisocial, and amoral behaviors. The presence of

neurological and genetic lesions of these areas in some individuals leads to behaviors that tend to give the rest of the human race a bad name. Most humans do not have these neurological or genetic lesions, and it is quite likely that within a societal structure providing some basic secular laws, most humans do not need threats of divine wrath to behave in a moral and caring fashion.

The social brain monitors the interactions between individuals in a society, between parents and their children, between spouses or partners, and between friends and society as a whole. Many different parts of the brain are involved, reflecting the critical role of such interactions for socialization. These parts include:

- **The limbic system that adds emotional flavoring to life.**
- **The amygdala that teaches us who and what to be afraid of.**
- **The hormones oxytocin and vasopressin that are involved in pair bonding, monogamy, love, maternal care, and trust of others.**
- **The orbitofrontal prefrontal lobes that allow us to be connected to our emotions through the limbic system and the autonomic nervous system. This system controls our emotional behavior and allows us to have empathy and understand the emotions of others. Antisocial behavior is common when this area is dysfunctional.**
- **The medial frontal cortex that is involved in "theory of mind" tasks and allows us to put ourselves into the mind of others.**
- **The inferior frontal gyrus and inferior temporal module that are involved in mirroring and allow us to understand the physical actions and intentions of others.**

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Chapter 29

The Rational Brain

Throughout this book I have referred to our spiritual brain and our thinking or rational brain. There are two views of this concept. One view is concrete and implies that these two involve separate, discrete, and localized regions of the brain. The second view is metaphorical and implies that rational thought and spiritual feelings tend to be different but they may or may not be performed by separate parts of the brain. Which of these is more correct? The following chapters will examine the evidence for the involvement of rational thoughts versus spiritual feelings in separate versus similar parts of the brain.

The concrete interpretation carries with it the implication of modularity of brain function. This has been a popular concept since there is abundant evidence that different parts of the brain subserve different functions. For example, it is clear that the occipital lobes are the primary site for processing sight, the parietal lobes process touch, the temporal lobes process hearing, and the olfactory lobes process smell. The regions of the brain with the greatest modularity are these areas for primary sensory input. The nerve tracts that communicate within these areas are referred to as intramodal or primary associations. Intermodal nerve tracts producing secondary associations provide for communication between two different modular units. For example, tracts between the visual and auditory cortex would allow the conscious brain to perceive a dog by both its appearance and its bark. The third hierarchical level of association between multiple modules occurs in the heteromodal, or tertiary, association cortex. These are the latest parts of the cortex to evolve. This is especially true of the prefrontal cortex. The three major heteromodal regions are the inferior temporal (area 20), the inferior parietal (areas 39 and 40), and prefrontal cortex. These are shown in Figure 1.

Thus, the degree of modularity of a function would depend upon whether it involved the primary, secondary, or tertiary association cortex. The heteromodal areas occupy a large percent of the brain and service many different functions, while the primary association areas service a single function. As we shall see, complex brain functions such as rational thought involve heteromodal areas.

Right Brain — Left Brain

Before launching into the studies of the neurology of rational thought, it is also necessary to examine the differing role of the right and left brain. While they have many functions in common, it is clear that speech and language are localized to the left brain and involve Broca's and Wernicke's areas while spatial orientation tends to

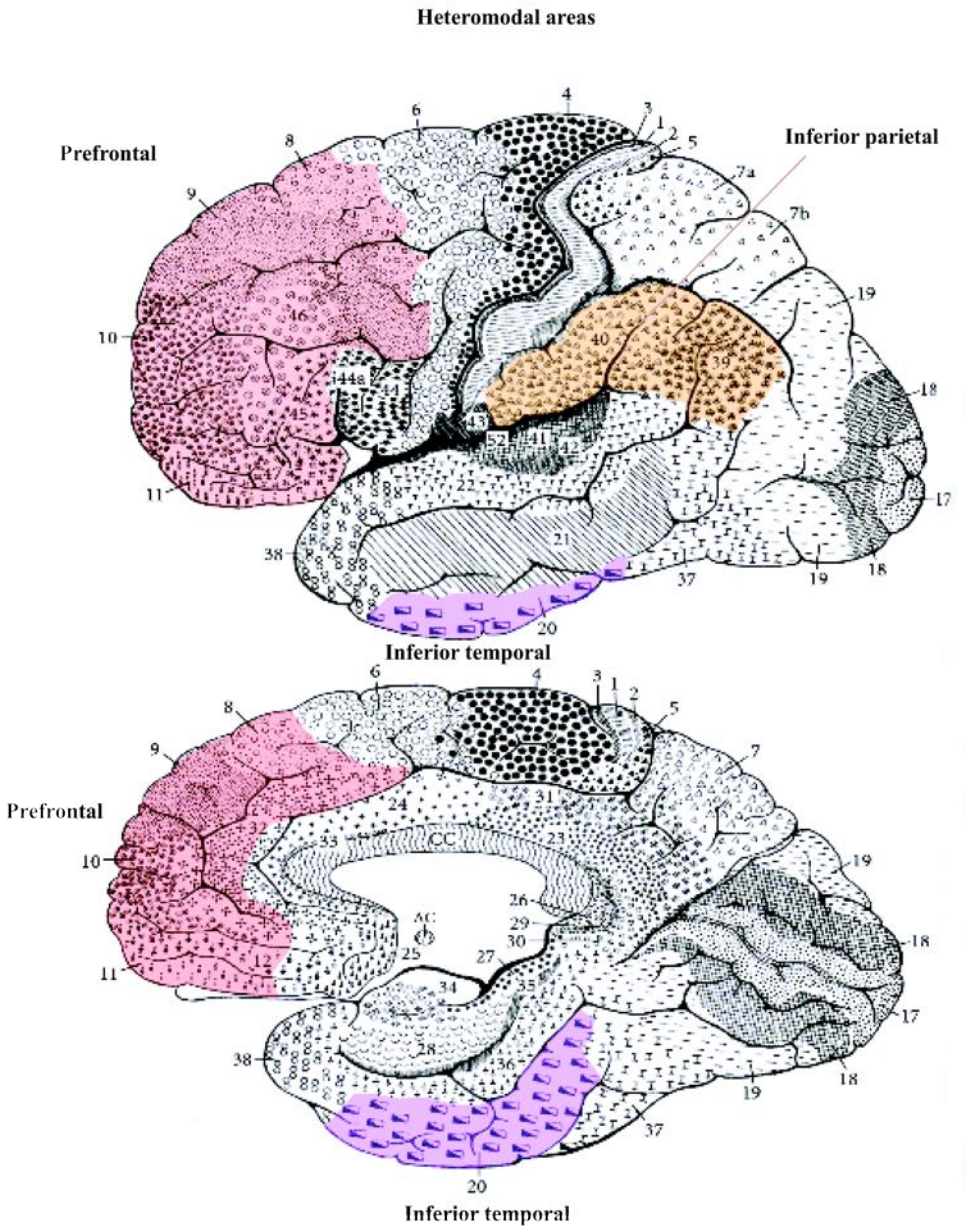

Figure 1. Tertiary or heteromodal association areas of the human brain.

be localized to the right hemisphere. This is practically illustrated by the fact that right handed individuals who have a stroke that compromises Broca's or Wernicke's area in the left hemisphere have trouble speaking, while those with strokes affecting comparable areas of the right brain have no effect on speech. Individuals with a stroke compromising the right hemisphere often have problems orienting themselves in space. In humans these specialized functions produce asymmetries in size between the

right and the left brain. The fact that the same asymmetries are present in animals who don't talk and don't have language suggests some more fundamental differences may be involved. [1p42] Many books have been written in the popular science field proposing that the left brain is the rational scientific, hard, male, "just give me the facts" brain, while the right brain is the intuitive, soft, feminine, spiritual brain. If this were valid we should not have to search any further for the location of the rational and the spiritual brain. The rational brain would be on the left; the spiritual brain would be on the right. However, neuroscientists do not agree with this popular version.

Novelty Versus Routine

Elkhonon Goldberg suggested a more fundamental difference: the right brain processes novel stimuli while the left brain processes routine stimuli. [1,2] This is highly relevant to learning. At an early stage of every learning process the organism is faced with "novelty," and at the end stage of the learning process thought is "familiar" and "routine." This view provides a reinterpretation of old assumptions about the left versus the right brain. For example, it was well known that music processing and the perception of faces occurred predominantly in the right hemisphere. This, however, was mostly true for musically naïve people. Trained musicians process music mostly with the left hemisphere. [3] The perception of new faces is also processed by the right hemisphere, while the perception of familiar faces is mostly processed in the left hemisphere. [4]

These findings of the preferential processing of novel information by the right hemisphere and routine information by the left hemisphere have been supported by PET scan studies. Based on PET studies of men who viewed pictures they had never seen previously and those they had seen previously, Tulving and colleagues [5,6] proposed that the right medial temporal lobe preferentially processed novel pictures.

Martin and colleagues [7] examined the learning of several types of information — meaningful words, nonsense words, real objects, and nonsense objects. Each type of information presentation was examined twice, first as a novel task and then as a practiced task. This showed that in the right middle temporal area, activation was consistently less with the practiced task. This was not the case for the left hemisphere. The fact that the results were the same for all four types of tasks is important because it shows that the activation of the right hemisphere depends less upon the type of task and more on whether it was a novel or a routine task. While there was a trend for meaningful words to activate the left temporal lobe and for meaningless words to activate the right temporal area, the meaningless words could be considered more novel. Similar results concerning the activation of the right hemisphere by novel tasks have been found for faces and symbols, [8] and for a complex frontal lobe task involving delayed response and delayed alteration. [9] These findings weaken the classic view that the right hemisphere is specialized for certain specific functions.

The change from novelty to learned or routine also results in successively less brain work for the learned task. This was well demonstrated in a PET study of

learning a popular computer puzzle called Tetris. [10] The rate of metabolism of the brain regions involved decreased with increasing practice. A seven-fold increase in skill was associated with a significant decrease in brain metabolism. This indicated that learning results in an increased efficiency of brain function. In summary, Goldberg states: [1p52]

> It appears that the cerebral orchestra is divided into two groups of players. Those sitting on the right of the aisle are quicker at basic mastery of the new repertoire, but in the long run, with due practice, those on the left of the aisle come closer to perfection.
>
> It can be argued that the whole history of human civilization has been characterized by a relative shift of the cognitive emphasis from the right hemisphere to the left hemisphere owing to the accumulation of ready-made cognitive "templates" of various kinds. These cognitive templates are stored externally through various cultural means, including language, and are internalized by individuals in the course of learning cognitive "prefabricates."

There is, however, more to the right brain/left brain issue than novelty versus routine. Further studies on roles of the left and right brain, based on split-brain and other experiments, will be discussed in more detail later.

Working Memory

The process of making decisions is carried out thousands of times per day and is aided by the *working memory.* Things such as birthdates, places, faces, and an untold number of other facts are stored in permanent memory, not in working memory. Working memory knows where this information is stored and accesses these facts, or "engrams," on a need-to-know basis. It temporarily brings these items "online," allowing the brain to place things in their proper spatial or time sequence, organize, prioritize, make decisions, and plan. It holds items online that would otherwise never meet and gives them a chance to interact. Working memory is constantly and rapidly changing its content. The dorso- lateral prefrontal cortex is the major location for working memory. [11] The efficiency of working memory is strongly correlated with IQ. [12]

Two major types of facts involve the questions "What?" and "Where?" The facts of the visual "What" system (an apple, or a cat, or a car) are stored along the occipital-temporal cortex and is referred to as the *ventral visual system.* The facts of the "Where" type (in the bathroom, the living room) and other spatial information are stored along the occipital-parietal cortex and is referred to as the *dorsal visual system* (see Figure 2.)

The inferior parietal lobule was discussed elsewhere in relation to the mirror neurons. When the relevant engrams are recalled, different parts of the prefrontal lobes are utilized. Accessing the "What" facts into working memory activates the inferior portions of the prefrontal lobes. Accessing the "Where" facts into working memory activates the superior portions of the prefrontal lobes. [13,14]

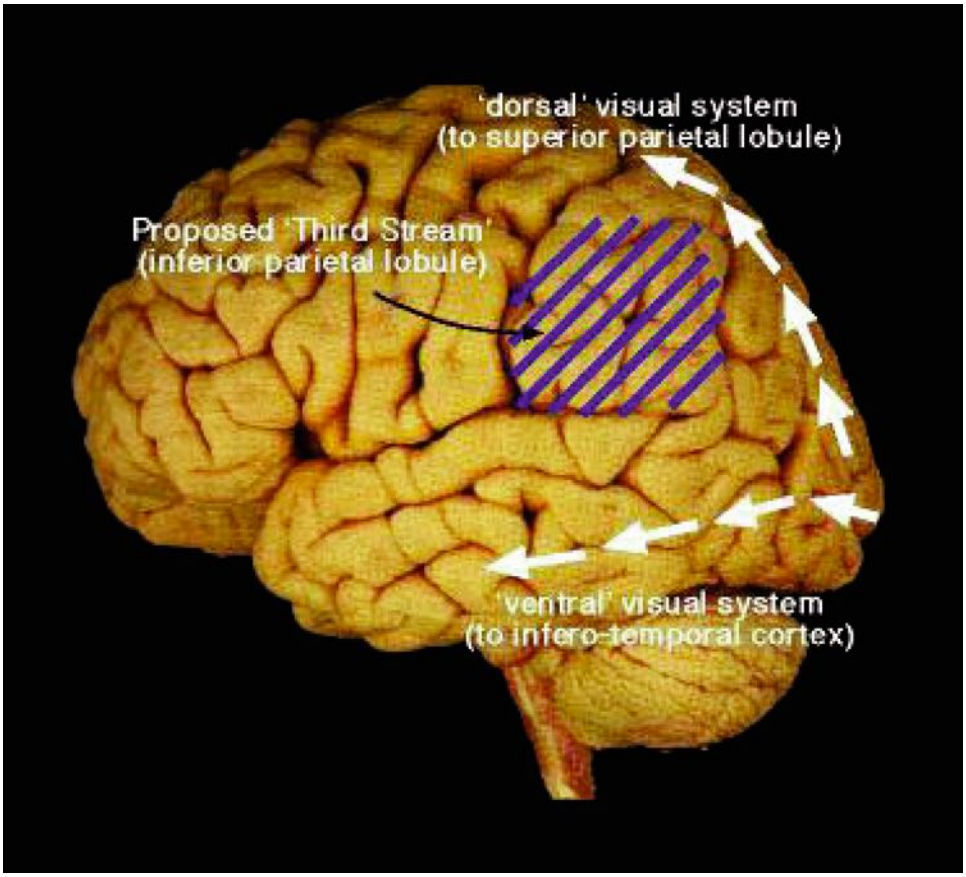

Figure 2. The location of the dorsal (Where?) and the ventral (What?) system and the inferior parietal lobule. [12a]

What is Rational Thought?

We cannot identify the brain areas involved in a rational thought unless we have a precise definition of rational thought. Decision-making is at the core of rational thought and is the skill that characterizes the rational brain. There are two types of decision-making: *veridical* and *adaptive.* Veridical is derived from the Latin verus = true + dicere = to say; thus veridical is "to say the truth." Veridical decision-making refers to making decisions about things that have a single, clearly defined value where there is only one correct answer. For example, when asked whether there are 10 or 12 months in a year, a veridical decision is involved, since the only valid decision is to say 12. By contrast, adaptive decisions refer to those where there is no absolute right answer. The answer is *ambiguous.* Some adaptive decisions have only a trivial effect on one's life, such as "Shall I order the steak or the lobster? Other adaptive decisions that a person makes can determine the future course of their life. "Shall I finish college or drop out and play basketball?" "Shall I take the high-paying job with no opportunity for advancement or the low-paying job with many opportunities for advancement?" "Shall I marry Jane or Sally?" Decisions relevant to this book would include, "Is

Darwin's theory of evolution correct, or is the account of the origin of life in Genesis correct?", "Is the Big Bang account of the origin of the universe evidence for the existence of God, or is it consistent with the laws of physics?"

The complexity of adaptive decision-making and its reliance on working memory was illustrated by Goldberg's and Podell's [15] example: "What suit shall I wear today?"

> The situation is ambiguous and it is up to the individual to make the choice. While the choice is usually made quickly and "unthinkingly," maybe half-awake, it is not random. Presumably, the individual weighs various priorities. Is it particularly important for him to be warm today? Or to look dapper? Or to look wealthy? Or to look conservative? Depending upon whether he is coming down with a cold, planning a date, trying to obtain a line of credit, or giving a job interview, he will rank the priorities differently. The priorities characterize the actor and not the contents of his closet. Once the priorities have been ranked, the situation has been disambiguated, and the remainder of the decision-making process is veridical.

Answering these questions requires working memory. If the decision about the suit requires knowing the current outside temperature, the engram containing the weather report on the morning news is accessed. If the decision about the suit relates to looking dapper, the engram containing the pictures of the styles in the latest fashion magazine is retrieved. And so on. A dance takes place between the cortex containing working memory and the adaptive decision-making cortex.

Where is Rational Thought Localized?

Since adaptive decision-making is at the core of the function of the rational brain, identifying the brain site for this process is very relevant. As referred to above, resolving the ambiguity surrounding an adaptive decision has been referred to as *disambiguating the situation.* Dealing with ambiguous situations represents the function of the frontal lobes in its finest hour. In the dementias, making adaptive decisions is one of the first skills to be lost. Making veridical decisions is more resistant to loss.

Given its importance, this aspect of cognition has been relatively ignored in cognitive neuroscience. Goldberg and Podell attempted to remedy this situation by developing a test for adaptive decision-making. [15-17] This test consists of a target which is a geometric design, followed by two additional designs. Figure 3 is an example. [15]

By presenting subjects with a number of such cards a Cognitive Bias Task (CBT) score can be calculated. This score is highest when the target and the choice are similar. For example, this would occur in the above card when the pair of blue dots was chosen. The score would be lowest when the target and the choice were different. This would occur in the above card when the red square was chosen.

Ambiguous decision. In the ambiguous decision-making, as part of the task the

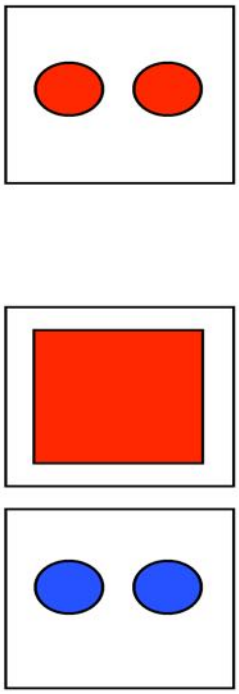

Figure 3. A sample card from the Cognitive Bias Task. The top is the target while the bottom two present the choice. From Goldberg and Podell. Adaptive versus Veridical Decision-making and the Frontal Lobes. In Consciousness and Cognition. *8: 364-377, 1999.*

subject is simply asked to "Look at the target and select the choice you like the most." This is ambiguous because there are no wrong answers and the subject is told there are no wrong answers. The subjects actually have two options: to base their response either on the properties of the targets (in this case, shape) or on some preference unrelated to the target (in this case, color). Despite the looseness of the task the responses were quantifiable and highly repeatable. Of interest, the responses were dramatically different for subjects with frontal lobe damage compared to those without such damage, while damage to other parts of the brain had no effect.

Disambiguated decision. In the second part of the task the decision was disambiguated by asking the subjects to "Make a choice most similar to the target" and then again with the instructions to "Make a choice most different from the target." The results for females with frontal lobe lesions are shown in Figure 4.

In the "match to similar" task (green) both the normal women and women with a frontal lobe lesion had high CBT scores, and in the "match to different" task (dark blue) both had low CBT scores. In the "like the best" task, the normal controls had a CBT score between these two extremes, indicating that in the ambiguous decisions some cards were matched by shape and some by color, whichever they "liked the best" (red). However, in women with

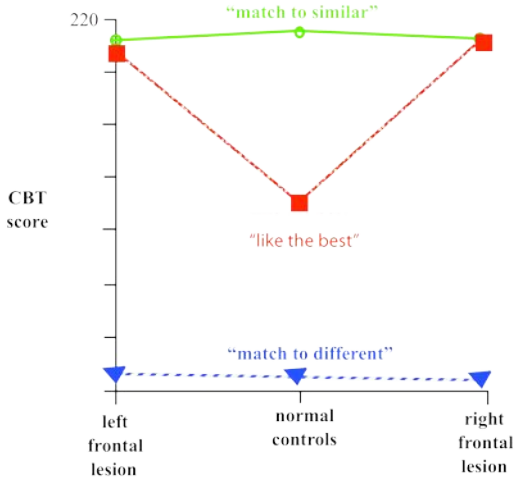

Figure 4. Cognitive Bias Task for females with left or right frontal lobe lesions compared to normal controls. From Goldberg and Podell. [15]

frontal lobe lesions, the CBT scores were identical to their "match to similar" scores, indicating they had problems with the ambiguous "like the best" decisions. Goldberg stated: [1p80]

> Our experiment shows that the frontal lobes are critical to a free-choice situation, when it is up to the subject to decide how to interpret an ambiguous situation. Once the situation has been disambiguated for the subject and the task has been reduced to the computation of the only correct response possible, the input of the frontal lobes is no longer critical, even though all the other aspects of the task remain the same. Of all the aspects of the human mind none are more intriguing than intentionality, volition, and free will. But these attributes of the human mind are fully at play only in situations affording multiple choices.

Goldberg refers to ambiguous decisions as actor-centered decisions and decries the fact that both cognitive neuroscientists and educators have ignored this form of decision-making. Most educators focus on fact-laden veridical decisions, while in life the adaptive decisions are the important ones. These are also the important decisions involved in the development of civilization and in deciding one's spiritual and religious views. Adaptive decisions are uniquely human and they are performed in the prefrontal lobes.

Brain Imaging Studies

The above conclusions about the role of the prefrontal cortex in decision-making were based on studies of normal versus brain injury subjects. A number of studies using brain-imaging techniques also support the role of the prefrontal lobes in decision-making. The following are some examples:

Cognitive bias task. One study actually used the Cognitive Bias Task. [18] Twelve young adult men were studied using SPECT (Single Photon Emission Computed Tomography). This showed bilateral activation of the dorsolateral prefrontal cortices and middle temporal gyri. The middle temporal activation represented the sensory response to the images. The prefrontal activation represented the decision-making aspect of the task.

Perceptual decision-making. Heekeren and colleagues [19] from the National Institute of Mental Health presented human subjects with the perceptual decision of determining whether an image was a face or a house. Two versions were used; clear pictures referred to as *suprathreshold images,* and unclear or blurred figures referred to as *perithreshold images.* They sought to identify the brain regions that were more activated by the suprathreshold than the perithreshold images. Functional MRI showed that this region was the left superior frontal sulcus in the posterior region of the dorsolateral area (Brodmann area 8/9) shown in Figure 5.

Thus, while the images of faces versus houses are stored in separate regions of the

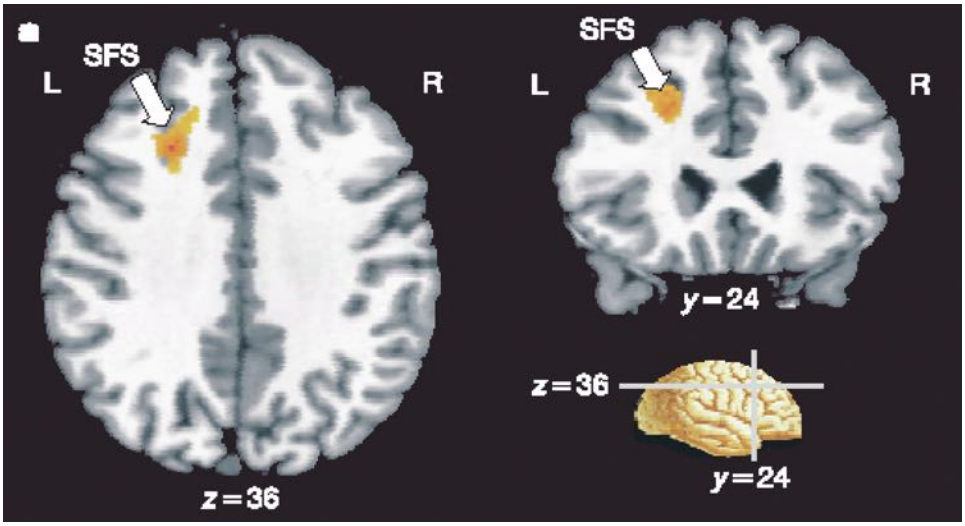

Figure 5. Perceptual decision-making in the superior frontal sulcus (SFS) of the posterior dorsolateral prefrontal cortex. From Heekeren et al.: A general mechanism for perceptual decision-making in the human brain. Reprinted by permission of Macmillan Publishing, Ltd. Nature. *431:859-862, 2004.* [19]

ventral temporal cortex, the decision about which was which rested in the dorsolateral area of the prefrontal cortex. Their study also provided insights into the role of attention in decision-making. When the targets were more ambiguous, the attentional networks were activated. When the images were clear, they were not. Other studies involving different types of decision-making [20-22] activate the same area, indicating that the *dorsolateral prefrontal region has general decision-making functions* independent of the stimulus.

Deductive and inductive reasoning. The rational brain is the brain involved in reasoning. Reasoning is a cognitive process of drawing inferences from a given set of information. Reasoned arguments involve the claim that one or more premises provide some grounds for accepting a conclusion. The arguments can be deductive or inductive. Deduction is what you do when you know the principles of something and deduce a particular case. For example, if you know the principles of arithmetic, you can deduce that 23 + 161 = 184, even if you have never seen this example before. Deductive reasoning can be judged as valid or invalid. Induction is the opposite. It is the process of reasoning in which the conclusion of an argument is very likely to be true, but this is not certain, given the premises. Inductive reason can only be judged as probable or improbable. The logic formats involved are called *syllogisms.* The following syllogisms illustrate the difference between deduction and induction. [23]

Deduction:

All animals with 32 teeth are cats. No cats are dogs. No dogs have 32 teeth.

Induction:

House cats have 32 teeth. Lions have 32 teeth. All felines have 32 teeth.

Goel and colleagues [23] presented 25 valid and 25 invalid deduction syllogisms and 25 probable and 25 improbable induction syllogisms to 16 subjects and asked them to judge each deduction as valid or invalid and each induction as probable or improbable. The deductive choices activated the left inferior frontal gyrus portion of the dorsolateral prefrontal cortex (Brodmann area 44 and 45). The inductive choices activated the left dorsolateral prefrontal gyrus. *Thus, as with adaptive and perceptual decision-making, both deductive and inductive reasoning also involved the dorsolateral region of the prefrontal cortex.*

Intelligence. Intelligence is assessed using intelligence or IQ tests. Statistical tests indicate that many types of IQ tests share a common factor called *g,* for general intelligence. PET studies have shown that when individuals perform tasks with high-g involvement, there is bilateral activation of the dorsolateral prefrontal cortex. [24] This is additional strong evidence of the role of this part of the brain in rational, intelligent thought.

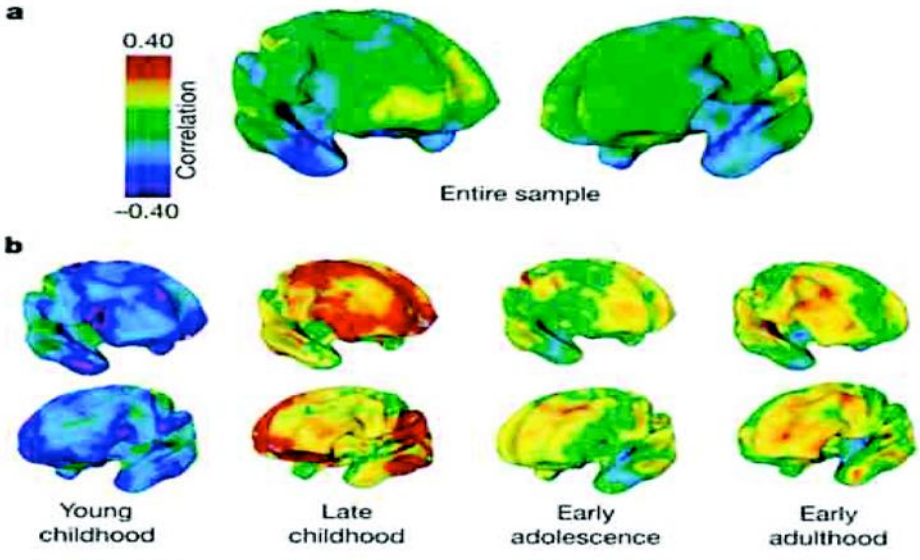

Figure 6. Correlations between IQ and thickness of the cortex of the brain. From Shaw et al: Reprinted by permission from Macmillan Publishing, Ltd. Nature. *440:676-679, 2006. By permission.*

Longitudinal studies illustrate why the location of the portion of the brain that correlates with IQ testing has been difficult. Phillip Shaw and colleagues at the National Institute of Mental Health performed MRI scans on 307 children from six to 19 years of age [25]. IQ was assessed using the Wechsler Intelligence Scales. Figure 6 shows in red the areas of the brain that showed the highest correlation between IQ and the thickness of the cortex of the brain.

The striking finding was that the strongest correlations occurred during late childhood, around 10 to 12 years of age, in the prefrontal and temporal lobes on both

the right and left sides of the brain. If these studies of structure rather than function had been limited to adults, this correlation would have been missed.

These findings suggest that the concept of left brain = language and rational thought while the right brain = intuitive and spiritual activities is too simplistic. The dorsolateral areas of both the right and the left prefrontal lobes represent the primary neural location of our rational brain with a contribution of the temporal lobes during development.

The dorsolateral prefrontal cortex is the neural site of working memory, intelligence loaded tests, abstract thought, adaptive decision-making, deductive and inductive reasoning. It is the major site of our thinking or rational brain.

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12a. From psyche.cs.monash.edu.au/v5/psyche-5-08-turnbull1.jpg

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I have really touched God. He came into me, myself; yes God exists, I cried, and I don't remember anything else. You all, healthy people, can't imagine the happiness which we epileptics feel during the second before our attack.

F. Dostoyevsky
The Idiot

Our deepest spiritual convictions may be nothing more than fluctuations in brain chemistry.

Albert Hoffman
Discoverer of LSD

The realization that the God Experience could be an artifact of the human brain was intellectually paralyzing.

Michael Persinger
Neuropsychological Bases of God Beliefs [1p16]

Chapter 30

The Spiritual Brain

In the previous chapters we have seen that specific brain areas are involved in consciousness, thinking and rational thought (the rational brain), pleasure (the pleasure brain), and societal interactions (the social brain). Is there also a spiritual brain, a neural location for feelings of spirituality, feelings of being connected to something larger than ourselves, feelings of immortality, feelings that we are special, and feelings that God is talking just to us? The answer is yes. This chapter reviews the evidence suggesting that the temporal lobes represent the neural location for spirituality.

Anatomy of the Temporal Lobes

Before entering this world of spiritual feelings it is important to provide a brief review of some of the important aspects of the temporal lobes. They function as the primary association area for hearing (language, music, rhythm) and smelling. They are the secondary association area for visual recognition of color and shapes including faces. They are the site for memory (hippocampus) and fear (amygdala). They link the past and present sensory and emotional experiences into a continuous self. The left temporal lobe is involved in speech. The speech circuit contains the cortex for hearing speech, for processing that speech (Wernicke's area), the nerve tracts for passing that information to Broca's area for expressive speech, and from there to the motor area for talking (Figure 1A). In response to auditory input, PET scan images of the speech circuit show activation of Wernicke's area, the auditory association cortex, and Broca's area (Figure 1B).

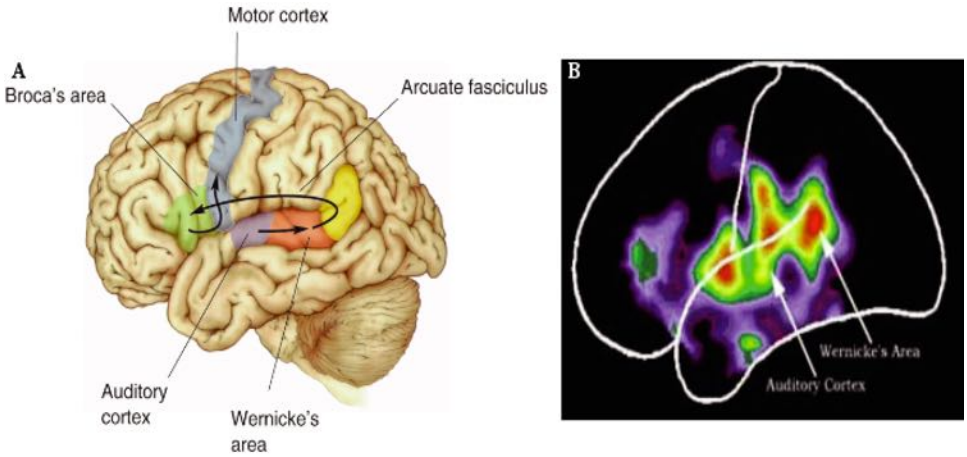


Figure 1. A. Speech circuit of the human brain. B. PET scan of speech circuit.

The association areas of the temporal lobe are shown in Figure 2.

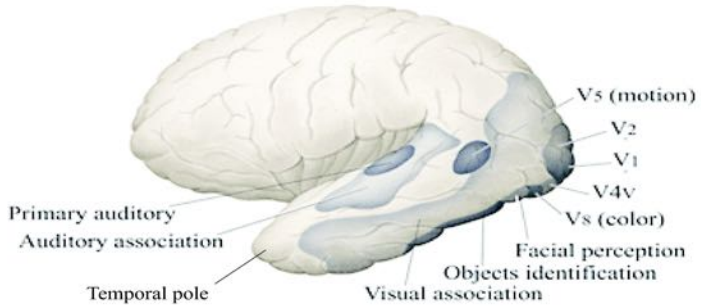


Figure 2. Visual association functions of the temporal lobes. [2]

V1 and V2 represent the visual cortex of the occipital lobe (Figure 2). The V4 area is critical for color consistency and hue discrimination. The V5 is the visual motion center. The right temporal lobes are important in spatial orientation—"where am I? How do I get home from here?" The very tips, or *poles,* of the temporal lobes are heavily connected with sensory regions and integrate sensory, emotional, and cognitive functions.

When monkeys who had both temporal poles removed were placed back in the colony, they were isolated and had very impaired social relationships. In humans, imaging studies indicate the temporal poles are involved in linking symbols to names and recalling emotional and traumatic events. The temporal pole on the dominant side is involved in recalling proper names and learning new visual patterns. Thus, individuals who have had the left temporal lobe removed have trouble recalling people's names. On the non-dominant side, the temporal pole processes words when perceiving sad faces and experiencing anger. Parts of the temporal lobe farther back from the pole participate in recalling names of objects and tools. As shown in Figure 3, the hippocampus and amygdala are located in the depths of the *mesial* or middle

part of the temporal lobe.

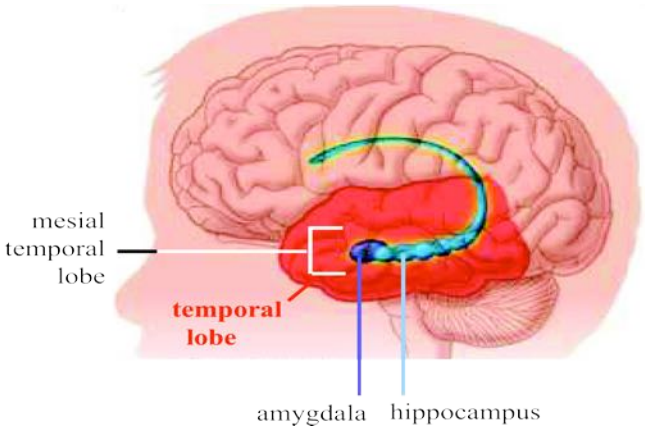


Figure 3. Relationship of the amygdala (purple) and hippocampus (green) and mesial temporal lobe (red) www.BrainConnection.com, Scientific Learning Corporation, 1999. By permission. [2b]

What is the evidence that the temporal lobes are the site of the spiritual brain? Evidence comes from studies of the electrical stimulation of the brain in conscious subjects, clinical histories of individuals with temporal lobe epilepsy both during and between seizures, the effects of traumatic lesions of the temporal lobes, imaging studies, studies of near-death experiences, spontaneous and drug-induced hallucinations and studies of individuals experiencing a range of spiritual and religious feelings. Some of these conditions produce a feeling of being detached from oneself as in out-of-body experiences or a feeling of being detached from one's own emotions (depersonalization); feelings that everything is unfamiliar, strange and not real (derealization); a sense of timelessness and spacelessness; hallucinations; ecstasy; dreamy states; joy; and other experiences that foster a religious interpretation.[3] Temporal lobe epilepsy (TLE) has played a central role in deciphering the functions of the temporal lobe.

Temporal Lobe Epilepsy (TLE)—History

While any part of the brain can be the site of seizure activity, over a period of many years it became apparent that there is something uniquely spiritual about seizure activity that emanated from the temporal lobes. One of the most common causes is sclerosis of the hippocampus in the mesial temporal lobe.

Sclerosis of the hippocampus was first identified in 1885.[4] This sclerosis was reported in patients with "alienation-type" seizures. In 1899, Hughlings Jackson[5] described what are now known as psychomotor seizures. The examination of the brain tissue of individuals who had a history of psychomotor seizures[6,7] showed unique changes with fibrosis and hardening, referred to as *hippocampal sclerosis.* In 1938, Gibbs and colleagues[8] first described the EEG pattern in patients with psychomotor seizures. A few years later, in studies of the open brain, neurosurgeons[9]

identified the temporal lobes as the site of psychomotor seizures.

A breakthrough in the treatment of TLE came with the recognition that EEG spikes, present in the absence of seizures, could be used to localize the exact site of the otherwise invisible lesions.[10] As a result, the brain tissue at such sites could be removed, resulting in the elimination of the seizures. In cases where the entire temporal lobe was removed, pathological examination usually showed the presence of hippocampal sclerosis.[11] The technique of placing electrodes deep into the temporal lobes during surgery allowed recordings to be made directly from the hippocampus. TLE is the most common of the drug-resistant forms of epilepsy. Of the 2.5 million people in the United States with epilepsy, 30 percent are resistant to drug treatment, and half of these, or 375,000, have temporal lobe epilepsy.[12]

A range of sensations (auras) prior to seizures are common in TLE. These can include psychic symptoms such as fear, upset stomach, and the aberrant sensation of various smells or tastes. If overt seizures occur, they are called *complex partial seizures,* consisting of freezing of motion, posturing of one arm, staring, lip-smacking, chewing, and other "automatisms." After the seizure there may be disorientation and amnesia of the event. If the seizure occurs in the left temporal lobe ,there may be a period of difficulty with speech and a verbal memory deficit. If it occurs in the right temporal lobe, there may be a visual-spatial memory deficit.

Wilder Penfield and Mapping of the Spiritual Human Brain

Just as consciousness and the "soul" are brain-based, so are spiritual and religious experiences. The evidence for this began with the studies by the famous Canadian neurosurgeon, Wilder Penfield. One advantage of animal studies in neuroscience is that it is possible to electrically stimulate different parts of the exposed brain. However, animals are not suitable for studies of spirituality since even if spiritual feelings were generated, they could not communicate those feelings to us. Since most people would object to having their brain exposed just to allow some curious scientist to probe around, such experimental studies are difficult in humans. The exception is when a brain is exposed for neurosurgical operations, as for epilepsy. A unique advantage of such surgery is that the brain has no pain receptors. It is thus possible to perform surgery on conscious, talking patients.

Taking advantage of this unique opportunity which is a part of the process in identifying the lesions causing temporal lobe epilepsy, Penfield began a systematic process of electrically stimulating different parts of the brain and recording the verbal responses in conscious subjects. He found that he was able to elicit episodes of "reliving past life" when the temporal lobe was stimulated. No other part of the brain elicited this response. He first obtained these results in 1934, when a patient related that she was reliving a past event. She "saw herself as she had been while giving birth to her baby." While Penfield immediately realized the relevance of this memory recall to the field of psychiatry, he wanted to accumulate additional careful documentation before publishing these remarkable results. Thus, it was not until he was invited to give the Mandsley lecture in 1954 that he shared two decades of his studies with his colleagues.[13-15]

Penfield classified the responses, both from seizures and from direct brain stimulation, into three types: *experiential,* having to do with the past; *interpretative,* having to do with the present; and *amnesic seizures,* with automatisms or psychomotor confusion. He noted that the electrical stimulation of the temporal lobe often brought back a period of past experience with a startling degree of vividness and detail, allowing the subject to review the sights and sounds and thinking of a previous period of time.[14] Penfield referred to these as *psychical* effects. This is not to be confused with psychotic. The word psychical was used by Hughlings Jackson to denote more complicated mental phenomena that involve the complex integration of many different neurons. Some case reports illustrate the point. The following are a few of Penfield's cases.

- A 19-year-old male had temporal lobe seizures that were sometimes precipitated by listening to music. At the beginning of each attack he experienced what he termed a flashback that was "much more distinct" than anything he could summon to his memory. During the operation, stimulation of the anterior part of the first temporal lobe convolution on the right caused him to say, "I feel as though I were in the bathroom at school." A few minutes later, when the electrode was re-applied near the same area, he said something about a "street corner." When asked where, he said, "South Bend, Indiana, corner of Jacob and Washington." A subsequent stimulation produced "music from *Guys and Dolls.*"
- A 26-year-old woman had recurring temporal lobe seizures. The attacks led her to say, "[I feel] as though I have lived through this all before." After another attack without warning she seemed to be sitting in the railroad station of a small town, which she felt was Vanceburg, Kentucky. "It was winter and the wind is blowing outside and I am waiting for a train." This was apparently an experience from her past life, but was one she had forgotten.
- A 33-year-old male had right temporal lobe epilepsy. During the operation, he was electrically stimulated at a depth of 2 cm in the right superior surface of the temporal lobe. This caused the patient to say, "That bittersweet taste on my tongue." He seemed confused and made swallowing movements. When the stimulation was turned off, the EEG showed that a 4-per-second generalized *theta* rhythm had been produced. While this was continuing the patient looked terrified and exclaimed, "Oh God! I am leaving my body."[13] These are called *out-of-body-experiences* (OBEs).
- A 30-year-old man had minor seizures apparently due to an old traumatic lesion of the left temporal lobe. During some of his minor attacks he stated that "thoughts" kept coming into his mind. When asked if they were memories he said, "No, they were more like words or combinations of words."

  He tried to explain by saying that it was like having a dictionary and having different words come to mind. At another time he said it was like thinking two things at once. At such time he would look around, he said,

> and know what was happening and yet the thoughts kept coming. This state was followed by confusion and automatism and after the automatism was over, some slight tendency to aphasia. [13]

- A 46-year-old man from South Africa had a diagnosis of left temporal lobe epilepsy. During stimulation of the left first temporal convolution, he stated he was going back to a conversation in Johannesburg and was "spiritually" speaking to an unknown woman. [15p629]
- A 31-year-old male had a diagnosis of left temporal lobe epilepsy that was often asociated with experiential hallucinations. During stimulus of the inferior temporal lobe he said, "I am going to die." When asked if he saw anything, he said, "No, God said I am going to die." [15p636]

The different epileptic discharges from the right temporal lobe were causing him to experience a sense of *déjá vu,* a sense of fear, and reproduction of previous experiences. One of his psychical responses after brain stimulation was, "I heard voices down along a river somewhere—a man's voice and a woman's voice calling." A few minutes later after stimulation of a similar area he said, "I hear voices, it is later at night, around the carnival somewhere—some sort of traveling circus. I saw lots of big wagons that they used to haul animals in." Re-stimulation a few minutes later produced, "I seemed to hear little voices, the voices of people calling from building to building somewhere—I do not know where it is but it is very familiar to me."

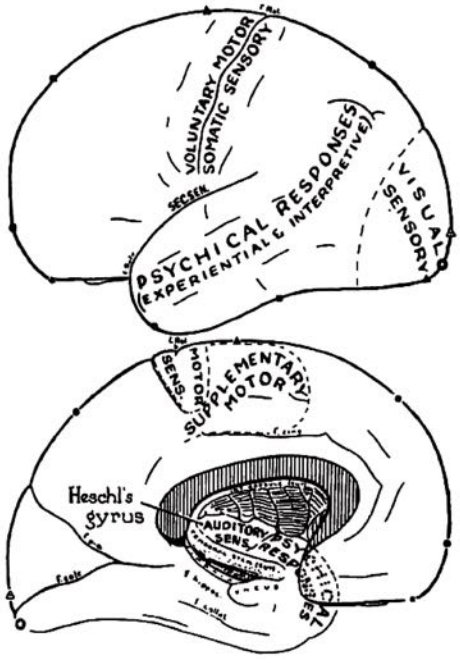


Figure 4. Areas of the cortex from which psychical responses are obtained. The upper figure shows the lateral structures; the lower figures shows medial structures. The major sensory and motor areas are also indicated. From Penfield [13] Permanent Record of the Stream of Consciousness. Acta Psychologia. *11:47–69, 1955. By permission.*

As shown in Figure 4, the entire temporal lobe and parts of the parietal lobe may be involved in the *experiential* and *interpretative* psychic experiences.

Better detail concerning the precise location of the sites of stimulation eliciting experiential responses is shown in Figure. 5.

The majority of the sites are at the Sylvian fissure at the top of the temporal lobes. This map is extremely relevant to the common statement that the right but not the left temporal lobe is the spiritual brain. Clearly, both the right and left temporal lobes are involved in experiential psychical responses. This map also shows that most of the experiential responses occur in the region of the auditory association

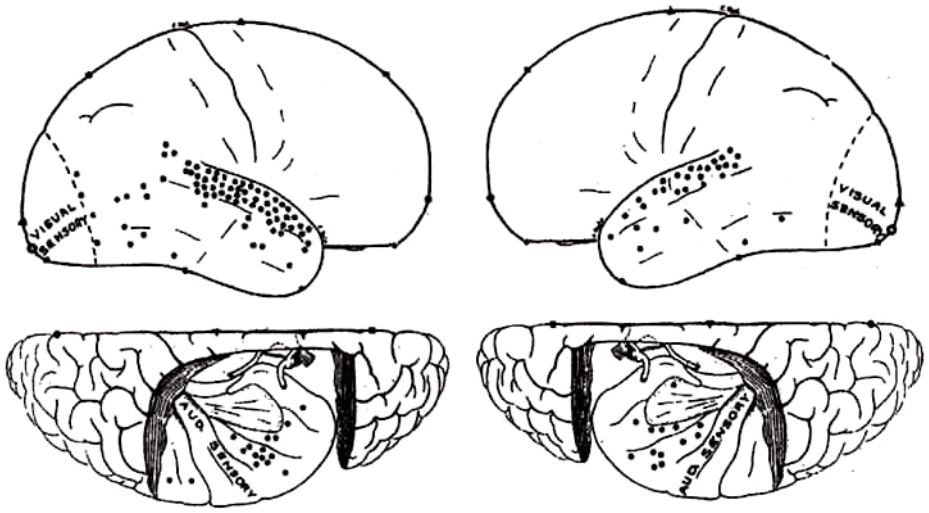


Figure 5. Summary of stimulation sites producing experiential responses. The top shows the sites from the right hemisphere (left) and left hemisphere (right). The bottom shows the comparable sites from the underside of the temporal lobes. From Penfield,[15] The Brain's Record of Auditory and Visual Experience. Brain. *84: 595–696, 1963. By permission.*

cortex, as shown in Figure 2. These sites are located between the visual (occipital) and auditory (gyrus of Heschl) association areas. This is consistent with the involvement of both visual and auditory aspects of experiential responses.

It is also of note that no experiential responses were elicited from the dominant (left) speech area. The expressive or ideational speech area mapped by Penfield is shown in Figure 6.

Comparing this map with the map of the left hemispheres in Figure 5 shows the complete separation of the area of expressive speech from the areas involved in experiential responses. One additional figure from Penfield's studies allows us to see first hand the effect that the speech area has on right brain—left brain differences.

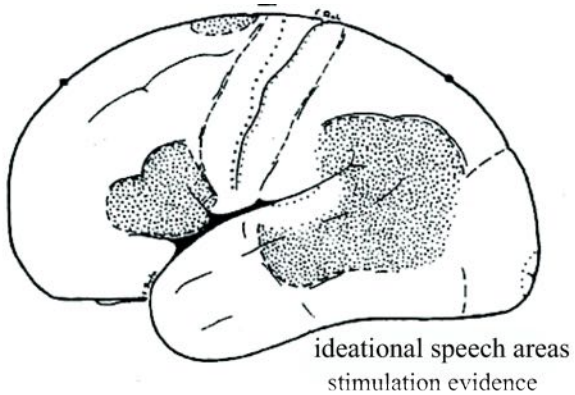


Figure 6. Map of the areas of the dominant hemisphere that are devoted to the ideational elaboration of speech. From Penfield,[15] The Brain's Record of Auditory and Visual Experience. Brain. *84: 595- 696, 1963. By permission.*

The large expanse of area involved in visual experiential responses in the temporal and occipital lobe on the non-dominant side is squeezed into one small area under the region of the auditory responses on the dominant side. This again illustrates that while there is a modest predominance of experiential responses emanating from the right hemisphere, the presence

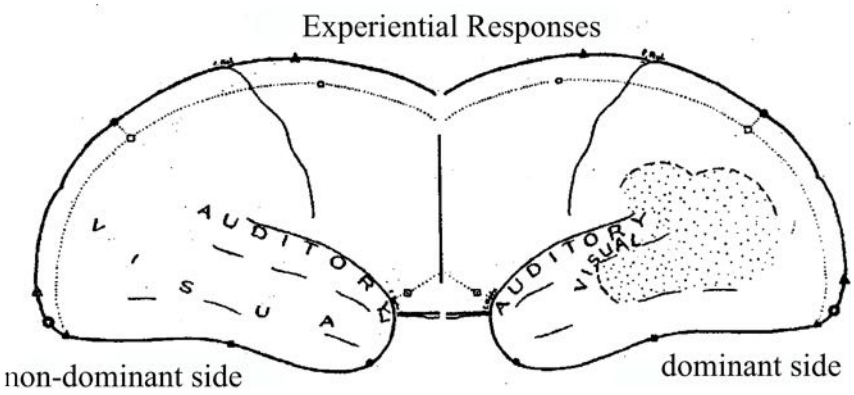


Figure 7. Auditory and visual experiential responses to stimulation shown for the lateral surfaces of both hemispheres. From Penfield,[15] The Brain's Record of Auditory and Visual Experience. Brain. *84: 595- 696, 1963. By permission.*

of the speech area has not eliminated them from the left hemisphere.

The area of the right hemisphere, corresponding to the speech area in the left hemisphere, is especially devoted to *interpretive* responses. Stimulation produces visual interpretive illusions, such as changes in the appearance of things as coming nearer or going farther away, changes in the apparent speed of things, and out-of-body experiences.

The region of the brain associated with automatisms was the amygdala; about 4 cm back from the tip of the temporal lobe and 4 cm deep into the lateral surface.[13] While in the automatic state, the patient is still conscious but in an altered state of consciousness. He may seem to be slightly or completely confused and may move about aimlessly, or may have some apparent purpose, a purpose not easily influenced by his companions. These are also called *fugue states,* and some examples will be given later. These illusions of familiarity and strangeness are almost always produced by discharge or stimulation of the non-dominant side.

There were a number of relevant characteristics and additional aspects of the psychical responses.

- Penfield felt that psychical responses were not hallucinations in the sense of psychotic or schizophrenic hallucinations because in all the cases the subject always talked to him, the "doctor," and never talked to the people in the re-play. In addition, they were not afraid. Patients having psychotic hallucinations often talk to the voices and are afraid of them.
- He also felt that the right temporal lobe was preferentially engaged in the reproduction of experiences from the past, while the left temporal lobe was preferentially involved in present experiences. This was presented as a supposition rather than fact. Whether valid or not, *psychical experiences were clearly generated from both the right and left temporal lobes.*
- Touching, music, lights and other sensory stimuli could precipitate temporal lobe

seizures. *Psychical precipitation by thoughts can also occur.*

- Hallucinations emanating from the right temporal lobe are more likely to involve non-verbal themes such as complex visual, musical, and singing themes, while hallucinations emanating from the left temporal lobe are more likely to involve verbal themes such as words and sentences. [16]
- *All subjects agreed that the psychical response was more vivid than anything they could voluntarily recall from memory.* They "never looked upon the experiential response as remembering. Instead it was a hearing — and seeing — again, a living through moments of past time."
- Penfield felt that in regard to memory, nothing was lost. The record of each man's experience was complete. He liked to describe what was happening in his psychical experiments in the following way:

> Among the millions and millions of nerve cells that clothe certain parts of the temporal lobe on each side, there runs a thread. It is the thread of time, the thread that has run through each succeeding wakeful hour of the individual's past life. Think of the thread, if you like, as a pathway through an unending sequence of nerve cells, nerve fibers and synapses. It is a pathway which can be followed again because of the continuing facilitation that has been created in the cell contacts.
>
> When, by chance, the neurosurgeon's electrode activates some portion of that thread, there is a response as though that thread were a wire recorder, or a strip of cinematographic film, on which are registered all those things of which the individual was once aware, the things he selected for his attention in that interval of time. Absent from it are impulses he ignored, the talk he did not hear.
>
> The time's strip of film runs forward, never backward, even when resurrected from the past. It seems to proceed again at time's own unchanged pace. It would seem, once one section of the strip has come alive, that a functional all-or-nothing principle steps in so as to protect the other portions of the film from activation by the electric current. As long as the electrode is held in place, the experience of a former day goes forward. There is no holding it back. When the electrode is withdrawn it stops as suddenly as it began.

In a final summary of his work [15] Penfield concluded that the interpretative temporal cortex involved in psychical experiences made possible the recall of previous perceptions, chiefly auditory and visual; the comparison of past experience with similar present experience; the subconscious elaboration of signals that interpret present experience; and the altering of previously recorded concepts such as a place, a person, a voice, or a piece of music. The religious conversions described below in individuals with TLE also indicate this revision in previously recorded concepts can involve a person's religious and spiritual orientation.

Wilder Penfield's brain mapping studies clearly placed both temporal lobes front and center as the site for many complex spiritual experiences, including the re-playing of past experiences, thought intrusions, feelings of *déjá vu,* out-of-body sensations, trances or *fugue* states, automatic behaviors, feelings of being in the presence of others, of hearing music, of hearing angelic voices, of intense meaningfulness, of being connected to some force greater than themselves, and of talking to God.

A review of the evidence accumulated since Penfield's studies also suggest the temporal lobes and its deep limbic structures, the amygdala, and hippocampus are the site of our spiritual brain.

Stimulation of the Amygdala and Hippocampus

A number of investigators have shown that deep temporal lobe stimulation in the area around the amygdala and hippocampus of the limbic system produces feelings of intense meaningfulness, of depersonalization, of a connection with God, of cosmic connectedness, of out-of-body experiences, a feeling of not being in this world, *déjá vu* (a feeling that something has been experienced before), *jamais vu* (a feeling something is happening for the first time even though it has been experienced before), fear, and hallucinations.[17-23] Figure 8 shows why "deep temporal lobe stimulation" can involve the stimulation of the amygdala or hippocampus.

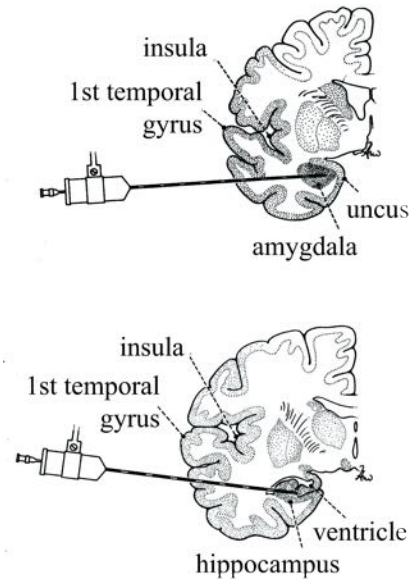


Figure 8. Demonstration of how deep temporal lobe stimulation results in the stimulation of the amygdala or hippocampus. Top: *4 cm from the temporal tip.* Bottom: *6 cm from the temporal tip. From Jasper and Rasmussen.* Association of Nervous and Mental Diseases. *36:316-334, 1958.*[18]

Passing an electrode through the outer surface of the temporal lobes into the deeper structures passes through the white matter tracts and then, depending upon the site of insertion, enters either the amygdala or the hippocampus.

Since the amygdala has wide connections to all parts of the brain, it serves as a master association area for emotionally charged memories—the fears, the pleasures, wonderful tastes and smells, the sexual pleasures and other sweet things, the evil things, the spiritual experience, the dreams, the nightmares and all other experiences that make life meaningful. Stimulation of the amygdala and hippocampus is capable of bringing all these feelings and emotions back from the realm of the

forgotten to the realm of the here and now. These features also make this area uniquely suitable for the production of visual and auditory spiritual and religious feelings.

More Out-of-Body Experiences

Blanke and colleagues[24] stimulated the right angular gyrus, also called the *inferior parietal lobule,* during surgery on a 43-year-old woman with epilepsy. This produced an OBE in which she saw her trunk and legs from above. Blanke proposed that the OBE was produced by disrupting the part of the brain responsible for feeling and knowing the position of the body. While this area is part of the parietal lobe, it is at the angle of the temporal and parietal lobe and is inside the areas reported by Penfield to produce psychical experiences.

Spiritual and Religious Experiences and Temporal Lobe Epilepsy (TLE)

The most fascinating part of TLE is the nature of the spiritual and religious feelings that may occur during the seizures and of the personality changes that often occur between the seizures. The following is a summary of some of these reports. I have gone into them in some detail because they are both fascinating and highly relevant to the subject of this book.

There have been many reports of spiritual and religious experiences associated with TLE. In one study, MRI scans were performed on 33 patients with refractory TLE.[25] All subjects also completed a religiosity scale. The volumes of the mesial temporal structures, the amygdala, and the hippocampus were compared in individuals with high and low scores on the religiosity scale. The religiosity scores were highest in those with the smallest sizes of the right hippocampus, consistent with many of these individuals having hippocampal sclerosis.

This association of religiosity with TLE is consistent with a study in Japan where 234 epileptic patients of all types were examined for seizure-related religious experiences.[26] Of these, only three were found to have had seizure-related religious experiences, but in every case the type of epilepsy was TLE. Between the seizures subjects experienced hyperreligiosity.

In a single case report, a 25-year-old female had intractable TLE. The seizures were characterized by a repetition of religious statements and a compulsive kissing behavior.[27] An MRI showed a right-sided, mesial temporal focus and hippocampal sclerosis. The auras, seizures, and religious thoughts were virtually eliminated after the removal of the right amygdala and hippocampus.

In a study of a normal population of 262 undergraduate students, MacDonald[28] had them complete an *Expressions of Spirituality Inventory* that he had designed. This assessed spirituality in five different dimensions. He also had them fill out a self-report scale related to any symptoms they may have had relevant to complex partial epileptic-like seizures. These would be similar to what Persinger (see below) would call *temporal lobe transients* (TLTs). The intriguing observation was that except for just one subscore, the presence of TLTs was strongly predicted by or correlated with each of the other four spirituality subscales. This pattern remained the same after controlling for

the participants' age, sex, and reported religious involvement. Thus, *the more spiritual the students were, the more likely it was that they had some type of TLT episode.*

Ecstatic seizures. In some cases the spiritual and pleasurable content of TLE seizures is so dramatic that they have been called "ecstatic" seizures. The first case with documented EEG was published in 1980.[29] The patient had stereotyped spells of psychomotor arrest and an indescribable sense of joy associated with epileptiform discharges from the right temporal lobe. Two types of ecstatic seizures have been described.[3] The first is an emotional seizure of deep pleasure. The second is primarily *a cognitive experience of insight into the unity, harmony, joy, and divinity of all reality, usually with pleasurable effect.*

One study examined 11 patients with ecstatic seizures.[30] Of these eight had sensory hallucinations, four had erotic sensations, and five described a religious or spiritual experience. Several had symptoms that were felt to have no counterpart in human experience. EEG localization of the site of the seizures was possible in four subjects: in two the right temporal lobe was involved, while the left temporal lobe was involved in the other two. Eight patients enjoyed the experience so much they wanted to continue to have seizures. Five subjects found they could self-induce the seizures, and four simply stopped taking their medication. The authors felt that ecstatic seizures associated with TLE have had a substantial impact on our cultural and religious history (see below).

Naito and Matsui[31] described a woman with left temporal lobe epilepsy with ecstatic seizures characterized by joyous visions of God and the sun. She reported that, "My mind, my whole being was pervaded by a feeling of delight."

Fugue states. Fugue states, or dissociative episodes, would be the third type of response with temporal lobe seizures or stimulation mentioned by Penfield, i.e., the production of automatic behaviors, altered consciousness, and confusion following stimulation of the area of the amygdala. The following case report[32] illustrates the aggressive and destructive behaviors that can occur during these fugue states.

> A 33-year-old engineer developed seizures at age 22 following an episode of severe gastrointestinal bleeding with shock. Attacks would typically commence with the patient complaining to his wife that some relatively minor event was not to his liking. He would proceed to brood aloud, dwell upon, and increasingly elaborate on this single theme with mounting anger, verbal abuse, and irrational accusations over a period of three to four hours, reaching a crescendo of rage which was always climaxed by an outburst of physical aggression during which he threw his children against the walls, spit or kicked at his wife, and on one occasion pinned her down while burning her bared chest with a lighted cigarette. During the latter part of these attacks, he appeared dazed and wild-eyed. As the anger spent itself in physical violence, he rather suddenly seemed to come to himself and wept violently, feeling hurt and broken. He claimed

nearly total amnesia for the attack.

This example illustrates many of the features of temporal lobe fugue states. Other aggressive behaviors have included robbing, stealing, rape and murder. As discussed in the chapter on the social brain, this would clearly qualify as a socializing disorder of the brain which, if not understood, could give the rest of the human race a bad name.

Autoscopic seizures. Autoscopy is defined as a visual experience where *one sees one's double,* a hallucinatory perception of one's own body visualized in external space. Autoscopy can also include typical out of body experiences consisting of a feeling of leaving one's body and viewing it from another perspective. In one report of 43 cases of patients with seizures who had out-of-body experiences or saw their own double, the temporal lobes were involved in 86 percent of those where the focus could be identified. [33] There was no preference for the right or left hemisphere.

TLE auras and non-epileptic religious conversions. Saver and Rabin [3] call attention to the deep similarities between some features of TLE auras and the features of intense, non-epileptic religious conversions.

> Individuals undergoing sudden religious awakening or conversion often report abruptly perceiving their ordinary, unenlightened selves as hollow, empty, and unreal (depersonalization) as a prelude to finding a truer, more authentic, religiously grounded self. Similarly, a sense of suddenly seeing through a view of appearances previously taken for real (derealization) to a deeper, supernatural, genuine reality is a frequent aspect of mystical-spiritual experiences. Also, doubling of consciousness—a simultaneous perception of a higher, purer, religiously oriented self and an irreligious self, contesting for control and spirit—is a recurrent leitmotif of religious experience. Although many individuals do not associate their intellectual auras with religious experience, it seems likely that the repeated, intense, visceral experiences of the self or external world as unreal would tend to foster a belief in a supernatural ground of reality and a religious outlook.

Personality changes between seizures. One aspect of TLE are the personality changes observed between the seizures, the so-called interictal periods. Gibbs first emphasized the strong association of psychosis with TLE in 1951. [34] In a study of 275 cases of focal epilepsy, he found that the prevalence of psychosis was 17 percent for those with a temporal lobe locus, compared to two percent for those with other types of epilepsy. Others have found a frequency of psychosis in TLE of between 11 and 14 percent. [35] Most of those with psychosis have left temporal lobe involvement. [35,36] This may represent the possibility that a thought disorder is especially likely to occur when the area for language and symbolic representation is disturbed.

Dewhurst and Beard [37,38] described six patients with TLE who had religious conversion experiences. The following are some examples:

> L. T. C. was a 55-year-old bus conductor with a history of left temporal lobe epilepsy. One day, in the middle of collecting fares, he had a minor seizure and was suddenly overcome with a feeling of bliss. He felt he was literally in Heaven. He collected the fares correctly, telling his passengers at the same time how pleased he was to be in Heaven. When he returned home he appeared not to recognize his wife. He later told his doctor that he felt like a bomb had burst in his head. He said that he had seen God and that his wife and family would soon join him in Heaven. He readily admitted to hearing music and voices. He remained in this state of exaltation, hearing divine and angelic voices, for two days. Two years later, following three seizures, he became elated again and stated [his] "mind had cleared." During this episode he lost his faith.

In this case, one set of temporal lobe seizures resulted in a religious conversion, while a subsequent set of seizures resulted in an anti-religious conversion. A left temporal lobectomy was performed with a cessation of seizures. He retained his belief from his second conversion and continued in an attitude of agnosticism.

> D. W. H. was a 33-year-old soldier. He was raised in a strict religious home but lost his interest in religion by age 21. While serving overseas he had his first minor seizure. Two weeks later while walking alone, he suddenly felt God's reality and his own insignificance. As a result of this revelation he recovered his lost faith and was determined to live in a Christian manner. However, this conversion experience gradually lost its impact and he once again ceased concerning himself with religion. Eleven years later he had two rare grand mal attacks in one day. Within 24 hours he had another religious conversion associated with a florid religious psychosis. He had a sudden dream-like feeling, saw a flash of light, and exclaimed, "I have seen the light." He suddenly knew that God was behind the sun and that his knowledge meant power; he could have power from God if he would only ask for it. He had a series of visions in which he felt that his past life was being judged; a book appeared before him, a world atlas with a torn page; a pendulum was swinging and when it stopped the world would end. He considered that he had received a message from God to mend his ways and to help others. The fact that he had been singled out in this way meant that he was God's chosen instrument.

This patient was diagnosed with left temporal lobe epilepsy. A left temporal lobectomy was performed. This resulted in a cessation of the seizures and psychotic experiences but his religious beliefs remained.

> J. P. was a 37-year-old Jewish male. He was brought up in a strictly

> Jewish Orthodox faith and remained devout until age 17. Although he then ceased to attend regular worship he felt guilty about these lapses. His first religious conversion occurred in the hospital after photic stimulation. He had a vision he was in the cockpit of an airplane, flying over a mountainous region. As it brought him into a different land he felt at peace and felt that the power of God was upon him and was changing him for the better. Afterwards he became intensely interested in following the teachings of Jesus Christ and became a member of the Pentecostal church. He was diagnosed with right temporal lobe epilepsy. No surgery was done and he continued in his preoccupation with religion. He often walked the streets carrying a sign "Be prepared to meet thy God."

This case was of interest, since instead of a conversion from little interest in religion to a great interest, here there was a change from one religion to another.

> J. R. was a 33-year-old male with a history of left temporal lobe epilepsy since age 18. His seizures were partially controlled on medication. At age 33 he stopped taking his medications and was soon having frequent seizures. At this point he suddenly realized that he was the Son of God; he possessed special powers of healing and could abolish cancer from the world; he had visions, and believed that he could understand other people's thoughts. Later he gave the following account of his conversion. "It was a beautiful morning and God was with me and I was thanking God. I was talking to God. I was with God. God isn't something hard looking down on us, God is trees and flowers and beauty and love. God was telling me to carry on and help the doctors."

This patient was not considered suitable for surgery and was re-started on medications. Five years later he was doing well, holding down a job, but still occasionally talking about God in an inappropriate way.

These cases and reports have been presented because of the remarkable insight they provide into the relationship between the temporal lobe events and religious and spiritual feelings, and in some cases, religious conversions. *It is clear that not all religious conversions are the result of TLE but it is equally clear that a number of individuals with TLE have experienced religious conversions.* It is also clear from these reports that *both the right and left temporal lobes can be involved.*

Cases of multiple personality and a feeling of devil or spiritual possession are rare in psychiatric practice. Despite this, Mesulam [39] reported that of 61 patients in the Behavioral Neurology Unit in Boston, 12 gave a history consistent with these syndromes. About one woman,

> On repeated occasions she believed she was the Messiah and that she had a special mission to fulfill. Some of the episodes lasted for almost a

year. During one she believed she was called by God to enter politics. She ran for an important public office and almost won. She explained these episodes as being "possessed by God."

In addition to being transformed by their experiences, an additional remarkable aspect of temporal lobe epilepsy is that the transformative changes in a patient's religious and spiritual outlook on life are often permanent. [40] As shown below, this is a feature they share with near-death experiences. While TLE is too rare to account for all cases of religious conversions, these results raise the question of whether certain life events might trigger sub-clinical electrical events and play a role in religious and spiritual experiences in normal individuals. This is discussed later. These observations clearly have relevance to the life-changing manner in which some people have "found God," or "discovered Jesus Christ."

In studies of three different groups of male and female college students, Persinger reported a significant correlation between signs of TLE and having paranormal experiences, such as thinking they can read another person's mind, feeling their souls have left their bodies, feeling close to a Universal Consciousness, thinking about a person they had not seen for awhile and then seeing that person a few minutes later, hearing an inner voice call their name, or hearing an inner voice telling them where to find something and subsequently finding it there. [41,42] There was also a significant correlation between the number of TLE signs and intense religious experiences. [43] Nine years later Persinger [44] studied an additional 400 men and 400 women with similar results relating to paranormal experiences.

The 4-H Syndrome. A distinct but fairly rare syndrome of TLE interictal behavior changes has been described. The symptoms include religiosity, alterations in sexual behavior, loss of a sense of humor, and a tendency toward extensive, and in some cases compulsive, writing and drawing. This was first described by Wasman and Geschwind [40] and has been referred to as the *Geschwind syndrome,* or the four H's syndrome: Hyperreligiosity, Hyposexuality, Humorlessness, and Hypergraphia. Other features include aggression, pedantic speech, a "sticky" or compulsive personality, and psychosis. [45] The personality structure included increased concern with philosophical, moral, and religious issues, and extensive writing on religious or philosophical themes, lengthy letters, diaries, and poetry. [46] Endocrine studies showing a decreased responsiveness to luteinizing hormone-releasing hormone *(LHRH)* [47,48] may explain the hyposexuality. Luteinizing hormone, which is produced by the pituitary gland, regulates the menstrual cycle and stimulates ovulation.

In one case [49] a 35-year-old man expressed the hypergraphia by painting an excessive number of buildings and houses. He also presented with hyposexuality and hyperreligiosity. An MRI showed right mesial hippocampal sclerosis.

Religious conversions have been reported in individuals with TLE of both the right and left temporal lobes. In some cases these conversions are permanent. A rare 4-H syndrome has been described

consisting of Hyperreligiosity, Hyposexuality, Humorlessness, and Hypergraphia, with increased concern with philosophical, moral and religious issues, and extensive writing on religious or philosophical themes.

Interictal behavior and the study of Bear and Fedio. An extensive study of interictal behavior in TLE was reported by Bear and Fedio.[50] They sought to answer two questions: 1) Do temporal lobe epileptics differ in behavior from controls without epilepsy, and 2) Is there a difference between right- and left-sided TLE? To test this they examined 15 patients with right temporal lobe epilepsy, 12 with left temporal lobe epilepsy, 12 normal controls, and nine patients under treatment for neuromuscular disorders unrelated to epilepsy. Each subject was given a self-report questionnaire covering 18 different types of behavior. In addition, an individual who knew the subject well (the rater) was asked to fill out the same questionnaire, with the questions changed to ask about a person other than themselves. This had both the advantage of a second opinion and of determining if a person was denying a symptom that others felt they had or exaggerating a symptom others felt they did not have. Both individuals with right and left TLE had scores for all 18 of the traits that were significantly greater than for the controls or the other group. These results suggest that a wide range of behavioral veriations occur in TLE in addition to religiosity.

Not all studies in the literature concur with the Bear and Fedio report.[52,53,57] Some have criticized it by virtue of the fact that 33 percent of the TLE cases had preexisting psychopathology and this may have driven many of the differences in the behavioral scales.[54] However, since there is general agreement that psychoses and hallucinations are significantly more common in TLE than in the general population or in other forms of epilepsy,[15,52,55,56] one could argue that directly or indirectly the differences were due to TLE.

Spiritual experiences following injury to the temporal lobe. Just as trauma to the frontal lobes provided us with insight into their function, the same is true for the role of the temporal lobes in religious experiences. In one case a 39-year-old woman had a traumatic injury to her right temporal lobe.[58] Prior to this she had no psychiatric problems. After the injury she developed an acute psychotic state similar to a schizophreniform disorder that was associated with religious delusions.

Fenwick and colleagues[59] examined the "psychic" experiences of 17 students called "sensitives," from the College of Psychic Studies and compared them to 17 church-going control subjects. The sensitives had experienced more head injuries and serious illnesses than the controls. Sixty-six percent showed evidence of right hemisphere and right temporal lobe dysfunction and of these, 35 percent had poor visual memories. There was evidence to suggest that some of their "psychic" experiences were associated with brain dysfunction. Mystical experiences showed a trend towards being related to non-dominant hemisphere dysfunction.

Hallucinations and the temporal lobe. Since ecstatic communications with God or supernatural beings are common in individuals with schizophrenia, identifying the

brain location of the visual and auditory hallucinations in this disorder could provide major clues to the location of the spiritual brain. In one study, brain imaging of schizophrenic subjects with religious delusions showed increased activity of the left temporal lobe with reduced activity of the left occipital lobe. [60] In a second study from Japan, direct brain stimulation was performed on individuals with schizophrenia. Their visual hallucinations were reproduced by deep temporal lobe stimulation. [61]

The God Module. In 1997, Vilayanur Ramachandram, director of the Center for Brain and Cognition at the University of California in San Diego, presented an intriguing paper at the Society for Neuroscience meeting. They were studying subjects with temporal lobe epilepsy and found that one of the effects of the seizures was to strengthen involuntary responses to religious words as tested by changes in galvanic skin response. One subject with TLE felt a rapturous "Oneness with the Creator" that carried over into the rest of his life. When asked if he believed in God, he replied, "But what else is there?" [62p182] Other TLE patients had made statements such as, "I finally understand what it is all about. This is the moment I've been waiting for all my life. Suddenly it all makes sense." "Finally, I have insight into the true nature of the cosmos."

The scientists *suggested that the temporal lobes were naturally attuned to ideas about a supreme being.* When thinking about why such a dedicated neural machinery would have evolved they speculated it may have been to encourage tribal loyalty or reinforce kinship ties or the stability of a closely knit clan. They noted that, "These studies do not in any way negate the validity of religious experience or God, they merely provide an explanation in terms of brain regions that may be involved." This report generated a lot of attention in the press and this portion of the brain was designated *The God Module* [63] or *The God Spot.* [64] Ramachandram felt that the left temporal lobe was *The God Module.* Craig Kinsely, from the University of Richmond in Virginia, commented, "There is a quandary of whether the mind created God or God created the mind."

The Feeling of a Presence

Arzy and coworkers in Switzerland reported that the stimulation of the left temporal-parietal junction repeatedly produced a creepy feeling of the presence of another person in their extra-personal space, that sombody was close by. [63a] An epileptic focus in this area could contribute to the sensation of being close to a supernatural being.

The Role of TLE in History and Religion

These relationships between TLE and religious experiences and conversions raise the question of whether TLE was a factor in the religious leanings of major figures in history, literature and religion. The answer is yes. The following are some examples.

Ezekiel. It has been suggested [65] that the oldest-known case of TLE, dating to approximately 2,600 years ago, might be the biblical figure of Ezekiel, son of Buzi. The book of Ezekiel contains prophecies against Israel and Judah and oracles against

foreign nations and about the future glory of Israel. Altschuler[65] proposed that Ezekiel possessed some of the symptoms of the 4-H syndrome, including hyperreligiosity, a compulsive personality, and repetitive hypergraphia. In addition he was aggressive, pedantic, and critical of many women, of whom he refered to as harlots. He also had other symptoms of epilepsy in general, including "fainting" spells and episodes of mutism.

Paul. The apostle Paul was raised as a religious Jew in the Pharisean sect devoted to purity of faith. Up until the time of his religious conversion, he had a notorious reputation for the thoroughness with which he hunted down and persecuted Christians.[37] During this period he was called "Saul." This was completely changed by a dramatic incident on the road to Damascus[46] in about 34 A. D. :

> As he neared Damascus in the course of his journey, suddenly a light from heaven flashed round him; he dropped to the ground and heard a voice saying to him "Saul, Saul, why do you persecute me? "Who are you?" he asked. "I am Jesus," he said "and you persecute me. Get up and go into the city; there you will be told what you are to do…"
>
> Saul got up from the ground, but though his eyes were open he could see nothing, so they took his hand and led him to Damascus. For three days he remained sightless, and neither ate nor drank.
>
> *Acts 9:3–6, 8, 9*

After three days he was visited by Ananias, a Damascus Christian, who laid his hands on him and welcomed him:

> In a moment something like scales fell off his eyes, he re-gained his sight, got up and was baptized. Then he took some food and felt strong again.
>
> *Acts 9:18, 19*

Some evidence that St. Paul had multiple seizure-like episodes comes from his letter to the church in Corinth 22 years earlier where he described multiple visions and called his illness a "thorn in the flesh" and from Satan.

> My wealth of visions might have puffed me up, so I was given a thorn in the flesh, an angel of Satan to rack me and keep me from being puffed up; three times over I prayed to the Lord to relieve me of it, but he told me, "It is enough for you to have my grace; it is a weakness that my power is fully felt."
>
> *2 Corinthians 12:1–9*

Interpretation of parts of the epistles of Paul suggests his facial motor and sensory disturbances were coming after ecstatic seizures and that his religious conversion occurred as a result of ecstatic visions associated with TLE.[37,46,66,67]

Paul was critically important in spreading the message of Christianity in the time following the death of Jesus. He was responsible for the Christian traditions such as giving up animal sacrifice and substituting the remembrance of the sacrifice of Jesus on the Cross; the substitution of wine as symbolic of the blood of Christ in place of blood from sacrificed animals; the elimination of the Jewish custom of circumcision in order to attract Gentiles; and the concept that Christ had died for their sins and that those sins would be forgiven. If it was not for these efforts and for the prolific writings of Paul, it is likely that Christianity would never have progressed beyond a tiny Roman religious sect. If the role of TLE in Paul's conversion is correct, it could be argued that without TLE Christianity would never have become the dominant religion of the Western world.

Teresa of Jesus. Garcia [68] has suggested that the vivid ecstasies of the Carmelite nun, Teresa of Jesus (Teresa de Ahumanda) were due to TLE.

Joan of Arc. For centuries romantics, historians, and scientists have debated the mystery of Joan of Arc's exceptional achievements. Foote-Smith and Bayne [69] wondered how an uneducated farmer's daughter, raised in harsh isolation in a remote village in medieval France, could have found the strength and resolution to alter the course of history. Based on her own words and the contemporary descriptions of observers, they suggested that the source of her visions and convictions was ecstatic TLE auras. In her own words from the text of her trial in Rouen in 1431, she states: [70]

> I was thirteen when I heard a Voice from God for my help and guidance. The first time that I heard this Voice, I was very much frightened; it was mid-day in the summer, in my father's garden.…I heard this Voice to my right, towards the Church: rarely do I hear it without its being accompanied also by a light. This light comes from the same side as the Voice. Generally it is a great light.…When I heard it for the third time, I recognized that it was the Voice of an Angel.…It told me it was necessary for me to come into France…it said to me two or three times a week: "You must go into France."…It said to me "Go, raise the siege which is being made before the City of Orleans. Go!"…and I replied that I was but a poor girl, who knew nothing of riding or fighting.…There was never a day when I do not hear this Voice, and I have much need of it.

These visions came upon her with increasing frequency and sustained her though the reversal of her military victories, betrayal, imprisonment, and trial. [69] A logical diagnosis would be to simply assume she had schizophrenia or a related thought disorder. However, the authors argue that her testimony was marked by caution, modesty, reasonableness in dealing with others, and clarity of thought; the episodic nature of her visions with clear sensorium interictally; the presence of a musicogenic form of epilepsy; and an ecstatic aura—all argue for TLE.

Patients with musicogenic epilepsy have seizures that are precipitated by music, especially music that has some emotional significance to the patient. [71] They may have

only a brief disturbance of consciousness. In Joan of Arc's case the evidence suggests the music that induced her seizures was from church bells. She stated to the judges that she heard the voices when *Ave Maria* was played by church bells in the evening. Often when she was in the fields and heard the church bells ring, she would fall to her knees." [70] Such a type of musicogenic epilepsy has been described. [72] There is even evidence that sometimes her episodes were self-induced, since she "was accustomed to repair daily to the church at the time of Vespers, or toward evening. She had the bells rung for half an hour." [70] Joan's first reaction to her voices and apparitions was one of fright, followed by ecstasy, followed by grief and tears when the apparitions vanished. As described above, it is not unusual for patients with ecstatic seizures to attempt to precipitate more seizures. Once she had determined to accept and embark on her mission, she appeared to be in a state of chronic exhilaration. [69] Her enthusiasm was so intense that it overwhelmed the English soldiers. Joan of Arc appeared to have other aspects of the 4-H syndrome, including humorless sobriety, hypermoralism, hyposexualism, aggression, and religiosity.

Dostoevsky. Fyodor Dostoevsky, the famous Russian novelist, also appears to have had musicogenic epilepsy. [69] The following is an account of a friend relating an argument that Dostoevsky, a believer, was engaged in conversation with an atheist:

> "God exists, He exists!" Dostoevsky finally cried, beside himself with excitement. At that same moment, the bells of the neighboring church rang for Easter matins. The air was vibrant and full of sound, "And I felt," Fyodor narrates, "that heavens have come down to earth and absorbed me. I really perceived God and was imbued with him. Yes, God exists….I cried…and I do not remember any more." [69]

Joseph Smith. Joseph Smith was the founder of the Mormon Church. In the spring of 1820 he was seized with some strange power which rendered him speechless. Darkness gathered around him, and he was greatly afraid. He wrote: [73]

> Just at this moment of great alarm I saw a pillar of light exactly above my head, above the brightness of the sun, which descended gradually until I found myself delivered.…When the light rested above me, I saw two personages, whose brightness and glory defy all description, standing above me in the air. One of them spake into me.…When I came to myself again, I found myself lying on my back looking up at the heaven.

These circumstances are strongly suggestive of TLE. [37]

Ellen White. Ellen White, born in 1827, was the co-founder of the Seventh-Day Adventist Movement. As a nine-year-old child she was hit in the face with a rock, leaving her in a stupor for three weeks. Following this injury her friends shunned her because of her disfigured face. Her personality changed and she became an avid Bible student and an intensely religious person. She complained of impaired memory,

nervousness, trouble concentrating, and fatigue and was unable to complete her formal education. When she was 12, her family became involved in the Millerite movement, members of which called themselves Adventists. A Baptist preacher, William Miller, predicted the second coming of Christ in 1844. When this did not occur it was termed the "great disappointment of 1844." With the guidance of Ellen White, Miller's disillusioned followers formed the Seventh-Day Adventist church. They also predicted the second coming of Christ but wisely did not specify exactly when this would occur.

Based on the presence of head injury, paroxysmal loss of consciousness, upward staring of the eyes, hundreds of visual hallucinations, mood and personality changes, automatisms, and hypergraphia, Hodder and Holmes[74] concluded that Ellen White had TLE. Her hypergraphia was prodigious, consisting of 5,000 periodical articles and 40 books totaling over 100,000 pages of text. Some of her writing was subsequently found to have been plagiarized from earlier religious writers.[75] Attributing White's visions, religiosity, and writing to TLE was clearly disturbing to Seventh-Day Adventists. In response to the Hodder and Holmes report, the trustees of the Ellen G. White Estate appointed a committee to examine whether she had TLE. Eight of the nine members of the committee were professors from Loma Linda University School of Medicine and Nursing, a prominent Seventh-Day Adventist school in Southern California. Not surprisingly, although not denying any of her symptoms, they concluded her writing was a divinely inspired gift of prophecy and that she did not have TLE.[76]

Other cases. In 1873, Howden published five cases of intense religiosity occurring in epileptics. He included Swedenborg, Sweden's math genius who at age 56 underwent a transformative spiritual event that was probably the result of a seizure.[77,78] He developed a messianic psychosis and subsequently spent the remaining 28 years of his life exploring the spirit world and describing his experiences in an extensive body of writings. Howden also concluded that Ann Lee, founder of the Shaker Movement, and the Islamic prophet, Mohammed, founder of Islam, had TLE.

Dewhurst and Beard[37] provided an extensive list of saints and mystics who probably had TLE. They had periodic attacks that included sensations of extreme heat and cold, trembling of the whole body, transient aphasia or paralysis, loss of consciousness, automatisms, feelings of passivity and childish regression, dissociations, hallucinations, ecstasies, and increased suggestibility. Saver and Rabin[3] have further extended the list.

Temporal lobe epilepsy and its spiritual manifestations may have played a major role in the religious conversions of many historical figures and in the origin of several religions.

Near-Death Experiences

Some individuals who have come very close to dying, or who have been clinically dead for varying periods of time, report profound spiritual sensations and feelings. After

they recover they often report significant changes in their attitude about God, religion, death, and personal relationships. Raymond Moody first wrote of these episodes in 1975 in his book, *Life After Life.* [79] He termed them "near-death experiences" or NDE. In those who have had NDE some of the common features include a feeling of extraordinary peace, out-of-body experiences, a sensation of being in a tunnel often ending by experiencing a brilliant white or golden light, and the "inner setting." [80] The "inner setting" refers to a feeling of being in heaven or a comparable setting such as being surrounded by flowers, trees, mountains, rivers, or streams.

Each of these symptoms is progressively less common in NDE with the extraordinary peace occurring in 60 to 75 percent, and "the inner setting," in 10 to 35 percent. Some experience a review of their past life, somewhat reminiscent of the re-playing of the tape in Penfield's studies. Grasso noted that similar NDE reports are obtained from a wide variety of subjects: "…believers and atheists, the educated and the ignorant; from old and young, saint and sinner, man and woman." [81]

NDE in pilots. This remarkable set of experiences has led many to propose that the events associated with NDE prove that heaven and God exists. A more sober and scientific account of the physiological events surrounding NDE have come from studies of the artificial induction of NDE in the laboratory. James Whinnery, an aerospace medicine physician, was asked by the navy and air force to come up with a solution to the problem of pilots blacking out during jet plane maneuvers. They were experiencing G-force-induced loss of consciousness known as *G-LOC.* To study this phenomenon a huge centrifuge was built at the Naval Warfare Center in Warminster, Pennsylvania. This centrifuge was large enough to hold a pilot and powerful enough to produce high G-forces. Extensive studies over many years identified the precise G-forces needed to produce varying durations of unconsciousness. [82] The wearing of an anti-G suit decreased length of unconsciousness and increased tolerance to higher G-forces.

Many of the pilots had an out-of-body experience while they were unconscious. Not being familiar with OBE, Whinnery referred to these as "dreamlets." In reviewing the literature he came upon the reports of NDE in patients with heart attacks and realized that this was what a number of his pilots were experiencing. The longer the period of unconsciousness and the closer they got to brain death, the greater the probability they had NDEs. The transition from grayout to unconsciousness resembled floating peacefully within a dark tunnel, which is much like some of the defining characteristics of an NDE. The pilots also reported a feeling of peace and serenity as they regained consciousness. [83] Moderate degrees of lack of oxygen (anoxia) preferentially affect the frontal lobes and it has been suggested that this is responsible for the feelings during NDEs of calm and a tranquil indifference to anything including pain. [84p192]

When G-LOC was produced gradually, it produced tunnel vision, then blindness, then blackout. This can be explained by progressive loss of blood flow to the occipital lobes producing tunnel vision, then loss of blood flow to the retina producing black-out, then anoxia for the rest of the brain, producing a total loss of consciousness. While in the centrifuge, if the pilots pressed on their eyes to increase

the intraocular pressure and interfere with ocular blood flow they experienced greyout and tunnel vision.[85] The feelings of serenity and peace are likely to have been produced by the increased release of various neurotransmitters such as endorphins, serotonin, and dopamine. Thus, rather than proving that God exists, NDE proves that when the brain is deprived of oxygen for prolonged periods of time, immediately prior to brain damage a range of physiological events occur that characterize NDE. Support for the role of anoxia in the production of NDEs comes from the observation that one of the very few other things to produce NDEs is prolonged exposure to carbon dioxide. This was used to treat nervous diseases in the 1950s.[86] Since it produced severe anoxia and risked brain damage, it was discontinued. While this was long before there was an appreciation of NDEs, it was probably the resultant NDEs that produced the positive changes in behavior described below.

A person actually needs to be near death to have an NDE. Melvin Morse studied NDE in children. His interest in NDE was stimulated by an experience he had during his pediatric residency in Seattle. He performed CPR on Katie, a child that had drowned in a swimming pool and had been without a heartbeat for 19 minutes. Her pupils were fixed and dilated. Three days later Katie regained consciousness. Several weeks later he encountered her in the hospital and Katie turned to her mother and said, " That's the guy who put the tube in my nose at the swimming pool." Morse was stunned, since the child was essentially brain-dead at the time. His report[87] was the first description of NDE in a child.

Morse went on to accumulate and study many additional cases of NDE in children[88-91] and to write several books on the subject including *Closer to the Light*[92] and *Transformed by the Light.*[93] In what has been termed the Seattle study, Morse interviewed 160 children from the intensive care unit at Children's Hospital in Seattle.[91,92] He used the 16-item Greyson scale[94] to quantitate the NDEs. Of the children who had experienced near-death, 88 percent had an NDE. By contrast, none of the other children had an NDE. This was the first clear demonstration that a person actually needs to be near death to have an NDE. Morse excluded a role for any of the drugs they were given, or dreams, or hallucinations. Some of the cases were able to do what Katie did, recount aspects of the experience and of the doctors and nurses they only had contact with when they were in deep coma and apparently dead.

NDE induced permanent changes in personality. Scientific explanations of the physiology of NDE do not detract from the fact that NDEs also produce remarkable changes in personality and spirituality. Exposure to death in traumatic situations such as in combat is often associated with *post-traumatic stress disorder (PTSD).* This is a debilitating psychiatric condition characterized by flashbacks; avoidance of stimuli associated with the trauma; and symptoms of increased arousal, including insomnia, irritability, difficulty concentrating, hypervigilance, and exaggerated startle response.[95] Substance abuse is also very common.[96] In dramatic contrast to this, in individuals who have actually died, been brought back to life, and had an NDE, the experience was not associated with the dysfunctional stress reactions typical of PTSD. Instead NDE was associated with better mental health and positive coping styles.

Raymond Moody based his psychiatric practice around counseling individuals with NDEs. The personality changes he observed in individuals who had experienced an NDE included a loss of the fear of dying, a sense of the importance of love in their lives, a sense of being connected with all things, an appreciation of learning, an urgency to experience life, a new feeling of being in control, and a better-developed sense of spirituality with the abandonment of religious doctrine purely for the sake of doctrine.[97] He recounts the following story of a man who studied in the seminary before his NDE:

> My doctor told me I "died" during the surgery. But I told him that I came to life. I saw in that vision what a stuck-up ass I was with all that theory, looking down on everyone who wasn't a member of my denomination or didn't subscribe to the theological beliefs that I did.
>
> A lot of people I know are going to be surprised when they find out that the Lord isn't interested in theology. He seems to find some of it amusing, as a matter of fact, because he wasn't interested at all in anything about my denomination. He wanted to know what was in my heart, not my head.

Moody also recounts the following as an example of a significant personality change in an adult with NDE:[97p51-52]

> When I "came back" [from the NDE], no one quite knew what to make of me. When I had my heart attack, I had been a very driven and angry type A personality (aggressive, impatient and selfish). If things didn't go right for me, I was impossible to live with. That was at home as well as work. If my wife wasn't dressed on time when we had some place to go, I would blow up and make the rest of the evening miserable for her. Why she put up with it, I don't know. I guess she grew accustomed to it over the years, though, because after my near-death experience she could hardly cope with my mellowness. I didn't yell at her any more. I didn't push her to do things, or anyone else for that matter. I became the easiest person to live with and the change was almost more than she could bear. It took a lot of patience on my part—which is something I had never possessed before—to keep our marriage together. She kept saying, "You are so different since your heart attack." I think she really wanted to say, "You've gone crazy."

When Melvin Morse re-interviewed the parents of children with NDE eight years later, he found these children had become special teenagers who had excellent relationships with their families. They seemed to share a maturity and wisdom that was humbling.[92p193] There was a conspicuous absence of drug abuse and even experimentation. There was little rebellion against authority, no excessive risk-taking,

and no teenage pregnancies. They all had good grades. One child described himself as more serious than his peers, but a lot happier. One girl said she saw life differently than most people. Little things that bother others did not bother her. She felt calmer and more in control. Her mother described her as "serene" and "very mature for her age." As with others in the study she did not fear death, but wanted to make sure she "lives life to the fullest." Morse felt that the right temporal lobes were the site of the positive aspects of NDEs. [92,93]

Morse met Katie again 15 years later. When asked how much she remembered of the NDE her reply encapsulates many of the personality features of individuals with NDEs: [98p17]

> "Oh, I remember everything, every little detail, and they're images that are always with me. My life is richer for it and I work every day to share that richness with my family and friends. There's so much work to do in this life. I wouldn't waste a minute of it."

In a study of adults, Morse interviewed elderly people who had an NDE as children. He noted that: [93]

> Nearly all of the people who had a NDE—no matter if it was 10 years ago or 50 — were still absolutely convinced their lives had meaning and there was a universal, unifying thread of love which provided that meaning. Matched against a control group, they scored much higher on life-attitude tests, significantly lower on fear-of-death tests, gave more money to charity, and took fewer medications. There's no other way to look at the data. These people were just transformed by the experience.

In addition, these adults had less depression, lower rates of drug and alcohol abuse, spent more time meditating, ate more fresh fruits and vegetables, did more exercise, spent more time with family members, and had increased scores relevant to good mental health and spiritual well-being. [91] Some of the adults with childhood NDEs felt they had paranormal abilities such as predicting events just before they happen. [93p84-107] Moody [97] also found that a small percent of his NDE subjects felt they had experienced some form of precognition.

There is a very high successful suicide rate among individuals who have previously attempted suicide. However, the rate of subsequent successful suicide is greatly reduced in individuals who had an NDE during their suicide attempt. [99] Of those who survived a Golden Gate bridge jump and had an NDE, none went on to commit suicide. [100] When asked whether the findings of increased mental and spiritual health among those with NDEs had any relevance to the rest of us, Morse recounted several individuals whose own lives were enriched simply by having close emotional ties to someone with NDEs.

Prim van Lommel of the Rijnstate Hospital in Arnheim, the Netherlands,

reported an eight-year longitudinal study of 344 cardiac-arrest patients who were clinically dead but revived.[101] Of these, 62 reported an NDE. With the possible exception of age, the only common thread was the experience of near-death. Extensive interviews and psychological tests were administered initially and after two- and eight-year intervals. Initially, those with NDEs reported more self-awareness, social awareness, and more religious feelings than those without NDEs. At two years, those with NDEs had a far more vivid recollection of the event, an increased belief in an afterlife, and less fear of death. After eight years, the effects seen after two years were more pronounced. The NDE group was more empathetic, emotionally vulnerable, and often showed evidence of increased intuitive awareness. They still showed no fear of death and held a strong belief in the afterlife.

Out-of-body experiences (OBE). An 11-year-old boy suffered a cardiac arrest in the hospital. He was without a heartbeat for 20 minutes. Seven years later he related the following:[92]

> The next thing I knew, I was in a room, crouched in a corner of the ceiling. I could see my body below me. I could see the doctors and nurses working by me. I saw a doctor put jelly on my chest. My hair was really messed up and I wished I had washed my hair before coming to the hospital. They had cut my clothes off, but my pants were still on. I heard a doctor say, "Stand back," and he then pushed one of the buttons on the paddles. Suddenly, I was back inside my body…

Morse[92] noted that NDE subjects could recall in great detail all aspects of the resuscitation procedure, including technical things they could not have known previously. By contrast, seriously ill but non-NDE subjects had only vague and often inaccurate recollections of the emergency room setting.

Some of the reports of OBE include remarkable, almost unbelievable statements. In one case[92] the patient claimed that while she was floating around above her body she noticed that there was a shoe on the ledge of the window. The skeptical physician looked and could not find it. The patient said, "It's out there, around the corner." It was only after the physician crawled out onto the ledge and looked around the corner that she saw the shoe. These OBE stories suggest that comatose patients who seem to be in the last stages of life may actually be undergoing a profound experience that involves total awareness of what is going on around them.[92]

The light. The following account from the International Association for Near-Death Studies (IANDS)[102] about a young girl who fell in her basement illustrates an experience with the light.

> I noticed the dim light growing slowly brighter. The source of the light was not in the basement, but far behind and slightly above me. I looked over my shoulder into the most beautiful light imaginable. It seemed to be at the end of a long tunnel which was gradually getting

> brighter and brighter as more and more of the light entered it. It was yellow-white and brilliant, but not painful to look at even directly. As I turned to face the Light with my full "body," I felt happier than I ever had before or have since.

Another study was also from a young girl near death from a ruptured appendix.

> Then the blackness was gone and in its place was a beautiful soft pink light. All the weight was gone, and I floated back up into the room as light as a feather. I seemed to be filled with this same light, which was the most profound spirit of love that you can imagine. Nothing has ever come near it since. I opened my eyes, and the whole room was just bathed in that beautiful light. In fact, the light completely surrounded everything in the room, so there were no shadows. I felt so happy.…I heard my father say, "What's she looking at?" The light lasted for a little while and it was wonderful.

The NDEs and religious history. Just as examples were given above concerning the role of TLE in religious history, Morse [92p141-144] listed a number of examples where NDEs with the light shaped individuals' life-long religious and spiritual affiliation. In one case, one of his patients experienced a light that totally engulfed him after an NDE at age 15. After that he knew he wanted to become a minister, and 30 years later was a successful mainstream Protestant minister.

Black Elk, a Native American spiritual leader, had an NDE at age nine. At the heart of his experience he was on the highest mountain of them all, and beneath him was the entire world. A bright light surrounded the earth, "wide as daylight."

The Indian guru Paramahansa Yogananda, author of *Autobiography of a Yogi,* had an NDE at age eight. He states, "There was a blinding light, enveloping my body and the entire room. My nausea and other uncontrollable symptoms disappeared; I was well." This light then stayed with him the rest of his life allowing him to illuminate others.

Jonathan Edwards, the Calvinist theologian, speaks of a divine light imparted to the soul by God. Morse wondered where Edwards learned of such a light. Some research showed that he nearly died of pleurisy as a child. This could have produced an NDE.

The inner setting. Kurt was a seven-year-old boy dying of muscular dystrophy. He had a cardiac arrest in the hospital and found himself outside his body, watching the doctors and nurses work to revive him.

> Then everything became dark, until I saw angels. I was in a beautiful place with flowers and rainbows, where everything was white like it had its own light. I talked to several people while I was there, including Jesus, who wanted me to stay with him. I wanted to stay but we decided I had

> to come back and see my parents again. I'm not afraid to go back to that place.

This was a common theme, of feeling so peaceful that the subjects did not want to come back.

NDE and the temporal lobes. Many of the features of NDE suggest the temporal lobes are involved. This includes the findings that stimulation of the temporal lobes can produce out-of-body experiences and feelings of great meaning and being connected to a greater force, [15,18,103,33] the many spiritual aspects of TLE, and the permanent nature of the interictal personality changes. Acute and moderate-to-severe anoxia produces abnormal nervous activity in the temporal lobes [104] and especially the hippocampus. [105-107] These factors suggested to Britton and Bootzin [108] that altered temporal lobe functioning may be involved in individuals who reported having transcendental NDEs during life-threatening events. To test this they examined 43 individuals who had a significant life-threatening event, had NDE symptoms, and had a minimum score of seven on Greyson's *Near-Death Experience Scale.* [94] They also examined 20 controls who had a life-threatening experience but scored less than seven on Greyson's scale. The presence of general symptoms of epilepsy and specific symptoms of TLE was assessed by administering the *Complex Partial Epileptic Signs and the Temporal Lobe Symptoms* sub-scales of the *Personal Philosophy Inventory.* [109] The subjects were also given an EEG during sleep and monitored for the timing of onset of rapid eye movement or REM sleep.

Paroxysmal EEG activity was found in 22 percent of the NDE subjects compared to five percent of the controls. In all NDE subjects this activity emanated from the left temporal lobe, while in the controls it emanated from the right temporal lobe. As shown in Figure 9 the NDE subjects had significantly higher scores on both the *Complex Partial Epileptic Signs* and the *Temporal Lobe Symptoms* tests. The scores on both tests were significantly higher in the subjects with NDEs.

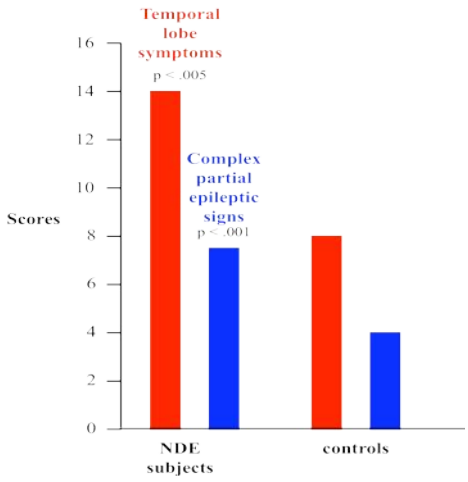


Figure 9. Scores on the Temporal Lobe Symptoms *and* Complex Partial Epileptic Signs scales *in the subjects with NDE and controls. From Britton and Bootzin, Near-Death Experiences and the Temporal Lobe.* Psychological Science. *15: 254-258, 2004. By permission from Blackwell Publishing.*

The results from the sleep studies provided some insight into why individuals with NDEs are more centered and resistant to stress. The NDE subjects had altered sleep patterns with a longer interval between the onset of sleep and rapid eye movements or REM, relative to the control group. Individuals with depression characteristically have a short sleep to REM interval averaging 60 minutes or less. A short sleep to REM interval has, in fact, proven to be an

excellent predictor of the risk of developing a major depression. The average interval is 90 minutes. In the controls without an NDE it averaged 77 minutes, while in those with NDE it averaged 109 minutes. While the cause of this increased REM latency is not known, it is likely to be related to the presence of less depression, the increased resistance to stress, and a more-spiritual outlook toward life.

Individuals with near-death experiences (NDE) have many features with a strong spiritual content including a feeling of great peace, depersonalization or out of body sensations, changes in visual perception interpreted as passing down a dark tunnel and coming out into a bright light, a review of one's life, and a feeling of seeing God and being in heaven. As with other forms of spiritual awakening, NDEs are often associated with a permanent decrease in an individual's susceptibility to depression and fear of death, improved overall mental health, increased tolerance of stress, and a greater appreciation for the spiritual aspects of life.

Mechanism of NDEs. Many have claimed that NDEs prove that God, a life after death, and heaven exist. However, the above studies showing that many of the elements of NDE can be produced in pilots when gravity-induced loss of consciousness is severe or prolonged, strongly implicate oxygen deprivation (anoxia) as a major factor. This is supported by the findings of Morse [91,110] that a person actually needs to be near death to have a NDE. The studies of Britton and Bootzin [108] indicate that the temporal lobes, amygdala, and hippocampus are involved.

Studies in rats have shown that a lack of oxygen results in an increase in the concentration of glutamate and aspartate in the hippocampus. [107] These excitatory neurotransmitters are related to N-methyl-D-aspartate (NMDA) that plays a central role in memory. NMDA binds to NMDA receptors. In humans, the anesthetic ketamine induces a detached depersonalized state, positive and negative symptoms of schizophrenia, and OBEs. [111-113] It is similar to the street drug PCP (phencyclidine) and is one of the few drugs known to reproduce some of the features of NDEs. Two compounds have been isolated in animals that are produced by the brain, bind to PCP receptors and have actions similar to PCP. [114,115] These are called alpha- and beta-endopsychosin (endo = produced internally, psychosin = psychosis producing). Ketamine, PCP, alpha-, and beta-endopsychosin all act by blocking the action of the NMDA receptors by binding to the PCP domain of the receptor. The administration of these compounds reproduces several components of the NDE experience, including depersonalization, hallucinations, sensory deprivation, and elated mood. This blockage also helps to prevent the nerve damage that normally occurs when aspartic acid and glutamate are released after anoxia. Jansen [116,117] has proposed a reasonable explanation for the production of NDEs. This model suggests that in the presence of severe hypoxia, as occurs with NDEs, alpha- and beta-endopsychosins are released to attempt to prevent the hippocampal cells from dying following the release

of glutamate and aspartate. This action at the NMDA receptors triggers the psychological and sensory aspects of NDEs. As discussed later, the release of DMT, or di-methyl-tryptamine, may also play a role in NDEs.

Endorphins also play a role in NDEs. The amygdala is the site of large concentrations of endorphin and enkephalin receptors. [118,119] Studies in dogs have shown that when the dogs were conscious at the time of cardiac arrest and subsequent death, there was a significant increase in brain endorphin levels. [120] This did not occur if the dogs were deeply anaesthetized at the time of death. In other animal studies, the administration of beta-endorphin into the cerebral spinal fluid produced a profound increase in neuronal activity in many parts of the limbic system at the same time that the animal became immobile. [121,122] These findings can account for the ability of this region of the brain to produce its own internal "high." Thus, instead of fear and terror there may be a state of calmness, peace, and even euphoria in the face of severe stress, pain or death. It has been suggested that, "It is this amygdala-induced opiate high that contributes to the feeling of religious rapture and the ecstasy associated with [feelings of a] life after death and the attainment of Nirvana." [16] It is likely that the release of endorphins and hypoxia of the prefrontal lobes [84p192] contribute to the pain-free bliss of NDEs. [123,124]

As much as some would like to use NDEs as proof that God, heaven, and a life-after-death exists, NDEs are most likely due to severe lack of oxygen to the brain. In the hippocampal portion of the temporal lobes this results in the release of two excitatory neurotransmitters, glutamate and aspartic acid, both of which cause nerve cell death. In a last ditch effort to prevent this, two endogenous psychedelic compounds are released — alpha- and beta-endopsychosin. Although they bind to and block the action of the NMDA receptors, thus preventing or delaying nerve cell death, they also produce spiritual sensations. This, in combination with the release of endorphins, produces a pain-free state of peaceful bliss. This biological explanation in no way detracts from the power of NDEs to produce life-long spiritual changes.

REM Dreams and the Right Temporal Lobe

The four major types of human EEG waves are shown in Figure 10. They include beta waves typical of the alert waking state, alpha waves typical of a relaxed or reflecting mental state, theta waves occurring when individuals are in a drowsy state, and the slow delta waves typical of dreamless sleep. Two of the five stages of sleep are Rapid Eye Movement (REM) and non-REM sleep. EEG recordings during non-REM sleep show slow, synchronized, delta waves. By contrast REM sleep occurs during what is termed *paradoxical sleep* because electrically the brain seems active and alert, showing a beta wave pattern. [125] When individuals wake up during REM sleep they typically report that they have been dreaming. By contrast, when individuals wake up during non-REM periods they only occasionally report they have been

dreaming. [126] The content of the dreams is also different. REM sleep dreams typically involve a great deal of visual imagery, emotion, and often involve implausible themes, while non-REM dreams tend to involve words and are speech-oriented with rambling monologues in the absence of visual imagery. [16,126,127]

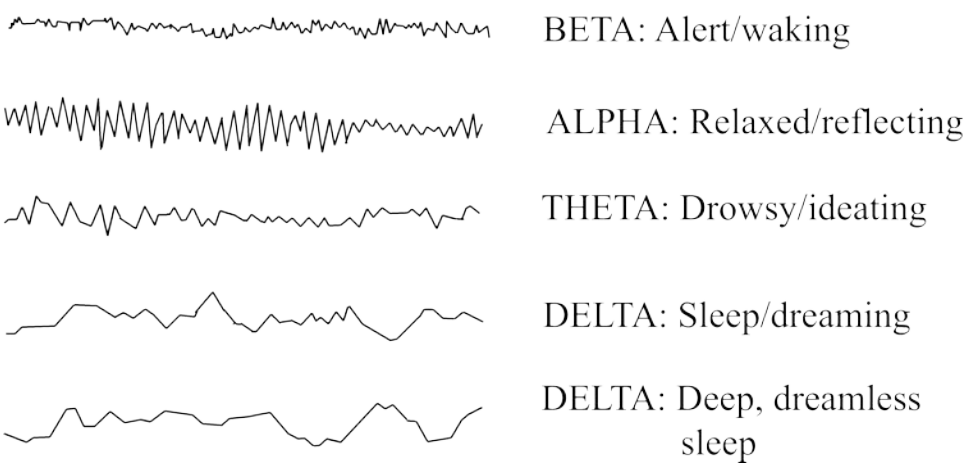


Figure 10. The four types of human EEG waves.

The positive effect of near-death experiences on sleep and REM latency raises the question, "What part of the brain is activated by REM versus non-REM dreams?" Given their content, it should not come as a surprise that EEG recordings show that the right hemisphere becomes highly active during REM sleep, while the left hemisphere is more active during non-REM sleep. [128,129] Brain imaging studies also support this and show greatly increased blood flow in the right temporal and parietal regions during REM sleep and in subjects who upon awakening report visual and auditory dreaming. [16,130]

Magnetic Brain Stimulation of the Temporal Lobes and Spirituality

Persinger describes an event that occurred in his laboratory. [131]

> In 1983 during a routine EEG study to monitor the effects of transcendental meditation, an experienced instructor of that technique displayed an electrical anomaly over her right temporal lobe. During an "electrical seizure," she reported she was "filled with the spirit" and felt the presence of God with her in the laboratory. The duration of the electrical transient was about 20 seconds.

To my knowledge this is the only record of a TLE-related "God Experience" that actually occurred during EEG monitoring. A portion of that EEG is shown in Figure 11. Persinger wondered if this experience could be experimentally induced. Since the brain is essentially a giant electrical machine with nerve impulses traveling across

billions of axons and dendrites, the application of magnets to different parts of the skull might be expected to elicit various types of symptoms and sensations. This

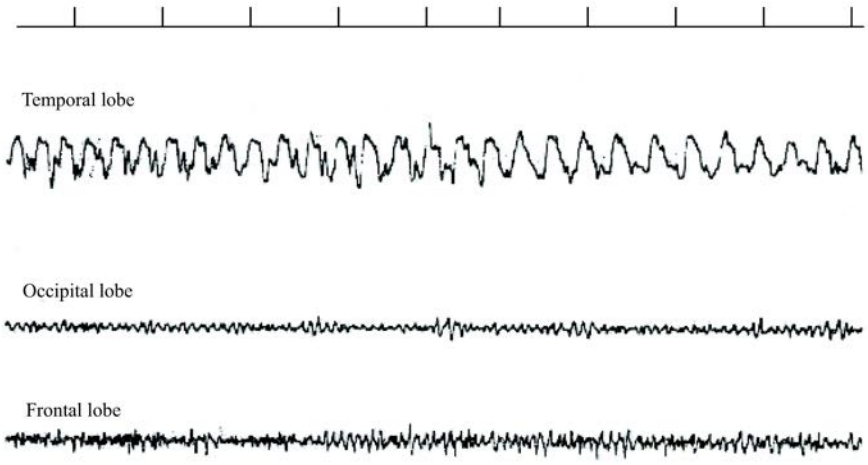


Figure 11. The occurrence of an electrical seizure over the temporal lobe during a "God Experience." From Persinger. [131] *By permission.*

technique is called *Transcranial Magnetic Stimulation* (TMS). It has become a popular tool for possible diagnosis and treatment of a range of conditions. When Persinger applied such a machine to his own brain, over the right temporal lobe, he found to his amazement that he experienced God for the first time. [62] Persinger [131,132] has since carried out experiments using these magnets on over 500 individuals over a period of 15 years. When the magnets were placed over the temporal lobes of normal individuals, it was reported that 80 percent had a mystical-sensed presence of a sentient or emoting being, often interpreted as the presence of God. This was referred to as the *God Machine.* These results, however, are controversial.

Granqvist and colleagues [133] in Sweden felt that since these results had not been replicated and since the magnets were very weak, a confirmatory double-blind study needed to be done. They carried out a study with 89 subjects, including a sham-treatment control group. All subjects were given a range of personality tests including the *Temporal Lobe Signs Inventory,* [134] the *Tellegen Absorption Scale* [135] to measure susceptibility to suggestion, and a *New Age Orientation Scale* [136] to assess individual differences in the adoption of a new age lifestyle orientation, with respect to broad systems of thought, as well as more specific beliefs, interests, and activities. They found no evidence for any effect of the magnets either in the entire group or in those scoring high on suggestibility. The authors suggested that the previous results were due to suggestibility and a subtle desire to please the experimenters.

A positive aspect of the study was their finding that the level of suggestibility consistently predicted the mystical and somatosensory experiences in both religious

and non-religious participants. These characteristics included absorption to mind-altering experiences, the adoption of a "new age" lifestyle orientation, and signs of anomalous temporal lobe activity. This is consistent with the conclusion (see later) that *normal individuals in the population may have temporal lobe transients and that these may play a role in our spiritual experiences.*

In response to these results, Persinger [137] suggested that it was necessary to be exposed to the magnet for longer than 15 minutes to produce an effect. In reply to this, Granqvist [137] pointed out that in setting up their study, they had worked closely with Persinger; they had even used his apparatus and software. In addition, their experimental design involved a total of 30 minutes of exposure to the magnets. They also pointed out that despite claims to the contrary, none of the Persinger studies had been truly double-blinded. John Horgan, a skeptical science writer, had Persinger try the machine on him. He felt no effect. [138]

This exchange of studies and responses is in the best tradition of science. It illustrates how critical it is to carry out careful double-blind experiments when working with subjective traits such as perceiving the presence of a superior being. This study in no way negates the many results reviewed in this chapter concerning the role of the temporal lobes in spirituality. It does, however, show that caution and double-blind studies are required when claims are made that tend to induce skepticism from our rational brain.

LSD, the Temporal Lobes, and Spirituality

We have seen that hallucinations associated with the direct stimulation of the brain, with spontaneous seizures of TLE, with brain trauma, stress, and schizophrenia all emanate from the temporal lobes, especially the area of emotional memory, the amygdala and hippocampus. Psychotropic drugs such as LSD represent the remaining major cause of hallucinations. Are temporal lobe structures also involved in LSD-induced hallucinations? The intensity of the sensory experiences resulting from the ingestion of LSD is illustrated in the following account: [16]

> About half an hour after taking it I began to notice the incredible clarity and vividness of my surroundings. Colors were brighter, plants seem to sparkle…and when I stopped and touched a leaf.…I could feel its energy, its life.…I could taste it through my fingers…and when I got to the park I was overwhelmed with the colors, the tastes, the smells. My eyes led me to one of the mountains surrounding the valley, and oh my God, I could see right through the mountain. It was like the molecular composition of the mountain was parting into separate molecules. I could see the spaces between the molecules which were all in a frenzy of activity…it was like I had X-ray vision and I could see right through the mountain and see the sky on the other side. I raised my hand to point to this incredible sight, and instead of one hand there were these trails of hands. It was then that I realized I could see through my hand. At first I

> could see the incredible cellular structure of the skin, and then the molecular structure…the pulsating molecules themselves…then my sight penetrated the skin and I could see the blood vessels, and then my eyes penetrated the blood vessels and I could see the blood platelets and the white corpuscles—and I kept thinking: how could I never have noticed this before? I had forgotten that I had taken LSD.

Another description of an LSD trip illustrates the religious experiences that psychedelics can produce. This subject was a housewife in her early thirties. [139p261.] The guide who stayed with her for her trip took her into a garden.

> I felt I was there with God on the day of the Creation. Everything was so fresh and new. Every plant and tree and fern and bush has its own particular holiness. As I walked along the ground the smells of nature rose to greet me — they were sweeter and more sacred than any incense. Around me bees hummed and birds sang and crickets chirped a ravishing hymn to Creation. Between the trees I could see the sun sending down rays of warming benediction upon this Eden, this forest paradise. I continued to wander through this wood in a state of puzzled rapture, wondering how it could have been that I lived only a few steps from this place, walked in it several times a week, and yet had never really seen it before.

Later she stated that, "Since that day I had brewing in me a sense of the relevance of that forest for the other areas of my life and the life of my family. For I have come to realize that my way of seeing and hearing and smelling the forest that way was greater than any way I had ever seen and heard and smelled before."

These descriptions give us insight into how spiritually transforming the experiences produced from alterations in the function of the temporal lobes can be. The production of similar images by a spontaneous TLE seizure could understandably result in a religious conversion. What is the mechanism of such powerful imagery? The LSD molecule is structurally similar to serotonin, a major neurotransmitter implicated in a range of behavioral disorders. It and other psychedelic drugs bind to serotonin 1A, 2A and 2C receptors. [140-142] Serotonin is an inhibitory neurotransmitter that normally inhibits the neurons of the amygdala and thus filters its sensory input so that we are not constantly bombarded by all the emotionally laden sounds, visions, memories and images stored there. LSD interferes with this action of serotonin by binding to the serotonin receptors in the amygdala and hippocampus. This interaction breaks down the filters and releases all the visual, auditory and emotional imagery as illustrated by the description of the above LSD trip.

The central role of serotonin in spiritual experiences was supported by a PET scan study of a series of 15 normal males. [143] The PET scan utilized a radioactive compound that, like LSD, also binds to serotonin 1A receptors. The hippocampus

and the brain stem nuclei enriched in serotonin (raphe nuclei) were examined. The subjects were administered the *Temperament and Character Inventory (TCI)*. There was an inverse association between the amount of binding to the serotonin 1A receptor and the self-transcendence scale, a measure of spirituality. It is of note that over time the self-transcendence subscale is the most stable and at the same time one of the most variable of the TCI scales. [144] None of the six other subscales showed such a relationship. Thus, *lower levels of the serotonin receptor were associated with higher spirituality scores*. The authors speculated that *the several-fold variability in serotonin 1A receptor density may explain why people vary greatly in spiritual zeal.*

A role of the temporal lobes in LSD hallucinations is indicated by studies where subjects slated for temporal lobectomy were given LSD before and after the surgery. There was a decrease in the richness of perceptual changes after the removal of the temporal lobe. [145]

Most other psychedelic drugs also interact with serotonin receptors. An exception is salvatorin A, another drug that causes hallucinations. It belongs to the mint family and has been used for its psychoactive properties in traditional spiritual practices by the Mazatecs of Oaxaca, Mexico. This drug acts primarily on kappa endorphin receptors. [146]

Psychedelic drugs are clearly potent hallucinogens. Great spiritual properties have been attributed to them, especially by the "new age" culture. In one study of 206 observed sessions of psychedelic drug use, chiefly LSD and peyote, 96 percent of the subjects experienced religious imagery of some kind, 91 percent saw religious buildings, and 58 percent encountered religious figures. [147]

The vast majority of individuals using LSD experience some type of religious imagery.

DMT and Spirituality

In 1990, Dr. Rich Strassman, a clinical psychiatrist at the University of New Mexico, obtained permission from the Drug Enforcement Agency (DEA) and other regulatory agencies to study the effects of di-methyl-tryptamine (DMT), in human volunteers. He summarized these results in his book, *DMT: The Spirit Molecule.* [148] As shown in Figure 12, DMT is closely related to serotonin.

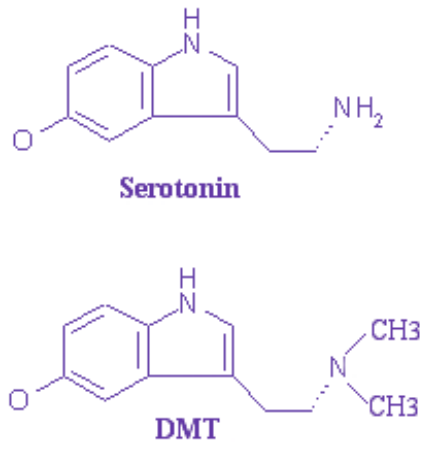


Figure 12. Serotonin and DMT.

DMT differs from serotonin only in the presence of two methyl groups (CH3) instead of two hydrogen atoms on the N atom. Strassman was impressed with several unique characteristics of DMT. It was known to have psychedelic properties, to be normally present in the human brain, to be synthesized in the

pineal gland, and to be actively transported into the brain. Compounds do not have mechanisms to actively transport them across membranes unless they have some function in the brain. These properties indicated it was an endogenous psychedelic compound.[149] He wondered, "What was DMT doing in the human brain?" One intriguing possibility was that it was released during intense meditation or severe stress and was responsible for the feelings of spiritual transformations that can occur during meditation and with NDEs. Since it caused hallucinations, there was also a possibility that schizophrenia was due to a genetically caused excess production of DMT. DMT had been classified by the DEA as a category I drug. These are drugs that are potentially dangerous and addictive and have no known use in medical treatment.

Strassman launched a two-year effort to obtain permission from a wide range of regulatory agencies to study the clinical effects of DMT with the ultimate purpose of determining if it might be involved in schizophrenia, NDE, or meditation. He wondered if it might be the human spirituality molecule. This effort to obtain permission was eventually successful and carefully monitored, double-blind clinical studies were begun using individuals who were experienced users of psychedelic drugs such as LSD, psilocybin, and DMT. DMT is the hallucinogen in *ayahuasca,* a sacramental beverage used in some churches in South America. If drug-naïve subjects had been used, they might later sue him claiming he caused them to become dependent upon psychedelic drugs. This was avoided by using individuals who had previously used psychedelic drugs many times. This also avoided some of the "bad trip" problems of new psychedelic drug users.

In these studies DMT was given intravenously. While street users smoke DMT, this route was not used because it was difficult to determine the precise dose administered. DMT is short acting with the peak effect occurring in two minutes. The effects were usually noticed even before the injection was completed. Subjects felt they were coming down after five minutes. They could talk after 12 to 15 minutes and they felt relatively normal after 30 minutes. The following are some of the experiences related by the subjects receiving DMT.[148p146-149]

The IV dose gave a rush which some compared to a "freight train," "ground zero," or a "nuclear cannon." Almost all commented on the "vibrations," of a powerful energy pulsing through them at a very rapid rate and high frequency. There was a feeling of dissociation of body and mind, producing comments like, "I no longer have a body," "my body dissolved—I was pure awareness." Sometimes this was associated with a feeling of weightless motion: "I am falling," "lifting up," or "flying." The early effects often cause a sense of fear and anxiety lasting 15 to 30 seconds.

Visual images were the predominant sensory effects of a full dose of DMT. They ranged from kaleidoscopic, geometric patterns to "tremendously intricate tiny geometric colors, like being one inch from a color television." Some images had "Mayan," "Islamic," or "Aztec" qualities. Colors were brighter, more intense, and deeper than those of normal awareness or dreams. "It was like the blue of a desert sky, but on another planet. The colors were a hundred times deeper." The inability to tell which images were "in front" and which were "behind" led to a feeling of being in a

"four-dimensional" world that was "beyond dimensionality." Specific images included "tunnels," "stairways," "ducts," "a DNA helix," and "a spinning golden disc." One group of remarkable sensations were collectively referred to as "contact," as in contact with aliens or non-human entities such as "spiders," "mantises," and "reptiles."

About half of the volunteers experienced auditory effects. Sounds were different and they heard things others did not hear. Some had an intensification of hearing, others became functionally deaf to distracting noises. They rarely heard voices or music. They heard non-word noises like "whining and whirring," "chattering," or "high-pitched noises."

Most subjects found the high-dose DMT exciting, euphoric, and extraordinarily pleasurable. For others the fear and anxiety were nearly unbearable, "menacing," and like "incredible torture." Another common effect was the loss of normal time perception. Almost all were surprised late in the session by how much time had passed.

The higher doses often caused a sense of complete loss of control. They felt utterly helpless and incapacitated. "I felt like an infant, helpless, unable to do anything." They also felt another "intelligence" or "force" directing their minds in an interactive manner. This was especially true of the contact with "beings." The following are specific statements made by some of the subjects: [148]

> "Something took my hand and yanked me. It seemed to say, 'Let's go!' Then I started flying through an intense circus-like environment. I've never been that out of my body before. We went though a maze at an incredible fast pace. I say 'we' because it seemed like I was accompanied."
>
> "If I could only hold onto this feeling. If everyone did this every day the world would be a much better place. Life would be a lot better. The potential for good was great. Feeling good within yourself. I guess meditation is supposed to get you to the same place."
>
> "There was a moment of color. The colors were words. I heard them saying 'God is in every cell of our body.'"
>
> "These experiences are like the height of meditation, accessing inner power and inner strength. I am in contact with something deeper and inside."
>
> "I felt a tremendous energy, brilliant pink light with white edges, building on my left side. I knew it was spiritual energy and love."
>
> "I feel very loved. It was a feeling in my chest. It was warm. My whole chest felt inflated. It was a really good feeling. I was loved by the entities or whatever they are. It was very pleasant and comforting." (In later conversations this person said it helped her by demonstrating that she

could lose control, particularly around a powerful man, and be safe and loved at the same time.)

Some of the "contact" experiences provide insight into the alien abduction reports, such as those related by the Harvard psychiatrist, John Mack in *Abduction: Human Encounters with Aliens.* [150] One of the DMT subjects stated: [148p192-197]

> They were trying to show me as much as possible. They were communicating in words. They were like clowns or jokers or jesters or imps. There were just so many of them doing their funny little thing. I settled into it. I was incredibly still and I felt like I was in an incredibly peaceful place. Then there was a message telling me that I had been given a gift, that this space was mine and I could go anytime. I should feel blessed to have form, to live. It went on forever. There were blue hands, fluttering things, then thousands of things flew out of those hands. I thought "What a show!" It was really healing.

Another related story:

> I felt like I was in an alien laboratory, in a hospital bed like this, but it was over there. A sort of landing bay, or recovery room. There were beings. They had a space for me. They weren't as surprised as I was. I was able to pay attention to every detail. There was one main creature, and he seemed to be behind it all. They activated a sexual circuit and I was flushed with an amazing orgasmic energy. A goofy chart popped up like an X-ray in a cartoon. When I was coming out I couldn't help but think "aliens."

Mack suggested that a *reconnection with spirituality* was at the heart of the abduction phenomena—sense of realness and the power of spiritual experiences. One of the most remarkable aspects of these DMT-induced contact experiences was how real they felt. The subjects knew these were drug-induced. However, if an individual had a spontaneous contact experience, triggered by personal crisis, trauma or loss, the realness of it could be overwhelming. This sense of realness was described by Strassman [148p200] as follows:

> The research subjects tenaciously resisted biological explanations because such explanations reduced the enormity, consistency, and undeniability of their encounters. How could anyone believe there were chunks of brain tissue that, when activated, flashed encounters with the beings, experimentation, and reprogramming? Neither did suggesting that it was a waking dream satisfy the volunteers' need for a model that made sense and fit their experience. One said,"This was not a dream or a hallucination. It was real. I can tell the difference. I couldn't have made it up if I wanted to." [148p314]

The same powerful sense of realness has been reported for NDEs,[151] hallucinations induced by the drugs ketamine and PCP,[116] and by hallucinations in general. The American Psychiatric Association notes that "a hallucination has the immediate sense of reality and true perception" and that "transient hallucinatory experiences are common in individuals without mental disorder."[152] These observations have clear implications for spiritual experiences in general and *provide insight into their power because they feel so real.* This relates to the issue of egocentricity discussed below, namely, "Since I experienced it, it was real." This intense sense of "feeling real" is understandable if we assume that the temporal lobes are the association areas for visual and auditory experiences. The vast majority of the time the hippocampal and amygdalar tape recorder for these experiences place into memory banks experiences that are real. In the rare cases where the experiences were internally generated, either as a spiritual experience or as a result of taking a psychedelic drug, the temporal lobes have no mechanism of distinguishing between the real and the unreal. It is as though everything coming to the temporal lobes is assumed to have really happened, to be real.

This conviction and sense of realness in the face of clear evidence of non-realness goes to the heart of the conflict between science and faith. Edmond O. Wilson claimed that you cannot tread the path of spirituality and the path of reason; you must choose between them. The DMT studies suggest this is not necessarily so since they show that even the sophisticated, science-savvy volunteers in this study felt and believed that the "contact" they experienced under DMT was not a dream, not a hallucination, but real. Thus, while the rational and the spiritual brain would always seem to be in conflict, this is not necessarily so.

It is simply necessary for the rational brain to understand that one of the characteristics of the spiritual brain is to strongly believe in something and have faith in something, even when the rational brain says it is unreasonable or that it did not and could not have happened. The rational brain needs to recognize that the spiritual brain can sometimes confuse externally generated reality with internally generated experience.

The rational brain needs to give the spiritual brain "its space," to have this faith without being derogatory and critical of its need to sometimes be irrational. It is like the marriage of an atheist to a theist—something that is perfectly possible and joyous as long as each respects the other's view of the world. These issues will be discussed again later in the part on science and religion.

The psychedelic drugs like DMT often produce a sensation of "contact," of being in the presence of and interacting with a non-human being. Highly intelligent and sophisticated test subjects who knew these feelings were drug-induced nevertheless insisted the contact had really happened. The temporal lobe-limbic system's emotional tape recorder sometimes cannot distinguish between externally generated real events and internally generated non-real experience thus providing a system in which the rational brain and

the spiritual brain are not necessarily in conflict. It is simply necessary for the rational brain to understand that one of the characteristics of the spiritual brain is to strongly believe in something, have faith in something, even when the rational brain says it is unreasonable or that it did not and could not have happened. The rational brain needs to give the spiritual brain "its space," to have this faith without being derogatory and critical of its need to sometimes be irrational.

DMT and hormone release. Strassman obtained blood samples from his subjects before and at varying times after the administration of DMT. The analyses showed that there was a sharp spike in levels of beta-endorphin, vasopressin, prolactin, growth hormone, and corticotrophin within minutes of the injection of DMT.[148p145] Corticotrophin stimulates the adrenal glands to release the stress hormone *cortisone.* It is likely that some of the psychological effects of DMT were secondary to increased release of one or more of these potent hormones.

DMT and serotonin. The consistent production of visual images, sounds, and fear indicate the primary effect of DMT is on the temporal lobes. In an effort to identify which serotonin receptors DMT was binding to, Strassman gave some of his subjects a second drug along with DMT. Two different drugs were used: pindolol, which is a serotonin 1A receptor antagonist, and cyproheptadine, a serotonin 2 receptor antagonist. While cyproheptadine had no effect, pindolol markedly enhanced the effect of DMT. This suggests that DMT was also acting as a serotonin 1A antagonist and when pindolol and DMT were given together, the psychogenic effect was enhanced. These results agree with the above PET studies showing a correlation between the spiritual transcendence score and the level of serotonin 1A receptors. Thus, DMT is likely to exert its effect by blocking the serotonin 1A receptors in the amygdala, hippocampus, and other areas of the temporal lobes.

The many similarities between DMT experiences, religious conversions, out-of-body experiences, NDEs, and alien abductions illustrate how all of these spiritual experiences can be generated by neurochemical events taking place inside the temporal lobes. It is little wonder that Strassman referred to DMT as the *Spirit Molecule.* It is also little wonder that psychedelic drugs have also been called *entheogens,* meaning *God-containing.*[138p20]

DMT is made in the human brain and has been referred to as the *Spirit Molecule*. When given intravenously it produces a wide range of visual and auditory psychedelic and spiritual experiences that have many features in common with OBE, NDEs, alien abductions, depersonalization, derealization, "contact" with other beings, and other spiritual phenomena. Like LSD it appears to exert its effect by inhibiting serotonin receptors in the temporal lobes. The release of this endogenous psychedelic compound during periods of stress and other conditions could play a role in generating spiritual experiences.

Psilocybin and Spirituality

Psilocybin is another popular psychedelic drug. It is derived from the psilocybin mushrooms and has a duration of action of four to six hours. A double-blind study of the effects of psilocybin were carried out in 1962 by Walter Pahnke, a psychiatrist in a Harvard doctoral program on religion and society.[153] Twenty divinity students were the subjects. They received either psilocybin or a placebo. Because it was carried out in the Marsh Chapel on Good Friday it has been called the *Good Friday Experiment*. The results were dramatic. All ten subjects receiving psilocybin rated their experience much higher on mystical qualities than the placebo group. In addition, as with NDEs there were positive long-term effects with improved attitude, deeper religious faith, a more-loving attitude and empathy toward others, and a greater appreciation of life.[138,154,155] However, as with DMT, psilocybin could also produce fear, anxiety, and a terrifying sensation of dying.

In a study by Timothy Leary and colleagues of the effects of psilocybin,[156] one of the subjects wrote the following account:

> I also felt that the only reasonable way to live in the same world was to love and to realize that no one else will ever fully share or understand this basis of our actions, nor will we understand theirs. But the faith, which is completely sustained of and by itself within ourselves alone, is the basis of other's actions and provides the necessary consensus to achieve some sort of simultaneity of time and place in the universe. Love, and the faith in love, keep us from being cosmically alone.

Griffith and colleagues[156a] of Johns Hopkins University School of Medicine carried out a second double-blind study in 2006. None of the 36 volunteers had prior experience with psychogenic drugs. This had the advantage of avoiding a possible selective bias wherein individuals who had previously had a positive experience with hallucinogens might be more likely to volunteer for the study. When administered under supportive conditions, psilocybin produced experiences which were evaluated by the volunteers as having *substantial and sustained personal meaning and spiritual significance.* In a two-month follow-up, in contrast to the placebo (Ritalin), psilocybin produced significantly positive attitudes about life and themselves, positive mood changes, and altruistic and positive social effects.

As with most other psychedelic drugs, psilocybin is structurally similar to serotonin and binds to serotonin receptors.[157,158] The production of visual and auditory hallucinations, fear, and anxiety are consistent with an effect on the temporal lobes.

After Aldous Huxley took mescaline, the psychedelic compound present in some species of cactus, he was moved to write the *The Doors of Perception and Heaven and Hell.*[159] He suggested that visionary vegetables and the psychedelic drugs they contained could provide a new spiritual stimulation for the masses that was easier than going to church and safer than alcohol.

The Swiss psychiatrist Franz Vollenweidner has used PET scanning to examine the site of action of a range of psychedelic drugs. He showed that in addition to their effect on the temporal lobes and limbic system, psychedelic drugs frequently activated the frontal lobes. [160,161] These results were consistent with the important role of the frontal lobes in consciousness and the fact that the primary effect of all psychedelic drugs is to produce an altered state of consciousness.

Psychedelic drugs have also been called *psychotomimetic,* or *psychosis-mimicking.* The extensive studies of LSD in the 1960s, showing that a drug could reproduce many symptoms of schizophrenia, were the primary driving force responsible for launching the field of biological psychiatry and the de-emphasizing of Freudian psychoanalytic explanations of psychopathology. The role of abnormalities of brain chemistry in psychotic and neurotic disorders was further advanced by the discovery of drugs, such as Thorazine and Haldol, that were so effective in the treatment of schizophrenia that they literally emptied out the wards of psychiatric institutions for the chronically ill patients. Since these two drugs worked by blocking dopamine D_2 receptors, this led to one of the major chemical-based theories of schizophrenia – that of an excess of dopamine activity in some parts of the brain. This led Vollenweider to wonder if the psychedelic drugs that bind to serotonin 1A and 2 receptors might also have a secondary effect on brain dopamine levels. PET scans using radioactive agents that bind to dopamine receptors showed there was an increase in dopamine release in the basal ganglia. [162,163] Since dopamine is the pleasure neurotransmitter, it is likely that the increase in dopamine release was responsible for the elevated mood and feelings of peace, joy and pleasure that psychedelics and spiritual feelings can produce.

Right Temporal Lobe or Both Temporal Lobes?

Although many authors have emphasized the role of the right temporal lobe as the site of the spiritual brain, how strong is the evidence for this? The main differences between the left and right temporal lobes are that the left is involved in verbal skills of speech and language and in mathematics, while the right is involved in non-verbal skills and spatial orientation. Is there any more to the left-right dichotomy than this? It is clear from the studies of Penfield and of TLE that both temporal lobes are involved in psychical, spiritual, and religious feelings and experiences. On the basis of a range of studies, there are some unique attributes of the right hemispheres. Studies of individuals with lesions of the right hemispheres are especially valuable since they cut through the New Age myths to the reality of the neurological defects. For example, focal lesions of the right hemisphere impair non-word aspects of speech such as prosody. Prosody refers to aspects of speech such as intonation, pitch, rate, loudness, and rhythm. [164] An additional factor is the tendency for conversion hysteria to affect the left side of the body which is controlled by the right hemisphere. [165]

White matter in the right hemisphere. In 1980, based on blood perfusion studies, Gur [166] reported that there was more grey matter relative to white matter in the left hemisphere than in the right hemisphere, and the right hemisphere had more intermodal white matter nerve tracts. This result suggested that the left hemisphere

tended to talk to itself while the right hemisphere tended to talk to the rest of the brain. This finding added to the mythology that the left-brain was the thinking and internally cognating hemisphere, while the right hemisphere was more open, communicative, intuitive, and holistically oriented. However, in 1999, Gur [167] revisited the issue using the much more sensitive and accurate MRI technique. This time the studies showed that there was in fact more grey matter in the left hemisphere, but this was mostly in men. There was slightly more white matter in the right hemisphere, but this was more so in women. Importantly, none of these differences were statistically significant. So much for the more holistic nature of the right hemisphere.

Self, spatial awareness, and the right temporal lobe. Spatial awareness has usually been attributed to the right parietal lobe. This idea has been based on the assumption that spatial neglect was typically associated with lesions of the right posterior parietal lobe. However, in monkeys, this disorder is due to lesions of the right or left superior temporal cortex. This seemed to present a puzzling species disparity. Karnath and colleagues from the Department of Cognitive Neurology in the University of Tübingen, Germany [168] carried out a careful analysis of 33 subjects with "pure spatial neglect." This showed that in humans the superior temporal gyrus (STG), not the posterior parietal cortex, was the location for spatial neglect. This STG area involved in spatial neglect is shown in Figure 13.

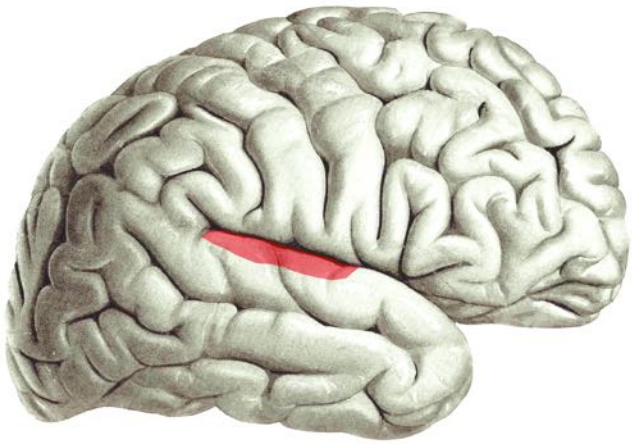


Figure 13. Superior temporal gyrus area for spatial neglect in humans. From Karnath et al.: Spatial awareness is a function of the temporal not the posterior parietal lobe. Nature. *411: 950-953, 2001.*

Unlike monkeys, in humans the area of spatial neglect is localized to the right temporal lobe since the left temporal lobe is subserved for speech. The STG is located at the transition between the "what" and the "where" systems of visual processing. Since the STG receives polysensory streams from both of these areas, it is a site of multimodal sensory convergence. Karnath and colleagues concluded that in early hominids, both temporal lobes were involved in spatial awareness, but with evolution

of speech spatial awareness shifted to the STG of the right temporal lobe, not to the right posterior parietal lobe.

Comparing the left portion of Figure 5, showing the areas on the right temporal lobe where Penfield elicited psychical responses, with Figure 13, indicates that Penfield's region shows a remarkable overlap with the area involved in the evaluation of the position of the "self" in space. This area is likely to play an important role in the out-of-body sensations and the depersonalization and derealization aspects of spiritual experiences.

Self, spatial awareness and limbic system. In addition to the role of the superior temporal gyrus in spatial orientation, specific parts of the limbic system also play a critical role. These are the hippocampus and a region between the hippocampus and the cortex called the *ectorhinal cortex.* The hippocampus contains "place cells" which fire when the individual is in a specific spatial location. These and other cells in the hippocampus provide a cognitive map of the layout of the environment. This map allows us to find our way back to a given site and even plan shortcuts. The ectorhinal cortex has "grid cells" which further refine knowledge of our position in space. [169] Thus, between the right superior temporal gyrus, the right and left hippocampus, and ectorhinal cortex, the temporal lobes play a major role in the of awareness of "self" in space.

Strassman eloquently defined the central role of spatial orientation in spiritual and mystical experiences. He proposed that the three pillars of a mystical experience were self, time, and space, with each undergoing a profound transfiguration.

> There is no longer any separation between the self and what is not the self. Personal identity and all of existence become one and the same. In fact, there is no "personal" identity because we understand at the most basic level the underlying unity and interdependence of all existence. Past, present, and future merge together in a timeless moment, the now of eternity. Time stops, in as much as it no longer "passes."…our self and time lose their boundaries, space becomes vast. Like time, space is no longer there but everywhere, limitless, without edges. Here and there are all the same. It is all here. [148p234]

In conclusion, the cortex of the left temporal lobe is specialized for verbal skills, including speech, reading and math, and the cortex of the right hemisphere, largely by default, is specialized for nonverbal skills, including spatial orientation and music appreciation. Other than this, there is nothing mysterious about the right hemisphere that gives it a valid reason to be exclusively reserved for spiritual and religious experiences. The left hemisphere also has an amygdala, a hippocampus, and an ectorhinal cortex and is fully capable of remembering meaningful emotional experiences, orienting the self in space and of spiritual expression.

With this background showing that the temporal lobes are often the neurological site of spiritual and religious feelings and experiences, we can now examine how three

different investigators have interpreted these findings. Two of them have proposed a primary role for the right temporal lobe, as outlined above; it is clear that both temporal lobes are involved in spirituality.

Persinger, Temporal Lobe Transients, and the God Experience

Michael Persinger is a professor of psychology at the Laurentian University in Ontario, Canada. His major research interest is the clinical and experimental correlates of stimulation of the temporal lobes of mammals including man. In his book, *Neuropsychological Bases of God Beliefs* [1] he has proposed that each person's *God Belief* is composed of a combination of their *God Experiences* and their *God Concept.* The God Experiences are transient phenomena that are loaded with emotion.

> *God experiences* exist for a few seconds or minutes at any given time. Multiple experiences can occur in quick succession. During this period, the person feels that the "self," or some reference indicating "the thinking entity," becomes united or "at one" with the symbolic form of all space-time. It may be called Allah, God, Cosmic Consciousness, or even some idiosyncratic label. Slightly deviant forms include references to intellectual abstracts such as "mathematical balance," "consciousness of time," or "extraterrestrial intrusions."
>
> Usually the God Experience involves euphoria and positive emotions. The person reports a type of God-high that is characterized by a sense of profound meaningfulness, peacefulness, and cosmic serenity. Invariably the state is perfused with references to reduction of death anxiety. It is defined as the anticipated extinction of the self-concept or "the thinking entity." During the God Experience, the person suddenly feels that he or she will not die. Instead, he or she will live forever as a part or subset of the symbol of all space-time. If the symbol is a father image, then the person expects to become a child of the father. If the symbol is "imageless," the person expects to become part of a Universal Whole. [1p1-2]

Persinger has proposed that temporal lobe transients (TLTs), play a major role in peoples' most intense God Experiences and that the God Experience is a phenomenon that is associated with the construction of the temporal lobes. He does not view TLTs as the equivalent to the seizures of temporal lobe epilepsy but rather as "a normal and more organized pattern of temporal lobe activity." They may, however, represent some type of aberrant electrical activity deep within the temporal lobes suggesting that:

> *A biological capacity for God Experience was critical for the survival of the human species.* Without some experiences that could balance the terror of personal extinction, existence of the human phenomena called the "self" could not be maintained. It would have been fragmented by the

persistent, gnawing realization that death could come at any time. [1p12]

The first time that Persinger recorded a minor electrical event from the temporal lobe of a meditator and heard his reports of cosmic bliss, he was impressed with the impact of this change on the person's behavior.

> There was no convulsion of any kind, just a smile and the facial expressions of cosmic serenity. But the experience was compelling. The individual, depressed and forlorn before the episode, left with a fresh view of the world. For a few brief seconds, the person has mingled with the Great Mentality whose rudiments are found in every human culture. The person experienced a conviction shared by millions of other individuals. [1p16]

The *God Concept,* by contrast, is a learned view of one's religion or relation to God. It is a product of years spent as a child in Sunday school or a comparable form of religious instruction. It also embodies such verbal statements as, "I am a Christian," or "I am a Jew," or " I am a Muslim." Although both the God Experience and the God Concept are continuous variables, Persinger suggested that a person's God Belief system could be categorized into four major groups depending upon whether their God Experience and God Concepts were weak or strong.

Some people may have many God Experiences but primitive or poorly socialized God Concepts. They would be classified as mystics or eccentrics. Some may have never had a God Experience but have strong God Concepts as a result of frequent church, mosque, or synagogue attendance, starting at an early age and maintained by weekly attendance to maintain their God Belief.

Those with a poorly developed God Concept and no God Experiences would often be atheists, agnostics, or "spiritual but not religious" individuals. However:

> Even the professed atheist displays some form of God Belief. If the behavior of atheists rather than their verbal displays are measured, then God Beliefs are evident. There are still references to the relationship between the self and the extensions of space and time. Death may be a final termination, but this known finality can be a source of anxiety reduction for people with certain types of reward history. More often, the atheist simply substitutes the conventional God Concept for abstract forms of mysticism. The "Great Nothingness," is almost indiscriminable from the Cosmic Whole of some Asian religions. [1p3]

Finally, individuals who have both a strong God Concept and one or more God Experiences are totally convinced of the validity of their experiences and the absolute truth of the God Concept. They may kill or sacrifice themselves for its benefit, or proselytize others to believe that they have the only true belief system. They can

represent the most rabid of the religious believers.

One of the most intriguing aspects of Persinger's analysis of the biological basis of religious experience are the different things that he proposed could set off the TLTs and produce spiritual feelings. They included hypoxia or lack of oxygen, low blood sugar, fever, illness, changes in cerebral blood flow, stress, a pounding beat, chanting, music, smells, and a range of drugs, especially psychedelic drugs such as LSD, peyote, mescaline, and different mushrooms. Hypoxia occurs at great heights and Persinger suggested that this might account for the fact that ancient religious figures were often known to climb to the tops of mountain. Woerlee [84] made the same point but related it to moderate hypoxia of the prefrontal lobes. At these heights, religious experiences took place. God spoke to the listener and gave special messages. For example, Moses went to the mountains to receive the ten commandments from God. While most yoga involves deep breaths, it can involve reduced breathing and Persinger felt that experienced meditators learned to control the production of TLTs.

Hypoglycemia was proposed as an especially popular method of producing the God Experience. Young initiates among American Indians were required to starve themselves until a God experience occurred and this single event influenced a person's life from then on. Wandering though the wilderness and quasi-starvation were popular Biblical techniques for obtaining the God Experience. Most communications with Jehovah occurred during protracted periods of effective starvation. As an example of a fever induced God Experience, Persinger [1p32] quotes the report of a young person with a severe case of scarlet fever:

> As I drifted in and out of consciousness, I felt I was going to die. Then suddenly I heard a voice say, "Don't worry, I am with you." I looked up and saw a soft white ray coming through the window. The voice said, "I am the Christ, through me there is salvation." I knew I had seen God. I was no longer afraid. When I awoke, my mother told me that two days had passed.

Stresses that are likely to produce God Experiences include death of the spouse or child, marriage, divorce, loss of a job or starting a new job or new responsibilities, being involved in a serious accident, leaving home for college, or a middle age crisis. Stress is likely to simulate TLTs though the release of pituitary hormones such as cortisol, vasopressin or oxytocin, or the release of neurotransmitters such as dopamine, serotonin, epinephrine, or endorphins. Most God Experiences occurring after stress, such as the death of a spouse, occur within one to four days of the death. It is common to experience the presence of the deceased person, smiling and stating, "Don't worry, I am in heaven with God." Persinger relates the following case of a woman whose husband, Fred, had died:

> I lay in bed trying to piece my life together. I lay there for hours. Suddenly, I felt Fred's presence beside me in the bed. I looked over and saw

> him standing beside me. He was dressed in his old work clothes and had a big smile on his face. He said, "Don't worry, Maud, I'm in heaven now. God has let me come to you. All our friends are here too. It's all true, what we believed about God…this is only a temporary separation." I went to sleep and didn't wake for hours. The next day I felt good, the sun was shining again; there was meaning to my life. I know that God exists because I have experienced His presence.

This well illustrates the enormous degree of calming and relief of anxiety that a strong spiritual experience or God Experience can bring about. In some ways these experiences resemble NDEs with their potential to bring about long-term changes and increased resistance to stress.

Music can drive the epileptic brain into seizures and some music can probably drive the normal brain into TLTs, especially very loud music with clapping, chanting, singing, and vocalizations such as "Amens" or "Allah." These are very important elements of religious services and revivals in all religions. Sounds are probably especially powerful because of the central position of the auditory sensory cortex in the temporal lobes. Other repetitious movements such as swaying, dancing, bobbing forward and backward, bowing, or jumping are important. The repetitious genuflecting of both the Jewish and Islamic religions can stimulate the God experience. The critical feature is the monotony and rhythm of the movement.

Smell directly stimulates the olfactory lobe part of the limbic system. Perfumes, incense, and other aromatic compounds are examples. Just as the temporal lobes are the site of the auditory cortex association areas, they are also the site of the olfactory association areas.

Persinger also points out the importance of egocentrism. This does not refer to being egotistical or self-centered. This refers to the relative reliance placed on one's personal experience as proof of reality. Egocentrism is epitomized by the following:

> All of us assume that our experiences are real and true. [170] We presume our memories to be accurate representations of what has happened. We assume that if we perceive something, it must exist, or, if we have not experienced something, it does not exist.

Egocentricism has the advantage of strengthening one's faith based on one's own experiences. However, it has the downside of being used by organized religions to stoke the conviction that one's religion and one's God is the only religion and the only God. This attitude is the fodder of prejudice and the source of religious wars and religious terrorism.

A problem with the Persinger model is that it tends to pathologize spirituality and religion. Although in many cases these feelings and sensations may be the result of TLTs, everyone has the capacity for some degree of spiritual and religious experience, yet it is unlikely that everyone has some microform of temporal lobe epilepsy.

Speaking in tongues provides an example of a common learned trait that appears to stimulate the temporal lobes rather than the temporal lobes stimulating the behavior.

Speaking in Tongues (Glossolalia)

Speaking in tongues, or *glossolalia* (*glossa*—tongue, and *lalô*—speak) is one of the features of the charismatic Pentecostal churches. As outlined in the chapter on Pentecostals, the membership in these churches has rapidly expanded in the twentieth century, despite the shrinking memberships of many other denominations. This leads one to wonder why Pentecostalism is so popular? While some of the reasons are covered later, one reason may be the practice of speaking in tongues. This refers to the utterance of meaningless syllables producing what appears to be an unknown foreign or mystic language. The Pentecostals believe that speaking in tongues is a gift from God through the Holy Spirit. In fact, the term *charismatic* is derived from the Greek word *charis,* meaning a gift. This profound religious experience was believed both to come directly from the Holy Spirit and to provide proof for the existence of God.

The enormously spiritual nature of speaking in tongues raises the question of whether this might be yet another way of directly accessing the spiritual brain using a method produced by the believers themselves, rather than by the Holy Spirit. In other words, "Is glossolalia a divinely given trait or is it a self-learned skill?"

To address this question Spanos and colleagues [171] had 60 undergraduate students listen to a 60-second sample of glossolalia and then asked them to attempt to reproduce this pseudolanguage on their own. In this baseline trial 20 percent of subjects exhibited fluent glossolalia after this very brief exposure. After this, half of the subjects, termed the *trained subjects,* also received two additional training sessions including audio- and videotaped samples of glossolalia interspersed with a chance to practice glossolalia. Live modeling of glossolalia and direct instruction and encouragement were also provided. Of these trained subjects, 70 percent produced fluent glossolalia. The authors concluded that *glossolalia was a rapidly acquired, socially learned behavior, rather than a divinely inspired one*.

Since the speech center, the auditory cortex, and the emotional brain are all located in the temporal lobe, another question is, "Does glossolalia involve the temporal lobes of the brain?" One EEG study provided an answer to this question. Persinger [172] reported the occurrence of spikes within the temporal lobe of a member of the Pentecostal faith, during and only during protracted intermittent episodes of glossolalia. In the same paper he described the presence of a delta-wave dominant electrical seizure from the temporal lobe for about 10 seconds during a peak experience within a period of routine transcendental meditation by a TM teacher. He proposed that these cases were consistent with his hypothesis that transient, focal, epileptic-like electrical discharges in the temporal lobe, without convulsions, may be associated with strong spiritual and religious experiences.

Newberg and colleagues [178] performed SPECT brain imaging of five Pentecostal charismatic Christian women while they were singing or speaking in tongues there was a significant bilateral decrease in blood flow in the dorsolateral prefrontal cortices.

This was not present with simple singing. The result was interpreted as indicating less voluntary control over glossolalia than over singing. The only portions of the brain that showed increased activity for glossolalia compared to singing were the left superior parietal cortex and the amygdala of the right temporal lobe and limbic system.

Together, these studies suggest that glossolalia, like meditation, can provide a method by which normal individuals who are not mystics can activate their spiritual or emotional brain.

Speaking in tongues, as practiced by members of the charismatic Pentecostal churches, may provide an additional way for individuals to directly access their spiritual brain.

Julian Jaynes, God, and the Bicameral Mind

In 1976, the Princeton psychiatrist Julian Jaynes published a book entitled *The Origin of Consciousness in the Breakdown of the Bicameral Mind.* [173] By *bicameral mind* he meant a mind without a consciousness. Individuals without a consciousness had no sense of self and thus did not understand that their own thoughts and actions were generated from within themselves. To replace this deficit they thought that external Gods created these thoughts and actions. For example, a hungry person with a fully developed sense of self and consciousness will simply say, "I am hungry, therefore I should eat." A bicameral individual without this understanding of self would assume the gods produced the hunger.

As with many students of consciousness, Jaynes was enamored by the role of the assumed powerful role the right temporal lobe plays in feelings and spirituality. As an example, he presented a figure showing two identical drawings of a half smiling, half frowning face (Figure 14). They differed only in whether the smile part or the frown part is on the right or left. When asked the questions, Which is happier? Which is sadder? Most of us say the figure on the top with the smile part on the right is happier, and the figure with the frown on the right is sadder. This is the non-verbal, presumably more emotional right brain shining through.

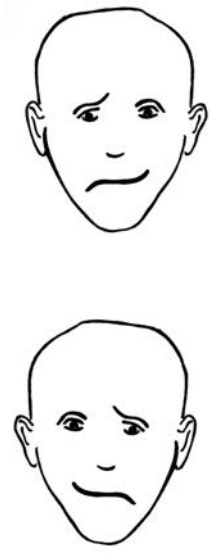


Figure 14. Two versions of a smiling-frowning face. From Jaynes. [173] *See text.*

Jayne proposed that the spiritual resources of the right temporal lobes spilled into the left hemisphere across the section of the commissures located at the level of the temporal lobes. He proposed that the Gods spoke to man from the right to the left temporal lobe. This concept is shown in Figure 15.

Jaynes proposed that consciousness did not evolve in man until quite recently, since the time of the Egyptian pharaohs. It was proposed that in the Egyptian civilization humans were directed by the bicameral voice of their first God-king, Osiris. Jaynes' claim was that religion owed its origin to a dialogue

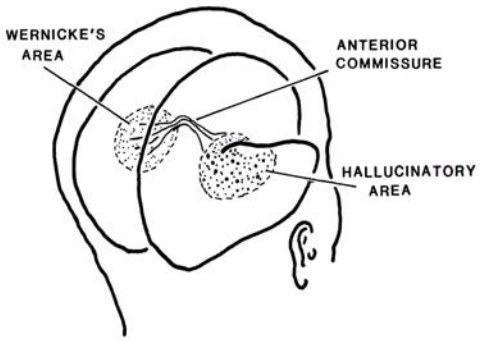


Figure 15. The connection between the left temporal lobe and Wernicke's area and the right temporal lobe or the hallucinatory area. From Jaynes. The Origin of Consciousness in the Breakdown of the Bicameral Mind. *Houghton Mifflin Co. Boston.* [173p104]

between the spiritual right temporal lobe with the rational left temporal lobe in ancient man. Prior to the development of consciousness, man was incapable of realizing that the gods were not speaking to them directly.

The concept that consciousness developed only in the last several thousand years is unlikely on many grounds. Anthropological findings dating back over 60,000 years suggest that early man was aware of his own mortality, something only a well-formed consciousness and sense of self would allow. In addition, since all behavior is associated with brain activity, and ultimately with the expression of a range of genes, it is unlikely that a major, species-changing event such as consciousness could have evolved in only the last several thousand years. Jaynes realized this and claimed the change was a cultural one. However, the genetic transmission of learned behavior is unlikely. Despite the improbability of Jaynes' theory of the origin of religion, I have presented it because like other proposals, it lays spirituality at the feet of the temporal lobes.

The Temporolimbic Marker Model of Saver and Rabin

Saver and Rabin [3] proposed a temporolimbic marker model that does not rely on pathologizing spirituality. The name temporolimbic is based on the fact that while the amygdala and the hippocampus, and the emotional memories they contain, are part of the temporal lobes, they are also part of the limbic system. They play a critical role in spiritual experiences produced by brain stimulation, temporal lobe seizures, auras, NDEs, and psychedelic drugs. The term *temporolimbic system* emphasizes the important role of the limbic system.

The amygdala and hippocampus mark incoming sensory stimuli as positive or negative experiences. [174] They serve as the brain's tape recorder for emotional events. In the temporolimbic marker model, the temporal lobes and limbic system remember and mark some experiences as producing a sense of depersonalization or derealization, of spiritual importance, of being in harmony with the rest of the universe, and of ecstasy. Spiritual experiences are seen as similar to those of ordinary experiences except that they are tagged by the limbic system as of profound emotional importance, joyous and of providing a feeling of being connected to something greater than themselves. [3] A remarkable conclusion from the literature reviewed in this chapter is that a single spiritual experience has the potential of producing a permanent life-long change in an individual's spiritual or religious outlook. This is

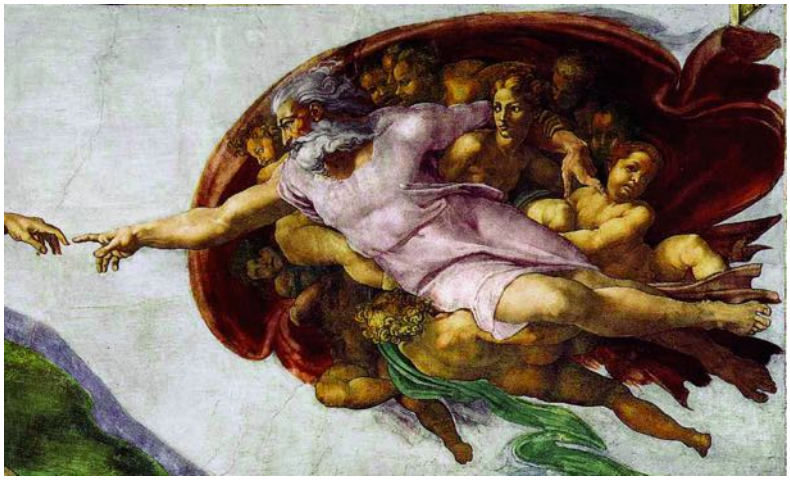
consistent with the temporolimbic marker model with its emphasis on the critical role of the hippocampus, a structure that monitors short- and long-term memory. The beauty of the marker model is that it relies on the normal functioning of the temporolimbic system, a system which is susceptible to changes in function by stress and a wide range of environmental events and as such, is applicable to everyone.

A critical advantage of incorporating the amygdala and the hippocampus, the emotional brain and the memory system into the model is the realization that the temporolimbic system is often unable to distinguish between real, external events, and non-real internally generated experiences. It records with equal fidelity whatever is presented to the tape recorder. Thus, *when internally generated spiritual and religious experiences occur they may be perceived as totally real.* While the rational brain and the spiritual brain often seem to be in conflict, this conflict is not inevitable. *It is simply necessary for the rational brain to understand that one of the characteristics of the spiritual brain is to strongly believe in something, have faith in something, even when the rational brain says it is unreasonable or that it did not and could not have happened.*

The temporolimbic system consists of the temporal lobes and the amygdala and hippocampal portion of the limbic system. The latter two structures serve as the site of emotional memory. Different studies show that a wide range of factors that influence temporal lobe function can produce hallucinations, paranormal, spiritual, mystical, and religious experiences. These factors include the electrical stimulation of the temporal lobes; spontaneous temporal lobe epileptic auras and seizures; trauma; the severe anoxia of near death, G-forces and carbon dioxide inhalation; psychedelic drugs; speaking in tongues; and many environmental stressors.

In addition, the superior temporal gyrus, the hippocampus, and the surrounding ectorhinal cortex have been shown to be the site of a sense of the self in space. Aberrant functioning of this area can result in the out-of-body sensations, depersonalization and derealization so common in spiritual and mystical experiences. These spiritual experiences are seen as similar to those of ordinary experiences except that they are tagged by the limbic system as of profound importance, meaningful, immensely joyous and of providing a sense of being connected to something greater than ourselves.

The temporal lobe emotional memory system is often unable to distinguish between real, external events and internally generated non-real experiences. Thus, when these internally generated spiritual experiences occur they may be perceived as totally real. It is necessary for the rational brain to understand that one of the characteristics of the spiritual brain is to strongly believe in something and have faith in something, even when the rational brain says it is unreasonable or that it did not and could not have happened. This is the essence of faith over reason. The temporolimbic system is our spiritual brain.



A final note. For the cover of this book I used Michelangelo's depiction of the Creation of Man from the Sistine Chapel. Michelangelo spent considerable time dissecting the human body to learn the secrets of anatomy, including removing and examining the brain. [171] It is of interest that in his fresco, God is resting on the outline of a human brain, right in the area of the temporal lobe. Whether as a part of his insightful genius or happy accident, it appears he got it right.

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Meditation is first and foremost a search for the God within.
Ken Wilbur
Grace and Grit, 1991 [1]

Chapter 31

The Meditating Brain

What is meditation? The following description [1] covers it well.

> Meditation, it is said, is a way to evoke the relaxation response. Meditation, others say, is a way to train and strengthen awareness; a method for centering and focusing the self; a way to halt constant verbal thinking and relax the body; a technique for calming the central nervous system; a way to relieve stress, bolster self-esteem, reduce anxiety, and alleviate depression. All of these things are true enough; meditation has been clinically demonstrated to do all of those things. But I would like to emphasize that meditation itself is, and always has been, a spiritual practice.

Various spiritual disciplines speak of the transformative feelings produced by different forms of meditation. These include ecstatic emotions, a sense of being lost in time and space, encounters with demonic or angelic entities, heavenly sounds and sights, a blinding white light, a feeling of having died and been re-born, contacting a powerful and loving presence underlying all reality, [2p73] pure or heightened awareness, pure consciousness, *samadhi, santori, nirvana,* [3] *ananda* (peace), [4] enlightenment, [5] inward contemplation, [6] pleasure, [7] a "eureka" moment, [3] mindfulness, and touching the Godhead. [8] These experiences cut across all denominations, faiths, and cultures. As wonderful as these descriptions sound, the vast majority of people who meditate just obtain a feeling of being very relaxed, rested, mellow, blissful and at peace with the world.

Given the intensely spiritual nature of meditation one would anticipate that the part of the brain that would be activated during meditation would be the spiritual brain — the temporal lobes. This is not necessarily the case, and for this reason I have given the meditating brain its own chapter. In the chapter on the spiritual brain, the spiritual sensations were arising spontaneously, from within, generated by electrical stimulation, epileptic auras, trauma, NDEs, psychedelic drugs, speaking in tongues, and other factors. There was no conscious effort to make the spiritual feelings happen; they just happened.

By contrast, the spiritual feelings associated with meditation are the result of a conscious effort to bring them about. This is done by evoking a highly focused attention, visualization, a range of rhythmic activities including deep breathing,

chanting, vocalizing mantras or different body movements. The type of meditation and the method used will dictate which parts of the brain will be activated. The body of knowledge about meditation is vast. I will only cover the types of meditation, the physical effects of meditation, meditation and *gamma* brain waves, and which parts of the brain are involved in meditation.

The Types of Meditation

The religions of the world are commonly classified into the ecstatic religions of the West (Christianity, Judaism, Islam) and the contemplative religions of the East (Buddhism, Hinduism, Taoism, and others). Meditation had its origin in the contemplative religions of the East. It was initially introduced into the United States at the World Parliament of Religions, held in Chicago in 1893.[6] The practice of various types of meditation has seen a continuous growth ever since. It experienced a giant increase in popularity following the counter-cultural revolution of the 1960s, the widespread interest in altered states of consciousness initiated by the use of psychedelic drugs, and the influx of large number of practitioners to the United States following the Communist invasions of China, North Vietnam, North Korea, and Tibet.[6p6.]

The two major types of meditation are *those that relax* and *those that excite.* The vast majority of practitioners teach a type that relaxes. This can be attained by either *focused* or *unfocused* efforts. In focused meditation practitioners focus their attention on an object such as a peaceful place, a word such as a mantra, an action such as breathing, on muscle movement or lack of movement as in yoga, or a thought such as compassion or love of God. In unfocused meditation the emphasis is on "mindfulness," a generalized state of alertness where the mind remains unfocused but is prepared to attend to any potential stimulus. Rapid breathing is often used for the type of meditation that excites. It has been suggested that this eventually leads to a relaxation response. The following is a partial list of some of the many specific types of meditation.

Transcendental Meditation (TM). This was taught by Maharishi Mahesh Yogi, a Vedantic meditation teacher. TM began in India in 1956. It involves the quiet repetitious thinking or vocalization of a mantra. A mantra is any word or syllable. TM has been labeled by some as a cult because it offers, for money, to teach TM and to provide pupils with their own individualized mantras. In fact a student can think up their own mantra. It is simply the monotonous repetition of words or phrases that focus the mind, increase attention, and produce a restful relaxation. A common mantra in TM is Om Mani Padme Hum, or just Hum. A common position to enhance TM and other forms of meditation is to assume the physically difficult crossed-legs lotus position as shown in Figure 1. The half-lotus position with one leg crossed is much easier.

One of the purported appeals of TM is its claim to be scientifically validated. Many of these studies[9] however, were carried out at the Maharishi Mahesh International University (MIU) in Fairfield, Iowa, now called the Maharishi International School of Management. There is considerable debate about whether

Figure 1. The legs-crossed lotus position. [8a]

TM or meditation in general produces effects above and beyond those of simple eyes-closed relaxation.

Mindfulness meditation. Mindfulness is an ancient Buddhist practice of sitting quietly and emptying the mind. One practitioner said, "Just by sitting and doing nothing, we are doing a tremendous amount." The goal of Buddhist meditation is to detach oneself from desires and objects which are the cause of suffering. This is sometimes called Zen meditation. Zen considers the "blank mind" to be a higher form of consciousness because it is free of attachments. An additional goal is to have as little tension in the body as possible. The following statements about mindfulness are from Jon Kabat-Zinn's book *Wherever You Go There You Are*. [10]

> Mindfulness means paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally. This kind of attention nurtures greater awareness, clarity, and acceptance of present-moment reality. It wakes us up to the fact that our lives unfold only in moments. If we are not fully present for many of those moments, we may not only miss what is most valuable in our lives but also fail to realize the richness and depth of our possibilities for growth and transformation.
>
> The funny thing about stopping is that as soon as you do it, here you are. Things get simpler. In some ways, it's as if you died and the world continued on. By "dying" now in this way, you actually become more alive now. There is nothing passive about it. Stopping actually makes the going more vivid, richer, more textured.
>
> I like to think of mindfulness simply as the art of conscious living. The most important point is to be yourself and not try to become anything that you are not already. Buddhism is fundamentally about being

> in touch with your own deepest nature and letting it flow out of you unimpeded. It has to do with waking up and seeing things as they are. In fact the word "Buddha" simply means one who has awakened to his or her own true nature.

Kabat-Zinn's instructions on the art of mindfulness are:

> TRY: Stopping, sitting down, and becoming aware of your breathing once in a while throughout the day. It can be for five minutes or five seconds. Let go into full acceptance of the present moment, including how you are feeling and what you perceive to be happening. For those moments, don't try to change anything at all, just breathe and let go. In your mind and in your heart, give yourself permission to allow this moment to be exactly as it is, and allow yourself to be exactly as you are. Then, when you're ready, move in the direction your heart tells you to go, mindfully and with resolution.

Thus, instead of the clearing the mind by repeating words, mindfulness clears the mind by simply concentrating only on the present moment, not the past, not the future. Mindfulness meditation has also been called Vipassana insight meditation, in the Theravada Buddhist tradition. The fact that the word "spirit" comes from the Latin word *spirare,* meaning "to breathe," may account for the emphasis on breathing in virtually all forms of meditation.

Tantric yoga meditation. This is a form of Buddhist meditation practiced by Ananda Marga, an international society dedicated to the achievement of both social and individual spiritual goals. It involves intense concentration of attention and the subjective sense of an ongoing struggle to achieve the ultimate union with the object of concentration and total self-adsorption or *samâdhi.* The concepts of *kundalini* (spinal energy) and *chakras* (spinal energy sites) are Tantric concepts. Ananda Marga practitioners often report the subjective sense of energy discharges or "rushes" at times during meditation. Tantric tradition emphases that all the energies of the organism are potentially capable of transformation into the spiritual energy of union with the object of devotion.[11] Some researchers have suggested that practicing attention based meditation might improve the ability to concentrate in children with attention deficit disorder.[12]

The Relaxation Response. Herbert Benson, M.D. is a cardiologist at Harvard Medical School. In the late 1960s he first began to study TM practitioners, then Tibetan Buddhist meditators and people practicing other forms of relaxation. In 1975 he published *The Relaxation Response*[7] describing what he felt were the key generic elements to meditation and generation of the relaxation response. These included a quiet environment, an object to dwell upon, a passive attitude, and a comfortable position.

The object to dwell on can be a repetitive word or sound or a feeling. Some prefer

to think about God. It was proposed that this helped to clear the mind so when a distracting thought occurred, returning to the repetition eliminated the thought. The passive attitude consisted of the emptying of all thoughts and distractions from one's mind. This was felt to be especially essential in eliciting the relaxation response. Sitting is essential to maintain wakefulness. If these elements were performed while lying down the subject would just fall asleep. Some keep their eyes open to further decrease the chance of falling asleep. This whole process is carried out for 20 minutes each day.

The relaxation response consists of a decrease in the heart rate, respiratory rate, blood pressure, and oxygen consumption and an increase in EEG alpha waves. It was proposed that these responses were due to a decrease in sympathetic tone and were the opposite of the fight and flight response to stress, where the pulse, respiratory rate, blood pressure and oxygen consumption all increase. It was suggested that the daily stresses of life were constantly triggering the flight or fight response, a major cause of hypertension. If meditation could reverse the flight or fight response, it might also be useful in the treatment of hypertension, and Benson's studies suggested this was the case.

The production of the relaxation response was not unique to TM meditation. Benson found that a wide range of other relaxation techniques also produced the relaxation response. These included Zen and Yoga; hypnosis; progressive relaxation, where the subject lies down and focuses on relaxing different muscles; and other similar techniques.

If the reader has not had previous experience with meditation he or she may wish to try the following simple instructions for the technique Benson gave to his subjects in his studies. [7p162]

- Sit quietly in a comfortable position.
- Close your eyes.
- Deeply relax all your muscles, beginning at the feet and progressing up to your face. Keep them relaxed.
- Breathe through your nose. Become aware of your breathing. As you breathe out, say one word, "ONE," silently to yourself. For example, breathe IN…OUT, "ONE"; IN…OUT, "ONE"; etc. Breathe easily and naturally,
- Continue for 10 to 20 minutes. You may open your eyes to check the time, but do not use an alarm. When you finish, sit quietly for several minutes, at first with your eyes closed and later with your eyes opened. Do not stand up for a few minutes.
- Do not worry about whether you are unsuccessful in achieving a deep level of relaxation. Maintain a passive attitude and permit relaxation to occur at its own pace. When distracting thoughts occur, try to ignore them by not dwelling upon them and return to repeating "ONE." With practice, the response should come with little effort. Practice the technique once or twice daily but not within two hours after any meal, since the digestive processes seem to interfere with the elicitation of the Relaxation Response.

Physical Yoga. Yoga can have many meanings. Yoga is a Sanskrit word derived from *"yuj"* which means to connect, join, or balance. In relationship to meditation the term itself means union, specifically the union between the individual's consciousness and a universal consciousness. Yoga can refer to this union, to a state of consciousness, or to the method of achieving this state of consciousness. "Yoga meditation" is often used to refer to various forms of meditation. The term "yogi" refers to an individual practitioner or teacher of meditation or yoga. Hatha yoga refers to a form of yoga that prepares the body for spiritual growth by the use of different physical positions and breathing exercises. Much of the yoga popularly practiced in the United States is some form of physical or hatha yoga. It began in the U.S. with the publication in 1966 of *Light on Yoga*[13] by B. K. S. Iyengar. In this book he explained 216 different yoga postures. This was a physically challenging form of yoga and was designed to provide treatment for a number of conditions including backache, high blood pressure, stress, depression and others. It has become enormously popular. A yoga teacher stated, "Prior to his book yoga classes were a cliché in which vegetarians gathered in dark room to meditate with burning candles and incense. Mr. Iyengar and his book literally turned the light on in the room and on the fact that yoga was not a flowery, soft, and easy practice. He showed us it could be fierce, dynamic and physical."[14] Other variations include "flow yoga" using a different set of body positions than Iyengar yoga and "hot yoga" in which yoga is practiced in a sauna-like hot room.

Several types of meditation and relaxation exercises have a number of features in common. These are:

- **a quiet environment,**
- **an object to dwell upon, such as a repetitive word or sound, a feeling, or awareness of breathing,**
- **a passive attitude, and**
- **a comfortable sitting position.**

These features help to clear the mind of extraneous thoughts. The sitting position helps to maintain a wakeful level of consciousness. Some recent forms of yoga meditation incorporate various forms of physical positioning of the body to enhance the spiritual effect.

Effects of Meditation

Many thousands of studies have been performed on the effects of meditation on a range of bodily functions. These studies have been extensively reviewed elsewhere.[5,6,15] While these studies vary widely in their scientific rigor there is a consensus that meditation results in a decrease in heart rate, respiratory rate, and blood pressure; an increase in EEG alpha and theta wave activity; an increased synchronization (coherence) of neuronal activity; a decrease in blood lactate level; decreased oxygen consumption; decreased muscle tension; increased blood

phenylalanine; decreased generation of carbon dioxide by muscles; decreased use of glucose by red blood cells; decrease in stress hormones, and an increase in the secretion of vasopressin and prolactin. Many of these are only modest changes, but some are dramatic. Coherence refers to the degree of synchronization of the electrical activity of a number of neurons. Increased coherence means increased efficiency of information transfer in the brain.

While there is considerable doubt about whether meditation is any more effective in bringing about these changes than simple eyes-closed resting,[16-18] a number of studies suggest that it is.[5,19-22] It can be seen from the above description that eyes-closed rest involves three of the six steps of the meditation procedure described by Benson. The primary difference is that meditation focuses on an object, or thought, or repeating a word or phrase, and a "passive attitude" to keep the mind free of all extraneous thoughts. During simple eyes-closed rest many thoughts can still swirl about in one's brain. Emptying of the brain of random thoughts may allow for a deeper level of concentrated relaxation than simple eyes-closed rest and this may account for the greater effect of meditation. Some of the changes described above as occurring during meditation do not occur during eye-closed rest.

Most forms of meditation result in deactivation of the autonomic nervous system and a feeling of intense relaxation. In a study of expert practitioners of Tantric Yoga recruited from the Ananda Marga Training Center, Corby and colleagues[11] recorded episodes of sudden autonomic activation coinciding with reports by the practitioner of an ecstatic state of intense concentration—a true *samâdhi* episode. This type of experience indicates that some forms of meditation constitute much more than just relaxation.

The EEG is the spatial average of activity generated by the superficial nerve cells of the cortex. The tracings would sum to zero if certain groups of cells were not linked and firing together.[23] The larger the area involved in synchronized activity, the higher the frequency and amplitude of the EEG. One of the effects of meditation is to increase the degree of synchrony of nerve cells. This is called *coherence.* As described below, coherence is taken to the extreme in practitioners who have completed thousands of hours of meditation. During meditation they produce high-frequency 25–70 Hz *gamma* waves.

Claims have been made that meditation can be used to treat a dizzying number of disorders and conditions. Again there is great variation in scientific rigor in the different studies. Any improvement disappears if meditation is discontinued. The interested reader can refer to the reviews of these studies.[6,15] A potential downside of meditation is the risk of becoming addicted to it. This may result in a distancing from family, job and responsibilities and a susceptibility to being manipulated into cults that claim to have "the answer" to life.[15]

The Dalai Lama, Compassionate Meditation, and Gamma Waves

Prior to a MIT conference on meditation, the Dalai Lama spent two days visiting the University of Wisconsin laboratory of neuroscientist Richard Davidson. Davidson

was interested in neuroplasticity, the concept that using the brain can physically change the brain. Hebb first proposed this in 1949. He suggested that learning, memory and other higher brain functions were accomplished by the formation of groups of nerve cells whose interactions were strengthened whenever the cells and certain pathways were activated. The research question was: As a result of neuroplasticity, are the brains of experienced Buddhist meditators different than those of non-meditators? To test this, the Dalai Lama dispatched eight of his most accomplished practitioners of Buddhist meditation to Davidson's laboratory. These practitioners had undergone mental training in the Tibetan Nyingmapa and Kagyupa traditions for 10 to 50 thousand hours over periods ranging from 10 to 40 years. The controls had no previous meditative experience but were interested in meditation and underwent training for one week prior to the experiment.

Objectless or compassionate meditation was practiced by the subjects to produce a state of "unconditional loving kindness and compassion" with an "unrestricted readiness and availability to help living beings." Unlike other forms of meditation, compassionate meditation does not require concentration on particular objects, memories, or images. Because "benevolence and compassion pervades the mind as a way of being," this state is called "pure compassion." During objectless meditation the subjects were asked to be in a non-meditative state. They were examined by power spectrum EEG during meditative and non-meditative states.

This study showed remarkable differences in high frequency 25–70 Hz *gamma* wave activity both in the neutral state and during mediation. [24] The differences in the non-meditative state were consistent with neuroplastic changes in the experienced meditators. Gamma power represents the additive effect of all the gamma waves. The gamma power results for the meditative state are shown in Figure 2.

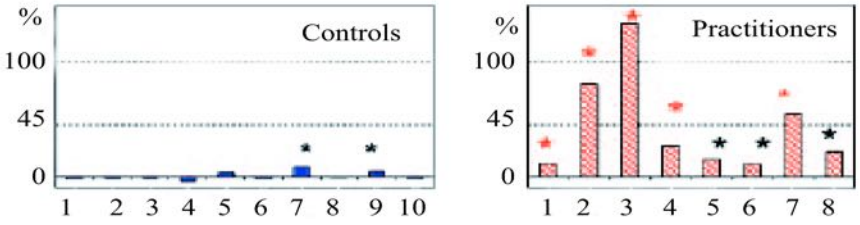

Figure 2. Relative gamma *power and mental training. The numbers on the bottom represent subjects. The data on the right of each figure is the relative total* gamma *power as the percent ratio between the basal state and the meditative state. The blue stars represent a 2-fold increase over baseline, the red stars a 3-fold increase. The results are presented for Controls and Practitioners. From Lutz et al.:* Proc Nat Acad Sci USA. *101:16369-16373. By permission of National Academy of Sciences. Copyright 2004.*

There was a dramatic increase in *gamma* power during meditation for the experienced practitioners compared to the controls. Figure 3 shows *gamma* power averaged across the whole brain and illustrates the brain locations with the greatest *gamma* power.

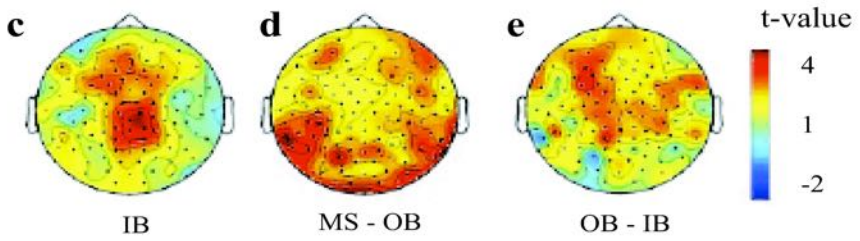

Figure 3. Relative gamma *power comparing controls to practitioners for different brain regions. c: initial base line (IB). d: Meditative state (MS) – ongoing baseline (OB). e: post-meditation ongoing baseline – initial baseline. From Lutz et al.: Proc Nat Acad Sci USA. 101:16369-16373. By permission National Academy of Sciences, U.S.A. Copyright 2004.*

These illustrations show the increase in *gamma* power (red areas) over the frontoparietal electrodes. The authors stated that the results demonstrated robust *gamma* wave oscillations and long-distance phase-synchrony in compassionate meditation. The movement of the *gamma* waves through the brain was far better organized and coordinated than in the controls. This indicated that massive distributed neural assemblies were synchronized with a high degree of in-phase timing for the thalamo-cortical and cortical-cortical interactions in this meditative state. The observation that these differences were more striking in the practitioners that had been training the longest is consistent with a neuroplastic effect.

What are *gamma* waves? Neural synchrony in the fast gamma band frequencies of 25 to 70 Hz has been implicated in mental processes involved in attention, working-memory, learning, information processing and conscious perception. This synchronization is thought to play a critical role in high-level cognitive functions. [25-27] There are striking similarities between these results and the proposed neural substrates for consciousness. [28]

Many in the West have assumed that meditation is just a form of relaxation. This is very likely true for the casual meditator. However, considerable evidence has been accumulated that in practitioners who have been meditating many hours a day for many years, brain blood flow, EEG, and spiritual experiences occur that are different from those obtained from simple eyes-closed relaxation.

A study of Buddhist monks with thousands of hours of mental training showed that objectless or compassionate meditation designed to produce a state of "unconditional loving kindness and compassion" was associated with high levels of EEG gamma wave activity. Gamma waves are high frequency 25–70 Hz brain waves that are indicative of a high level of synchronization of neuronal activity and are important in cognition and consciousness. The results were also consistent with the presence of neuroplastic changes in the brain of practitioners with a history of prolonged mental training.

The Effect of Meditation on Brain Function as Determined by Imaging Studies

Imaging studies are relevant to the issue of whether there is a "meditating brain." Only a small number of relevant studies have been carried out. The most well known are those by Newberg and d'Aquili, described in their book, *Why God Won't Go Away*.[29,30] They examined eight devout Buddhists who were accomplished practitioners of Tibetan "mindful" meditation. As in all meditation, the goal was to quiet the constant chatter of the conscious mind and lose themselves in the deeper, simpler reality within. Meditating practitioners were examined using a SPECT (Single Photon Emission Computed Tomography) scanner, a tool that detects emissions of a radioactive compound that is injected when the subject pulls a string to tell the investigators they are at the peak of the process. Figures 4 and 5 show the results.

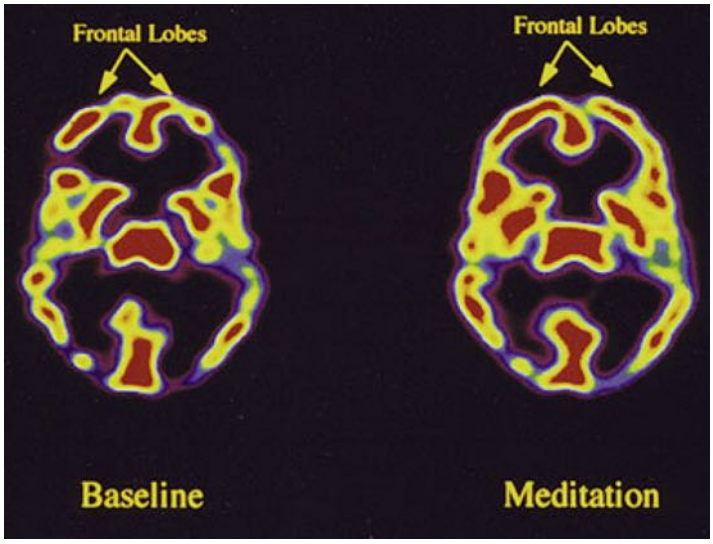

Figure 4. SPECT Scan of a Tibetan Buddhist monk at baseline and during meditation. From Newberg, University of Pennsylvania Health System. There was increased activity in the prefrontal lobes during meditation reflecting increased concentration. Reproduced with permission of the authors and publisher from: Newberg, A. Pourdenad, M. Alavi, A. & d'Aquili, E. G. Cerebral blood flow during meditative prayer: preliminary findings and methodological issues. Perceptual and Motor Skills. *97: 625-630, 2003.*

These scans show a combination of activation of the inferior, orbital, and dorsolateral prefrontal cortex representing the increased concentration involved in meditation and decreased activity of the left posterior superior parietal lobe which they called the *orienting association area.* This area constantly receives and evaluates sensory input as to where one is in space and this keeps the self informed as an entity separate from the environment and from others. When input to this area is decreased by sensory isolation or by rhythmic events, such as repeating mantras or clearing the mind of thoughts. Newberg and d'Aquili suggested that the sense of self as an isolated entity was diminished and as a result, the spiritual sense of the person as part of something greater than the self was increased.

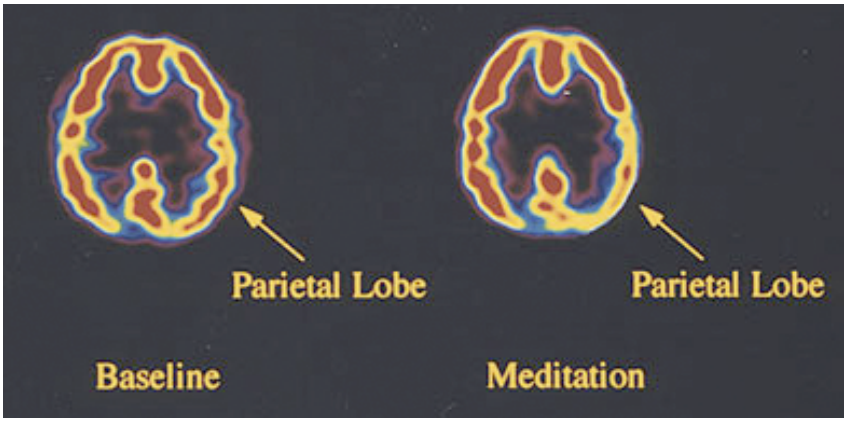

Figure 5. SPECT scan of a Tibetan Buddhist monk at baseline and during meditation. From Newberg, University of Pennsylvania Health System. There was decreased activation of the left parietal lobe (on the reader's right). Reproduced same as Figure 4.

When Franciscan nuns were examined during prayer there was a positive correlation between the blood flow in the right prefrontal cortex and the right thalamus, and a relative decrease in the right superior parietal lobe [31] (Figure 6).

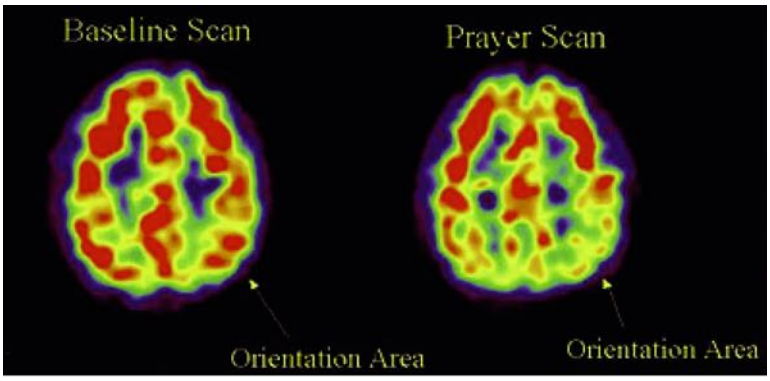

Figure 6. Franciscan nun during prayer showing decreased activation of the right parietal orientation association area. From Newberg, University of Pennsylvania Health System, by permission.

There was also activation of the speech area consistent with the silent use of words in the prayers. Newberg and colleagues believed that "the orientation association area is extremely important in the brain's sense of mystical and religious experience, which often involves altered perception of space and time, self and ego." [29p29] They make their point in more detail as follows: [29p87]

> The orientation association area — the part of the brain that helps us distinguish the self from the rest of the world and orients that self in space — requires a constant stream of sensory information to do its job well.

> When that stream is interrupted, it has to work with whatever information is available. In neurological parlance, the orientation area is deafferentiated (*afferent* = neural pathway toward, *de* = unblock) — it is forced to operate on little or no neural input. The likely result of this deafferentiation is a softer, less precise definition of the boundaries of the self. This softening of the self, we believe, is responsible for the unitary experience practitioners of ritual often describe.
>
> The same neurobiological mechanism underlying unitary experiences can also be set in motion, in a slightly different manner, by the intense, sustained practice of slow ritual activity such as chanting or contemplative prayer. These slow rhythmic behaviors stimulate the quiescent system, which, when pushed to very high level, directly activates the inhibitory effects of the hippocampus, with the eventual result of deafferentiating the orientation area and ultimately, of blurring the edges of the brain's sense of self, opening the door to the unitary states that are the primary goal of religious ritual.

In summary, it was proposed that meditation and other rituals resulted in a suppression of the area of the brain responsible for identifying the self in space. As a result, the individual merged with the oneness of the universe, with the cosmic consciousness, with God. While this is almost poetic in its inherent beauty and seems to have great heuristic value for understanding spiritual experiences, there are a couple of problems. The first is that imaging studies of meditating individuals by other investigators have given different results. The second relates to the issue of whether the posterior superior parietal area is the penultimate brain area for developing a sense of the self in space. As described in the previous chapter, the superior temporal gyrus, hippocampus, and ectorhinal cortex play the major role in spatial orientation. In addition, studies in humans after tumor resection indicate that a subcortical parietal-frontal lobe pathway is important in spatial orientation [32] and yet the frontal lobes showed no increase in activity.

Recent studies have examined the brain areas involved in the concept of self as distinct from the location of self in space. [33] It could be argued that these areas might also be deafferentiated during prayer. The areas of the brain involved in this self-network are shown in Figure 7.

These areas are the medial prefrontal cortex, [34,35] the precuneus, and the anterior insula. The medial prefrontal cortex portion, as well as the dorsolateral prefrontal cortex, were activated in the studies of meditating monks described by Newberg and d'Aquili. [30] They attributed this to focused attention. The precunus is in a similar location (Brodmann 7) as the orienting area, but in the self-network it is involved in autobiographical memories related to the identification of the self rather than a positional self.

Herzog and colleagues [36] used PET scanning to examine eight members of a yoga meditation group during a non-meditation control state and during meditative

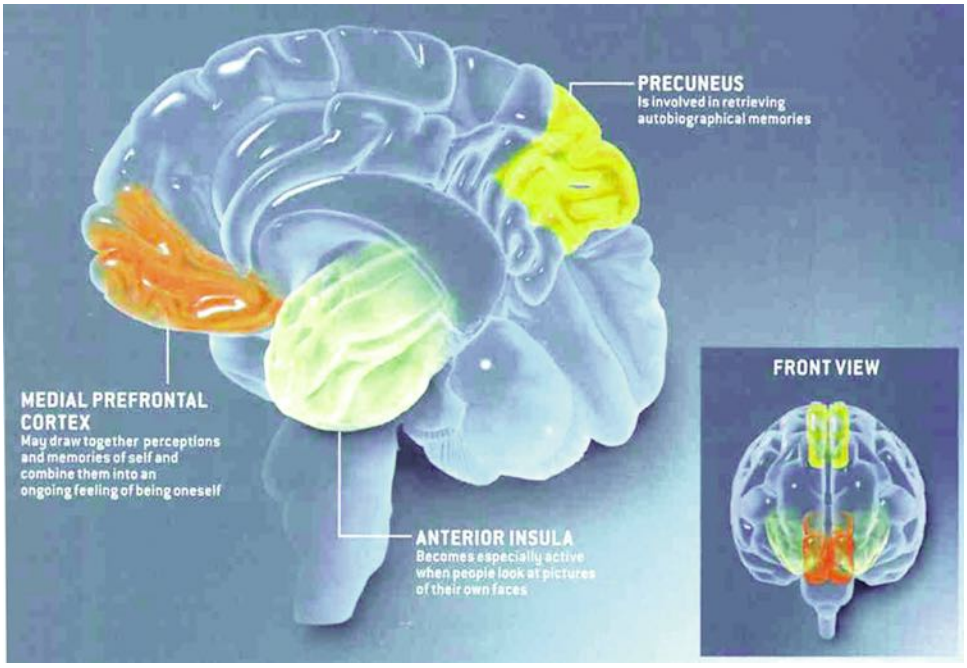

Figure 7. Components of a self-network. From Carl Zimmer, The Neurobiology of the Self. Scientific American. *293:93-101, 2005. 3FX, Inc.* [33]

relaxation. They showed a slight increase in frontal lobe blood flow and a more pronounced reduction in the posterior occipital and parietal areas. They did not observe any difference in the two hemispheres. Thus, except for the lack of a primarily left-sided effect, these results tended to agree with those of Newberg and d'Aquili.

A series of studies from researchers at the University of Copenhagen have produced different results. Nine young adults who were highly experienced yoga teachers were examined by PET scanning during non-meditation and relaxation (Yoga Nidra) meditation. [37] During meditation there was activation of portions of the posterior occipital cortex involved in visual imagery. During non-meditation, there was relative activation of the prefrontal cortex and other brain areas that support focused attention. These results, showing activation of the visual imagery areas of the brain and a relative loss of executive attentional control during meditation, tended to be the opposite of the results obtained by Newberg and d'Aquili.

The Copenhagen group obtained similar results in a PET study of light sleep. [38] EEG monitoring was used to determine the stage of sleep and the subjects were interviewed after the scans to determine if they had been dreaming and, if so, what they were dreaming about. During stage-1 sleep there was an increase in blood flow to the posterior occipital cortex representing the visual secondary association areas (Figure 8). Since the eyes were closed, the primary V1 visual cortex was not activated.

There was a relative decrease in blood flow in the frontal and parietal lobes and other areas associated with goal-directed action, a function that is suppressed during sleep. They proposed that stage-1 sleep represents a dreaming state of wakefulness

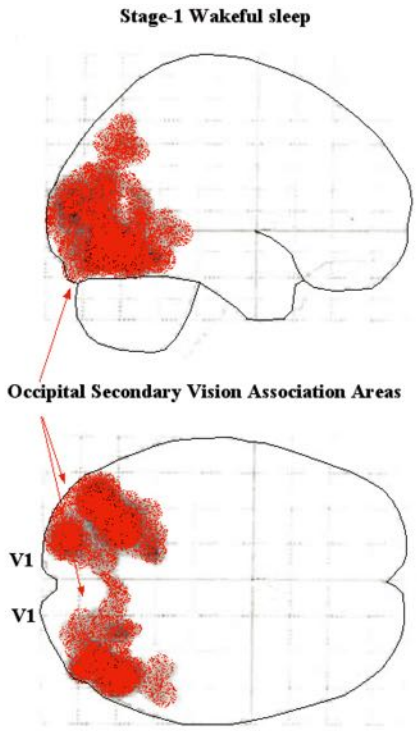

Figure 8. PET scan showing the areas of increased blood flow during stage-1 sleep. From Kjaer et al.: Journal of Sleep Research. *11:201-207, 2002. By permission.*

associated with visual imagery, while REM sleep reflects the dreaming state of the unaware, more-soundly sleeping brain. In this regard the brain during light sleep is similar to the brain changes they found in relaxation meditation. There were also similarities to the results of PET scans during a hypnotic state.[39] Furthermore, the results also showed bilateral activation of the posterior occipital and parietal cortex and other areas especially in the left hemisphere, suggesting that the three states of altered consciousness, meditation, hypnosis, and stage-1 wakeful sleep, have much in common.[23,38]

The same group also performed PET scanning during meditation with a radio-active compound that was specific for the dopamine D_2 receptor. This showed a 65 percent increase in dopamine release in the basal ganglia during Yoga Nidra meditation and was correlated with an increase in EEG *theta* activity, a characteristic feature of meditation. Since dopamine in the basal ganglia modulates excitatory glutamate neurons, the authors suggested that one effect of meditation is to regulate glutamate pathways in the brain, and this may be the mechanism of stimulating *theta* wave activity.

In his book *Zen and the Brain,*[40] James Austin of the University of Colorado, presented a PET scan of his own brain during just "letting go" sessions of meditation. There was prominent activity over regions of the frontal lobes; in the transverse and superior temporal gyrus, hippocampus, and posterior cingulate; and in the portions of the parietal lobes closest to the occipital lobes. Austin stated he primarily presented these results in his book to illustrate to his readers the use of PET scanning and to introduce the subject of functional neuroanatomy.[15] A larger number of individuals would be needed for more definitive results.

Benson and colleagues[41] carried out a study involving five subjects with very similar results. Using functional MRI (fMRI) they examined blood flow to various parts of the brain in a number of subjects using the meditation method described by Benson to elicit the relaxation response. They observed significant increases in activity of the dorsolateral prefrontal areas, parietal cortex, hippocampus, temporal lobe,

anterior cingulate and other areas. They did not observe any significant decrease in activity in the orientation area of the parietal lobes. They attributed the changes to a combination of focused attention and to the regulation of the autonomic nervous system. The activation of the posterior parietal regions is consistent with the visual imagery results of the Copenhagen group. In addition, both the Austin and Benson studies suggested some involvement of the spiritual brain since the temporal lobes, hippocampus, and cingulate were activated.

These results seem confusing. In 2003 there was a meeting involving the Dalai Lama, the exiled spiritual leader of Tibet, other Buddhists, and neuroscientists at the Massachusetts Institute of Technology. [42] The participants aired their West versus East divergent views of how the brain works. It was noted that during meditation some Buddhist practitioners specialized in attention, while others specialized in the demanding practice of visual imagery. The above confusing mix of results may be understandable in this context. The brain scan of a practitioner specializing in attention would show activation of the prefrontal lobe structures that are involved in attention and less activation in posterior cortical structures. The brain scan of a practitioner specializing in visual imagery would show activation of the posterior cortex containing the secondary association areas for vision in the occipital lobes and posterior portions of the parietal lobes. Practitioners using both techniques would show a combination of both patterns and might also activate portions of the spiritual brain, the temporal lobes and hippocampus.

The poetic and spiritual interpretations of Newberg and d'Aquili concerning their proposal that the reported decreased blood flow to the left parietal region represents the brain losing contact with itself and merging in a selfless oneness with cosmic consciousness or with God, are intriguing. Whether this interpretation is correct or not will require replication by other investigators.

Brain Imaging During Religious and Mystical Experiences

In addition to the studies of meditation, several brain imaging studies of spiritual individuals engaged in various religious activities have been described. In one study, PET imaging was used to examine the effect of a religious experience. [43] The religious subjects were members of an evangelical fundamentalist community in Germany. Religious feelings were triggered in the religious subjects by reading one of the verses from the book of *Psalms* that had a special meaning to this group. During religious recitation in the religious group there was activation of the dorsolateral prefrontal, dorsomedial frontal, and medial parietal cortex. The latter plays a role in visual memory. There are strong anatomical connections between the medial parietal cortex and the prefrontal lobes. This pathway plays a role in a variety of cognitive processes. There was no activation of the centers for emotion such as the amygdala or other areas of the limbic system. The authors interpreted their study as indicating that religious experience is a *cognitive* phenomenon. As in the Newberg and d'Aquili studies, the prefrontal cortex was activated. However, instead of inactivation of the left parietal lobe, both the right and left the parietal lobes were activated. The interpretation of

the activation of the frontal and parietal lobes as cognitive process was different from the Newberg and d'Aquili interpretation of deafferentiation of the orientation association area.

Another study used fMRI imaging of 15 cloistered Carmelite nuns.[44] They were asked to relive the most intense mystical experience they ever had. They were not asked to actually achieve a state of spiritual union with God during the experiment because, as the nuns put it, "God cannot be summoned at will." As a control the nuns were asked to relive the most intense state of union with another human ever felt in their lives while in the order. The study found that reliving the mystical experiences activated more than a dozen different areas of the brain, including the right orbitofrontal cortex, right middle temporal cortex, right inferior and superior parietal lobules, left inferior parietal lobule, right and left caudate, left medial prefrontal cortex, left anterior cingulate cortex, left inferior parietal lobules, left insula and visual cortex.

The authors claimed that their research discredited the theory of a "God spot" in the brain. Many of the areas they observed overlapped with those mentioned above in studies of meditation and prayer. Since many areas of the prefrontal and parietal cortex were activated, their results tend to agree with the German study that willed religious and mystical experiences involve a *cognitive* process. These studies do not negate the concept of a spiritual brain. As mentioned at the start of this chapter the spiritual feelings associated with meditation, prayer, religious thought, reading religious verses and thinking of past mystical experiences are the result of *a conscious effort to bring about spiritual feelings.* As a result they activate many different parts of the brain especially the cognitive centers. By contrast, the spiritual sensations described in the chapter on the spiritual brain were not the result of trying to be spiritual. Instead, they were *arising spontaneously* from within, and were generated by electrical stimulation, epileptic auras, trauma, NDEs, psychedelic drugs, speaking in tongues, and other factors. They came from the temporal lobes — from the spiritual brain.

Brain imaging studies of experienced meditating practitioners have shown three general types of pattern:

- **Activation of the prefrontal lobes**
- **Activation of the occipital and posterior parietal lobes**
- **A combination of both patterns. In studies showing both, there was some activation of the temporolimbic system, suggesting some involvement of the spiritual brain.**

The activation of the frontal lobes is consistent with a meditation style involving focused attention or cognition. The activation of the occipital lobes is consistent with a meditation style involving visual imagery and closely resembles that seen in stage-1 wakeful sleep and hypnosis. For the most highly experienced practitioners meditation elicits changes in the body and brain that are different than those of simple relaxation.

Studies of Newberg and d'Aquili showed both activation of the prefrontal lobes and a reciprocal decrease in blood flow in the left superior parietal lobe, an area purported to be involved in the location of the concept of self in space and in autobiographical memory of the self. Other areas have been shown to also be involved in the sense of self in space and the concept of self. Their proposal that a decrease in activation of the superior posterior parietal lobe represents a loss of self allowing for the merging of a selfless whole with a cosmic spirit or God requires independent replication.

The spiritual experiences associated with the temporal lobes are spontaneous, internally generated and effortless, while the spiritual experiences in meditation, prayer, religious experiences, and reliving mystical experiences are due to a conscious effort to experience spirituality. The areas of the brain that are activated reflect that effort. They are largely independent of the spiritual brain.

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Chapter 32

The Hopeful Brain

The Hopeful Brain refers to the ability of the human brain to heal the body. This is accomplished through what is called the *placebo effect.* The placebo effect is simultaneously one of the most amazing aspects of the human brain and one of the most misunderstood. It is amazing because it shows that the brain is capable of bringing about the same level of healing for a range of disabilities as the most powerful drugs developed over the past century. It is misunderstood because many think of it as something that is "just in your mind" and has no true physiological effect on the body. This chapter shows that the placebo effect is illustrative of the ability of the mind and the brain to marshall many of the same effects that are brought about by the best that the pharmaceutical industry has to offer for healing the broken body. This is important to the theme of this book because a specific mindset, a specific belief, or a specific faith, are the critical elements to releasing the placebo effect. The placebo effect plays a major role in explaining the healing effect of prayer and of the laying on of hands by the physician, priest, witch doctor, or shaman. The placebo effect will help us to understand the healing power of spirituality.

The word *placebo* comes from Latin and means "I shall please." It is derived from the Catholic vesper service for the dead, where paid mourners participated in the funeral service. The placebo effect has had a number of definitions. One defines the placebo effect as "the bodily change due to the symbolic effect of treatment or the treatment situation and not its pharmacologic or physiologic properties." [1] The problem with this definition is that the placebo effect has its own pharmacologic and physiologic properties. A better approach is to use just the first part of this definition. Thus, as will become clear as this chapter unfolds — the placebo effect is the bodily change due to the symbolic effect of treatment or the treatment situation.

The simple act of receiving any treatment (active or not) may be effective because of the expectation of a benefit. The expectation of benefit is likely to be greater when the associated accoutrements are the most impressive. In our western society these would be a white coat, a stethoscope in the pocket or around the neck, the diplomas on the wall, and a hospital or clinic setting — the "white coat effect." In primitive societies these would be an impressive witch doctor's mask, outrageous clothing, chanting and instruments that could include rattles, snakes, fire, and smoke — the "witch doctor effect." If the treatment offered contained no effective active

ingredient, then whether the ineffective treatment was a drug or a snake's tail, whether it was a "white coat effect" or a "witch doctor effect," both would be equally effective. The reason people get better is in part due to nature's innate healing ability. With the exception of a very few active drugs such as belladonna and digitalis, *until the twentieth century every non-surgical treatment used by physicians in the previous two thousand years owed any effectiveness to the placebo effect.*

So what is this amazing effect? In the following pages I present a number of studies that have shown the power of the placebo effect. Some of these studies also provide insights into how the placebo effect works.

How the Placebo Effect Complicates Drug Studies

The placebo effect is so strong that the Federal Drug Administration (FDA) determines that a drug is effective enough to be released for public use only if its effect is significantly better than placebo. The accepted standard is a random, double-blind design in which subjects who meet criteria for inclusion in a given study are randomly and blindly assigned to a treatment or a placebo group. Double-blind means that neither the patient nor the doctor knows which is which. It is critical that the doctor also be kept in the dark; if he or she knows whether the patient is on the drug or placebo, the doctor may unconsciously be biased in his or her evaluation of the response. The following example was a study of the effectiveness of a long-acting, injectable form of risperidone, a drug used to treat schizophrenia.[2] Individuals with schizophrenia have both positive symptoms such as hallucinations and delusions and negative symptoms such as social withdrawal. A *Positive and Negative Symptom Scale* was used to evaluate the results. The injections were given every two weeks and three different doses of the drug were given: 25, 50 and 75 mg every two weeks. Figure 1 illustrates the results.

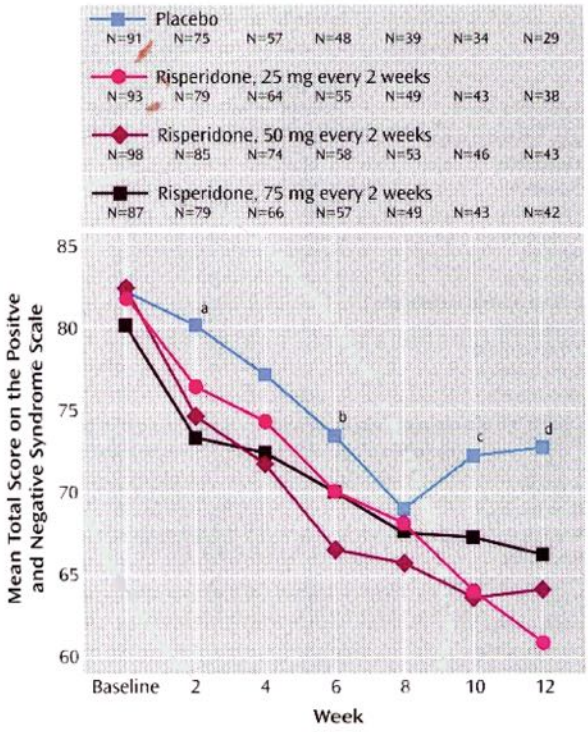

Figure 1. Response of positive and negative symptoms of schizophrenia to risperidone and placebo. From Kane et al.: Am J Psychiatry. *160:1125-1132, 2003. By permission.*

The blue line shows that the placebo was almost as effective as the active drug. By the eighth week the response to placebo was virtually indistinguishable from the effect of all three

doses of risperidone. It was only after the eighth week that the effect of the placebo began to wear off, while the effect of all three doses of risperidone persisted. The same degree of effectiveness of placebo has been demonstrated for drugs used to treat a wide range of conditions. The placebo effect represents the sum of a number of effects, including the natural healing course of the disease, the subject trying to please the doctor, the simple easing of anxiety by having a diagnosis and receiving any treatment, faith in the practitioner, and expectation of improvement.[3,4] More than once a drug company has invested many millions of dollars in a new drug, only to have to abandon it when it fails to be any more effective than placebo.

Placebo and Mammary Artery Ligation. The presence of a placebo effect for drugs is impressive enough. The demonstration of a strong placebo effect for surgical procedures is even more impressive. Two of the most famous examples relate to surgical procedures to treat angina pectoris and osteoarthritis of the knee. Both of these conditions produce objective evidence of disease — a narrowing of coronary arteries or a narrowing of the cartilage plate.

In the 1950s, tying or ligating a pair of arteries called the internal mammary arteries, on the inside wall of the chest, was a popular treatment for coronary artery disease. The rationale behind the surgery was that ligating these arteries was supposed to divert more blood to the coronary arteries. It had the advantage that the heart did not have to be stopped to carry out the surgery. Seventy-five percent of patients who had the operation experienced relief of angina pain.

In 1959 Cobb and colleagues[5] reported a double-blind study of this procedure. Of 17 patients, the mammary artery ligation was performed in eight, while the other nine were given anesthesia and an incision was performed but the mammary arteries were not ligated. The study was double-blind in that neither the patient nor the physicians charged with evaluating the results knew what was behind the scar, a ligation or no ligation. *The sham operation was just as effective as the real operation.* A second independent study came to the same conclusion.[6] For both studies combined, there were a total of 21 patients who received the real ligation and 14 who had the sham operation. In both groups 71 percent showed significant improvement of their symptoms. As a result of these studies mammary artery surgery was abandoned.

Placebo and Arthroscopic Knee Surgery. Degenerative osteoarthritis of the knees is a common effect of aging. It is made worse if there had been any unusual stress on the knees, as may occur in some professional or recreational sports. It is characterized by degeneration and thinning of the cartilage plates between the tibia and femur, resulting in a narrowing of the space between these bones (Figure 2).

When medication is no longer effective, an expensive surgical procedure called "debridement" is often performed. This involves passing an arthroscope through a small incision, shaving down the cartilage, and lavage, consisting of flushing out the debris. This procedure costs about $5,000, and up to the year 2002, 650,000 were performed each year in the United States. In 2002 Moseley and colleagues[7] reported a double-blind study of this surgical procedure. A total of 180 patients were randomly assigned to the debridement and lavage, lavage only, or a sham surgery. The sham

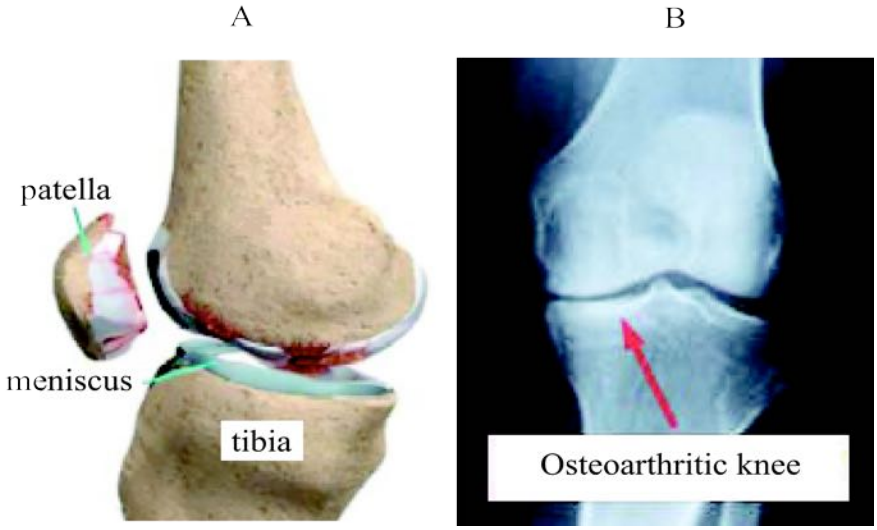

Figure 2. A. Osteoarthritis is due to the degeneration of the meniscus of cartilage between the femur and tibia. B. By X-ray this shows up as a narrowing of the space between the bones. [6a]

surgery involved all the same steps as involved in the real surgery, including surgical draping, anesthesia and splashing saline around to make the sounds of lavage. The only difference was that in the sham surgery, although an incision was made, the arthroscope was not inserted. They also spent just as much time in the recovery room as those with the real arthroscopy. The level of pain, ability to walk, and use of the knee was assessed for two years.

While the real surgery resulted in a significant decrease in pain and increase in function, *it was no greater than that in the placebo group or the lavage-only group.* Those in the placebo group who derived benefit from the procedure "believed" in effectiveness of the "surgery." In contrast to the risperidone study above, where the placebo effect only lasted eight weeks, the effect could still be measured after two years. In his book, the *Anatomy of Hope,* Groopman [8] suggested that subjects who are in chronic pain from any form of disability, become afraid of pain and allow it to become their master. As a result, movement is restricted to prevent pain, but the resultant muscle atrophy only further exacerbates their disability. Once the fear of pain is mastered, people behave as if they were cured, even if it is a "cure" based on placebo effect. Once the cycle of "worshiping the pain god" is broken, the improvement can last for years. *This provides us some insight into the role that faith and hope can play in remaining healthy.*

Pain Pathways

The physiology of pain provides some understanding of how placebos can work to alleviate pain. The ascending and descending pain pathways are shown in Figure 3.

A and C pain fibers from the body enter the dorsal horn of the spinal column. These sensations are passed to the spinothalamic tract that runs from the spinal cord,

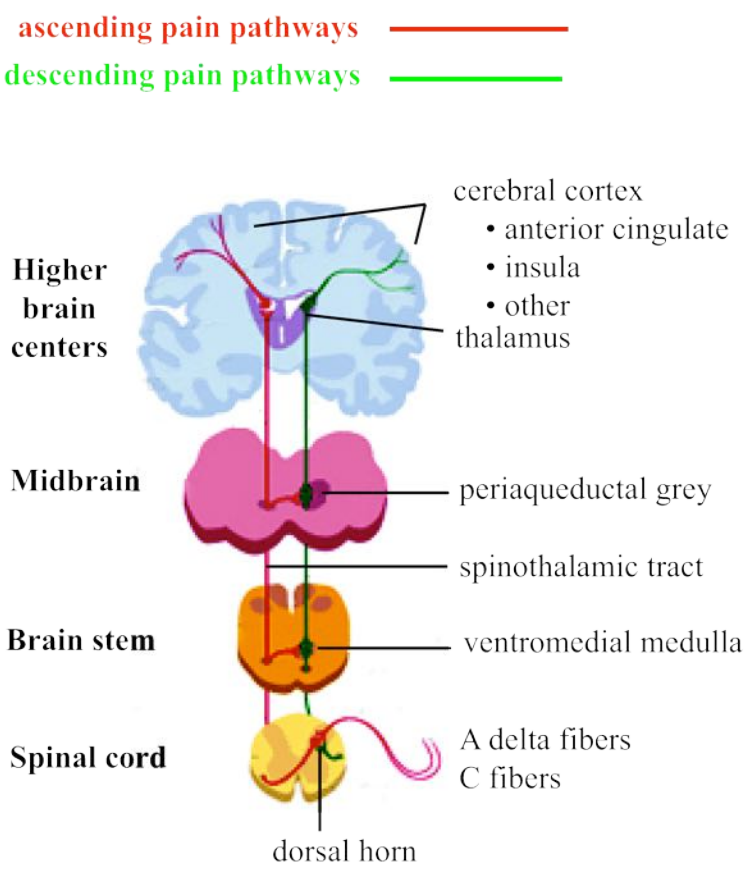

Figure 3. Ascending and descending pain fibers.[8a]

through the brain stem and midbrain, to the thalamus and from there to the cerebral cortex where they are interpreted as pain. Descending *inhibiting* pathways start in the anterior cingulate, insula, and other areas of the cortex, pass the thalamus, the periaqueductal grey, the ventromedial medulla, and finally back down to the spinal cord. A group of cells called "on" cells increase pain and play a role in defensive withdrawal reflexes, while another group of "off" cells turn pain off. Since the perception of pain is critical for survival, the "on" cells are usually predominant. Morphine and other drugs that relieve pain work by enhancing the effect of the "off" cells. The body has its own endogenous morphine compounds called *endorphins* (*endo* = endogenous, *orphine* = morphine) and *enkephalins* (in the head). The periaqueductal grey is especially rich in receptors for endorphins and enkephalins. In 1969 Reynolds[9] showed that the electrical stimulation of the periaqueductal grey in rats was so effective in suppressing pain that although the animals were still alert they could be operated on without feeling any pain. As soon as the current was turned off, the pain returned.

The descending pain pathways can act to either inhibit or facilitate pain.[10] Endorphins, enkephalins, serotonin and norepinephrine[11] are involved in the

inhibition of pain by the descending pain pathway. Other endogenous compounds such as substance P and cholecystokinin (CCK) enhance the pain.

When drug addicts take an overdose and end up in the emergency room, they are given an injection of a drug called Naloxone. This drug binds to the opioid receptors and displaces the heroin or other narcotic drugs that are causing a potentially lethal effect. Naloxone is effective because it binds to but does not stimulate the opioid receptors. It also blocks the effects of endorphins and enkephalins.

Placebo Effect, Pain, and Endorphins

The above paragraphs illustrated the remarkable power of the placebo effect for relieving pain but did not show how it works. In 1978, a major clue was provided by Jon Levine and colleagues.[12] They examined a total of 47 patients who had an impacted third molar removed using Valium, nitrous oxide, and a local block as anesthesia. This anesthesia slowly wore off, and after two hours they were told they were going to receive a powerful anti-pain drug. Some were given morphine, while others were given a placebo. At three hours they were told they were going to receive a medication that might make the pain worse. Some were given Naloxone, while others were given placebo. They were divided into those who responded to the placebo and those who did not. The results are given in Figure 4.

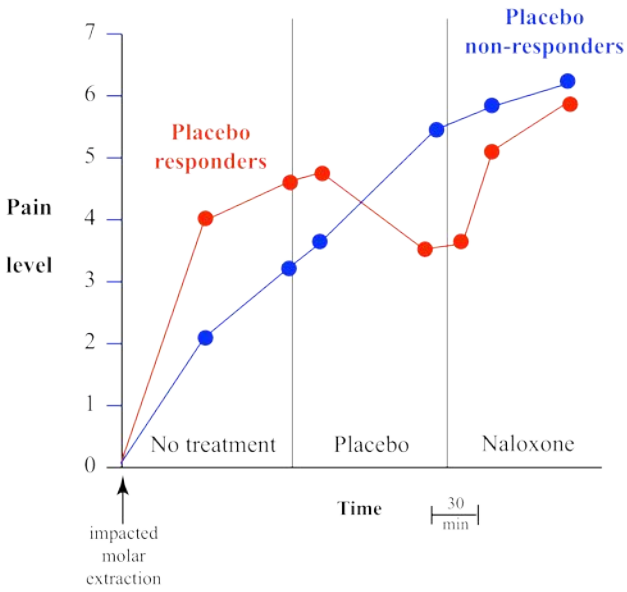

Figure 4. Effect of placebo on dental pain and effect of subsequent Naloxone in subjects who were placebo responders and those who were placebo non-responders. From Levine et al.: Lancet. *2:654-657, 1978.*[12] *By permission from Elsevier.*

This study showed that in placebo responders, the Naloxone, which blocks opioid receptors, reversed the effect of the placebo, suggesting the placebo effect was due to the internal release of endorphins. In the placebo non-responders, the pain just continued to increase after surgery. By the end of the experiment the level of pain was the same for both groups. Numerous subsequent studies have replicated these results.

Dr. Fabrisio Benedetti of the Department of Neurosciences at the University of Turin in Italy also carried out important studies to explain how the placebo effect for pain works.[13] He and his colleagues elicited pain in volunteers by compressing a cuff around the arm. The pain was evaluated by monitoring blood pressure, pulse, sweating, and muscle contraction, and by subjective reports of the level of the pain

response. In a great show of doctoral authority, the volunteer watched as a dose of morphine was injected into an intravenous line. After a few minutes the cuff was inflated again and this time there was no pain. This process was repeated several times. In subsequent tests, all aspects of the procedure were the same except that, unknown to the volunteer, saline instead of morphine was injected. Again there was no evidence of or report of pain. In later tests the placebo and naloxone were injected together. If the placebo effect was due to the endogenous release of enodorphins, the Naloxone would block the placebo effect. With this combination the pulse and blood pressure increased and the volunteers began to sweat and report pain, indicating the placebo effect had been blocked. This experiment indicated that the placebo effect elicited by the *expectation of pain relief* was produced by the release of endogenous endorphins. Additional evidence for the important role of expectation came from studies showing that when the placebo was administered out of sight of the subject, this resulted in a significant reduction in the placebo effect. [14] The administration of drugs that block the effect of cholecystokinin (CCK) enhance the placebo effect, [15] suggesting that the inhibition of CCK may contribute to the placebo effect associated with the expectation of pain relief.

In addition to pain, the placebo effect is especially effective for other subjective symptoms such as depression. While part of this effect may be mediated by changes in endogenous opiates, the neurons that contain opiate receptors are closely interlinked with a range of neurotransmitters including serotonin, dopamine, norepinephrine, and GABA (gamma-amino-butyric acid). This broader effect may play a role in the effectiveness of the placebo effect on mood and other behaviors. [16]

Placebo Effect and the Prefrontal Cortex

Despite the above studies showing that the production of endogenous endorphins play a role in the placebo effect for pain, there was still controversy about whether the effect on pain was due to inhibition of pain transmission, the emotional aspects of pain, or simply an artifact of trying to please the investigators, the so-called report bias. [4] There was also the question of how the increase in endorphins was produced. To address these issues, Tor Wagner [16a] and colleagues used fMRI to examine how the different parts of the brain were affected by the placebo effect. The parts of the brain that are activated during pain processing in humans are shown in Figure 5.

These players form the *pain matrix* and are as follows: the rostral anterior cingulate cortex, reported to track changes in pain response mediated by hypnosis; the parahippocampal complex and insula, involved in the discrimination of types of pain and the emotional context of pain; and the thalamus, the major relay station for pain fibers from the body to the brain.

The prefrontal cortex, consisting of the dorsolateral prefrontal cortex and the orbitofrontal cortex, acts to maintain and constantly update the expectations of pain, and modulates pain processing by other areas of the brain. The orbitofrontal cortex plays a role in learning based on rewards. Finally, the midbrain in the area of the pariaqueductal grey contains a high concentration of opiate neurons associated with

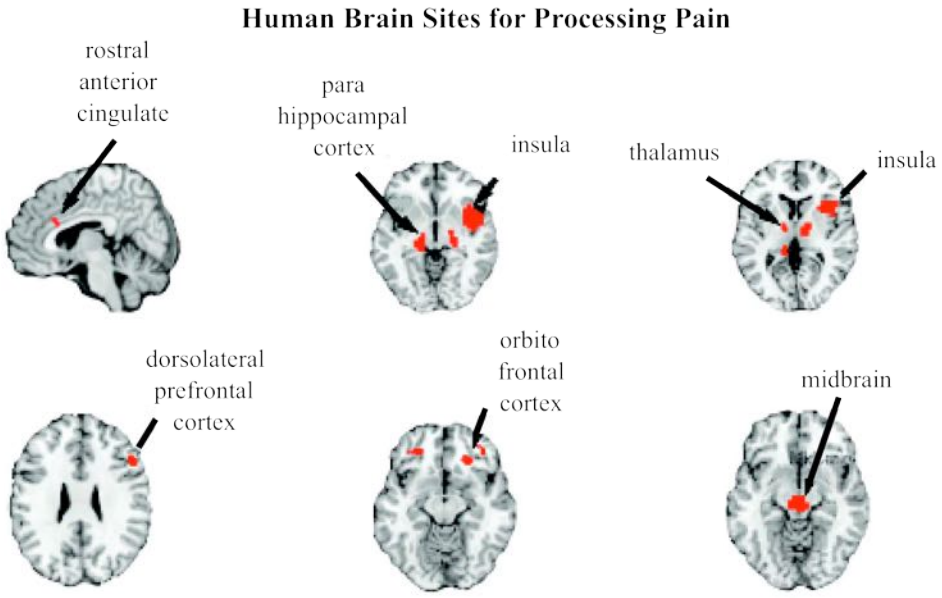

Figure 5. The parts of the human brain involved in the perception of pain. Adapted from Wagner et al., Science. *303:1162 –1167, 2004.*[16a] *By permission.*

pain fibers coming from the body. This is the site where most of the endogenous opiates are produced, resulting in the placebo effect. Monitoring of the activity in these sites (red areas in Figure 5) allowed a number of hypotheses to be examined.

Wagner's study involved 50 subjects. Varying levels of pain were elicited by electrical or heat stimulation of the skin. Part of the study design involved the application of a cream to the skin. In some cases subjects were told the cream should help control the pain; in other cases they were told the cream contained no active ingredients and was serving as a control. An additional aspect of the study was to warn or not warn subjects that the pain was coming. This study design allowed the investigators to study the flow of blood to different parts of the brain under control versus placebo conditions and under conditions of expecting or not expecting pain. The following are some of the findings:

- The expectation of pain relief is associated with the activation of the prefrontal cortex. This activation in turn was associated with an increase in activity of the midbrain and a decrease in the activation of other parts of the pain matrix. The magnitude of the placebo response was correlated with the degree of decrease in blood flow to the regions of the brain that process pain. This supported Wagner's first hypothesis that *the placebo response was associated with a decrease in the activation of the pain matrix,* and second hypothesis that *the prefrontal cortex mediated the anticipation of pain relief.*
- The strong correlation of the activation of the dorsolateral and orbitofrontal cortex and the activation of the midbrain during anticipation of pain relief suggests that prefrontal mechanisms and cognitive control trigger the opioid

release involved in part of the placebo response.

- There is clearly more to the placebo effect than just the release of endogenous endorphins. In anticipation of pain relief, the prefrontal cortex decreases the activation of the structures of the pain matrix independent of opioid release.
- These results clearly reject the proposal that the placebo effect is due to report bias [4] or the equivalent of no treatment.
- While 72 percent of subjects showed a placebo effect, the remaining 28 percent did not. The role of genetic factors in placebo response is discussed below.

Other imaging and EEG studies have also supported a role for the prefrontal cortex in the placebo effect with expectation of pain relief [17-19] and relief of depression. [20] In the latter study, individuals whose depression improved with placebo showed a significant increase in prefrontal EEG concordance. By contrast drug responders showed a decrease in prefrontal EEG concordance.

These studies provide an important link in the ability of the mind to control the body. They indicate that the placebo effect is associated with an active cognitive brain process and is not equivalent to no treatment or biased reporting. They illustrate the importance of the mind set, in this case expectation of pain relief. This expectation factor directly relates to the "white coat" and the "witch doctor" effects noted previously.

Placebo Effect and Acupuncture

Acupuncture is a form of Traditional Chinese Medicine based on practices and theories that go back thousands of years. One of these theories is that the body's vital energy, called *chi* or *qi,* circulates through channels called meridians. Each of 12 meridians represents a major organ system. Originally there were 365 acupuncture points on these meridians but during the past 2,000 years the number has increased to about 2,000. Yin and yang are opposing forces in the body. When these get out of balance, *qi* is blocked. Inserting needles in the acupuncture points is purported to unblock the *qi.* Some practitioners place the needles near the site of the disease and some select points at different parts of the body based on the symptoms. Most do both. In electroacupuncture, an electrical current is passed through the needles to increase the effectiveness of acupuncture. [21]

The problem that Western medicine has with this theory is that there is no physical or objective evidence for the presence of these channels or meridians. However, there is no question that acupuncture can be effective. It has been used in the place of conventional anesthesia during surgery, and many have reported its effectiveness for a wide range of disorders. In a study designed to resolve this dilemma, Klaus Linde and colleagues at the University of Technology in Munich examined 302 patients suffering from migraine headaches. The study design included three groups: those who received standard acupuncture with the needles inserted into classic, meridian based acupuncture points, sham acupuncture where the needles were inserted in non-acupuncture sites, and patients on a waiting list to be treated. All subjects kept diaries on their headache symptoms. They were not told which acupuncture group they were in.

The results showed that 51 percent in the acupuncture group, 53 percent in the sham group, and 15 percent on the waiting list had a significant decrease in their headaches. The authors concluded that the effect "may be due to a non-specific physiological effect of needling, to a powerful placebo effect, or both." This study indicated that no matter how the needles were placed, acupuncture was effective. As Michael Shermer [22] suggested, this study does suggest that "*Qi* theory is full of holes."

Brain imaging by PET scan has been performed on individuals receiving acupuncture for pain due to osteoarthritis to explore the areas of the brain involved. [18] Fourteen subjects were examined in a single-blind study. Each subject received real acupuncture, sham acupuncture, and a single pin prick. The real and placebo acupuncture were associated with an expectation of pain relief, while the pin prick was not. Although none of the treatments relieved the pain, the real acupuncture and the sham acupuncture resulted in activation of the right dorsolateral prefrontal cortex, anterior cingulate and midbrain, similar to the areas involved in the study by Wagner and colleagues. This showed that the prefrontal cortex, cingulate, and midbrain were activated by the expectation of pain relief even in the absence of pain relief. While some studies of real and sham acupuncture sites suggest that only real sites activate specific brain areas, most show that both real and sham sites activate brain sites to the same degree.

Placebo, PET, and Parkinson's Disease

Parkinson's Disease (PD) is due to a degeneration of the neurons in the specific dopamine-rich areas of the brain. Since dopamine is critical for the normal initiation of movement, Parkinson's disease patients have difficulty initiating movement. This results in the typical mask like face and shuffling gait. Drugs which enhance the level of dopamine in these critical areas alleviate the symptoms. PET brain imaging can be performed with radioactive labeled compounds, such as [^{11}C] raclopride (RAC), that bind to dopamine D_2 receptors. The degree to which these compounds can bind depends upon how many of the D_2 receptors are empty. The lower the level of dopamine in the synapses, the greater the binding of the radioactive compound and the greater the signal. The higher the level of dopamine in the synapses, the lower the signal. Thus PET scanning with RAC provides an objective method of determining the amount of dopamine released in the synapses of dopamine rich neurons.

An RAC study was carried out on six PD patients. [23] In one part of the study, all patients were at different times given an active drug to treat their PD symptoms or they were given a placebo. In another part of the experiment, the patients were only given the active drug. The active drug increased the release of dopamine in the synapses and decreased the binding of RAC. The placebo had the same effect and there was no significant difference between the two. Both resulted in an improvement in symptoms. As shown in the chapter on the pleasure brain, rewards release dopamine into the synapses of dopamine reward pathways. All PD patients in this study had previously received treatment and knew what to expect of their medication. The authors suggested that the unconscious expectation of reward (drug effect)

resulted in the release of dopamine, whether the active drug was given or not.

Endorphins, PET, and the *COMT* Gene

Other radioactive compounds that target different neurotransmitters can also be used in PET scans. The radioactive compound [^{11}C] carfentanil binds to enkephalin receptors. Enkephalins, like endorphins, are the body's endogenous pain medications. Since placebo responses are elicited more easily in some individuals than others, genetic factors are likely to be involved. Placebo responses, especially those to pain, involve the production of endogenous endorphins and enkephalins. Thus, genes that affect the production of these endogenous pain-killing compounds could explain the difference in placebo responses. Catechol-o-methyl-transferase is one of the enzymes that break down dopamine and norepinephrine. The gene involved is called *COMT.* A common genetic variant of this gene results in the presence of either methionine (met) or valine (val) at amino acid position 158 in the *COMT* enzyme. Individuals who inherit the met allele from both parents (met/met) have lower enzyme activity than those that inherit the val allele from both parents (val/val). Met/met individuals with low *COMT* activity have higher amounts of dopamine in their synapses. Met/met homozygotes have chronically increased levels of dopamine. This in turn results in a secondary decrease in the nerve content of enkephalins and subsequently result in an increase in μ-opioid receptors. The level of μ-opioid receptors in different parts of the brain can be detected by PET scans using [^{11}C] carfentanil. These relationships are shown in Figure 6.

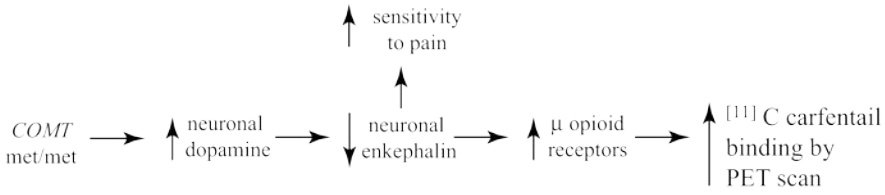

Figure 6. Method by which [^{11}C] carfentanil PET scanning can evaluate the effect of the COMT val158met polymorphism on response to pain.

Subjects with the met/met, met/val and val/val *COMT* genotypes were subjected to a painful stimulus and examined by [^{11}C] carfentanil PET scanning to determine the percent increase in enkephalin release.[24] The results are shown in Figure 7.

This showed a significant effect of *COMT* gene variants on the amount of enkephalins released in response to a painful stimulus. These changes were noted in the dorsal anterior cingulate, anterior and posterior thalamic nucleus, and amygdala, all parts of the brain involved in either the transmission or interpretation of pain. While placebo responses to pain were not examined, it is very likely that since the *COMT* gene plays a role in the regulation of the enkephalin release involved in the placebo response to pain, the *COMT gene will thus play a role in determining who will have the greatest placebo responses.* Other still-unidentified genes are also likely to produce genetic variation in the level of the placebo effect.

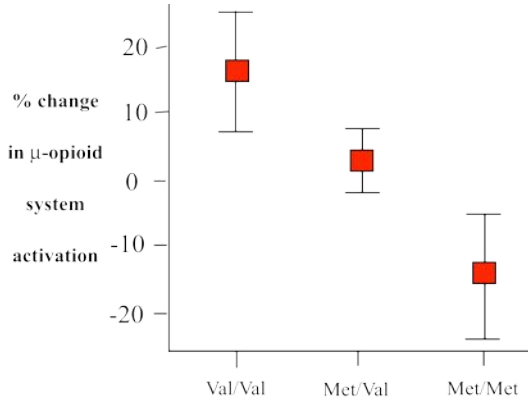

Figure 7. Effect of COMT *val158met genotype on percent change in enkephalin release following a painful stimulus. From Zubleta et al.* Science. *299:1240-1242, 2003.*

These results illustrate the important role that different genes play in regulating the amount of endorphins and enkephalins that can be released during the placebo effect. This suggests that *in addition to cultural differences and differences in religious indoctrination, genetic factors contribute to differences in the effectiveness of faith in maintaining good health.*

Nocebo Effect

The opposite of the placebo effect is the *nocebo* effect. Nocebo derives its meaning from the Latin term "I will harm." It refers to symptoms or bodily changes that follow the administration of an inert substance that the patient believes to be an active drug.[25] As with the placebo effect, expectation and suggestion play an important role. As an example, a placebo-controlled study of the potential effect of aspirin for the treatment of angina involved three different medical centers. At two of the centers, the consent form noted that "gastrointestinal irritation" was a possible side effect, while at the third center there was no mention of this side effect. *Patients at the first two centers reported a significantly higher incidence of GI upset than at the third center.*[26] In addition, six times as many subjects in the first two groups left the study because of these side effects than in the third center. There was no medical evidence that those complaining of GI symptoms actually had GI disease. This is the *nocebo effect — the development of adverse symptoms based on the expectation of adverse symptoms.* This has also been referred to as "negative placebo effect."[27] It might also be termed the "voodoo effect." There have been many other examples of headaches, bronchial asthma, allergic, and other symptoms in subjects taking placebos as part of randomized clinical studies that represent nocebo effects.

In some cases the nocebo effect has resulted in an epidemic of symptoms. An example was the religious sect called the "jumpers." Members of this group experienced seizure-like jerking of the head, an arm, a leg, or sometimes the entire body. One author reported seeing a person stand in one place and jerk forward and backwards with their head almost touching the floor in front and behind. Hundreds of people often jerked at one time.[27] Other examples of epidemics of psychogenic symptoms or disorders have been recorded.

The placebo effect is a powerful example of mind over body. It is especially potent when the individual has an expectation of benefit, whether a decrease in pain, a relief of depression, or other aspect of

good health. When there is relief of pain, part of the placebo effect is due to the release of endorphins and enkephalins, the body's own internal morphine-like compounds. An additional part of the placebo effect is derived from an activation of the prefrontal cognitive centers producing a decrease in activation of the pain matrix consisting of different brains areas involved in the processing of pain signals. The effectiveness of the placebo response varies in different individuals. Genetic factors play a role in this variation.

The nocebo effect is the opposite of the placebo effect. It involves the production of troublesome symptoms or side effects when given a placebo. Like the placebo effect, the expectation of a given result plays a major role.

Both the placebo and nocebo effects help us to understand the powerful role that faith and belief can play in many aspects of good health.

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Success means getting what you want; happiness means wanting what you get.
Richard Bolstad [1]

A generous man will prosper; he who refreshes others will himself be refreshed.
Proverbs 11:25

Chapter 33

The Happiness Brain

Most studies of human mood have focused on pathological states such as depression. Happiness is not simply the absence of depression. It is a dimension in its own right that has only recently received research attention. People can be unhappy but not clinically depressed. It is often stated that one of the advantages of religion is that it makes people happy. Unfortunately, as discussed elsewhere it can also make people hateful, sad and miserable. This leads to the question, "What causes people to be happy?" Studies suggest humans are inherently happy and that happiness is *unrelated* to financial success or material wealth. Surveys across many countries have repeatedly shown that most members of our species are at least mildly happy. [2] Using a simple five-question happiness scale [2] on representative samples from 43 nations, Ed and Carol Diener, psychologists at the University of Illinois, found that 86 percent of people scored above neutral. In another study, 10 groups of widely different people were asked to rate the statement, "You are satisfied with your life?" on a scale of 1 (complete disagreement) to 7 (complete agreement). The results are shown in Figure 1.

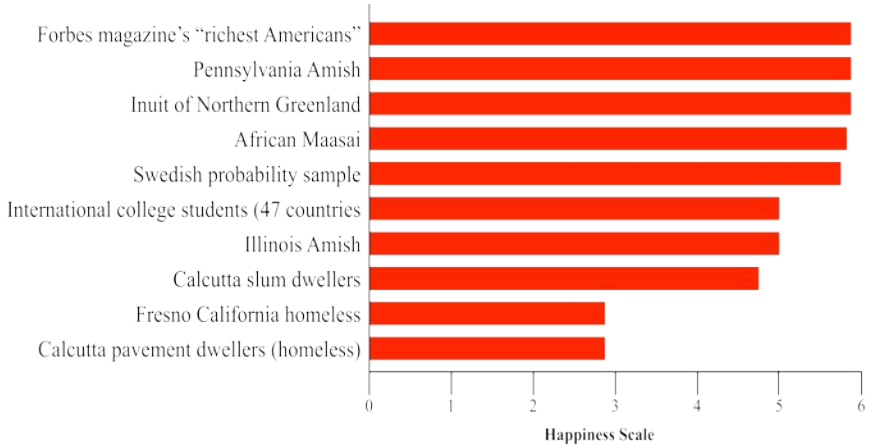

Figure 1. Results of different people being asked if they are satisfied with their lives. Based on data from Ed Diener and Martin Seligman, Beyond Money: Toward an Economy of Well Being in Psychological Science in the Public Interest, 2004, [6] and R. Biswas-Diener. [2]

Remarkably, most people were well above average regardless of their material wealth. Thus a group of the richest Americans rated no higher than the much more austere living Pennsylvania Amish, Inuit of northern Greenland, or the African Maasai. Even Calcutta slum dwellers rated themselves above average. Only the two groups of the homeless in California and Calcutta rated themselves below average.

While it is easy to understand why homeless people would be unhappy and since the slum dwellers in Calcutta who had homes were much happier, there may be some aspect of being homeless that is antithical to feeling happy. A number of studies on learned helplessness suggest that one factor is a loss of control over one's life.

The lack of correlation between wealth and happiness is further illustrated in Figure 2 showing the average rates of happiness in the U.S. did not increase over periods during which the gross national product doubled and even quintupled.

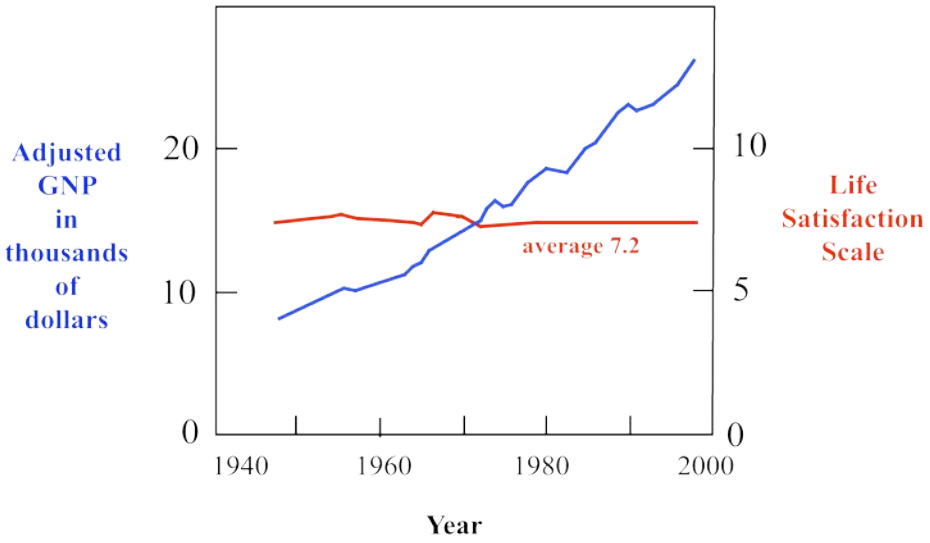

Figure 2. Lack of correlation between gross national income and level of happiness. From Easterlin Journal of Economic Behavior and Organization. *27:35-47, 1995.*[3]

A major reason for the lack of correlation between GNP and happiness is that people quickly adapt to a wide range of circumstances. Someone inheriting or winning a great deal of money may temporarily be happier, but they soon settle back to their previous innate level of happiness. The same holds for those with progressively increasing yearly incomes. After each raise, people adapt and return to a previous level of happiness, a phenomena that Allen Parducci[4] called the *hedonic treadmill.*

Just as altruism in humans is likely to be the result of its having a positive selective value in evolution, it has also been suggested that happiness is common because it also has a positive selective value. People who are in a good mood are more creative, helpful, sociable, and more energized and able to tackle the business of the day. Many studies have shown that happy people are healthier, tend to live longer, have more enduring marriages, and have better jobs.[5]

Social Relationships

To attempt to further identify what factors played the greatest role in happiness, Ed Diener and Martin Seligman examined those who scored in the top 10 percent of the happiness score and compared them to those in the bottom 10 percent. The single most important variable was the presence of social relationships. Nearly everyone in the top 10 percent were surrounded by good friends and had healthy family ties, while those in the bottom 10 percent rarely had these traits. [6]

This is consistent with studies showing that married people tend to be happier and live longer than unmarried, separated, or divorced people. [7] The relationship with health was demonstrated by a study showing that among patients who had a bone marrow transplant, those with strong social support, 54 percent survived two years compared to 20 percent for those without social support. [7] In one study, 126 randomly selected healthy Harvard graduates from the early 1950s were followed for 35 years. After that time 100 percent of those who reported low warmth and closeness from both parents had diseases such as coronary artery disease, hypertension, duodenal ulcer, and alcoholism, compared to only 47 percent with these diseases among those reporting high levels of warmth and closeness to both parents. [8]

The important role of love and caring in health [9] was also shown in a study of 10,000 Israeli men, 40 years of age and older. Those who perceived their wives to be loving and supportive had half the rate of angina of those who felt unloved and unsupported. [10]

This effect even applies to animals. In a remarkable study that was subsequently replicated two times, Nerem and colleagues [11] fed rabbits a diet high in fat and cholesterol. In one group of rabbits the assistant took them out of their cages, and petted and talked to them before feeding. The other group was just fed in the cage. The first group had 60 percent less atherosclerosis than the second group. These and other studies indicate that social relationships and a feeling of belonging and being loved and cared for play an important role in happiness and health.

Being in Control

In 1983 Laudenslager and colleagues [12] exposed some rats to electric shocks from which they could escape and others to shocks from which they could not escape. The control rats received no shocks. The rats were re-exposed to a small amount of shock 24 hours later, after which a test of their level of cellular immunity was performed. Those that were exposed to the inescapable shock showed a suppression of their immune response, while both the controls and those who could escape the shocks showed no immune suppression.

In studies in dogs [13] those that were exposed to unavoidable shocks eventually gave up on trying to prevent the shocks. When subsequently exposed to escapable shocks they did not even try to escape. This phenomenon was termed *learned helplessness.* In humans, learned helplessness resulting from a perceived loss of control over one's environment results in depression. [14] It is very likely that the low happiness scores in the homeless subjects in the study in Figure 1 were a result of learned helplessness over their situation.

The role of being "in control" in health and happiness has been shown in a number of studies. In one study done in a nursing home for the elderly, one group of subjects was given a plant and told to look after it, they were responsible for the plant's health. Another group was also given a plant but told that the staff would look after it. Over the next 18 months twice as many of those who were not "in control" of their plants died compared to those who were "in control" of their plants. [15]

It should not be surprising that the rational brain is the part of the brain involved in choosing when to be in control. In a study by Spence and Frith, [16] subjects were instructed to simply lift their right or left finger on response to a noise. Brain scans predictably showed that the auditory cortex was activated by the noise, and lifting a finger activated the region of the motor cortex for fingers. However, when the subjects were allowed to make their own free will choice about which finger to raise, the dorsolateral prefrontal cortex, one of the sites of the rational brain, was also activated. Thus, being "in control" and having free will to choose activated a different part of the brain compared to not being "in control." This area of the brain is underactive in depression.

Helping Others

As will be discussed in a later chapter, there is a strong selective value for altruism, which is defined as kind acts that put the individual at risk for the benefit of the group. There are also benefits to mental and physical health and happiness. The old phrase, "Tis better to give than receive" was scientifically validated in a study by Schwartz and colleagues. [17] They studied a random sample of 2,016 members of the Presbyterian church throughout the United States. Numerous variables were examined, including giving and receiving help, prayer activities, self-reported mental and physical health, and religious activities. Statistical analysis showed that giving help was more significantly associated with better mental health than receiving help.

One study that factored out the role of religion is important for the subject of this book. Musick and co-workers [18] tested the question of whether older volunteers benefited in terms of better health and well-being. They examined 8,832 subjects collected from 1989 to 1994. They were asked whether they had volunteered in the past year through a religious, educational, political, senior citizen, or other organization. The analysis showed the protective effect of volunteering in terms of a lowered death rate was greatest when the volunteering was for fewer than 40 hours per week and among those who lacked other social supports. Although 69 percent of the volunteer work was done through religious organizations, there was no relation between reduced mortality and degree of religious service attendance, They concluded that *volunteering, rather than its religious context, explained the beneficial effects.*

This result was supported in a study by Oman and colleagues, [19] who in 1990 examined 2,025 residents of Marin County, California, 55 years of age or older. Residents who were involved in two or more helping organizations were placed in a "high volunteerism" group. Mortality was measured from 1990 to 1995. Those in the "high volunteerism" group had a 63 percent lower likelihood of dying than the

non-volunteers. After a correction for many other factors, including age, gender, exercise, general health, marital status, and religious attendance, "high volunteerism" was still associated with a 44 percent reduction in mortality. The absolute figures were a mortality rate of 30.1 percent for the non-volunteers versus 12.8 percent for the "high volunteerism" group. Remarkably, this 44 percent reduction was greater than the effect of physical mobility (39 percent), exercising four times per week (30 percent), weekly attendance at religious services (29 percent). It was only modestly lower than that associated with the granddaddy of all risk factors, not smoking (39 percent).

These are just a few of numerous studies showing that altruistic behaviors and volunteerism are associated with happiness, improved mood, enhanced self-esteem, and better mental and physical health, and that helping others per se may be a major part of the increased longevity seen in religious versus non-religious individuals.[9] It is little wonder that there has been selection for altruistic behaviors during human evolution.

Christian, Jewish, Buddhist, Islamic, and Native American spiritual traditions all emphasize the benefits that accrue from helping others. One could argue that if all of these religions are man-made, this is simply a reflection of man's inherent tendency to altruism and the happiness it brings. It was probably assumed that these "good" behaviors had to be wrapped in the authority of religious dogma to ensure they were carried out, even though they originated from man himself.

Human beings have evolved an emotional system that leads them to be generally happy, to think positively, and to quickly adjust to both positive and negative events. A strong and supportive social network of friends and family, and helping others, are among the greatest contributors to happiness. Helping others may provide a significant contribution to the positive effects of religion on longevity and health.

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It is the heart which perceives God and not the reason.

Blaise Pascal
Pensées (1660)

Chapter 34

The Biology of Faith Versus Reason

Sometimes faith is described as the belief in something in the absence of evidence. [1] By this view faith becomes the antithesis of reason. The existence of faith cuts to the core question of this book — how can reason and faith, a thinking rational brain, and a spiritual brain coexist in the same body?

Blaise Pascal (1623–1662) the famous and brilliant seventeenth century mathematician was the epitome of a person who used his rational brain. He made important contributions to the construction of mechanical calculators, the study of fluids, the concepts of pressure and vacuum, and the mathematics of projective geometry. At the tender age of 16 he contributed to the theory of probability and modern economics. He wrote powerfully in the defense of the scientific method. [2] In 1654 he came perilously close to being killed in an accident in which his horses lunged over a bridge and the carriage he was riding in almost followed. This terrifying experience left him unconscious for some time. Upon recovering 15 days later, between 10:30 p.m. and 12:30 a.m., reminiscent of near-death experiences and despite this massive and prolific use of his rational brain, Pascal had an intense religious vision and conversion. In 1657 his religious faith was further reinforced when his 10-year-old niece appeared to have been cured of a painful and infected fistula of a tear duct after she touched what was believed to have been a thorn from the crown that had tortured Christ.

How then does such an individual massively steeped in the productive use of his rational brain come to terms with endorsing the Christian faith and a believing in God? To Pascal, God was the Christian God depicted in the Bible. The Bible provided information about this Christian God but not proof for the existence of God. Pascal wormed his way out of the dilemma of how to be rational and still believe in God using what has been called Pascal's Wager, outlined in *Pensées,* the last book he wrote. The wager involved the application of decision theory to the belief in God. He argued that it was always a better "bet" to believe in God than not believe in God because the expected value of belief is greater. This rationale is summarized as follows:

> You may believe in God, and if God exists, you go to heaven, your gain is infinite.
> You may believe in God, and if God doesn't exist, your loss is finite and therefore negligible.

> You may not believe in God, and if God doesn't exist, your gain is finite and therefore negligible.
> You may not believe in God, and if God exists, you will go to hell, your loss is infinite.

In essence he felt it was better to believe in a non-existent God than to offend one that did exist. He favored the infinite gain and avoided directly addressing the question of whether God exists or not. While this may have worked for Pascal, in reality it was basically a cop-out and did not address the real question, Does God exist? It only addressed the question of whether one should believe in God.

To some authors, reason is totally excluded by faith. For example, in *De Carne Cristi,* Father Tertullian (150–225 A.D). states:

> After Jesus Christ we have no need of speculation, after the Gospel no need of research. When we come to believe, we have no desire to believe anything else; for we begin by believing that there is nothing else which we have to believe…

One could argue that Christianity itself is based on a distrust of knowledge, wisdom and reason. In Genesis, Adam and Eve were evicted from their blissful state of ignorance by eating of the tree of knowledge. Christianity views this act as the source of man's inherent sin and evil and the New Testament takes it for granted that man is sinful and evil. The view that knowledge and wisdom are evil is further confirmed in *I Corinthians* 1 verses:

> 18. I will destroy the wisdom of the wise.
> 20. Has not God made foolish the wisdom of this world?
> 21. The world through wisdom did not know God.
> 27. God has chosen the foolish things of the world to put to shame the wise.

The opposite extreme is authored by Clifford as quoted by William James in his 1897 book *The Will to Believe,* [3p47]

> If belief has been accepted on insufficient evidence the pleasure is a stolen one…It is sinful because it is stolen in defiance of our duty to mankind. The duty is to guard ourselves from such beliefs as from a pestilence which may shortly master our own body then spread to the rest of the town…
>
> If a man, holding a belief which he was taught in childhood or persuaded of afterward, keeps down and pushes away any doubts which arise about it in his mind, purposely avoids the reading of books and the company of men that call into question or discuss it, and regards as

> impious those questions which cannot easily be asked without disturbing it — the life of that man is one of sin against mankind.

Another call for reason over faith was written by Baruch Spinoza in 1670: [4]

> …if anything is there set down [in the Bible] which can be proved in set terms to contravene the order of nature, or not to be deductible therefrom, we must believe it to have been foisted into the sacred writings by irreligious hands; for whatsoever is contrary to nature is also contrary to reason, and whatsoever is contrary to reason is absurd, as *ipso facto,* to be rejected.

These extreme views illustrate the magnitude of the problem. As seductive as Pascal's attempt to reconcile the rational and the spiritual brain may be, it had an empty and inadequate ring. Can the neuroscience of cognition help us to better understand how the spiritual brain sometimes overwhelms the rational brain? There are several interesting aspects of this question.

One of these aspects has already been covered in the chapter, "The Spiritual Brain." For example, when certain areas of the brain were exposed to DMT, the scientists involved in the experiment absolutely believed that despite all the contrary evidence, they had been abducted by aliens. Under certain circumstances, the rational brain of rational men is totally ignored. This is likely due to the fact that the memory systems of the temporal lobe generally cannot distinguish between externally versus internally generated memories. Thus, strong spiritual experiences such as those produced by psychedelic drugs or aberrant electrical activity may seem as real, as real events. Some additional aspects are covered in Chapter 42 on the evolution of spirituality. Of several other factors, I will first examine the role of the conscious versus the unconscious mind in making simple versus complex decisions.

Complex Decisions are Made in the Unconscious; Simple Decisions in the Conscious Brain

One would think that complex questions, such as those involving faith and religion, would require a great deal of conscious thought and rumination, while simple decisions, such as whether to wear the solid red or the paisley tie, would be made automatically and unconsciously. In fact the reverse is the case. The conscious brain evaluates things held in working memory and the capacity of working memory is limited such that only simple decisions are made in the conscious brain. By contrast the unconscious brain has access to an almost unlimited number of variables based on past experience. Thus, complex decisions that involve weighing the relative merits of many different variables are best made in the unconscious brain.

This is illustrated in a study carried out in the department of psychology at the University of Amsterdam. [5] The participants all read information about four hypothetical cars. In one part of the study they were given only four characteristics

(simple decision) rated positive or negative, on which to base their choice. In another part of the study they were given 12 characteristics (complex decision). The best car was characterized by 75 percent positive characteristics, the worst car by 25 percent positive characteristics, and the other two cars by 50 percent positive characteristics. Some subjects were asked to think about the cars for four minutes, then make a decision about which was best. This used the conscious brain. Other subjects were also asked to think about the four cars for four minutes but were distracted by also being asked to solve an anagram. Since the distracted subjects could not actively think about the cars, they were using their unconscious brain to make the decision. Their results, in terms of the percentage of subjects who made the correct decision about which of four cars was the most desirable, are shown in Figure 1.

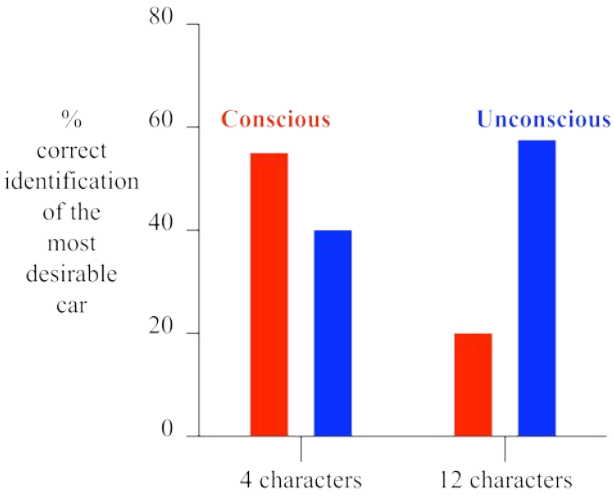

Figure 1. Percentage of participants who chose the most desirable car as a function of the complexity of the decision and conscious or unconscious mode of thought. From Dijksterhuris et al. Science. *311:1005-1007, 2006.* [5]

The unconscious brain is able to juggle many different decision variables and is thus best suited for making complex decisions, while the conscious brain, capable of juggling only a few decision variables, is best at making simple decisions. The choice of whether to believe in God and to accept the many different aspects of religious belief is clearly more complex than choosing between cars. This suggests that decisions concerning complex issues such as belief in God, faith, and religion, where hundreds of different aspects of the issue are involved, are likely to bypass the conscious rational brain and utilize the unconscious brain.

The conscious, thinking, rational brain is by-passed when individuals make complex, multifaceted decisions such as those that relate to religion and faith. The rational brain is also bypassed when memory systems of the temporal lobes are internally stimulated. This may produce spiritual experiences that are indistinguishable from reality.

Man's Craving for Information and the Pleasure It Produces

One of the most pleasurable things that humans do is to acquire new information, new knowledge, or new insight into the unknown. Viewing a dramatic sunset, seascape, or snowcapped mountain; hearing a beautiful song; reading an entertaining novel; learning a new concept; or having a spiritual experience are all profoundly

gratifying and bring us great pleasure. Why is this so? Irving Biederman of the department of psychology at the University of Southern California and Edward Vessel from New York University have sought to answer this question. They proposed that this enjoyment is deeply connected to an innate hunger and even craving for information. They suggest that human beings are designed to be *infovores*—seekers and devourers of new information and knowledge. "This craving begins with certain types of stimuli, then proceeds to more sophisticated levels of perception and cognition that draw on associations the brain makes with previous experience." [6] It was suggested that this craving for and acquiring of new information would have adaptive value in evolution, in that those individuals who are perceived as knowledgeable and more intelligent would have a selective advantage in mate selection. The concept of human being infovores is reminiscent of Augustine of Hippo's concept of "eros of the mind," which referred to the deep longing within the human mind to make sense of things, a passion for understanding and knowledge. It is related to Daniel Dennet's "hyperactive agent detection device" [7,8] and Karen Armstrong's [9] *logos* (word) versus *mythos* (myth) as means of making sense of the world.

Why do humans perceive the acquiring of new knowledge or understanding as pleasurable? In addition to the reward and pleasure system based on dopamine neurons described previously, opioid receptors are also involved in the subjective feeling of pleasure. Opioid receptors come in three types, *mu*, *kappa,* and *delta.* The *mu* receptors respond to drugs derived from the poppy plant, such as heroin and morphine. Their addictive properties are well known. These receptors did not evolve just so we could derive pleasure from and become addicted to morphine and heroin. They are present in the brain because the brain produces built-in, or endogenous, morphine-like compounds called *endorphins.* These are the compounds that play a critical role in the placebo effect for pain. Before a new drug for alleviating pain can be approved by the Federal Drug Administration (FDA) it must be shown to work better than the built-in endorphins. Endorphins are also the friend of long-distance runners, kicking in after the first few miles and providing such pleasure that running is addictive for some people. Biederman and Vessel [6] proposed that the stimulation of the *mu* opioid receptors is the mechanism by which the acquiring of new knowledge and new understanding can be very pleasurable. On what do they base this?

In addition to the presence of *mu* receptors in the pain pathways, they are also present in many other parts of the brain. For example, when we view any scene, the neurons are activated progressing along a ventral visual pathway. This pathway starts with the neurons in the V_1 to V_4 portions of the occipital lobe involved in the initial processing of vision. These areas detect color, form, contour, and texture of objects. The next part of the pathway is the primary association area for vision, consisting of the lateral occipital and ventral occipital-temporal cortex. These areas integrate the visual information to detect surfaces, objects, and places. The final portion of the pathway is the parahippocampal and rhinal cortex of the temporal lobe, where new visual information interacts with previously stored memories to determine if it is new information. While all areas of the ventral visual pathway possess opioid receptors,

they are most heavily concentrated in the parahippocampal and rhinal cortexes. This is illustrated in Figure 2.

The high density of opioid receptors at the end of the visual pathway, where it intersects with the storage of memories, allows new information and new knowledge to be a pleasurable experience. Just as the pleasurable experience of taking heroin may produce a craving for more, the pleasurable experience of acquiring new information may produce a craving for more, producing an infovore. Other studies suggest that a similar increasing density of opioid receptors is present in the auditory pathway. Supporting this is the observation that the thrills experienced from listening to a stirring piece of music are eliminated by the administration of naloxone, a *mu* opioid antagonist.

New spiritual experiences, acquired either by seeing symbols of spiritual figures, by hearing a rousing sermon, or the insight produced by acquiring information leading one to believe in God, would also provide great pleasure to the recipient. It is of note that this process takes place in the temporal lobes, the spiritual brain of man. There are rich connections between these parts of the brain and the dopamine-rich striatum, suggesting the activation of the dopamine pleasure pathways may also be involved. Similar ideas of a pleasure from the stimulation of the dopamine reward system by new facts, have been proposed in learning theory. [10] It is likely that new spiritual experiences would also result in pleasure due to the stimulation of the dopamine reward system.

These mechanisms help us to understand why man is such a spiritual being and why a belief in God or other spiritual entities by most of our species is unlikely to ever go away. It is likely that the devout Jews doveting for hours before the wailing wall, the Muslims repeatedly reading and speaking the verses of the Qur'an, and the Pentecostal Christians speaking in tongues are all deriving great pleasure from their spiritual activities.

These findings can also help us to understand why faith and the spiritual brain often win out over the rational brain, and why most people in the world believe in God. While the acquiring of new scientific facts and knowledge and the creation of new music or scientific theories also bring great pleasure, because of their upbringing and early exposure to religion and culture, the majority of people in the world are more involved in spiritual activities than in rational and scientific activities. The great pleasure derived from these activities provides little incentive to change.

Man's Resistance to Changes in His Belief System

Another important aspect to the relationship between faith and reason is the fact that cognitive psychological research has repeatedly shown that people tend to seek out, recall, and interpret evidence in a manner that sustains their belief system.

The interpretation of data is often deeply shaped by the beliefs of the researcher. These implicit beliefs are often so deeply held that they affect the way in which people process information and arrive at judgments. Both religious and anti-religious belief systems are often resistant to anything that threatens to undermine, challenge, qualify, or disconfirm them. Deeply held assumptions often render these implicit theories

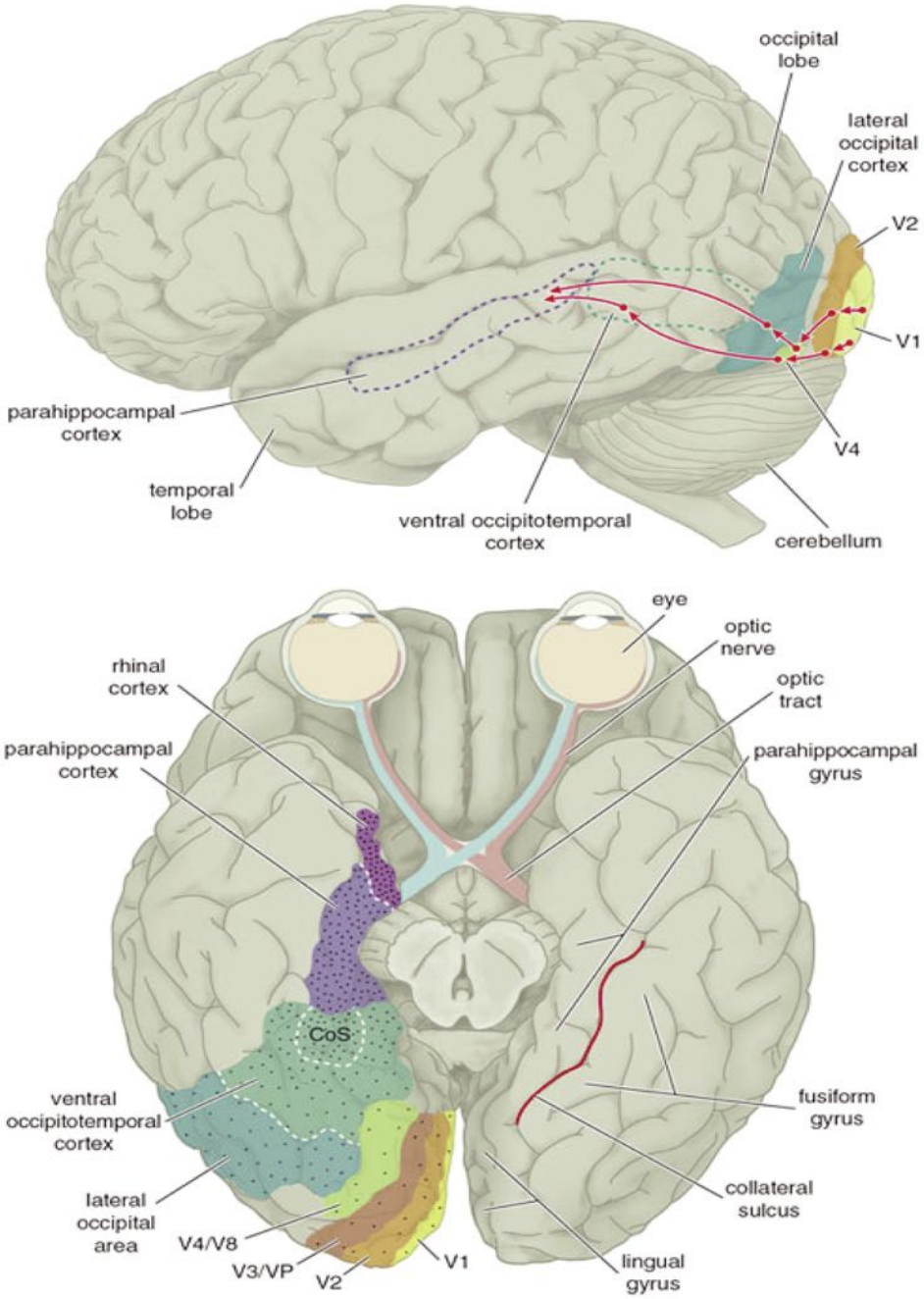

Figure 2. The visual pathways of the human brain. The opioid receptors are shown as black dots. This shows that the density of opioid receptors increases along the visual pathway and is maximal in the parahippocampal cortex and rhinal cortex. From Biederman and Vessel, Perceptual Pleasure and the Brain. American Scientist. *94:247-253, 2006.*[6] *By permission.*

"almost impervious to data." [1,11p83]

This is what lead my mentor in mammalogy and my friend in pre-med to violently strike out at me when I challenged their belief systems. This is what led to the phrase "Science moves funereally. Scientists don't change their minds, they just die off." [12p254] And what led Thomas Kuhn in his book, *The Structure of Scientific Revolutions* [13] to describe what he termed a *paradigm shift,* or replacement of old ideas with new ones. He described three stages. The first stage is the absolute rejection of a revolutionary new idea that threatens the old paradigm. The new ideas are, "crazy, insane, nonsense." The second stage is the beginning of a grudging, tentative acceptance of the new idea. The final stage is the rapid and full adoption of the new paradigm, often associated with claims by the original objectors that "they actually thought of it first."

Studies of how memories are stored help us to understand the neurological basis of such resistance to change. It has generally been felt that scenes and faces that come across our visual field stimulate millions of different neurons [14] and that a large number of neurons are involved in storing such scenes in memory. This is true for the average scene or the average face. But what about the memory of faces or things that we have seen thousands of times? Do these still require millions of neurons or does the process become simplified and require fewer neurons? What about only a thousand neurons? Only 10? Or even only one?

Gabriel Kreiman and colleagues [15,16,17] made recordings from single cells in the medial temporal lobes of human patients during neurosurgery. They found that for images the patients had been exposed to thousands of times, such as the face of President Clinton, only a single cell was required to store the recognition of the image. Other images did not elicit a similar response. This effect is shown in Figure 3.

The single cell responded vigorously to a line drawing, a photograph, or a group photograph of Bill Clinton. It was indifferent to images of past presidents, other unknown faces, or random images. In earlier studies these were called "grandmother cells" because studies had shown a single-cell response to pictures of subject's grandmothers but not to pictures of unrelated individuals.

These studies did not imply that only one "grandmother cell" was involved in the recognition of these repeatedly viewed objects. It is likely that several cells were involved. The important point is that very few cells were required for a rapid and efficient recall of even abstract characterizations of the objects.

The principle would be the same for individuals with a religious upbringing repeatedly exposed to pictures of Jesus Christ, or images of Christ on the Cross, or images related to other religions. The repetitive nature of childhood and adult religious instructions are likely to have produced "grandmother cells" related to religious issues. It is also relevant that these cells are closely associated with the limbic structures or the emotional brain. Thus, not only are they rapidly and easily recalled, they often have a strong emotional flavor. Since the areas involved are also part of the spiritual brain, spiritual as well as emotional flavoring may occur. Once these cells are thoroughly hardwired into the temporal lobe early in life, they may represent a form

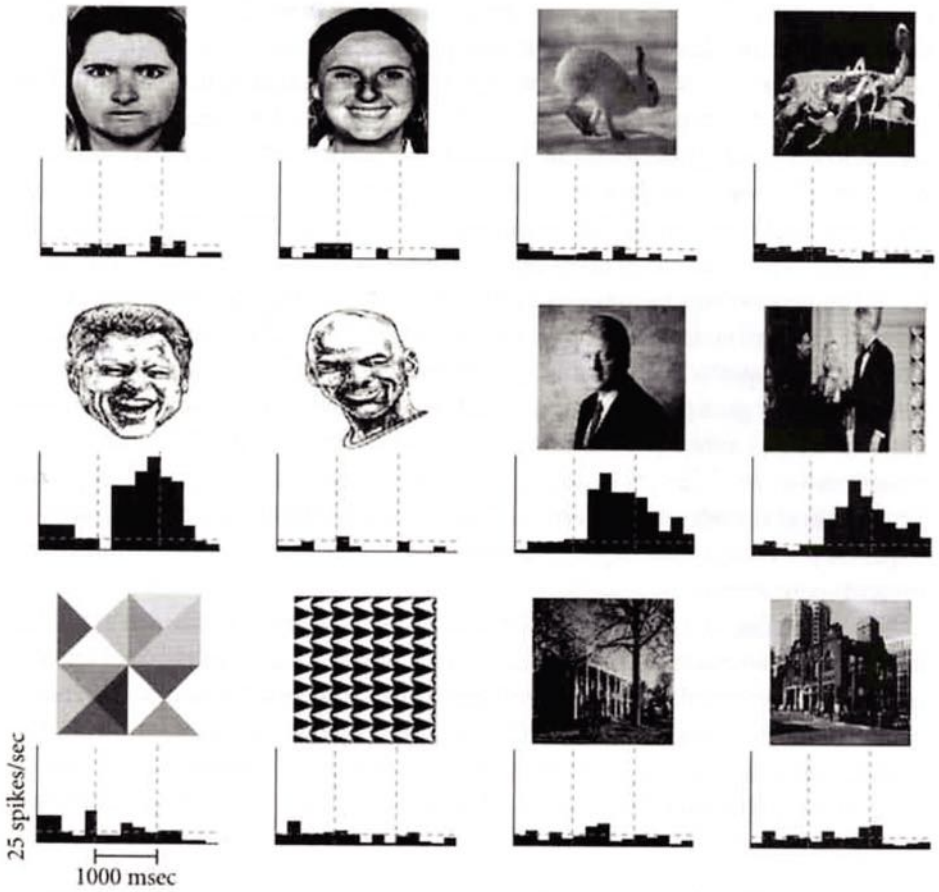

Figure 3. A cell selectively responding to different pictures of Bill Clinton. The area below the pictures show the firing pattern of a single amygdala neuron from a patient looking at drawings or photographs for one second each. Only the figures of the president elicited responses. From Koch. The Quest for Consciousness. *Roberts and Company Publishers, Englewood, CO, 2004.*[18] *By permission.*

of "I got here first" phenomena and thus contribute to the tendency of humans to be conservative and resistant to change.

This phenomenon is likely to be the basis of the statement of many priests, "Give me a child for five years and I will give you a Catholic for life." This may also explain the existence of scientists who have religious beliefs. This is likely due to having had a strong religious upbringing or spiritual experiences. Those belief systems, once placed into their "grandmother neurons," may be very resistant to change despite exposure to new data and often-conflicting data. It has often been stated that it is logically impossible to reconcile faith and reason. In the abstract, this is correct. It is impossible to reconcile a system based on fact with a system that makes it necessary to ignore fact. However, when reason understands the unique needs and complexities of the spiritual brain, reason and faith are less incompatible.

Many of the most complex decisions that man makes, including those relating to his spiritual nature, take place in the subconscious mind or are internally generated by the spiritual brain thus bypassing the conscious rational brain. In addition, the intake of new information, new knowledge and new insights is a pleasurable experience. This pleasure is brought about by the stimulation of opioid receptors in the higher sensory association areas located in the temporal lobes — in the spiritual brain. Through this mechanism spiritual experiences and insights may provide great pleasure. New knowledge or insights can also produce pleasure through the direct stimulation of the dopamine reward pathways. This can account for why man is such a spiritual being and derives such pleasure from participating in religious rituals.

The repeated exposure to ideas or images results in their being encoded into small number of single neurons in the temporal lobe. This process is likely to contribute to the fact that humans are resistant to any change in their belief system once they are ingrained into memory. As a result, a faith system learned in childhood is likely to persist for a lifetime.

The neurophysiology reviewed in this chapter provides us with an understanding of how the spiritual brain can sometimes overpower the fact-driven rational brain and helps us to understand how the rational and spiritual brain can peacefully coexist.

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Chapter 35

Neurology: Summary

To understand the power that spirituality, religion and faith can play in the lives of humans it is necessary to review some of the basic aspects of how the brain works. To conceive of how our thinking, rational brain, with its "Just give me the facts" outlook on life, can coexist with our spiritual brain with its faith-oriented "Don't confuse me with facts my mind is made up" approach, it is necessary to understand the functioning of the human brain.

None of these features can take place in the absence of consciousness. Our current knowledge of consciousness shows that its unique feature of self-awareness and 'awareness of that awareness' is the result of a high level of integration of information with inter-connection and cross-talk between many different parts of the brain. The highest level of this integration takes place in the prefrontal lobes. They serve as the master brain, the area of association of associations, the integration of integrations. The frontal lobes also serve as the executive director of the brain, with responsibility for some of our most human capabilities of compassion, empathy, long-term planning, goal-directedness, abstract reasoning, spatial memory, working memory, impulse control and paying attention. As the famous Russian neurophysiologist Luria said, the frontal lobes are "the organ of civilization."

The dopamine reward pathways are the portion of the brain most clearly related to the survival of the individual and the species. These pathways reward eating and reproduction without which we would die or become extinct. When defective, these pathways can be responsible for a wide range of addictions involving tobacco, alcohol, cocaine, crack, heroin, and other drugs, gambling and other activities. Knowledge of the pleasure brain helps us to understand that in many cases these addictive behaviors are founded in biology, in contrast to the frequently held religious view that they are the result of a pervasive moral decay.

Other parts of the brain form our social brain. They are responsible for monitoring social interactions between parents and their children, spouses or partners, friends, and society as a whole. A pair of pituitary hormones, vasopressin and oxytocin, play a major role in pair bonding, monogamy, love, maternal care, and trust of others. These admirable features of human behavior are in large part built in. This is in contrast to the conclusion of many religions that we are incapable of having these altruistic behaviors on our own and need to be forced to do them by rules,

rituals, recriminations, guilt and reward of eternal happiness in heaven — if we behave.

A specific portion of the prefrontal lobes, the dorsolateral cortex, is especially involved in rational thought, reasoning, and decision-making. It is the part of the brain involved in ambiguous choices with no absolute correct answers, a characteristic of the highest form of human reasoning. This part of the brain can be viewed as our "skeptical brain." It is the portion of our brain that is in the greatest degree of conflict with the spiritual brain.

One of the most remarkable and informative aspects of the neurology of the brain is the evidence for a role of the temporolimbic system as the site of our spiritual brain. Finding God, Jesus, or religion has been widely credited with producing positive and permanent changes in human behavior. The same long-lasting positive changes associated with the sense of meaningful, profound importance, immense joy and of being connected to something greater than ourselves are produced by a range of events that affect the function of the temporolimbic system. These events include the electrical stimulation of the temporal lobes, spontaneous temporal lobe epileptic auras and seizures, trauma, near-death experiences, rituals, speaking in tongues, and psychedelic drugs. A remarkable aspect of one of these drugs, DMT, is its ability to produce the feeling of having been in contact with a non-human presence and the strong conviction that the experience was real in the face of a clear understanding that it was not. The vast majority of the time the temporolimbic tape recorder places into our memory banks experiences that were real. In rare cases where the experiences were internally generated and not real, either as a spiritual experience or the result of taking a psychedelic drug, the temporolimbic tape recorder may be unable to distinguish between what was real and what was not real. This provides us with a framework for allowing a peaceful coexistence between the rational brain and the spiritual brain. It is simply necessary for the rational brain to understand that one of the characteristics of the spiritual brain is to strongly believe in something and have faith in something, even when the rational brain says it is unreasonable or that it did not and could not have happened. That is the essence of faith over reason. It can happen. It does happen. Now we can have some insight as to why it happens.

Since various forms of meditation have been widely used to foster a sense of spirituality and connectedness to something greater than ourselves, one would anticipate that they would activate our spiritual brain. In reality, the parts of the brain that are activated or deactivated simply reflect the method of meditation used, such as highly focused attention or unfocused mindfulness. While some imaging studies have suggested that meditation may involve the dissolution of the individual "self" and merging it with a universal self, this requires independent verification.

A substantial part of spirituality, faith, and religion provide a sense of hope and healing in the face of disease or misfortune. Studies of the neurology of the placebo effect clearly show the power of the mind over the body and of the ability of a positive and believing attitude in health and healing.

The human brain is an incredible organ. It is the reason humans can call

themselves human. The hardwired modules for rational thought, empathy, decision making, social interaction, pleasure, hope, mindful healing, and spirituality exist because these traits have survival value and were selected for. To be hardwired is to be genetically controlled. The following chapters examine the role of our genes in rational thought and spirituality.

Part V

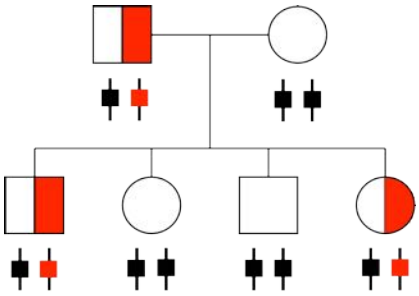
The Genetics of Reason and Spirituality

Everything that our brain does is ultimately the result of an interaction between our genes and our environment. For some traits our genes play the major role, for some the environment is the primary factor, and for most it is a combination of the two. On average, depending upon the trait, the genetic contribution accounts for 40 to 90 percent of a trait.

When speaking of genetic factors, many people, including many scientists, think in terms of disorders or traits caused by a single gene. Part V is about the role of genetic factors in reason and spirituality. It is also about disorders or traits that are due to the action of multiple genes instead of single genes. The purpose of this introduction, and the next chapter, is to introduce the reader to the differences between entities due to single genes, called *Mendelian inheritance,* and entities due to multiple genes, called *polygenic inheritance.*

We all learned in high school biology that the field of genetics started with the work of Gregor Mendel, an obscure Augustinian monk who loved working with the plants in the garden of his monastery near Brünn in Austria. The prevailing paradigm of his day, based on the theory of Jean Baptiste Lamarck, was that the environment played the major role in determining different traits. In the fine tradition of experimental science, Mendel sought to demonstrate this by growing an atypical variety of a plant next to a typical variety and observing their offspring. This experiment was "designed to support Lamarck's views concerning the influence of environment upon plants." Instead, Mendel found that the plants' respective offspring retained the essential traits of the parents, and therefore were not influenced by the environment. This brilliant insight led Mendel to a series of experiments over the next seven years, examining the crosses between peas with a variety of different traits.

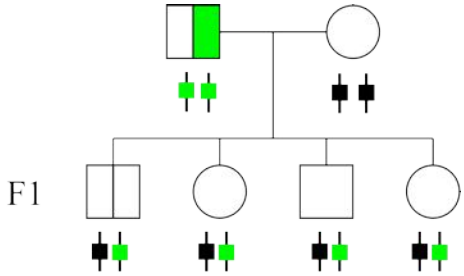
Mendel found there were two different ways that traits were inherited. To illustrate this I will diagram a typical family tree where females are represented as circles and males as squares. Instead of using Mendel's peas, I will simply illustrate colored genes and the colored traits they produce. All higher organisms, including plants, have two sets of genes: one from their mother and the other from their father.



dominant trait

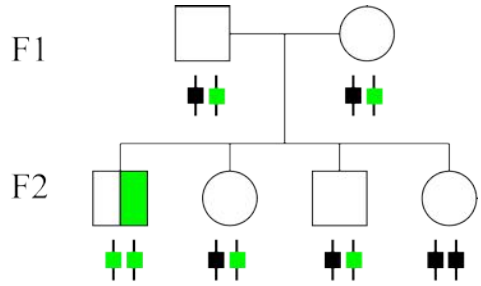
In this diagram the red trait is caused by the red factor, later called a *gene.* Here it is carried by the father and is passed to 50 percent of his offspring. Since only one copy of the red gene is required to cause the red trait, Mendel called this a dominant trait. The red gene is dominant over the black gene. The first set of offspring was called the F1 generation. A second set resulting from further matings was called the F2 generation. If the offspring were crossed with each other the same 50 percent ratio was observed in the F2 generation.

For some traits Mendel observed a different pattern of inheritance.



recessive trait

Here, in a cross between a father with the green trait and a mother without this trait, none of the children in the F1 generation showed the trait. However, if the offspring were crossed,



recessive trait

the trait was present in the F2 generation at Mendel's famous 1:3 ratio. One of the

offspring has a double dose of the green gene and presents with the green trait. These are called *homozygotes.* Two of the offspring have a single dose and do not have the trait. These are called *heterozygotes.* The final offspring have no green gene and do not have the green trait. Since the heterozygotes with a single dose of the green gene do not have the green trait, the green gene is recessive to the black gene. Mendel called this *recessive inheritance.* Based on many different experiments Mendel formulated several laws of inheritance describing his findings concerning dominant and recessive inheritance, describing the fact that the maternal and paternal copies of a gene separate from each other in the formation of eggs and sperm and recombine at fertilization, and describing the fact that genes are inherited as independent units.

In 1865 Mendel [1] reported his findings in an article entitled *Experiments with Plant Hybrids.* It was published in an obscure journal and forgotten until it was independently rediscovered in 1900 by three different scientists. This piece of work, along with Darwin's *The Origin of Species,* are two of the most important, influential and enduring works in the history of mankind. Mendel's work represented the birth of the study of genetics, a field that in the past 100 plus years has lead to an explosive increase in knowledge, culminating with the sequencing of the entire genomes of man and many other organisms.

I have renewed the reader's knowledge of single gene inheritance for the simple purpose of illustrating what I will *not* be talking about in the following chapters. Mendelian traits represent single gene inheritance where a given trait is entirely due to one gene. The vast majority of human traits and common disorders are not inherited in this fashion. They are rather due to the combined effect of multiple different genes. This is called *polygenic inheritance.* Understanding polygenic inheritance is critical to understanding the genetics of reason and spirituality.

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Chapter 36

Polygenic Inheritance

In addition to Mendel's studies of single genes, he also presented the first clear description of polygenic inheritance. [1] He made a cross between white and purple-red flowering beans. The offspring were an intermediate color. In the F2 generation, instead of the expected 1:3 ratio of white and purple-red, he observed a continuous range of colors from white to purple-red. He proposed that more than one gene was involved in determining flower color in this plant.

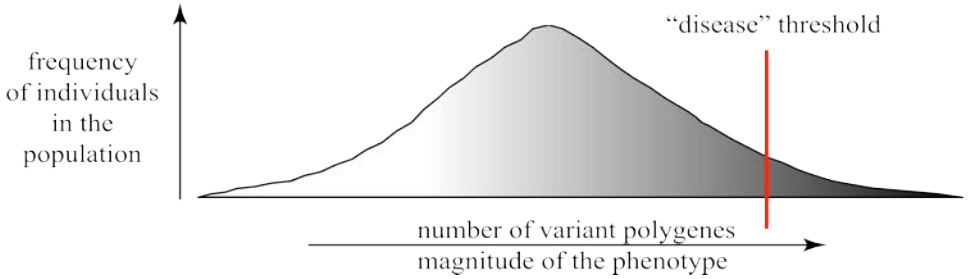
If the early geneticists had placed more faith in Mendel's brilliant insights, the war of words that soon ensued would not have occurred. But early geneticists such as William Bateson and Hugo DeVries [2] didn't. Contrary to Mendel, they thought these continuous variables were due to environmental factors. However, another early geneticist, Francis Galton, studied continuous variables such as height and mental ability and showed they were hereditary. For example, the children of two tall parents tend to be tall, and the children of two short parents tend to be short. Carl Pearson, the father of statistics, developed the correlation coefficient that quantitated these variations and provided a statistical test of whether the average value of a trait in one group of people was the same or different than in another group.

This led to two camps, the "Mendelians" who believed that individual genes were involved and the "biometricians" who denied the existence of discrete genes. In 1906 Yule suggested that continuous traits were due to the interaction of many individual genes each with a small effect interacting with the environment. [2] This concept was confirmed by a study of the color of wheat grains. In the F2 generation, the ratio of 1 white to 63 red grains conformed to the expectation for three genes, each of which had two variants or alleles.

Thus, early in the twentieth century all of the key elements of the inheritance of continuous traits was worked out. Polygenic inheritance was the result of the additive and interactive effect of multiple genes, each with a small effect, interacting with the environment. This is the mechanism of inheritance of height; weight; intelligence; blood pressure; coronary artery disease; autoimmune diseases such as rheumatoid arthritis and lupus erythematosis; all the mental disorders, including depression, manic depression, schizophrenia, autism, attention deficit disorder, obsessive compulsive disorder, dyslexia, learning disorders; and all of the personality traits including spirituality.

A Threshold Model

When we define a disorder, such as childhood attention deficit hyperactivity disorder (ADHD), people often get the impression that it is an all-or-none entity. In reality it is a continuous variable just like height. Our definitions just give the illusion that you either have it or you don't. This threshold effect is illustrated as follows:



While everyone to the right of the "disease" threshold by definition has the entity and everyone to the left does not, it is clear that we are simply and arbitrarily cutting the curve into two parts (dichotomizing) a continuous trait. [3]

How Many Genes?

When we ask, "How many genes are involved?" there are two aspects of this question. We can be asking, "For a single individual, what is the minimal number of genes that can produce a given trait?" This number could be as low as two genes each, with two variants for a total of four variants. However, in reality the number of genes required to produce a given trait in a single individual is much higher than this, but the exact number is difficult to determine. Alternatively, we could be asking an easier question, "For the whole population, what is the maximum number of genes that can contribute to a given trait?" This number is easier to determine and the answer is, "many." For example, when the effect of an individual gene on a common trait is statistically examined we usually find that it accounts for only *one to two percent* of the total picture or, what we call in statistics-speak, the *variance.* If twin studies showed that environmental factors accounted for 40 percent of the variance and genes accounted for 60 percent, this would imply that on a population basis, approximately 30 different genes (60/2) would be required to produce the disorder.

Polygenes

The variant genes that play a role in polygenic disorders are often referred to as *polygenes* to distinguish them from mutant genes that cause single gene disorders. [3] Mutant genes are genes that when present in heterozygous form (dominant) or homozygous form (recessive) cause a disorder or disease all by themselves. Because they have such a deleterious effect, mutant genes are strongly selected against, and thus they are rare. The change in the nucleic acid sequence caused by the mutation usually results in a severe disruption of the function of the gene.

By contrast, the change in the nucleic acid resulting in a variant polygene usually

has a minimal effect on the function of the gene. Here the function of the gene may be only modestly decreased (or increased). Because the effect is small there is little selection against individual polygenes, and as a result they may be very common in the population. Also, because the effect on gene function is modest, the cooperative effect of many different genes is required to produce a given trait. A motto for polygenic disorders is "common gene, common disorder." Table 1 [3] lists in more detail some of the differences between single gene and polygenic disorders.

Table 1. Comparison of single gene versus polygenic disorders

	Single gene disorders	***Polygenic disorders***
Number of genes involved	1	3 to dozens
Frequency of disorder	rare (<1%)	common
Gene frequency	rare (<1%)	common (5–95%)
Effect on gene function	major	minor
Method of identification	linkage analysis	association analysis
Type of subjects studied	large families	affected individuals
Variance explained per gene	100%	.5 to 5%
Specificity	disease-specific	spectrum of disorders
Type of DNA alteration	exons, splice junctions deletions, insertions	promoters, microsatellites regulatory RNA genes

The method of identification refers to how the causative genes are identified. Linkage analysis requires large families of affected individuals and identifies whole regions of chromosomes that may carry the relevant variant genes. Association analysis examines the frequency of genetic variants of specific genes in affected individuals compared to controls.

Specificity refers to whether the gene defect is specific for a given disorder. For example, the mutation that causes Huntington's Disease causes Huntington's Disease and nothing else. No one without the mutant gene has Huntington's disease and everyone with the mutant gene has the disease. By contrast, individual polygenes can be associated with a wide range of related disorders and affected individuals may have a spectrum of disorders. For example, the serotonin transporter gene has been associated with ADHD, depression, anxiety, autism and other behavioral disorders, and individuals with ADHD may also suffer from the same spectrum of disorders. These are called *comorbid disorders* and tend to cluster together because they share some genes in common.

The detrimental effect of the DNA alterations involved in single gene disorders arises from altering the structure or sequence of the gene. The mild effect of the DNA alterations involved in polygenes arises from alterations in promoter regions or changes in the number of repeats in microsatellites near the promoter region. [4] or alterations in regulatory RNA genes [6].

Epistasis

Epistasis is an important aspect of polygenic inheritance. It refers to an interaction between two (or more) genes where the resulting effect is greater than the sum of the

effect of each gene individually. A study by Fossella and colleagues [5] illustrates epistasis. As shown in the chapter on "The Hopeful Brain," the *COMT* gene has a valine/methionine polymorphism, and met/met individuals with two copies of the met variant have much lower levels of the catechol-o-methyltransferase enzyme than val/val subjects. Since this enzyme breaks down dopamine in the synapses, met/met subjects have higher brain dopamine levels than val/val subjects. Fossella and colleagues used a computerized assessment to test for frontal lobe executive control in 200 adult subjects. Since dopamine is an important neurotransmitter for the frontal lobes, their hypothesis was that those with higher brain dopamine levels would have better-functioning frontal lobes and thus higher scores on executive functioning. The results of the correlation between the *COMT* val/met genotypes and executive control scores are shown in Figure 2. As hypothesized, the executive control scores were the highest in those with the met/met genotype and progressively lower in those with the val/met and val/val genotypes. However, this trend was not significant ($p < .1$).

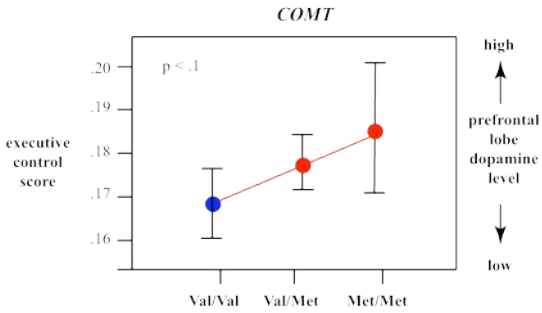


Figure 2. The correlation between a score for prefrontal lobe executive function and the COMT *gene. Fossella et al.: Assessing the molecular genetics of attention networks.* BMC Neuroscience. *3:14, 2002.* [5]

A second enzyme called monoamine oxidase A (MAOA) also breaks down dopamine in the synapses. The *MAOA* gene is located on the X-chromosome and has a repeat polymorphism consisting of variable number of a 30-base-pair segment of DNA in the promoter region of the gene. Individuals who only carry the 3-repeat variant have a five-fold decrease in *MAOA* enzyme levels compared to those who only carry the 4-repeat. As with the *COMT* met variant, they would also have higher brain levels of dopamine. Figure 3 shows the correlation between the *MAOA* genotype and the executive control score. Again, as hypothesized, the executive control scores were the highest in those with the 3-repeat genotype and lowest in those with the 4-repeat genotypes. This trend was just barely significant ($p < .05$).

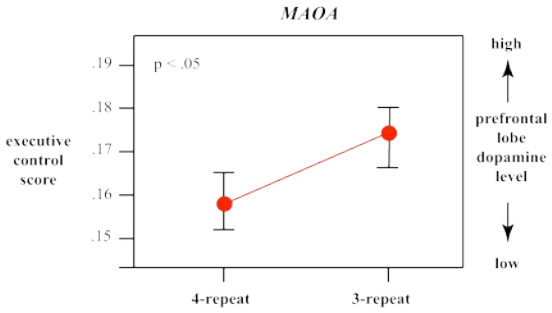


Figure 3. The correlation between a score for prefrontal lobe executive function and the MAOA *gene. Fossella et al.:* BMC Neuroscience. *3:14, 2002.* [5]

Now comes the *epistasis* part. Since both the *COMT* and *MAOA* genes regulate the breakdown of dopamine, one might anticipate that if a person carried the poorly functioning variants at both genes, the results might be more dramatic than the

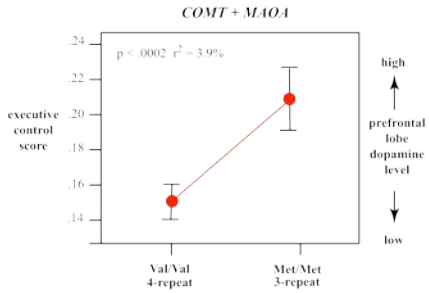


Figure 4. The correlation between a score for prefrontal lobe executive function and the COMT *and* MAOA *genes. Fossella et al.:* BMC Neuroscience. *3:14, 2002.* [5]

simple additive effect of both genes independently. Figure 4 shows the results for individuals that carried both of the low-functioning variants (met/met and 3-repeat) versus those with both of the high-functioning variants (val/val and 4-repeat).

This shows that when individuals inherit both the *COMT* and *MAOA* low-functioning variants, the average executive function scores are much higher (21.5 %) than for either low-functioning variant alone (*COMT* 18.5 %, *MAOA* 17.5 %) and much lower (15.0 %) than for high-functioning variant alone (*COMT* 16.8 %, *MAOA* 16.0 %). In addition, the difference between the high and low values was highly significant ($p < .0002$). Together these two genes now accounted for 3.9 percent of the variance, much higher than either gene alone or the simple additive effect of both genes. Twin studies have shown that genetic factors account for 89 percent of the variance of the executive control score. If the *COMT* and *MAOA* genes account for only 3.9 % of the variance many other genes would be necessary to account for the remaining 85.1 %.

Most of the common mental and physical disorders and human behavioral traits are polygenically inherited. Polygenic inheritance is due to the additive and epistatic interaction of many different genes, each accounting for only a small percent of the total trait and interacting with the environment.

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Chapter 37

The Genetics of Bad Behavior

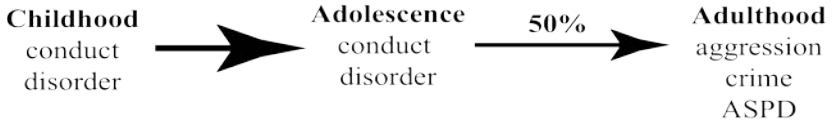
There are two reasons why I have included a chapter on the genetics of bad or antisocial behavior. First, many studies have been carried out on the interaction of genes and environment for this entity. These studies beautifully illustrate this important interaction. Second, one of the most frequently cited positive aspects of religion is to ensure moral behavior. But what if humans are inherently good, and amoral behavior is primarily the result of certain genes we inherit rather than the environment we are brought up in, or the amount of religious training we have revieved? This question and this possibility make an examination of the origins of amoral behavior a relevant subject.

When we speak of antisocial behavior, two different entities are involved: conduct disorder (CD) and antisocial personality disorder (ASPD). While they are essentially the same disorder, they differ primarily in that CD defines antisocial behavior in children up to the age of 20, while ASPD defines antisocial behavior in individuals 21 years of age and older and can be diagnosed only if CD was present prior to age 21. The essential feature of CD is a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated.[1] Examples include bullying and threatening others, using a weapon, cruelty to animals, arson, destroying property of others, breaking into houses, burglary, repeated running away from home, and truancy. The essential features of ASPD are the same as CD except that they refer to adulthood. These features specifically include repeated fights, assaults and arrests, conning others, a reckless disregard for the safety of others, constant irresponsibility, and lack of remorse for these behaviors.

While classically thought to be due primarily to socioeconomic and environmental factors, an increasing body of evidence indicates that genes play a major role in CD and ASPD. This conclusion is based on family, twin, and adoption studies.

Conduct disorder is a lifelong condition. One of the most highly replicated findings in the field of psychiatry is that the symptoms of childhood CD persist into adulthood and drive adult antisocial behavior. This conclusion is based on longitudinal studies where subjects are examined in childhood and then re-studied when they are adults. This approach is far more reliable than asking adults to remember their childhood behaviors. Many such longitudinal studies have been performed and they all conform to what I refer to as the 50 percent rule. On average

50 percent of children with CD have a range of antisocial behaviors as adults. This is diagrammed as follows:



The following is an example of the most famous of many of these reports. Dr. Lee Robins [2] at the Washington University School of Medicine in St. Louis carried out this early, classic study of conduct disorder and antisocial personality. In 1922, the St. Louis Psychiatric Clinic was opened in the Municipal Courts Building with the purpose of demonstrating the presumed effectiveness of psychiatric treatment of juvenile delinquents. The clinic continued to operate for 22 years, finally closing its doors in 1944. For many years the records were stored until the demands for space resulted in the proposal to burn them. Foresighted intervention got them transferred to Washington University. A sampling showed that this group included a large number of severely antisocial children, providing "a treasure trove of research materials representing the first step in the study of the natural history of the development of adult antisocial behavior." The plan was to take a population of children seen in the clinic 30 years previously, match them with a sample of normal school children, and find both groups as adults. Matching for sex, socioeconomic status, and other factors would allow the effects of these variables to be sorted out. This produced a group of 524 white children seen in the clinic for behavior problems, of which 406 were referred for antisocial behaviors. These consisted of theft, burglary, robbery, forgery, truancy, chronic tardiness at school, running away, sexual perversion, public masturbation, excess heterosexual interest or activity, vandalism, false fire alarms, carrying deadly weapons, incorrigibility, refusal to work, lying, fighting, and physical cruelty. Robins stated,

> We had expected that the deviant children referred for antisocial behavior would provide a high rate of antisocial adults, but we had not anticipated finding differences invading so many areas of their lives. Not only were antisocial children more often arrested and imprisoned as adults, as expected, but they were more mobile geographically, had more marital difficulties, poorer occupational and economic histories, impoverished social and organizational relationships, poor Armed Service records, excessive use of alcohol, and to some extent, even poorer physical health. The control subjects consistently had the most favorable outcomes. That the tendency toward deviant behavior pervades every area in which society sets norms, strongly suggests that the occurrence of deviance is a unitary phenomenon. No clear connections were found between the type of deviance in childhood and the type of deviance in adults.

Robins concluded that *antisocial behavior in childhood predicts no specific kind of*

deviance but rather a generalized inability to conform and perform in many areas. The best predictor of adult antisocial behavior was the *total number of antisocial behaviors as a child, not the type of antisocial behaviors.* Although the average age of referral was 13 years, most of the children had a history of behavior problems dating back many years. *The median age of onset for boys later diagnosed with sociopathic personality was seven years.* It was also striking that *no child without serious childhood antisocial behavior became a sociopathic adult.*

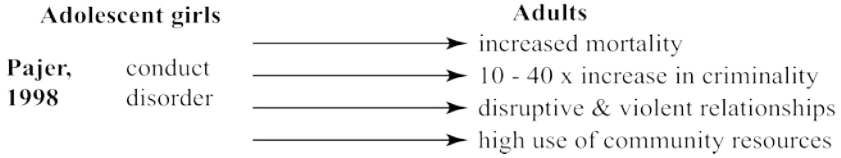
These findings indicate that *adult antisocial personality disorder has its origins in early childhood,* and if a boy or girl passes through childhood without symptoms of antisocial behavior it is unlikely they will develop subsequent problems. Strong and early evidence for the role of genetic factors came from the observation that sociopathic and alcoholic fathers produced a significantly higher rate of sociopathic children (32 percent) than did fathers without this diagnosis (16 percent). *The highest risk factor for producing an adult with antisocial personality was the presence of 10 or more antisocial behaviors as a child, plus an alcoholic father.* By striking contrast, when the parents had no problems, or problems that were not of an antisocial type, there was no increased risk of the child becoming an antisocial adult.

Many sociological studies have blamed juvenile delinquency and antisocial behavior on poverty, poor housing and poor jobs. However, when Robins dissected out these variables she found that *having a sociopathic or alcoholic father was a far better predictor of a child developing an antisocial personality than was the earning power or socioeconomic status of the father.* She pointed out that

> "Families can live in slums and be on relief rolls *without* their children responding to the frustrations of poverty or to the examples of delinquency in their neighborhoods with sociopathic behavior *if* the families' poverty stems from other than antisocial behavior. It is unreasonable, then to attribute a crucial role in the production of adult antisocial behavior to the frustration consequent to low prestige and poverty in childhood."

The major finding from Robins's study was that the best predictor of adult antisocial behavior was the presence of childhood antisocial behavior, along with a family history of alcoholism or antisocial behavior. The type of behavioral problems in childhood was much less important than the number of deviant behaviors. This concept has been supported by many subsequent studies.

The following diagram shows one additional longitudinal study, this time in girls.



In a paper entitled, "What Happens to 'Bad' Girls," Pajer [3] reviewed studies of the adult outcome of girls with conduct disorder as adolescents. This showed a significant increase in the frequency of both mental and physical disorders, increased mortality (often involving a violent death), a 10- to 40-fold increase in criminality, dysfunctional and often violent relationships, and high rates of using community services. In some cases the crimes committed consisted of burglary and assault rather than the usual female crimes of shoplifting, drug use, and prostitution.

Since one to 10 percent of children have CD, this disorder plays a major role in society's load of antisocial behavior. It has been repeatedly shown that most of the criminal behavior in the general population is carried out by a small number ASPD individuals who are repeat offenders.

Family studies of CD. A number of studies have shown that the fathers of children with CD commonly had CD, ASPD or criminal records themselves. [4-7] The role of genes versus the environment was examined in a study where 72 children who attended a psychiatric clinic with a diagnosis of ADHD were divided into two groups, those with at least one antisocial parent and those without an antisocial parent. In the group with an antisocial parent, the ADHD children tended to have CD, and 23.5 percent of the siblings had CD. By contrast, the ADHD children without an antisocial parent tended to have ADHD without disruptive conduct and zero siblings had CD. [8] In studies where the antisocial and aggressive behaviors were examined by a continuous scale of minimal to severe, the scores for the fathers strongly correlated with the scores for their sons. [9,10]

Simply because the fathers have CD-ASPD does not prove that CD is genetic. Their sons could have CD because of the antisocial environment provided by the father. To explore genetic factors, one study examined siblings and half-siblings. If there was a genetic component to CD, it should have been more common in boys whose fathers had antisocial behaviors than in their half-brothers whose fathers did not have antisocial behaviors. This is what was found. Twice as many sons of the fathers with antisocial behavior had CD than did half-brothers whose fathers did not have antisocial behavior. [11] While studies of half-siblings are informative, studies of twins are even more so.

Twin studies of CD. Twin studies are an important method of identifying the relative role of the genes versus the environment. Identical twins share 100 percent of their genes in common, while fraternal twins share 50 percent of their genes in common. The frequency with which a condition is present in both twins is called the *concordance rate.* For example, if a study starts by identifying a twin with CD and finds that 60 percent of the time the other twin also has CD, then the concordance rate is 60 percent. If a disorder is caused entirely by environmental factors, the concordance rate will be the same for identical and fraternal twins. If one twin comes down with a highly infectious disorder such as the flu, the other twin is likely to also get the flu, whether he or she is an identical or fraternal twin. The concordance rate would be the same for both the identical and fraternal twin. By contrast, if a condition is entirely genetic, the concordance rate would be twice as high in identical

twins than in fraternal twins. For intermediate cases due to both genes and enviornmental factors, formulas allow the determination to the relative role of each.

The largest twin study of CD was reported by Slutske and coworkers [12] and utilized the Australian Twin Registry. They examined 2,682 adult twins. The remarkable finding was that genetic factors contributed to at least 71 percent of the disorder. This stands in marked contrast to the usual assumption that conduct disorder is a learned behavior and due to poor parenting, parental conflict and divorce. This very high degree of genetic loading supports the highly reproducible findings described above that CD is a life-course persistent entity as described later in this chapter.

An important aspect of the Australian study was the finding that in addition to a genetic component for the presence of three or more childhood CD symptoms there was also a significant genetic component to the presence of only one or two symptoms. This suggested a multiple threshold model in which increasing numbers of relevant genes result in a continuously increasing susceptability to the symptoms of CD.

An even larger twin study involving 7,449, seven-year-old twins examined aggression as a general trait. [13] Two types of aggression were examined, direct aggression that was essentially CD and indirect or relational aggression that involved a lot of aggressive behaviors without directly harming others. Additive genetic factors accounted for 53 to 66 percent of both types of aggression in both males and females. A number of other twin studies of CD and ASPD have also been reported. As shown in the following section, the degree of the genetic contribution in older children and adults is related to age.

Twin Studies of Juvenile Delinquency and Adult Crime

One of the most interesting findings to come out of twin studies of juvenile delinquency and criminal behavior in adults is the finding that the genetic component is minimal for juvenile delinquency but substantial for adults. This is illustrated in Figure 1.

These studies show that for juvenile delinquency the ratio of the concordance rate in fraternal versus identical twins was close to 1.0. This figure indicates there was very little genetic component to juvenile delinquency. By contrast, for adults the concordance rate for fraternal twins was less than half that for the identical twins, indicating the presence of a substantial genetic component to adult crime. The difference is due to the fact that there is a high degree of "background noise" in juvenile delinquency. In adolescents, acting out in the form of juvenile delinquency is almost a rite of passage. This is the reason why juvenile justice is more lenient than adult justice and why records of juvenile offenders can often be expunged. This result does not mean that some juvenile delinquency is not associated with genetic factors, it is just drowned out with the high level of general, non-genetic delinquency. However, most delinquent behavior fades away by adulthood. Deviant behavior tends to persist predominantly in those with a strong genetic component. As a result, crime in adults does show a genetic component.

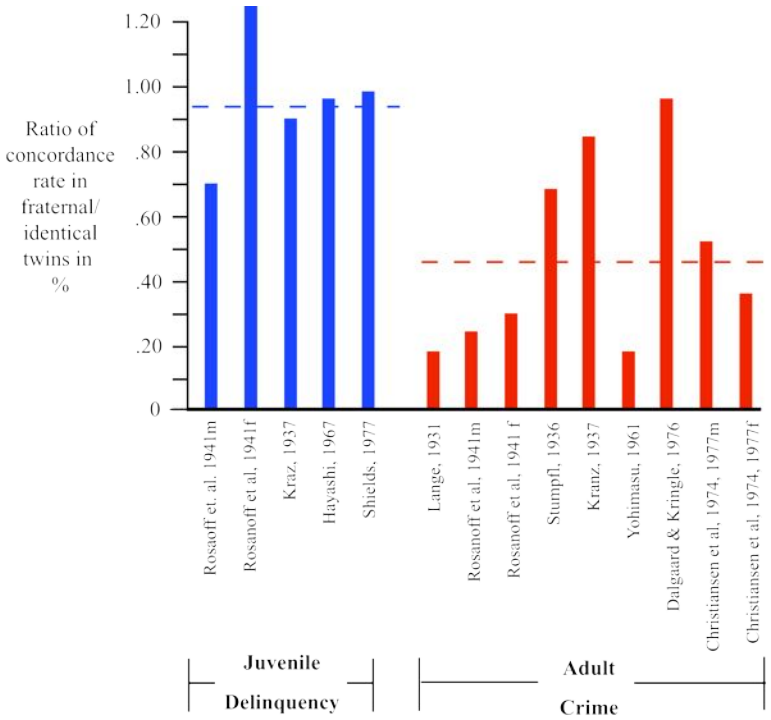


Figure 1. Comparison of the ratio of the percent concordance for identical versus fraternal twins for juvenile delinquency versus adult crime. Data from Cloninger and Gottesman, 1986 in Mednick, S. A. et al.: The Causes of Crime, *Cambridge University Press.*[14] *Dotted lines show the means for the ratios for juvenile delinquency and adult crime.*

Adoption studies of antisocial behavior. The most powerful evidence about the relative role of genes and the environment in antisocial behavior comes from adoption studies. This evidence is the result of examining four types of cross-fostering. It is possible to examine the adopted children of antisocial parents raised by either normal or antisocial parents as well as the adopted children of normal parents raised by either normal or antisocial parents. Adoption studies have shown a significantly increased rate of criminality in adoptees with criminal biological parents who were raised in non-antisocial homes.[15-21] These studies are of particular value in demonstrating that conduct disorder and antisocial behavior can occur in the absence of a negative childhood environment such as parental separation, abuse, or alcoholism.

An example of one such four-way cross-fostering study was that undertaken in Stockholm, Sweden by Cloninger and colleagues.[19-21] It included 862 men and 913 women born out of wedlock from 1930 to 1959 and adopted into families of non-relatives at an early age. There were two important aspects of this study, the relationship between alcohol abuse and crime, and the cross-fostering results. The four-way cross-fostering results are summarized for males in Figure 2.

There was only a modest increase in the frequency of criminal behavior when a child with a non-criminal parent was raised in a household with a criminal versus a non-criminal parent (7 percent vs 3 percent). However, the effect was dramatic when

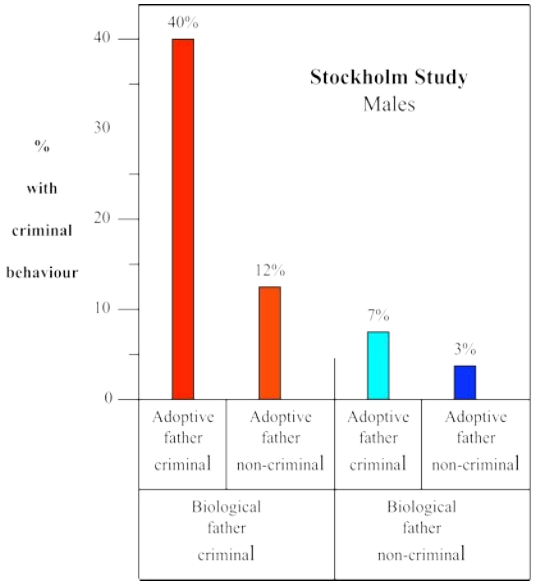


Figure 2. Summary of adoption study of Cloninger et al.: Predisposition to petty criminality. Archives of General Psychiatry. *39: 1242-1247.* [19-21] *Copyright 1982, American Medical Association.*

the children had a criminal parent. Here 40 percent of such children raised with a criminal parent had criminal behavior, versus only 12 percent of such children raised with a non-criminal parent. Although the percentages were smaller, the ratios were even greater for females. The Stockholm studies also found no evidence for a genetic contribution to delinquency in young adolescent. This again verified the above observations that genetic factors predominantly play a role in adult criminality.

In a separate series of studies, Cadoret and colleagues [22-24] examined subjects who were adopted in the first few days of life and studied when they were 19 to 47 years of age. They examined 95 male and 102 female adopted offspring who were separated at birth from biological parents who had ASPD and/or alcoholism. An interaction between the genes and environment was demonstrated by a higher level of aggression and CD in those with both a biological parent with ASPD and an adoptive parent with one or more antisocial problems. This relationship is shown in Figure 3.

The presence of increasing problems in the adoptive parents' home had no effect on adolescent aggressive behavior in the absence of a biological parent with ASPD. However, when there was a biological parent with APSD, the risk of adolescent aggression increased with more adverse factors in the adoptive home.

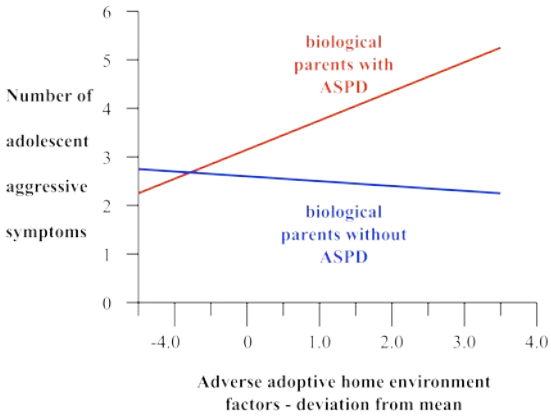


Figure 3. Interaction between genes and the environment in the prediction of adolescent aggression. From Caboret et al. [22] Archives of General Psychiatry. *52:916-924. Copyright 1995.*

Adolescence limited and Life-course persistent antisocial behavior. As shown in the above twin studies, genetic factors appear to be less important for adolescent than for adult crime. This concept has been reviewed by Moffitt. [25] She addressed what she termed "two incongruous facts about antisocial behavior: A) it shows

impressive continuity over age, but B) dramatically increases in frequency during adolescence. The increase during adolescence was so dramatic that to account for this she proposed there were two types of antisocial behavior, adolescence-limited and life-course persistent. This is illustrated in the Figure 4.

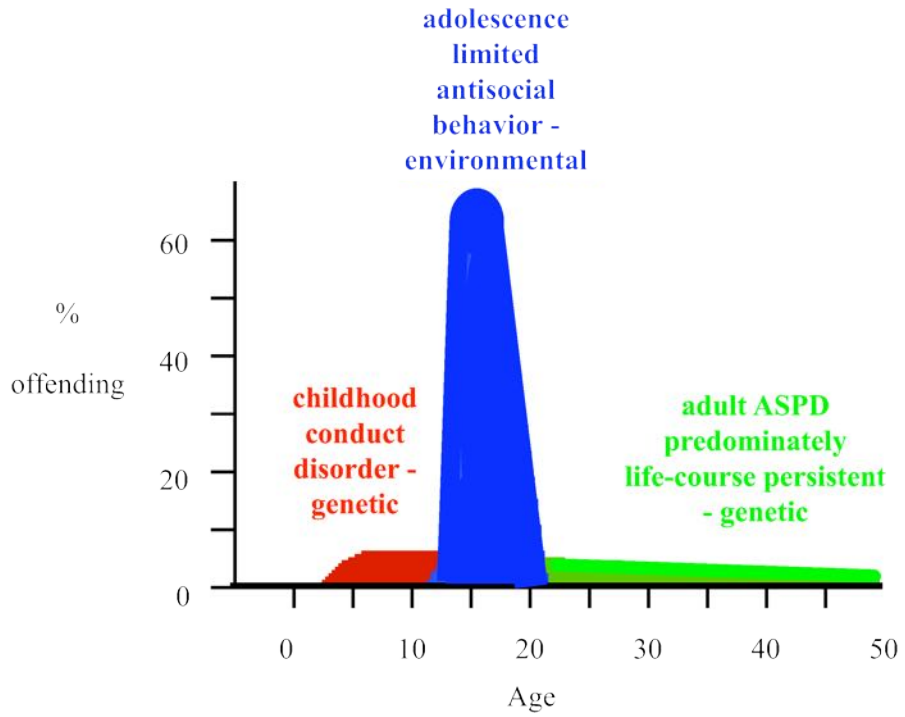


Figure 4. Diagram of life-course persistent versus adolescence-limited antisocial behavior. After Moffitt, T. E. Psychological Review. *10:674-701,1993.* [25]

The majority of adult crimes were committed by the life-course persistent subjects. The life-course persistent antisocial behavior would equate to the persistent conduct disorder symptoms noted earlier and would represent the genetic form of antisocial behavior starting virtually at birth and lasting a lifetime. This is consistent with the tendency for childhood conduct disorder to persist and to be one of the best predicters of adult criminal behavior. As for the adolescence-limited antisocial behavior, Moffitt suggested that a maturity gap encourages teens to mimic antisocial behavior in ways that are normative and adjustive. The period of adolescent delinquency matches the gap between sexual maturity and the time of separation from the parents. After this they employ more socially accepted outlets such as marriage, parenthood, higher education, and employment. She proposed that the surge in adolescence-limited criminal behavior might be the result of mimicking the behavior of those with the life-course persistent antisocial behavior, thus giving this group unusual influence on the whole of adolescent delinquency. Moffitt [25] also predicted that the two groups carried out different types of crime.

Life-course-persistent offenders with poor self control, pathological interpersonal relationships, weak connections to other people, and a lifelong antisocial personality account for violence against persons as well as for crimes committed in late life. Adolescence-limited offenders account primarily for crimes which serve to meet adolescents' lust for acknowledgement and privilege: theft, vandalism, public disorder, and substance abuse.

The results of these studies have significant implications. The common view is that the environment in which children are raised plays the major role in predicting criminal behavior. These studies show that the major effect is from a combination of "bad genes" and "bad environment," not a bad environment per se. Placing a non-genetically predisposed child into a bad environment has relatively little effect on criminal outcome, suggesting that if the seed is not "bad," it will not grow. By contrast, the "bad seed" will grow in either environment but it sprouts fastest in a "bad environment."

With regard to the subject of this book, a religious upbringing is likely to have only a modest effect on preventing antisocial behavior for the majority of children, since they have a normal genetic make-up. A religious upbringing is likely to have its greatest effect for a child who has inherited genes for antisocial behavior.

The results of these studies imply that if most antisocial behavior is the result of the actions of a distinct minority of the population, the world should be perpetually blessed with peace and tranquility. Unfortunately, this is not the case. One of the reasons is that psychopaths like Hitler, Mussolini, Stalin, Sadam Hussein and others who are at ease with ruthless brutality often rise to be leaders. Once they attain power they are willing to use any means to remain in power. As a result, such individuals have a disproportionate effect on the history of mankind. As discussed in a subsequent chapter, religions themselves, with the intolerance they often foster toward other groups with different beliefs, have also contributed greatly to human conflicts and wars.

Some Specific Genes — MAO

There are two aspects to the genetics of antisocial behavior. The first, described above, relates to the use of twin and adoption studies to show that genetic factors play a major role. The second is to actually identify some of the specific genes involved. In earlier chapters the role of the two genes, *COMT* and *MAOA,* that code for the enzymes that break down dopamine were illustrated for several traits. In 1993 Brunner and colleagues [26] described a family from Holland in which numerous males had a borderline IQ and a history of aggression, including arson, attempted rape, and exhibitionism. Biochemical studies identified a C–>T mutation that resulted in

inactivation of the *MAOA* gene. Since the *MAOA* gene is X-linked, only males, who carry just one X-chromosome, were affected. The extra normal X chromosome in females compensated for the defective *MAOA* gene and they are not affected. A portion of the pedigree is shown in Figure 5. This is an example of a rare single abnormal gene causing a behavioral disorder. Most behavioral disorders, including antisocial behavior, are polygenically inherited.

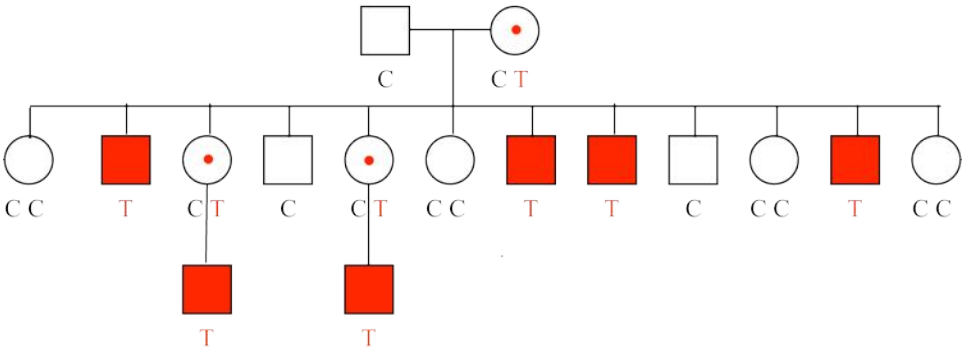


Figure 5. A part of the pedigree reported by Brunner et al. [26] Science. *262:578-580, 1993. The females with the* ***T*** *mutation were C****T*** *carriers and did not have symptoms. The males with only the* ***T*** *mutation had one or more symptom of antisocial behavior.*

An excellent example of the interaction of a single gene and environmental factors also involved the *MAOA* gene. Caspi and coworkers [27] studied a large sample of children from birth to adulthood. When examined without the genetic data childhood maltreatment made little difference in antisocial behavior in the adults. However, when the interaction between the *MAOA* gene and the presence or absence of maltreatment in childhood was studied, the results, shown in Figure 6, were dramatic.

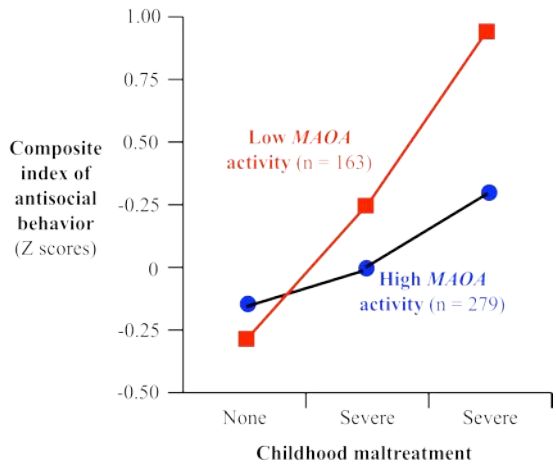


Figure 6. Interaction between the MAOA *gene and the degree of maltreatment in childhood. From Caspi et al.* Science. *297:851-854, 2002. By permission.*

Those individuals carrying the high *MAOA* variant were less likely to show antisocial behavior regardless of whether or not they were maltreated in childhood. However, those individuals with low *MAOA* variant showed much higher levels of adult antisocial behavior if they had been maltreated as children than if they had not been maltreated.

COMT, the other gene responsible for the breakdown of dopamine, is also associated with antisocial behavior. In a study of

240 children with ADHD, the presence of comorbid CD was significantly associated with the valine allele of the val/met variant described previously. CD was also associated with low birth weight and with an interaction between the *COMT* gene and low birth weight. [28]

Genes play a significant role in adult aggressive and criminal behavior. Individuals who carry a set of genes that predispose them to antisocial behavior begin to manifest this condition by the development of conduct disorder in early childhood. In about 50 percent of cases this genetic predisposition leads to criminal and other antisocial behavior in adulthood. The likelihood of antisocial behavior is increased when an individual with such genes is exposed to maltreatment or other disruptive environmental influences.

The concept that humans are inherently predisposed to misbehave unless they are exposed to a strict religious environment is clearly incorrect. However, being raised in a supportive environment that may include a range of religious values would help to prevent antisocial behaviors in the small proportion of individuals who inherit genes for antisocial behavior.

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Generosity without hope of reciprocation is the rarest and most cherished of human behaviors, subtle and difficult to define, distributed in a highly selective pattern, surrounded by ritual and circumstance, and honored by medallions and emotional orations.

E. O. Wilson
On Human Nature [1]

Chapter 38

The Genetics of Good Behavior

The previous chapter pointed out that genes play a major role in the development of lifelong bad behavior as manifested by Conduct Disorder and Antisocial Personality Disorder, and that only a few percent of the population have this problem. The findings demonstrated that the majority of humans were not inherently wicked or amoral, and humans did not need to belong to a religious group to keep them from behaving in an antisocial fashion. But what about the opposite end of the spectrum? Do genes and evolution play a role in the production of individuals with good, prosocial and altruistic behavior? Are there individuals who not only do not behave badly but behave unselfishly and even place the welfare of their fellow man above that of their own? If these individuals exist, is this behavior common and is it a uniquely human trait? The evidence suggests that altruism is real, it is common, and some aspects of it are uniquely human.

Altruism

Altruism is defined as costly acts that confer benefits on other individuals, a selflessness that puts individuals at risk for the benefit of the group. From an evolutionary point of view such behavior would seem to be a counterintuitive anomaly and difficult to explain. Darwin himself recognized that altruism presented a difficulty for his theory of evolution that emphasizes self-serving survival of the more fit. [2] A number of researchers have provided important clues as to how altruism may have evolved. The following are some of the elements involved.

Kin selection. In the 1960s the evolutionary biologist William Hamilton [3] proposed a theory of kin selection. He showed that helping relatives can increase the chances that one's own genes will be passed on through them. This is a form of selective advantage for individuals who use the golden rule. [4] This is the form of altruism most likely to be seen in other primates and animals.

Direct reciprocal altruism. In the 1970s Robert Trivers [5] proposed the concept of reciprocal altruism, a "tit for tat" form of cooperation in which helping a non-relative increases one's own fitness as long as the recipient is expected to return

the favor. This form of altruism, involving genetically unrelated individuals, was a signifcant expansion over kin selection where only relatives were involved. Direct reciprocal altruism would only work in situations where it is possible to keep track of who helped whom, but it allowed an extension of its effect beyond the size of the groups involved in just kin selection. This form of altruism is best described as, "You scratch my back and I'll scratch yours." [6] The degree to which humans show a division of labor and cooperate with genetically unrelated individuals is unparalleled in other animal societies. [7]

Indirect reciprocal altruism and reputation. In addition to direct reciprocal altruism, humans often help others even if the altruistic act is not likely to be returned by the recipient. [8] Different types of economic games have been used to explore different aspects of altruism in humans. Based on such studies, Martin Nowak of Harvard University and Karl Sigmund [6,9] of the University of Vienna developed the theory of indirect reciprocal altruism. It can be described as, "I help you and somebody else helps me." The term indirect comes from the fact that if other individuals observe the generous behavior they would be more likely to cooperate with the generous person. The generous person thus develops a reputation for being generous and cooperative. The authors concluded that the reputation of individuals played an important role in social interactions. As a result of reputation-building, the altruistic person will eventually benefit even if it comes from someone other than the original direct recipient.

Reputation has a powerful cooperation-enhancing effect on social interactions [10] and an individual's behavior is driven by the desire to acquire a good reputation. When a game is set up so a donor cannot acquire a good reputation, they cooperate in 37 percent of cases. When the game is set up so they can attain a good reputation, they cooperate in 74 percent of cases. [11] Clearly when someone is keeping score, individuals are more cooperative. An open display of generosity will enhance a person's reputation. As stated by Milinski [10] it helps to "Do good and talk about it." [4] The intelligence and cognitive, language, and "theory of mind" skills of humans are critical factors for the development of reputations.

Strong reciprocal altruism, altruistic rewarding, and punishing. An additional characteristic of human altruism is what has been termed *strong reciprocal altruism.* [12] This is characterized by a combination of altruistic rewarding where altruistic behavior is rewarded, and altruistic punishing where sanctions are placed on those who violate the norm and do not cooperate or help. These are called defectors, and defectors who scam the system to their advantage face reprimands and punishment. Without such punishment the defectors would quickly take over. Some have questioned whether this alone is adequate to account for why cooperation involves much larger groups in humans than in other primates. In modeling studies, Fehr and Fischbacker [7] showed that one additional factor, consisting of punishing those who were not willing to punish others was also necessary. This would be analogous to laws punishing parents who did not or could not control their own children. This effect is shown in Figure 1.

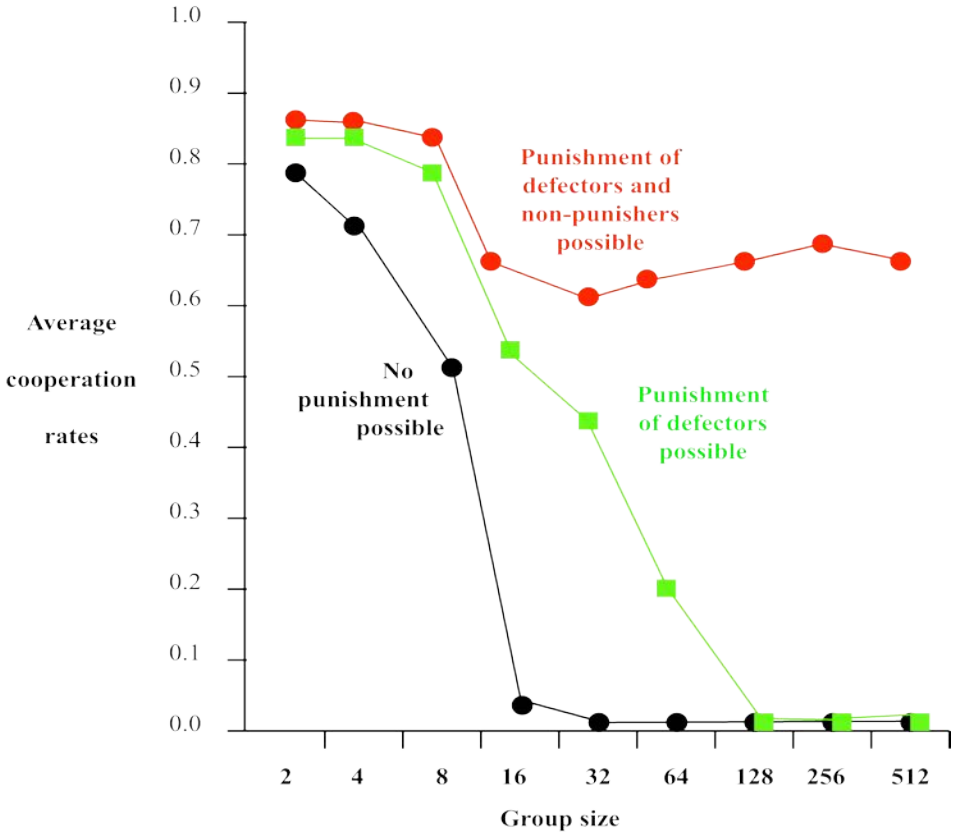

Figure 1. Simulation of the evolution of cooperation in a game testing altruism. From Fehr and Fischbacher: The Nature of Human Altruism. Reprinted by permission from Macmillan Publishing, Ltd. Nature. *425: 785-791, 2003.*

After multiple generations of no punishment of any type, the average cooperation rate dropped to zero at a group size of 16. When punishment of defectors was allowed, the rate of cooperation did not drop to zero until there were 128 individuals in the group. If punishment of non-punishers was also allowed, the rate of cooperation remained very high (over 80 percent) and did not drop off in larger groups. The opportunity for reputation-building and punishment has played a major role in the evolution of human cooperation to include large groups of genetically unrelated individuals.[7]

Studies of contemporary hunter-gatherers and other evidence suggest that altruistic punishment may have been common in mobile foraging bands during the first 100,000 years of the evolution of modern man.[13] While religion may have played some role in altruism by threatening punishment by a supernatural force,[14] modeling studies show it is not a critical ingredient. Besides, *religion developed long after altruism was already well evolved.*

While humans uniquely possess altruism in extended groups, when genetic mixing between two groups occurs, rates of helping and cooperation decline

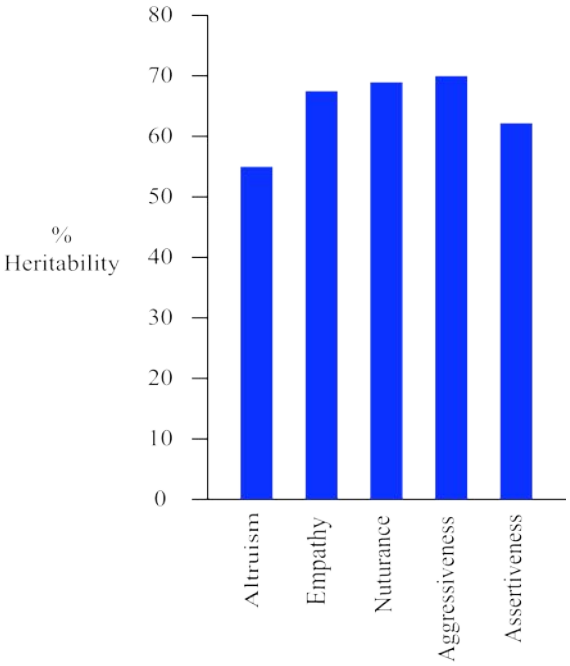

Figure 2. Heritability estimates for five traits relating to altruism and aggression. From Rushton et al.: Altruism and Aggression: The Heritability of Individual Differences. Journal of Personality and Social Psychology. *50:1192-1198, 1986.* [16]

dramatically and approach zero.[15] This is indicative of one of the major problems humans have had throughout history, that of mistrusting individuals outside their own kin, social, political or religious group.

The Genetics of Altruism

Rushton and colleagues[16] from the University of London gave questionnaires that measured altruistic and aggressive tendencies to 573 twins. The heritability estimates for altruism, empathy, nurturance, aggressiveness, and assertiveness are shown in Figure 2. The majority of the variance of each scale was due to genetic factors. Specifically the heritability of altruism was 56 percent. Altruism increased with age while aggressiveness decreased. *Virtually zero percent of the variance of each trait was due to the common environment such as early religious instruction.*

Unfairness, Emotion, and Reason

The inverse of altruism is unfair behavior such as cheating and deception. Sanfey and coworkers[17] utilized fMRI studies of individuals playing the Ultimatum Game to identify the parts of the brain that were involved assessing unfair behavior. In the Ultimatum Game two players decide on how to split $10. This was a version of what children do when they are asked to share a piece of cake. To reduce conflict they often adopt the strategy of "You cut, I'll take my choice." In this study, responders played against other people or against the computer and were aware of which was which. In the Ultimatum Game the proposer offers a given cut and the responder can accept or reject the cut. An added complication is that if the responder chooses not to accept the cut, neither person gets any money. Thus, there are considerable consequences for the responders that cry foul and turn down the deal.

One might expect that the responder would accept any amount of money rather than walk away with nothing. However, studies of how people play this game in many societies show this is never the case. When the offer seems unfair, the responder often rejects the offer. The acceptance rates by offers from humans as opposed to those coming from a computer are shown in Figure 3.

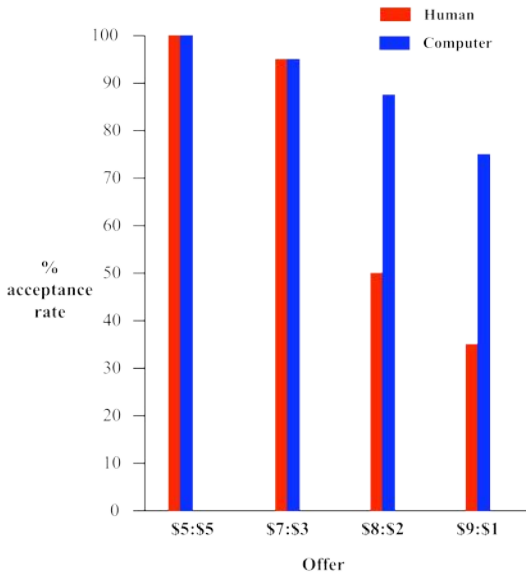

Figure 3. Acceptance rates by split offer from the Ultimatum Game played against humans or the computer. From Sanfrey et al.: Science. *300:1755-1758, 2003.* [17]

The acceptance rates were much lower for unfair offers coming from humans than those coming from the computer, indicating individuals were much more likely to punish a person for unfair behavior than a computer. This suggests that unfairness engenders an emotional reaction of anger, and people are willing to sacrifice considerable financial gain to punish the unfair person.

The fMRI studies showed that unfair offers stimulated the regions of the brain involved in both emotion (the insula) and reason (dorsolateral prefrontal cortex). The activation of the insula occurs with negative emotional states. The greater the unfairness of the offer, the greater the relative activation of the insula. The activation of the insula was much greater when the unfair offer came from a person rather than from a computer, indicating the anger was directed against a fellow human and not the amount of the split.

In contrast to the emotional reaction to unfair and rejected offers, accepted offers were more likely to produce relatively more activation of the dorsolateral prefrontal cortex, even if they were unfair. This suggests that subjects used more rational thought and less emotion in deciding whether to accept an offer, and less rational thought and more emotion in deciding to reject an offer.

These studies have several important implications. The most obvious is that decision-making in humans is not purely rational—emotions play an important role and can lead to counterintuitive results. The second implication is that by producing anger and with it a desire to punish unfair activity, emotions played a critical role in the evolution of altruism.

Altruistic Behavior and Dopamine Reward Pathways

To examine the possible neural basis of altruistic behavior Rilling and colleagues performed fMRI studies on 36 women as they played the Prisoner's Dilemma Game. [18] In the game two players have a choice to cooperate, not to cooperate, or for one to cooperate while the other does not. In the latter case, cooperation incurs costs to the individual and benefits only accrue to the other player. Monetary reward is the oil that makes the game run. Repeated playing of the game results in the evolution of different strategies that different players use to maximize their gain. Mutual cooperation was associated with consistent activation in brain areas that have been

linked to the reward pathways. The results suggested that the activation of reward pathways reinforced reciprocal altruism and motivated subjects to resist the temptation to selfishly accept favors without reciprocating them. There was evidence of a negative response of the dopamine system if a subject cooperated but the opponent did not.

The concept of spirituality includes being kind, doing good things, and acting for the good of one's neighbor. *Human spirituality and altruism may be linked by a common effect on reward pathways and they may have reciprocally cooperated and aided in the evolution of each other.*

Altruistic Behavior and Dopamine Genes

A study of 354 families from the general population in Israel showed a significant association of the *Selflessness Scale,* a measure of altruism, with the dopamine D_4 (*DRD4*), dopamine D_5 (*DRD5*) and insulin-like growth factor (*IGF2*) genes.[19] The *DRD4* is the same gene that we found to be associated with spirituality.[20] The association of two different dopamine genes with altruism is consistent with the fMRI studies showing that altruism stimulates the "feel good" reward pathways.

Humans show a considerably higher level of altruistic or cooperative behavior than any other species. Twin studies show a significant genetic contribution to altruistic traits and molecular genetic studies show that dopamine genes are involved. The stimulation of the dopamine reward pathways may make altruistic acts a pleasure to perform.

These factors combine to account for the presence of altruism and cooperation at levels of magnitude that are much greater for humans than for any other species. The major lesson is that man has evolved a set of biological and genetic systems that usually lead him to behave in a helpful, cooperative, and altruistic fashion toward his fellow man, independent of religion.

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Chapter 39

The Genetics of Reason

As described in Chapter 26, the prefrontal cortex is the neural site of abstract thought, adaptive decision-making, deductive and inductive reasoning, and represents the site of the rational brain. Adaptive decision-making, where there are no true answers, most closely represents the uniqueness of human rational thought and what I refer to when I speak of the conflict between our rational and spiritual brain. Here I ask the question, "To what extent are genetic factors involved in the ability to carry out rational thought?" To answer this in the above context would require an examination of twin studies of adaptive decision-making. Unfortunately there are no such studies, so we cannot answer this question directly. There are, however, many twin studies of intelligence and as we shall see, intelligence is related to a basic factor called g, which is correlated with the ability to carry out a wide range of cognitive or thinking behaviors including adaptive reasoning.

Intelligence Tests

As described previously Francis Galton was one of the first scientists to show that continuous traits were genetically inherited. In 1869 he published a genealogical study entitled *Hereditary Genius.* [1] He selected a representative sample of prominent men in the arts, sciences, politics, military, literature, and other areas of intellectual achievement and inquired into the status of their relatives. Figure 1 shows an example, the Gregory family.

The index person was James Gregory, "inventor of the reflecting telescope; a man of very acute and penetrating genius. He was the most important member of a very important scientific family, partly eminent as mathematicians and largely so as physicians." A brief perusal of this pedigree shows it was rife with professors, physicians, and mathematicians. While Galton understood that these individuals benefited from superior environments, he attributed most of these familiar clusters of excellence to the inheritance of innate natural ability in the form of superior intelligence. In a search for more objective measures of this innate ability, Galton set up an Anthropometric Laboratory in the Science Museum in South Kensington. For a small fee, visitors were measured for a range of traits including reaction times, visual and auditory sensitivity. Data on over 9,000 subjects was accumulated, and in studying this material Galton made many advances in the statistical methods for analyzing continuous traits.

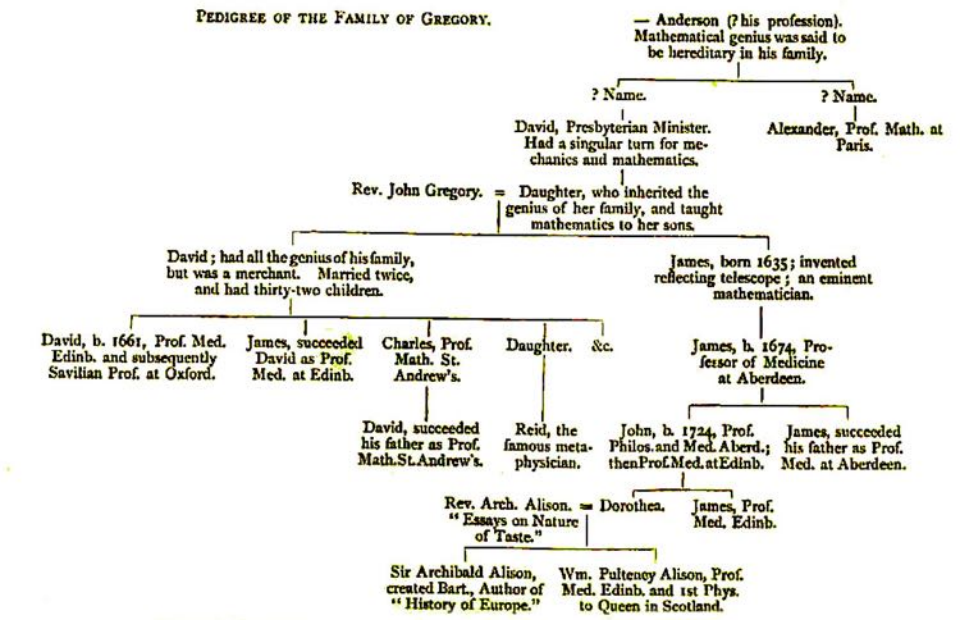

Figure 1. The Gregory Family from Francis Galton, Hereditary Genius, *1869.* [1]

One of Galton's students, James Cattell, became the first professor of psychology at the University of Pennsylvania. Like Galton, he believed that intelligence was related to reaction time. He and his students developed a range of "mental tests." [2] He became the first chairman of the American Psychological Association's Committee on Mental and Physical Tests. However, one of his own graduate students dealt a severe blow to the validity of these tests when he showed virtually no correlation between the test results and the academic performance of 300 college students. [3] Clearly a different approach to predicting academic and intellectual ability was needed.

The failure of the Cattell mental tests was due to their narrow scope, limited range of scores, and failure to measure higher mental skills. In 1895, two French psychologists, Alfred Binet and Victor Henri, published a study on individual psychological differences. They proposed that a wider variety of tests, including those that assessed higher mental functions such as imagination, comprehension, and complex memory tasks would more accurately predict academic achievement. This proved to be the case. In 1904 the French minister of public instruction asked Binet to develop a method of testing that would aid in the identification of children most likely to need assistance with special education classes. With his student, Theodore Simon, they developed what was called the *Binet-Simon Metrical Scale of Intelligence.* [4]

An important aspect of this scale was an age adjustment, which compared the performance of a given subject to others of the same age. The average score for a given age was set to 100. These came be to known as IQ tests (Intelligence Quotient). The IQ scale proved to be extremely useful in identifying mentally retarded children. Its results were consistent with independent measures, such as the evaluation of teachers

and peers and the ease of trainability. In 1911, Lewis Terman, a psychology professor from Stanford, published the *Stanford Revision of the Binet-Simon* scales. This test came to be known as the Stanford-Binet and was eventually standardized on a sample of 3,000 children and adults.

In 1939 David Wechsler published his own version of an intelligence test known as the *Wechsler Adult Intelligence Scale (WAIS).* The child version was called the *WISC-R (Wechsler Intelligence Scale for Children-Revised).* These tests are especially valuable because of the wide range of traits they test. They are well standardized for reliability, reproducibility and validity, and are machine-scored. These characteristics made them ideal for large-scale adoption and twin studies suitable for the examination of the role of genes in intelligence.

What is Intelligence?

Intelligence tests have often been criticized because of the lack of a clear theoretical construct of what intelligence is. Intelligence is generally felt to refer to an individual's innate cognitive ability. Since innate means inherited, this upsets some who questioned the role of genes as a factor in determining intelligence. Some have factitiously stated that "intelligence is whatever intelligence tests measure." [5] Snyderman and Rothman [4] surveyed 1,023 social scientists and educators skilled in the administration of IQ tests and asked them which of 13 different descriptors they thought were most closely related to intelligence. Over 95 percent agreed that abstract thinking or reasoning, problem solving ability, and the capacity to acquire knowledge were the most relevant aspects of intelligence. Thus, contrary to the criticism that test measurers don't know what they are testing, the survey showed virtually universal agreement that the key element of intelligence is the ability to learn and to use complex mental tasks such as abstract reasoning and problem solving. By contrast, motivational and sensory abilities were not considered to be a part of innate intelligence. The Wechsler Intelligence Scales consist of six subscales to measure verbal IQ (general information, problem comprehension, arithmetic, digit span, vocabulary, and similarities) and five subscales to measure performance IQ (picture completion and arrangement, block design, object assembly and digit symbol).

An English psychologist, Charles Spearman, noted that virtually all tests of intelligence and mental ability were strongly correlated with each other. Using a statistical test he invented, called *factor analysis,* Spearman concluded that the ability to perform these tests was related to a common factor *g,* for general intelligence. [6] Further studies suggest that *g* represents a common ability underlying achievement in a wide range of cognitive skills that relate to the mental manipulation of images, symbols, words, numbers or concepts. By contrast, skills that merely call for the reproduction of highly practiced or rotely learned skills are poor measures of *g.* There was agreement among the social scientists and educators that whatever the IQ test measures, it is an important determinant of success in society.

The Genetics of Intelligence

There have been more twin studies of intelligence than any other human trait.

Bouchard and McGue[7] reviewed the world literature as of 1981. They identified 111 studies yielding 526 familial correlations based upon 113,942 twin pairings. Figure 2 presents some of the more important aspects of these results in the form of correlation coefficients between identical twins reared together, fraternal twins reared together, and siblings reared together. Correlation coefficients refer to a statistical measure that ranges from 0 for no correlation to 1.0 for a perfect correlation.

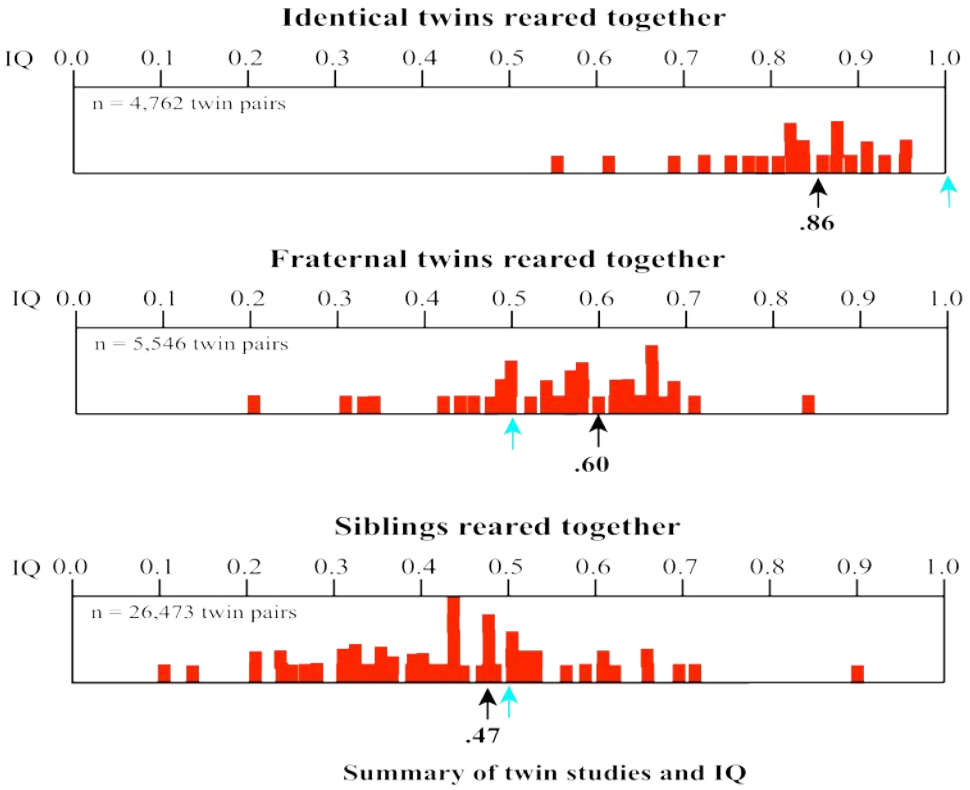

Figure 2. Diagrams of a subset of the results of twin studies of IQ reviewed by Bouchard and McGue, Science. *212:1055-1059, 1981.*[7]

The blue arrows represent the correlations expected based on a simple polygenic model with no environmental or other non-gene effects. This is 1.0 for identical twins since they share 100 percent of their genes. It is 0.5 for both fraternal twins and siblings reared together since individuals in both of these groups share 50 percent of their genes in common. Correlations alone do not determine whether intelligence is due to environmental or genetic factors. For example, a disorder caused by a purely environmental factor such as a virus, could result in a correleation coefficient of 1.0. It is the relative correlation for identical twins versus fraternal twins that determines the role of genetic factors. The closer the observed results for the fraternal twins and siblings reared together come to being one half of the correlation for the identical twins, the greater the genetic component. In these studies the means are corrected for

the number of pairings in different studies. Thus a study of 2,000 pairs is weighted higher than a study of 200 pairs. The weighted average correlation of IQ for the identical twins was .86. There were a small number (60) of identical twins reared apart. For them, the weighted average correlation was .76. The weighted average for the fraternal twins was .60 while the weighted average for siblings reared together was .47. When these two groups are combined, the mean weighted correlation is very close to the value of .50 expected for a polygenetic genetic model with little environmental effect.

Despite this strong evidence for the role of genes, several aspects of these results indicate that environmental factors also play a role. These are: A) the correlation coefficient for the identical twins was .86, not 1.0; B) the correlation coefficient for the identical twins reared apart was lower than for those reared together; C) the correlation for fraternal twins reared together was higher than for siblings reared together; and D) the correlation for a small number of siblings reared apart was .20, lower than for siblings reared together.

The total variance in these studies is the sum of genetic factors or heritability (G), environmental factors (E) and a gene-environment interaction factor, G-E. Several estimates of these values have been reported. On average G = .60, E = .22, and G-E = .18,[4] indicating that approximately 60 percent of intelligence is genetically determined, 22 percent is environmentally determined and 18 percent is the result of an interaction between genes and the environment.

A recent collaborative study of the genetics of cognition by scientists in three different countries, the Netherlands, Australia and Japan, involved 378 identical twins and 540 fraternal twins. The heritabilities for IQ were 87, 83, and 71 percent respectively.[8] These figures represent some of the highest genetic loading of any human trait other than single gene disorders. This is consistent with a very high degree of natural selection for intelligence. These scientists also examined the heritability of some of the basic neurological processes believed to contribute to intelligence such as reaction time, working memory[9] and spatial memory. Interestingly, the heritabilities of these were considerably lower, in the 33 to 64 percent range. However, in a study of twins 80 or more years of age,[10] the heritability of IQ was 62 percent, similar to that in the prior summary. Here the contributing basic neurological processes showed similar heritabilities of 62 percent for processing speed, 55 percent for verbal ability, and 52 percent for working memory.

Adoption studies support the results of twin studies by also indicating a significant role of genes in intelligence.[4] Some have resisted a role of genes in IQ because it implies that improvement of the environment will not increase a child's IQ. However, several studies have shown that when a child is removed from a neglectful and intellectually impoverished environment and placed into an intellectually enriched environment the children's IQs were significantly higher than for those left in a impoverished environment.[4] Thus, despite a major role for genetic factors, there is still room for improvement in IQ due to an improved environment.

Importance of IQ to Success in Society

As noted above, all of the social scientists and educators agreed that IQ was a potent predictor of success in life. Specifically significant correlations have been reported between a higher IQ and:

- a decrease in number of children
- a later age of having their first child
- a later age of first intercourse
- less poverty
- less teenage delinquency
- less tobacco smoking
- better grades
- greater college attendance
- less antisocial and criminal behavior
- fewer behavioral problems in children
- fewer problems with motor and social development
- fewer illegitimate births
- less use of welfare
- a higher socioeconomic status
- a higher income
- less drug abuse
- less alcohol use
- more years of education
- better home environments
- far less time in prison

These associations are documented elsewhere.[11,12] Some of the controversial aspects of IQ testing were not covered here since they were not relevant to the issues of this book. The interested reader is referred elsewhere.[4] It is clear that *g*, the biological factor correlated with all intelligence tests and involved in mental manipulation of images, symbols, words, numbers or concepts, plays a fundamental role in all major aspects of success in human social interactions. This suggests the presence of many different reasons for the involvement of a high level of natural selection for this important trait.

Intelligence is a measure of innate cognitive or thinking ability. The results of a wide range of tests of higher order thinking processes are strongly correlated suggesting an underlying factor, *g*, that is related to the mental manipulation of images, symbols, words and numbers. Twin studies indicate that approximately 60 percent of *g* is due to genes alone, 22 percent to the environment, and 18 percent to a gene-environment interaction. Some studies show a genetic component to IQ as high as 87 percent. IQ is positively correlated with virtually every prosocial aspect of civilized man.

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The predisposition to religious belief is the most complex and powerful force in the human mind and in all possibility an integral part of human nature.

E. O. Wilson
On Human Nature [1]

Chapter 40

The Genetics of Spirituality

Until very recently the field of psychology paid little attention to the possibility that genes might play a role in traits such as spirituality and religious beliefs. [2] Psychologists had simply assumed that religious attitudes and beliefs were largely shaped by the attitudes and beliefs of parents and peers.

Before entering into the subject of the genetics of spirituality, it is necessary to introduce several terms. As shown in the chapter on the genetics of antisocial behavior, twin and adoption studies are valuable methods for determining the relative role of genes versus the environment in human behavior. The three major types of variation in human behavior are: *psychiatric disorders* such as major depression, manic depressive disorder, and conduct disorder; *personality traits* such as extraversion and neuroticism; and *cultural attitudes* such as sexual, political, and religious beliefs.

Twin studies have defined the relative role of genes versus the environment and have also divided the environmental factors into two types: *shared environment* versus *unique environment.* The shared environment includes such influences as general parenting, and the economic status, political orientation, and religious upbringing of the parents and peers. Both twins would be exposed to attendance at the same church, mosque or synagogue and be exposed to the same religious and political views. These are all part of a shared environment. By contrast, many times twins are placed in separate classes, have separate teachers and friends and attend different summer camps and colleges. These represent a *unique environment.*

A final term used in twin studies is *variance.* For any continuous trait such as height, weight, or score on a given questionnaire, there will be a great deal of variation from individual to individual. This variation is called the variance. Different influences such as genes or environmental factors influence this variation. The proportion of the variance attributed to a specific factor is referred to as the percentage of the variance. Thus, for a single gene disease such as Huntington's Disease, the gene accounts for 100 percent of the variance of Huntington's Disease. In the case of the flu mentioned below, the influenza virus accounts for 100 percent of the variance of the flu.

One of the major tenets of psychology from the time of Freud was that the early

shared environment was critical to later psychological development. However, twin studies of psychiatric disorders, such as conduct disorder, clearly showed that the percent of the variance contributed by the shared environment was virtually zero. Forty to 90 percent of the variance was due to genes, with the remainder being due to the unique environment. This was hard for psychologists to accept, but this could be understood if we assumed that these more severe conditions were due to a disorder of brain chemistry rather than how individuals were raised.

When twin studies of personality traits were carried out[3] the results were the same. These results really upset many psychologists and led behavioral geneticist David Rowe to state:[4]

> Given the environmental emphasis in behavior science theories, the idea that the shared environment fails to impact on personality development is radical; but it is, nevertheless, supported by an extensive literature of twin and adoption data.

Thus, twin studies of both psychiatric disorders and personality traits have shown that the shared environment plays a relatively minor role. The belief that this would not be the case for cultural attitudes was so strong that psychologists often spoke of the cultural "inheritance" of religious values without even mentioning genes.[5]

Twin Studies of Religious Belief

The view of cultural inheritance has now also changed as a result of recent twin studies which have shown that *genetic factors play as much of a role in cultural attitudes as they do in personality traits and psychiatric disorders, and that the shared environment is much less important.*

One of the first studies was reported in 1986 by Martin and colleagues.[6] They examined a sample of 825 adult twin pairs from Australia and England and reported that genetic factors accounted for 22 to 35 percent of the variance of a range of religious attitudes, including those about Bible truth, divine law, Sabbath observance, and church authority. They found little evidence for "vertical cultural inheritance." In 1990, based on the Minnesota Twin Study of twins reared together and apart, Waller and colleagues[7] reported that genes accounted for 41 to 47 percent of the variance of a range of religious variables. Again there was little or no involvement of the shared environment.

Lindon Eaves at the Virginia Commonwealth University in Richmond, Virginia, has written extensively about the genetics of religion and spirituality. This interest is derived from the fact that he was both a behavioral geneticist and an Anglican priest. Preliminary studies showed that a very large study with a broad range of different relationships would be necessary to accurately determine the role of genetic factors and shared and non-shared environment. This led to the development of a study consisting of 14,761 twins and their relatives, producing a total of 29,691 subjects. It was appropriately named the *Virginia 30,000.*[8,9] When gender was included, this study produced 80 different types of family relationships.

All the subjects completed a modified *Eysenck Personality Questionnaire* and a *Health and Lifestyles Questionnaire.* The Eysenck Questionnaire produced three major personality traits—psychoticism (pessimistic, impulsive, low self-esteem),[10] extraversion (extraverted and outgoing versus introverted and shy), and neuroticism (nervous, anxious, phobic, and panic attacks). There was also a lie scale to detect individuals who attempted to fake "looking good." The Health and Lifestyles Questionnaire produced cultural attitude scales about sex, economics, the military, politics and religious fundamentalism. Figure 1 shows the average correlation (R) between the identical versus the fraternal twins for each of these traits. [Recall that if there is no similarity or correlation, R = 0.00, while if the scores are identical with a perfect correlation, R = 1.00]

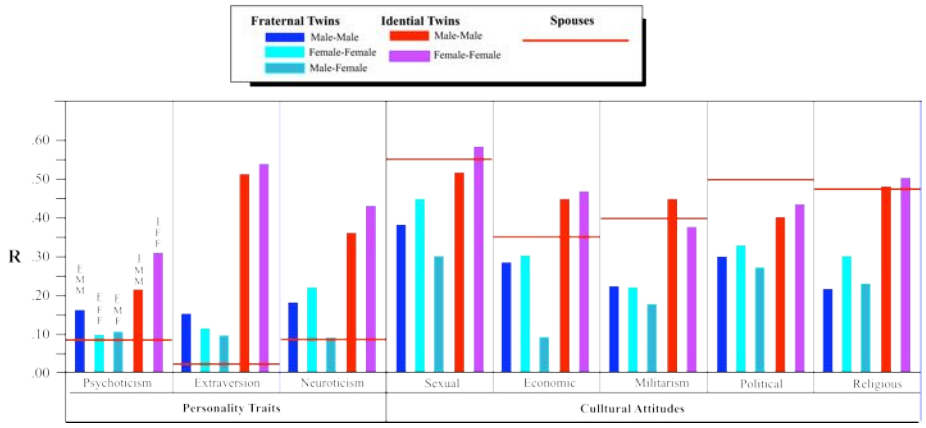

Figure 1. Correlations (R) between fraternal and identical twins for three personality variables and five cultural variables. The shades of blue bars show correlations between fraternal (F) male twins (F MM), female twins (F FF) and male-female twins (F MF). The identical twins (I) are shown in shades of red bars for males (I MM) and females (I FF). The correlations between scores for spouses are shown by the red lines. Based on data from Eaves et al. Twin Research. *2:62-80, 1999.*[8]

Heritability refers to the proportion of the total variance attributable to genetic factors. It is *approximately equivalent to twice the difference between the correlation for identical versus fraternal twins.* Simple inspection of Figure 1 shows that the correlations were higher for identical twins than for fraternal twins for both the personality traits and the cultural attitudes. This indicates a significant role of genes in these variables.

The horizontal red lines show the correlations between spouses. These correlations are minimal for personality traits but quite high for cultural variables. This is understandable based on the fact that people are much more likely to marry partners with similar cultural values than with similar personality traits. This is intuitively clear for anyone who has ever been involved in computer dating. The computer profiles provide information on religious and political affiliation, type of job, income, politics and sexual attitudes, but little on personality traits—a reflection

of what people judge to be important in the selection of a spouse. Figure 2 shows the estimates for the genetic contribution or heritability for males and females.

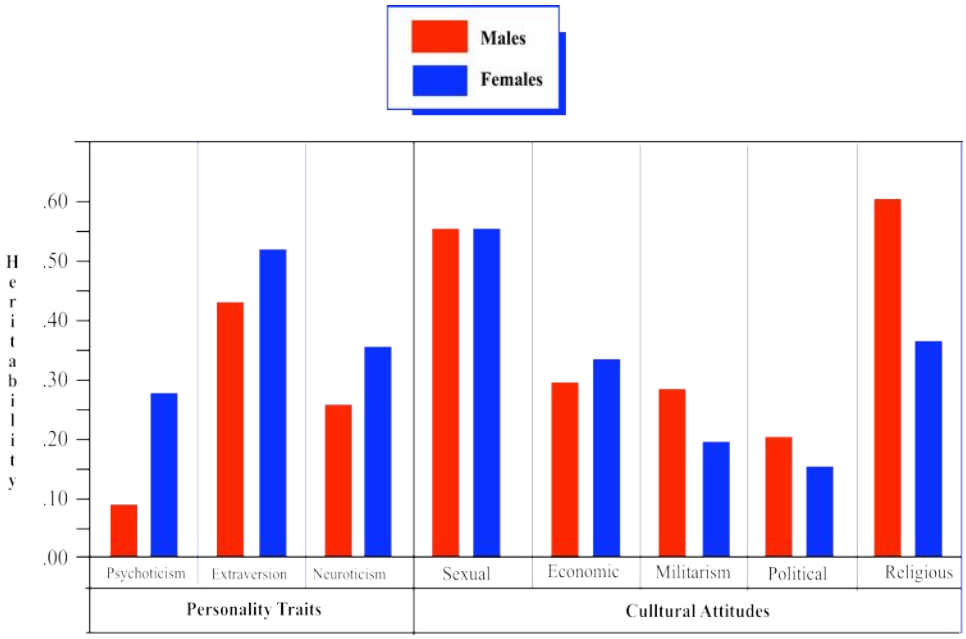

Figure 2. Heritability estimates for personality traits and cultural attitudes. Based on data from Eaves et al. Twin Research. *2:62-80, 1999.* [8]

Genetic factors are most important for extraversion with heritability estimates of 42.8 percent for males and 50.4 percent for females. Several of the cultural attitude variables have remarkably high heritability estimates such as 46 percent for sexual attitudes for both males and females. The highest heritability was 64.5 percent for religion in males. It was 37 percent for females. For religious attitudes the common environment contributed to 32 percent of the variance in females but 0 percent of the variance for males. Eaves and colleagues concluded,

> The total contribution of genetic factors to differences in personality and social attitudes is significant and pervasive.

They further stated,

> The significant contribution of genetic factors to social attitudes means that virtually no measurable aspect of human behavioral variation is… far removed from the impact of events at the genetic level.

To explain this counterintuitive level of genetic involvement in cultural attitudes, the authors proposed,

> Small initial genetic differences in behavior and preference are augmented over time by the incorporation into the phenotype of environmental information, correlated with the phenotype.

They were referring to the observation by Thomas Bouchard that *genes play a role in the selection of the environment.*[11] For example, an adolescent with a genetic predisposition to conduct disorder is likely to join a gang and as a result eventually become associated with an antisocial environment as a young adult. By contrast an adolescent with a high IQ and propensity to enjoy studying is likely to go to college and become associated with a much more law-abiding environment as an adult. While the eventual involvement in antisocial behavior for each of these two people would seem to be predominately due to environmental factors, genetic factors clearly played a critical and fundamental role. This is also related to what Richard Dawkins[12] referred to as the "extended genetic phenotype" and to Bouchard's[11] view of

> …humans as dynamic creative organisms for whom the opportunity to learn and to experience new environments amplifies the effects of the genotype on the phenotype.

> **Genetic factors can make a significant contribution to cultural attitudes. This contribution is greater for religious attitudes than for economic, military, or political attitudes. The significant genetic contribution to both personality traits and cultural attitudes indicates that most aspects of human behavior are strongly influenced by our genes.**

Studies of Kenneth Kendler and associates[13] indicate that the role of genes in religious attitudes can vary depending upon the nature of how those attitudes are assessed. They examined data on 1,902 twins also from the Virginia Twin Registry. Religious behavior was assessed by three scales: *personal devotion, personal conservatism,* and *institutional conservatism.*

Personal devotion was assessed by questions such as "How important are your religious beliefs in your daily life?", "When you have problems or difficulties in your family, work, or personal life, how often do you seek spiritual comfort?", and "Other than at mealtime, how often do you pray to God privately?"

Personal conservatism was assessed by questions such as, "Do you believe that God or a universal spirit observes your actions and rewards or punishes you for them?" and "Do you agree with the following statement: The Bible is the actual word of God and is to be taken literally, word for word?"

Institutional conservatism was assessed on the basis of their religious affiliation with the following being in order of decreasing conservatism: Fundamentalist Protestant (Church of God, Pentecostal Assembly of God, Jehovah's Witnesses), Baptist, Catholic, mainline Protestant, and other or unaffiliated. Figure 3 shows the results.

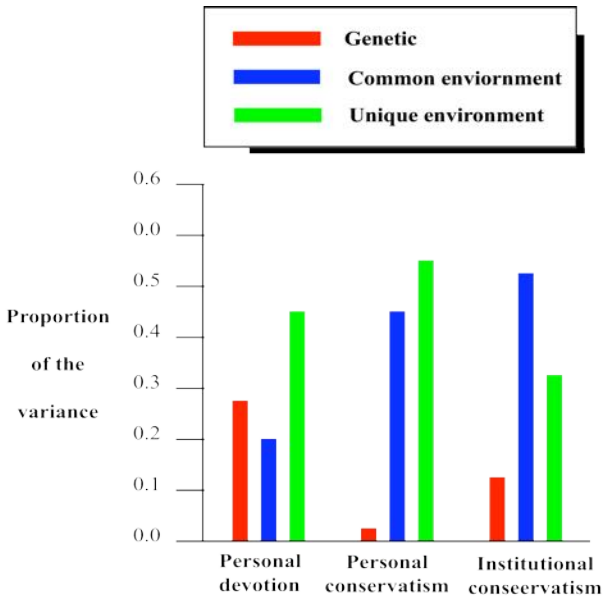

Figure 3. Role of genetic and environmental factors in three measures of religious belief. Based on data from Kendler et al. Am J Psychiatry. *154:322-329, 1997.*

There was a considerable genetic component to *personal devotion,* but only a modest genetic component to *institutional conservatism,* and no genetic component to *personal conservatism.* The latter was entirely due to environmental influences that were about equally divided between a common and unique environment. Institutional conservatism was almost entirely due to environmental factors, especially common environment. As described later, this study also examined the effect of these religious values on alcohol and tobacco use.

When religious behavior is assessed on the basis of factors that relate to religious affiliation, environmental factors play the major role.

Twins reared apart. Thomas Bouchard and colleagues[2] reported a smaller but important study of religious values. This study was important because it used the *Minnesota Study of Twins Reared Apart.* Such studies are rare since only a small proportion of twins are reared apart. They are valuable because this removes the possibility that identical twins behave the same because they are emotionally closer than fraternal twins, rather than because they share more genes in common. The authors examined genetic and environmental influences on *intrinsic religiousness* and *extrinsic religiousness.*[14,15] The *extrinsically* motivated people used their religion largely for social reasons associated with attending church, while the *intrinsically* motivated people geuninely lived their religion. There was little correlation between the two scales, indicating they tap independent dimensions. Subjects were also administered the *Multidimensional Personality Questionnaire (MPQ).* Of 14 different personality scales, the intrinsically religious scale was significantly and positively associated only with traditionalism and constraint and inversely associated with aggression. The heritability of the intrinsic religiousness scale was 43 percent; of the extrinsic religiousness scale, heritability was 39 percent, indicating that almost half of the variance of both of these variables was due to genetic factors.

Twin Studies of Spirituality

Self-transcendence refers to the capacity to reach out and find meaning in life in

dimensions beyond oneself. In 1993 Dr. Robert Cloninger at Washington University in St. Louis developed a personality inventory that included four scales for temperaments and three for character. This was called the *Temperament and Character Inventory (TCI).*[16,17] One of the character dimensions was self-transcendence — a measure of spirituality. This represented the first time that a questionnaire to assess personality traits had included a scale for spirituality.

Self-transcendence consisted of three subscales: *self-forgetfulness, transpersonal identification,* and *spiritual acceptance.* The questions relating to *self-forgetfulness* included losing oneself in thought, time or space. During such states individuals may experience flashes of insight or understanding. Creativity and originality may be enhanced in this state. The questions relating to *transpersonal identification* covered issues of feeling connected to others, to nature, to the universe, and a willingness to sacrifice oneself for the good of other people to make the world a better place. Ardent environmentalists would be likely to score high on this scale.

The questions indicating a capacity for *spiritual acceptance* included believing in miracles, believing that many things cannot be scientifically explained, having a spiritual connection to others, having meaningful religious experiences, having one's life directed by a spiritual force greater than any human being, and feeling in contact with a divine and wonderful spiritual power. The other end of this scale would include people who don't believe in things that cannot be explained scientifically. Based on these questions it can be seen that the subscore for spiritual acceptance is clearly the most relevant for estimating the degree to which an individual may become involved in religious experiences and spirituality. Twin studies using the TCI provide us with information of the role of genes in spirituality. There have been several such studies.

Kirk and colleagues[18] examined the self-transcendence scale as a measure of spirituality in 1,279 Australian twins 50 years of age or older. An age of 50 or more was important since the role of family environment diminishes after individuals leave home.[19] The self-transcendence scores varied significantly by gender and across different religious affiliations. The scores were higher for females and individuals identifying themselves as evangelical and fundamentalist. They were intermediate for other religious groups and lowest for those with no religious affiliation. There were small but significant correlations with optimism, extraversion, and good general health, and for fatigue, anxiety, and depression. The results for the involvement of genetic factors, and common and unique environments for self-transcendence in male and female twins are shown in Figure 4.

In both males and females, about half of spiritual self-transcendence was the result of genetic factors and half was the result of the unique environment, with no contribution from the common environment. This was an astonishing result. It showed that spirituality was unrelated to the common environment, including religious upbringing. *This clearly indicates that spirituality is an intrinsic biological trait and is not transmitted by culture.* Most personality traits tend to share this remarkable characteristic. When all factors were considered together using a statistical tool called

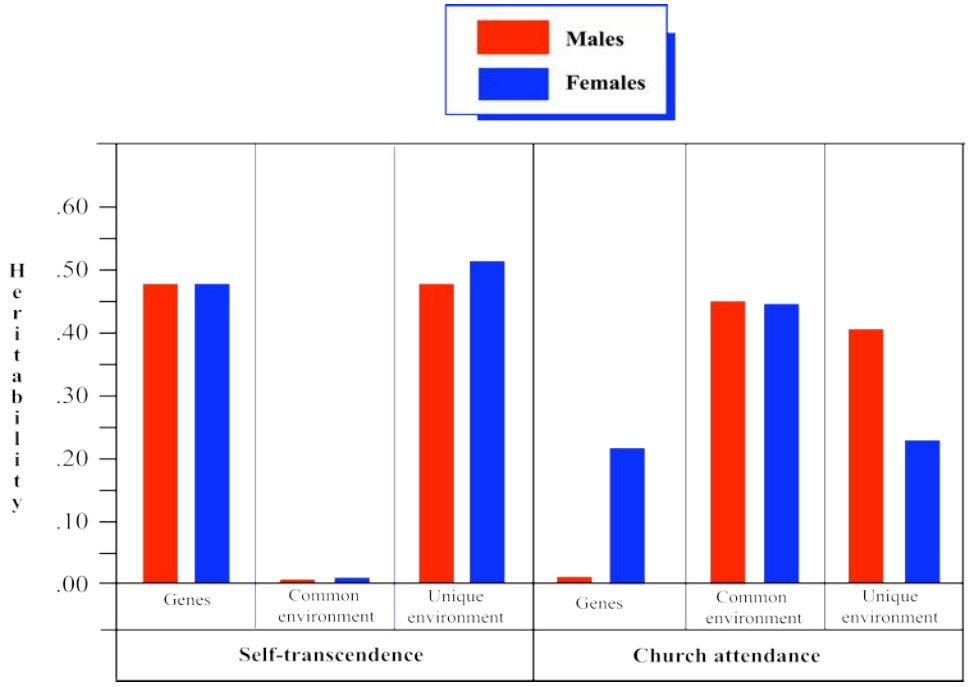

Figure 4. Estimates of the role of genes, common and unique environment for self-transcendence in 50+-year-old Australian twins. Based on data from Kirk et al. Twin Research. *2:81-87, 1999.* [18]

multivariate analysis, the genetic contribution to self-transcendence averaged 40 percent for both sexes. These results were unchanged when the study size had increased to 2,517 twins. [20]

Ando and colleagues [21,22] reported twin studies for 617 pairs of adolescent and young adult twins in Japan. They examined the TCI traits and their subscales. The contribution of genes to the variance of all scales and subscales ranged from 22 to 49 percent. Specifically, genes contributed to 41 percent of the variance of self-transcendence and 39 percent of the variance of spiritual acceptance. Unique environmental factors contributed the rest. As with the Australian twins, *the shared environment, including religious upbringing, contributed nothing.* The high contribution of genes to spirituality and lack of contribution of the family environment is counterintuitive and minimizes a role of cultural perspectives or social learning in spirituality.

Twin studies indicate that spirituality is an intrinsic biological trait strongly controlled by genes and unique environment and is not determined by cultural influences such as religious education. *Spirituality comes from within.*

Twin Studies of *Spiritual but not Religious*

Many individuals describe themselves as *spiritual but not religious.* This raises the

question of whether genetic factors play a greater role in individuals who are *spiritual and religious* or those who are *spiritual but not religious?* Dr. Ming Tsuang and colleagues from Harvard Medical School used the Vietnam Era Twin Registry to examine the role of genetic and environmental factors for these traits. [23] To do this they used a *Spiritual Well-Being Scale.* [24] This consisted of 10 questions for a "vertical dimension" that related to one's sense of well-being in relationship with God *(spiritual and religious).* An additional 10 questions related to a "horizontal dimension" for an existential sense of well-being related to perception of purpose and satisfaction in life, apart from any religious reference *(spiritual but not religious).* Genetic factors accounted for 37 percent of the spiritual and religious scale and 36 percent of the *spiritual but not religious* scale. Most of the rest was due to the non-shared environment. Thus, *genetic factors were just as important for the spiritual but not religious as the spiritual and religious scales.*

Tsuang et al. also computed an *Index of Spiritual Involvement* based on a subset of the questions from *Kass's Index of Core Spiritual Experiences.* [25] The questions sought to measure the strength of a person's religious or spiritual orientation and the time spent on religious or spiritual practices. Other assessments included the *Multidimensional Personality Questionnaire* and an assessment of any psychiatric disorders. Genetic factors accounted for 23 percent of the variance of the *Index of Spiritual Involvement.* The common environment explained 32 percent and the unique environment explained 23 percent, indicating that cultural and religious upbringing did play a role in this scale.

An additional informative aspect of this study was the correlation between the *spiritual and religious* and the *spiritual but not religious* scales and the different personality traits. The interesting result was that the religious well-being, *spiritual and religious* scale was significantly correlated only with the personality traits of traditionalism and constraint, perhaps best described as a conservative and rigid approach to life. This agreed with the results by Eaves and colleagues [8] described above.

In contrast, the *spiritual but not religious,* existential well-being scale, based on meaningful but non-religious aspects of life, was positively associated with many advantageous personality traits such as general sense of well-being, social closeness and communion as well as constraint. It was negatively correlated with disadvantageous personality traits such as a poor reaction to stress, alienation, aggression, and negative emotion, and all the negative summary traits of odd/eccentric, dramatic/erratic, and anxious/fearful. A negative correlation means that the higher the score on a well-being scale, the lower the score on the personality trait.

The results for the psychiatric disorders showed the same trend. There was a significant *negative* correlation between the *spiritual but not religious* scale and chronic depression, but not for the religious well-being scale. High scores on both of the types of scales seemed to protect against alcohol or nicotine dependence.

These results suggest that *individuals can attain a significant sense of well-being, satisfaction with life, and a sense of purpose without turning to organized religion,* and conversely, *turning to religion does not necessarily bring the same level of positive and*

purposeful outlook on life and satisfaction as a non-religious, existential outlook. This "horizontal" dimension of *spiritual but not religious* is a measure of spirituality in relation to "a life purpose, satisfaction with life, and positive life experiences." [26]

A scale consistent with being *spiritual but not religious* was associated with positive personality traits. A scale consistent with being *spiritual and religious* was only associated with personality traits suggesting a conservative and more rigid approach to life. High scores on both traits were protective against substance abuse.

These results suggest that being *spiritual but not religious* is associated with better mental health than being *spiritual and religious.*

Church Attendance

In contrast to measures of intrinsic spirituality, church attendance taps the dimension of participation in active organized religion. Many psychologists felt that certainly this trait would be influenced by the shared environment, and this proved to be the case. Studies of genetic factors in church attendance have been carried out in both the United States and Australia. In 1999 Kirk and colleagues compared the accumulated results for these two countries. [27] In the United States this involved the Virginia 30,000 study, while in Australia it involved the Australia Twin Registry.

Church attendance was more common in the United States than in Australia. For example, an average of 20 percent of subjects in the United States stated they rarely attended church while an average of 50 percent of subjects in Australia rarely attended church. In both countries attendance was greater for women than men and greater for individuals 50 years of age or greater than for younger subjects. Figure 5 compares the results for the analysis of the relative importance of genetic versus environmental factors for both countries.

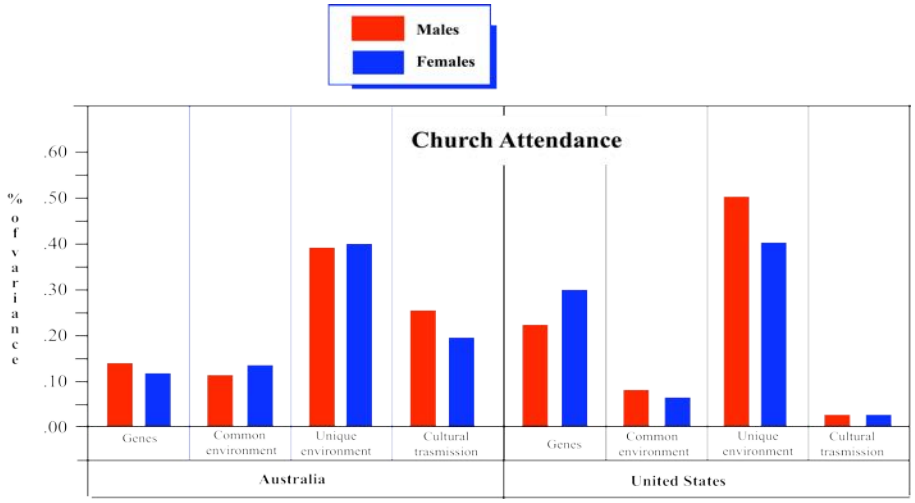

Figure 5. Twin studies of church attendance in Australia and the United States. From Kirk et al.: Twin Research. *2:99-107, 1999.* [27]

Somewhat surprisingly, the unique environment still played the greatest role in both countries. Cultural transmission, measured as parent-to-offspring environmental transmission, was more important in the Australian sample, while genetic factors were more important in the United States sample. Both genes and the environment play a significant role in church attendance in both the United States and Australia. Common environment and cultural factors are far more important than they are for spirituality. Spirituality and religiousness are separate entities and involve separate sets of genes. Spirituality comes from the inside. Religiousness comes from the outside as learned from parents, teachers, friends and church leaders.

The Role of Specific Genes

While twin and adoption studies provide evidence that genetic factors are involved in a given trait or disorder, they do not show which genes are involved. As described in Chapter 36, genetic studies using association techniques are required to identify the role of specific genes. My laboratory was the first to identify the role of a specific gene in spirituality. [28] The gene was the dopamine D_4 receptor gene *(DRD4).* We did not initially set out to examine the genetics of spirituality. We were instead interested in determining if we could confirm studies of others that the *DRD4* gene played a role in *novelty seeking,* one of the personality traits in Cloninger's TCI questionnaire.

We tested this using a sample of university students and individuals with a history of substance abuse. Before doing the study, we reasoned that if we did not find an association between the *DRD4* gene and novelty seeking, perhaps this gene might instead be associated with one of the other of the seven dimensions in the TCI. To avoid the loss of statistical power that is associated with looking at seven different variables rather than just one, we used a statistical technique called *multivariate analysis of covariance* (MANOVA). This in essence looked at all seven traits simultaneously. This study failed to replicate the association of the *DRD4* gene with novelty seeking but did show a strong association with self-transcendence. [28] We then examined the three self-transcendence subscores of self-forgetful, transpersonal, and spiritual acceptance. There was a borderline association with the self-forgetful subscore but a strong association with spiritual-acceptance where it accounted for 6.7 percent of the variance ($p < .001$). Compared with most studies of single genes in complex, polygenic traits, this was a high value.

Dean Hamer, working at the National Institutes of Health was one of the scientists who first reported an association between the *DRD4* gene and novelty seeking. [29] He became interested in our results with the *DRD4* gene and spirituality and attempted to replicate them in a larger study of males and females from the general population. Instead of an association with the *DRD4* gene, he found an association with another dopamine gene, the *dopamine vesicular transporter gene —VMAT2.* Before dopamine is released from nerve terminals it is stored in small membrane-lined sacs called *vesicles.* Nothing gets through a membrane without interacting with a transporter protein specifically designed to transport it through the

fatty layers. *VMAT2* is the gene for one of the two dopamine vesicular transporter proteins. Genetic heterogeneity, where different sets of genes account for the same trait in different populations of individuals, is the most likely reason for the difference between Hamer's studies and our studies.

Hamer was sufficiently impressed with his findings that he wrote a book entitled *The God Gene*[30] about the role of the *VMAT2* gene in spirituality. Since this is a polygenic trait, the book title is a stretch, since this gene accounted for only one percent of the total variance of the self-transcendence trait. He did note that the *VMAT2* gene was just one of a number of genes likely to be involved in spirituality. Hamer suggested that the involvement of dopamine genes in spirituality may be related to the fact that dopamine plays a major role in the pleasure brain, and that spiritual feelings are pleasurable. This could provide a mechanism for a significant degree of natural selection for individuals with well functioning spiritual pathways.

The fact that two different dopamine genes, *DRD4* and *VMAT2,* have now been reported to be associated with spirituality, and the fact that dopamine is the "feel good" neurotransmitter, may account for the powerful role that spirituality plays in the human condition and why the majority of people in the world derive great comfort from a belief in a God. It would also offer a partial explanation for the fact that individuals scoring high on self-transcendence are less likely to abuse alcohol. This may be because individuals whose reward pathways are activated by spirituality would have less need to artificially activate their reward pathways with alcohol or drugs.

In addition to dopamine, serotonin is another neurotransmitter that plays a major role in mood. Borg and coworkers from the Karolinska Institute in Sweden,[31] utilized PET scanning and a radioactive compound that specifically bound to serotonin 1A receptors in the brain. They found that that the binding of this compound was lowest in those with the highest scores for self-transcendence, suggesting that *such individuals had higher levels of brain serotonin.* No correlations were found for the other six dimensions of the TCI. This study implicated a role of serotonin in spiritual experiences and prompted an association study of the serotonin 1A receptor gene *(HTR1A)* for TCI variables.[32] This showed that the *HTR1A* gene was significantly associated with the self-transcendence scale and with the subscore of spiritual acceptance. This is consistent with the powerful effect of serotonin modifying psychedelic drugs that produce spiritual experiences.

Three different genes have been shown to be associated with self-transcendence and spiritual acceptance. Two are dopamine genes, suggesting a link between spiritual feelings and the pleasure pathways of the brain. Serotonin also plays a role in happiness and mood, and the other gene was a serotonin receptor gene. PET studies have shown a link between high spiritually scores and high brain serotonin levels. Since spirituality is a polygenic trait, it is likely that many other genes will eventually be shown to be associated with spirituality.

Dopamine and serotonin are the "feel good" neurotransmitters.

The association of two dopamine genes and a serotonin gene with the spirituality scores could explain the powerful effect that spirituality and religion have on the human condition.

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Part VI

Natural Selection of Reason and Spirituality

Parts IV and V showed that rational thought and spiritual experiences occur in different parts of the brain and that of these structures each is supported by a distinct set of genes. All living or fossil organisms that possess a specific structure with a specific function and a specific set of genes did not attain these things by chance. They evolved. Evolution is the result of the natural selection of a respective set of genes because those genes bring an advantage to the organism. The demonstration of a given structure, its function and the role of genetic factors is the easy part. It is easy because we can directly observe these things in living organisms. Understanding the selective forces involved is not so simple because that occurred in the past, a past that predates written historical records. We can look at fossils and at anthropological sites and try to get them to speak to us, but that speech is indirect and intuitive. Different people may hear different things. There is no absolute gold standard to prove which theory is right and which is wrong. However, there is general agreement about many aspects of this story. With these caveats in mind, the following chapters present some aspects of the evolution of intelligence and spirituality.

Intelligence is what you use when you don't know what to do.

Piaget [1]

Chapter 41

The Evolution of Intelligence

The chapter on the genetics of intelligence presented a long list of traits and skills that were associated with a high IQ. While one could argue that the correlation with a decreased birth rate would eventually produce a race of stupid humans and a strong selection against a progressive increase in intelligence, Flynn [2,3] has shown that in the past century there has been a progressive and "massive" gain in IQ in the general population. While the reasons for this are complex they include a general improvement in test-taking skills associated with improved education and different selective factors.

The many other correlations with advantageous traits might seem to make the question, "What skills were involved in the selective process in the evolution of high intelligence?," a no-brainer. Virtually any of the long list of traits and skills associated with IQ, that were also desirable in the selection of a mate, would have a selective advantage and play a role in the evolution of IQ. However, rather than simply concluding the chapter with this statement, there are a number of interesting questions that need to be addressed: "What parts of the brain have shown the greatest evolutionary increase in size?" "What cognitive skills are unique to humans?" "What role did the multiple ice ages play in the evolution of intelligence?" "What is the time scale for the acquisition of various cultural skills associated with modern man?" and, "What is the role of social skills in the evolution of intelligence?"

What Parts of the Human Brain Have Shown the Greatest Evolutionary Increase in Size?

As described in previous chapters, the frontal lobes and especially the prefrontal lobes, are the site of creative thinking, planning of future actions, decision-making, artistic expression, working memory, abstract reasoning, spatial orientation, and other aspects of behavior critical to the development of modern civilized man. It is a widely accepted truism that the major critical feature of the evolution of humans is that the frontal lobes were proportionately larger in size than man's nearest relatives, the chimpanzee and other great apes. But is this truism true? This conclusion was based on the examination of fixed brains of humans and other primates, but fixed tissues are susceptible to shrinkage artifacts. Using 3-dimensional MRI images of living subjects eliminated these artifacts. When this was done [4] the relative size of the frontal lobes was the same for humans, chimpanzees, and orangutans (Figure 1).

When the relative areas of different sections of the frontal lobes and the relative

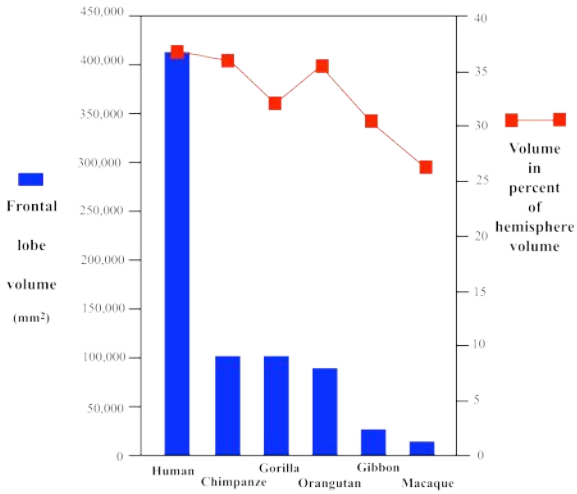

Figure 1. Absolute and relative volumes of the frontal lobes across primate species. From Semendeferi et al.: Journal of Human Evolution. *32:375-388, 1997.* [4]

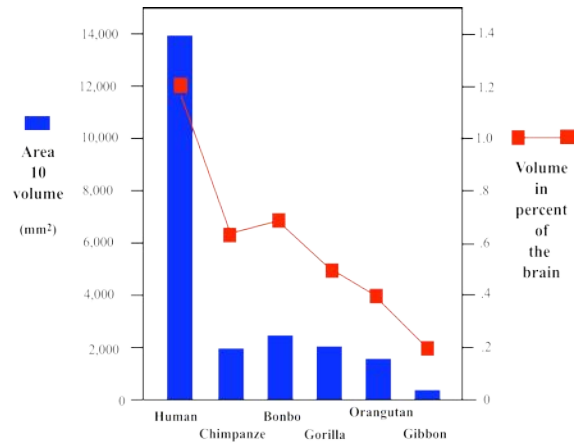

Figure 2. Absolute and relative volumes of area 10 of the prefrontal lobes across primate species. From Semendeferi et al.: American Journal of Physical Anthropology. *114:224-241, 2001.* [6]

amounts of grey versus white matter were examined the results were the same. The authors concluded: "The human frontal lobes are not larger than would be expected from a primate of our size." These results confirm what Bonin [5] stated in 1948, "Man has precisely the frontal lobes which he deserves." The assumption that a relatively greater size of the frontal lobes in humans would explain their greater intellectual capacity had to be abandoned. This similarity in the rate of evolution of the frontal lobes is not surprising given the great similarity between the human and chimpanzee genomes.

But what about the size of the prefrontal lobes or their subparts? In a subsequent study the Semenderferi group examined this question. [6] Specifically, they found a disproportionate relative increase in the size of area 10 of the frontal lobes. This is the very front-most portion of the prefrontal lobes (see Figure 2, Chapter 26). The relative size of this area in humans and other primates is shown in Figure 2.

In contrast to the results for the whole frontal lobe, area 10 of the prefrontal lobes was relatively larger for humans than for chimpanzees or other great apes. This area is involved in planning future actions, undertaking initiatives, reasoning, working memory and attention. Further studies of grey, white and total volumes showed that one of the greatest changes during the evolution of humans was an increase in prefrontal white matter. [7] Since white matter represents nerve axons, this suggests that an increase in neural interconnections played a key role in the evolution of the human brain.

Brain imaging studies of humans and the great apes show a disproportionate evolutionary increase in size and neural interconnections of area 10 of the prefrontal lobes. This area is associated with making plans for future activity, working memory, and attention. In the evolution of intelligence, an increase in connections between nerve cells is as important or even more important as an increase in size.

What Cognitive Skills are Unique to Humans?

The above studies indicate that the evolutionary increase in size and neural connections of prefrontal lobes of the great apes have almost kept pace with similar changes in humans. This suggests that we may have underestimated many of the capabilities and cognitive skills of our ape relatives. Many animal studies support this conclusion. The following is a list that summarizes the extensive literature on *human skills that have also been found to be present in chimpanzees, other great apes and other animals:* [8-10]

- a concept of self
- aggression, violence and murder
- consciousness
- cross-modal perception
- deception
- hunting
- insight
- politics
- use of language for communication
- adornment behavior
- art
- cooperation and altruism
- culture
- empathy
- incest avoidance
- mental illness
- rational thought
- use of tools

Clearly, despite the world dominance of the human species there are not many skills that we uniquely possess. The two areas that seem uniquely human are the high level of intelligence and the capacity to have awareness of our immortality, to imagine the divine, to believe in an afterlife, in heaven and in God or Gods. The potential role of selection for the latter areas is discussed in the next chapter.

The Role of the Ice Ages in the Evolution of Human Intelligence

The rapid four-fold increase in the size of the human brain began 2.5 million years ago, coincident with the onset of the ice ages. While it was often thought that each ice age was the result of gradual cooling and warming, studies of ice cores indicate that the climate changes, especially the cooling portion, [11] could be quite rapid. These abrupt changes are likely to have devastated the ecosystems on which our ancestors depended. As discussed in Chapter 16, on the finches of the Galapagos, abrupt climate changes can produce a remarkable acceleration in rates of evolution, especially when the changes persist. William Calvin [11,12,13] has suggested that the ice ages played a major role in the evolution of intelligence. Because of the rapid

environmental changes, versatility and the ability to quickly adapt would provide a great advantage to our human ancestors struggling to survive. Clustering into groups would allow the combining of resources, partitioning different skills to different members of the tribe, and the sharing of food. There was a need to rapidly acquire social skills and to be able to plan ahead for the winter months. The alternative was to starve to death. The repeated cycles of the ice age changes accentuated the selective process and the progression from small groups to tribes. It is likely that we can attribute much of our high level of intelligence and social skills to the periodic presence of ice covering the Northern Hemisphere.

The Timeframe for the Evolution of Human Intelligence

Until recently it was assumed that most of the traits of modern man arouse from a cultural explosion occurring 40,000 years ago in the Upper Pleistocene. This ushered in a wide range of sophisticated behaviors, including advanced weaponry, long-distance trade networks, expression through art and music, and other characteristics of a cultural Great Leap Forward. [14] However, archeological discoveries suggest that many of the capabilities of modern humans dated to much earlier times. Figure 3 summarizes this body of data.

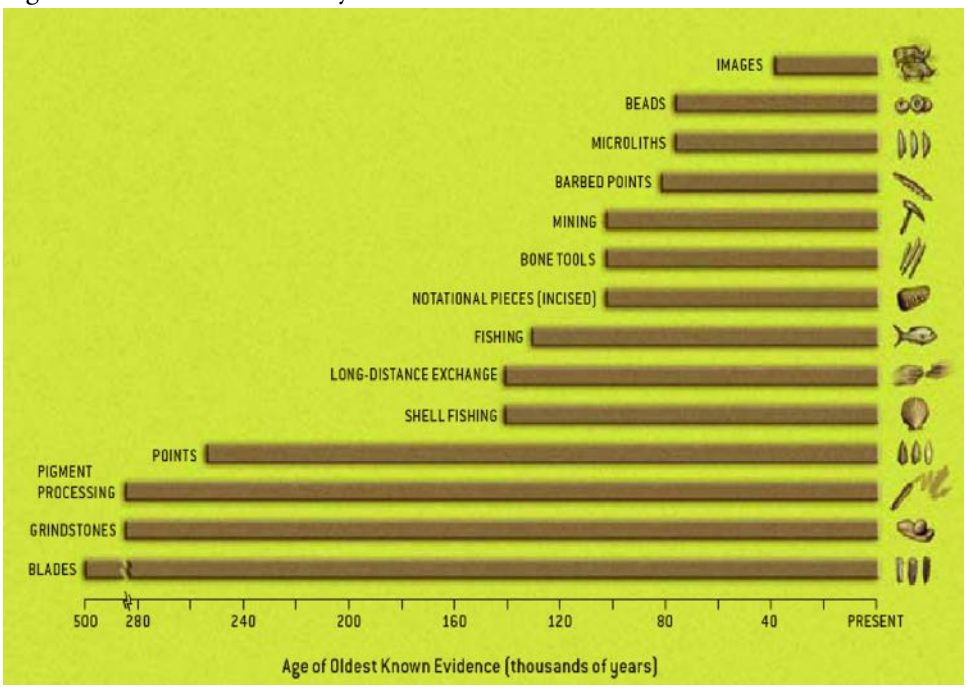

Figure 3. The time frame for a number of cultural and intellectual capabilities of early humans. From Wong, The Morning of the Modern Mind. Scientific American. *292:86-95, 2005.* [14] *By permission.*

This data shows that many important aspects of intelligent behavior began as early as 280 to 500 thousand years ago. Figure 4 shows the location of some of these archeological sites.

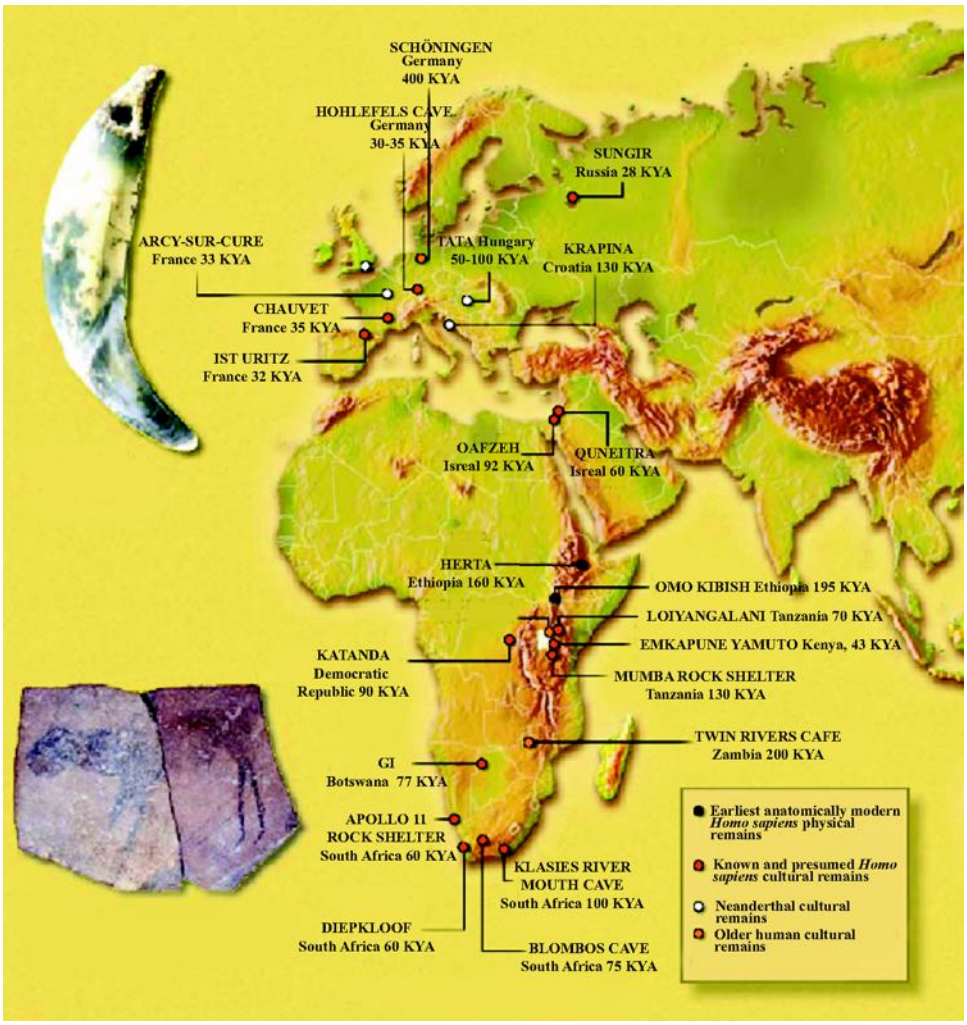

Figure 4. The archeological sites and dates in thousands of years ago (KYA) for many of the items shown in Figure 3. From Wong, The Morning of the Modern Mind. Scientific American. *292:86-95, 2005.* [14] *By permission*

Specifically, some of the older of these included a 400,000-year-old wooden throwing spear from Schöningen, Germany; a 233,000-year-old figurine from Berkekhat, Israel; and 100,000-year-old notched bone fragments from the Klasies River Mouth Cave, South Africa. [14] More recent artifacts include 77,000-year-old abstractly engraved ochres from Blombos Caves in South Africa 15 (Figure 5.)

While the meaning of these abstract images is unknown they suggest an ability to think symbolically was present over 77,000 years ago. [15]

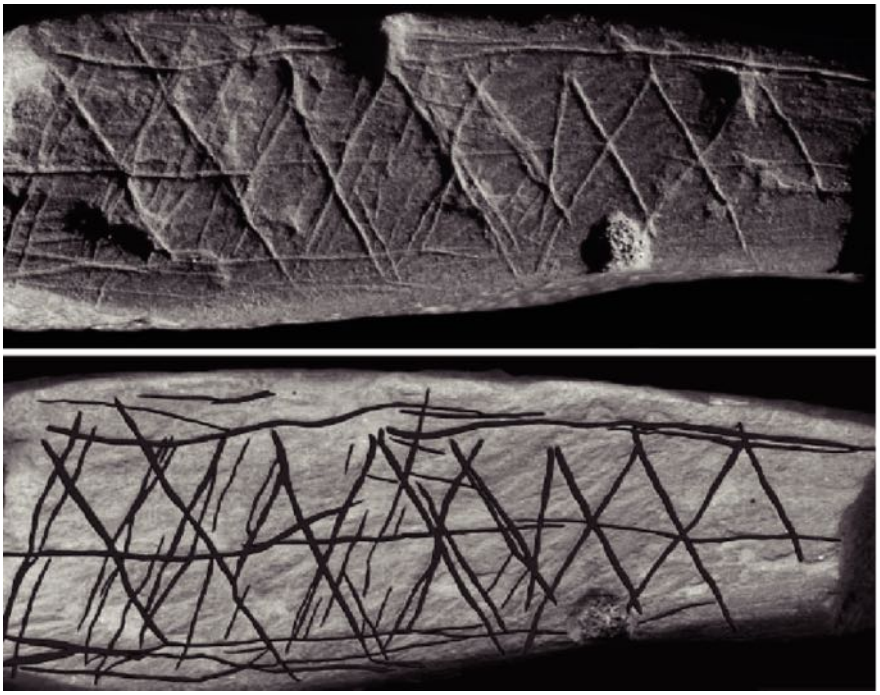

Figure 5. Engraved ochres from a Blombos cave in South Africa. Top: *oblique lighting to accentuate the surface features.* Bottom: *A tracing of the lines to emphasize the pattern. From Henshilwood et al.: Emergence of Modern Human Behavior: Middle Stone Age Engravings from South Africa.* Science. *295:1278-1280, 2002.*[15] *By permission.*

The Role of Social Skills in the Evolution of Human Intelligence

Given the many ways in which humans are similar to the great apes, or vice versa, when we speak of the evolution of human intelligence we need to address those selective factors that allowed intelligence to increase to a level greater than that seen in the great apes. It is likely that the greatest degree of selection revolved around females picking a mate that was most able to succeed in life. This is still true today. These skills involve the traits that are controlled by the prefrontal lobes, the areas of the human brain that evolved most rapidly. These skills include planning future actions, initiating plans, reasoning, and paying attention. This area of the brain is also involved in working memory, a neurological function that is critical for reasoning, planning, and decision-making, and is highly correlated with IQ.

While one could speculate about the particular cognitive or social skills that are most important in the selection for intelligence, studies of intelligence tests have indicated that a wide range of tests all tap a common factor called *g.* In addition, a number of tests of physiological brain functions, such as working memory and reaction time, each individually correlate well with *g.*[16] These facts suggest that whatever trait was valued most for mate selection, including intelligence itself, it is likely to result in the continued selection of genes for improving intelligence.[16] The number of suggestions of what skills were most involved in this selection process is as

varied as the number of authors writing on the subject. They include the ability to:

- be cunning and able to manipulate others [17]
- be deceptive [18]
- be predatory and able to secure food [19]
- delay impulsive behavior for a greater future gain [20p48]
- empathize [9p528]
- form into groups as defense against predators [21]
- learn social skills. [24]
- make the best tools [22]
- plan ahead [12]
- play power games in social politics [20p84]
- possess sexual attractiveness and body symmetry [23]
- socialize. [21,22]
- solve problems and learn [10p292]
- string sounds together to form meaningful sentences [12]
- tell interesting stories [20p236]
- throw spears with precision [11]
- use speech effectively [23,25]
- use symbols to represent people and concepts [20,26p191]

All of these tasks require a well-functioning brain, especially the prefrontal cortex. The greater the selection for these traits, the better the prefrontal cortex will function. The better the function of the prefrontal cortex, the greater the level of *g* and the higher the intelligence. The concept of "use it or lose it" is valid. Those who are best able to use their prefrontal lobes make the most desirous mates. The genes responsible for this improvement are selected, and intelligence and cognitive skills progressively increase. Which of the above traits were most important in this evolutionary process will never be known for certain. It is likely that they all are involved to some degree.

***g* is the fundamental biological factor behind a range of cognitive skills that take the measure of the mind of man. Individuals who were best able to perform a large number of those skills were most likely to win the race for sexual selection and thus pass on the responsible genes. This would result in a progressive increase in *g* and intelligence.**

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The human nervous system possesses curious and profound hungers for many objects which are neither meat nor drink, neither satisfiers of oxygen need, nor of sex need, nor of material need, nor of any other more obvious visceral demand.

Gardner Murphy.
Human Potentialities [1]

Man has another mental quality which the animal lacks. He is aware of himself, of his past and of his future, which is death; of his smallness and powerlessness. Man transcends all other life because he is, for the first time, life aware of itself.

Erick Fromm [2]

All religious and philosophical systems are principally an antidote to the certainty of death.

Arthur Schopenhauer

Fear begets Gods Lucretius, c. 99–55 BC

One of the major functions of religious belief is to reduce a person's fear of death.

Hood [3]

Chapter 42

The Evolution of Spirituality

Previous chapters have shown that the human nervous system possesses a unique capacity for spirituality. A specific part of the brain is involved; genetic factors play an important role, and a few of the specific genes involved have been identified. As with intelligence, entities that involve a specific structure and a specific set of genes do not arise by chance—they evolve. Spirituality differs from intelligence in that it is a uniquely human trait. As with intelligence, a number of theories have been proposed about how this natural selection and evolution took place, some of which are discussed in this chapter.

Is Spirituality a Spandrel?

Evolutionary psychology refers to the field of study of the role of natural selection in human behavioral traits. It had originally been termed *social biology* in deference to E.O. Wilson's 1975 book, *Sociobiology.* [4] Because of the controversial nature of sociobiology, [5] the field was renamed *evolutionary psychology.* [6] It has also been called *adaptive evolution,* where "adaptive" is used in the context of referring to traits that allow humans to flourish in a particular environment. Not every adaptive trait is the result of genes and natural selection. For example, the ability to sing well is more likely one of many uses of our vocal cords rather than a result of Darwinian natural selection for skills in singing.

While evolutionary psychology is a legitimate field of study, some have criticized it as reducing the complexity of human experience to simple genetic determinism. This is a specious argument since, as discussed in Part V, behavioral traits are due to the additive and epistatic effect of many different genes interacting with the environment. The complaint of genetic predeterminism has no validity because the effect of *the genetic component is not strong enough to produce genetic predeterminism.* The effect of genes is strong enough to alter the *probability of some behaviors* but not produce them with certainty.

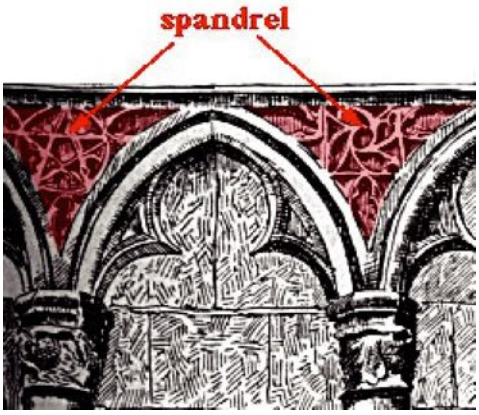

Figure 1. Spandrels formed by the intersection of two rounded arches.

Steven J. Gould and Richard Lewontin took on the whole field of evolutionary psychology in a widely cited paper entitled, "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptionist Programme." [7] Spandrels refer to the triangular spaces formed by the intersection of two rounded arches, as shown in Figure 1.

Spandrels just happen as the result of other features. The point Gould and Lewontin were making was that some behaviors might "just happen" because of certain pre-existing aspects of the structure and function of the human brain, not because there was active natural selection to produce them. An example might be the noise that a physician hears when he or she places a stethocope over the heart. These noises are the result of the flapping of the heart valves as the heart pumps blood. They are not the result of natural selection for "heart noises." The Panglossian paradigm part of the title refers to the ridicule that Voltaire heaped on Dr. Pangloss for suggesting that. "Our noses were made to carry spectacles, so we have spectacles." The spectacles were secondary to something else (poor eyesight), not due to the fact we have noses. Some have suggested that spirituality started as a spandrel that turned out to be useful and was subsequently enhanced by natural selection. [8]

Michael Shermer [9p39] proposed that magical thinking was a spandrel and was a necessary byproduct of rational thought that comes to the fore when uncertainties arise in the absence of proven scientific explanations. He gives as an example the high degree of superstition and magical thinking associated with batting in baseball, where even the best hitters connect only 30 percent of the time (uncertainty), compared to the virtual absence of magical thinking for outfielders who catch the ball over 95 percent of the time (certainty). I suspect he is correct; both causal thinking and magical thinking may be a product of a rational brain and the frontal lobes. However, I would argue that the intense feelings of spirituality and of being connected with a transcendent being is distinct from superstition and magical thinking per se and are a product of the temporal lobes.

The issue of the role of evolution in spirituality falls under the purview of *evolutionary psychology.* Does man possess spirituality as a result of natural selection because it had survival value, or is spirituality a spandrel? It is difficult to give a definitive answer, however, since spirituality has a strong genetic component, and since it is one of the most enduring and universal of human traits, and since much of spirituality appears to be associated with a specific brain structure, the temporal lobes, I propose spirituality is the result of natural selection and is not a spandrel.

Is Spirituality a Meme?

As shown in the chapter on the genetics of spirituality, cultural transmission explained some of the variance of participation in religion as measured by church attendance. In his book, *The Selfish Gene,* Richard Dawkins [10] renamed cultural transmission as *memes.* Memes refer to characteristics that are transmitted non-genetically from individual to individual and generation-to-generation. The term *memes* was meant to be analogous to genes. Dawkins referred to the work of Jenkins [11] who studied the songs of the saddleback bird on an island off New Zealand. By comparing the songs of fathers and sons, he showed the patterns were not inherited genetically. Young birds adopted the songs from their territorial neighbors by imitation. New songs arose by change in pitch. These were referred to as *cultural mutations.* As in genetic mutations there may be progressive changes in these songs. Finally, as with the punctuated equilibria of real evolution, cultural evolution may also go through long periods of stagnation followed by periods of rapid change. Dawkins referred to the centuries of cultural stagnation of the Dark Ages compared to the rapid changes of the Renaissance and Industrial Revolution as an example. Other examples of memes are tunes, ideas, catch phrases, clothes, fashions, architecture, language, poems, and a multitude of other features that define the human race.

Cultural evolution and biological evolution, or memes and genes, have much in common. They are transmitted from generation to generation, replicate, mutate, show progression and undergo periods of stagnation followed by periods of rapid change. The major distinction is that cultural or meme evolution can take place much more rapidly than biological evolution. Witness the rapidly accelerated use of the internet as a means of communication and acquisition of knowledge over a period of only a few years. This represents a cultural and behavioral change thousands of times faster than biological evolution.

The obvious question arises, "Is the development of spirituality in man the result of a meme, or of evolution by natural selection?" If spirituality was culturally transmitted, twin studies would not have shown a significant genetic component and the concordance rate would have been the same for identical versus fraternal twins. This was not the case. Twin studies of spirituality showed that genes accounted for 50 percent of the variance, the unique environment for 50 percent, and the common environment, including cultural influences, zero percent. [12] This indicated that *spirituality was an intrinsic biological trait, not a meme*. By contrast, common

environment and cultural transmission accounted for a significant percent of the variance of church attendance suggesting that religion is transmitted, at least in part, as a meme. [13p480]

Spirituality Alleviates Man's Fear of His Own Death, of His Mortality

While there are many features that humans and the great apes have in common, one feature that is unique to humans is an awareness of our own mortality—an awareness that we are going to die and that death could come at any moment. In their book, *Ego in Evolution,* Ester and William Menaker [14] state:

> In the animal world from which we emerged, anxiety—or shall we say, fear—serves a survival function and appears as a warning of impending danger to be reacted to with the full panoply of automatic instinctual equipment which is available for the individual's survival. Human evolution poses a new problem, although it is motivated by the same survival need. It is obvious that the great human evolutionary acquisition, awareness [of death], must add a special dimension to fear.

Man is burdened with death awareness. Death awareness is the bitter fruit of man having risen to a high level of consciousness. Malinowski [15] stated it as follows:

> The existence of strong personal attachments and the fact of death, which *of all of human events is the most upsetting and disorganizing to man's calculations, are perhaps the main sources of religious belief. The affirmation that death is not real, that man has a soul and that this is immortal, arises out of a deep need to deny personal destruction.*

Few would argue that man is uniquely aware of his own death, but how does he cope with this knowledge? The best way to alleviate a fear of death is to maintain the belief that we actually do not die, that we possess a soul that transcends death and lives on after we die, providing us with immortality. The site where this immortality is played out is heaven. Most religions, both Western and Eastern, contain elements of this comforting concept. Such an ability to feel connected with transcendence into something beyond our own existence is at the heart of the definition of spirituality. This would alleviate the fear of death and provide a sense of peace to alleviate and balance man's unique capacity to have foreknowledge that he will die. The greater an individual's ability to feel connected with this sense of something beyond his own existence, the less his fear of death and the greater his feeling of being at peace with life. Benson [16] suggested, "In order to counter this fundamental angst, humans are 'wired' for God. "

In their article, *Theism as a By-Product of Natural Selection,* Maser and Gallup [17] suggested the role of the fear of death in spirituality as follows:

> We contend that mind is a necessary but not sufficient condition for

> theistic thought. A motivational aspect to the theory is needed to explain the strong, compelling hold that theistic thought has on the lives of so many people. We maintain that the capacity to conceive of God comes with the mind, but the primary driving force is the understanding that the self is subject to annihilation.
>
> The organism, which is aware of itself, and bearing witness to the demise of its associates, should be able to take the next logical step and conceive of a non-self, or its death. Once aware of one's own existence, one is in a position to contemplate eventual nonexistence. *The realization of the inevitability of our own demise is the unique price paid for self-awareness. In terms of our theory, death is a major motivational component forcing into use our cognitive capacity to conceive of God.*

Anthropological findings are consistent with the presence of this form of spirituality in early man. A number of Neanderthal graves have been discovered in Europe that clearly indicate the presence of "ceremonial" burials where bodies were painted with red ochre and provided with stone implements, tools, flowers, and food, presumably for use in the afterlife. [18] The red ochre is believed to have been used to create an illusion of the presence of lifegiving blood circulating through the dead body. The extensive anthropological literature indicates that a similar care of the dead was a widespread practice at the dawn of humanity. [19] One of the most beautiful and comforting poems ever written is a testament to the role of a fear of death in spirituality and religion.

> *Yea, though I walk through the valley of the shadow of death, I will fear no evil: For thou art with me; Thy rod and thy staff they comfort me.*
>
> *Psalms 23:4*

Selective value? While the development of spirituality and a belief in life after death, heaven and God is an effective way of minimizing a fear of death, how does this have survival value? The belief in an afterlife could clearly reduce the level of fear involved in dangerous tasks such as hunting animals for food and of battling competing tribes, making the individual a far braver hunter and a more fierce warrior. This is analogous to the manner in which a spiritual fervor often played a critical role in many of the victories of the First Crusaders against numerically vastly superior opposing forces. [20]

In addition to a fear of death, Alper, [21] in his paper, "The Evolutionary Origins of Spiritual Consciousness," added one more dimension created by an awareness of our death:

> In light of our awareness of inevitable death, life takes on a newfound sense of existential meaninglessness. Our struggles to survive become an exercise in futility. Between death's inevitability and all of the suffering we are forced to endure, we are compelled to ask: Why go on living? What is

> the point? How was our species to justify its continued existence in light of such a hopeless circumstance? Why struggle today when tomorrow we won't even be here? Under such circumstances, the motivation principle of self-preservation that had sustained life for all these billions of years no longer applied to our species.

On the assumption that poorly controlled anxiety reduces fitness, Alper proposes that individuals with the greatest sense of spirituality were the most likely to survive.

> As generations of these protohumans passed, those whose cerebral constitutions most effectively dealt with the anxiety resulting from their awareness of death were selected to survive. This process continued until a cognitive function emerged that altered the way these protohumans perceived reality by adding a "spiritual" component to their perspectives.…Nature selected those individuals who developed a spiritual function. That function being built is the perception that there exists an alternate and transcendental reality that supercedes the limitations of this finite physical realm which can only offer us pain, suffering and ultimately death.

Spirituality Gives Man Control over a Threatening World

An additional advantage of spirituality and religion is that they provide the individual with better sense of control over a threatening world. This is especially apparent in what we might call, with a flare of superiority, primitive religions. Edward Tylor, one of the nineteenth century pioneers in "evolutionary" cultural anthropology, stressed that primitive man saw manifestations of personified spiritual agents in living things as well as inanimate objects. This was termed *animism.* Attributing spirits to threatening objects in nature provides some sense of control since one can pray to these spirits and plead for them to behave themselves. Then it is only a modest step from praying to the spirits of inanimate objects to praying to a more sophisticated, overreaching supernatural force — a god or gods. This is an intriguing explanation for the development of a belief in God and religion that could also be transmitted from generation to generation as a meme, with no involvement of genes or natural selection. Natural selection could be involved if individuals whose level of spirituality makes them the most adept at communication with the spirits are also the most resilient to a threatening environment. This could be akin to a form of placebo effect. Those who are convinced they are protected because they prayed to the spirits may be the most resistant to the stress of a threatening environment.

Spirituality and Near-Death Experiences

The clear connection between near-death experiences and spirituality was discussed previously. Saver and Rabin [22p505] suggested that components of the near-death

experience and a response to severe stress may have adaptive benefit. For example, when trapped by a predator, passive immobilization and feigning death may promote clarity of perception and insight that allows the individual to identify and carry out previously unrecognized strategies to escape desperate life-threatening circumstances.

Spirituality and Optimism

Hamer [23p10] suggested that the selection for dopaminergic spirituality genes was driven by their ability to produce an innate sense of "feel good" optimism. This would have selective value in the sense that optimism relates to the will to keep on living and procreating, despite the fact that death is ultimately inevitable. Studies have shown that optimism seems to promote better health and quicker recovery from disease, features that would have positive selective value.

Newberg and colleagues [24] suggested a different kind of association of spirituality with a "feel good" sensation. They suggested that the neurological machinery of spiritual transcendence may have arisen from the neural circuitry that evolved for mating and sexual experience. They suggested that:

> Mystics of all times and cultures have used the same expressive terms to describe their ineffable experience: bliss, rapture, ecstasy, and exaltation. They speak of losing themselves in the sublime sense of union, of melting into elation, and of the total satisfaction of desires.
>
> We believe it is no coincidence that this is also the language of sexual pleasure. Nor is it surprising, because the very neurological structures and pathways involved in transcendent experience — including the arousal, quiescent, and limbic systems — evolved primarily to link sexual pleasures to the powerful sensations of orgasm.

We saw in previous chapters that one of the most effective mechanisms of evolution was the co-option of old structures and functions into new structures and functions. It is clear that sex came before spirituality. Some of the rewarding aspects of spirituality may have co-opted the pre-existing mechanism involved in the pleasures of sex.

Spirituality, Religion, and Societal Cohesiveness

E. O. Wilson believed that any gene programming a behavior to make one small group or tribe more cohesive than another might be favored by natural selection. A band of religious hunter-gatherers might be just a little bit better at hunting and gathering than one that was less cohesive. As Wilson put it:

> When the gods are served, the Darwinian fitness of the members of the tribe is the ultimate unrecognized beneficiary. [25p184]

He also said:

> Consequently religions are like other human institutions in that they evolve in directions that enhance the welfare of the practitioners. Because this demographic benefit must accrue to the group as a whole, it can be gained partly by altruism and partly by exploitation, with certain sectors profiting at the expense of others. [25p175]

Noting that religions are widespread throughout the world, however much their specific rituals and traditions vary, Wilson concluded that the religious impulse is a universal aspect of human nature. Wilson then asks what the adaptive significance of religious behavior might be.

> The highest forms of religious practice, when examined more closely, can be seen to confer biological advantage. Above all they congeal identity. In the midst of the chaotic and potentially disorienting experiences each person undergoes daily, religion classifies him, provides him with unquestioned membership in a group claiming great powers, and by this means gives him a driving purpose in life compatible with his self-interest. [25p188]

In addition to congealing identity, there are many reasons why a spiritual or religious group could provide a reproductive advantage over the non-spiritual, non-religious group. Most religions include rituals related to all of the most critical aspects of reproductive life including membership in a group, rules of courtship, marriage, childbirth, and even the last rites of death. Many of these are capable of influencing reproductive fitness. An additional factor would be the ostracism and the marginalization it would produce if an individual did not join the group. This could result in a decreased likelihood of finding a mate, thus having fewer or no children.

The more spiritual an individual was, the more likely he or she would join a group of like-minded individuals, and this in turn would enhance their survivability in a hostile world. This would be analogous to the selective value of joining a tribe during the ice ages, mentioned in the previous chapter, except that the reason to join would be spirituality rather than the pervasiveness of ice. One could argue that spirituality has a self-perpetuating quality and religions are the means of ensuring that perpetuation, a theme also voiced by John Bowker.

Religion and Natural Selection

On the first page of his beautifully illustrated book, *World Religions,* John Bowker [26] speaks of religion and natural selection. He first points out that religion is derived from the word *religare,* meaning to bind things closely together. This is appropriate since religions bind people together in common practices and beliefs, and draw them together in a common goal of life. He went on to state:

> Religions are the earliest protective systems we know about that enabled people to have children and to raise them to adulthood. The importance of this is obvious: natural selection and evolution means that

> wherever the processes of birth and bringing up children (that is passing on genes and looking after children) are best protected, their human communities survive and flourish.
>
> Culture [from the Latin word *cultus,* meaning worship of the gods] is protective; religions, with their various patterns of belief and practice, are the earliest cultural system that we know about for the protection of gene replication and the nurture of children.…religions have been the best systems that humans could devise to ensure survival.

While we might forgive Bowker for his enthusiasm for his favorite subject, these thoughts are supported by E. O. Wilson, who stated that "religions, like other human institutions, evolve so as to further the welfare of their practitioners." [4p561] This provides support for the concept that there has been selection for the genes associated with spirituality. Individuals with the greatest inherent spirituality are the ones most likely to join a religious group and thus are most likely to benefit from the protective effect of such a group.

Spirituality as a Defense Mechanism

Justin Barrett, [27] of the Institute of Cognition in Belfast, suggested that individuals who believed in a form of animism, in which any activity in the environment was assumed to have been caused by a living spiritual agent, would possess a self-protective form of hypervigilance. For example, if they assumed that a twig breaking in the forest was always the result of a living agent rather than a result of the wind, they would fare better when a breaking twig really was due to a dangerous living agent. This form of protective vigilance would provide a selective advantage for those carrying this trait.

Inborn Spirituality as a Moral Watchdog

Developmental psychologist Jesse Bering reasoned that if humans are naturally inclined to believe in God and the afterlife, then children should exhibit signs of these traits before being indoctrinated into a given religion. To test this he examined subjects in three different age groups, those in kindergarten, those in late elementary school, and adults. [28] They were all exposed to a puppet show in which a mouse is suddenly eaten by an alligator. They were then asked questions such as: Now that the mouse is dead, does it miss its mom? Is it still hungry? Did it love and hate? The total set of questions involved six different areas. They included biological questions relating brain function such as, Does the mouse need to eat?; psychological biological questions such as, Is the mouse hungry? Is the mouse thirsty? There were questions about perception such as, Can the mouse hear? Can he taste?; emotional questions such as, Does the mouse still love his mother? Is the mouse angry?; questions relating to desire such as, Does the mouse want things?; and questions about knowledge such as, Does the mouse know things? The responses to these questions are shown in Figure 2.

For every type of question the children were more likely to believe that the dead

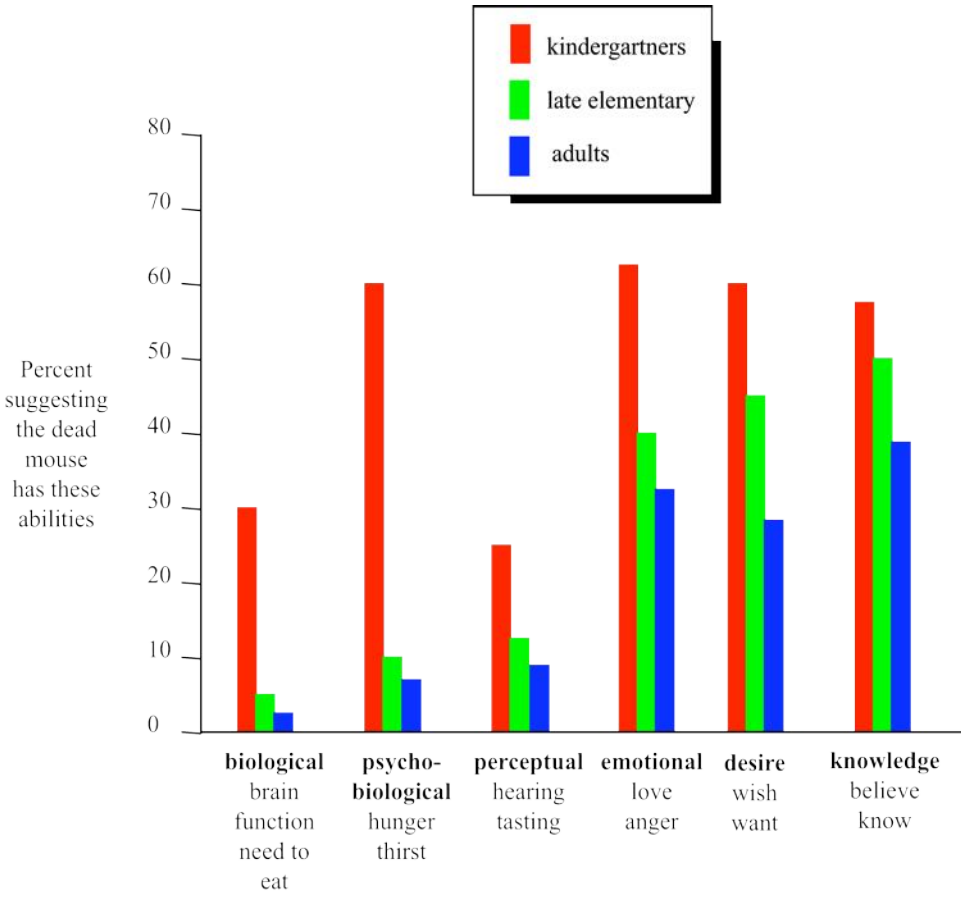

Figure 2. Results of beliefs of kindergartners, late elementary, and adult subjects relating to a dead mouse. See text. Diagram plotted as percent suggesting the dead mouse has abilities. In original paper by Jesse Bering, the results were plotted based on denial of these abilities. [28]

mouse had the different capabilities. Of interest, many of the late elementary children and adults also attributed traits relating to emotions, desires, and knowledge to the dead mouse. The drop-off with age is likely to be related to a loss of naïve ideas about death as the children better understood the biology of life. It was suggested that because no one knows what it is like to be dead, people attribute to dead agents the mental traits that they cannot imagine being without. More importantly, it suggests that a belief in supernatural agents pirates the brain's mental inference systems that are designed to reason about everyday living agents. Stated differently, *the spiritual brain often takes precedence over the rational brain.* While some psychologists have proposed that supernatural beliefs are all culturally derived, Bering suggested that afterlife beliefs are the default state, and it is in fact counterintuitive for people to deny them.

If this need to believe in the afterlife is indeed instinctual and is strong enough to countermand rational input, it is reasonable to believe that there was an evolutionary advantage for such beliefs. Bering suggested that most hunter-gatherer societies had a

fear of ancestral ghosts who were constantly watching and monitoring their behavior. This would result in more pro-social as opposed to anti-social behavior, to the selective benefit of both the individual and the group.

To test this, they set up an experiment in which subjects were told they were evaluating a new test of spatial intelligence but that the program still had some glitches and would occasionally flash the correct answer on the screen. When this happened they were to immediately hit the space bar to clear the answer. The psychologist measured the time it took to hit the space bar as a measure of cheating. When some of the subjects were told that a graduate student involved in these studies had died suddenly and there had been sightings of his ghost in the room, *those students cheated less than the controls.* This suggests they consciously or unconsciously believed the ghost was monitoring their behavior. These studies suggest it might be an evolutionary advantage if humans believed that omnipotent deities would punish them if they did wrong, and as a result, they would always do right.

A Spiritual Mate

One additional selective advantage of a high level of spirituality is that such a trait would be unusually appealing to the opposite sex. Some have suggested that spiritual qualities include compassion, honesty, steadiness, and unconditional love.[29] In Cloninger's personality inventory, spiritual qualities included feeling connected to others and a willingness to sacrifice oneself for the good of others. Based on the previous paragraph, always doing the right thing could be added to this list. These traits would certainly be very attractive to a potential mate. The resulting positive sexual selection would result in the perpetuation of the relevant spirituality genes.

A number of factors may have been involved in the evolution of man's capacity for spirituality. These include a reduction in the fear of death, a feeling of being in better control over a hostile environment, a feeling of being monitored for moral behavior, improved social cohesiveness, and greater feelings of joy, happiness and optimism. These in turn may have had selective value by allowing spiritual individuals to more easily escape life-threatening circumstances, to make better hunters and warriors, to have greater resistance to stress and disease, to behave morally, to belong to a protective religious group, and to have greater appeal to a sexual partner.

Twin and genetic studies show a significant role of genes in spirituality and no role for the common environment. This makes the idea that spirituality is a side product of other brain structures or functions (a spandrel) or a result of cultural evolution (a meme) — quite unlikely.

Humans are unique in that they are aware of and fear their own mortality. A major driving force behind the invention of *The Theory of God* was to provide a way to alleviate these fears by proposing that

humans had a soul that was immortal.

Spirituality can be defined as a feeling of a connection with something greater than oneself including any form of social order. Perhaps the greatest factor in the evolution of spirituality is that such a trait would maximize the development of man as a social animal.

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Part VII

Other Aspects of Spirituality and Religion

In addition to the items already covered, there are a number of other issues and questions that are relevant to the title of this book, *Did Man Create God?* These include the issues of the origin of the world's major religions, the role of mystics, mysticism, myth, ritual, and psychedelics in the formation of the different religions.

One of the major problems with religion is the assumption by adherents that theirs is the true religion favored by God. This raises the question, Does God play favorites? Other relevant questions include, Is religion inherently evil, inherently good, or a mixture of both? In addition, one of the major problems for religion relates to what has been termed the *Problem of Evil.* How can a kind, compassionate God stand by and allow so much evil to happen to mankind?

Another question comes from the fact that major sources of religious prejudice, wars, and terrorism derive from a literal interpretation of the various sacred books. Thus, one needs to ask, Are the sacred books literally true? A final relevant question becomes — Is God Dead? An examination of Pentecostalism provides an intriguing answer.

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Creating Gods is something that human beings have always done. When one religious idea ceases to work for them, it is simply replaced.

All religions change and develop. If they do not, they become obsolete.

It is far more important for a particular idea of God to work than for it to be logically or scientifically sound.

The idea of a personal God can only be a stage in our religious development.

Karen Armstrong
A History of God [1]

Chapter 43

The Origins of Religion

While the enormous diversity of man's beliefs is relevant to the question, *Did Man Create God?* anything other than a modest summary of the world's religions is beyond the scope of this book. Several excellent books on the subject are available for the reader who is interested in a more extensive review. [1-5] I will instead concentrate on a more limited objective — an examination of the origins and basic tenets of some of the world's major religions. This subject has relevance to the role that man played in placing a formal framework around his irrepressible spirituality. Developing a range of religions, each tailored to different cultures satisfied a yearning for structure. This subject also reveals how man has recognized for thousands of years that reason and religious faith were often in conflict — and how the different religions dealt with this difficult issue.

The religions of the world tend to divide into two major groups, those that look inward and those that look outward. Those that look inward seek eternal truth by the "examination of the streams and oceans of your inner nature." [3] These approaches gave rise to Hinduism, Buddhism, Jainism, and other Eastern religions. By contrast, Western religions concentrate on the outer world and relationships with other humans, but especially with a higher power recognized as God, the creator of all life, a savior, a personal companion through life who is there for the individual through the stresses of birth, marriage, life, and death, and is a provider of eternal life after death. This gave rise to Judaism, Christianity, and Islam. In a sense, many of the Eastern religions foster praying inward in the form of meditation and yoga, while Western religions foster praying outward to God. All religions make extensive use of symbolism, myths, and rituals.

Animism and the "Primitive Religions"

Animism is the oldest form of religious belief on earth and probably dates to the

Paleolithic age. It is basically a belief in the existence of spiritual beings and the belief that man shares the spiritual realm with the universe around him. Animism implies that everything has a consciousness, a spirit, and a soul. In fact, the term *animism* is derived from the Latin word *anima,* meaning breath or soul. A basic tenet of animism is that we should relate respectfully to all things.

In ancient times before the development of the monotheism of the West and the contemplative religions of the East, the rapid evolution of man's intelligence left him with the capacity to think, to wonder, to be curious, and to ask questions such as Why? and How? Why does the sun come up in the morning and set in the evening? Why the rain, thunder, and lightning? Why is there sometimes so much rain that floods are produced? Why does the rain sometimes stop, producing droughts, crop failure, and famine? Why death? Why is the world such a dangerous place? How do I control these frightening forces of nature? The objective scientific method of hypothesis formation and testing was several thousand years into the future and man's curiosity and intellect demanded immediate answers. In such a setting it is easy to see why animism, a belief in spirits, was the first manifestation of man's spirituality and was the first religion that man produced. The reasoning is straightforward. Since I have a "spirit" or a "soul" and since I am conscious and aware of my own actions, all other things must also have a "spirit"— the sky, rocks, rivers, oceans, mountains, plants, crops, animals, the whole universe. This view also implies the inverse, that all animate and inanimate objects represent the expression of the spirits.

If all objects had a spirit, the world would be a far safer and more controllable place. One can talk to the other spirits and plead with them to be less threatening. If pleading does not work, elevating them to the spiritual realm and praying to them might. Some of the things the inanimate objects do, like produce volcanic eruptions, thunder, and lightning, are so powerful and so majestic they must have come from some source that is far more powerful than man, some all-pervasive spirit, some supreme being. The spirits could also have lives of their own, giving rise to a range of man-made stories or myths. The different spirits were often represented by different symbols and could be controlled by rituals. Priests or shamans usually performed the requisite rituals. Sir Edwin Tylor first used the term animism in his 1871 book, *Primitive Cultures.* Animism is neither extinct nor necessarily restricted to primitive man. It still exists today in some form in many countries and many different cultures.

I placed "primitive religions" in quotes since one could argue that some elements of these religions could form the basis of an advanced, more rational religion of the future — closing a giant cycle and returning religion to its origins. While the assumption that inanimate objects are alive and that all objects have a soul is in contradiction to modern scientific reason, the element of feeling at one with nature and the universe, and of respecting all living and non-living things, is extremely laudable. Graham Harvey in *Animism: Respecting the Living World*[6] described these ideas as the "new animism" and referred to a second definition of animism as "a concern with knowing how to behave appropriately toward other persons, not all of whom are human." Had mankind retained some aspects of this "primitive" form of

religion, millions of lives would have been spared, lives that were sacrificed in the name of "more advanced monotheistic religions" and to the prejudice that "My God is the only God, and certainly better than your god." We would also have been spared from the terrorism fostered by religious fundamentalism. In conclusion, we should be careful of whom and what we call primitive.

Polytheism

While animism and polytheism have elements in common, polytheism could be considered an evolutionary improvement in the "meme" sense in that the gods were more personalized, were formed into nuclear families, and directly interacted with human activities. This interaction involved having gods for problems with love, fertility, weather, crops, music, war, specific regions or families, and other human needs. Different gods were often adopted from earlier cultures that rose and fell in popularity. Man invented gods that most suited his needs at the time. Pantheism was popular in ancient Egypt, Greece, and Rome. It remains very popular today, playing an integral role in Hinduism, some forms of Buddhism, Confucianism, Taoism, Shintoism, and religions in Africa and the Americas. Like animism, it was nonjudgmental. People were free to worship whatever god or gods they wished.

Plato, Aristotle, and the Ancient Greeks

Given the conflict between reason and religion, it is ironic that even though Plato was passionately interested in reason and logic, many of his ideas formed the later foundations of the monotheistic religions. Plato (427–347 BCE) devoted much of his early work to defending Socrates, who fostered reason in his followers by thought-provoking questions. For his efforts, Socrates was sentenced to death in 399 BCE for the corruption of youth.

Plato is well known for his *Allegory of the Cave.* Chained prisoners in the cave can only see what is taking place behind them by observing the shadows they cast on the cave's wall. As a result they mistake the shadows for reality. Plato did not use the word "God," but he believed in the existence of the divine that was static and unchanging and could only be indirectly sensed as through the shadows. However, man was capable of regaining divine status by purification of the reasoning powers of the mind.

Aristotle (384–322 BCE) was Plato's student. He visualized the Supreme Deity as a timeless and impassable being who did not involve himself in earthly things and was remote from human needs. This was the antithesis of a personal god. The Supreme Deity was the Unmoved Mover consisting of pure thought and causing all the motion and activity in the universe. He was not composed of matter, since matter is flawed. Man was in a privileged position — his soul had the divine gift of intellect, making him kin to God and divine in nature. Aspects of these ideas of the ancient Greeks influenced all the later monotheistic religions.

Zoroastrianism

In about 1200 BCE a mystic prophet by the name of Zarathustra or Zoroaster,

wrote the 17 hymns called the *Gathas.* These came to him through a series of visions from God, or *Ahura Mazda.* The Gathas stressed personal responsibility. A person's fate depended upon whether he chose to go with the good spirits called *aburas,* or the evil spirits called *daevas.* The good spirits came from the good god, *Ahura Mazda,* creator of life, while the bad or demonic spirits came from the bad god, *Angra Mainyu.* Figure 1 shows an image of Ahura Mazda.

Figure 1. The Guardian Spirit of Ahura Mazda representing the essence of god within people. From Bowker, World Religions.[3] *By permission.*

After death those who choose the good spirits went to paradise; those who choose the bad spirits went to the House of Lie, a place of torment. Since Zarathustra assumed that it was not difficult to choose the good spirits, his teachings were basically optimistic. By the seventh century BCE, Zoroastrianism had become the official state religion of the Persian Empire. A remarkable aspect of Zoroastrianism was its *tolerance of other religions based on the assumption that the ultimate judgment of a person was based on their good deeds, not on their beliefs.* Unfortunately this tolerant faith ended with the Muslim conquests in the seventh century BCE. Some elements of Zoroastrianism still persist in India today. All three of the present-day monotheistic religions borrowed concepts of good versus evil, paradise versus damnation, and heaven versus hell from Zoroastrianism.

The Eastern Religions

Hinduism. Hinduism is one of the oldest of man's religions. It had its origins among the people of the Indus valley. The Aryans, who originated from a region just north of the Tigris and Euphrates rivers, invaded northwest India in 1500 BCE. They brought with them oral teachings known as the *Vedas,* which for Hindus represent eternal truth. The Vedic religion has an elaborate plethora of gods that eventually evolved into the trinity of Brahma, Vishnu and Shiva. The Brahmins or priests dominated this religion. The society was divided into four levels with the Brahmins at the top, followed by the warriors, the traders and farmers, and the menials and servants. This may have provided the basis for the subsequent caste system in which Brahmins were at the top and the outcasts or untouchables were on the bottom. The

Hindus believed in reincarnation with the eternal soul, or *atman,* being reborn millions of times and in many forms from the heavens to the hells according to moral law, or *karma.* [3] People can be released *(moksha)* from this cycle of rebirth. There were many paths to moksha, including yoga. Hinduism is basically a method of appropriate behavior, or *dharma,* as a path to good rebirth or to release from rebirth. There are four desirable goals of life. In addition to dharma and moksha, they include *artha,* or the pursuit of legitimate worldly success, and *kama,* the pursuit of legitimate pleasure. This is certainly a long way from the sexually repressive nature of some forms of Christianity. It is believed that the essence of all reality — the earth, sun, moon, sky, birds, and animals — are one. One method of entering the power of this universe is through *mantras,* or sacred chants.

Figure 2. The four heads of Brahma. [9]

Unlike Islam, where God is unknowable and unseen, the gods of Hinduism are explicit and colorful. Brahma (Figure 2), the creator, is not worshiped like the other gods because his work was not done until the next creation of the world.

Brahma originally had five heads so he could see his lover wherever she was. Shiva destroyed one of the heads because Brahma offended him. Shiva is a bit of everything—destroyer, creator, and preserver. He is often portrayed with four hands (Figure 3), each signifying a different aspect of his power.

Figure 3. Shiva. [10]

Beginning as a minor god, Shiva gained importance and entry into the trinity after absorbing characteristics of other gods. Shivism is one of the most popular of the Hindu cults. Practitioners attempt to attain the nature of Shiva though yoga and renunciation. They mark their forehead with three horizontal marks representing the three aspects of Shiva.

Vishnu, the Supreme Being, was the *pervader* and *preserver* and represented the Universe. His was also shown with four arms representing the principal directions of space north, south, east, and west (Figure 4).

Vishnavites represent one of the largest of the Hindu groups. Vishnuism gave rise to the Hare Krishna movement once popular in the United States. The Hindu religion is rich with other gods, pilgrimages, festivals, sacrifices, and other rituals.

Figure 4. Vishnu the pervader and preserver. [11]

Figure 5. Typical figure of the Buddha.

Buddhism. In about 538 BCE, Siddhartha Gautama was born to royalty and lived a protected life in a palace. At age 29 he saw human suffering for the first time. This led him to leave his wife and luxurious home to sit for six years at the feet of various Hindu gurus, searching for the secret of existence. He lived an ascetic life during this period known as the *Great Renunciation.* Still failing to find the answers he sought, he eventually put himself into a trance, sitting under the Bodhi tree, and attained enlightenment. Buddhism provided a new hope of liberation from suffering through the attainment of *nirvana*, the end of pain. Gautama had become the Buddha, the Enlightened One. The Hindu God Brahma convinced him to teach others, and over the next 45 years, Buddha traveled India preaching that the only stable thing in the world was *dharma*, the truth about right living. Since the gods had not helped Gautama achieve nirvana, he did not believe they were of much use to mankind, and Buddhism is not about God. He believed the ultimate reality was higher than the gods. The attainment of enlightenment is achieved though meditation and spiritual exercise and ultimately allowed practitioners to escape from constant rebirth and the suffering it entailed. The Buddha is most often depicted as rotund and in a sitting posture as shown in Figure 5.

The Buddha saw Four Noble Truths during his enlightenment. The first was Existence, or *dukkha,* filled with suffering. Second, the suffering arises from a constant effort to find something permanent and stable in a transient world. Third, dukkha can cease entirely by attaining nirvana. Fourth, nirvana can be reached by following the Eightfold Path consisting of eight right steps: right understanding, thought, speech, action, livelihood, effort, mindfulness, and concentration. Right understanding includes Dependent

Organization, the concept that all things in the Universe are connected.

While Buddha believed in many of the concepts of Hinduism, he differed in one important aspect. Instead of believing in constant rebirth of the soul or atman, he felt that nothing is really permanent. One appearance simply gives rise to the next; there is no true death just a reappearance in a different form. Since even the gods were considered to be only temporary forms, he was against the Hindu practice of making animal sacrifices to the gods.

Buddhism was popular because of the appealing concept of enlightenment and moral law or karma and because individuals had control of their own fates and an opportunity for salvation. The Buddhist funeral rites dispelled fears about death, and governments appreciated it because it was seen as encouraging moral and peaceful citizens. [3]

Jainism. Jainism is named after Jain, a follower of the Jinas, the spiritual conquerors who lived in the Jain region of India in the Ganges basin. The Jains believe that 24 *tirthankaras* appear in each half-cycle of time to teach the release of the soul from its entanglement in material existence, known as karma. [3] Jainism appears to have had its origins in the ninth to the sixth century BCE. Like the Buddhists, they do not believe in a creator God.

The Jains are ascetics who take the Great Vows of nonviolence, speaking the truth, not taking what is not given, abstaining from sexual activity, a detachment from persons, places and things, and not eating after dark. The lay Jains take a less stringent set of vows that include being vegetarians and not destroying life by hunting and fishing. Being a farmer is acceptable. During the end of a Jain festival, lay people make confessions to an ascetic monk and ask him to pardon their sins. They seek to have a friendly relationship with all beings and to be unfriendly to none. The non-violence of the Jains appeared to have deeply influenced the non-violent philosophy of Mahatma Gandhi.

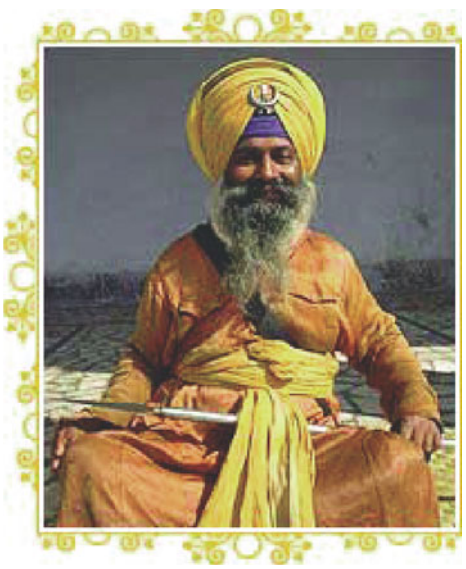

Figure 6. A Sikh showing two of the K's: the uncut hair and steel dagger. [12]

Sikhism. Sikhism began in northern India in the fifteenth century with the teachings of the founder Guru Nanak. A Sikh believes in one God and the ten successive gurus of the Sikh faith. The members outwardly mark their Sikhism by keeping five K's: *Kesh,* uncut hair, showing acceptance of God's will; *Kangha,* the comb showing controlled spirituality and cleanliness; *Kirpan,* a steel dagger, showing determination to defend truth; *Kara,* a steel bangle worn on the wrists, showing unity with God and bending to the Guru; and *Kachk,* an undergarment, showing moral strength and chastity [3] (Figure 6).

Figure 7. Lao Tzu, traveling on an ox, wrote the text of the Tao Te Ching. *From Bowker,* World Religions. [3]

In Sikhism there is a strong emphasis on communal life, community service and the temple, the center of Sikh life where vegetarian food is often available for free to people of all religions. One of the gurus, Ram Das (1534–1581), founded Amritsar and the Golden Temple, the most sacred site for Sikhs.

Taoism. Taoism refers to the practice of seeking access to *Tao,* "the way," the supreme reality. This is done through meditation with breath control and mind-body exercises. A common theme is the harmonizing of the fundamental energies of the universe and of the cosmic currents of yin and yang to attain immortality. The two main texts of Taoism are the *Chuan Tzi* and *Tao Te Ching.* The latter has been ascribed to the sage Lao Tzu (Figure 7).

It is believed that Tao is the unchanging principle beyond the universe. *Tao Te Ching* endorses a spiritualized version of immortality arising from a natural and harmonious life, with little importance attached to material gain. It endorses a political philosophy in which rulers do not seek to impose and dominate affairs of the nation and state. There is a close connection between body, mind, and environment in Taoist thought. The human body is a vital energy system consisting of patterned flow of *ch'i.* If ch'i is solidified it forms a subtle form of sexual and emotional energy called *ching.* Further refinement results in *shen,* or spirit or consciousness. Many medical techniques in traditional Chinese medicine are based on these concepts.

While Gods played a role in most of the Eastern religions the primary focus was on turning inward using meditation, yoga, and other techniques to attempt to attain enlightenment or union with the absolute truth or with the oneness of the universe. As in the Western religions there was an emphasis on moral behavior and compassion for others. The great diversity of the Eastern religions shows that the human race is incredibly talented in its ability to devise structure to place around its innate spirituality.

The Origins of Monotheism and Judaism

The temporal and theological relationship among the three major monotheistic Western Religions is Judaism –> Christianity –> Islam. Thus, if we wish to search for the origins of monotheism we need to look to the origins of Judaism and with it the origin of the concept of one God. Karen Armstrong has described this in great

detail in her book, *A History of God.* [1] Figure 8 shows a map of the ancient world of the Bible.

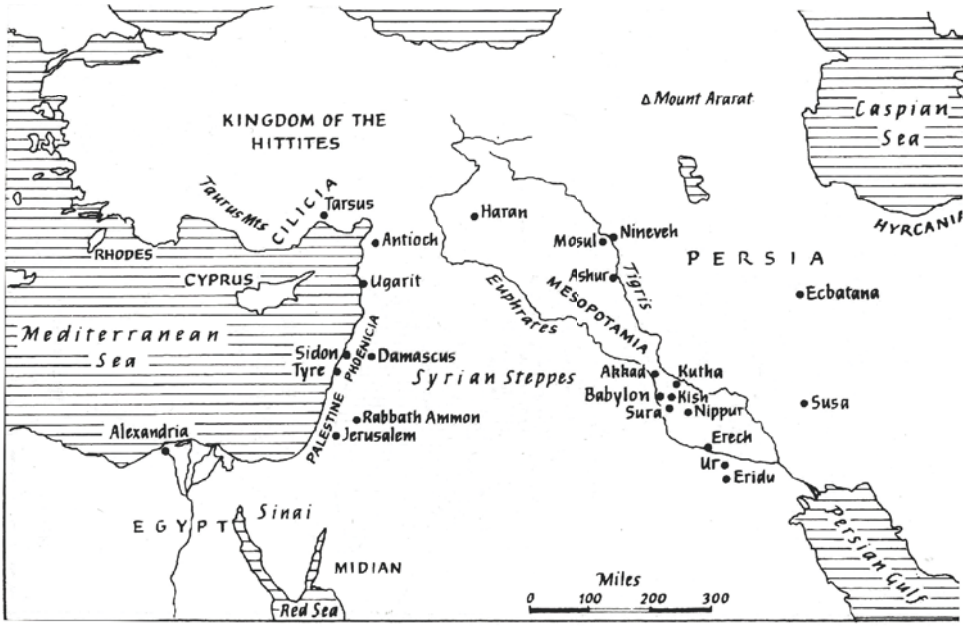

Figure 8. The ancient land of the Bible. From Karen Armstrong, A History of God. [1]

Around 4,000 BCE the Sumerians had established one of the first great cultures of the civilized world in three cities in Mesopotamia. These were located in what is now Iraq in the region of the Tigris and Euphrates rivers. The cities were Ur, Erech, and Kish. For orientation to modern Iraq, Baghdad is just north of Babylon on the Tigris river. The priests of the region recited the *Emuma Eish,* an epic poem that celebrated the victory of the gods over chaos. This story included the creation of the universe from divine stuff in the swamps of Mesopotamia. In the best tradition of polytheism, a flurry of gods emerged from this swamp including Marduk, the Sun god. He was the most perfect of the divine line and created man. Since the first man was created from the substance of gods he shared in the gods' divine nature.

A wandering chieftain left Ur and led his people to settle in Canaan, the region around Jerusalem, between the twentieth and nineteenth centuries BCE. His name was Abraham, and he is held in common by all of the three major monotheistic religions — Judaism, Christianity, and Islam. His son was Isaac and his grandson was Jacob, later renamed Israel. The Bible says that Jacob's sons became the ancestors of the twelve tribes of Israel. Abraham emigrated to Egypt during a severe famine in Canaan. He and his people were enslaved by the Egyptians but liberated by a deity called Yahweh, or God.

Although this all took place 19 centuries before the birth of Christ, it was not until the eighth century BCE that the historical account of these events was written down by two biblical authors. One was called "J" because he called God by title of

Yahweh. The other was called "E" because he preferred the more formal name for God of *Elohim.* By this time, Canaan had been divided into two parts, a northern region consisting of the Kingdom of Israel, and the southern region consisting of the Kingdom of Judah. J wrote about Judah, while E wrote about Israel. The two accounts often contain conflicting stories. It was not until the sixth century BCE that a third author, "P," wrote the chapter of Genesis and his version of creation. These historical notes are of interest since the creationists base their claims of a young universe on the belief that the Bible is the direct word of God. This history of the writing of the First Testament seems much more consistent with a small group of average human authors attempting to provide a historical and metaphorical account of events that had occurred many centuries earlier. *The story they produced is far more likely to have human than divine inspiration.*

Yahweh tells Abraham that he has a special destiny and will become the father of a mighty nation. The rest of this marvelous story is depicted in the First Testament of the Bible. The new religion of one God did not come easily to the Israelites. [1p50] Paganism was still rampant in Canaan in the fifth century BCE. Much credit for the rescue of the one God religion is given to a priest called Ezekiel. "For about five years he stayed alone in his house and did not speak to a soul. Then he had a shattering vision of Yahweh, which literally knocked him out." [1p58] He journeyed to Tel Aviv where the Second Isaiah took the cause one step further by declaring that Yahweh was the *only* God. Through their efforts "Yahweh had finally absorbed his rivals in the religious imagination of Israel. The lure of paganism had lost its attraction and the religion of Judaism had been born."

Believers in a single God benefited by having a powerful, loving, and generally merciful and just ruler. The faithful could have a personal if distant relationship with their God. However, while Paganism was an essentially tolerant faith, *Yahweh was a jealous God.* If people obeyed his laws, they would be blessed and become prosperous. If they disobeyed his laws, or worshiped other gods, the consequences could be devastating. They would be torn from the land, strewn to the ends of the earth, and terror would grip their hearts.

The Origins of Christianity

While it is known that Jesus was a charismatic faith healer from Palestine who preached charity, following the Golden Rule, and showing loving kindness toward others, the first account of his life was not penned until the Gospel of Mark was written at about 70 CE, some 40 years after his death, leaving room for a considerable degree of poetic license. Mark wrote more about what Jesus meant to his followers "than a reliable straight forward portrayal" of his life. [1p79,13,14] His followers saw Jesus as a new Moses. When he was alive, the Jews believed he was the Messiah and hailed him as the son of David, the king and spiritual leader who founded the first independent Jewish kingdom in Jerusalem. Jesus was not the only faith healer of his time, and the fact that he was crucified like a common criminal could have reasonably been such an ignominious fate that it meant the end of his influence. However, unlike

many others who were crucified, there were rumors that Jesus had arisen from the dead. *Based on this miraculous event, his disciples believed that he would soon return and bring with him the Messianic Kingdom of God.* This led to the subsequent fundamentalist pre- and post-millennial apocalyptical beliefs. [p564]

Paul is credited with rescuing Christianity. Without his proselytizing it is quite likely the Christianity would never have survived. One of Paul's major contributions was eliminating the need for Christians to be circumcised, thus opening the faith to gentiles. Paul used the term "in Christ" in relation to his experience of Jesus. The word "Christ" was a translation of the Hebrew word *Massiach,* meaning the Anointed One.

The concept of Jesus as the Son of God also had its origins with Paul. No one in the Jewish community imagined that Yahweh actually had a son. Paul called Jesus "the Son of God" in the Jewish sense, meaning that he possessed some of God's powers. The claim that Jesus was actually the "Son of God" was one of the embellishments introduced by his later followers. The doctrine that Jesus was God in human form was not finalized until the fourth century. [1p81]

Paul also introduced what was to become an additional pillar of Christianity — the concept that Jesus died for our sins. This elevated the scandalous form of his death into something he did for his followers. After several hundred years of persecution and struggle, the Roman Emperor Constantine finally legalized Christianity in 313 CE. Christians were then able to own property, worship freely, and contribute to public life.

One of the problems humans get themselves into when they write the rules of their own religions is that logical conundrums can begin to creep into the system. This was illustrated by the fierce controversy that broke out shortly after Christianity was legalized. Arius, an elder of the church, pointed out the following logical inconsistency: If there is only one true God, God the Creator, God the Almighty, how could Jesus Christ have been God in the same way as God the Father? To resolve the issue, Arius believed Jesus was not made of "God stuff" and thus was not truly divine. Another elder, Athanasius, believed Jesus was a true God. He and his followers used the term *homoousian,* meaning "made of the same stuff." One proposed solution was to instead use the term *homoiousian,* meaning of a similar but not identical nature. The ludicrous nature of this hair splitting led Gibbon to comment how absurd it was that Christian unity should have been threatened by a mere diphthong. [1p112]

Eventually a trio of theologians in eastern Turkey came up with a brilliant solution that satisfied everyone. They proposed there were two aspects of the scriptures, the obvious part that consisted of the public teachings, termed *kerygma,* and an inner secret, mysterious or esoteric tradition handed down from the apostles as a "private and secret teaching." This was termed *dogma.* These elusive religious realities could only be suggested in the symbolic gestures of the liturgy, or even better, by silence. In essence, inconsistencies were handled by simply not talking about them. They were placed behind a logical shield. In a sense this dogma encompassed that which could not be seen, as in Plato's cave.

An additional understanding to emerge from this trio of theologians was the

Figure 9. The Trinity represented by King David (father), Jesus (son), and a dove (holy ghost or spirit) from a painting Virgin and Child *by Jan Provost II. 1524. National Gallery of Scotland, Edinburgh, and the Bridgemen Art Library.*

concept that God had a single essence termed *ousia,* which remained incomprehensible to humans, and three expressions, termed *hypostases,* by which He could be known. These were the Trinity of the *Father, Son,* and *Holy Spirit,* or *Holy Ghost* (Figure 9).

This interpretation was proposed to avoid confusion as to whether the Father, the Son, or the Spirit was God. If so, were there now three Gods when there was supposed to be only one? Was God being split into three parts? The answer was that none of these were God, they were only the means by which the mystery of the unknowable *ousia* of God could be glimpsed. [1p116] One of the reasons that the trio produced this formulation was to prevent God from being totally grasped by the human intellect. *This allowed the rational brain to be walled off from the spiritual brain* — an element that has persisted in all three of the monotheistic religions.

Islam

In 610 CE, Muhammad ibn Abdallah, a member of the Meccan tribe of Quraysh, was on one of his annual spiritual trips to Mount Hira during the month of Ramadan. He sat in a tiny cave praying to al-Lah (Allah) which he identified as being the same God worshipped by the Jews and Christians. However, unlike the Jews and Christians, the Arabs were feeling left out by the fact that al-Lah had never sent them a prophet or a scripture of their own analogous to Moses and Jesus and the Old and New Testament. Judaism and Christianity had made few converts in the Arab world, and at that time most worshiped a traditional form of paganism. This was due in part to the fact that the Persians and Byzantines primarily used these religions to promote their imperialistic goals.

One night during his stay in the cave, Muhammad was violently awakened by an overwhelming divine presence that commanded him to recite. He initially refused but by the third command, the words of a new scripture, the Qur'an (Koran), began to pour from his mouth. Muhammad could not read or write, so others wrote down his words. This process continued *sura* (chapter) by *sura, ayat* (verse) by *ayat,* over a period of 23 years. Since most Arabs of the time were also unable to read or write, the verses of the Qur'an were memorized and spoken. Armstrong. [1p140-144] makes the point that this played a major role in the rapid spread of Muhammad's new religion called *Islam.*

> To a Westerner who cannot appreciate the extraordinary beauty of Arabic, the Koran seems boring and repetitive.…Muslims often say that

> when reading the Koran in a translation, they feel that they are reading from a different book because nothing of the beauty of Arabic has been conveyed.…The Koran was not meant for private perusal but for liturgical recitation. When Muslims hear a sura chanted in the mosque they are reminded of all the central tenets of their faith.…In the reading Muslims claim that they experience a sense of transcendence, of an ultimate reality and power that lie behind the transient and fleeting phenomena of the mundane world.…Because of the poetic beauty of the verses many were converted on the spot.…It is as though Muhammad had created an entirely new literary form that some people were not ready for but which thrilled others. Without this experience of the Koran, it is extremely unlikely the Islam would have taken root.

It is thus of little wonder that Muhammad is referred to as both a poet and a prophet. As is also the case in Judaism and Christianity, there is a deep congruence between art and religion. Both are capable of touching the soul.

Poetry alone cannot be the basis of a new religion. Content is critical. What did the Koran teach? Among other things it taught that one should share their wealth with the poor. This alms-giving, or zakat, was one of the five tenets of Islam. It taught that *Muslims should make God their focus and sole priority*. Since there was only one God, and thus all religions were derived from that God, Muslims were required to recognize the validity of other religions. War was held to be abhorrent. The only war that was just was a war in self-defense. A strong sense of equality was a central tenet and the religion of al-Lah was originally very positive for women. It forbade the common practice of the day of killing female children since they were viewed as second-class citizens. It was only later after men usurped the religion that women's rights were so severely restricted.

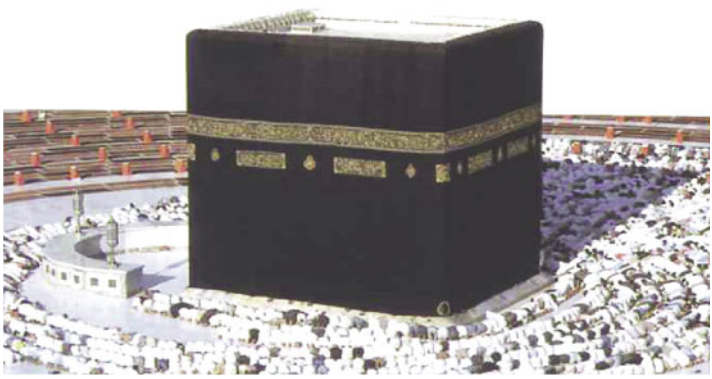

Figure 10. The Kabah in Mecca. From Bowker, World Religions.[3]

The Kabah. The Kabah or Ka'ba is a great monolithic black cube built in the city of Mecca. Figure 10.

It is believed that the Kabah was built at God's command by Abraham and his son. It stands on a site that many consider to have been the sanctuary founded by Adam, the first man. Prior to Muhammad it was a shrine to many Arabian deities. Muhammad toppled these and re-dedicated the Kabah to the one true God. Each year millions of Muslims visit and swarm around and around the Kabah, often being spiritually overwhelmed in the process.

Sunnis and Shiites. From the very beginning there was a major division in the Islam world. Since Muhammad had no living male children, after his death a close friend, Abu Bakr was elected as the first caliph. After three elected caliphs, Ali ibn Abi Talib, Muhammad's cousin and son-in-law, was the first blood relative of Muhammad to become caliph. The Shiah called him the first *Imam,* or Leader. *The Shiah (Shiites) believed that the caliphs should all be related to Muhammad, that only members of Muhammad's family had true knowledge of God.* The Imams were believed to embody God's presence on earth. The *Sunni believed the caliphs did not need to be in Muhammad's bloodline.* These two sects have been fighting for centuries. During the time of the first crusade, the Muslim world was so splintered by internal fighting they were unable to defeat the Christian invaders. [7]

Like Judaism and Christianity before them, Islam traditionalists believed that God's essence was unfathomable by man and would always elude their understanding. God could never be wholly contained by the human mind. There was again a separation into the unknowable and the knowable, the uncreated and the created. The uncreated was the unattainable essence of God. It was like the dogma of Christianity. The created was the knowable portion meant for human consumption. The created was like the kerygma of Christianity. Thus, for some Muslims, there was once again a forced separation between reason and spirituality. Reason did not apply and could not be applied to God's essence.

The Falsafah and Reason. Unlike Christianity, which was often very threatened by science, the Koran stresses that Muslims are not to abdicate their reason but should look at the world with curiosity. This led the early Muslims to a tradition of being at peace with natural science. As part of this intellectual freedom, Islam translators made the writings of the ancient Greeks available in Arabic. In fact it was their translations that later made all of the ancient Greek writings available to the West. Muslims studied astronomy, medicine, and mathematics, and in the ninth and tenth century many scientific discoveries occurred in the Islam world. As part of this academic freedom a new type of Muslim emerged around 870 CE called the *Falsafah.* In contrast to the traditionalists, they believed it was unhealthy to relegate God to a separate intellectual category in which faith was kept isolated from other human endeavors. They had no intention of abolishing the Islam religion but wanted to purify it from its primitive and parochial elements. Instead of seeing God as a mystery, the Falsafahs believed God was reason itself. Their God was to be discovered in logical arguments. They also did not reject the Koran but felt that both the Koran and reason were valid paths to God. *They saw no fundamental contradiction between science and revelation or reason and faith.*

The Falsafah philosophers were reaching their peak by the turn of the millennium. One of the intellectual leaders held that a prophet like Muhammad was superior to any philosopher because he was not dependent upon human reason but enjoyed a direct and intuitive knowledge of God. Later another leader felt that reason could tell them that God existed but could not tell them anything about him. This led al-Ghazzali (1058–1111) to suggest, "If reason could not tell us anything about

God, what was the point of rational discussion of theological matters?" [8] He also reasoned that since the reality that we call "God" cannot be tested empirically, how could we be sure that our beliefs were not mere delusions? He eventually concluded that mystical religious experience was the only way of verifying a reality that lay beyond the reach of human intellect and thought. He proposed that some people possess "the prophetic spirit" that is higher than reason and remained convinced that it was impossible to demonstrate the existence of God by logic and rational proof. Thereafter Muslim philosophy would become inseparable from spirituality and a mystical discussion of God.

Thus, after several hundred years of attempting to bring reason into the realm of God and religion, the experiment failed and ended with the realization that God could not be rationally proven to exist. The philosophical orientation of the Falsafah appealed mostly to the intellectual elite and it remained a small sect. It did not appeal to the majority of Muslims for whom a knowledge of and *familiarity with God occurred in the realm of a religious spiritual experience, not in the realm of reason.*

The three great monotheistic religions represented a great leap forward in providing structure to the spirituality of man. All three provided a God that was the creator of man and the universe and a lifelong personal and spiritual companion. After death, as long as man followed certain well-defined moral rules, God also provided an eternal afterlife in heaven. This God was remarkably like man himself, both in appearance and personal qualities. Like man he was capable of love, hate, jealousy, anger, rage, and revenge. He judged, punished, created, and destroyed. He was especially vengeful if man chose to worship idols. This all-knowing God was the symbol of transcendence — the essence of spirituality. This transcendence was so great that the true nature of God could only be known imperfectly and indirectly. There was an overt acceptance of the fact that reason and faith occupied separate worlds. The existence or non-existence of God was not open to knowing by reason. Knowledge of and acceptance of God was a matter of faith and religious experience. Reason was not welcome.

The wide diversity of man's religions is in keeping with the statement that "Creating Gods is something that human beings have always done. When one religious idea ceases to work for them it is simply replaced." [1] The fact that the God of all three monotheistic religions so closely projected the needs, fears, desires and even appearance of man, is consistent with the probability that not only the religions, but God, the object of the religion—was created by man.

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Mystics are the pioneers of the spiritual world.

Evelyn Underhill
Mysticism [1]

You cannot tread the path of spirituality and the path of reason; you must choose between them.

Edward O. Wilson

Chapter 44

Mysticism

What is mysticism? The term is derived from myth and mystery, meaning to close the eyes or the mouth, to experience darkness or silence. It is the antithesis of reason. Mystical knowledge or knowing comes not from thought and thinking but from emotion and feelings unrestrained by reason. During mystical experiences there is a profound transfiguration of self, time, and space. [2] William James, in his book, *The Varieties of Religious Experience,* [3] proposed four aspects for a definition of mysticism: *ineffable,* or impossible to convey in ordinary language; *noetic,* or seeming to reveal deep, profound truth; *transient,* rarely lasting more than an hour or so; and *passive,* in which the person feels gripped by a force much greater than himself. One of the essentials of religious mysticism is a feeling of a direct union between the soul and God. [4] At a minimum there is a sense of finally understanding some aspect of absolute knowledge.

Mysticism has not been popular in the West because it is generally associated with cranks and charlatans. However, it has been very popular in various other places and times in the world. Mystics are considered to have a special direct vision of godly things, a unique spiritual talent that is shared by only a few. As an approach to God it is intuitive rather than reasoned, imaginative rather than cerebral, and ecstatic rather than placid. Mysticism is best understood as an unusual trait, not accessible to everyone, replete with visions, hallucinations, and voices often emanating from the deeper recesses of the temporal lobes, or spiritual brain, and having a life-altering effect on the individual so possessed. Mystics have attained prominence in some religious groups because their passion has allowed them to infect the less endowed with their thoughts and visions.

> In true mystics we see personal religion raised to its highest power. If we accept their experience as genuine, it involves a discourse with the spiritual world, an awareness of it, which transcends the normal experience, and appears to be independent of the general religious consciousness of the community to which they belong. Mystics speak directly with God as persons and not as members of a group. They live by

> an immediate knowledge far more than by belief, by a knowledge achieved in those hours of direct unmediated discourse with the Transcendent when, as they say, they were "in union with God." A certitude then gained governs all of their reactions to the universe.
>
> By the very term "mystic" we indicate a certain aloofness from the crowd suggesting that they are in possession of a secret which the community as a whole does not and cannot share, that they live at levels to which others cannot see. [4p36-37]

Much of the distrust imparted to mystics comes from this sense of aloofness and independence from the herd. One can best gain an entrée into the world of mysticism by examining the life and thought of some of the most famous mystics or mystical groups in history. Plotinus was one of the first and had a profound influence on later mystics and religious thought.

Plotinus. Drawing upon Plato's ideas, Plotinus (204–270 BCE) is considered to be the founder of the mystical and religious Neoplatonism. Considered a full-grown mystic by Underhill [4p27] he designed a system to achieve an understanding of self. Instead of seeking an explanation of the universe in science he urged his disciples to withdraw into themselves to explore their own psyche. To Plotinus, the ultimate reality was a primal unity called *the One.* In true mystic fashion he claimed the One was present everywhere but absent from those unable to perceive it. He developed a complex spiritual cosmology of three Beings consisting of Divine Reality, *the Godhead,* the absolute unconditioned One; its manifestation as nous *the Divine Mind,* or *Spirit* which inspires the "intelligible" and external world; and *the Psyche,* the life or soul of the universe. [4p16] The mystic nature of the One is illustrated by Plotinus's statement that:

> The One is nameless: If we are to think positively of the One there would be more truth in Silence. We cannot say that it exists, since as a Being itself it is not a thing but is distinct from all things. It is Everything and Nothing, it can be not of the existing things, and yet it is all. Seeking nothing, possessing nothing, lacking nothing, the One is perfect. [5p102]

There have been Jewish, Christian, and Islamic mystics and mystic sects. These include the Kabbalah for Judaism, St. Teresa of Avila for Christianity, and the Sufi for Islam.

Kabbalah. In the eleventh century in Spain, the mystic Solomon Idn Gadirol called the Jewish system of secret mysticisms the *Kabbalah,* standing for the "received' tradition of the Jews. This mystical knowledge was initially transmitted by mouth to ear. The Kabbalists were dedicated to the study of the ancient wisdom of the Talmud or Oral Torah, the book of Jewish law. They searched for mysterious connections and hidden truths. In this process they turned their attention to numbers, assigning each letter of the Hebrew alphabet a numerical value. [6] It was held that words that had the

same total sum were connected in some way. In 1280 CE, Moses de Léon compiled the famous Jewish mystical work called the *Zohar (The Book of Splendor).* While it was purported to be a treasury of ancient writings explaining God's relationship with the world in terms of *sefirot,* it is likely to have been written by de Léon himself. The sefirot are attributions of God known as emanations though which the universe was created.[7] The Zohar emphasized that humans could affect the higher world and the pious can achieve union with God. The ten elements of the sefirot, or the *Tree of Life,* are often represented as 10 spheres as in Figure 1.

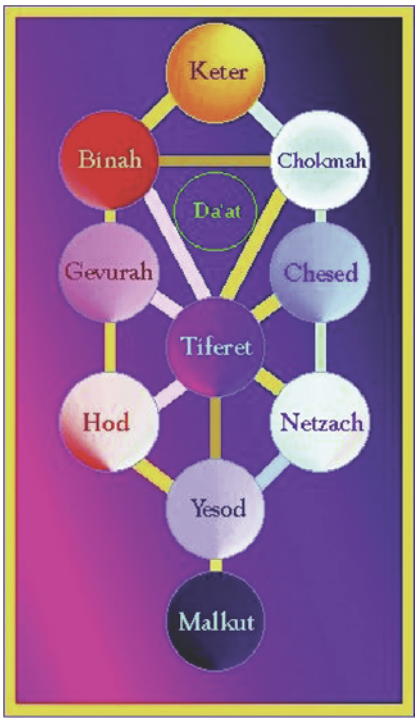

Figure 1. The sefirot, *or Tree of Life, of the Kabbalah with its 10 spheres or sephiroth. The sephiroth are arranged in a rigid hierarchy, with each lower one growing out of the one immediately above.*

The Tree of Life originally was a Babylonian concept. It found its way into the Hebrew legend of Adam and Eve. Each circle, or *sephiroth,* represented a different aspect of God. The *Keter* was the crown, unknown and all-embracing. Others were wisdom, understanding or intelligence, kindness, power, beauty, victory and foundation. The last, Malkuth, was a funnel through which the other nine flowed and represented the Spirit of God. Each connection was identified with a letter of the Hebrew alphabet. These letters play a role in Tarot cards used by fortune-tellers.

Different groupings by units of three sephiroth also had mystical meanings representing thought or reason, emotion, and nature that were derived from aspects of Plato, Aristotle, the Bible, and the Talmud. The common light that circulated between the sephiroth represented Knowledge, or *Da'ath,* the universal consciousness of God. The spiritual universe was termed *En Sof,* meaning infinite and standing for that which is incomprehensible, has no beginning and no end, and is inseparable from God. When all the characteristics of God are present in a region of the universe, that region is perfect. However, if God removed one of those characteristics, a point of imperfection was produced. This allowed man to have free will, something he would not have if Divine Law permeated the entire universe.

The Kabbalah reached its peak in the sixteenth and seventeenth centuries. Many believed the earth was in its final days, and Shabbetai Zevi, a self-proclaimed messiah, arrived on the scene to save the Jews. In 1666 he was captured by the Turks and given the choice of converting to Islam or being put to death. He chose conversion and was thus discredited.

The Tree of Life is emblematic of the problem with mysticism. The presence of ten different sephiroth, 22 different interconnections each of which may be positive

or negative, and the many possible sub-groupings, is capable of producing a huge number of potential mystical interactions—all made up by man. The essence of mysticism is that it is based on assumptions that cannot be objectively verified and are outside the realm of reason and rationality. One of the fascinations of mysticism is that despite the total lack of objectivity, faithful followers often take the teachings as absolute truths. This ability to succumb to this self-delusion is illustrated in *The Universal Meaning of the Kabbalah,* by Leo Schaya. [8] He noted that the sephiroth were believed to have an essential and incorruptible unity because of the truths revealed by the relationships between the sephiroth, as if simply by virtue of being complex and full of mysterious interactions all of the elements of Kabbalah must be true.

Other Jewish mystics include Shimon bar Yochal, Abraham ben Samuel Abulafia, Moses ben Shem Tob de Leon, Lsaac Luria, Moshe Chaim Luzzatto, Nachman of Breslow, Abraham Isaac Kook, and Menachem Mendel Schneerson. Abraham Abulafia (1240–1291), was a highly educated man and was converted to mysticism by an intense religious experience at age 31. He evolved a Jewish form of yoga using concentration on breathing, recitation of a mantra, and the adoption of a special posture to achieve an altered form of consciousness.

Figure 2. St. Teresa of Àvila. [9]

St. Teresa of Avila. St Teresa (1515–1582) (Figure 2) was the daughter of a Spanish nobleman. She was crippled by disease as a child but was apparently cured after prayer to Saint Joseph. Against her father's will she entered a Carmelite house at age 17, and shortly thereafter again lapsed into a state of poor health. She began having ecstatic visions which were judged to have been genuine, holy, and true by the Dominicans and Jesuits. Against considerable opposition she opened her own reformed convent of Saint John of Avila.

She wrote extensively. Like other writings of medieval mystics, hers contained directions for techniques of spiritual concentration and inner contemplation. On St. Peter's Day in 1559 she believed Christ was present in her in bodily but invisible form. This vision continued for more than two years. In a separate vision, a celestial being drove a fiery golden lance into her heart, causing great spiritual pain, representative of her compassion for the suffering of Jesus.

The essence of St. Teresa's mystical writings was the ascent of the soul in four stages. These were the "heart's devotion" consisting of devout observance of Christ and penitence; the "devotion of peace," a stage of quietude in which the human will is lost in that of God's; "devotion of union," an ecstatic state with a conscious rapture

in the love of God; and finally a "devotion of ecstasy," in which the consciousness of being disappears in a union with God. As shown previously there is evidence to suggest that the ecstatic mysticism of St. Teresa of Àvila was related to her having temporal lobe epilepsy.

Other Christian mystics include St. Augustine of Hippo, St. Bernard of Clairvaux, Meister Eckehart, St. Francis of Assisi, St. Hildegarde of Bingen, St. Gertrude the Great, John the Apostle, St. John of the Cross, St. Mechthild of Magdeburg, Johann Tauler, St. Jon de Ruysbroeck, St. Paul, St. Catherine of Siena, St. Catherine of Genoa, Jacob Boehme, Jacopone da Todi, George Fox,[4] and many others. St. Paul, was described previously in relation to temporal lobe epilepsy. Regarding him, Underhill[4p55] stated:

> The New Testament is thick with reports of mystical experiences. The Fourth Gospel and the Epistles of St. Paul depend for their whole character on the soaring mystical genius their writers possessed. Had St. Paul never been caught up to the third heaven [the dwelling place of God], he would have had a very different outlook on the world, and Christianity would have been a different religion in consequence.

Sufi. The Sufis were Muslims who sought a mystical approach to connecting with God. The term probably came from *suf,* the name for the woolen garment that the early Sufi wore. Like the Kabbalists who were searching for the secret meaning of the ancient Jewish writings, the Sufi were also searching for the ancient, hidden, secret, or esoteric teachings of Muhammad. These teachings were presumed to only have been given to Muhammad's immediate companions, who had the capacity to have a direct experiential knowledge of Allah, and were then passed on to their students. The early Sufis lived lives of poverty and piety and were a minor sect of Islam.

Al-Ghazali. (1058–1111) (Figure 3) Al-Ghazali was a well-educated Muslim with an appointment as professor at the Nizamiyah University of Baghdad, one of the most prestigious institutions of learning in the golden era of Muslim history. He gave up his academic appointment to become a wandering ascetic. At the end of this solitary period he became a prolific writer. He proposed that the mystical religious experience was the only way of verifying a reality that lay beyond the reach of the human intellect and reason.[5p189-191] *Reason was unable to comprehend the absolute and the infinite.*

Figure 3. Abu Hamid al-Ghazali, famous Muslim mystic.[11]

He proposed that the only way to obtain a balance between reason and religion was to recognize that reason dealt with the finite while

religion dealt with the infinite. He claimed that some people possessed a power that he called "the prophetic spirit." Those who lacked it should not deny that it exists simply because they had not experienced it.

This is consistent with the assumption that only a small subset of individuals are able to have ecstatic mystical experiences. For those who lacked this mystical ability, al-Ghazali devised a discipline to enable Muslims to cultivate a consciousness of God's reality on a daily basis. This consisted of a prescribed fasting, chanting, sleepless vigils, measured breathing, and contemplation, producing a sense of transcendental presence. To enhance concentration some used music and dancing. One order was known as the Whirling Dervishes. Their spinning dance was an aid to concentration.

Al-Ghazali was probably the greatest Islamic theologian. He eliminated the excesses of Sufism yet brought its basic tenets into the mainstream of Islamic religion. He emphasized both the obedient life through the usual laws of Islam, but added in Sufism with its mystical experience between the soul and God.[7] As a result, during the twelfth and thirteenth centuries Sufism changed from a minority mystic movement to become a dominant Islamic force, and this philosophy would become inseparable from spirituality and a mystical dimension of Allah. All Muslims became involved in a constant struggle (jihad) to find Allah in all things and to strip away everything else. While many modern Muslims may believe that Sufism is outside the sphere of Islam, it is in reality simply the name for the inner or esoteric dimensions of Islam.

Other Islamic mystics included al Hallaj, Jalal ad-Dim Rumi, Khwejeh Shams al-Din Muhammad Hafez-e Shirazi, Abdul Qadir Gilani, Abu Yazid Bistami, and others. Muhammed himself heard voices, saw visions, and sweated profusely during his mystical interludes, symptoms that are consistent with temporal lobe epilepsy.

Based on the impressive number of mystics for all three of the major monotheistic religions, it is clear that *mysticism and mystics have played a major role in helping man to flesh out the spiritual framework of his religions.* Underhill[4] expressed the following in relation to the role of mystics in the development of Christianity:

> If we ask ourselves what the history of the Church would be without the history of its mystics, then we begin to see how much its light and color emanates from them, how much of its doctrine represents their experience translated into dogmatic form.
>
> They [the mystics] are pushed out, as it were, by the visible Church like tentacles, to explore the unseen world which surrounds it, and drawn back again to its bosom that they may impart to the whole body the more abundant life which they have found. If the unfailing family of the mystics did not thus perpetually push out beyond the protective edges of the organism and bring official Christianity back into direct touch with the highest spiritual values, and so consistently reaffirm the fact — felt and experienced by them—of the intimate correspondence, the regenerating contact of God with the soul, the Church would long ago have fallen

victim to the tendency to relapse into the mechanical which dogs all organized groups.

Mysticism for the Common Man

These examples illustrate the assumption that only a select few can be linked into a direct mystical union with God. What about the common man? Is he relegated to standing on the sidelines listening to the rapturous descriptions of the chosen few? Temporal lobe epilepsy or its equivalent may have played a major role in determining who is chosen for the extreme end of these mystical abilities and who is not. In this regard the common man should not be upset by the fact that they are normal and have normal brains. We have seen that Abulafia, a Jewish mystic, St. Teresa of Àvila, a Christian mystic, and Abu Hamid al-Ghazali, a Muslim mystic have all suggested ways that the common man could, at some level, have mystical experiences. Many others, including the practitioners of the Eastern religions, have also proposed methods to allow anyone to have some mystical contact with their spiritual brain. These active methods include meditation, yoga, prayer, chanting, dancing, music, poetry, ritual, fasting, speaking in tongues, and psychedelic drugs. Passive normal or extraordinary episodes, such as life-threatening events, near death, hypoxia, grief, illness, childbirth, love-making, or natural beauty may also elicit varying levels of mystical experiences. These are all capable of producing a sense of transcendence into a realm of an altered level of consciousness and a feeling of being connected to a force greater than ourselves.

Huston Smith [10] proposed that despite the differences in the different religions, the mystical experiences of each transcend time, place, culture, and individual identity. He termed this the *perennial philosophy.* This commonality, moderated by cultural differences, is understandable, since all those involved are genetically similar members of the human race and all have similar functioning temporal lobes.

Mysticism represents a sense of knowing that emanates from the spiritual brain. During a mystical experience there is a profound transfiguration of self, time, and space and often a feeling of having a direct union between the soul and God or with the absolute truth. Knowing based on mysticism is the antithesis of reason, because it cannot be objectively verified. It is the stuff that faith is made of. Because it often emanates from the temporal lobe, hippocampus, and amygdala, it has a consuming emotional flavor and is believed to be real and true with far greater fervor and conviction than rational knowledge. It is so powerful that some have felt that without it, religions based on reason alone are likely to fail. *Without the intermittent emanations from the spiritual brain in many different individuals across the centuries and the world, it is unlikely that any of the formal religions as we know them now would exist.*

While mystic ecstasies are usually the purview of a select few, many methods have been developed, such as meditation, yoga, prayer, dance, swaying, rituals, fasting, speaking in tongues, and the taking of psychedelic drugs, to make a semblance of this mystical experience available to the common man. "Knowledge" based on mysticism is likely to be defended with far greater passion than knowledge based on reason, and therein lies its danger, since it can easily form the fodder for of despots, wars, and terrorism.

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It seems that we will always generate Gods, powers, and other entities as first causes to explain what we observe. Indeed, we cannot do otherwise.

Human ceremonial ritual provides the "common man" access to some modified form of mystical experience.

Eugene d'Aquili and Andrew Newberg
The Mystical Mind [1]

The function of ritual is to give form to human life.

Joseph Campbell
Myths to Live By [2]

Once Gods are closely connected to salient human activities, it strenghthens the idea that gods are present and involved in our lives.

Todd Tremlin
Minds and Gods [2a]

Chapter 45

Myth and Ritual

Myth

Myths form the basis of religion. One aspect of the human mind that accompanied the evolution of a high level of intelligence was an obsession with wanting to know the answer to all possible questions. Why are we here? What is the purpose of our existence? How did we come into being? Who created us? Where do we go when we die? What causes thunder and lightning? We are like an inquisitive child. Why? Why? This desire to know was undoubtedly related to attempts by the human mind to reduce the level of anxiety associated with the threatening aspects of the unknown. In the times prior to the scientific method, if we didn't know the answer, we simply made up one.

The neurological basis of this human obsession with wanting to know and wanting to put some level of organization into the mysteries of the natural world has been labeled different things. Eugene d'Aquili and Andrew Newberg [1] referred to it as the "cognitive imperative," and suggested it was the result of a number of different cognitive operators. In the same sense that mathematics uses operators for addition (+), subtraction (-), multiplication (x) and division (/), they proposed that the human mind had seven different operators. It is these operators that force us to ask questions. The one most relevant to myth-making was the causal operator that assigns causation to events. The causal operator lies at the very heart of our scientific investigations, philosophical speculations, and religious beliefs. A binary operator was also proposed that allowed the brain to decompose continuous variables, such as a range from good to evil, into a dichotomous variable of good versus evil. Such dichotomy is prevalent

in myths. A good example in modern times was presented in George Lucas's film, *Star Wars,* where the "dark side" of Darth Vader represented pure evil, and the Jedi rebels represented pure good. Unfortunately, the binary operator produces a bad precedent of reducing the shades of grey of human experience into all black or white.

It has been suggested that this obsession to know was due to a "hyperactive agent detection device," or HADD,[3,4] that not only alerts us to real dangers, such as poisonous snakes, but also generates false positive responses, such as believing that rocks and trees are imbued with spirits. The human brain is capable of perceiving reality based on observed and verifiable facts, such as the fact that the sun comes up every morning and sets every evening. However, it is also good at explaining reality based on a hyperactive causal operator that reaches a conclusion based poorly on fact, such as assuming that the sun rises and sets because it is pulled around heaven by a sun god riding a majestic chariot.

Karen Armstrong[5] referred to these two ways of acquiring knowledge as *logos* (true knowledge) and *mythos* (myth). They were both essential and complementary. Logos was rational, pragmatic, and scientific. Although based on fact, logos could leave humans with a queasy sense of unease. For thousands of years the assumed logos was that the earth was at the center of the solar system. Copernicus and Galileo showed it was not — the sun was at the center. Well at least, our solar system was at the center of our galaxy. No, this was also shown not to be true. Then at least our galaxy was the only galaxy. No, it is just one of billions in the universe. For thousands of years it was assumed that God created man and other life on earth. Then Darwin showed that life on earth evolved over millions of years by natural selection of the species that were the most fit for a given environment. In papers understandable by an elite few, Einstein showed that time slowed down at high speeds and other physicists showed that at a micro level, a particle can be in two places at once. Thus, logos, despite its claim as the ultimate form of knowledge, was not always constant. It could change. Professional skeptics called scientists drove that change. Their tool was the scientific method of hypothesis making and testing. The mark of a good scientist was that he or she did not take their theories too seriously. They needed to be ready at the drop of the next new fact or new observation to move onto a new and better theory. This shifting base, driven by an elite group whose tools, methods, and results became increasingly difficult for the non-scientist to understand, added to the sense of unease with logos. Logos was not concerned with meaning, just the facts. Logos could not explain the meaning of life. Even the discoverers of the new physics felt a sense of unease with pure logos.

By contrast, mythos was a timeless constant in human existence. It was based on faith. It could always be depended on. It provided the world with meaning, and unless humans found some meaning in their lives they tended to fall into despair. Mythos could not be verified by rational proof and was not intended to be taken literally. It was more like art, music and poetry. Mythos was associated with mysticism and intuitive insight. While science began to take over and provide answers to some of man's "Why" questions, for many, myths, taken on faith, were far more satisfying.

In the pre-modern world, unless a historical event was mythologized it could not be religious. Unlike logos that forges ahead, mythos looks backward to our sacred beginnings. It assumes that everything important has already been achieved and thought about. To assume an event was literally true was to confuse mythos with logos.[5] Making that assumption was dangerous since the next archeological dig might disprove or change logos. Not so mythos. *By not being rooted to fact, mythos could be constant and unchanging and in view of man's preference for consistency — comforting and soothing.* As science advanced it began to discount mythos and to assume only logos had validity. Although people have often tried to turn the mythos of their faith into logos, this has never really been successful. Mythos is more closely connected with our emotional and spiritual brain. *It is far more comforting than logos. Fundamentalism can best be viewed as being the result of confusing mythos with logos; of believing that the myths we have made up to explain our world are literally true;* of believing, for example, that the world is only 4,000 years old and that the mythos of the book of Genesis is logos.

Joseph Campbell[6] spent a lifetime researching mythology around the world, looking for similarities of ancient and modern societies, including Greek, Roman, Egyptian, Asian, and Nordic. Three common mythological themes emerged: First, myths involve questions about our existence, including the creation of the world, birth and death. Second, they contain conundrums raised by unresolvable contradictions relating to creation versus destruction, life versus death, gods versus humans. Third, they attempt to reconcile and make sense of these issues to resolve our fears and anxieties.

Ritual

Myth and ritual are inseparable. Joseph Campbell, the master of myth, stated that myths were the mental supports of ritual and rites and that rites were the physical enactments of myths[2] He stated that:

> By absorbing the myths of his social group and participating in its rites, the youngster is structured to accord with his social as well as natural environment, and turned from an amorphous nature product, prematurely born, into a defined and competent member of some specific, efficiently functioning social order.

This is reminiscent of the saying, "Give me a youngster for the first few years and I will give you a Catholic for life." This, of course, applies to any religion. The myths and rituals children grow up with stay with them for the rest of their lives, as well as the religions they were designed to support. D'Aquili and Newberg[1] defined ritual as having the following qualities:

- It is structured or patterned.
- It is rhythmic and repetitive.

- Within individuals it acts to synchronize various neural processes.
- Within groups it acts to synchronize the thoughts of the individual participants.

Animal studies have shown that repetitious rhythms result in the arousal of the limbic system, the emotional brain.[7,8] Studies in humans have indicated that repetitive auditory and visual stimuli can produce increased arousal and intensely pleasurable, spiritual experiences.[9] Anyone who has stood in the midst of thousands of fans in a rock concert or simply listened quietly to his or her favorite songs on an iPod implicitly understands the spiritual effects of rhythm. Prayer can be viewed as a combination of myth and ritual. Rhythmic stimuli activate a portion of the brain that produces a sense of union or oneness with the world, an important aspect of spirituality.[1]

Most animals have mating and other rituals. These are hardwired into their genetic machinery, instinctual, and critical for survival. The rituals that humans perform are not hardwired. They are culturally determined. Concerning rituals, D'Aquili and Newberg[1] commented:

> Many religious traditions indicate that states [induced by ritual] yield not only a feeling of union with a greater force or power but also an intense awareness that death is not to be feared and a sense of harmony of the individual with the universe.

The highly evolved intelligence of humans brought with it an intense quest for knowledge, a quest for knowing the answers to a thousand questions that start with "Why?" In the pre-modern age, with the absence of concrete knowledge, the answers were made up, producing myths (mythos). Since many myths address important spiritual issues, including the existence of a supreme being, they often form the basis of religions. Since they are not based in fact, myths can remain unchanged over the centuries, bringing a sense of stability and permanence in a changing world. By contrast, scientific facts (logos) often change with new data. Mythos is thus inherently more comforting than logos.

Rituals, consisting of repetitious, rhythmic chanting, singing, or prayer, activate portions of the brain that enhance the sense of spirituality and oneness with a supreme being and represent the physical enactment of myths. Myths and rituals form an integral part of all religions.

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They eat the root which they call peyote, and which they venerate as though it were deity.
Aldous Huxley
The Doors of Perception, 1954

Chapter 46

Psychedelics and Religion

Mysticism played a major role in the formation of man's religions. A previous chapter emphasized this role by a select group of mystics whose unique temporal lobes poured out their intense ecstatic experiences. In many cases this was a result of epilepsy or an epilepsy equivalent. Their spirituality was the result of *intrinsic* characteristics of their own brains. As previously discussed, a second type of spirituality is produced *extrinsically* by taking a range of psychedelic drugs. These compounds provide a powerful sense of a connection with a supernatural being. As such they may have played an important role in the early spiritual development of mankind.

The four major sources of the psychedelics involved are the psilocybin-containing mushrooms; the *Ayahuasca* brews containing DMT and β-carbolines; the mescaline-containing peyote catus; and the muscimol-containing *Amanita muscaria,* or *fly-agaric* mushroom. In different cultures and locations, all four have been claimed to possess God-like qualities, and *Amanita muscaria* was even considered a god in its own right. All four played a role in the spiritual life of their users, and *Amanita muscaria* may have played a major role in the formation of at least three of the world's major religions.

The study of the role of mushrooms in religion is called *ethnomycology.* R. Gordon Wasson was father and founder of ethnomycology. Over a lifetime he wrote 10 books and over 70 articles in academic journals and magazines on the subject. His collection of over 4,000 books, pamphlets, photographs, charts, slides, and archeological artifacts currently reside in the Ethnomycological Collection in the Harvard Botanical Museum. He tells the following story of how he became so involved in mycology, the study of mushrooms. [1]

> In 1921 I fell in love with a Russian girl, Valentina Pavlovna, in London where she was studying medicine.…We took our delayed honeymoon late August 1927 in Big Indian, the Catskills.…On our first day, after lunch, we went for a walk, down a path.…We were hand in hand and a picture of bliss. Suddenly, before I knew it, my bride threw down my hand roughly and ran up into the forest, with cries of ecstasy. She had seen toadstools growing, many kinds of toadstools. She had not seen the like since Russia, in 1917. She was in a delirium of excitement

> and began gathering them right and left in her skirt. From the path I called to her, admonishing her not to gather them: they were toadstools, I said, they were poisonous.

That evening, despite his pleading, his wife cooked and ate the mushrooms. Gordon was certain he would be a widower by morning, but was not. The experience led both of them to realize that in some parts of the world, like England, the people tend to be *mycophobes,* and are deathly afraid of mushrooms and certain they are all poisonous. In other parts of the world, like Russia, the people are *mycophils,* love mushrooms, eat them, and know from long experience which are poisonous and which are not. They came to realize that something intrinsic to different cultures led to these differences. They both independently felt that religion somehow was involved. After that day, in their spare time they began a lifelong quest to understand the basis of these cultural and religious differences.

As their work progressed, Wasson and his colleagues became dissatisfied with the then current names for the effects that certain mushrooms had on the mind. They were especially not happy with the terms *hallucinogenic,* meaning "to roam or wander in one's mind," or *psychedelic,* meaning "mind-manifesting," since these tended to ignore the important spiritual effects of these compounds. A committee was formed "to devise a new word for the potions that held antiquity in awe."[1p30] They decided the best word was *entheogen,* meaning *"God generated within."* The intent of this chapter is to explore the role of entheogens in the formation of man's belief in God and the formation of man's religions.

Psilocybin Mushrooms and Mesoamerica

Mushroom stones, such as the ones shown in Figure 1, date back as far as 1,000 BCE. While they were initially misidentified, they are now understood to be effigies of a mushroom deity.[2] They have been found in the tombs of Mayan nobles, suggesting an association with the Lords of Xibalba, deity rulers of the dead.

Figure 1. Pre-Columbian Mayan mushroom stones dating to 1,000 to 500 BCE found throughout Central America but principally in the Guatemala highlands, indicating the presence of mushroom cults involving the sacramental consumption of sacred mushrooms.[2a]

The Spanish Franciscan friar, Bernardino de Sahagén, preserved extensive handwritten records of sixteenth century Mexican culture. Among other things he

described how groups of people came together to eat mushrooms and how this produced visions, often of things in their future life including visions of their own death, thus bringing a compassionate acceptance of the individual's own imortality. [2]

In general the friars saw the mushroom ceremonies as devil worship and as a mockery of the consumption of the body of Christ in the Eucharistic communion rite. As a result they banned this religious practice. Back in Spain, the effects of eating the mushrooms were described in diabolical terms, such as causing uncontrollable fits and violence, [3] a practice that could easily lead to mycophobia in Spain. The suppression of the visionary mushroom cult by the Spanish clergy seemed so complete that for four centuries it disappeared from the memory of the general and scholarly public.

On September 19, 1952, Wasson received a letter from Robert Graves in Majorca, with a clipping indicating that Richard Evans Schultes, a professor of botany at Harvard and director of the Botanical Museum there, had published two papers containing the startling news that mushroom cults still existed and that Schultes had even brought back from Mexico specimens of the entheogenic mushrooms. Wasson called him the same day and learned that Schultes had visited a remote village called Huautla de Jiménez, in the State of Oaxaca, Mexico, in 1937, 1938, and 1939. He had published the two papers in 1939 and 1940. [4,5] The mushrooms were called *teonanácatl.* The Spanish interpreted this as meaning "God's flesh." This translation contributed to their claim that the mushrooms mocked the Eucharist. Wasson [6] suggested that a more-accurate translation was "wondrous or sacred mushroom," reflecting the vision-inducing qualities that provided deep spiritual insight and inspiration, traits that may have led to it being revered by the Mazatec Indians.

In 1953, Wassen visited the village during the rainy season when the mushrooms sprouted. This was the first of 10 visits he made to the region. In 1955 he asked Allan Richardson, a professional New York photographer, to join him to record the events of the journey. They met Maria Sabina, a *curandera,* or shaman, in a remote village in the state of Oaxaca. She was a *sabia,* or wise woman, a living representative of a lineage of shamanic healers reaching back to the pre-Conquest time. She was 60 years old and had been practicing her art secretly in her tiny village, known only to a very few. She was the guide for the session known as a *veladas.* Wasson described the beginning of the veladas as follows:

> We were mindful of the drama of the situation. We were attending as participants in a mushroomic supper of unique anthropological interest, which was being held pursuant to a tradition of unfathomed age, possibly going back to the time when the remote ancestors of our hosts were living in Asia, back perhaps to the dawn of man's cultural history, when he was discovering the idea of God. [7]

After they were into the session Wasson described what he saw and felt as follows:

> …geometric patterns, angular not circular, in richest colors, such as

> might adorn textiles or carpets. Then the patterns grew into architectural structures, with colonnades and architraves, patios of regal splendor, the stone-work all in brilliant colors, gold and onyx and ebony, all most harmoniously and ingeniously contrived, in richest magnificence extending beyond the reach of sight, in vistas measureless to man.…They seemed to belong…to the imaginary architecture described by the visionaries of the Bible. [7]

Their experiences were described in the book that Wasson and his wife had worked on for years, called *Mushrooms, Russia and History.* [7] The book came out in a limited edition issue of only 512 copies. A separate account simultaneously appeared in an article Wasson wrote for *Life* magazine. [8] Both the book and the magazine were released on May 13, 1957. The article in *Life* caused a sensation and played an important role in launching the psychedelic revolution of the 1960s. It resulted in thousands of hippies trekking off to the mountains of Oaxaca in search of their own nirvana. This was a source of great displeasure to Wasson, who felt that the crass search for a drug high disrespected the spiritual and religious nature of the *veladas.*

To identify the nature of the entheogenic substance, Wasson sent samples of the mushrooms used in the Maria Sabina sessions to Albert Hoffman, the Sandoz chemist who discovered LSD and its mind-altering properties. He used himself and his lab assistant as the bioassay, ingesting the different analytical fractions until he had purified the active ingredient that he identified as *psilocybin. Psilocybin* is a very stable compound, due to the presence of an attached protective phosphorus group. After ingestion, enzymes remove the phosphorous group, producing *psilocin. Psilocin* is identical to DMT except that it has a hydroxyl (OH) group in the 4 position making it 4-hydroxy DMT. Wasson brought Hoffman back with him on one of his trips to revisit Maria Sabina and gave her some of this pure, synthetic *psilocybin.* She told him that the effect was the same as eating the mushrooms. There are no reports that psilocybin is addictive or causes psychological dependence or tolerance.

In 1974 Wasson wrote of his experiences among the Mazatec Indians in a book entitled *Maria Sabina and her Mazatec Mushroom Velada.* During her *veladas* Maria Sabina would sing and chant for hours with percussive clapping and slapping of her hands. To portray a fuller account of the experience, the publication also contained recordings of Maria during these sessions. [9] Of the many books that Wasson wrote, he characterized this as the one that brought him the most joy.

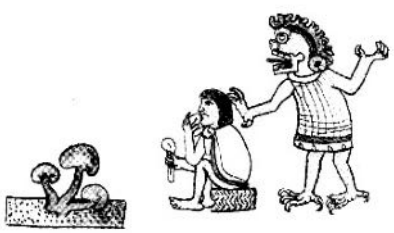

Figure 2. Mexican drawing of the sixteenth century showing three mushrooms, a man eating them, and a god behind him, who is speaking through the mushroom. From Gordon Wasson's 1957 article in Life *magazine.* [8]

In addition to being spiritual guides, one of the shaman's primary duties is to heal. This healing ability was not primarily due to their own healing skills.

They used the magic mushrooms to gain access to the gods, who then used the shaman as a conduit through which healing could take place. This is illustrated in Figure 2.

Following the intense interest in psilocybin, it was found that over 180 species of mushrooms and many other plants around the world contained this compound. [10-12] While *Psilocybe mexicana* is the most popular mushroom in Mexico, *Psilocybe cubensis* (Figure 3), originally called *Stroharia cubnensis,* the starborn magic mushroom, is the most widely cultivated psilocybin mushroom in the world.

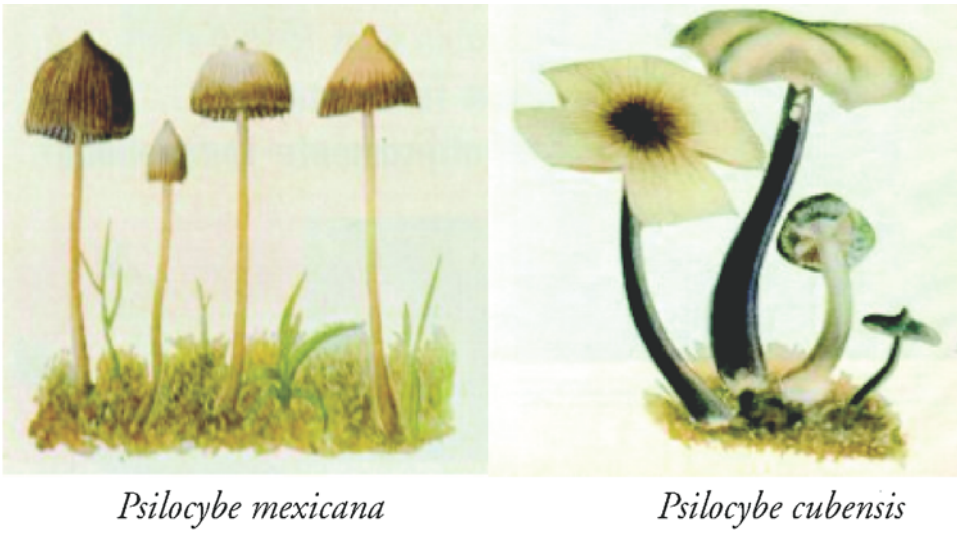

Figure 3. Two common psilocybin-containing mushrooms. From Wasson, Life *magazine 100: 1957.* [8]

While the species of the mushroom is not known, Algerian cave paintings, dating into the Paleolithic period as far back as 9,000 BCE, show human-like figures with mushroom images all over their bodies (Figure 4). [13,10]

This is strong evidence that mushrooms were known and used in a mystic manner at the very beginning of human history. Wasson [14] suggested that the accidental ingestion of an hallucinogenic plant, probably a mushroom, constituted human beings' earliest encounter with the concept of deity, God and the supernatural. This idea was later restated in a different fashion. [6]

Figure 4. Cave painting of Bee-Head Mushroom Goddess, from the Round-Head Culture 9,000 to 6,000 BCE, from the Tassili Plateau of Algeria. Drawing by Kathleen Harrison. From Ralph Metzner. [2]

In the lives of us all, even those who are most earthbound, there are moments when the world stops, when the most humdrum things

> suddenly and unaccountably clothe themselves with beauty, haunting and ravishing beauty. It now seems to me that such flashes must emerge from our unconscious well where our visions have all this time been stored, for the mushroomic visions are an endless sequence of those flashes.…What an amazing thing that we should all be carrying this inventory of wonders around with us, ready to be tripped into our conscious world by mushrooms! Are Indians far wrong in calling these divine? We suspect that in its fullest sense, the creative faculty, whether in the humanities or science or industry, that most precious of man's distinctive possessions and the one most clearly partaking of the divine, is linked in some way to the area of the mind that the mushrooms unlock.

This article, written decades ago, was prophetic to the concept elaborated in this book that the temporal lobes serve as man's spiritual brain and carry within them a spirituality that can be unlocked by intrinsic and extrinsic agents. In addition, the *Life* article spoke of the theme of the independence of the rational and the spiritual brain when Wasson stated that, "the effect of the mushrooms was to bring about a fusion of the spirit with the rational side of the brain continuing to reason and to observe the sensations that the spiritual side is enjoying."

Ayahuasca and the Amazon Basin

Ayahuasca (EYE-a-wass-ca) is a hallucinogenic brew made up of two distinct Amazonian plants. The first, *Banisteriopsis caapi*, contains three different β–carbolines: harmine, harmaline, and tetrahydroharmine, all of which act as inhibitors of the enzyme monoamine oxidase (MAO). The second is *Psychotra viridis*, containing the psychedelic drug DMT, described in the chapter on the spiritual brain. When taken orally, DMT by itself has no psychedelic effects because MAO rapidly destroys it in the stomach. When taken with β–carbolines, the destructive action of the MAO is inhibited for about eight hours and the DMT can have its full psychedelic effect. Huasca means vine, and aya means soul or spirit. Thus ayahuasca is considered the "vine of the soul" or "the vine of the spirit."

Native *entheogenic* plants are widely used by shamans or priests around the world. Shamanism refers to any practice of spiritual healing and divination, or connecting to supernatural powers, that involves the induction of an altered state of consciousness, called the "shamanic journey." [15] Shamans seek spiritual and healing knowledge from the spirit world. They cultivate a direct perceptual and spiritual relationship with animals, plants, and the Earth itself. In the Northern Hemisphere they generally use music, drumming, and dance. If psychedelics are used, they tend to be derived from mushrooms or cacti. In the Southern Hemisphere ayahuasca is the most powerful and widespread of the shamanic hallucinogens. These *entheogenic* plants provide access to spiritual or transpersonal dimension of consciousness and mystical experiences that are indistinguishable from the classic religious mysticism described in a prior chapter. [15]

Not all of the ayahuasca use in South America involves tribal shamans. Three organized Christian church groups in Brazil use ayahuasca as the central sacrament. These are the *Santo Daime,* the *Barquinia,* and the *União do Vegetal (UDV).* The UDV is currently the largest, with thousands of members and some branches in North America and Europe. Gabriel de Costa, a rubber trapper, founded it in 1954. It can openly use ayahuasca in its ceremony because its leaders convinced the Brazilian government to declare the practice legal when used for religious purposes. Church members come from all walks of life, rural and urban, rich and poor, educated and uneducated. As with all religions, the social aspects involving group worship and celebration with singing and prayer strengthened community bonds and gave its members a sense of participation and belonging. In addition to their drug use, part of their appeal rests in a concern for the worldwide degradation of the ecosystem and biosphere, fostering a revival of the ancient awareness of the organic and spiritual interconnectedness of all life on the planet. In this sense it is "new Animism" plus ayahuasca.

Anthropological evidence, in the form of snuffing tubes and trays, indicates the use of hallucinogenic plants in South American dates as far back as 1,500 to 2,000 BCE. [16] As shown below, this brings the onset of the use of psychedelic substances as spiritual aids to mystic experiences to a comparable time in both the Americans and Eurasia.

Psychological effects of ayahuasca. The elements of the ayahuasca experience include a perception of the separation of the soul from the physical body associated with a sense of flying; visions of snakes and other predatory animals; a sense of contact with supernatural realms; visions of distant cities and landscapes; and a sensation of "seeing" the detailed reenactment of recent unsolved crimes. [17]

Michael Harner, an anthropologist who lived among the Jivaro Indians of the Ecuadoran Amazon, described his experience with ayahuasca as follows: [18]

> For several hours after drinking the brew, I found myself although awake, in a world literally beyond my wildest dreams. I met bird-like people, as well as a dragon-like creature who explained they were the true Gods of this world. I enlisted the services of other spirit helpers in attempting to fly through the far reaches of the Galaxy. Transported into a trance where the supernatural seemed natural, I realized that anthropologists, including myself, had profoundly underestimated the importance of the drug in affecting native ideology.

The healing aspects of ayahuasca. In addition to being a guide for the spiritual and psychedelic aspects of the use of ayahuasca, the shamans were also healers. As with the users of the psilocybin mushrooms, the shamans took the drug, sang the songs and performed the rituals to evoke the spirits which then did the healing. In the healing rituals, the spirits are referred to as "allies" and "helpers" to remove the bad or malevolent spirits. The set and setting of the ritual was as important as the ayahuasca.

Because the shamans often seemed to enjoy exceptional health and long life, in

1992 Dennis McKenna and colleagues began a study of the effect of ayahuasca use by the UDV. Fifteen long-term ayahuasca users and 15 matched control non-users were studied using a range of psychological and psychiatric tests. They found that long-term users commonly underwent experiences that changed their lives and behavior in a positive and profound way, similar to the effect of near-death experiences. Since joining the UDV they felt they had undergone a personal and spiritual transformation. On the psychological tests they appeared to be more confident, relaxed, optimistic, uninhibited, outgoing, and energetic. [17] This was not a reflection of a pre-existing personality, since prior to entry into the UDV they described themselves as impulsive, disrespectful, angry, rebellious, and aggressive. In laboratory tests there was a persistent elevation of serotonin uptake by receptors in the platelets, possibly the result of a DMT-induced elevation of serotonergic activity in the brain.

This study showed that the regular use of ayahuasca, at least within the context of the ritual and supportive environment of the UDV, appeared safe and without long-term toxicity. [19] An interesting finding was the low level of alcoholism and drug abuse among the UDV members. The authors felt that these results were not necessarily due to the ayahuasca alone, but to a partaking of ayahuasca within the ritual context of the UDV ceremonial structure. In this regard, the results, at least with alcohol and drug abuse, are similar to those obtained with the spiritually based 12-step programs to treat alcoholism and drug use, or to belonging to other more familiar religious groups that include prescriptions against alcohol or drug use.

Figure 5. Peyote cactus. [19a]

Mescaline, Peyote, and the Native American Church

Peyote, *Lophophora williamsii,* is a small, round cactus with fuzzy tufts instead of spines. The above-ground portion, containing a single white cactus flower, is the drug-containing "button" that is cut and eaten either fresh or dried (Figure 5).

The active psychedelic ingredient is mescaline. Unlike all the other entheogens, which have a structure similar to serotonin, the structure of mescaline is more closely related to dextroamphetamine. Its effects, however, resemble those of psilocybin, producing profound sensory alterations, a heightened sensitivity to sound, color, and textures, and exhilaration. Its effects last about 24 hours. Like the sacred mushrooms, peyote has a long history of use both as a medicinal and entheogen. Its first use was documented 400 years ago among the Aztecs. The Spanish invaders saw its use as a crime against God, punishable by death. Despite these

attempts at suppression, the religious use of peyote is more widespread today than any of the other entheogens. It is considered divine by the Indians representing a messenger that allows them to directly communicate with God and cure all bodily and spiritual ailments.

Most peyote ceremonies consist of much drumming, singing, prayer, and story telling. Deeply meaningful and highly personalized inspirational revelation is often a very important part of the individual's experience. Mutual participation in the ceremonies often results in lifelong friendships. [20]

In the late 1800s, the great herds of animals on which the Indians depended for food had been killed off, and the Indians were defeated and decimated by starvation and disease. Those remaining were herded into reservations. During this time of impoverishment and hopelessness, the ancient peyote ceremony began to make a comeback. This was related to the ability of the peyote ceremony to provide the sensation that something is being done to and for the individuals, providing them with a feeling of power.

By the turn of the century over 50 different tribes had begun using peyote in sacramental ceremonies. One of several important leaders in this movement was James Mooney, a Smithsonian Institute archeologist. He had participated in peyote ceremonies and became convinced that it was such an important part of their culture that the Indians needed new laws to protect their right to use peyote in religious ceremonies. He helped them found and incorporate the Native American Church. This church blended ancient Indian rituals, peyote ceremonies, and Christian theology. The peyote ceremonies were not a constant component of the services but tended to be called about once a month at times of particular need such as the failing health of a member or other more joyous occasions. Laws banning peyote use were enacted in 11 southwestern states but were generally not enforced. In 1960, an Arizona Judge ruled that Native Americans were guaranteed access to the peyote sacrament under the first and fourteenth amendments of the constitution. The Native American Church currently has an estimated 250,000 members across many states and provinces in the United States and Canada.

Amanita muscaria, Soma, and Hinduism

Amanita muscaria is a beautiful and striking mushroom with a brilliant red cap covered with white specks. It has also been called the *Sacred Mushroom* (Figure 6).

In the English speaking world it was known as *fly-agaric* because it attracts flies. Maggot infestation is one of the most common reasons for making the mushroom inedible. Since it grows in association with the rootlets of certain trees, it is found in the mountains and only in areas where there are trees, especially birch, and only when there is rain. It contains several psychedelic compounds, including ibotenic acid and muscimole. The dried form is more hallucinogenic and less poisonous. When a gram or more is consumed the symptoms include relaxation, drowsiness, decreased blood pressure, increased sweating and salivation, changes in mood, euphoria, and hallucinations. In higher doses it can cause agitation as well as hallucinations. Death

Figure 6. Amanita muscaria psychedelic mushroom. From Allegro, The Sacred Mushroom and the Cross. [21]

is very rare. The deadly reputation of the *Amanita* is due to other species such as *Amanita virosa* (the Destroying Angels).

A property that is almost unique to *Amanita muscaria* relates to aspects of the metabolism of ibotenic acid. A carboxyl radical is removed, yielding muscimole. This process occurs in the liver and is very inefficient. About 80 percent of the ingested ibotenic acid passes through the body to the urine. As a result, the urine of a person who has ingested *Amanita muscaria* is itself intoxicating, and the urine of someone who drinks this urine is also intoxicating. This can be cycled several times before its potency is lost. This property would allow the priest or shaman to consume the mushrooms, suffer the unpleasant side effects and let the rest of the tribe drink his urine containing a detoxified version of the fly-agaric.

Interest in the potential role of *Amanita muscaria* in religion was initiated in 1968 with the publication of Wasson's book, *Soma, the Devine Mushroom of Immortality.* [22] He proposed that *Amanita muscaria* was used as a spiritual lubricant from the earliest beginnings of civilization, was the *Soma* of the Hindu Rig-Veda scriptures, the *Mukhomor* of the Siberian plains, and the *amrita* of Buddhist scriptures. Based on his studies, others have suggested that Soma also played a significant role in the early development of Judaism and Christianity.

Wasson reported circumstantial evidence that Soma was commonly imbibed in very ancient times, long before the advent of literacy. He proposed that it was an inebriant as far back as the period of 6,000 to 4,000 BCE, when Uralic, the precursor to over a dozen Eurasian languages, was spoken. It evoked religious adoration, and in the second millennium BCE was brought onto the Iranian plateau and to the Indus Valley. Wasson stated that fly-agaric was:

> …a plant that could be plausibly named the Herb of Immortality responding to one of man's deepest desires in the early stages of his intellectual development. The superb fly-agaric gave him a glimpse of horizons beyond any that he knew in his hardy struggle for survival of planes of existence far removed and above his daily round of besetting cares. It contributed to the shaping of his mythological world and his religious life.

It is thus not surprising that fly-agaric was positioned to play a central role in the

development of both western and eastern religions. In this regard, Wasson provides an intriguing explanation of the origin of some of the ideas that have been central to all great religions. In Siberia and other northern regions of Eurasia, where the Aryans originated, the tall Siberian birch, with its delicate dancing foliage and its dazzling white bark, was a thing of ethereal beauty. The roots of the birch tree were also the primary source of fly-agaric and of a second fungus, *Fomes fomentarius,* the source of punk, or touchwood, the primary tinder that catches the spark from a fire-drill and bursts into flames. Punk also had a mystical role in that in many primitive societies the procreation of fire was analogous to the sex act. This and a related word, *spunk,* for semen, still carry various erotic meanings. Wasson comments that:

> The birch, parent to both fly-agaric and punk, naturally held pride of place as the Tree of Life, providing punk, the key to fire for the body, and in the fly-agaric for the soul.

He further suggested,

> The peoples who emigrated from the forest belt to the southern latitudes took with them vivid memories of the herb and the imagery. The renown of the Herb of Immortality [Tree of Knowledge] and the Tree of Life spread by word of mouth far and wide, and in the South [except in the mountains] where the birch and the fly-agaric were little more than cherished tales generations and thousands of miles removed from the source of inspiration, the concepts were still stirring the imaginations of poets, story-tellers, and sages.

These poets and story-tellers very likely included those who wrote the Bible and other religious works where the concepts of a Tree of Life, the fruit of that tree, the Tree of Knowledge of Good and Evil, the Pillar of the World, the Cosmic Tree and of Immortality — all hold a central place and stem back to the birch tree and fly agaric. A prominent example is the Biblical account of Adam and Eve and the Garden of Eden. This myth states that God planted two magical trees in paradise, the Tree of Life and the Tree of Knowledge of Good and Evil, and instructed Adam not to eat the fruit of the Tree of Knowledge. This would result in enlightenment, a passing from darkness into light, knowledge of good and evil, raising them above the level of animals into God-like qualities, and signaling the sinful end of innocence. It was suggested that the forbidden fruit may have been the Sacred Mushroom which when eaten produced just such a sense of connection with divine knowledge. This concept is represented in the fresco painting in the church of Plaincourault in France, where the *Amanita muscaria* is gloriously portrayed, entwined with a serpent, while Eve stands by holding her belly (Figure 7).

Despite the fact that these figures even show the white speckles on top of a red crown, typical of the Devine Mushroom, some art historians have denied the proposal

Figure 7. A Christian fresco showing the Amanita muscaria as the Tree of Knowledge of good and evil in the Garden of Eden. From Wasson, Soma, the Devine Mushroom of Immortality.[22] *Copied by Mme. Bory of the Laboratoire de Crypto-gamie, Museum National d'History Naturelle, Paris.*

by mycologists that this figure represents *Amanita muscaria.* Wasson suspects the mycologists were more likely have had it right.[22]

The Soma of Hinduism. When the Aryans swept into the Indus valley 3,500 years ago bringing with them the Vedas and the origins of Hinduism, they also brought magical religious ceremonies based on the cult of Soma. This cult used hallucinogenic plants, but which plants were involved remained a mystery until the publication of Wasson's book. Others investigating the source of Soma had used modern texts. This produced no clear answers. Wesson's approach was unique. He knew that the use of Soma had died out many centuries ago. Thus, to obtain clues to its nature he felt it only made sense to examine religious texts written at the time that Soma was actually used. These were the Rig Veda that dated before 4,000 BCE and represented the earliest written form of Sanskrit mantras. Of more than 1,000 holy hymns in the Rig Veda, 120 were devoted exclusively to Soma. Wasson based his conclusion that the Soma drink of the Vedic Aryans was made from the red and white *Amanita muscaria* mushroom on the following pieces of evidence taken directly from those verses.

1. The verses spoke of a plant that has neither seed nor blossom nor leaf nor root. The only plants with these characteristics were mushrooms.
2. Vedic synonyms for Soma included terms such as *aja,* meaning "one-foot," suggestive of mushrooms.
3. The Rig Veda described the soma-plant as "tawney," meaning brown. This is the color of the dried *Amanita muscaria* mushroom, its most psychoactive and least toxic form.
4. The Rig Veda constantly referred to the fact that the plant for Soma came from the mountains. This is where the birch trees, whose roots are necessary for the *Amanita muscaria* to grow, are found.
5. The verses refer to Soma as the child of thunderstorms. The fly-agaric often sprouts overnight following a rainstorm.
6. The verses referred to the two forms of Soma: a form that was taken directly, and a form that was taken in the form of the urine of any person who had ingested the mushroom. One verse spoke of the Soma from the "piss of swollen men."

These and many other clues in the ancient Rig Veda verses clearly identified *Amanita muscaria* as the source of the Soma. As Wasson stated: "The hymns of the Rig Vega fit the fly-agaric like a glove."

Soma so impressed the Indians that it became a god in its own right. Thus it was at the same time a god, a plant, and the juice of that plant. The ancient traditions recorded in the Rig Veda assert that Paranja, the god of thunder, was the father of Soma. This makes great sense because the mushroom seems to magically appear after thunderstorms. To understand these verses it is important to know there were three major gods in the Rig Veda: *Agni,* god of fire, *Soma,* moon god and personification of the soma drug, and *Indra,* who enjoyed the effects of soma and became more god-like in the process. These three gods form the basic elements of a fire-ritual in which Agni represents the sacrificial flames, Soma the sacrificial offering, and Indra the celebrant rendered divine by the soma. The following two verses illustrate some of the ways the Rig Veda refers to Soma:

> Rig Veda 9.113.4 Where there are joys and pleasures, gladness and delight, where the desires of desire are fulfilled, there make me immortal. O drop of Soma, flow for Indra.

> Rig Veda 9.113.7 We have drunk the Soma; we have become immortal; we have gone to the light; we have found the Gods. What can hatred and malice of mortals do to us now, O immortal one?

The Soma plant was a condensed God. Not only was Soma drinking condoned, it was the only way to guarantee entry into heaven. Patrons could pay for costly Soma sacrifices and thereby ensure their place in the everafter. Those who pressed out its intoxicating blood and drank it felt God come to life within them and were lifted up in spirit to the heavenly realms of endless light. [23] The use of Soma ended about 2,500 years ago and with it the Soma sacrifices. This was likely to have been due to an increased difficulty in obtaining it. As a result the Brahmins were forced to devise new ways to offer salvation to keep their followers. Brahminism developed as a replacement a set of complex scriptural injunctions, rituals that only Brahmin priests could administer, thus assuring their place in the spiritual life of the average Indian. It was proposed that *the widespread practice of yoga served as a Soma substitute for attaining access to the soul and that the effects of both were similar.*

The Amrita of Buddhism. *Amrita* is the Buddhist equivalent of soma. It is Sanskrit for "elixir of immortality" and literally means "deathlessness." It is similar to the Greek word *ambrosia,* which means "food of the gods" and "no death." *Amanita muscaria* was used by the practitioners of Vajrayana Buddhism during the period between 500 and 1,000 CE when Buddhism was introduced to Tibet, where it became the state religion.

The Soma of Siberia. The use of fly-agaric was widespread in northern Eurasia and has still been used in recent times in Siberia. There is a rich literature presenting

different aspects of this use. In 1900 Karl von Ditmar provided the following description of fly agric use by the Koryak tribe. [22p156] *Mukhomor* is the name for Siberian Soma.

> Mukhomor eaters describe the narcosis as most beautiful and splendid. The most powerful images, such as they never see in their lives otherwise pass before their eyes and lull them into a state of most intense enjoyment. Among the numerous persons who I myself have seen intoxicated in this way, I cannot remember a single one who was raving or wild. Outwardly the effect was always thoroughly calming — I might almost say, comforting. For the most part the people sit smiling and friendly, mumbling quietly to themselves, and all their movements are slow and cautious.

In 1809 Georg Heinrich von Langsdorf had provided another view of the habits of the Koryak tribe: [22p248]

> The Koryaks have known since time immemorial that the urine of a person who has consumed fly-agaric has a stronger narcotic and intoxication power than the fly-agaric itself and this effect persists for a long time after consumption. For example, a man may be moderately drunk on fly-agaric today and by tomorrow may have completely slept off this moderate intoxication and be completely sober; but if he now drinks a cup of his own urine, he will become far more intoxicated than he was from the mushrooms the day before. It is not at all uncommon, therefore that drunkards who have consumed the poisonous mushroom will preserve their urine as if it were a precious liqueur and will drink it as the occasion offers.

The urine can also be consumed by others, transmitting the effects of the same mushroom to many individuals. Many of the shamans, previous to their séances, eat fly-agaric in order to get into ecstatic states. Then, through their urine, this effect may be transferred to their followers who receive its benefits with fewer side effects.

While agreeing with Masson that Soma was derived from mushrooms, Terrence McKenna [24] suggested the mushroom involved was *Psilocybe (Stroharia) cubensis,* the world's most common psilocybin-containing mushroom. In India it frequently grew on cow dung.

Mushrooms and western religion. Two years after Wasson's book on Soma appeared, John Allegro published *The Sacred Mushroom and the Cross.* [21] He proposed that a secret mystic fertility sect in ancient Sumeria used *Amanita muscaria* and played a role in the spiritual beginnings of Judaism and Christianity. He suggested that certain passages were inserted into the Bible to transmit information about this secret sect to its scattered followers.

Allegro was not some crackpot new age dopehead. He was a lecturer in Old Testament and Inter-Testamental Studies at the University of Manchester. He was appointed the first British representative on an international team given the responsibility of translating and editing the Dead Sea scrolls for publication. The resulting book sold over a quarter of a million copies. He was a linguist and understood the subtle meaning of ancient Aramaic words, the language of the time of Jesus.

As pointed out in the last chapter, civilization began around 4,000 BCE in Sumeria, the region around the Tigris and Euphrates rivers. Some of the first writing consisted of wedge-shaped cuneiform letters. These were the precursors of Hebrew, Aramaic, and Arabic. The cuneiform method was well suited to the alluvial soil of the area, providing an abundance of fine clay that could be moistened and shaped into writing tablets. The early alphabetic writing was used to express only the harder consonantal sounds, while the softer vowels were left to be inserted according to the most likely intended meaning of the word. The full use of vowels was not introduced until the Christian era. This often left considerable doubt about the precise meaning of passages of the Bible. Syllables were made up of word-bricks which resisted phonetic change over time. These could be joined together to make phrases and sentences. Thus, understanding of the early Sumerian language made it possible to trace the Indo-European and Semitic verbal roots and begin to decipher the name of Gods, heroes, plants, and animals appearing in cultic mythologies. [21]

A number of these word-bricks related to concepts about fertility, which in turn were associated with God and the Word of God as the all-powerful creator of life. Because of the central role of fertility and creation, phallic designations were given to many of the Sumerian, Greek, and Semitic gods, tribal ancestors and heroes. The word Yahweh for God meant "the seed of life." The Sumerian phoneme *U,* referring to fertility and creation, was "the most important phoneme in the whole of Near Eastern Religion." The seed of God, in whatever form, was supremely holy. The terms *curse* and *sin* were derived from the idea of "seed running to waste," so sin in essence meant to "make ineffective." By contrast the term "faith" meant the opposite, to "make effective."

Allegro proposed that many of the classical and biblical stories were based on pieces of vegetation and on the sacred mushroom in particular. Its hallucinogenic properties and phallic appearance formed the basis of mystical fertility cults in the Near East that persisted for thousands of years. Allegro suggested the writers of the Bible were playing with forms of words that have subsequently become lost over the centuries, and in many cases the original words referred to the sacred mushroom. As an example of this word play he suggested that the Biblical phrase,

> *And I will give unto thee the keys of the kingdom of heaven.*
>
> *Matthew 16:19*

was based on the term *bolt* or *key,* referring to the sacred fungus, and the kingdom of heaven to its hallucinogenic ability to open the way to new and exciting mystical

experiences. [21p47] Another example was the passage that likens the kingdom of heaven to a mustard seed.

> *Another parable put he forth unto them, saying, The kingdom of heaven is like to a grain of mustard seed, which a man took, and sowed in his field.*
> *Matthew 13:31*

This appears to be based on the Semitic *khardela* for "mustard," and *ardila* for "mushroom," such that the whole discussion stems from a play on the word for the secret mushroom.

Allegro suggested that the virgin birth of Jesus had its symbolic origin in the magical way in which mushrooms suddenly appeared "without seed" from God following thunderstorms and rain. The baby that resulted from this divine union was thus the "Son of God," and was more truly representative of its Heavenly Father than any other form of plant or animal life. [21p55]

In summary, based on a detailed knowledge of the subtle aspects of Aramaic, an ancient language of the time of Jesus, Allegro proposed that the plant mythology and terms that existed over the thousands of years of the ancient world provided the New Testament cryptographers with "cover" to pass on information about a secret fertility sect revolving around the hallucinogenic properties and sexual symbolism of the sacred mushroom, *Amanita muscaria.* Based on his reading of the Dead Sea Scrolls, Allegro proposed that Christianity was a derivative religion, in that a hundred years before Jesus, a "Teacher of Righteousness" was crucified for similar teachings. He proposed that this proto-Jesus was reinvented around 30 CE to appeal to Gentiles in a time of persecution by Rome and the orthodox Jewish priests. "It was the obvious device to convey to the scattered cells of the cult, reminders of their sacred doctrines and incantatory names and expressions concealed within a story of a "second Moses," another lawgiver, Joshus (Greek *Iesous,* "Jesus"). Thus was born the Gospel myth of the New Testament."

These ideas were not shared by his colleagues, and Allegro met with severe criticism for his views, considered blasphemous by many. However, elements of the story remain plausible, and all parts of this chapter illustrate the potential role of hallucinogenic mushrooms in the early spiritual stirrings of mankind. Despite the unpopularity of these proposals, Clark Heinrich expanded upon them in his 2002 book, *Magic Mushrooms in Religion and Alchemy.* [23] Wasson had eaten samples of *Amanita muscaria* without experiencing any of the spiritual experiences attributed to the mushroom. This led him to wonder if there was some secret to its preparation. Heinrich experimented extensively with ingesting a range of preparations of *Amanita muscaria.* He found that drying the mushrooms before ingestion dramatically decreased the undesirable side effects. Independent of the unpleasant side effects, he felt a tremendous vitality, as though he could conquer the world. Others felt a powerful urge to speak about the godliness and wonderful power they were experiencing, with a sense that what they said was the absolute truth and was spoken

with conviction, passion, and eloquence. The elation and euphoria became amplified to the point of bliss. [23p17] The mushroom can also have an anti-hallucinogenic effect in which one sees things exactly as they are without mental overlay, mimicking the yoga-induced cessation of thought in the mind. This results in a tremendous increase in consciousness, as though one's brain has been subsumed by the mind of God.

During one period of 30 days, Heinrich and a friend ate the dried mushroom every day. For most of the time they felt immense energy, strength, spirituality, occasional sickness, and frequent euphoria, but being taken into the blissful light eluded them. Then, near the last day, following the lead of the Shamans and Indian priests, they decided to drink their own urine. Surprisingly it had a pleasant fragrance. He reported that:

> Within minutes after drinking something amazing started to happen. My body began to feel very light, as though I weighed almost nothing. It felt as if the molecules that comprised my body were separating and allowing air to pass between them, or that I could feel the space between the atoms. I became aware of tremendous energy at my feet that rose up through my body in wave after wave. "Feeling good" was rapidly changing into the most blissful feeling I had ever experienced. My mind and entire body were in the throes of a kind of meta-orgasm that wouldn't stop — not that I wanted to.

With these experiences in mind, Heinrich was particularly intrigued by how Allegro's proposal of the existence of a mystical mushroom-based sect could explain some of the most puzzling aspects of the Biblical accounts of Abraham, Moses, and Yahweh. Many of these get pretty bizarre and I leave those who are interested to read them for themselves. I will list just one — his take on circumcision.

It is not inherently apparent why God would ask Abraham to cut off not only his foreskin but the foreskin of all his descendents and anyone else who came into his household even if not related. This was ostensibly so the resultant scar would prove to everyone forever that Abraham and God had made a special holy covenant. But wouldn't a cut on the wrist, or forehead, or some type of a tattoo, been less mutilating and easier for others to see? Why circumcision? As Heinrich stated: "I don't have a foreskin today because someone almost four thousand years ago was in the throes of a paranoid delusion and everybody went along with him. I can hear the men and boys even now: 'Great idea Abraham! Let's all mutilate our penises!' "

Heinrich suggested that the idea was actually traceable to the mushroom cult. *Amanita muscaria* with its thick shaft and bulbous red head is the ultimate phallic symbol. As the sacred mushroom grows it causes the veil to separate and fall off, revealing a smaller bulb underneath, a form of mushroom self-circumcision producing a plant version of a circumcised penis. Worshipers may have wanted a way to identify other members of their secret sect and wanted their penises to look like the shaft and the concealed bulb of the sacred mushroom.

While the speculations of John Allegro and Clark Heinrich may seem singularly sacrilegious to many, there is none-the-less extensive evidence that psychedelic plants are found in virtually all parts of the world and that they played an important role in the development of religious beliefs in the Americas, Europe and Asia. Their effect on the mind of man was so powerful and so spiritual that they have been given the name *entheogenic,* meaning *God generated within.* Archeological evidence indicates they have been with mankind from its earliest beginnings and have played a major role in the development of his spiritual evolution. It is likely that without them man's belief systems and religions might be entirely different from what they are now. Wasson [25] summarized well the symbiotic relationship between sacred mushrooms and the spirituality of humans:

> As man emerged from his brutish past, thousands of years ago, there was a stage in the evolution of his awareness when the discovery of a mushroom with miraculous properties was a revelation to him, a veritable detonator to his soul, arousing in him sentiments of awe and reverence, and gentleness and love, to the highest pitch of which mankind is capable, all those sentiments and virtues that mankind has ever since regarded as the highest attributes of his kind. It made him see what his perishing mortal eye cannot see.…What today is resolved into a mere drug…was for him a prodigious miracle, inspiring in him poetry and philosophy and religion.

Many different plants around the world contain a range of psychedelic drugs which are capable of strongly augmenting man's innate capacity for spirituality. They do this by providing a powerful feeling of communication with a supernatural power. It is not at all unlikely that these entheogens (god-producing substances) played a profound and critical role in facilitating man's early belief in a god or gods and in the development of his religions.

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The Lord God has chosen you to be a people for His own possession, out of all the peoples that are on the face of the earth.

Deuteronomy 7:6

The scandal of particularity is the root of all religious evil.

John Horgan
Rational Mysticism

Chapter 47

Does God Play Favorites?

The Jews claim they are the "chosen ones." The Muslims claim their Allah is "the only true God." Evangelical Christians claim that only those who are "born again" will be taken by the Rapture into heaven and the rest of the world will be lost in years of tribulation. In wars each side prays for a victory. At a more mundane level, before sports events each team prays that they will win. All of these events assume that *God plays favorites.* They assume that God has a personal investment in one religion over another, for one combatant over another, for one team over another, as though He was keeping a moral scorecard on all human activities. In *The World's Religions,* Huston Smith called this characteristic of religion the "Scandal of Particularity." [1p308]

The Chosen People. The above quote from Deuteronomy is the source of the conviction that the Jews are the "chosen people." While this would seem to be a wonderful position to be in, an alternative rabbinic view is that God offered the laws of the Torah to the world at large but only the Jews were willing to accept its rigors. [1] As a result the Jews were also elected to shoulder an enormous load of suffering that would otherwise have been shared by the rest of the world. In this sense being the chosen people had a distinct downside.

It is understandable that, since the Jews were the first people on earth to ascribe to the view of monotheism, God would be quite pleased with them, and since Abraham was willing to suffer persecution for this belief, God chose Abraham and his descendents to teach monotheism. It may be more accurate to say that the Jews chose God than to say that God chose the Jews.

Many Jews are uncomfortable with this designation because it is mindful of the Nazi concept of a supreme, superior Aryan race. Nonetheless, many are undoubtedly pleased, and some non-Jews would like to share in the distinction. For example, the Mormon Church claimed their members were descended from the Hebrews so they could share in the distinction of being among the chosen ones. Also, as illustrated in the following section on the Rapture, fundamentalist Christians have even incorporated the fact that the Jews were God's chosen ones into a portion of their plans. A skeptic might say this designation was proof that the Bible was written by

men, not God. Since the men that did the writing were Jewish, they seized upon this unique opportunity to claim favored status with God.

Islam and the Infidels. The Qur'an (Koran) states,

> "O Prophet, struggle with the unbelievers and hypocrites, and be thou harsh with them."
>
> *Qur'an 9:73*

When Mohammad asked Allah for permission to fight them, permission was granted. Thus, Muslims believe that Mohammad was given a divine command to fight against people, not in self-defense but because infidels do not worship Allah. As long as they paid their taxes, Jews and Christians were exempt, but idol worshipers, including Muslims who were not believers, could be forced to embrace Islam.

> "Slay the idolaters wherever you find them."
>
> *Qur'an 9:5*

> "The unbelievers among the People of the Book [other religions] and the pagans shall burn forever in the fire of Hell. They are the vilest of all creatures."
>
> *Qur'an 98:1-8*

There are many other verses in the Qur'an that speak of religious tolerance and of granting asylum to those who ask for it. Nonetheless Islamic writings carry the clear implication that Allah favors the believers in Islam and has little tolerance for infidels. In the hands of extremist fundamentalists, this forms the basis of Islamic terrorism. Muslims are not alone in fostering the belief that one's own religion is the best religion. The Rapturists are just as adamant in their belief that God plays favorites.

The Rapture. Some fundamentalist Christians believe in the Rapture. This is the belief that at any moment a secret rapture will occur such that "born again" true believers who have accepted Jesus Christ as their savior will be swept into heaven, while all the non-believers will be subjected to seven years of a horrendous, hell-like Great Tribulation. When the seven years of hell are over, Christ will return and set up a kingdom of 1,000 years of peace on earth.

Rapturists cite the writings of St. Irenaeus as the beginning of their belief system. In 177 CE St. Irenaeus was appointed bishop of Lyons. His life's work was to combat the Gnostics. The Gnostics were supreme pessimists about the evils of life on earth, and to counter this Irenaeus taught that there would be a thousand peaceful, evil-free years immediately following the Second Coming of Christ. Since the Second Coming of Christ preceded the 1,000 years of bliss, this belief was called *premillennialism.*

An American ex-Anglican priest, John Nelson Darby expanded on this concept. Around 1830 Darby met a 15-year-old girl, Margaret McDonald, who claimed to have had a private revelation about a secret rapture that would occur shortly. By secret

she meant that while the Rapture was initiated by the Second Coming of Christ, at first He did not actually set foot on earth. His return was secret and the raptured ones would "meet Him in the Clouds" and go back to heaven with him. Only a very select group of the most faithful of Christians would be included in this rapture. For the rest of the world this Rapture would usher in seven years of the Great Tribulation. This would end in the defeat of the antichrist and the judgment of Christ's followers. Then a 1,000-year reign of Christ on earth would begin for the benefit of ethnic Jews. After the millennium the enemies of Israel, Gog and Magog *(Ezekiel 38, 39; Revelation 20),* would battle Christ one final time, and the final judgment would begin. The wicked would spend an eternity without any good or God. Those who had responded to God throughout their lives, the righteous, would experience no more death and have eternal life in the presence of God forever.

The widespread dissemination of a faith in the Rapture is partially attributed to the *Scofield Reference Bible,* printed in 1909. This was the most influential study Bible in English and its notes always explained passages from the Rapturists' perspective. [2] Belief in the Rapture is surprisingly common in the United States. In 1970 Hal Lindsey's book, *The Late Great Planet Earth,* sold almost as many copies as the Bible. He predicted that the Rapture was due before the end of the 1980s. While clearly incorrect, later Rapture books such as the *Left Behind* series by Tim LaHaye and Jerry Jenkins have sold more than 50 million copies.

Throughout history Christians have believed the world would see a horrific persecution just before the second coming of Christ. This persecution is attributed to the antichrist, also called the "man of sin," the "son of perdition," and the "man of lawlessness." Much of this comes from *2 Thessalonians 2:3,* where Paul warns that people should not think that the Lord has already come, "for that day will not come, unless the rebellion comes first, and the man of lawlessness is revealed, the son of perdition."

During the Great Tribulation and before the final victory of Christ, the antichrist will take a seat in the Temple of God and proclaim himself to be God. Since this Temple is in Jerusalem, this cannot occur unless the Jews, the Chosen Ones, have retaken Jerusalem. Thus, Rapturists and Christian fundamentalists in general were delighted when the Jews recaptured Jerusalem in the wars of 1948 and 1967. They are staunch Christian-Zionists. It is also necessary that the Jewish Temple be rebuilt; otherwise how could the antichrist claim himself to be God from within that Temple? [2] There can be many antichrists, all the doing of the devil. Fundamentalist Christians often label any politician, any institution, anything they do not approve of as an antichrist. This label has variously been applied to the United Nations and many modern politicians.

Following the defeat of the antichrist, the Lord "shall stand on the Mount of Olives which lies before Jerusalem.…Then the Lord your God will come, and all the holy ones with Him *(Zechariah 14:2-5)*. This accounts for why many fundamentalist Christians have moved to Israel and bought homes in view of the Mount of Olives so they can greet Him upon his return. Christ will then save the Jewish people from extinction.

Some of the implications of the Rapture are astounding. Rapturism is spiritual home for those who think the world is careening out of control. It entails a pessimistic view of the world, but one that the faithful will not have to deal with since they will be raptured into heaven. This view accounts for why many fundamentalists do not participate in the political process. They hold the view, "Why polish the brass on a sinking ship?" They do not believe this world is worth improving. Some even refuse to vote. Based on this view Currie thought that no Rapture believing fundamentalist organization would be able to remain as a long-term political force. [2] But some do get involved in politics. James Watt, the fundamentalist Reagan-era Secretary of the Interior justified the clearcutting of the nation's forests and other anti-environment "Use it or lose it" views based on the statement at his confirmation hearing of, "I do not know how many future generations we can count on before the Lord returns." [2p7]

Other implications are that born-again pilots will be raptured out of their planes leaving the unbelievers to perish in the crash. Doctors and essential civil servants will be gone. Television announcers will suddenly disappear from the screen. One of the powerful methods for recruiting new converts to this form of Christian fundamentalism comes from the statement, "Don't be left behind. Convert now before it is too late." The implied favoritism is the ultimate evangelical proselytizing tool, and it works.

The Seventh-Day Adventists propose even more severe consequences for unbelievers, in that Christ will actually destroy those who are left behind. Instead of a thousand years of Christ's rule in peace and tranquility, for a thousand years only Satan and his angels will be living on earth. A Second Coming then occurs wherein the righteous will be returned to a cleansed earth and establish a New Jerusalem. Hell does not exist as a place of eternal damnation because those who go to hell are burned up, utterly destroyed, and cease forever to exist. [3] The unrighteous who died before the Second Coming will be resurrected and consumed by fire and by God, along with Satan and his angels. The universe will then be free of sin and sinners.

The Rapture and its variants represent the ultimate in God playing favorites. Only the most faithful of the Christians will be raptured. The remaining Christians, all the Jews, Muslims, Buddhists, Hindus, Taoists, and everyone else in the world will suffer in the Great Tribulation or be destroyed outright.

It is a very human trait to want to believe we are special in some way. Many religions imply they are God's favorites and use this assumption to provide believers with an enhanced sense of self-worth and proselytizing fervor. This view is inconsistent with the existence of a fair and impartial God who loves all members of his flock equally. Wanting to be special and better than others is a human wish, not a Godly one. Its use in any context suggests that all claims of favoritism were ultimately of human authorship.

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With or without religion, good people can behave well and bad people can do evil but for good people to do evil — that takes religion.

Steven Weinberg,
Nobel Laureate

Religion is inherently prone to violence.

Hector Avalos
Fighting Words: The Origins of Religious Violence [1]

An only God is by nature a jealous God, who will not allow another to live.

Arthur Schopenhauer [2]

Monotheism has a violent legacy because it "abhors, reviles, rejects, and ejects whatever it defines as outside its compass."

Regina Schwartz
The Curse of Cain. The Violent Legacy of Monotheism [3]

Why do people who are obsessed with good and evil end up murdering innocents, somehow slipping into becoming more evil than the evil they aim to fight?... Purifying the world through murder.

Jessica Stern
Terror in the Name of God [4]

Religious faith represents so uncompromising a misuse of the power of our minds that it forms a kind of perverse, cultural singularity — a vanishing point beyond which rational discourse proves impossible... it is the most prolific source of violence in our history.

Sam Harris
The End of Faith [5]

Chapter 48

The Evils of Religion

If the reader incorrectly believes I am unfairly bashing religion, the chapter immediatly following this is on the Benefits of Religion. I could have placed either chapter first. In essence, both great evil and great good have been done by or in the name of religion. I will address some of the evils first. Many books have been written on the subject. [3-9] Sam Harris summarizes a common theme in *The End of Faith*: [5p13]

> Intolerance is thus intrinsic to every creed. Once a person believes — really believes — that certain ideas can lead to eternal happiness, or to its antithesis, he cannot tolerate the possibility that the people he loves might be led astray by the blandishments of unbelievers. Certainty about the next life is simply incompatible with tolerance in this one.

A few of the numerous examples of violence toward others in the name of God are discussed in this chapter.

The Old Testament

The Bible itself shows that God can be jealous, angry, wrathful, vengeful, brutal, sadistic, murderous, and violent. An example is the story of the exodus from Egypt where God led Moses and the children of Israel to freedom. To force the Pharaoh to let them go, God "slew all the males" and killed "every woman that hath known man by lying with him," killed the kings of Midian, stole all their cattle, flocks and goods, and burned their cities. God also brought on a plague of locusts and darkness *(Exodus 10).* Further on in *Exodus,* "Thus saith the LORD God of Israel. Put every man his sword by his side, and go in and out from gate to gate throughout the camp, and slay every man his brother, and every man his companion, and every man his neighbor. And the children of Levi did according to the word of Moses: and there fell of the people that day about three thousand men" *Exodus* 32:26-28.

God's jealousness is cited in many places:

- "For you shall worship no other god, for the LORD, whose name is Jealous, is a jealous God" *Exodus 34:14.*
- "I, the LORD your God, am a jealous God" *Deuteronomy 5:9.*
- "You shall surely kill him; your hand shall be first against him to put him to death, and afterward the hand of all the people. And you shall stone him with stones until he dies, because he sought to entice you away from the LORD your God" *Deuteronomy 13:9-10.*
- "They shall be wasted with hunger, devoured by pestilence and bitter destruction; I will also send against them the teeth of beasts, with the poison of serpents of the dust" *Deuteronomy 32:24.*
- "Make no covenant with them and show them no mercy.…But this is how you must deal with them: break down their altars, smash their pillars, hew down their sacred poles, and burn their idols with fire" *Deuteronomy 7.*
- Further on, *Deuteronomy 28:23-34* lists many curses for failing to obey the laws of God. They include being afflicted with madness and blindness, being oppressed and robbed, having your wife ravished, your oxen slaughtered, your donkey, sheep, sons, and daughters taken, and in general being continually abused, crushed and driven mad.
- Punishment for misdeeds is often severe. "If no proof of the girl's virginity can be found, she shall be brought to the door of her father's house and there the men of her town shall stone her to death." The penalty for adultery, fornication, and rape is equally harsh. "If a man is found sleeping with another man's wife, both the man who slept with her and the woman must die." "If a man happens to meet in a town a virgin pledged to be married and he sleeps with her, you shall take both of them to the gate of that town and stone them to death. If out in the country a man happens to meet a girl pledged to be married and rapes her, only

the man who has done this shall die" *Deuteronomy 22:20-25.*

In addition to frequent themes of violence, themes of possessing the land also abound in the Old Testament. Foreign marriages and alliances and the belief in the religion of foreigners defile the land. The land must be held in perpetuity with no pieces cultivated by foreigners. In *The Curse of Cain. The Violent Legacy of Monotheism,* Regina Schwartz [3] concluded that since the bulk of biblical narratives was composed by a dispossessed people, their myths of conquest were fantasies of victory over the oppressor. Since God has no need of land, these parts of the Bible were clearly the product of man.

Richard Dawkins summarized this God as follows: [9a]

> The God of the Old Testament is arguably the most unpleasant character in all fiction: jealous and proud of it; a petty, unjust, unforgiving control freak; a vindictive, bloodthirsty ethnic cleanser; a misogynistic, homophobic, racist, infanticidal, genocidal, filicidal, pestilential, megalomaniacal, sadomasochistic, capriciously malevolent bully.

Again, such a listing of particularly human traits supports the probability that man, not God, wrote the book.

The New Testament

It is often assumed that the God of the old, or Hebrew Bible, can be jealous, vengeful, judging and violent, while the God of the New Testament is loving and forgiving. However, in the New Testament, God still sits in judgment of all Christians, punishing them for their sins, and bringing apocalyptic ruin, destruction, and death down on non-believers. In his book, *Is Religion Killing Us?* Nelson-Pallmeyer [9p60-62] asks:

> If we believe that Jesus died for us so that we shall not be condemned, then we should ask, "Condemned by whom?" The answer is God. What remains unstated in classic Christian statements of faith is that Jesus died in order to save us from God, not from sin. More precisely, Jesus' sacrificial death saves us from a violent God who punishes sin. The idea that God sent Jesus to die for our sins makes sense only if we embrace violent and punishing images of God featured predominantly in the Hebrew scriptures.
>
> Understood in a sacrificial light, the Eucharist, or Lord's Supper, ritualizes appeasement of a bloodthirsty punishing deity. It commemorates Jesus' blood sacrifice in which Jesus stands between sinful humanity and God's violent judgment.…Jesus, in order to appease a punishing deity, had to be born of a virgin in order to break the cycle by which women through childbirth passed on sin from generation to generation.

As outlined in the chapter, "Does God Play Favorites?" the apocalyptic verses in the New Testament present Jesus returning as the cosmic judge. Those who pass his test live happily everafter with Jesus in the kingdom of heaven. Those who fail the test will be subjected to years of a horrendous, hell-like Great Tribulation.

While these and hundreds of other passages hardly seem to be the actions of a kind and benevolent God, they could easily represent the behavior of a God made by man in man's image. It is little wonder that with this kind of model, mankind could behave in a murderous fashion when called upon to defend "his" God and the land of "his" God.

The Inquisitions

The word *heresy* is derived from the Greek word *hairesis* meaning to choose. In a religious sense it means to choose a belief system that differs from orthodox beliefs, with orthodox meaning "straight thinking." Heresy can work in multiple directions. To the Catholic Church, Protestantism is heretical. To Protestants, Catholicism is heretical. If the concept that "my religion is the only religion" did not exist, religious heresy would not exist.

Different inquisitions were designed to deal with different forms of heresy. Thus, there was the Medieval, or Episcopal, Inquisition established in 1184 to deal with heretical Gnostic Cathars in Europe. This was followed by the Papal Inquisition of the 1230s to deal with the failure of the Episcopal Inquisition. The Spanish Inquisition was founded in 1478 by Ferdinand and Isabella of Castile and resulted in the expulsion of many thousands of Jews and Muslims from Spain. It was followed by Portuguese, Peruvian, and Mexican Inquisitions. In addition to unspeakable tortures, an additional perverse aspect of some inquisitions was that all property belonging to a convicted heretic would be forfeited to the church. The church then shared it with local officials and the victim's accusers, as a reward for their candor. With enough candor one could become quite wealthy, as long as you were not turned in by someone else with even more candor.

Anti-Semitism was a common theme, with Jews being accused of unlikely crimes such as killing Christian infants and drinking their blood. For centuries, men and women who were guilty of little more than being ugly, old, widowed, mentally ill, or of the wrong ethnic group were convicted of impossible crimes and then murdered for God's sake. [5]

In 1542 Pope Paul III initiated the Roman Inquisition with the formation of the Congregation for the Doctrine of the Faith. This body was later responsible for the trial of Galileo Galilei in 1633 for his "grave suspicion of heresy" resulting from his support of the Copernican theory that the earth revolved around the sun. The many expulsions, burnings at the stake, tortures, and imprisonments brought about by innumerable inquisitions represent one of the most tragic faces of evil in the name of religion. Harris [5p85] blames blind, unquestioning faith itself:

> The question of how the church managed to transform Jesus'

> principle message of loving one's neighbor and turning the other cheek into a doctrine of murder and rapine seems to promise a harrowing mystery; but it is not mystery at all. Apart from the Bible's heterogeneity and outright self-contradiction, allowing it to justify diverse and irreconcilable aims, the culprit is clearly faith itself. Whenever a man imagines that he need only believe the truth of a proposition, without evidence — that unbelievers will go to hell, that Jews drink the blood of infants — he becomes capable of anything.

The Crusades

Pope Urban II unleashed the First Crusade when in 1095, at the French town of Clermont, he delivered an electrifying speech claiming that a race absolutely alien to God had invaded Jerusalem, the land of the Christians, and had subdued the people with sword, rapine and flame. None of this was true. In fact the Muslims of Jerusalem were living peacefully with the endogenous Christians. [10] The pope's call to the Frank knights to travel to the land of the Bible was made for political reasons.

On July 15, 1099 the Crusaders finally captured Jerusalem and unleashed incredible acts of brutality on the Muslims and other citizens. The following chilling account is from the memoirs of Raymond d'Guilers, the Bishop of Orange: [11]

> With the fall of its towers one could see marvelous works. Some of the pagans were mercifully beheaded, others pierced by arrows plunged from towers, and yet others, tortured for a long time, were then burned to death in searing flames. Piles of heads, hands and feet lay in the houses and streets, and men and knights were running to and fro over corpses…there was such a massacre that our men were wading up to their ankles in enemy blood.

The killing frenzy was so great that even non-Muslims were slaughtered:

> …they were stabbing women who had fled into palaces and dwellings; seizing infants by the soles of their feet from their mother's laps or their cradles and dashing them against the walls and breaking their necks; they were slaughtering some with weapons, or striking them down with stones; they were sparing absolutely no gentile of any place or kind. [10p317]

Even to this day, 1,000 years later, Osma bin Laden cites the Crusades as one of the reasons for his murderous rage against the non-Muslim world.

Cromwell's Slaughter of Catholics

Oliver Cromwell called himself Oliver the Protector. Others called him a cruel traitor, usurper, and hypocrite. Still others found him broad-minded, tolerant, passionately religious, and ferociously moral. Cromwell's influence as a military commander and politician during the English civil war dramatically altered the

British Isles's landscape. His suppression of Royalists in Ireland during 1649 still resonates. After its capture the massacre of nearly 3,500 people in Drogheda — comprising around 2,700 Royalist soldiers and all the men in the town carrying arms, including civilians, prisoners, and Catholic priests — fuelled Irish-English, Catholic-Protestant strife for over three centuries. [12]

The Qur'an and Islam

The Bible is not unique in it depiction of violence, retribution, and a jealous God. The heart of Islamic belief is that there is no God but God and that God is Allah.

- "God is Great" "Allah is great." "Worship none but Allah." *Qur'an 2:83*
- One's fate is determined by whether one believes this or not. For those who do not believe, "Allah has set a seal upon their hearts and upon their hearing and there is a covering of their eyes, and there is a great punishment for them." *Qur'an 2:7*
- While some passages of the Qur'an preach tolerance of other beliefs, others do not. "Of those who reject faith the patrons are the Evil Ones: from light they will lead them forth into the depths of darkness. They will be Companions of the Fire, to dwell therein." *Qur'an 2:257*
- "O you who believe! Do not take the Jews and the Christians for friends; they are friends of each other; and whoever amongst you takes them for a friend, then surely he is one of them." *Qur'an 5:51*
- "Whoever acts in opposition to Allah and His Apostle, he shall surely have the fire of hell to abide in it." *Qur'an 9:63*

These and many other passages easily provide religious fundamentalists with permission to undertake wars, violence and terrorism. Seeing the enemy as subhuman is a critical aspect of the process that allows one set of humans to kill or maim other humans. [4] Passages of both the Bible and the Qur'an can provide cover for extremists who genuinely believe those outside the faith are "infidels," "heathens," or other dehumanizing labels.

The Assassins. The Assassins operated over a period of two centuries from 1090 to 1275. As with the Islamic extremists of today they sought to spread a pure form of Islam. [4] Unlike today's terrorists who kill indiscriminately, the Assassins stabbed specific individuals, such as politicians or religious leaders. This killing in close proximity to the victum virtually assured the Assassins would be caught and often put to death themselves. In this sense they resembled the suicide bombers of today. They seriously threatened several Turkish governments.

Wahhabinism. By the 1700s the once-powerful Islamic Ottoman empire was in serious disarray. Western Europe was in its ascendancy intellectually, scientifically, commercially, and militarily, and the Islamic empire struggled unsuccessfully to keep up. In the Arabian peninsula, Muhammad ibn Abd al-Wahhab (1703–1792) broke

away from Istanbul and created a state of his own. His response to the increasing secularization of the empire was to return to a more puritanical form of Islam with a strict moral code based on a literal interpretation of the Qur'an. [6] He issued a religious decree, or *fatwa,* stating that all non-Wahhabia were infidels, thus allowing the persecution of innocent people. [4] In his book, *The Crisis of Islam. Holy War and Unholy Terror,* Bernard Lewis [13p122] reports:

> Whenever they could, they enforced their beliefs with the utmost severity and ferocity, demolishing tombs, desecrating what they called false and idolatrous holy places, and slaughtering large numbers of men, women and children who failed to meet their standards of Islamic purity and authenticity. Another practice introduced by ibn Abd al-Wahhab was the condemnation and burning of books. These consisted mainly of Islamic works on theology and law deemed contrary to Wahhabi doctrine. The burning of books was often accompanied by the summary execution of those who wrote, copied, or taught them. [13p128]

Wahhabinism was only a minor Islamic sect under the Ottomans. However, it became a major global political force after oil-rich Saudi Arabia adopted its religious rigors in 1933.

> This resulted in Wahhabinism becoming the official, state-enforced doctrine of one of the most influential governments in all Islam — the custodian of the two holiest places of Islam, the host of the annual pilgrimage, which brings millions of Muslims from every part of the world to share in its rites and rituals. At the same time, the teachers and preachers of Wahhabinism had at their disposal immense financial resources, which they used to promote and spread their version of Islam.

Wahhabinism enforces a restrictive dress code, restricts the freedoms of women, cuts off the hands of thieves, and practices many other restrictive practices. In the Qur'an *jihad,* meaning "struggle," has two meanings. The meaning adopted by most Muslims refers to an internal spiritual struggle to conform to the teachings of Muhammad. A second meaning refers to a military-type struggle of Islam against infidels. The latter is the meaning adopted by Wahhabins. Wahhabinism forms the basis for the beliefs of the Taliban and Osama bin Laden. Its philosophical anti-secular, anti-modernity, anti-infidel underpinnings are largely responsible for the hatred toward Western culture seen in modern Islamic terrorism. Jessica Stern in her book, *Terror in the Name of God*, stated:

> Modernity introduces a world where the potential future paths are so varied, so unknown, and the lack of authority is so great that individuals seek assurance and comfort in the elimination of unsettling possibilities.

> Too much choice, especially regarding identity, can be overwhelming and even frightening. Under these circumstances, some people crave closing off options; they crave discipline imposed from the outside. The "strictness" of militant religious groups — and the clarity they offer about self and other is part of their appeal. [4p69]
>
> Purifying the world through holy war is addictive. Holy war intensifies the boundaries between Us and Them, satisfying the inherently human longing for a clearer identity and a definite purpose in life, creating a seductive state of bliss. [4p137]
>
> Religion is the ideal mobilization tool for violence. [4p137] "Whatever universalist goals they may have, religions give people identity by posting a basic distinction between believers and nonbelievers, between a superior in-group and a different inferior out-group." [14]

Mixing this with the Muslim claim that "There is no correct religion besides God but Islam" [4 13398p83] makes a particularly dangerous combination. Unfortunately, "each generation of Islamic fundamentalism becomes uglier and uglier." [4p136]

Suicide bombings and Islam. Apologists for Islamic terrorism often claim Islam is a peaceful religion and that there is nothing in the Qur'an to justify suicide bombings. That is belied by the following:

> The believers who stay at home…are not the equal of those who fight for the cause of God with their goods and their persons…God has promised all a good reward; but far richer is the recompense of those who fight for Him.…He that leaves his dwelling to fight for God and His apostle and is then overtaken by death, shall be rewarded by God.…The unbelievers are your inveterate enemies.
>
> *Qur'an 4:95-101*

Multiple virgins are part of the promised heavenly reward. Sam Harris suggested that the Qur'an makes suicide bombing "seem like a career opportunity." [5]

Islam and the selling of nuclear secrets. Abdul Qadeer Khan was the father of Pakistan's nuclear bomb, and for decades was the highly respected head of their nuclear program. However, it later became apparent that for over a decade he masterminded a vast, clandestine, and hugely profitable enterprise of selling nuclear secrets to the rogue nations of the world — North Korea, Iran and Libya. He "did more to destabilize the planet than did many of the world's worst regimes." [15] Why did he do this? After the successful nuclear tests in 1998, bringing Pakistan into the nuclear club, Kahn became more religious, and he was doing this to bolster the standing of Muslims in the world. He has been quoted as saying, "We Muslims have to be strong and equal to any other country, and therefore I want to help some countries to be strong." The danger of placing nuclear bombs in the hands of individuals or governments who have no fear of dying and believe that dying in the

name of Allah is a "career opportunity" and "Allah's will" is self-evident.

Belief in the Apocalypse

All three monotheistic traditions incorporate the concept of an apocalypse. [4p322-323] However, each believes it will be the one to prevail in the catastrophic events of the final days. This itself can lead to terrorist acts. Evangelical Christians believe that Jesus will return at the Mount of Olives overlooking the temple. Both they and Messianic Jews believe that rebuilding the Temple Mount is a prerequisite to the process of redemption. Unfortunately, the Muslim Dome of the Rock, believed to be the site where Muhammad rose to heaven, was built in 688 CE on the site of the Temple Mount. In 1984, to facilitate the rebuilding of the Temple Mount, Yoel Lerner, a radical Messianic Jew, plotted to blow up the Dome of the Rock, the third most holy site for Muslims. He believed the Messiah could not return when the sacred site was "polluted" by the Dome of the Rock? The only reason he did not carry out this task was that he could not find a Rabbi to bless the plan. In her book, *The Battle for God. A History of Fundamentalism,* Karen Armstrong notes: [6p148]

> It was a perilous moment. Not only would the bombing of the Dome of the Rock have ended the peace process, it would almost certainly have resulted in a war in which, for the first time, the whole Muslim world would have joined forces against Israel. Strategists in Washington agreed that, in the context of the Cold War, when the Soviets supported the Arabs and the United States, [supported] Israel, the destruction of the Dome of the Rock could well have sparked World War III. The specter of nuclear catastrophe did not trouble these extreme Kookists, however. They were convinced that by instigating the apocalypse here on Earth, they would activate powers in the divine world and "oblige" God to intervene on their behalf and send the Messiah to save Israel.

As with the Muslims described above, these extremists also have no fear of mass death and see it as a good thing. The horror of 9/11 and many more incidents make it quite likely that if the human race destroys itself, it will be over religious rather than political issues. Post 9/11 efforts to accelerate the apocalypse and the return of the messiah by all three Western religions may contribute to this conflict [16]. Since Evangelical Christians believe that the messiah will not return until every person on earth is converted, they are expanding their proselytizing efforts to bring this about. Christians are supportive of the Jews because they believe the messiah will return to the Temple in Jerusalem. For the Jews, the downside of this support is that the Jews who have not converted to Christianity will "be left behind." Some Jews are attempting to rebuild the ancient Temple in preparation for the appearance of their messiah. The problem with this plan has already been described.

In 2004, when Mahmoud Ahmadinejad, the president of Iran, was mayor of Tehran, he spent millions improving the city in preparation for the return of their

messiah, the Mahdi. As Ahmadinejad stated in his United Nations speech, the Mahdi will emerge from a well to conquer the world and convert everyone to Islam.

Members of each religion believe that when their messiah returns the other religions will be destroyed. This clearly contains the seeds for future conflict.

Eastern Religions

While the Eastern religions are often considered to be less violent than the monotheist religions of the West, Japanese Buddhism declared all Japanese wars as holy wars. "The religious atrocities of devotees of Shinto, which inspired Japanese militarism through World War II, are too notorious to be overlooked." [17]

Sacred Texts

Given the violence portrayed in the sacred religious texts and by some people who live by these texts, the following quote from Nelson-Pallmeyer is not an unreasonable suggestion:

> The violence-of-God traditions in the Hebrew Scriptures, the Christian New Testament, and the Qur'an must be understood and challenged if we are to have any realistic hope of building a peaceful world. [9]

He also suggested that the religious violence prevalent among the followers of monotheistic faith traditions is not primarily a problem of believers distorting their "sacred" texts. It is, rather, a problem rooted in the violence-of-God traditions that lie at the heart of those "sacred" texts. The sacred texts cannot be challenged because they are perceived as being the direct word of God. [9] *A rational first step to tone down the violence done in the name of religion would be to accept that the sacred texts were not written by Yahweh, God or Allah, but by man.*

Recent Religious Wars

Sam Harris [5] has given the following listing of recent religious wars: Palestine (Jews v. Muslims), the Balkans (Orthodox Serbians v. Catholic Croatians, Bosnian and Albanian Muslims), Northern Ireland (Protestants v. Catholics), Kashmir (Muslims v. Hindus), Sudan (Muslims v. Christians and animists), Nigeria (Muslims v. Christians), Ethiopia and Eritrea (Muslims v. Christians), Sri Lanka (Sinhalese Buddhists v. Tamil Hindus), Indonesia (Muslims v. Timorese Christians), and the Caucasus (Orthodox Russians v. Chechen Muslims and Muslim Azerbaijanis v. Catholic and Orthodox Armenians). It is clear that the capacity for humans to kill each other over religious differences knows no end.

Negative Health Consequences of Religion

Religious beliefs can have a negative impact on health if beliefs based on isolated Biblical passages are taken out of context and interpreted literally. This may lead believers to the conclusion that God, rather than humans, will bring about a cure.

The negative impact of this may take the form of refusing life-saving medication or treatments, unduly delaying medical care, refusing blood transfusions, refusing childhood immunizations, refusing prenatal care and physician assisted delivery, replacing mental health care with religion, and fostering mass suicide. [18]

Some of these negative effects are amenable to objective study. For example, a religious group called Faith Assembly practices out-of-hospital, non-physician attended birthing without prenatal care. In a county in Indiana, zero percent of the Faith Assembly subjects had at least one prenatal visit compared to 99 percent for the non-Faith Assembly women. Perinatal mortality was three times greater and maternal mortality was almost 100 times greater in Faith Assembly women compared to non-Faith Assembly women. [19]

Christian Scientists who rarely consult doctors provide a second example. Age-adjusted death rates were significantly higher ($p = .003$) in Christian Science women than non-Christian Science women. [20]

Religious opposition to birth control contributes to overpopulation, and the proscription against the use of condoms and the exchange of needles, have contributed to the acceleration of the spread of AIDS in both Africa and the United States. The proscription of many religious groups against stem cell research threatens to deprive thousands of those affected with Parkinson's disease, juvenile diabetes, and other diseases of a potential cure. The proscription against abortion denies women control over their own reproduction and can be especially counterproductive when the mothers and the fathers are not ready to be responsible parents. While controversial, Steven Levitt, award-winning economist, has suggested that the recent dramatic drop in the crime rate is due, in part, to the legalization of abortion decades previously. This resulted in a decrease in the birth rate of children whose parents were unable to properly parent them. [21]

Examples of mass suicide related to religious beliefs and cults include the 800 members of the Rev. Jim Jones' People's Temple cult who died in Guyana in 1978, the 72 members of David Koresch's Branch Davidians who died in 1993, and the 39 members of Marshall Applewhite's Heaven's Gate cult who died in 1997 believing that aliens hidden behind the Hale-Bopp comet would come and take them to a better place. [18]

The literal interpretation of sacred texts. Virtually all of the evils of religion can be ascribed to the belief that the sacred texts, whether the Bible or the Qur'an or others, represent the word of God or Allah, and thus believers assume every word is literally true. Sam Harris [5p73] summarized the madness of this as follows:

> Jesus Christ — who, as it turns out, was born of a virgin, cheated death, and rose bodily into the heavens — can now be eaten in the form of a cracker. A few Latin words spoken over your favorite Burgundy, and you can drink his blood as well. Is there any doubt that a lone subscriber to these beliefs would be considered mad? Rather, is there any doubt he would be mad? The danger of religious faith is that it allows otherwise

> normal human beings to reap the fruits of madness and consider them holy. Because each new generation of children is taught that religious propositions need not be justified in the way that all others must, civilization is still besieged by the armies of the preposterous. We are, even now, killing ourselves over ancient literature. Who would have thought something so tragically absurd could be possible?

Fundamentalism and Politics

Fundamentalists and related Christian sects tend to come in two flavors: *premillennialist* and *postmillennialist.* The premillennialist believes that the end of times will come before the return of Christ. When Christ does return he will bring with him a thousand years of peace and heaven on earth. For premillennialists, every major natural catastrophe such as earthquakes or tsunamis are believed to be the beginning of the end. Those who believe that the end of time is near tend not to become involved in politics since it would be pointless. Postmillennialists believe that righteousness and justice will gradually spread and last for a thousand years and when Christ does come again the earth will be purified for his appearance. This has important implications since if the reign of God comes gradually then it is the duty of Christians to take control of the political and secular institutions and run them according to Biblical dictates. This leads to "dominion theology" based on the first chapter of the Book of Genesis in which God, having created Adam and Eve, says to them: [22]

> Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the face of the earth.
>
> *Genesis 1:28*

Thus, according to this view, Christians are to take dominion over all major institutions and run them until Christ returns. Even premillennialists can buy into this philosophy if they make a modest adjustment in faith by believing the end of days will come before Christ appears, but this may be some time from now. The concept of Biblical law was taken to the extreme by theologian Rousas John Rushdoony. [22p393] He insisted that the Old Testament laws mandating the death penalty for adulterers, homosexuals, blasphemers, those who engage in premarital sex, astrologers, witches, and teachers of false doctrine should be enforced today. This piece of literal fundamentalist nonsense would eliminate half of the population and make the Holocaust look like child's play.

> **There are many examples of the inhumanity of man toward his fellow man undertaken in the name of religion. The violence-of-God traditions in the Hebrew Scriptures, the Christian New Testament, and the Qur'an must be understood and challenged if we are to have**

any realistic hope of building a peaceful world. Standing in the way of this is the fact that these texts are perceived as being the direct word of God and thus are literally true.

A rational first step toward toning down the violence done in the name of religion would be to promote the understanding that the sacred texts were not written by Yahweh, God or Allah, but by man. They should be viewed as metaphorical, with the realization that one metaphor is not inherently better than another.

Without such an understanding it is more likely that mankind will self-destruct over religion than over any other issue.

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Religions are social systems whose participants avow belief in a supernatural agent or agents whose approval is to be sought.

Daniel C Dennett
Breaking the Spell [1]

By definition, a supernatural event is beyond the reach of scientific investigation.

Harold Koenig
The Healing Power of Faith [2]

Chapter 49

The Benefits of Religion

Despite the numerous evils of religion presented in the previous chapter, the positive attributes of religion far outweigh the negatives. One principle reason for this is that although the evils can negatively impact many thousands and sometimes millions of people, the positives can potentially impact most of the rest of humanity—totaling billions. Religion is mostly a matter of individual faith and has the potential to bring great comfort and peace to all who believe; as outlined previously, most members of our species believe in God. One of the premises of this book is that man is hardwired for spirituality and for belief in a supreme being. A belief in God is the ultimate outcome of the workings of the human spiritual brain, and most humans who believe in God ascribe to some formalized framework for this belief—namely religion.

A partial list of the benefits of religion includes health benefits of belief and prayer, spirituality as a life-changing event, a sense of being grounded by belonging to something larger and more important than oneself, a supportive structure for baptisms, weddings, and funerals, assurance of moral behavior, helping to provide a cohesive and stable community, a reason to help others, the comfort and support of belief, the feeling that someone is there to support you unconditionally, someone who will forgive your sins, real or imagined, and perhaps most importantly, a lessened fear of death based on a belief in a life after death. Some passages of both the Bible and Qur'an are pure poetry and provide great emotional support. An example is the Lord's Prayer given by Jesus to his disciples.

Our Father which art in heaven,
Hallowed be thy name.
Thy Kingdom come,
Thy will be done on earth,
as it is in heaven,
Give us this day our daily bread.
And forgive us our debts,

as we forgive our debtors.
And lead us not into temptation;
but deliver us from evil:
For thine is the kingdom, and the power,
and the glory, for ever, Amen.

Matthew 6:9-13 (KJV)

The comfort different versions of this prayer can provide has undoubtedly been experienced billions of times in the past two millennia. When sung by beautiful voices by a church choir even the most jaded atheist would be moved to tears. There are dozens of other equally poetic and moving passages.

The following pages review the beneficial aspects of religion and faith that are most amenable to scientific investigation. In scientific studies it is necessary to have a non-biased or epidemiologically sound study group, a control group, a hypothesis, a well-defined end point, and a valid statistical analysis of the results. As an example one might start with the hypothesis that religious faith decreases one's likelihood of being depressed. A reasonable study might choose 500 individuals who are matched by race, age, gender, geographical location, and social class. All individuals could be given a well-validated and standardized assessment of depression, and the frequency of such depression would be compared in 250 subjects who belonged to a specific religious faith versus 250 subjects who did not. If there were a statistically significant decrease in depression in the religious group, the hypothesis would appear to have been supported. Before having total confidence in the result, most scientists would wait to see if other researchers could replicate the findings.

Religion and Health

The role of religion and faith in health has been extensively studied largely because health issues provide a more objective outcome than more subjective and non-specific outcomes, such as a sense of "feeling good." The literature on this subject is very large and readers interested in a comprehensive review of hundreds of reports are referred to the *Handbook of Religion and Health*.[3] Because twin studies are often large and thus provide good statistical power, and because they also allow an examination of the role of genetic factors, I will also review some of these.

General mental health. Larson and coworkers[4] reviewed 35 reports concerning the effect of religious commitment and mental health reported in the two major American psychiatric journals between 1978 and 1989. In the majority of the reports there was a positive effect of religious commitment on mental health, especially when measured on the basis of involvement in ceremony, social support, use of prayer, and a perceived positive relationship with God.

Death anxiety. As discussed previously, awareness of one's own mortality is a unique characteristic of the human species and may have played a role in the development of religion. Support for the effectiveness of religion in assuaging such fears comes from a study of the relationship between death anxiety and religious belief

in several hundred elderly people attending senior lunch programs. Of those who reported they were "very likely" to rely on religious faith and prayer when under stress, 10.3 percent experienced death anxiety, compared to 25 percent of less-religious people. [5]

Smoking. Several religions, such as the Mormons and Seventh-Day Adventists, specifically request that their members not smoke or drink. Independent of these groups, even among the more mainstream denominations, religiosity is associated with lower rates of smoking. For example, in a study of almost 4,000 older people in North Carolina, those who both attended religious services at least once a week and prayed or studied the Bible at least daily were 90 percent less likely to smoke than people not involved in these activities. [6] As outlined below, religiosity is also associated with a decrease in other types of substance abuse.

Adolescent Problem Behavior Syndrome. The relationship between the role of religion and adolescent behavior is complex. In 1977 Richard and Shirley Jessor [7] from the University of Colorado found that prevalence of alcohol abuse, drug abuse, smoking, delinquent behavior, precocious sexual intercourse and teenage pregnancies were all strongly correlated with each other. Adolescents with any one of these behaviors were more likely to have one or more of the other behaviors. This became known as the *Adolescent Problem Behavior Syndrome.* [8,9] They also found that adolescents with this syndrome were less likely to indulge in conforming behaviors such as regular attendance of school or church. Statistical analysis indicated all of these behaviors were associated with an underlying latent variable that they termed *unconventionality.* An independent study of American high school seniors by Bachman and coworkers [10] showed that while increased religious commitment was associated with a decreased use of alcohol, pot, tobacco and other drugs, a similar level of decreased use was noted for non-religious variables, such as having good grades. This is shown in Figure 1.

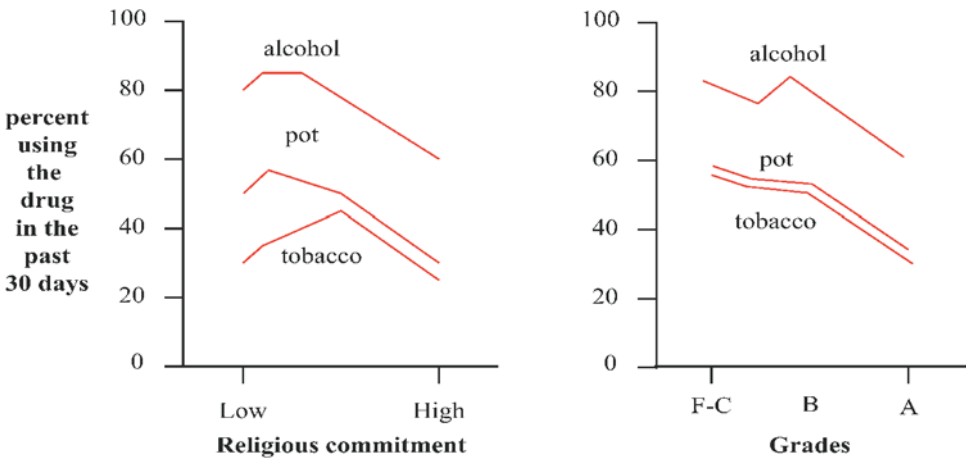
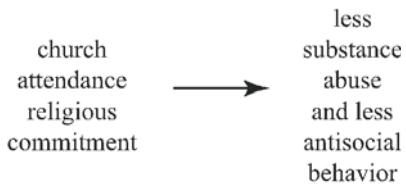


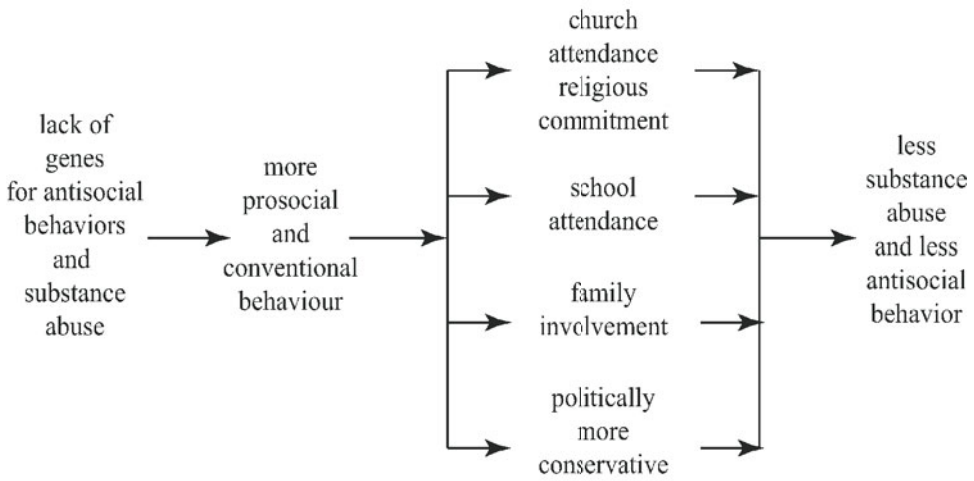
Figure 1. Association of religious commitment and good grades with decreased use of alcohol, pot, and tobacco in a group of American high school seniors. From Bachman et al., J Public Health. *71:59-69, 1981.* [10] *Reprinted with permission from the American Public Health Association*

There was also a strong trend in those with low versus high religious commitment to increased alcohol, drug and tobacco use, high versus low truancy, radical versus conservative political views, and spending most nights out versus staying at home.

As discussed previously antisocial behavior, conduct disorder, and adolescent problem behavior syndrome have a strong genetic basis. This raises the point that studies showing a positive effect of church attendance and religious affiliation on preventing substance abuse and other antisocial behaviors may not be as straightforward as they seem on the surface. Thus, instead of the simple relationship shown in the following diagram,



the relationship may be more complex. The following diagram is a possible example,



Here, part of the reason individuals with considerable religious affiliation have less antisocial or other behaviors is due to a hidden latent variable, one's genetic make-up, that primarily controls a range of problem behaviors and secondarily leads to religious commitment and other prosocial traits.

Substance abuse. A twin study by Boomsma and colleagues in the Netherlands [11] found support for the role of religious upbringing in the prevention of substance abuse and antisocial behaviors *even taking the contribution of genetics into consideration.* They examined 1,967 twins and showed that a religious upbringing *reduced the influence of genetic factors on disruptive behaviors in males.* Even more striking, a related study [12] found that in non-religious families, genetic factors accounted for 40 percent of why females started to drink. By contrast, in religious

families the religious upbringing accounted for low levels of starting to drink in females, while genetic factors played no role.

In a study in Missouri of 1,687 female adolescent twins, Heath and coworkers [13] also reported a strong protective effect of religious involvement against alcohol use. This was particularly significant in African-American adolescent girls. Other studies confirm the role of religiosity in the prevention of alcohol and drug abuse in Caucasian adolescent females. [14,15]

As described previously, in the twin study by Kendler and coworkers [16] religiosity was measured by the variables of *personal devotion, personal conservatism,* and *institutional conservatism.* They found that high levels of *personal devotion* were associated with lower-than-average levels of depression but not with lower levels of anxiety or somatic complaints. There was a highly significant association of decreased alcohol use and nicotine dependence with all three measures of religiosity. [16,17] High levels of both *personal devotion* and *institutional conservatism* were associated with resistance to depression in the face of the stress of the death of a loved one or personal illness. [17]

Treatment of substance abuse. Many studies have shown the important role of religion in the treatment of substance abuse. One of the first was reported by David Desmond and J. Maddux at the University of Texas Health Science Center in San Antonio, Texas. They found that among male heroin addicts undergoing treatment at a public health service hospital, after one year into recovery those who were in a religious-based recovery program were almost eight times more likely to report abstinence than those involved in a purely secular, non-religious program. [18]

One of the major problems in treatment of drug and alcohol abuse is the presence of continual craving. There is some evidence that individuals involved in religious based programs may feel less of this intense craving than those in non-religious programs, possibly the result of a greater level of inner peace. [2p81] George Valliant, Harvard Medical School psychiatrist and pioneer in the treatment of substance abuse, suggested that to successfully recover from chronic drug and alcohol addictions, patients need "powerful new sources of self-esteem and hope" [19] and forgiveness of past sins. This may be the element that religion can supply.

Multiple studies have consistently shown that several measures of religiousness are associated with lower levels of abuse of alcohol, drugs and tobacco. Religion can also play a strong supportive role in the treatment of substance abuse.

Depression. Prevention of depression is one of the most widely replicated effects of religion. Three dimensions of religious activities are commonly recognized. These are organizational religious activities (the social aspects of religion such as church attendance), nonorganizational religious activities (private prayer and Bible reading) and subjective religiousness (importance of religion to the individual, intrinsic religiosity). So many studies have been done on the role of organizational religious activity and depression that instead of relating the individual results, it is more useful

to simply state that 85 percent of these studies support a protective effect against depression. [3p124] The magnitude of this effect is illustrated by the finding that the frequency of depression was 20 to 60 percent higher in those individuals who had no involvement in organizational religious activities. The finding that non-organizational or private religious activity was less protective against depression than organizational religious activity further emphasized the role of social factors. However, statistical analysis showed that while the social aspects of organizational religious activities played an important role, they were not the entire explanation for the prevention of depression. *Intrinsic religiosity,* where religious faith was personally very important, was more protective against depression than *extrinsic religiosity,* where individuals became involved in religion for social prestige and affirmation of one's lifestyle. [3p127]

Studies also show an impressive role of intrinsic religiosity on remission of depression in depressed older adults hospitalized for medical illness. A high score for intrinsic religiosity was associated with a 70 percent increase in the rate of remission of depression. [20] A more detailed portrayal of the results is shown in Figure 2.

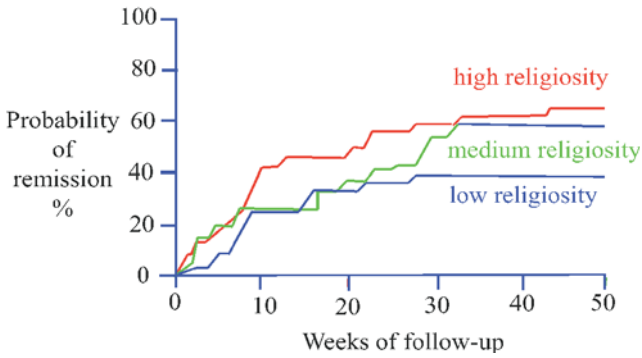


Figure 2. Survival curves for remission of depression based on level of intrinsic religiosity. From Koenig et al.: American Journal of Psychiatry. *155: 536-542, 1998.* [20] *By permission.*

Among the subjects whose physical illness did not improve, the rate of remission from depression doubled for each 10 percent increase in the intrinsic religiosity score.

Many studies have shown that involvement in organizational religious activity, such as church-going, and intrinsic religiosity where faith is personally important, are associated with decreased levels of depression. Rates of recovery from depression among the elderly is significantly increased with higher levels of intrinsic religiosity.

Extrinsic religiosity, where individuals are involved in religious activity simply for social prestige, is associated with increased levels of depression.

Heart disease. In a study of almost 4,000 men and women 65 years of age and older, [21] those who often attended religious service and read the Bible frequently were

40 percent less likely to have hypertension than those who attended church or read the Bible infrequently. In an even larger study of 10,059 Israeli civil servants followed over 25 years, the highly orthodox Jews experienced a lower risk of dying of coronary artery disease than less-orthodox, secular or non-religious Jews. [22] The survival curves in this study are shown in Figure 3.

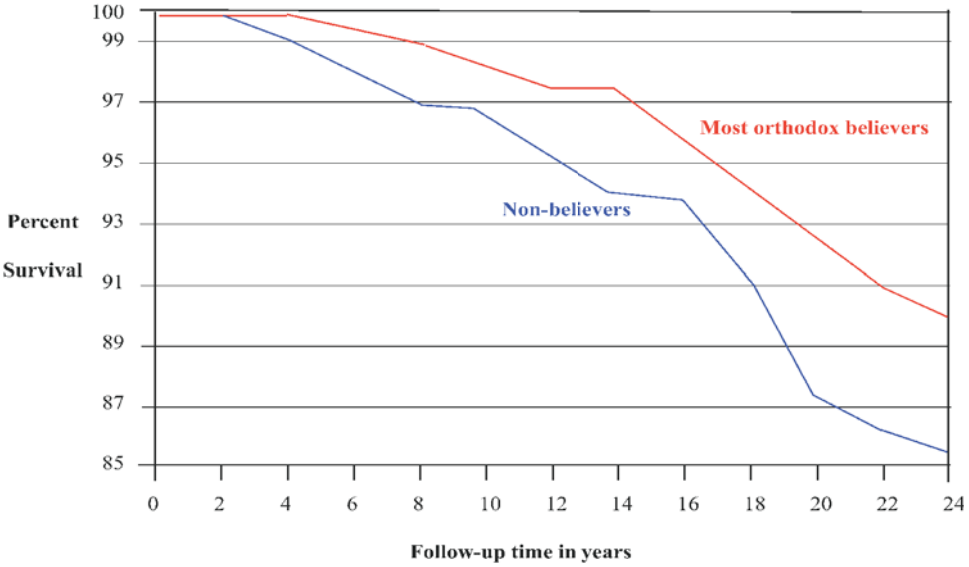


Figure 3. Survival curves showing mortality from coronary heart disease among Jewish orthodox believers and nonbelievers. From Goldbourt et al.: Cardiology. *82:100-121, 199 S. Karger AG, Basel.* [22] *By permission.*

They were also at a lower risk of dying from all natural causes. This was not explained by health factors such as not smoking, having a lower blood pressure, or lower cholesterol level. Again, *the belief in an all-powerful God who intervenes directly in their lives was the most important factor.*

In the section below on the effectiveness of prayer, one of the endpoints was the number of complications seen following heart surgery. Oxman and coworkers [23] used this variable in a study of the role of religion in health. They selected 232 patients 55 years of age and older who were undergoing heart surgery for coronary artery disease or valve replacement. Individuals who were both socially active and derived comfort from their faith were 14 times less likely to die in the six months following surgery than those who lacked these factors. *Of the religious factors the degree of strength and comfort from religion was the most important.*

Immune function. Lymphocytes are one of the major elements of the immune system that protect us from insults including injury, bacteria and viruses. Cytokines are chemical compounds produced during the inflammatory response to these objects. High levels of one of these cytokines, interleukin-6 (IL-6), are an indicator of a weakened immune system. A study of 1,718 elderly subjects showed that those involved in a high level of attendance of religious services were 50 percent less likely

to have high IL-6 levels compared to those who did not attend religious services. Religious attendance was also associated with lower levels of other immune-inflammatory markers. [24]

Life Span. It should come as no surprise that with religiosity being associated with so many health benefits that it would also be associated with a longer life span. In 1997 William Strawbridge [25] reported a large study on the role of religiosity and longevity. He followed 5,286 people between the ages of 21 and 65 living in Alameda County, California. In addition to its large size, an additional unique aspect of this study was that it continued over a long period of time—from 1965 to 1994. When complete, it showed that the hazard of dying at a given age was 36 percent less for people who attended church services frequently versus those who attended less than once per week. While close family ties and friendships were identified as one of the protective factors, when these were factored out there was still a 23 percent decrease in the rate of dying for church attendees. The association between frequent church attendance and lower mortality was greater for women than for men. The effects of a healthier lifestyle and close social ties only accounted for 30 percent of the reduction in mortality. It is likely that a sense of inner peace associated with a deep personal faith accounted for most of the effect.

These results agree with those of an earlier smaller study of 2,754 Midwestern men and women aged 35 to 69 followed for 12 years. Among women who never attended church, 17.3 percent died. By contrast, among women who attended church often, 5.4 percent died. [26] One study suggested that *deriving strength from religion was the strongest predictor of survival.* [27]

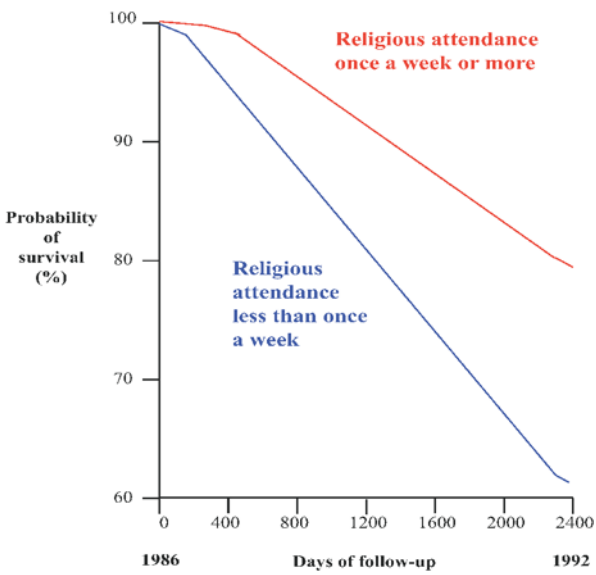


Figure 4. Religious attendance and six-year survival. From Koenig et al.: J Gerontol A Biol Sci Med Sci. *54:M370-376, 1999.* [28] *By permission.*

In a study designed to see if the results of the Strawbridge study could be replicated on the east coast, Koenig and colleagues [28] followed 3,968 people 65 years of age or older in the Piedomont area of North Carolina for six years. The results are shown in Figure 4. There was a significantly lower probability of dying in those with religious attendance of once a week or more. As in other studies, the effect was stronger in women than men.

The largest study of religiosity and mortality to date was by Hummer and coworkers. [29] They followed a random national sample of 21,204 adults from 1987 to

1995. Those who did not attend church lived to an average age 75.3 years. Those who attended church at least once a week lived to an average age of 81.9 years.

A number of studies suggest individuals with strong religious beliefs live longer than those without such beliefs.

Does Prayer Work?

> Q: "When did you realize you were God?"
> A: "While praying. I realized I was talking to myself."
>
> Peter Medak, Director
> *The Ruling Class*

Untold billions of inhabitants of the planet earth pray occasionally or often. Does all of this praying have any effect? The famous and outspoken atheist, Madeline Murray O'Hair, characterized praying as "Talking to yourself." If man created God then her assessment would be fundamentally correct. But, that still does not answer the question, "Does prayer work?" As shown in the chapter on placebo effect, if one strongly believes something will be effective, especially with regard to one's health, it will be effective, even when there is no active ingredient.

When attempting to scientifically evaluate the effectiveness of prayer, there are several different types of prayer. *Petitionary prayer* occurs when a person prays to God to do something such as heal an illness or protect them from death or other evil. A second form of prayer is when someone else prays for you. This is called *intercessory prayer.* It can be done either with or without the person knowing they are being prayed for. *Petitionary prayer* allows the placebo effect to play a role in effecting the outcome. Other types of prayer, such as prayer of confession, contemplative prayer, and meditative prayer do not provide the expectation of an objective result, so their effectiveness is difficult to assess. I will first examine the effectiveness of *petitionary prayer.*

Petitionary prayer. When an individual prays it is often used as a coping mechanism. A soldier who prays on the battlefield may feel he is being protected from death and thus will act more bravely. A number of studies have shown that individuals feel that praying helped them to cope with stress. The endpoint in these studies is very subjective. In a study of 100 patients filling out a *Helpfulness of Prayer Scale* immediately prior to coronary artery bypass surgery, 96 patients felt it helped them to cope. [30] Of these 70 ranked it a 15 on a scale of 0 to 15. A similar coping effect of prayer has been reported for cancer patients [31] and adult hospitalized patients. [30] Benson [32] observed objective effects of prayer in cardiac patients in the form of a decreased heart rate, blood pressure and number of episodes of angina. Similar effects have been observed with relaxation exercises and meditation. [33,34]

Affirming personal values. Part of the effectiveness of *petitionary prayer* may come about as a result of re-affirming one's personal values. In a study of 80 UCLA undergraduates, Creswell and coworkers [35] found that any *positive self-affirmation acts*

as a buffer against stressful events. Prior to being exposed to a very stressful event the students in the study group were asked to reflect on values that were *especially meaningful* to them. These ranged from religious values to secular ones, including political beliefs or social values. The control group was asked to reflect on values that were *unimportant and not meaningful* to them. Blood levels of cortisol, a powerful stress hormone, were assayed after the stressful event. When stimulated continuously over time, cortisol can lead to cognitive impairments and increased risk for physical disease. There was significantly less release of cortisol in the study group who reflected on meaningful personal values before the stress than in the control group.

The authors remarked that it was "remarkable that such a brief, subtle value affirmation has the ability to mute cortisol response and serve as a buffer against stress.…It's helpful to remind yourself you're a good person with talents, and remind yourself what is important to you; that can be hard to do when you're going through something that's really awful." Since religious beliefs are a very important part of the value system for many people, this study helps us to understand the powerful effect that self-affirmation in the form of prayer can have to reduce stress and increase coping. An equally important result of the study was that reflecting on non-religious value systems can also reduce stress and increase coping.

Intercessory prayer. When individuals are not aware of the praying, the power of placebo effect is removed. Evidence that intercessory prayer does not work would not prove that God does not exist since God might be ignoring those prayers. However, evidence that intercessory prayer does work would provide some presumptive evidence for the existence of God, since a supernatural force would be one of the few viable explanations for such an effect. Thus, it is not surprising that many attempts to prove or disprove the effectiveness of intercessory prayer have been undertaken.

Longevity of kings. Francis Galton, one of the fathers of statistical genetics, reasoned that since everyone in England was constantly praying for the king in the form of "Long live the king" and other prayers, if prayer was effective, kings should live longer than their subjects. Galton found that in fact, "Sovereigns were literally the shortest lived of all who have the advantage of affluence." Galton reasoned that members of the clergy should also have longer lives since they were the most "prayerful class" of all and among the most prayed for. It turned out that when Galton compared the longevity of eminent clergy with eminent doctors and lawyers, the clergy were the shortest lived of these three groups. Galton also reasoned that ships carrying missionaries should sink less often since they would be constantly praying for safe passage. There was no difference in rates of sinking of these ships compared with others.

Sex ratios. Rupert Sheldrake, a contemporary of Galton, knew that in India male children were preferred over female children, and a great deal of prayer was expended attempting to influence this outcome. However, he found that the male : female sex ratio was the same, 106:100 in both India and England.

Modern studies of intercessory prayer. Several high visibility reports that intercessory prayer is effective have been published.[36-38] However, each of these had significant problems with statistical analysis,[39] randomization of cases,[40] study

design [41] or outright fraud. [41]

One of the best evaluations of intercessory prayer ever undertaken was a multi-center study led by Dr. Herbert Benson of Harvard Medical School. A total of 1,800 subjects involved in heart bypass surgery were divided into three groups of about 600 each consisting of those who were prayed for and knew they were being prayed for, those who were prayed for and only knew it was a possibility they were prayed for, and those who were not prayed for but knew it was a possibility they were prayed for. Three Christian groups were given the first name and first initial of the last name of those that they prayed for. The praying started the night before surgery and continued for two weeks. The study looked for complications within 30 days of surgery. The doctors were blind to those who were or were not prayed for. The results are shown in Figure 6.

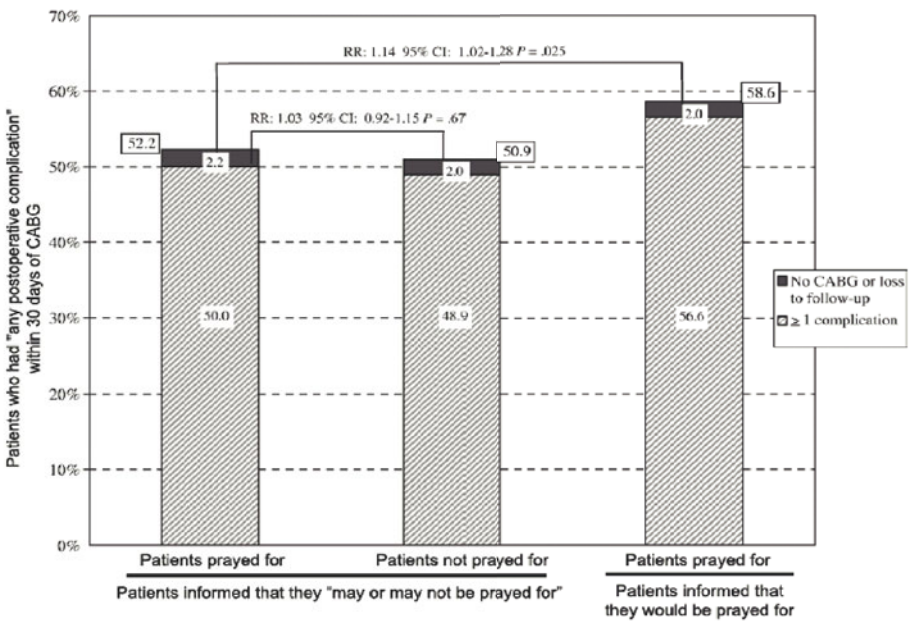


Figure 6. Results of study of Benson et al. Am Heart Journal. *151:934-942. Copyright 2006.* [42] *By permission from Elsevier.*

Fifty-nine percent of the patients who knew they were being prayed for developed a complication versus 52 percent of those who were prayed for but were told it was just a possibility and 51 percent for those who were not prayed for. Thus, those who were prayed for and knew they were prayed for actually did somewhat worse than those who were not prayed for. This difference was barely significant (p = .025). In another much smaller study, examining treatment for alcoholism, there was also a significantly worse outcome for those who were being prayed for and knew they were being prayed for than those who were not prayed for. [43] These small differences are most likely due to chance and these studies should not be taken to

indicate that praying for someone can be harmful.

In petitionary prayer, where an individual prays for him- or herself, a positive outcome is often seen, especially when the outcome is better health. A belief in God and in a good outcome allows placebo effects to play a powerful role in producing a favorable outcome.

In intercessory prayer, where someone else prays for an individual who may not know he or she is being prayed for, a placebo effect is not possible, and carefully designed studies of intercessory prayer have shown it has no effect.

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Chapter 50

The Problem of Evil

One of the most difficult conundrums that religion has had to face over the centuries is the "problem of evil." If God is a loving and compassionate being why does he let so many evil things happen? Why does he let children die of cancer and be killed in accidents? Take away a young father of five children by a heart attack? Kill hundreds of thousands in a tsunami? Allow horrendous wars? Allow genocide? The "problem of evil" has been characterized as the single greatest challenge to religious faith.

The Greek skeptic Epicurus of the fourth century BCE was the first known thinker to spell out the dilemma of the "problem of evil." He wrote, "Either God wants to abolish evil and cannot; or he can, but does not want to. If he wants to, but cannot he is impotent. If he can but does not want to, he is wicked." Either way, for God and those who believe in him, it is a lose-lose dilemma.

This chapter addresses the many different answers that priests, rabbis, clerics, imams, theologians and other keepers of the faith have proposed for one of the most problematic of the questions that religion has to deal with.

The Gnostics

This was such a difficult question that one early religious group, the Gnostics, (from *gnôsis,* meaning "knowledge"), answered it in a uniquely creative fashion. They were a group of quasi-Christian mystics who were popular in the first few centuries after the death of Christ. Instead of developing a massive set of circumlocutions based on a perfect, all-knowing, loving, and compassionate God, they simply suggested that God never had these qualities in the first place. They proposed that he was a seriously flawed, even demonic and malicious, being whom they called the *Demiurge.* This name was originally coined by Plato to represent the creator of the base world, as opposed to the world of the sublime. While most of the religious mystics of the world were optimists whose faith claimed that despite all the evil, the world was basically "all right," the Gnostic mystics were supreme pessimists and felt the world was basically "all wrong." Instead of viewing the cosmos and nature as essentially neutral, they envisioned the cosmos and nature as fundamentally hostile to human endeavor. They also believed there was a true good God called the "the True Father," who could be held blameless for the evil of the Demiurge. Part of the appeal of the Gnostics was their claim that there was a higher, less flawed world to which the soul will return, an

"all right" heaven. This concept was adopted by many other religions.

The Deists

Another creative variation that was less extreme than Gnosticism was Deism. This religious philosophy affirms the existence of God the creator, but proposes that once he finished creating the early universe he retired or went off to create other universes. Deism allowed a peace treaty between Darwin's theory of evolution and creationism by providing for the existence of "old earth" creationists. God created the universe but the creation of the earth and all life on earth was the result of cosmic and biological evolution. This also got God off the hook for evil in the world. Basically he could say, as humans tend to do, "It's not my fault." God got things started, but what happened after that was due to the forces of nature he created. The trouble with the Deism solution is that the vast majority of humans are not Deists but Theists and believe in a hard-working, personal, unretired God whom they tend to hold responsible for evil.

Theodicy

Another solution is to attempt to explain away the coexistence of evil and a personal, caring God. This is called a *theodicy.* The term is derived from the Greek *theós,* meaning God, and *dikê,* meaning justice. The following are some of the common theodicy-type solutions to the "problem of evil."

The free-will solution. God gave man free will. This in itself suggests that God is very intelligent since it freed him from being responsible for the second-to-second action of every person on earth. Wise move, God! This also means that when man is responsible for evil, such as Hitler's killing of the Jews, it is not God's fault. Blame the ability of man to do what ever he wishes, to exercise his own free will. In this form evil occurs because God allowed man to have free will. The inverse form holds that God allows evil to occur so man can have free will. Both forms have the same result. This human form of evil is termed "moral evil." Of course the free will solution does not excuse "natural evil" in the form of tsunamis, hurricanes, earthquakes, and other acts of nature that God should be able to control.

Inanimate free will solution. One of the natural disasters that posed a great challenge to understanding the problem of evil occurred in Lisbon in 1755. Because it was All Saint's Day, people were attending church. An earthquake caused the stone structures to collapse killing over 100,000 people. This was a particularly onerous example of God's failure to prevent evil. To explain natural evil some have suggested the "free process solution." [1] This is based on the assumption that if humans have free will, then all of nature in general, including tectonic plates should also have free will. Thus, earthquakes and tsunamis are not God's fault; the disasters they produce are the fault of the free will of nature. This does not really explain why an all-powerful God could not have compromised just a little bit. For example, couldn't he have delayed the Lisbon earthquake by one day to Monday, when all the churches were empty?

The character-building solution. A good example of this is when a couple has a

child with Down syndrome. This chromosome abnormality causes mental retardation and in previous years parents were advised to deal with this form of evil by placing the child in an institution. Over time, people stopped doing this and found that Down syndrome children are friendly, loving, and often a delight to raise, and provide true character-building for the parents. Another example is being born deaf. Some deaf people find such identity and character-building from their deafness that they refuse treatment with a cochlear implant. This solution suggests that evil helps to build man's character and to become the noble souls that God can be proud of. Of course if you are killed by the evil event, it is a bit late for character building.

The Yin and Yang solution. The Taoist religion speaks of yin and yang representing the many opposites in the universe, such as male and female and good and evil. They illustrate this concept with the following symbol of interlocking curves.

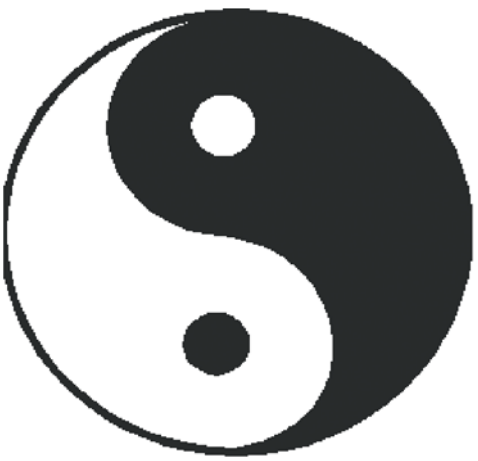

Figure 1. Yin and yang.

The yin and yang hypothesis suggests that one extreme of anything cannot exist and cannot be fully defined without the other extreme. If there was only divine perfection there would be no evil, but nothing exists in a single isolated pure state. As soon as there is some subtle variation to perfection, some dimensionality, there is automatically a window for the presence of evil. This view suggests that if there is good there must also be evil. That is just the way things are. Accept it. Don't blame God. The fifth century theologian Augustine of Hippo mounted the same solution. He couched it in terms of *privatio boni,* or a privation of good—an evil thing can only be referred to as a negative form of a good thing. In a similar vein, to the Hindu Vedantist the question of "Why does God permit evil?" is as meaningless as "Why does God permit good?" The fire burns one man and warms another, and is neither cruel nor kind. [2]

A variant of this is that in order to do good deeds, one needs individuals in need of good deeds. One cannot give alms to the poor if there are no poor, or tend to the lepers if there are no lepers, or rescue the buried victims of a powerful earthquake if there are no powerful earthquakes.

The "God's mysterious plan" solution. By far the most common explanation for God allowing evil to occur is that it was part of God's mysterious plan. God knows exactly what he is doing and in the long run the evil that happens is all part of "God's plan." We mere mortals are just too stupid to understand his long-term plans. This is the common fodder of movies where a Spencer Tracy-like priest comforts a sobbing mother after her child has died with the words, "It is all part of God's grand plan," or its variant, "He is now in a better place."

The "God is also suffering" solution. Christians believe that God has shared the

suffering of humans by living a truly human life in the body of Jesus Christ on earth. This gives comfort in that God is not above our misery, but along side us in the darkness. John Polkinghorne [1] gives the example of a concentration camp in World War II. A young Jewish boy was hung and was twisting and dying in a Gestapo noose. From the crowd of his fellow Jews, forced to witness the execution, came the cry "Where is God now?" One of them tells us that he reached inside himself for the answer. "He is there, hanging in the noose." There are, of course, two ways to interpret this: either God is suffering along with us or God also just died. Polkinghorne chooses the former stating "This insight, of God as the fellow sufferer, that Christians believe was historically acted out in the cross of Jesus Christ, meets the problem of suffering at the profoundest possible level." This explanation leaves unanswered the question of why would a rational, all-powerful God want to flagellate himself?

The "We get what we deserve" solution. After the 2004 tsunami in the Indian Ocean, many religious apologists claimed that humans were being punished for a variety of ills. [3] Israel's chief Sephardic rabbi, Shlomo Amar, suggested "This is an expression of God's ire with the world. The world is being punished for wrong doing." A Hindu high priest suggested the tsunami was caused by "a huge amount of pent-up manmade evil on Earth." On MSNBC Jennifer Giroux said the tsunami was divine punishment for America's "cloning, homosexual marriages, abortion, lack of God in the schools, and taking Jesus out of Christmas." James Haught [3] suggested this was nonsense. "Why would a loving creator drown Asians in a rage over American sins?" It is also difficult to apply this solution to a young baby just diagnosed with retinoblastoma. The "We get what we deserve" solution is basically a Rorschach test for a range of upset believers and leaves a lot to be desired.

The "Man Created God" Solution

The trouble with all of these explanations is that while they are philosophically or theologically interesting, they are not inherently very satisfying or comforting. If my child is mangled and killed in a automobile accident or if massive numbers of my ancestors are killed in pogroms or other forms of genocide, none of these excuses for God allowing these things to happen are satisfactory. The very existence of the hypothesis of an all-powerful God carries with it the implication that any form of evil could have been prevented if He had simply chosen to do so. The only truly logical and satisfying answer is to take God out of the equation entirely. If he does not exist he cannot be blamed for evil. Thus, the one solution that totally eliminates the "problem of evil" is to assume that man created God.

The "problem of evil" is one of the greatest challenges for religion to explain. While many solutions have been proposed none adequately deals with the fact that an all powerful, personal, caring God could eliminate the worst aspects of evil if he wanted to. The one solution that is the most logically satisfying to the thinking brain is to assume that Man Created God—in which case the "problem of evil" disappears.

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…the idea of God as author of books is a myth, if ever there was one.…The books reputed all divine are simply not filled with truth from beginning to end.…They contain as many errors as books of their kind…

Alfred Loisy [1]
The Origins of the New Testament

Chapter 51

Are the Sacred Books Literally True?

Many of the most problematic aspects of religion, especially religious fundamentalism, stem from the assumption that the sacred texts such as the Bible and the Qur'an are the direct word of God and thus every word is literally true. The alternative view espoused in this book is that all the sacred books were written by human beings who sought to provide their followers with myths, rules and rituals to live by and to form the basis of their religions. Three of the ways to examine the validity of the claim that the sacred books are the direct word of God and thus inerrant are to determine a) Who really wrote them? b) Are the different parts of the texts consistent with each other? and c) Are there clear examples of where the supposed inerrant text has been recently changed by man? For English-speaking people much more on the subject of infallability has been written on the Bible than on the Qu'ran. Thus my emphasis will be on the Bible.

Who Wrote the Bible?

The New Testament, especially the Gospels of Matthew, Mark, Luke, and John, were written by unknown early Christians between 70 and 100 CE. [2,3] As pointed out by Bible scholar Randel Helms, in *Who Wrote the Gospels?,* the answer to the question of their authorship is: "Not Matthew, not Mark, not Luke, and not John." Helms further stated,

> Christians in the second century, possessing anonymous manuscripts and eager to give names to them, fastened upon four historical figures—the Apostles Matthew and John, Luke the "beloved physician" of Paul, and John Mark of Jerusalem, the "son" of Peter. It's relatively easy to show that these identifications are imaginary and based on wishful thinking. [3p1]

Each of these four canonical Gospels were largely fictional accounts concerning a historical figure, Jesus of Nazareth. As stated by Helms in *Gospel Fictions,* the Gospels are not so much about Jesus as the early Christians' own attitudes concerning Jesus. [2p16] The Gospels were intended to be a life-enhancing literature written in a

fashion that would maximally enhance the acceptance of Christianity. "The Gospels are, it must be said with gratitude, works of art, the supreme fictions in our culture, narratives produced by enormously influential literary artists who put their art in the service of a theological vision." [1p11] As stated by John Meir in his biography of Jesus, "The gospels are 1st century Greco-Roman religious propaganda." [4]

Even the Old Testament was a re-written, enhanced version of the old Hebrew Bible written in Greek. "Christians, by interpretive fiat, created a new book, one that had never existed before—the "Old" Testament—turning the Hebrew Bible, especially in its Greek Septuagint translation, into a book 'really' about Jesus." [5] Some believers claimed the New Testament was true because it was predicted by the Old Testament. In reality it was a stacked deck, a tautology, since both were written, or re-written, by early Christians. As stated by Northrop Frye,

> How do we know that the Gospel story is true? Because it confirms the prophecies of the Old Testament. How do we know that the Old Testament prophecies are true? Because they are confimed by the Gospel story. Evidence, so called, is bounced back and forth between the testaments like a tennis ball; and no other evidence is given us. The two testaments form a double mirror, each reflecting the other but neither the world outside. [6p78]

Both the Old Testament and New Testament were written or re-written by largely anonomous early Christians to elevate Jesus of Nazareth to the status of a miracle worker who died for their sins, was the resurected son of God, and was a spiritual figure on which a new religion, Christianity, espousing a belief in one God, could be built. Instead of being a result of the direct word of God, the Bible is a product of early propagandists anxious to ensure the survival of a new and fragile religion.

Inconsistencies in the Bible

Christian fundamentalists, creationists, and evangelical Christians base their beliefs on the infallibility of the Bible. There is no room for metaphor. No room for allegory. No room for myth. They believe that if a single word is shown to be wrong then every word can be called into question. This belief in the inerrancy of sacred texts is not unique to Christians; Jewish and Islamic Fundamentalists also believe in the inerrancy of the Old Testament and the Qur'an.

In premodern times virtually all Christians believed in the literal truth of the Bible. For example, according to the Councilor Documents of the Catholic Church:

> The books of both the Old and New Testaments in their entirety, with all their parts, are written under the inspiration of the Holy Spirit: they have God as their author. Therefore, since everything asserted must be held to be asserted by the Holy Spirit, it follows that the books of the Scripture must be acknowledged as teaching solidly, faithfully, and

> without error that truth which God wanted put into sacred writing for the sake of salvation.
>
> *Dei Verbum* [11]

This view was shaken in 1860. Shortly after the publication of Darwin's *On the Origin of Species,* seven Anglican clergymen published *Essays and Reviews.* [7] This translation made a book entitled *Higher Criticisms of the Bible,* originally written in German by German Biblical scholars, available to the English-speaking public. Based on techniques of literary analysis, historical research, archeology, and comparative linguistics they argued that the first five books of the Bible, traditionally attributed to the word of God spoken to Moses, were, in fact, written much later by a number of different authors. The book of Isaiah had at least two different authors; King David did not write the *Psalms; most of the miracles should not be taken literally; many of the Biblical events were not historically true; and the Biblical tales were simply "myths."* [8p95]

This was clearly the antithesis of the beliefs of fundamentalists. In premodern as well as modern times a significant part of believing that the Bible is literally true came from fear. For example, in referring to the rapturists, Currie [9p382] wrote:

> They must understand all passages of the Bible literally because they think that otherwise they will have left the barn door open for the horses to escape: once any passage is declared to be figurative, where do they stop, without an accepted authority as a guide? Rapturists choose to be literalistic in their interpretation of apocalyptic literature because they think that anything else is just too dangerous. Literal Scripture interpretation is their only stable spiritual authority.

One of the best places to look to when testing the inerrancy of the Bible is the Bible itself. If one passage of the Bible says one thing while another passage says the opposite, which is true? Which is divinely inspired. If God was directly responsible for the text of the Bible it should be totally free of any hint of inconsistency. *God should be the ultimate copy editor.* There are, however, over 700 inconsistencies in the Bible and the readers are invited to examine the list themselves. [10] The following are just a few examples:

- God is repeatedly portrayed as all-seeing and knowing all, as in *Proverbs 15:3* "The eyes of the LORD are in every place, Keeping watch on the evil and the good" and in *Hebrews 4:13* "And there is no creature hidden from His sight," but in *Genesis* 4:9 he must ask Cain where his brother Abel was, and in *Exodus* he asks the Jews to mark their houses with blood so he will know which ones to "pass over."
- According to passages in *Exodus 20:5, Numbers 4:18*, and *Isaiah 12:21–22* children are to bear the sins of their parents, while according to *Deuteronomy 24:16* and *Ezekiel 18:20,* they are not.
- In *Leviticus 24:20* and *Deuteronomy 19:21* we are instructed to take an eye for an eye and tooth for a tooth, while in *Matthew 5:39* and *Luke 6:29* we are told to

turn the other cheek.

- The story of Noah's ark, as stated in the Bible, contains many aspects that could never have happened. The size of the ark was too great to have been built only of wood; loading it with a pair of all the animals on earth would have taken dozens of years, not a week; a worldwide flood is physically impossible; there is no evidence from DNA sequencing that all animals were derived from a single pair in recent times; and there is no geological evidence for a worldwide flood.[10] There is, however, some evidence for a catastrophic but local flood in Mesopotamia several thousand years BCE.[11] Thus, while potentially based on a kernel of truth, virtually all aspects of the Biblical accounts are metaphors.

The many examples of inconsistencies and physically or historically impossible stories in the Bible provide ample evidence that the Bible was written by man and later, to enhance its authenticity and power, claimed to have been the direct word of God. Explanations of these inconsistencies by believers in the inerrancy of the Bible are weak. These include suggesting the inconsistencies are not really inconsistent; suggesting that God put them there on purpose; or suggesting that the inerrancy of the Bible is limited to things God intended to reveal. In other words the inconsistencies are not God's word, only the consistencies are His, leaving man to sort out the difference.

Seeing the Bible not as literally true but as a metaphor for the role of God in people's lives and as source of message-laden, poetic, and spiritually lifting stories and myths allows the Bible to contain many inconsistencies and errors. Since it was written by many authors hundreds of years after the fact, it would be expected to have many inconsistencies. Since its stories were meant for their metaphorical content, it would be acceptable to contain many factual errors. These inconsistencies do not detract from the Bible as a source of rules to live by. *Holy books only become dangerous and destructive when they are assumed to be inerrant and literally true, and when the holy book of one religion is assumed to be better than the holy book of another.*

The anthropologist Andrew Wallace[12] estimated that over the course of their time on earth humans have produced 100,000 different religions. Based on his time in history, the degree to which his environment is seen as threatening, his level of knowledge of natural science, and the type of his culture—*man himself is the origin of both his religions and the Gods on which they are based.*

Man Made Changes in Sacred Texts

A problem with many religions is that their basic tenets trace back to formulations made a few thousand years ago, when the world was a different place than it is now and there was only a rudimentary amount of valid scientific knowledge. The rules and rituals made then may not always apply to modern times. Sam Harris, in his book, *The End of Faith,*[13] was particularly concerned with the irrational nature of many of the things man holds most sacred. He stated:

> Because most religions offer no valid mechanism by which their core beliefs can be tested and revised, each new generation of believers is condemned to inherit the superstitions and tribal hatreds of its predecessors. [We show] a willingness to live, kill, and die on account of propositions for which we have no evidence.
>
> Most religions have merely canonized a few products of ancient ignorance and derangement and passed them down to us as though they were primordial truths. This leaves billions of us believing what no sane person could believe on his own. If one didn't know better, one would think that man, in his fear of losing all that he loves, had created heaven, along with its gatekeeper God, in his own image.

If the rules, myths, and rituals of a given religion came directly from God they should be immutable. In reality, clear-cut man-made changes in the rules occur all the time, suggesting that the original rules were also man-made. A few of many examples are discussed here.

Limbo goes to heaven. One of the basic tenets of the Catholic church is that there is heaven and hell and two intermediate stations called purgatory and limbo. Limbo is for children who have died before they have had a chance to be baptized. They stay in limbo and do not go to heaven. However, in modern times, many of the newest recruits to Catholicism come from Africa, where the infant mortality rate is very high. This caused much distress in these new African converts because when the parents died they could not be reunited with their lost babies, since they were stuck in limbo. To solve this difficult problem and improve African conversion rates, a group of Vatican theological advisors recommended to Pope Benedict XVI that limbo be eliminated and that these babies should be allowed to go to heaven instead.

This was not the only change in the sacred realms of the afterlife. In the softer self-help world of modern times, the fire and brimstone and everlasting torture of Hell no longer brings in new believers. [14] As a result many priests have simply stopped talking about hell. To further soften *Dante's Inferno,* in 1999 Pope John Paul II redefined hell as "the state of those who freely and definitively separate themselves from God." No more fire. No more brimstone.

One of the problems with re-definitions is that once you start messing with one part, the whole landscape of the afterlife changes. It used to be that babies needed to be baptized so that when they died, either as children or adults, they could go to heaven. If babies who died now go to heaven without being baptized, is the baptismal ritual no longer necessary? Should that sacred ritual be eliminated? What happens to the untold millions of babies already in limbo, before the rules changed? Do they now march en masse into heaven? If hell is now a softer place, what happens to purgatory, the original "softer than hell" place? Is it also slated to disappear?

Mormonism, Native Americans and the Chosen People. Joseph Smith founded the Church of Jesus Christ of the the Latter-day Saints. In 1827 an angel named Moroni was supposed to have led Smith to a set of golden plates buried in a hillside near his

New York home. God gave Smith a set of special glasses and seer stones that allowed him to translate the tablets from the Reformed Egyptian language into the *Book of Mormon: Another Testament of Jesus Christ.* [This convenience alone, that ancient Egyptian texts should just happen to be buried next to his home in New York, should stretch the credulity of any rational mind.] These divine scriptures restored the Christian church to God's original version and left the rest of Christianity in a state of less-than-divine apostasy. To put this in perspective, recall that it has been suggested that Joseph Smith's visions were the result of temporal lobe epilepsy.

These sacred scriptures describe a tribe of Jews who sailed from Jerusalem to the New World in 600 BCE and split into two groups, the pure God-fearing "whites," or *Nephites,* and the idol-worshiping blacks, or *Lamanites.* By 385 CE some lighter-skinned Native American Lamanites returned to and were accepted by the church. Missionaries used this supposed ancestral link between Native Americans and Polynesians with Hebrews as a conversion tool by claiming American and Polynesian natives were also members of the "chosen race." Due in part to this enticement, millions of people from Central and South America and the South Pacific became Mormons. As stated by one Mormon attorney, "We were taught that all the blessings of the Hebrew lineage belonged to us and that we were special people. It not only made me feel special but it gave me a sense of transcendental identity, and identity with God." [15]

Unfortunately, modern science has put a major kink in Joseph Smith's vision. Analyzing mitochondrial DNA, Simon Southerton, a Mormon molecular biologists from Australia, found no trace of Middle Eastern DNA in the genetic material of today's American Indians or Pacific Islanders. [16] This produced a major problem for the Mormon leaders who cannot acknowledge any factual errors in the Book of Mormon because the prophet Joseph Smith stated it was the "most correct of any book on Earth." To admit this would result in a loss of confidence in Joseph Smith as an infallible prophet. This also produced a major problem for all those individuals who were made to feel so special because they were one of the "chosen people."

The solution was to slightly alter the original interpretation of the Book of Mormon. Instead of meaning that the Hebrews were the first and only inhabitants of the New World, the new rule is that in fact the Hebrew migration was restricted to a small region of Central America and that the DNA signature was "swallowed up" by the much larger number of pre-existing Native Americans. As Southerton pointed out, the new interpretation was counter to both a plain reading of the text and the words of Mormon leaders. It was also counter to the simple genetic fact that DNA breeds true and does not get "swallowed up." If Native Americans had some Hebrew DNA it would still be present. DNA analytical methods can pick up a few specific sequences among billions.

These DNA studies have understandably upset many. One Polynesian, who grew up believing he was a Hebrew, said, "I visualized myself among the fighting Lamanites and lived out the fantasies of the Book of Mormon as I read it. It gave me prestige to know that these were my true ancestors. Some days I am angry, and some days I feel pity for my people who have become obsessed with something that is

nothing but a hoax." [15]

This is an example of the fallacy of treating mythos as logos. It is also an example where the "scandal of particularity" bites back. Trying to feel better about yourself because you think you are among the "chosen people," and then finding out you are not is perhaps more difficult than never deluding yourself in the first place.

Ayatollah Khomeini and the Shariah. The Arabic term *Shariah* means "The Path to the Watering Hole," and represents the body of sacred Islamic laws derived from the Koran. They are *immutable, divinely inspired laws* held to be the only rightly guided way of life and regulate every aspect of a Muslim's lifestyle. Khomeini, the Ayatollah of Iran, displaced the Shah and brought religious fundamentalism back to Iran. He was forced to move from theologian to secular head of state. As part of new secular duties he wanted to institute changes in certain labor laws. The problem was that the Council of Guardians was blocking these changes because they contradicted the *Shariah.* The *Shariah* were pre-industrial rules, and new rules were needed in an industrial state. In the early 1970s Khomeini proposed *Velayat-e Faqih,* or "The Mandate of the Jurist," proclaiming that *faqih,* or jurists, should head the state to ensure that society conforms to God's will as revealed in the *Shariah.* So far, no problem. However, in 1987, Khomeini made a declaration of independence in which he declared that the state was emancipated from the constraining laws of traditional religion. Then on January 12, 1988, speaker Rafsanjani, on behalf of Khomeini, gave a further new interpretation of *velayat-e faqih,* stating that *God had actually not revealed in the Koran all of the laws that Muslims needed.* He delegated to the *Majlis,* or representative assembly, the authority to make up new laws on their own initiative. Did this mean that Khomeini was embracing a Western style democracy? By no means. It was stated that this right to legislate did not come from the people but from God. Divine rulings simply passed from God to the prophet, to the Imams or religious leaders, to Imam Khomeini, and from him to the *Majlis.* [8] It was claimed that this man-made rule change produced a "democracy that was better than in the West because it was rooted in God."

This is just a small sampling of a number of man-made changes in sacred "immutable" texts.

All religions assume their sacred texts represent the direct word of God. Many thus assume they are inerrant and literally true. However, historical evidence shows that both the Old and the New Testament were written or rewritten by early Christian propagandists. In addition, there are hundreds of inconsistencies in the Bible. That is not inerrancy. Some of its stories cannot possibly be physically or historically true. That is not inerrancy. Both historically and logically Occam's razor suggests that the poetic and inspirational verses of the Bible and other holy books were instead written by poetic and inspirational humans.

An additional problem of assuming inerrancy in the sacred texts

is that after the passage of hundreds or thousands of years, customs and knowledge change and some of these "immutable" laws need to be altered. To accommodate this, man has frequently changed the sacred rules. If the texts were truly dictated by an all-knowing God who knew the future, they should have been formulated in a way that did not need changing. Again applying Occam's razor suggests that the reason the original laws are less than perfect is that they were man-made.

Over the course of their time on earth, humans have produced 100,000 different religions. God would have been better served with a "one for all, all for one religion." This clearly suggests this plethora of religions and gods were all produced by a plethora of different humans to suit their needs at the time.

With man as author of the Theory of God and writing the holy books as metaphors for rules to live by, the rationale for all fundamentalist beliefs that are based on the literal inerrancy of these texts disappears and with it all of the attendant reasons for religious wars, intolerance and terrorism.

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Chapter 52

Is God Dead? Ask the Pentecostals

On October 22, 1965, *Time* magazine ran a cover story emblazoned in red block letters on a black background asking, **IS GOD DEAD?** It emphasized the fact that throughout the Western world membership in religious congregations was declining. The conclusion was that God would die of old age and exhaustion, probably within the next decade. It was just a matter of time. [1p164] The secular age was upon us. The age of religion would soon be behind us. Now, 40 years later it is clear that God is not dead.

The Russian Revolution of 1917 provided an excellent illustration of the failure of God to die. Marxism and Leninism posited that the road to socialism demanded the death of God. Karl Marx suggested that religion was simply an "opiate of the masses." However, much to the dismay of the leaders of the revolution, religion refused to become extinct, and when communism collapsed in the 1990s, religion experienced a resurgence.

At the height of Stalin's communism in 1937, the League of Militant Godless who were trying to suppress religion had to admit that as much as one-third of the urban and two-thirds of the rural population were still practicing religion in one form or another. Thus, despite over 70 years of suppression of religion by an avowed atheistic government, religion survived and thrived.

Some of the individuals who have put forth atheistic ideas, such as Feuerbach, Marx and Freud, attempted to offer explanations of why perfectly rational human beings should believe that God exists. They suggested that these ideas must lie in a malfunctioning of the mind and the subtle influences of human consciousness and unconsciousness. These individuals came to their assumptions prior to the explosion of the field of the neuroscience of cognition in the latter part of the twentieth century. [2,3]

In reality a belief in God is not due to a malfunction of the mind. It is the product of a normal mind in which spirituality plays an important role, is hardwired into neurons and genes of the brain, and is of such importance to the development of mankind that it has been perfected over thousands of years of evolution and natural selection. The Pentecostal movement is a good example of the human thirst for spiritual fulfillment.

Pentecostalism

Pentecostalism has been described as "a spiritual hurricane that has already touched half a billion people, and an alternative vision of the human future whose impact may only be at its earliest stages." [4] The half-billion estimate is probably high. More conservative estimates suggest a world membership of 115 million, [5] still a significant figure.

The term *Pentecostal* comes from the Jewish holiday called Pentecost that occurs 50 days after Passover and from the Biblical Day of Pentecost — the day that, according to *Acts 2* of the New Testament, the early Christians first experienced the phenomenon of speaking in tongues.

> *Acts 2:1.When the day of Pentecost came, they were all together in one place.*
>
> *2:2. Suddenly a sound like the blowing of a violent wind came from heaven and filled the whole house where they were sitting.*
>
> *2:3. They saw what seemed to be tongues of fire that separated and came to rest on each of them.*
>
> *2:4. All of them were filled with the Holy Spirit and began to speak in other tongues as the Spirit enabled them.*

As described previously, speaking in tongues, or *glossolalia,* refers to the utterance of meaningless syllables producing what appears to be an unknown foreign or mystic language. Despite the fact that the words produced are incomprehensible, speaking in tongues is presented as a miracle of universal translation enabling people from many parts of the world to understand each other.

Legend was that just prior to the end of history, God would pour down torrents of a "latter rain," as foreseen by the prophet Joel. This would surpass even the first Pentecost in its potency. There would be a worldwide resurgence of faith, and the healing and miracles that had been so evident in the first years of Christianity would happen again as a prelude to the second coming of Jesus Christ. [4]

Origins of Pentecostalism. While Pentecostalism is considered to be a product of the American religious ethos, it traces its origins to the primitive church in the first Christian communities of Rome and other cities, where groups of believers led lives aimed at perfection and endowed with charismatic gifts. The most prominent gift was speaking in tongues as the Apostles and disciples of Jesus did on the day of Pentecost. [6] Receiving this divine power was known as being filled with the Holy Spirit.

In the second century, an ecstatic movement was founded by Montanus and called *Montanism.* As described by historians, Montanus at times "became beside himself, and being suddenly in a sort of frenzy and ecstasy, he raved and began to babble and utter strange things." [6] By the fourth century charismatic gifts had faded from the scene.

The path to the development of charismatic faiths picked up again in America with the multiple waves of revivalism starting with the first wave from 1725–1750.

The appeal of revivalism lay more in its violent physical manifestations than in its theology.

> As long as a person had jerks, parts of his body would snap back and forth with such rapidity that the long braids of hair cracked like whips.…Many western revivalists regarded the physical phenomena as heavenly visitations, while they resorted to time-tested techniques to induce them in susceptible persons.…On the other hand, the better educated Presbyterian and Congregationalist ministers denounced them as vulgar animal displays. [7]

In his book, *Fire from Heaven,* Harvey Cox [4] traced the beginning of the Pentecostal movement in the United States to April 9, 1906, at 312 Azusa St., Los Angeles, when a black preacher named William Joseph Seymor began a unique type of church service. He had previously heard a woman pray aloud in a language he could not understand. Seymour was touched to the core. He could sense that the woman had somehow attained a depth of spiritual intensity he had long sought but never found. He was excited because such "speaking in tongues" was held to be a sure sign of the imminent coming of the last days and the descent of the heavenly city foreseen in *Revelation.*

The charismatic Azusa Street revivals continued day after day, month after month forming the Pacific Apostolic Faith Movement. People prayed all night and anything could happen. They spoke in tongues, leaped into the air, shouted, and fell to the floor in trances called "being slain by the Lord." The term "holy rollers" was commonly used. One man stated that when the Spirit entered him he felt as though "everything in my body was laughing with unspeakable joy." [4] Word of these uniquely spiritual services spread rapidly throughout the country. The following characteristics of Pentecostalism are what made it so popular.

Open to all. The congregation consisted of men and women, blacks and whites, rich and poor, but especially the poor and the down and out. It was felt that the dissolution of racial, gender, and economic barriers was the surest sign of the Spirit's pentecostal presence and the approaching of the New Jerusalem. One of the movement's early interpreters wrote in 1910,

> God sent this latter rain to gather up all the poor and outcast, and make us love everybody.…He poured it out upon the little sons and daughters, and servants and handmaidens.…God is taking the despised things, the base things, and being glorified in them.

Currently Pentecostalism has slowed considerably among white people, while its expansion among minorities and in the third world continues to accelerate.

Primal speech: Speaking in tongues. Cox [4] proposed that the appeal of Pentecostalism involved three spheres: primal speech, primal piety, and primal hope.

People had become dissatisfied with the coldness and empty formality of the standard churches and longed for something better. The so-called "text-based" churches primarily just read the Bible. This was usually done by the minister providing a dry and cerebral form of Christianity that many found unattractive and unintelligible. The Catholic church was even more structured and distant. By contrast the Pentecostal churches provided a direct, immediate, experiential connection to the Holy Spirit and God. It filled what one writer called "the ecstasy deficit." The Pentecostals had rediscovered a powerful and primal form of religious expression. There was a wonderful perceived nearness of the Spirit, as close as one's own larynx and vocal cords.

As described previously, speaking in tongues provides a powerful direct connection to the spiritual brain. The Spirit of God needs no mediators but is available to anyone in an intense and immediate way. In contrast to accessing the spiritual brain through the quiet templative meditation used by the Eastern religions, Pentecostalism utilizes a raucous, hyperactive, hypnotic and very noisy approach to the spiritual brain.

Primal piety. This refers to the resurgence in Pentecostalism of trances, visions, healings, dreams, dancing, and other archetypal religious expressions. These touch on what has been refered to as the "elementary forms" of human religiosity.

Primal hope. This points to Pentecostalism's millennial outlook and its insistence that a radically new world age is about to occur. This unmistakable expectation of a better future especially resonated with the poor and disadvantaged. Pentecostals differ from fundamentalists in that fundamentalists believe they are the only ones that will be saved at the end of time. Pentecostals "do insist they have something other believers lack, but they usually concede that they are not the only passengers on the ship of salvation."[4p275]

Faith healing. Some Pentecostal churches also utilize prayers for healing and "the laying on of hands." Rather than a substitute for modern medicine, this can be viewed as complementary to modern medicine. As described in the chapter on the placebo effect, a strong belief in the healer can trigger powerful healing responses in the human body. For those too poor to obtain modern medicine this faith healing is arguably better than nothing.

Music. While most churches utilize organ music in their service, this type of music does not get the congregation thumping their feet on the floor, clapping their hands, rocking back and forth and slapping their thighs. The music of the Pentecostal churches does this. This music provides the same primitive loud beat seen in pop concerts which serves to further tap into the spiritual brain. Cox even suggested that Pentecostalism was the religious version of jazz. Both were coming into their own at the turn of the century, both were powerfully influenced by African American culture and both manifested similar qualities of tone, style and mood.

Adaptable to any culture. Despite the incomprehensibility of speaking in tongues, this very trait allowed Pentecostalism to be adapted to any language. Nonsense syllables are pretty much the same in all languages and all cultures. The potent combination of

biblical imagery and ecstatic worship unlocking existing but often repressed religious patterns enabled Pentecostalism to root itself in almost any culture. [4]

This powerful combination of factors led Cox [4] to state that

> After a mere ninety years, what began as a despised and ridiculed sect is quickly becoming both the preferred religion of the urban poor and the powerful bearer of a radically alternative vision of what the human world might one day become…At Azusa Street, a kind of primal spirituality that has been all but suffocated by centuries of western Christian moralism and rationality reemerged with explosive power. This resurfacing of archetypal modes of worship…helps explain why the movement raced across the planet with such electrifying speed.

Because of these factors Pentecostalism could become Russian in Russia, African in Africa, Chilean in Chile, Portuguese in Brazil and on and on, adapting to any culture. In fact Pentecostalism has rapidly spread to all corners of the globe.

In his book, *Is Latin America Turning Protestant?,* David Stoll [8] showed that in many Latin American countries non-Catholic Christianity is growing five to six times the rate of the general population. In Brazil, 90 percent of this increase is Pentecostal. He predicted that five or six Latin American countries will have mostly Pentecostal majorities by 2010. The Yoido Full Gospel Pentecostal Church of Korea is a further example of the rapid expansion of Pentecostalism, this time in Asia. In 1963 it had 2,000 members. This was followed by steady and rapid growth and by 1995, it had expanded to 800,000 members.

Cox [4] posited one important remaining question:

> Will the current renaissance of religions lead toward some peaceful parliament of faiths, such as the one originally envisioned by the planners of the World's Columbian Exposition in Chicago more than one hundred years ago, or will it ignite new outbursts of jihads, crusades and inquisitions?

I have chosen to use Pentecostalism as an example for the resurgence of religion in the world because of its rather dramatic character and the remarkable way that speaking in tongues provides direct access to the spiritual brain. Other proselytizing religious moments such as evangelicalism are also making significant inroads.

Alister McGrath, in his excellent book, *The Twilight of Atheism,* suggests that the resurgence of religion in the latter half of the twentieth century was due to the failure of atheism. Others have suggested that the world would be better off if we eliminated faith and religion altogether. [9,10] I would rather suggest that the resurgence of religion is not due to a failure of atheism. The resurgence is due to man's innate thirst for spirituality. A preferred form of atheism would be one that recognizes the existence

of man's hardwired spiritual brain and understands that for the majority of humans, religion and a belief in God will never die. This form of atheism is totally compatible with the resurgence of religion and makes unrealistic the common belief of the 1960s that atheism would be the solution to the world's problems and that an atheistic world would have fewer wars and provide a better hope for the future. It also makes unrealistic the wish that faith and religion would disappear. In reality, atheism is a philosophy adopted by only a relatively small number individuals. The rest of the people on the planet will always believe in one faith or another. Rather than relying on atheism or the elimination of faith and religion to accomplish all these things, retaining faith and religion but eliminating the illusion that the sacred texts are literally true, is far more likely to attain the goal of an end to religious wars, intolerance and terrorism and far more likely to prevent "new outbursts of jihads, crusades, and inquisitions." [4]

In the 1960s it was commonly assumed that God was dead or dying and that the secular age was upon us. However, contrary to this perceived wisdom there has been a resurgence of interest in religion. Pentecostals represent one of the religious groups showing the most rapid rise in membership. Some of the reasons for this includes their utilization of three primal factors:

Primal speech in the form of speaking in tongues.

Primal piety in the form of trances, visions, healings, dreams, primal music, dancing, and other archetypal religious expressions which touch on what have been referred to as the elementary forms of human religiosity.

Primal hope which points to Pentecostalism's millennial outlook and its insistence that a radically new world age is about to occur.

The primal speech and piety may provide a mechanism, similar to meditation, of acquiring direct access to the spiritual brain. Man's persistent yearning for transcendent spirituality indicates that for the human species religion and a belief in God will never die.

Rather than relying on atheism or the elimination of faith to solve the problem of religious wars and terrorism, retaining faith and religion but eliminating the illusion that the sacred texts are literally true is far more likely to attain this goal and far more likely to prevent new outbursts of jihads, crusades and inquisitions.

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What is strange, what is marvelous, is not that God really exists, the marvel is that such an idea, the idea of the necessity of God, could have entered the heart of such a savage and vicious beast as man; so holy it is, so moving, so wise, and such a great honor it does to man.

Fyodor Dostoevsky
The Brothers Karamazov

We invent God to explain the unexplainable.

Jean Paul Sartre

…[If] your God is capable of designing worlds and doing all the other godlike things…he needs an explanation in his own right.

Richard Dawkins
Climbing Mount Improbable [1p68]

If one didn't know better, one would think that man, in his fear of losing all that he loves, had created heaven, along with its gatekeeper God, in his own image.

Sam Harris
The End of Faith [2]

The Old Testament states that God created man in His own image. We would argue that just the opposite occurred. Because of our capacity to use personal experience as a means of inferring the experience of others and because of the well-studied phenomenon of generalization, humans create God(s) in their own image, rather than vice versa.

Maser and Gallup
Theism as a By-Product of Natural Selection [3p527]

I believe that gods exist to the extent that people believe in them. I believe that we created gods, not the other way around. But that doesn't make God any less "real." Indeed, it makes God all the more powerful. So, yes, I believe in, and maybe, to some extent fear, the God in your head, and all the gods in the heads of believers. They are real, omnipresent, and something approaching omnipotent.

Vince Sarich [4p11]

Part VIII

Summary: Did Man Create God?

It will never be possible to prove whether God exists or not. This has been the subject of thousands of writers over the centuries, and the conclusion is always the same — since God is a supernatural force and thus beyond the realm of natural law, the existence of God cannot be proven or disproven. Certainly, proving that something does not exist is arguably more difficult than proving it exists. If you find it, it must exist, end of story. If you don't find it, one could always argue you did not look in the right places. I start with that point as a given. As pointed out in the

Introduction, the questions "Did Man Create God?" or, "Is the Theory of God a man-made theory?" are fundamentally different from the question "Does God Exist?" It is perfectly possible that the answer to the question, "Did Man Create God?" is "Yes," and yet a God, different than the one man made, still exists.

The concept that man created God is not original to me. It has been around for a long time. While the history of this question is related to the history of atheism, I will only relate those aspects of the history of atheism that directly relate to the question, Did man create God? as distinct from the issue of whether God does or does not exist. For the interested reader, the history of the successes and failures of atheism per se, are well reviewed by Alister McGrath in his book, *The Twilight of Atheism.* [5]

One early example relating to the idea that man created God was proposed by Mary Ann Evans (1819–1880). Her pen name was George Elliot. She was a prominent advocate of atheism in Victorian England. Well versed in the German language, she translated Friedrich Strauss's book, *Life of Jesus.* Based on the growing skepticism of biblical miracles, including the resurrection, Strauss sought to explain how Christians came to believe when there was no objective historical basis for their faith. She concluded that:

> Religion is ultimately an expression of the human mind's ability to generate myths in the first place and then interpret them as truths revealed by God.

In the following sections I will use the term *Theory of God* to refer to a theory that is similar to other man-made theories such as the theory of evolution, the theory of relativity, or the theory of the atom. Theories are developed to explain the seemingly unexplainable. They may be based on a series of facts, such as the Theory of Evolution, or they may be based on thought experiments, such as the Theory of Relativity, or the Theory of God. Referring to the question of whether man was the author of the Theory of God rather than to the question "Did man create God?" might be less objectionable to some readers. However, the basic concept is the same.

Definition of God

One of the problems that arose when man formulated the Theory of God is the definition of God. The National Catholic Almanac suggests the use of the following terms to describe God: almighty, eternal, holy, immortal, immense, immutable, incomprehensible, ineffable, infinite, invisible, unknowable, just, loving, merciful, wise, omnipotent, omniscient, omnipresent, perfect, supreme, and true. [6] As pointed out by George Smith [7] most of the terms such as eternal, immortal, immense, immutable, incomprehensible, ineffable, infinite, invisible, unknowable, omnipresent, and perfect are indistinguishable from nothingness. The remaining terms such as loving, just, merciful, holy, and wise are anthropomorphic. These features suggest that when man conceived the Theory of God he created God in the image of the best parts of himself. Then to add an aura of transcendency to his

creation, he added a series of impressive sounding traits that in essence were indistinguishable from nothing.

God has also been described as *omniscient,* in that he knows everything, past, present, and future. The problem with omniscience is that if God knows the future with infallible certainty, the future is predetermined and man is impotent to change it.

> Without volition, morality becomes meaningless. We cannot blame or praise a man for an action over which he has no control. Without volition the Christian scheme of salvation is a farce; men are predestined for either heaven or hell, and they have no voice in the matter…the Christian is forever plagued with the dilemma of preaching a religion of salvation to a world of men who, according to the doctrine of omniscience, are nothing more than automatons. [7p73]

All of these problems are eliminated if man is the author of the Theory of God. Man makes mistakes in logic and also produces inconsistencies in his sacred books. God does not.

The Creation Theory

Over the entire history of mankind, one of the major reasons for evoking the existence of a God or Gods was to explain what was then the unexplainable. How was the universe created? The stars? The earth? The plants and animals? Man? In the past few centuries, science has been able to produce explanations that are viable alternatives to the concept of *God The Creator.* In Parts I and II, I hope to have convinced the reader that Darwin's proposal of evolution by natural selection is perfectly adequate to explain the origin of all life on earth and there are no irreducibly complex aspects of nature that require a God to fill in the gaps. An Intelligent Designer is not required and need not apply for the job. Not only is such a designer not necessary it would only raise the question — Who created the Intelligent Designer?

In Part III, I hope to have convinced the reader that the weirdness of quantum physics includes the ability to create billions of universes out of space energy, out of virtually nothing. When the constants are just right, the random quantum fluctuations in space vacuum can result in a super rapid inflation leading to the birth of a stable universe capable of eventually supporting life. Neither the Big Bang nor the precise accuracy of specific constants as entertained in the Anthropic Principle prove the presence of an Intelligent Designer. By random chance one of the billions of embryonic quantum bubble fluctuations had the "right stuff" to make our universe. In Carl Sagan's words, [8] claiming that only a God could have managed to get the "stuff right" and the "right bubble" requires an answer to the question, "Who made the bubble maker?"

The complexity of nature, the apparent creation of the universe out of nothing, and the precision of the cosmological constants have repeatedly been proposed to

have provided proof of the existence of God. The science reviewed in part III show that these arguments do not prove that God exists. However, just as they do not prove that God exists, they also do not prove that God does not exist. They do however provide strong evidence that man made up the Theory of God in an attempt to explain how the universe, the earth, and man were created. This supports the premise of this book that while the existence of God cannot be proven either way, one aspect of the question, "Did man create God?" can be answered "yes" with a reasonable degree of likelihood. Man was the originator of the portion of the Theory of God that proposed that God was the creator. Man made up this theory at a time when the level of knowledge in the natural sciences was at such a primitive level that this seemed to be the best theory available.

The Theory of the Soul

Part IV reviews the neurological location of many of the important functions of the human brain. The Theory of God has been applied to many other aspects of man's most troubling questions such as, "What happens to us when we die? Does the essence of us, our spirit and our soul live on after we die? Is there a heaven? Is there a hell? Is moral behavior rewarded by an eternal life of bliss in heaven? Are 21 virgins waiting for the Muslims who die fighting the infidels?" One of the central themes of this book is the remarkable ability of man to possess both a rational brain that critically analyzes and assesses all these important questions and a spiritual brain that does not care much about facts and just plunges ahead with its need to find the transcendent, to rise above mere mortality, and to connect with an all-encompassing spiritual presence.

As shown in the chapter on consciousness, while the exact mechanism or structures involved are still being debated, there is no debate among neuroscientists that consciousness itself is a product of the brain. Consciousness dies when the brain dies. The soul and spirit also die when the brain dies, and with it the promise of an afterlife, a heaven, a hell, eternal rewards for good behavior, and eternal damnation for bad behavior. Thus, these aspects of the Theory of God that relate to the concept of a soul, an afterlife, and eternal reward for good behavior, all die in the face of modern science.

The Prayer Theory

Other chapters in Part IV review many other components of the human brain — the areas mediating rational thought, planning for the future, experiencing pleasure, emotion, social interactions, meditation, hope and happiness. The dorsolateral frontal lobes control rational thinking. The limbic system is the emotional brain and the orbitofrontal lobes monitor social interactions and moral behavior. Pleasure, a critical aspect of basic survival, relates to eating and reproducing and is mediated by the dopaminergic reward pathways.

The brain also possesses the capacity for self-healing in the form of an enormously powerful placebo effect. The more people believe that some outside

entity such as a physician, pill, herb, witch doctor or supernatural force will help them, the more likely it actually will. The more they believe that a personal God is there for them, the more effective the healing power of prayer will be. In personal prayer, the individuals pray for themselves or know they are being prayed for. This form of prayer can be effective. By contrast, in intercessory prayer, the individuals do not know someone is praying for them. This form of prayer that requires some type of supernatural power and has been shown not to work.

The Spiritual Brain

Neuroscience allows us to understand the existence of the spiritual brain, where it is and how it functions. This remarkable spiritual brain largely emanates from the temporal lobes. Within these structures lie the hippocampus, the center of regular memory, and the amygdala, the center of emotional memory. Other parts of the temporal lobes process the sensations of hearing and seeing. These come together to provide the neural substrate for powerful spiritual feelings.

A transcendent sense of spirituality may be produced when parts of the temporal lobes are stimulated by electrical probes, epileptic or partial seizures, psychedelic drugs, near-death experiences, prayer, religious services, rituals, various methods of meditation, speaking in tongues, or simply feelings of love. Some have called this the God part of the brain. It also allows us to understand that spiritual thoughts are intensely rewarding for man.

Neuroscience helps us to understand that there is a craving for a belief in something greater than ourselves, for a belief in the correctness of all aspects of the Theory of God. Understanding this also helps us to see that while the Theory of God is man-made, the feelings associated with the Theory of God are real and will never go away. This is similar to the above quote from Vince Sarich that even if man created God, it does not make God any less real or less powerful. Neuroscience helps our rational brain to understand this and to live in peace with the spiritual brain. As a result, it can be all right for an individual with a highly developed rational brain, such as a scientist, to also believe in the transcendent and, in some cases, to have a religious faith.

The last chapter of Part IV, on the biology of faith versus reason, shows how the spiritual brain can overpower the fact-driven rational brain. This is brought about by a number of factors including the fact that major decisions are made in the unconscious mind out of sight of the rational brain, and that man has evolved a built-in pleasurable craving for information and understanding that sometimes allows questions to be answered on the basis of faith in the complete absence of facts. In addition, neuroscience has shown that images, spoken words and phrases, and probably beliefs, that we have been repeatedly exposed to, can be instantly recalled from only a few neurons, and in some cases only one. This level of efficiency provides insight to why images and beliefs acquired early in childhood tend to be very resistant to change. It is understandable that an individual well steeped in the religious dogma of the family can grow up to be a scientist but still retain strong religious beliefs and irrational faiths.

An Inborn Moral Law

Part V reviewed the role of genes in controlling different aspects of our behavior. The environment, interacting with our genes, plays a role in controlling the different functions of the brain. In some cases genes play the major role, in some the environment plays the major role, while in most cases the environment and genes play about an equal role. Most functions of the brain are the result of polygenic inheritance — the interaction of many different genes, each with a small effect, and the environment. Since a given gene is usually responsible for less than one to two percent of the sum total of all forces producing a given trait, it is incorrect to speak of a "depression gene," an "alcoholism gene," or a "God gene." It is permissible to talk of depression genes, alcoholism genes, or spirituality genes.

Some have suggested that moral behavior in humans, the so-called Moral Law, could only have been divinely inspired and is thus proof of the existence of God. [9] However, based on genetic studies it is apparent that "bad behavior" or "antisocial behavior" is strongly genetic and is a relatively *rare human trait.* Good or altruistic behavior is also under significant genetic control and is as common as antisocial behavior is rare, and is exhibited by many species other than our own. Religion may help us to behave, but we can behave compassionately and well on our own. *Moral Law is an inborn behavior, not a divine one.*

Intelligence is under greater genetic control than most other human traits. Innate spirituality, independent of religion, is also under strong genetic control. Not surprisingly, religious affiliation and church-going per se are largely under environmental control, but genes also play a part. However, spirituality itself, the driving force behind a need for religion and a need for man to formulate a Theory of God, has a strong genetic component.

Spirituality: An Evolved Trait

The genes for spirituality and the functions they serve did not just happen. They evolved. Part VI shows the role of evolution and natural selection for both the high level of human intelligence and the high level of human spirituality. *Both were critical for man's survival.* A high level of intelligence provided man with the ability to make tools and function in a complex society. While the great apes also made tools and functioned in a social framework, with the added advantage of speech, humans have carried this to a much higher level. While there are many reasons why the development of spirituality had a survival value, it is likely that the most important reason was to enhance a unique level of mutually cooperative social interaction and cohesiveness.

Other Aspects of Religion and Spirituality

A number of other interesting aspects of religion and human spirituality are reviewed in Part VII. These include the origin of the world's major religions, the role of mysticism, myth, ritual, and even psychedelic drugs in the origin of religions, the question of whether God plays favorites, such that one religion is better than another,

the evil and the good of religion, the problem of evil, and the question of the inerrancy of the Bible.

Multiple Religions

While there are three major religions in the West, and a somewhat greater number in the East, over the course of his time on earth, man has actually produced 100,000 different religions. Since God would have been better served with a "one for all, all for one religion," this clearly suggests that the plethora of religions and Gods were all produced by man to suit his needs at a given place and a given time.

Psychedelics and Religion

A wide range of psychedelic compounds are powerful stimulants of man's spiritual brain. The majority of these compounds are derived from plants that are common and grow throughout the world. Many studies show that these compounds have played a profound and critical role in facilitating man's early belief in God and in the development of many of his religions.

The Problem of Evil

The *Problem of Evil* refers to the question of how could a compassionate personal God allow so much evil to happen? This has always been a major problem for the Theory of God. The Problem of Evil is totally eliminated by the propositions that man was the author of the Theory of God and that man created God.

The Inerrancy of the Sacred Books

If one were asked to identify the single major factor that has allowed religion to be the source of so much evil in the world, despite its potential to do great good, that factor would be believing that the sacred books were written by God and thus are absolutely true and without error. This belief in the literal truth of sacred books, and with it the false belief that one religion is superior to another, has led to horrendous levels of religious prejudice, hatred, wars, and terrorism. If the members of the different religious faiths understood that the Theory of God and the resultant sacred books were written by man rather than by God, and that they were written using allegory and metaphor to illustrate the path to a moral and spiritual life — this evil underbelly of religion would vanish.

Is God Dead?

The final chapter of Part VII is titled "Is God Dead? Ask the Pentecostals." This chapter contains a number of important points. One is that the more directly we can stimulate the spiritual brain, the more popular the religion will be and the more compelling its faith. The second, even more important point is that not only is religion not dead, in all likelihood it will never die. Spirituality is too important to the human species to allow this to happen.

There are many other issues and questions that could not be covered because

there must be some limitations on the length of this book. In the remaining part of this summary I will discuss a few remaining key points.

The Problem of Postponement

One of the methods that married couples often use when they argue about difficult issues is to say, "Can we talk about this later." This can be both an advantage and a problem. An advantage is that difficult issues can be indefinitely postponed so that the pain of resolving them never has to be endured. A disadvantage is that the pain of resolving them is never faced and they continue to fester. This could be called the "problem of postponement." In the history of man, this approach has been used repeatedly for seemingly unsolvable mysteries, such as, "Who created the universe, the earth, and man?" These difficult issues are temporarily "resolved" in the Theory of God by giving Him the role of the all-powerful creator of all things.

In the absence of scientific knowledge this was a reasonable theory. However, in modern times, many of the uncertainties that faced premodern humans have been resolved. Newton's theory of gravity explains the motion and interactions of planets, disproving the tenets of astrology; advances in statistics have led to an understanding of probabilities and a better understanding of chance events; Mendel's laws of genetics and the discovery of the structure of DNA have resolved the mystery of how traits are transmitted from generation to generation; Darwin's theory of evolution has replaced the need for a creator in the Theory of God. The total list of the successes of our rational brain is huge.

Despite this, a very large proportion of the world's population still believes that ultimately God created us and still regulates our lives. This view elicits the "problem of postponement" and leaves unresolved the questions of, "Who made the bubble-maker? Who created God? Who created the creator? Was it yet another creator? Is there a God for God? If so, is there then a God for God's God?" To avoid being drawn into this endless spiral of unanswerable questions it is easier to revert to Occam's Razor by simply saying our rational brain knows who created God — man created God and man invented the Theory of God to encompass all aspects of God. Now the "problem of postponement" is solved.

Is Religion Necessary for a Moral Life?

It is often suggested that God is necessary to provide the authority for humans to be moral. If man created God then this characteristic was instilled into the God theory by man. To do this the human authors had to be inherently moral and good. We have seen in previous chapters that in fact man is more likely to inherently behave well than behave badly. While the authors of the different sacred books were moral people they must have been concerned that other humans would not behave morally on their own. Claiming that these moral rules, such as the Ten Commandments, came from God would allow them to carry more authority and there would be a greater likelihood that they would be obeyed.

It is likely that one of the reasons Christianity is so popular is that Jesus represents

the epitome of what morality is all about — a pervasive goodness, kindness, love and forgiveness—a "Do unto others as you would have them do unto you," type of person. This carries a powerful impact when combined with the spiritual nature of religion and the mythology that he was resurrected after death and died for our sins (whatever they are). The popularity of Christianity undoubtedly lies in the fact that man is inherently good and thus can relate well to the goodness of the teachings of Christ. These tenets are not unique to Christianity. With the exception of radical fundamentalist religions, virtually all other religions have the same core values consistent with the probability they were all made by man.

Is Religion Necessary for a Happy, Meaningful, or Purposeful Life?

It has often been suggested that religion brings happiness, purpose and a meaning to life. While it would seem to be reasonable that a person finding spiritual enlightenment in religion might be happy, as outlined in Chapter 33, man is an inherently happy species. A modest level of happiness has been hardwired into our brains and appears to have had some survival value. Religion is just one of many ways man can achieve both happiness and a sense of purpose. There are many other inherent purposes in life, not the least of which is to get a good education; find meaningful work; develop unique skills; get married, have children, develop loving relationships with your spouse, children, and friends; be active in the community, volunteer and give to others; create poetry, music, novels, works of art, and scientific theories; and a thousand and one other things that bring pleasure and a feeling of being happy to be alive. All of these can give a sense of purpose to one's life.

How Do We Answer the Three Questions of Pope John Paul II?

Pope John Paul II suggested there were three questions that were most important to man. These were:

Who am I?
What is there after this life?
Where have I come from and where am I going?

Who am I? Where have I come from? In previous chapters I have suggested answers to these questions. We are the product of evolution due to random mutations and natural selection. We have not evolved as a result of a purpose-driven, designed end. We have evolved as a result of a fundamentally random process and as Gould stated, if the "tape could be rewound" it is very likely that the result would have been drastically different. For example during the Cambrian explosion of the dozens of phyla produced, only one, *Pikaia,* was capable of being a chordate and thus predecessor to all of the vertebrates, including us. If this one phylum had not evolved at that critical time, it is likely that neither we nor any other intelligent beings would be here to discuss these issues.

As the Nobel Prize-winning geneticist Jacques Monod put it in his 1971 book,

Chance and Necessity, [10]

> We are utterly without purpose in the cosmos. We would like to think ourselves necessary, inevitable, ordained from all eternity. All religions, nearly all philosophies, and even a part of science testify to the unwearying, heroic effort of mankind desperately denying its own contingency [random existence].

There was no point in asking why things happened; they just did. While evolution was a great tinkerer, it had no goal.

What is there after this life? We are an intelligent, creative, complex and spiritual species and when *we die,* other than in the memories and love of those around us, we are gone forever. There is no afterlife, no hell, no heaven, no rewards for good behavior, and no hell for bad behavior. However, one could argue that a form of "heaven and hell" does exist in the memories of those who have known us. When we have behaved well our "soul" lives on in a "heaven" consisting of the pleasant memories that our friends and loved ones have of us. When we have not behaved well our "soul" lives on in a "hell" in the form of unpleasant memories that our friends and loved ones (if any) have of us. That is our eternal reward or our eternal punishment. Our soul, heaven and hell exist not in some hypothetical place above and below, but in a real place — the minds and memories of those who have known us.

Where am I going? We cannot accurately predict the future but I can state with certainty that the greatest threat to the future of mankind is not the existence of wars based on differing political philosophies but wars based on different religious philosophies. During the entire period of the cold war, the United States and Russia managed, just barely, to avoid using the atomic bomb to kill the majority of each other's citizens. However, this capacity to build nuclear bombs, or other instruments of mass destruction, is spreading to more and more nations, including those where secular rule and religion are combined and those where a fanatical religious ideology is based on the literal interpretation of sacred texts. Now, the probability that these instruments will be used for religious domination or terrorism or to bring about a prophesized end of the world is almost a certainty, especially when dying for a religious cause is viewed as a shortcut to heaven, the "will of God," [11] a great "career opportunity" [2] or a way to be sexually rewarded with 21 virgins.

Is Man Inherently Sinful and Evil?

One of the central tenets of Christianity is the concept of original sin. Ever since Eve tasted of the tree of knowledge in the Garden of Eden, man has been considered to be inherently sinful and in need of redemption and salvation. George Smith puts it as follows: [7p308]

> In exchange for obedience, Christianity promises salvation in an afterlife; but in order to elicit obedience through this promise,

> Christianity must convince men that they *need* salvation, that there is something to be "saved" from. Christianity has nothing to offer a happy man living in a natural, intelligible universe. If Christianity is to gain a motivational foothold, it must declare war on earthly pleasure and happiness, and this, historically, has been its precise course of action. In the eyes of Christianity, man is sinful and helpless in the face of God, and is potential fuel for the flames of hell. Just as Christianity must destroy reason before it can introduce faith, so it must destroy happiness before it can introduce salvation.
>
> It is not accidental that Christianity is profoundly anti-pleasure, especially in the area of sex; this bias serves a specific function. Pleasure is the fuel of life, and sexual pleasure is the most intense form of pleasure that man can experience. To deny oneself pleasure, or convince oneself that pleasure is evil, is to produce frustrations and anxiety and thereby become potential material for salvation.

While perhaps a bit extreme, it is nevertheless true that Christianity has the flavor of knocking a man down and then offering to rescue him, with the condition that he concur with the fact of his sinfulness and accept Jesus Christ as the savior from his evil nature. Man would have been better off if he had not been knocked down in the first place. Even though Christianity takes the position that man is inherently evil and sinful, and possesses "original sin" just by being born, we have seen from the prior chapters on the genetics of bad and good behavior and the biology of pleasure and happiness that humans are an inherently good and happy species. Since the natural enjoyment of sexual pleasure has been hard wired into us to ensure our survival, we might as well enjoy it without guilt.

Is Science Incompatible with Religion?

Science is dedicated to understanding reality based on the scientific method of observation and objectively testing facts and theories. By contrast, religion is dedicated to the proposition that an important segment of reality is unknowable and must be taken on faith. While hundreds of books have been written on the subject of whether science and religion are thus incompatible, the answer is simple and straightforward: Yes and No. If we are talking about religions that assume that the Bible and Qur'an are literally true, and believe the account of the creation of the universe, the earth, and man as stated in *Genesis* is true, and literally believe in miracles and other improbable features of the biblical stories, then science and religion are clearly incompatible. If we are speaking of the war that the purveyors of Intelligent Design have waged on evolution and on the scientific method itself, then science and religion are clearly incompatible. If we are speaking of the claims of the young earth creationists, then science and religion are incompatible.

However, if we are talking about religions that see the sacred texts as metaphors for a moral and spiritual life and accept the teachings of modern science, then science

and this type of religion are clearly compatible. In fact the fields of neuroscience, genetics and evolution have taught us that man possesses a spiritual brain and that genetic factors play an important role in man's quest for spirituality, and that high levels of spirituality probably played an important role in natural selection and the evolution of the human species. This understanding helps make science and the latter type of religion very compatible.

Another aspect of this question is seen from the fact that many scientists are religious. This is indicated by two surveys of scientists taken in the twentieth century. [5p111] The first, in 1916, indicated that 40 percent of scientists had some form of religious belief. At the time this result was regarded as shocking or even scandalous. However, the second, taken in 1996, showed no significant reduction in this percentage. This serves as a challenge to the popular notion that as science progresses and advances it will produce a relentless erosion of religious faith.

Is the Rational Brain Incompatible With Spirituality?

To answer this requires a definition of spirituality. There are a number of dictionary definitions that refer to spirituality in relation to religious, supernatural, and sacred entities. Since a person may be spiritual without being religious and without believing in supernatural entities including God, a definition that does not include these as necessary conditions is preferable. The definition I prefer is to have a sense of awe and appreciation of entities that are greater than oneself. These entities may be God, Jesus, Buddha, or other supernatural force, but they may also be an awe and appreciation of nature, trees, the smell of flowers, the singing of birds, family, friends, the pleasure derived from a job well done, some remarkable skill, or just of love itself. The readers may easily add their own favorite transcendent items. In this sense the rational brain can become totally comfortable with spirituality.

Is the Rational Brain Incompatible with Religion and Faith?

This question is similar to the question of whether science is compatible with religion, but sufficiently different to justify its own section. A major theme of this book is not only whether man's rational brain and spiritual brain can coexist in harmony but also whether man's rational brain and religion and faith can coexist in harmony. As with the question of whether science and religion are compatible, the answer depends upon the religion and the faith. Belief systems relating to God can be divided into essentially four different levels of compatibility with the rational brain: *1. Maximally compatible, 2. Compatible with minor qualifications, 3. Compatible with major qualifications, 4. Incompatible.*

1. Maximally compatible. The following is a list of a number of examples of belief systems that are maximally compatible with the needs of the rational brain.

Atheism. A number of modern authors such as George Smith, [7] Richard Dawkins, [1,12-16] and Sam Harris, [2] have forcefully proposed that faith and religion are evil forces in society and the rational brain is only totally comfortable with atheism which is best defined as not believing in the existence of God. While this could be

considered to be a belief system in its own right, it may also be considered as simply the absence of belief. [7p7]

Agnosticism. In 1869, Thomas Henry Huxley (1825–1895), the nineteenth century defender of Darwinism, proposed the term agnostic to refer to a position of uncertainty about whether God existed or not. While some individuals such as Dawkins [17p92] referred to this as a cop-out and an insult to the rational brain, Huxley had a point. If the existence of God cannot be proven one way or the other, the logical position for skeptics could be agnosticism. On the other hand if one believes that the preponderance of evidence suggests that man was the author of the Theory of God, then the rational brain would be more comfortable with atheism than agnosticism.

One could be both an agnostic and an atheist: an agnostic because one recognized that the proof of the existence or non-existence of God is impossible and an atheist because one felt that the probability that God did not exist is the more likely of the two possibilities.

Some claim that this degree of rationalism that denies the existence of God is dull and lacks the ability to produce a sense of wonder about the world. I would counter that there is almost an unlimited reservoir of aspects of nature, science, astronomy, history, poetry, literature, drama, and all of the other forms of knowledge, to provide a wonderful sense of awe and excitement about living and being alive.

One example of this can be found in Mary Robinson's *Ode inscribed to the Infant Son of S.T. Coleridge, Esq.* (1806) [5] in which she emancipates Nature from being God's creation to approaching a divinity in its own right. This type of excitement with the world of nature was also illustrated in Shelley's poem Hymn to Intellectual Beauty:

The awful shadow of some unseen Power
Floats though unseen among us,— visiting
This various world with as inconstant wing
As summer winds that creep from flower to flower

Secular humanism. Secular humanism is a philosophy that applauds reason, ethics, and justice, and specifically rejects supernatural forces. Some of the principles and beliefs of the secular humanism movement are outlined by Paul Kurtz: [18]

- the application of reason and science to the understanding of the universe and to the solving of human problems
- deplore looking to the supernatural for human salvation
- democracy is the best protection against authoritarian elites and repressive governments
- the separation of church and state
- supporting the disadvantaged and handicapped
- enjoying life here and now and developing our creative talents
- optimism rather than pessimism, hope rather than despair

- learning in the place of dogma, truth instead of ignorance
- the joy of life rather than guilt or sin
- tolerance in the place of fear
- love instead of hatred
- compassion over selfishness
- reason rather than blind faith or irrationality
- humanism as a realistic alternative to theologies of despair and of violence
- humanism as a source of personal significance and genuine satisfaction in the service of others

It is clear that *secular humanism* is a belief system that is maximally compatible with the rational brain as well as one that would end all religious and secular wars and all religious terrorism.

Buddhism. Buddha preached that the only stable thing in the world was *dharma,* the truth about right living. Since the gods had not helped Buddha to achieve nirvana he did not believe they were of much use to mankind, so Buddhism is not about God. He believed that the ultimate reality was higher than the gods. The attainment of enlightenment was achieved through spiritual exercise and meditation. Buddhism is thus a model for how humans can lead a moral and spiritual life without resorting to the Theory of God. The rational brain can be very much at peace with a spiritual brain that believes in the teachings of Buddhism.

Jainism. The rational brain can also be at peace with Jainism, a form of spirituality that also does not believe in a creator God. Jain ascetics seek to have a friendly, non-violent relationship with all living beings.

2. Compatible with minor qualifications. I would place in this category any religion that does not believe in the inerrancy of the Bible, the Qur'an or any other sacred text, either because they understand that these texts simply provide metaphors for a moral and spiritual life, or because they understand that these texts were written by man, not by God. I would also include those who believe that religion is a living entity that needs to adapt to modern life and not be frozen into rigid beliefs of 2,000 years ago, who believe in the inclusion of members even if they have doubts about some aspects of the faith (agnostics), and who believe in the inclusion of women and individuals of all sexual orientation. However, this still leaves a broad area for a range of beliefs that may have to be taken on faith. Foremost of these is a belief in God. Thus, I would also include in this group religions whose members believe in God as a transcendent being or in nature and the mysteries of the universe as a strong expression of spirituality, but do not always believe in a personal God that answers prayers, or believe in hell or a heaven that rewards one for good behavior. Such religions would qualify as being compatible with the rational brain with an understanding nod to the needs of the spiritual brain. Three examples would be the Unitarian/Universalist Church, Reform Judaism, and Taoism.

Unitarian/Universalist Church. Some of the principles and teachings of the Unitarian/Universalist church include:

- The inherent worth and dignity of every person
- Justice, equity and compassion in human relations
- Acceptance of one another and encouragement to spiritual growth in our congregations
- A free and responsible search for truth and meaning
- The goal of world community with peace, liberty, and justice for all
- Direct experience of that transcending mystery and wonder, affirmed in all cultures, which moves us to a renewal of the spirit and an openness to the forces which create and uphold life
- Words and deeds of prophetic women and men which challenge us to confront powers and structures of evil with justice, compassion, and the transforming power of love
- Wisdom from the world's religions which inspires us in our ethical and spiritual life
- Jewish and Christian teachings which call us to respond to God's love by loving our neighbors as ourselves
- Humanist teachings which counsel us to heed the guidance of reason and the results of science, and warn us against idolatries of the mind and spirit
- Spiritual teachings of earth-centered traditions which celebrate the sacred circle of life and instruct us to live in harmony with the rhythms of nature

While the section that states "Jewish and Christian teachings which call us to respond to God's love by loving our neighbors as ourselves" suggests all members believe in God, this is essentially an affirmation of the Golden Rule of treating others as we would like to be treated. Some members of the Unitarian/Universalist church believe in God, while some are atheists and some are agnostics. The church is accepting of members of all religions and faiths.

Reform Judaism. Reform Judaism began in the United States about 130 years ago under the leadership of Rabbi Isaac Mayer Wise, who brought it from Europe. It remains firmly rooted in the Jewish tradition but asserts that Judaism "frozen in time is an heirloom, not a living fountain." It "affirms belief without rejecting those who doubt." [18] While its tenets have many similarities to those of the Unitarian/Universalist Church, they may have a stronger belief in God. "We believe that all human beings are created in the image of God." They see the Torah as God-inspired, not the literal word of God. They consider children to be Jewish if they are born of a Jewish father or mother, not just if they are born of a Jewish mother. Women are accepted into all levels of the synagogue, and gays and lesbians are accorded full participation. The majority of Jews in the United States are reform Jews. In my career I have worked with many Reform Jewish scientists who were excellent scientists and still retained the rituals and myths of their religion as an integral part of their lives.

Taoism. Taoists seek to harmonize the fundamental energies of the universe

consisting of the cosmic currents of *yin* and *yang* to attain immortality. They de-emphasize material gain and emphasize a close connection between the mind, body and the environment. I have placed Taoism in the category of *compatible with minor qualifications* since the rational brain has some difficulty with the concept of immortality.

3. Compatible with major qualifications. I would place most religions in this group. It includes all religions that do not insist on the inerrancy of the Bible but do believe in a personal God that responds to one's prayers. Members may or may not believe in heaven, hell, and miracles. One could reasonably ask, "How could I possibly believe that the rational brain would be comfortable with this set of beliefs?" Basically, I do not, which is why I placed it in the group of "Compatible with major qualifications." Those qualifications are that the rational brain is capable of understanding that not all people in the world are comfortable with a purely rational approach to life and that there is also a spiritual brain with its own set of needs and with its ability, as discussed previously, to bypass the rational brain and to make up its own mind about the total needs of the individual. That is the major qualification that allows the rational brain to live in some degree of peace with its more emotionally needy spiritual partner.

Scientists with a strong religious faith would belong in this category. A scientist could believe that the stories that Jesus brought dead people back to life, walked on water, or parted the seas were metaphors for his faith, without literally believing these events really happened, and without affecting his belief in Jesus' teaching of the Golden Rule and love for one's fellow man.

Spiritual but not religious is a category that is also compatible with the rational brain. This category could fit under either compatible with minor or with major qualifications depending upon the spiritual beliefs. Either way it clearly avoids the last category of being incompatible with the rational brain.

4. Incompatible. I would place all religions that believe in the inerrancy of the sacred texts in this category. This would include all fundamentalist faiths, whether Christian, Jewish, Islamic or other. I would especially include all faiths that believe in any form of the apocalypse, whether pre- or post-millennial, and that believe their religion alone is *the* true religion. While the appeal to the spiritual brain may be great, the appeal to the rational brain is zero, even when the rational brain understands the needs of the spiritual brain. In these cases the rational brain would be saying, "enough is enough." No level of qualification should allow the rational brain to be comfortable with these faiths. These are the faiths that have been responsible for most of the religious wars, intolerance, hatred, and terrorism. The elimination of the belief in the literal truth of the sacred texts and the concept that one religion is superior to another would be of enormous benefit to mankind.

Did the Rational Brain Create God as a Gift to the Spiritual Brain?

All of the evidence presented in this book suggests the rational brain created God and the *Theory of God* to explain the unknown, to assuage man's fear of death and to satisfy the urges of the spiritual brain to belong to a transcendent spirituality larger

than itself.

Is Religion Doomed or is Science Doomed?

Edward O. Wilson suggested that scientific naturalism, that favorite evil word of the creationists, would spell the death knell to religion.

> We have come to the crucial stage in the history of biology when religion itself is subject to the explanation of the natural sciences. As I have tried to show, sociobiology can account for the very origin of mythology by the principle of natural selection acting on the genetically evolving material structure of the human brain. If this interpretation is correct, the final decisive edge enjoyed by scientific naturalism will come from its capacity to explain traditional religion, its chief competitor, as a wholly material phenomenon. Theology is not likely to survive as an independent intellectual discipline. [20p192]

In other words, once an evolutionary explanation for the existence of religion has been fashioned, the very idea of God is doomed. [21p183] I would argue for just the opposite. Based on many thousands of years of selective fine-tuning, the rewards of spirituality are so great that they will always be an important part of the human condition. These rewards can be achieved within or outside the bounds of a formal religion, a person can be spiritual but not religious. However, based on surveys it appears that most people will only be satisfied if they place themselves within some type of a religious setting. While some, like Richard Dawkins can be "an intellectually fulfilled atheist," [13p6] the majority of the human race will find some type of spirituality, with or without a belief in God, more satisfying.

It is even conceivable that in a thousand years, science as a discipline designed to further knowledge will have ceased, since virtually all aspects of the physical and biological world will have been discovered. "Scientists" will mostly be technicians whose job it is to keep stuff, based on discoveries made many years previously, running. I anticipate that evolution, Darwinism, and all of the other scientific discoveries of the present and the future will have been accepted and incorporated into the collective psyche of the species. We will have long since found that such knowledge is not a threat to spiritual values. Hopefully, the majority of humans will have come to understand that man was the author of the Theory of God and will have adopted one of the first three of the above options for satisfying both their rational and spiritual brain and that the ultimate — a rational spirituality — will be the glue that holds mankind together to grow in peace.

The evidence suggests that our rational brain created God to satisfy the transcendent yearnings of our spiritual brain. Instead of denying the existence and reality of the spiritual brain, we need instead to provide for an accommodation between rationality and spirituality, a way for them to live together in peaceful co-existence. Hopefully, in time, the majority of humans will recognize that man's rational brain was the author of the *Theory of God* and that man created God. As a result it will also be accepted that all religions are equally valid and that the sacred texts were written by man. Rather than being the literal word of God these works are metaphors for how we should lead moral and spiritual lives. In this context hate, terrorism, killing, and wars based on religious beliefs would become a part of mankind's past. Humans will eventually have found a way to satisfy both their rational and spiritual brain and will have attained the ultimate goal — a rational spirituality. Such a spirituality can be the glue that holds mankind together in peace.

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