

The Biology of Religion: A Darwinian Gospel

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ABSTRACT

The vigor of religious feelings, and the fact that most, if not all, cultures include a system of spiritual belief, suggest that humans have an innate predisposition towards religiousness. There are several possible adaptive advantages that may help explain such a disposition; religions promote cooperative relations, they induce people to obey sensible rules, and they soothe the minds of their followers. These advantages could very well have directed evolution towards the design of a spiritually inclined brain. Accepting that God is inside our heads, the important question is not if he exists, but rather: What can he do for us? As a rule of thumb humans are advised to conform to their inborn tendencies, implying that we ought to believe in spirits. Religiousness offers both direct rewards, for example the joy associated with communicating with a god, as well as indirect benefits such as those suggested above.

Ought God to Worry?

When Darwin published his theory of evolution, some of his strongest opponents were priests. The church was trembling. Would his ideas demolish the biblical description of creation, and the concept of Man as standing apart from all other creatures?

It looks as though God does not need to worry. A recent survey published in *Nature* (Larson & Witham, 1997) concludes that even scientists are just as engaged in religious behavior now as they were at the beginning of the century. Another report in *Science* (Easterbrook, 1997) finds that religion has reconciled its conflicts with rational inquiry and is prospering. We are indeed devoted to our spirits.

So is God with us after all?

There may be a composite answer. Yes, God exists. At the least he is in your brain, encoded for by the genes responsible for the design of your mental functions. A notion sug-

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gested by previous authors as well (Richerson & Boyd, 1989; Josephson, 1993; Steadman & Palmer, 1995). Recent experiments even suggest that the religious experience is associated with a specific part of the brain, the temporal lobe (Motluk, 1997).

In Support of the Spirits

It is difficult to design an accurate definition of religion that is sufficiently general to cover all the elements of spiritual life. After all, religions may permeate most aspects of human behavior, sometimes in obvious ways, while at other times the spiritual component is more subtle. Steadman and Palmer (1995) stress the communicated acceptance of a supernatural claim as a crucial element of religion. For the present purpose a more traditional description is sufficient, such as the following adapted from Horton (1960): Belief in the supernatural and the influence that belief has on human actions and emotions.

Even Neanderthals may have been religious. Neanderthal graves, dating back at least 100,000 years, contain evidence suggesting the dead were buried along with flowers (Solecki, 1975; Lewin, 1984). These people not only took the trouble of burying their dead, they even added something beautiful to the graves. Presumably they had the imagination (and sense) to see visions of an afterlife, maybe in the form of a Neanderthal heaven filled with flowers and fruits, or a reincarnation here on earth.

Since then, mankind has developed an estimated 100,000 religions (Wallace, 1966). Today we find elements of religiousness in all cultures, from nomadic tribes to scientifically based societies. Neither history nor anthropology knows of cultures from which spirituality has been totally absent (Murdoch, 1967; Rappaport, 1971).

It seems remarkable that the concept of a spiritual power has survived so well. Scientific explanations, or, for that matter, the lack of scientific explanations, have not managed to erode the vitality of faith. Neither has the lack of a written language, with many cults thriving as verbal traditions.

Purely cultural traits are not expected to have such a capacity to permeate and survive. A more plausible explanation is that the spirits are nurtured by an inherent adaptation. In the present article I shall expand on this statement, providing a model for the evolution of religiousness, and discuss possible consequences for modern society.

God is in our Genes

The cross-cultural validity is probably the most convincing argument supporting the claim that humans have an inborn tendency for religiousness. Anything which is universal to human culture is likely to have contributed to human survival, and anything that contribute to human survival will be selected for. Genes favoring such behavior will permeate the genetic pool of the species.

A second point is the vigor of faith. For those who believe, the power can be overwhelmingly strong—a force which exceeds most other leanings. The vigor is witnessed by the observation that religions survive and thrive in the presence of strong adverse forces. Well known examples include the prosecution of the early Christian communities, and the attempt of the Soviet communists to introduce secular ideologies as substitutes for religion. True spirituality

seems to survive all assaults, and the disciples tend to give the religious aspect of their lives a high priority.

One more point may be worth mentioning. In biology, you expect the amount of resources allocated to a certain type of behavior to correlate with the importance of that behavior for survival. And the more important the function is, the stronger you expect its genetic correlate to be. Observations of present societies, primitive or advanced, suggest that humans spend a lot of energy on religious behavior (Wallace, 1966; Rappaport, 1971). It is, for example, significant that most of the grandiose structures and great works of art that have survived from previous cultures, are of a religious nature. There are temples, burial chambers, sacrificial altars, and objects designed to please or worship gods. The idea of allocating energy to create artifacts for the spirits most likely emerged independently in many places. And even in cultures, like those of nomadic peoples or hunter-gatherers, who do not construct objects designed to last, religious behavior consumes a significant amount of time and energy. People spend time worshipping, and quite often they waste valuable food or other useful possessions as offerings to the spirits.

Combined, these observations make it unlikely that religions are a purely cultural phenomenon.

Adaptive Advantages Conferred by Religion

In order to substantiate the case, I ought to be able to explain why our genes have developed in this direction. That is, how did faith contribute to the survival of the species?

A tribe of aborigines living in the inhospitable Australian desert survived by setting off on long seasonal wanderings. Every year they moved in a large circle, making sure that each season was spent at a location where food was available at that particular time of year. However, when asked by an anthropologist why they broke camp so often, their answer was not that it was necessary in order to find food, rather they claimed to be following the will of the spirits. What if some indolent member of the tribe came to the conclusion that the spirits were just another fairy-tale and decided to stay put? His genes would not do very well.

The above story illustrates how religion can push behavior in a sensible direction. Logical appeal seems to exercise less power than that derived from tuning in your brain to supernatural forces. We are endowed with a unique ability to reason, yet finding our own answers does not always imply finding sensible answers. Sometimes our thoughts only lead to an irrational stubbornness. Religion may guide people towards behavior that has proven sensible, but without knowing why it is sensible. Probably even more important, religion may unite people behind appropriate rules of conduct that would be difficult to enforce by any other means. A tribe where people obey rules and cooperate will be better able to cope with both natural misfortunes and human enemies. So a religion that lays down reasonable rules, and delivers godly rewards or punishment in order to enforce them, must have bestowed an evolutionary advantage. Several authors stress the benefits of religion on social harmony (Rappaport, 1971; Batson, 1983; Burhoe, 1986; Richerson & Boyd, 1989; Hefner, 1991; Josephson, 1993; Lynn, 1996).

A more specific point concerns the use of rituals. Ritual behavior presumably goes back to our animal forefathers in the form of gestures and other acts serving communicative purposes. Humans developed some of these into complex ceremonies, typically in connection

with rites of passage (Wallace, 1966; Rappaport, 1971). Compared to oral communication, rituals serve additional functions: They have a strong socializing component, and they add emotion to a statement, which help ensure that the message is observed. A wedding, for example, serves the purpose of securing the relationship and thus reducing the tension that easily evolves in connection with access to sexual partners. The self-consciousness and free will of humans required the addition of sanctity to the pairbonding process in order to avoid fights.

Most rituals became intermingled with religious belief. This is a symbiotic relationship; the rituals obtain increased authority, and religion emerges as a more prominent factor of society. Both effects presumably confer an adaptive advantage. Rituals may have been among the first manifestations of religiousness.

The last million years of human history must have witnessed many examples of one population replacing another. A tribe with an appropriate religion would be expected to fare well in such competition. It may be that the main advantage of having a well organized tribe related not so much to the occasional skirmish, but rather to exploiting natural resources more efficiently, which, in turn, results in bringing up more children. As a consequence, the genes favoring such behavior would be spread.

The above arguments are primarily concerned with advantages for the community. Within a specific tribe, the more religious members may have obtained particular benefits. People with such inclinations were more likely to end up as (religious) leaders, which possibly implied a position enabling them to gain more than their share of resources, such as more food and more or better mates.

The spirits also offer advantages to those who do not obtain a high position in society. The combination of animal emotions and a human super intelligence may have traumatic consequences. Our ability to speculate gives rise to all sorts of distress. While animals tend to sleep soundly after a good meal or after escaping a predator, humans worry about whether they will find food tomorrow and whether they will be able to escape the next time. Our understanding of the trials of life has brought emotional diseases in its wake, such as nervousness and depression.

The spirits provide a suitable dressing. They give sensible (which, in this context, equates with comforting) answers to unpleasant questions. An understanding of death may be a heavy burden, but most religions have an answer. If I am eaten by a tiger tomorrow, it is the will of God. And when the tiger has satisfied its hunger, I am in heaven. So why worry? A decent religion offers a view of reality that explains all the phenomena you may observe, and leads you to believe that somebody is shielding you from an otherwise uncertain existence. The soothing effects release energy for the many functions of life, which again translates into improved reproductive potential. Satisfied people find partners more easily and give more care to their offspring. Satisfied individuals also create a better society.

It is easy to point out possible advantages bestowed by the spirits. In my opinion the potential gain is sufficient to explain why those with a nascent tendency towards religiousness spread their genes more efficiently than those without such tendencies. It should be pointed out, however, that not all aspects of religiousness need be adaptive for the genes to develop in this direction, for example the celibacy observed by catholic priests can hardly be considered an evolutionary stable strategy. For the present model, it is sufficient to assume that, on the average, the consequences of believing in spirits were adaptive during a significant part of the last million years of human evolution.

The Evolution of Religiousness

The main period of brain development in humans occurred between 2 and 3 million years ago, and correlate with the first stone tools (Lewin, 1984; Tattersall, 1997). It is tempting to speculate that a rudimentary disposition towards spirituality entered our brains during or soon after that period, but this will remain conjecture. Spirits do not tend to fossilize. I have previously cited evidence suggesting religiousness among Neanderthals (Solecki, 1975; Lewin, 1984). Based on recent excavations of fossils (Arsuaga, 1993) and genetic analysis of Neanderthal mitochondrial DNA (Kriings, Stone, Schmitz, Krainitzki, Stoneking, & Paabo, 1996), the Neanderthals are assumed to have followed a separate line of descent from that of our forefathers more than half a million years ago. Thus it seems likely that spirituality existed before that time.

Even the apes have developed self-consciousness (Kitchen, Denton, & Brent, 1996; Wright, 1996), one of the requirements for being religious. It is not obvious that chimpanzees lack the intellectual prerequisites for spirituality, their (presumed) lack of religion could be explained by less adaptive value due to differences in lifestyle as compared to the human lineage. With the hominoids, both the benefits and the intellectual capacity were most likely present 2 - 3 million years ago.

We are believed to have evolved from primates with hierarchical societies (Jolly, 1972; Lewin, 1984). The leadership of our forefathers' tribes may have moved from "the dictatorship of alpha males" towards "democracy" long before the invention of elections. An extended need for cooperation, as a direct or indirect consequence of our hunting practices, required the leaders to be less autocratic. However, our inherent inclination towards submission probably remained. The change towards cooperation rather than domination may have left this tendency partly "vacant." It is typical for evolution to base new properties on already existing structures. Thus the presence of a tendency to practice obedience to a leader may have boosted the disposition to submit to a higher power. Today we often see this connection reversed. An emperor or a dictator who wishes to have obedient subjects tries to induce reverence.

It should be pointed out that assuming there is an inherent tendency to believe in gods, it is not appropriate to talk about "religious genes." There is not one or a few specific genes that cause you to believe in a god, in the same way that there are genes which determine your blood type or the color of your eyes. Rather you expect that a large subset of genes involved in the construction of your brain have slightly altered functions as a consequence of this tendency.

In my model, religious inclinations first appeared in the human brain some 2 - 3 million years ago. The genetic changes probably concerned brain arrangements involved in functions such as the following: Submission to a higher power, the creation of thought constructs and adhering to the belief in them whether or not they can be substantiated, the redirection of love and devotion towards abstract beings, as well as the socializing based on spiritual aspects such as in connection with rituals. All these aspects of the mind were present prior to any religious commitment, so religiousness did not require any drastic changes in the brain, just modifications of existing functions to open up for a novel use of these functions, that is the commitment to the spirits.

Individuals and tribes who obtained the more useful changes in this direction prospered, causing a selection for religiousness. The predisposition may have reached most of

its present strength by the time our forefathers emerged from an evolutionary bottleneck some 150,000 years ago (Horai, Hyasaka, Knondo, Tsugane, & Takahata, 1995; Erlich, Bergström, Stoneking, & Gyllensten, 1996). As with most of our innate predispositions, including our urge to eat and have sex, religiousness does not have a hundred percent penetrating power. I see religiousness as a less prominent trait than our desire for mates or food, but possibly equally conspicuous as our ability to fall in love, and more important than the tendency to enjoy visual aesthetics as discussed in a previous paper (Grinde, 1996a).

As an alternative explanation, Vaneechoutte (1993) has suggested that religions are simply a cultural adaptation to certain consequences of our animal emotions and human superintelligence. He claims it is not in our genes, but he does view religion as beneficial for our well-being. It is, however, hard to imagine that well-being has not improved fitness. And if this effect has been available for a million years or more, it seems highly unlikely that it would not have had an impact on the genome. Yet, I agree that the tremendous success of religions may not be solely because the trait has been selected for, but also because spirituality fits in with other aspects of human nature. As I believe religiousness does not require any drastic changes in the genome, the difference between the ideas suggested in the present article and those of Vaneechoutte are not drastic.

And then, of course, there is a third alternative. The one favored by the majority.

The Evolution of Religion

It is important to distinguish between the evolution of religiousness, which is a biological process, that is a process accompanied by a change in the genetic makeup of humans, and the evolution of religions, which is primarily a cultural process. The evolutionary split between those of the present races that genetically stand the furthest apart, occurred some 100,000 years ago (Hammer, 1995; Horai et al., 1995). To my knowledge, there is no suggestions that societies on one side of this split are more religious than those on the other side, implying that the tendency has not changed drastically after that time. So for the last 100,000 years we are witnessing the “evolution” of religions rather than of religiousness.

The development of creeds can be represented by an evolutionary tree. Early, primitive faiths gradually developed into more complex systems with advanced thought structures and intricate rituals (Rappaport, 1971; Wiebe, 1987; Barnes, 1992). Culture added substance and elaboration to the belief. Some tenets prospered, others vanished (Wallace, 1966).

There is a lesson to be learned from linguistics. The emergence of intricate belief systems probably occurred simultaneous with the development of languages in vast number of separate communities around the globe. At times, certain traditions expanded and gained domination over larger regions, leading to the loss of cultural diversity. The most dramatic elimination of languages probably occurred some 3,000 to 10,000 years ago in connection with the expansion of agriculture (Diamond, 1997). Most likely, there was a concomitant elimination of creeds. Yet, up until recent centuries, a vast number of faiths remained. Then two main trends, Christianity and Islam, exterminated much of the remaining religious diversity.

Taking Benefit of a Spiritual Mind

It is not obvious that traits advantageous to humans during the last two million years of evolution should be coveted today. Our way of life has changed drastically over the last hundreds of years, rendering some traits that were beneficial in the past inappropriate for the present. Furthermore, evolutionary success is measured in terms of reproductive potential. Most people will agree that modern societies should strive to increase the quality of life rather than the number of people. But when it comes to religiousness, I believe the advantages may be as vital today as they were for our tribal ancestors.

In a previous article, I have argued that, as a rule of thumb, humans are advised to conform to their inborn tendencies in order to enhance the quality of life (Grinde, 1996b). The arguments are based on the following lines of thought. The brain is equipped with mechanisms delivering rewards and punishment, in the form of pleasure and pain, to influence your behavior (Koob, 1992; Nesse & Berridge, 1997). Obvious examples of the two types of mechanisms include sexual arousal or burning your finger. By adhering to your inborn tendencies you are given the possibility to harvest from the reward mechanism and avoid the pain. Furthermore, to live in discord with your innate nature may impose stress.

I believe that these principles, discussed in more detail in the previous paper, applies to spirituality as well. The way your brain is constructed, it offers you religiousness, and to believe in a god may both add pleasure and relieve stress.

Communication with the spirits is an important aspect of religious behavior, and as can be confirmed by practitioners of any creed, the experience of closeness to a god is cherished. This is just what you should expect if evolution has placed God in our genes. There should be an accompanying reward mechanism in the brain to direct people towards relevant behavior. The joy of God is not just something the priests advertise; it may reflect real structures in our brains. A survey does indeed propose that religious people are more friendly and happy (Ellison, 1992).

The methods used for getting in touch with the spirits often include ways of stimulating the brain which offer rewards independent of any religious content. Music, dance, meditation, and feasting are popular ingredients in formulas developed for approaching spirits (Wallace, 1966). The stimulation of two or more independent reward systems, as in chanting where you combine music with closeness to a god, offers a particularly powerful experience and a concomitant strong motivation towards participation.

Furthermore, the destiny of the individual is as uncertain as ever. We may not have to worry about tigers, but we are surrounded by guns and dangerous cars, and we worry about exams, electricity bills, pollution, and lots of things that our forefathers could not have envisaged in their wildest dreams. As before, the answers offered by a god may be more helpful than those provided by logic.

It should also be pointed out that most religious communities create an environment that caters to our social needs, an element of life that most likely is not as well taken care of in our industrialized society than in the tribal setting.

It is tempting to suggest the following prophecy: God is worth his weight in gold; the heavier he appears to you, the more valuable he is.

Besides the individual benefits obtained by tuning in to the spirits, there are the advantages for society discussed above. These may be even more important today than they were for our forefathers. Present societies are more complex and probably even more in need of prin-

ciples that can influence and coordinate the behavior of their citizens. While tribal societies could rely on personal relationships between all its members, today most people live in a setting where they associate with only a very limited number of those they are expected to feel solidarity with. Religion is a powerful tool in dealing with social problems.

Yet I would choose my god carefully. Particularly, the dominant religions have a long history in causing mischief. Among the many requirements of the ideal scripture is that the doctrines involved should adjust to human behavioral biology. They should take into consideration all our inherent tendencies. Many religions have the drawback of unnecessarily trying to steer us away from natural behavior. For example, it makes sense to direct people away from violence, but the reasons for directing us away from sexuality seem less justified. Claiming that sex is immoral can easily become a significant stress factor, at the least it prevents people from harvesting obvious rewards. A more updated scripture might state that sexual desires are natural and good, but that they should be practiced in ways that do not harm others.

To conclude: One, as an individual you are advised to find yourself the most favorable god and let him, or her, improve your quality of life. Two, the community should support the congregations they believe work for the benefit of the society.

The Real Dilemma of Science and Religion

One function of religion has been to offer people explanations for observations and questions otherwise inexplicable. Although the unknown still exists at the edges of science, the space available for an explaining God is rapidly shrinking. Yet, certain questions may never find a scientific answer, such as what started the big bang and if there is a limit to the universe. So, as suggested by Wertheim (1997), those who desire a god that elucidates mysteries may relate their religion to cosmology.

I believe we may be better served by a religion attending to other functions, such as a god who primarily appeals to feelings, rather than rationality, and who directs practitioners towards a serviceable, moral, and a sensible behavior.

Richard Dawkins, who has been called science's chief gladiator against religion, claims that anyone who believes in a creator God is scientifically illiterate. Einstein once said that a limited scientific understanding tends to move us away from God, while a deeper understanding of the universe brings us closer. Based on human behavioral biology, I have come to an alternative stance. For me, the troublesome aspect of the conflict between science and religion is not the question of what religion may or may not be able to explain, but rather that science has the power of laying bare the nature of religiousness. Unfortunately, it appears inherently difficult to believe in the context of this article, that is believe that God is in your genes, and at the same time believe in the Almighty.

The Darwinian Gospel: A Religion for the Utopian?

As previously pointed out, religion involves intense emotions, which implies the possibility of drastic disagreements. A common religion for all humans, or simply having religions that are sufficiently open-minded to accommodate local variants, should make the earth a better place to live. As early as in the 16th century the Indian Mogul emperor Akbar tried to create a synthesis of all the creeds he knew. In the 19th century Báhá'í appeared with a similar mission.

Unfortunately neither reached very far. It seems as if religions, like humans and other animals, rely on a certain measure of assertiveness and egoism in order to survive and prosper.

A bible designed specifically for the benefit of humans, taking into account all aspects of our behavioral biology, as well as the particular needs of modern society, would be a great gift for mankind. With the help of a suitable god, we could bring together all humans and make them feel solidarity and responsibility, not just for each other, but for our planet and for future generations, and at the same time make them happy.

Unfortunately, at present that goal seems rather Utopian. Actually, inducing people to believe in such a construct may be the minor problem. I see an opportunity to cope with the dilemma of science and religion. The bible suggests that humans were created to believe in God. We may claim that the genetic changes were initiated by a heavenly power. The story becomes even more plausible if we state that the heavenly power, or God, is not an actual figure, but rather the universal laws of nature.

Based on the atrocities connected with religious disagreements over the past centuries, the impassable obstacle may be to have people agree on the task. But, if science moves forth, maybe some day we will find a way.

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