

The Natural Basis for Spirituality: Redefining the Inner Light

Summary

In past centuries, the evidence for God's existence seemed direct because a spiritual being was the only way to make sense of our world in its exquisite detail, beauty, and purpose. For uncountable millennia, it seemed obvious that the rising sun required a God to pull it across the sky. Springtime buds and flowers somehow had the spirit of an all-powerful God, who controlled the entire world and had obviously created it. Many believed that they could feel God directly, as an intangible principle or as an emotional force. But gradually, knowledge of the natural world has accumulated through philosophy and science. We understand how the sun rises in the sky, how atoms form molecules, which can engage in chemical reactions, and how bacteria and viruses cause disease. We have learned that humanity evolved from other animal species and that animals are related to plants and all other forms of life through their common genetic heritage. The facts are so well explained by physics, chemistry, and evolutionary biology that life on our world might appear inevitable. To some, these tentative conclusions may seem a diversion from the obvious spiritual base of our natural world. But the new knowledge is simply the result of an active pursuit of the truth, and can be understood in any language or culture. It enhances the beauty and miracles that we see in our everyday lives.

We can now reconcile the accumulated knowledge of science with spirituality and the ancient faiths about God. From the study of the brain we know that it is responsible for our thoughts, emotions, and memories. This knowledge affects everyone because it defines our inner selves. Neuroscientists from all over the world now agree that the brain is a very complex (living, loving) machine, controlled by the principles of chemistry, electronics, and biology. It consists of huge numbers of cells, called neurons, that cause us to perceive, categorize, and remember the world. Though we don't yet understand all the details, we know the basic principles. This knowledge is extraordinarily important, because it provides clues about how the mind is linked to the brain and to spirituality. Thoughts, emotions, and memories are represented in the brain by neurons, through a sequence of electrical and chemical signals. Since we only see the world through our senses, our knowledge of the world is entirely a construct of them. But we also know that senses are directly influenced by emotions and memories.

Maturing throughout childhood, the brain gains experience and new capacities, and we become adept at predicting what will happen in a wide variety of situations. But much of the organization of the brain is determined at birth. Infants must focus on survival, so they have an overpowering necessity to find parents (or anyone who listens) and cry for food. They learn to recognize faces, sounds and smells in a fuzzy new world, but it remains challenging and mysterious. Even when an infant at 6-12 months has learned to attract parents with smiles and laughter, though they are loved and trusted, parents still remain mysterious. The infant wonders where they come from, where they go, and why parents are sometimes willing to give, but other times not. Parents are powerful mysterious forces that have their own will but can be controlled and reasoned with to some extent. These facts of life are the basis for our spirituality. We expect food, attention, and security from parents, and this is remembered in adult life as "God". When we sense the existence of a "being" giving love and security, we remember the awareness of our parents when we were infants.

For each one of us, the world is large, complex, and mysterious, but for our ancestors God was larger, because the world's mysteries were explained by their faith. This placed many of the world's

mysteries in perspective. Christians who believe in the story of Jesus sense his presence and words in their daily lives. Other religions have a similar sense of God and spirit. Modern knowledge allows us to redefine this relationship. Our ancestors' God still exists for us in nearly the same form, because our inner lives are very much like theirs. But in addition we now understand that God is a capacity of our brains, and is part of our mind.

Introduction

One question that seekers of religion and philosophy have had for millennia is what relationship exists between the mind, emotions, spiritual lives, and the "real world" outside us. The continuing process of learning about the internal self and its relationship to the external world, central to many religions, can now be understood as a statement about the human brain. Because much is now known about the human brain and the mind, we can redefine the nature of our faith in God in the modern terms of science.

Our ancestors' evidence for spirit

In past centuries, the evidence for God's existence seemed very direct. Only one or more "Supreme Beings" could possibly have arranged our world and universe with such exquisite detail, beauty, and purpose. For uncountable millenia, the experience every day of the sun rising to generate warmth and the experience every year of springtime arriving to bring forth buds and flowers was proof of the power of God. Such an all-powerful God controlled the entire world and had obviously created it. Even more important, God could be felt directly by all people, sometimes as an intangible principle and other times as a powerful emotional force. The power of God could be felt in the merriment of a feast when food was plenty, in the horror of an epidemic or in the joy of spontaneous love.

In prehistoric times, human cultures that developed a collective "relationship" with a god were endowed with the good fortune of his favor. Such an arrangement over time was often condensed into a religion in which the spirit was defined either directly through an image, or by example as in the parables of the Bible. The social force of such a religious contract allowed laws to be laid out concerning proper personal and group conduct. God kept the promise as long as we humans did. If humans didn't fulfill their religious contract, then God was not obliged to. Over the millennia, this gave logic to repeating themes of success and disaster. Because of the difficulty of performing unswervingly to a divine standard, humans could seldom live by their part of the contract. In effect, the result of believing in an unfailing god was to give humans responsibility for our own failures. The advantage, however, was to give us indirect responsibility for our success, helping us to recognize the beneficial spirit in others and ourselves.

Some doubted the existence of a God because he had never been seen. However in the minds of many, faith about his existence was based in his power. The case for God's existence was well accepted, especially by learned people, many of whom were involved in religious protocol. And equally important, since the emotional power of God could be felt directly by anyone receptive to His message, a religion grew when the faithful espoused the particular advantages of the faith. Thus, "faith in God" became common if not inevitable. Even if God's image could never be seen by most, with diligence and some effort one could acquire faith. From this accrued the intangible benefit of the religion's spiritual contract, and along with it, the real benefit of belonging to a community with its specific code of conduct. Thus faith in God was part of everyone's life, even if God's visage was not. Although one

might choose not to believe, certainly one lived in a world that did.

Accumulation of knowledge: early science

As human culture advanced, we acquired knowledge of the natural world. By the 18th century, astronomy had developed far enough to provide a reasonable answer to the question of why the sun rose in the sky each day. The idea that the beauty of the world had been created by God seemed to some out of date, because now much was understood about physics, chemistry, and biology. If one was awe-struck by a beautiful sunrise, a little knowledge of astronomy and science of the atmosphere could explain how the colorful scene was created. The origin of species in all their diversity and splendor was so well explained by evolution and biochemistry that life on earth seemed not only miraculous but inevitable.

Eventually, it seemed possible to answer any question that could be asked about the mysteries of the natural world by reducing the question into a series of smaller ones. By the 19th century bacterial germs were known to be the basis of many types of disease. By that time animals and plants were known to be composed of "cells" that looked similar to bacteria. By the 20th century, the genetic basis of evolution ("natural selection") was widely accepted: the human species had emerged through genetic mutations from other animal species. Animals were hypothesized to be distantly related to plants and both had probably originated in the world's oceans. As this knowledge accumulated about Nature, the belief that God had created the world and its contents seemed a bit old-fashioned.

To those who did not follow the new knowledge about the natural world, such "reductionism" seemed a diversion from the obvious spiritual base of our natural world. However, to those active in gathering it, (e.g. the philosophers of ancient Greece and post-Medieval Europe) the reductionist knowledge was the result of asking questions in a way that could be understood in any nation, language, or culture. Knowledge was the set of answers that could be agreed upon. Although the answers redefined the natural world's miraculous beauty in a new language of science, the subjective beauty remained, miraculous.

Ancient vs. modern belief

In ancient times, those who believed in God found it convenient to assign the world's splendors to evidence for God. The more unanswered questions about the mysterious natural world one could find, the more likely that God was responsible for arranging the world's mysteries, and the greater the faith in God. Although this reasoning today may seem somewhat circular, it appealed to generations of seekers over many centuries.

The literal belief in the origin of the world familiar to us in the story of Genesis eroded gradually over several centuries. The erosion was contested by some who applied a literal view to the Bible stories. However, others accepted the erosion of literal belief as progress, and attempted to weave modern knowledge of the natural world into their religious faith. Some who were thus enlightened assigned the responsibility of their new knowledge to God's will, asserting that the principles of the natural sciences were created by God. Some of these faithful insisted that God had created the universe and given it rules to develop galaxies, stars, the planets, and life on Earth.

Gradually by the last half of the twentieth century, many religions had redefined faith in God

away from its earlier basis in literal belief. Ancient notions of God living in the sky and ruling over the star-filled heaven had long since been discarded by the 1960's when the exploration of space produced vivid photographs of the Earth taken from the Moon. Most no longer believed that God literally pulled up the rising sun or enticed plants to grow, but could still rely on "belief in God". After all, there were many unknowns for which science had no specific answers. Although the origin of life proposed by evolutionary biology seemed inevitable according to the theories of chemistry, the organization of the rules of physics and chemistry seemed immutable and therefore evidence of the power of God. The origin of the universe was unknown and might never be known with certainty, so it could be assigned safely to God. Also, another basis of faith remained. The mysterious power of love and the inexplicable ways of human relationships, assigned to the spirit of God for millennia, remained unscathed. Over the last century, modern people have professed a faith in God entirely consistent with the ancient one.

The stories of the Bible are convincing evidence still that human life at the dawn of history was similar in many ways to our busy lives today. The Bible stories are vivid because they relate directly to our own lives, and this is good evidence that the nature of human relationships, motivation, and cultural identity haven't changed much. Although we may not literally believe much in the old stories about the origin of the world, we have a very good reason to continue the "faith in God" that our ancestors invented. We have the same motivation in our daily lives!

Today's faith and spirituality

Although God's existence may not seem as certain as it did in previous centuries, many still hold to their faith as a way to unify their love, motivation and cultural identity. People of many religions still adhere to a special set of rules that they believe endows them spirituality of a personal and cultural nature in a tried-and-true historical tradition. Judeo-Christians continue to speak of God's love for us, and feel the presence of His spirit in Jesus' words. Christians try to embody Christ's example in personal relationships. The modern Society of Friends generally holds that the "Light" inside us, directly felt by some, is evidence of the spirit of God.

Since the spiritual qualities of our lives evidently haven't changed much over time, it seems likely that our modern God feels to us as the ancient God did to our ancestors. However, our knowledge, technology, and culture have changed. Consistent with our new concepts, we need new words for describing the spiritual nature of "God". We want to understand why "faith in God" was so attractive to our ancestors. We need to understand what part of this faith has changed today, and what part remains the same. A major reason for this quest is honesty in communication. If the basis for our faith has changed, we need to acknowledge the change and reaffirm our faith. However, the reason is more than honesty. Because of new knowledge acquired in the last century, the very basis of our culture is at stake.

A goal of high priority is to revise the language of spirituality so that our children understand concepts of God and the inner life historically defined by many different religions in texts such as the Bible. If children learn about themselves, their culture and world in separately taught subjects, such as politics, science, language and religion, and are also taught explicitly or by omission that the subjects cannot be related directly, they are missing an essential component that was given to our ancestors by their ancient culture. That essential component was continuity. The cultures of the ancient world, with all of its mysteries and contradictions, provided continuity from family to education and community with stories and sharing of "the spirit" that many of today's younger generation lack.

Another important goal is to provide better communication between modern cultures. If it is possible that there is a common basis in all humans for spiritual thinking, surely it will benefit all of us to understand in every way possible this common heritage.

Modern knowledge of the brain

Because of the rapid progress in the knowledge of the brain, I believe that we can now reconcile the accumulated knowledge of science with the ancient faiths about God. Consistent with the similarity in our lives, evidently our brains have not changed much in several millennia. Neuroscientists from all over the world now agree that the brain is a very complex machine, controlled by the principles of chemistry, electronics, and biology. The brain consists of unimaginable numbers of cells, called neurons, that cause us to perceive, categorize, and remember the world. Not all the details of the brain's mechanisms are completely known. It may take more than a hundred years at the present pace for even a rough outline to be filled in.

Yet knowledge of the brain has progressed to the point where we now understand the brain's basic principles. This knowledge is extraordinarily important, because it provides clues about the origin of our perceptions, thoughts, emotions and anxieties in terms of chemistry and biology. This knowledge provides a basis for understanding the mind as a function of the brain. The mind is not physical in the same sense as the brain, yet it is responsible for our humanity and entire personality. The mind is how our brain perceives and categorizes itself.

The mind and consciousness

Our modern view of the mind has grown considerably. We now understand that the mind has many components, some conscious and some unconscious. The difference between the two relates to our "awareness" of ideas. Some thoughts and ideas are on the surface of our mind and we can discuss them with other people. Other ideas cannot be discussed because they are localized to parts of the brain that are not functionally connected to the speech centers. The brain shares information from sensory input, retrieved memories, and deliberate thoughts, and places this into short term memory. Some neuroscientists theorize that this type of short term scratch-pad memory is the basis for "consciousness" (Koch, 2014). This short term memory is accessible to motor control centers that control and generate speech and hand motion. If we can verbalize our thoughts about something, we are aware and therefore "conscious" of it. Further, this conscious awareness can be communicated by gestures of hands or face.

Interconnections in the brain are very complex, however, so awareness has many levels. We communicate in many ways beyond speech that are important in interpersonal relationships. For example, hand movements or "body language" give us alternative ways of communicating that imply different modes of consciousness. We can be aware of a person motioning with hands but not immediately recognize the meaning of it in the speech center of our mind. Body movements, like our perceptions, are based on previous experience. For example, we ordinarily do not consciously decide which motions to make with our legs and feet while we walk, yet our gait is distinctive and often uniquely recognizable from a distance.

We may wonder to what extent consciousness depends on communication. We can agree that someone who cannot communicate for some reason, for example, because of paralysis, can still be

aware and conscious yet simply unable to respond. An electroencephalogram (EEG) of brain waves can show brain activity that might be considered conscious activity, especially in reaction to sensory input such as sight or sound. But other brain activity is not considered conscious and we are neither aware of it nor can we talk about it. An isolated brain without sensory input or muscle control output is thought to go into a sleep-like state, and therefore cannot be considered conscious. In this unusual case a brain could not communicate. But ordinarily life requires sensation and motor control of muscles, which then allows communication at one or more levels of consciousness.

Philosophers have wondered for millenia whether animals can be considered conscious. A pet kept by a family, such as a dog or cat, communicates basic needs about food and pleasure, but some may question whether this indicates the animal is conscious. Although most animal species do not have mental powers comparable to humans, possession of our abilities is not necessary for consciousness, because communication about life's essentials is common among all animals. Some animals have brain powers that far exceed ours in specific categories. For example, a bird flying at high speed through a forest by swerving quickly to avoid tree trunks and branches far exceeds our capacity for fast thinking. Hawks have daytime visual acuity that exceeds ours, and many nocturnal animals have better night vision than ours. A monkey can climb through trees with incredible coordination of movement. Whales can communicate across distances of many miles. A bird can give specific alarm calls to its neighbors denoting different threats, for example, a snake or a cat, and can recognize its mate among hundreds. Animals may not have our language ability but they can gesture and vocalize to communicate. Although they may not have all our mental abilities, they have consciousness just as we do.

Identity of thought and perception

Ideas, thoughts and emotions of the mind are represented in the brain by collections of neurons signaling perceptions and decisions about them. Ideas in the brain code for possible muscle movements, but before a movement is generated, the brain must decide which movement to make. This implies that different ideas compete in some way before we decide upon them and implement them in action. All of these brain signals are relayed by neurons that transmit signals with a type of electrical signal called an "action potential" (electrical spike).

A neuron creates an action potential by briefly opening small pores in its cellular membrane, thereby admitting sodium ions (i.e. salt). The result is a very short burst of electricity inside the neuron. The electrical burst quickly travels throughout the cell to the point where the neuron makes contact with its neighbor. This point, called a "synapse" works by releasing a small amount of a biochemical, called "neurotransmitter," which diffuses to the neighbor and binds to a chemical receptor (analogous to a taste sensor in the tongue) in the neighbor cell's membrane. The receptor opens a pore which briefly admits some salt to carry the signal into the neighbor. If the neighbor receives enough of these synaptic inputs, it may also generate an action potential. Another type of synapse is a direct connection between two neurons which allows them to pass electrical signals directly without the use of neurotransmitters.

There are only about 20 types of neurotransmitter in the brain but there are millions of possible perceptions and ideas, so the exact identity of the neurotransmitter that relays a signal from one neuron to the next is relatively unimportant. The identity of the neurotransmitter cannot tell the neighbor much about the many possible perceptions or ideas it could represent, although its precise chemical properties are necessary for its ability to relay the signal faithfully. More important for the eventual interpretation of the signal is which neighbor neurons receive the signal and when. Thus the type of neurotransmitter

utilized is only a vehicle for an idea and cannot represent much of its content. An idea's content is represented more precisely by the billions of interconnected neural circuits that specialize in different types of perception and thought such as color vision or memory or emotion.

Such a "chain" of signals is the vehicle for the traffic of ideas everywhere in the brain. Neurons exist in a plethora of shapes and sizes and but they all work in a similar fashion. Action potential signals inside a neuron are summed together, processed, and sent on to other neurons. A neuron's function is related to its precise location in the neural circuit, which neighbors provide it with signals, exactly how it sums its inputs and generates its precise firing pattern, and which neighbors it sends a signal to. Neurons are responsible for the outputs of the brain: the control of muscles or the release of hormones.

We perceive the world around us by special "sensory neurons" that are endowed with the ability to sense light, sound, the presence of various types of chemicals, and a dozen or so types of touch sensation and pain. The sensory neurons send their signals like any other neuron in the form of action potentials and chemical and electrical synapses. The job of sensory neurons is to code the sensory information in a way that will be faithfully carried to the brain and interpreted correctly even under difficult situations such as a dark moonless night or a brilliant snowfield under a bright sun. The brain also detects chemical signals from the body that relay hunger or satiety.

The activity of neural circuits in sensing the world around us and categorizing this information is the basis of thoughts and the function of our mind. How the activity of different neurons is related in time and in strength, and exactly how this activity is apportioned into myriad circuits determines what thoughts we have. The process of competition between thoughts, largely responsible for human success, is the source of many problems. It is responsible for the dichotomy between "good" and "bad" ideas. The good idea is one that is implemented, has some positive consequence, and is repeated (Athalye et al., 2018). A bad idea is one that is considered but not put into action. Although such a definition may seem oversimplified, it is to a great extent the basis for our agonizing over difficult decisions. Depending on the complexity of the situation we are faced with, we may need many repetitions before learning which path is "good". The competition in ideas between our internalized parental directives and other needs and desires causes a dichotomy in our minds that has been called the "conscience". This process of competition is carried out at the level of single neurons.

Perception and memory

The knowledge of the mind and brain affects each one of us, for it defines our inner core. We now know that the world, as we perceive, understand, and remember it is entirely a construct of our physical senses and brain. The brain is also entirely responsible for our inner emotions and anxieties. When we recall a memory of a past event, the brain activity that relates the memory is similar to the activity that our brain reviews continuously from the physical senses. Sensory memories are stored in the region of the brain that originally had the sensation. Yet the memory is not exactly the same as a perception, and normally we can tell the difference.

Since both perceptions and signals from memory are relayed in the brain with the same type of "action potential," they are similar and to some extent indistinguishable. Therefore, the strength of a perception has much to do with its immediacy. If other people agree with us on the details, we can agree that our perception represents reality. Our ability to corroborate others in this way depends on our

memory, experience, and sometimes on our imagination and ability to empathize. The external reality of the world has no other basis in the activity of the brain, because the brain that generates the mind is completely dependent on perception to sense the world around it.

Perception, however, is dependent on past experience. Over the past several decades, neuroscience has found that sensory perception (i.e. vision, touch, hearing, etc) is subject to change depending on the sense's experience. Therefore our sense of "the world" around us is dependent not only on what small part of it we can directly sense, but also on how we have sensed it before. Exactly how we are influenced by previous sensory experiences, of course, is dependent on the details of the brain's mechanisms of memory.

Brain and prejudice

As we mature throughout childhood, our brains gain more experiences and capacities, and we become more adept at predicting what will happen in a wide variety of situations. This tendency is essential for our survival. For example, it was important for our distant ancestors to be able to predict what a wild animal would do, based on a glimpse. Animals that look and act similarly tend (in our experience) to act predictably. It is important, for example, to be able to distinguish between a "domestic" dog and a "wild" one. Although at a first glance both look similar, their behavior towards us differs, and our experience helps to identify the difference. In a similar way, we depend on our experiences with family, close friends, distant acquaintances, and strangers to predict the outcome of social encounters. We are able to predict with very good probability, based on a glimpse of a person's clothing, posture, and a short conversation, what is happening in a person's "mind" and how the person will likely react to us: interested or not, friend or foe. Although such predictions may require much experience, and are not always correct, nevertheless we become adept at them.

The reason we are adept at predicting the outcome of such an encounter is the dependency of our sensory perception on memory. Along with perceptions of a flower, landscape, or person, we recall and associate them with similar perceptions from our past. This is, luckily for us, the way the brain functions. We don't need to be motivated to learn in this manner. Our brain continuously builds collages from our many senses and stores the collage for future reference. Such experience is recalled (whether we are aware of it or not) with every new sensation. Its mechanism in our brains may seem an almost miraculous adjustment to living in a complex world. This is prejudice.

Unfortunately, although prejudice is necessary for the brain's minute-by-minute function, it causes our attention to be directed to some extent by our past, not entirely the present. Before we can link any new facts together to predict the outcome of a new situation, our experiences from the past take control. The reason is that our actual perception depends on experience. Therefore it takes sometimes quite a lot of new different experiences before our brain reorganizes to "see" things differently. This process of past controlling perception takes place not only in our mind's "awareness" but also at the level of a single neuron.

Memories and dreams

Just as memories can affect perception, old memories can be affected by newer ones. Recent research has shown that positive memories are more likely to be recalled, and that long-term memories can under some circumstances be mixed together or confused. Although the process of long-term

memory retrieval (recall) is only roughly understood, it is thought to be accomplished in special regions of the brain that re-activate the regions that were activated by the original perceptions. The function of dreams is controversial, but is generally thought to be a reorganization or modulation of long-term memories, often from the recent past, but sometimes from the distant past. Dreams may be also related to imagination, which is a capacity of the brain to generalize from memories and experiences. The powerful early memories that we all have from our early infancy may not always be conscious, but they exist nevertheless in the brain, and they can be retrieved in some form, e.g. in dreams or emotions. Thus some dreams may recall memories that we do not ordinarily experience. The memories that we have from our enjoyment of childhood and family life may provide a basis for some dreams because they are important, positive, and non-confrontational. However, some dreams appear to retrieve unpleasant or traumatic experiences. It is likely that early memories affect us strongly because they can generate emotions related to the original experience. Dreams that recall these memories and emotions are likely related to our spirituality. As adults, we can recognize in friends and family similar themes in memories of early family life that we weave into our spiritual lives.

Free will

It is immediately obvious to many of us that our minds are not completely "deterministic" nor driven entirely by physical mechanisms. We don't always make the same decision when faced with a similar problem, and we aren't always able to follow advice sincerely given by family and friends, even though we may try. This capability of "free will" seems incompatible with a brain that is completely mechanistic. Yet free will is consistent with the known facts about the brain. One reason that our decisions are never completely predictable is that our neurons receive "noise" (analogous to what we hear in a seashell) along with the signals from other neurons. Random thermal noise that originates from the irregular motion of atoms and molecules is everywhere in the brain, and it is a severe problem for brain function. If it is too powerful, the noise can swamp a neuron's signal and prevent a "correct" perception or decision. However, neurons can also use thermal noise to advantage when making decisions. If two signals (i.e. ideas) are about equal in strength, the noise prevents the neuron from always making the same decision. This gives some unpredictability to our ideas and causes us to try new courses of action. It frees us from a completely mechanistic decision-making process. It gives us free will.

Modern physics tells us that everything, including what may appear to be random motion or noise, is deterministic, that is, it is connected to everything else in the world through quantum mechanics. Some would say, therefore, that noise cannot give us free will because it's all determined by quantum mechanical interconnections to our surroundings. But this notion is generally not relevant to most of us when we are considering a thought or plan of action at a conscious or unconscious level. If a neuron makes a decision based on memories and sensory input, it makes little difference to the mind and brain whether the noise that affects our neural signal processing is determined by quantum mechanics or not. It is still unpredictable from our perspective and therefore provides us with what appears to us as free will.

Brain's capabilities at birth

Some of the brain's organization is genetically programmed, and this may explain why all of our minds have much in common. Although there is variation in our genetic structure and how body organs and brain develop, the genes of any species including our own are highly conserved (i.e. similar)

between individuals. Yet no two brains are exactly alike in microscopic detail or even in major details of organization because of genetic variation, and because so much of the brain's organization is affected by differences in experience during the development of young children.

Further, much of the organization of the brain is securely determined long before birth. This is important for the survival of young mammals. The overpowering necessity for the young is to find the parents and in an appropriate way ask for and receive food. Therefore the brains of all infants have this much in common. Every infant needs to recognize "parent" and cry for attention (Hernandez-Miranda et al., 2017). The visual system of an infant will continue to develop at a great pace for several years, but the infant can recognize faces, sounds and smells in a fuzzy, unknown new world.

Parents

Although the infant's brain at birth is developed enough to see parents, and to eat, smile, and cry, the rest of the world to a large degree is unknown and mysterious. At 6 weeks an infant can attract parents with a "social smile," and gradually learns other strategies for attracting them. Parents, though they are the essential "lifeline" of food, warmth, and loving touch, are also mysterious. Where do they come from, and where do they go? Why are parents sometimes willing to give, but other times not? Who are the other people (i.e. "strangers") that come close, smile, and then retreat? These intricacies will take the infant a lifetime of experience to detail and secure. Meanwhile, the infant organizes the sensations as well as everyday experiences allow.

Parents, for the infant, are powerful mysterious forces that have their own will but can be controlled and reasoned with to some extent. The infant's recognition of this situation is extremely important. Infants become adept at recognizing the presence of parents. Such a "parent detector" is important because the infant is more likely to survive if parents are near. This fact of life has remained unchanged for millenia.

The "parent detector" in an infant's brain consists of sensors for the parent's body, face, voice, smell and touch. The infant can distinguish parents from strangers and soon develops a repertoire of situations in which the outcome can be predicted. One of these, of course, is that when hunger comes, a plaintive cry will produce a mother who will feed and care for the infant. In the game of "peek-a-boo," the infant finds reassurance that parents, as do other objects, have a physical reality and don't just vanish. The game of "throw toys out of crib" or "spill food on floor" provides additional practice about parental presence.

The need for a "parent detector" is so strong that to be without it literally means death for an infant. All humans share to some extent this facility. We all know what it is like to have parents come to feed us, leave us sad and alone, only to return again (though we may have forgotten the details). The infant's familiarity with this situation is the security that allows curiosity about the world. Because this knowledge of parents is so important to an infant, the tendency to recognize the human face and identify with it may be a genetically programmed facility (i.e. a universal constant) in the infant's brain. Certainly the infant learns afresh many details of how to interact with the "spirit-like" beings who feed, provide warmth and soothe.

Memory of parents and God

The "parent detector" and our powerful memories of parents is the basis for spirituality and belief in God. Our memory of the love and sharing that our parents gave us persists through childhood into adult life. Our capacity to recognize the essential "humanity" in a face or a voice, and identify with it, is a basic resource of the human brain. The belief in a God is a memory of the countless times we interacted with parents when we were young. The memory remains with us as adults because according to the principles of Natural Selection there is an advantage for our having it: humans who identify with other humans in a deep way from their childhood on are more successful in the world. If we maintain the sense of security that we had during infancy in knowing that parents would return to us, we are more likely to interact in a mutually beneficial way as an adult. For example, when we thank Jesus or God for his gifts, we rely on our powerful memories of our early life for the expectation of love and care.

Basis for spirit in the brain

Our capacity for perceiving in terms of previous experience is genetic so we have it at birth. Our capacity for recognizing the essential "humanity" of a person is possibly also genetic but it is largely influenced by our perceptual experience. We have "face detectors" built from countless experiences seeing our parents' faces. Our "voice detectors" allow us to recognize our parents' voices. These parts of our brain were fine-tuned, when we were infants, to recognize specifically our parents. However, in the process of socialization our brains generalize from "parent detector" to "person detector". The experience of the "parent detector," of course, is prejudiced. We expect food, attention, and security from parents, and this is remembered in adult life as "God". There is a connection between the essential "humanity" of a person and our early memory of our parents. The connection is the love and care we remember of our parents and receive from others during the rest of our lives. It is a capacity of the brain, like many others, genetically specified.

When we sense the existence of a "being" who can transmit love, security, and the motivation for making decisions, we are dependent on our perceptual experience in the same manner as any other perception. The memory takes us back to awareness of our parents when we were infants. The infant knows little of the complexity of the world but can directly "feel" the presence of parents. The infant does not know that the awareness is based on vision, hearing, and touch, but for infants who have these senses intact, such knowledge is not important. The important thing is to know when parents are near. This is the basis for the "spirit" that we may sense as God.

God and the mind

For our ancestors, the world was large, complicated, and mysterious, but for them God was larger, and this placed much of the world's mystery in perspective. Our modern knowledge allows us to redefine this relationship. God as felt by our ancestors still exists for us in the same form, as our lives are very much like our ancestors' lives. But in addition we now understand that God is a capacity of our brains, and is part of our mind. In this view, God is perceived no less potent but the mind is expanded to include God. The spirit of God is maintained by the adult mind because the spirit provides a sense of security for others' company and culture. In ancient times, this provided an advantage to those communities who maintained feelings of spirits. Communities were closer-knit and their people derived much from extended family ties maintained through common beliefs. In modern times the same benefit persists. Miracles continue to be worked in the modern world because our need for love and security remains the same as our ancestors' needs.

Miracles of Faith and Healing

When an amazing and unbelievable thing happens in response to spiritual words and feelings, we say it is a miracle. For example, Christian faith healers remove pain and cure disease by invoking the love and authority of God in Jesus' name. In personal lives, incredible but seemingly mundane coincidences may have great personal meaning and overflowing joy. For people of any religion, a simple honest compliment or bit of luck can bring an upwelling of gratitude. These big or small miracles are sometimes attributed by Christians to Jesus, who was known as a miracle worker. Faith healing may in some cases be related to the brain's ability to modulate pain and control the function of all body organs. Pain is a neural signal like any other signal in the brain, and is under the brain's control.

It is widely appreciated that pain can be reduced or removed with the right combination of encouragement and empowerment. Yet, when a disease is cured by a faith healer invoking God's love there may be no obvious mechanism. Each one of us is different, with different genes, experiences, memories, and daily lives, so medical science in many cases cannot determine the reason for a positive outcome. Consequently, the role of faith and love in healing are apparently the most significant reason for a cure. By invoking God's love and asking Jesus (or e.g. a prophet or angel) to help, we expect positive results, and this may produce a miracle, even when medical science is at a loss to explain how. The healing process may recall memories of early childhood experiences of care and unconditional love from parents and family. For Christians this is embodied in the stories of love and words of Jesus.

Faith healers often help people recover from severe pain, for example in arthritis. Many forms of arthritis are due to degeneration of the cartilage and underlying bone in the joints. Although joint cartilage contains no nerves to transmit pain and no blood vessels to directly supply nutrients, the underlying bone and other tissues surrounding the joint have many nerves and are well supplied with blood vessels. To heal the joint, the damaged cartilage needs to regrow, which will then allow the bone to heal as well. Moderate exercise that moves the joint without a heavy load is beneficial for it supplies nutrients and removes toxins in the cartilage, allowing it to heal.

When a faith healer invokes the words and love of Jesus, the recipient may feel the Holy Spirit, which is a feeling of elation and empowerment, and this can remove the pain so that the joints can be moved normally. This joint motion will bring the necessary nutrients to the joint, allowing it to regrow. Depending on how the love and faith proceeds, once the joints are moved, the cartilage then has a chance to recover over the next few weeks and months. If the positive feelings from faith in Jesus' words can keep the pain down, regular daily exercise and a change to a healthy diet may cause a permanent cure for the arthritic sufferer. Although in this case the physiological mechanisms for recovery are well understood, simply receiving the words of faith and love from Jesus through a faith healer can enact an instant miracle. Healing of this type is not possible to predict from current medical knowledge. Thus it is rightly called miraculous.

Many other examples of recovery from disability or disease have been reported, for example, recovery from blindness or cancer. In some cases of blindness the eye is functioning correctly but the brain does not register the visual image because it is actively suppressed. Hearing the love and words of God spoken by a faith healer can remove the suppression. This type of healing can work according to known brain mechanisms but it must be considered a miracle because it cannot be predicted from

medical science. In other cases, disease cures can rely on healing of the body's immune and digestive systems. These systems are under control of the brain and so are amenable to faith healing. When faith in God empowers the brain, this can strengthen the immune system, which may then be more able to fight off a growing cancer or other progressive disease. Simply being in a better mood from one's faith may empower one to eat a better diet, which can give the body extra energy to heal. Although miracles of faith healing may work in part through known mechanisms, they are miraculous because they are not predictable.

Faith and science

Natural science is both traditional and modern. Our ancestors were interested in finding answers to their questions for the same reason that we are today. Science employs a language and procedure to minimize the dependency of our perceptions on personal experience – it is supposed to be “objective”. Science is always changing, because as new hypotheses are discovered, old theories are discarded. However, as science discovers more facts about the origin of life, our bodies, and our minds and consciousness, we can gain tremendous insight by reflecting a little on the meaning. The study of the brain and mind, though it tries to be objective, is also the most subjective science since it defines our mind and inner identity.

Science is limited by personal experience. It is impossible for any one person to personally verify more than a small fraction of the facts that have been accumulated by modern science. It is also impossible for any person to verify that their own body consists of the incredibly intricate assortment of organs, cells, molecules and atoms discovered by science. Therefore, to believe in "facts" implies a trust in humanity.

If one is in a doubting mood, facts about our biological and chemical constitution seem possibly untrue, somehow less important than life, consciousness, and our love for each other. But when one is in a trusting mood, the facts stand because they are helpful to us. Our interpretation of the facts is dependent on our mind and brain. Therefore, to use facts without verifying them directly is an act of faith in humanity. Science is the one faith in the world that we can all agree upon. If we choose not to use the facts, or if we don't have the time to agree on them, the loss is our own. Yet, using the facts, we understand ourselves with a new dimension. For example, when Christians talk to Jesus, they relate to a community in which they give and receive love and care. Thus a personal savior such as Jesus can embody many aspects of memories and experiences into a simple and direct faith.

Worldliness, transcendence, and spirit

For some, the spirit of God transcends the daily worries and anxieties of worldliness, since the spirit is felt as all-powerful and more important for each one of us than the decisions we make in our lives. This transcendence is reflected in the function of the brain. Our daily concerns and decisions are organized by the mind through sensory input that is mixed with a heavy dose of memories to allow us to survive in the world. The mind is completely reliant on this mixture of present-day salient input from the senses along with the memories from our childhood and adult experiences. The presence of the spirit is therefore a consequence of the brain's transcendence of daily stimulation by early memories that appear in the present but are symbols saved by the brain from our early months being cared for by our parents. A memory created by this important loving care is helpful for us to rely on, since it allows us to form deep bonds with our family, friends, and colleagues in the world.

Those who would proclaim that their God is the only one have much to celebrate since they have made a very basic connection between their early memories and those of the others who share their faith. But every religion that makes the same transcendent connection to early memories can claim the same unique spirit. What is common among all religions that have such a transcendent spirit is the supremely important love and care we all receive from parents when we were infants, and a story that refers to the same love and care in allegory. So while the Gods mentioned by religions may differ, they all refer to the common thread we all share in loving care that transcends language and culture.

Language of spirit

Every religion has its prophets and leaders who were exceptional people in their time and who conceived new ideas and traditions of spirituality that were meaningful for the culture around them. Moses brought a set of rules that were clear enough for everyone to understand and to live by. Christ brought a novel interpretation of subjective rules for relationships. Mohammed brought a new sense of God's presence. Martin Luther redefined our relationship with God. Buddha related a new appreciation of learning about oneself and community through meditation.

The ideas of George Fox and the early Quakers were revolutionary for their time, the mid-1600's. Before that time, many religions taught that the "spirit" is outside our bodies and to communicate with the spirit requires a church or priest. By emphasizing that each person has the "Light of God" inside them, the early Quakers were saying something very powerful about the function of the brain. Although they did not have the tools of modern science, they knew that the essence of the "spirit" is inside every one of us. And some people of older faiths, for example Buddhism and Islam, were taught similar ideas.

To continue the revelation handed to us by great prophets through history, we need to develop a new language of spirituality, based on traditional principles, that assimilates the modern knowledge of the brain into our everyday lives. We need to give our children not only love, security, and identity, but also a sense of where these intangibles originate, and how they develop. The spirit that we developed as infants about our parents and the immediately surrounding world became more generalized, as we grew up, to include the larger community. How this process develops in any one of us from experience with our own parents is sometimes very personal, but nevertheless it transcends our private boundaries.

An important way to relate development of the spirit to everyday life is to ask ourselves how we know other people are similar to us. To answer this question we may recall early experiences in our life (of "spirits"), generalized by our adult perception of the world. To ask a child to consider how parents can balance their own needs with the child's need for love, discipline, and education requires the child to momentarily overcome internal desires to consider the terms of the relationship ("covenant"). As infants already have a sense of the "spirit" that represents their parents' external love and providing, children who can identify the previously felt internal spirit with a parental covenant and sense of justice are able to generalize this identification to others.

The God presented in the books of the Old Testament is concerned with such issues of equality and fairness. How each person can be treated fairly is an issue that concerns all people in a society as it does parent and child. The story of Exodus, for example, written about a society determining its fate by starting afresh, can be readily understood by young children because it concerns the same issues that

they struggle with. In the New Testament, Jesus' simplification of the rules of Judaism was revolutionary because he gave subjective rules for conduct based on "internal spirituality". George Fox's contribution continued to redefine our internal spiritual life. As we ponder our own beliefs, it may be useful to review the history of knowledge about spirits as a continuum. Taken in this context, the recent knowledge of the mind based on neuroscience is a continuation of the progress of spirituality from ancient times.

Conclusion

The belief in a Great Spirit is an ancient one that originated in an amazement at the world's wonders and in awareness of an inner spiritual life. As investigations in physical and biological sciences have secured our knowledge about the natural world, a traditional belief in God based on wonder about the world's mysteries has been transformed into a reflection on our living memories of love, on the nature of inner spirituality, and its relationship with the mind. We now understand that these may originate in our own memories from early childhood. The mind is based in the brain, a complex "living, loving" machine responsible for our every worldly awareness. The brain contains the faculties responsible for our awareness of spirits, which reflect our early experiences with parents and extend in our adult lives to our relationships with others.

Traditionally great religions are based in an allegory presented as a series of stories as in the Bible. In prehistoric times such stories were passed through verbal memory from parent to child. When we hear these stories, memories from our own childhood are blended with stories from our parents about their early experiences and their ancestors'. Our spirituality, therefore, is a mixture of all of these but resides inside our minds as a memory from infancy of our own parents' love and care.

References:

- Akrami A, Kopec CD, Diamond ME, Brody CD. (2018) Posterior parietal cortex represents sensory history and mediates its effects on behaviour. *Nature*. 554:368-372.
<https://www.nature.com/articles/nature25510>
- Alberini CM, Travaglia A (2017) Infantile amnesia: a critical period of learning to learn and remember. *J Neurosci* 14 June 2017, 37:5783-5795; <https://doi.org/10.1523/jneurosci.0324-17.2017>
- Athalye VR, Santos FJ, Carmena JM, Costa RM. (2018) Evidence for a neural law of effect. *Science*. 359:1024-1029. doi: 10.1126/science.aao6058.
<https://science.sciencemag.org/content/359/6379/1024.long> <https://doi.org/10.1126/science.aao6058>
- Blake PR, McAuliffe K, Warneken F. (2014) The developmental origins of fairness: the knowledge-behavior gap. *Trends Cogn Sci*. 18:559-561.
<https://app.dimensions.ai/details/publication/pub.1031241055> <https://doi.org/10.1016/j.tics.2014.08.003>
- Blake PR, McAuliffe K, Corbit J, Callaghan TC, Barry O, Bowie A, Kleutsch L, Kramer KL, Ross E, Vongsachang H, Wrangham R, Warneken F. (2015) The ontogeny of fairness in seven societies. *Nature*. 528:258-261. <https://www.nature.com/articles/nature15703> <https://doi.org/10.1038/nature15703>

Dehaene S (2014) *Consciousness and the Brain*. Viking, NY ISBN 9780670025435.

Heisenberg M. (2009) Is free will an illusion? *Nature*. 459:164-165.

<https://www.nature.com/articles/459164a>

Hernandez-Miranda LR, Ruffault PL, Bouvier JC, Murray AJ, Morin-Surun MP, Zampieri N, Cholewa-Waclaw JB, Ey E, Brunet JF, Champagnat J, Fortin G, Birchmeier C. (2017) Genetic identification of a hindbrain nucleus essential for innate vocalization. *Proc Natl Acad Sci USA*. 114:8095-8100.

<https://www.pnas.org/content/114/30/8095> <https://doi.org/10.1073/pnas.1702893114>

Kandel ER, Schwartz JH, Jessell, TM (2000) *Principles of Neural Science*, 5th Edition. McGraw Hill Medical. ISBN-13: 9780071390118.

Koch C (2014) In the playing ground of consciousness. *Science* 343:487.

<https://science.sciencemag.org/content/343/6170/487.full>

Norenzayan A, Shariff AF. (2008) The origin and evolution of religious prosociality. *Science*. 322:58-62. <https://science.sciencemag.org/content/322/5898/58>

Smith K (2011) Neuroscience vs philosophy: Taking aim at free will. *Nature* 477, 23-25.

<https://www.nature.com/news/2011/110831/full/477023a.html> <https://doi.org/10.1038/477023a>

Stringer C, Patchitariu M, Steinmetz N, Reddy CB, Carandini M, Harris KD (2019) Spontaneous behaviors drive multidimensional, brainwide activity. *Science* 364: 255. *Online Science* 364, eaav/7893 (2019). <https://science.sciencemag.org/content/364/6437/eaav7893>

<https://doi.org/10.1126/science.aav7893>.

Tononi G, Boly M, Massimini M, Koch C. (2016) Integrated information theory: from consciousness to its physical substrate. *Nat Rev Neurosci*. 17:450-46. <https://www.nature.com/articles/nrn.2016.44>

<http://doi.org/10.1038/nrn.2016.44>.

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