

Beyond Demonic Memes

Why Richard Dawkins is Wrong About Religion

by David Sloan Wilson

Richard Dawkins and I share much in common. We are both biologists by training who have written widely about evolutionary theory. We share an interest in culture as an evolutionary process in its own right. We are both atheists in our personal convictions who have written books on religion. In *Darwin's Cathedral* I attempted to contribute to the relatively new field of evolutionary religious studies. When Dawkins' *The God Delusion* was published I naturally assumed that he was basing his critique of religion on the scientific study of religion from an evolutionary perspective. I regret to report otherwise. He has not done any original work on the subject and he has not fairly represented the work of his colleagues. Hence this critique of *The God Delusion* and the larger issues at stake.

Where We Agree and Where We Part Company

In *The God Delusion* Dawkins makes it clear that he loathes religion for its intolerance, blind faith, cruelty, extremism, abuse, and prejudice. He attributes these problems to religion and thinks that the world would be a better place without it. Given recent events in the Middle East and even here in America, it is understandable why he might draw such a conclusion, but the question is: What's evolution got to do with it?

Dawkins and I agree that evolutionary theory provides a powerful framework for studying religion, and we even agree on some of the details, so it is important to pinpoint exactly where we part company. Evolutionists employ a number of hypotheses to study any trait, even something as mundane as the spots on a guppy. Is it an adaptation that evolved by natural selection? If so, did it evolve by benefiting whole groups, compared to other groups, or individuals compared to other individuals within groups? With cultural evolution there is a third possibility. Since cultural traits pass from person to person, they bear an intriguing resemblance to disease organisms. Perhaps they evolve to enhance their own transmission without benefiting human individuals or groups.

If the trait is not an adaptation, then it can nevertheless persist in the population for a variety of reasons. Perhaps it was adaptive in the past but not the present, such as our eating habits, which make sense in the food-scarce environment of our ancestors but not with a MacDonald's on every corner. Perhaps the trait is a byproduct of another adaptation. For example, moths use celestial light sources to orient their flight (an adaptation), but this causes them to spiral toward earthly light sources such as a streetlamp or a flame (a costly byproduct), as Dawkins so beautifully recounts in *The God Delusion*. Finally, the trait might be selectively neutral and persist in the population by genetic or cultural drift.

Dawkins and I agree that these major hypotheses provide an excellent framework for organizing the study of religion, which by itself is an important achievement. We also agree that the hypotheses are not mutually exclusive. Evolution is a messy, complicated process, like the creation of laws and sausages, and all of the major hypotheses might be relevant to some degree. Nevertheless, real progress requires determining *which* hypotheses are most important for the evolution of particular traits. The spots on a guppy might seem parochial, but they are famous among biologists as a case study of evolutionary analysis. They can be explained primarily as adaptations in response to two powerful selective forces: predators remove the most conspicuous males from the population, whereas female guppies mate with the most conspicuous males. The interaction between these two selection pressures explains an impressive amount of detail about guppy spots — why males have them and females don't, why males are more colorful in habitats without predators, and even why the spots are primarily red when the predators are

crustaceans (whose visual system is blind to the color red), as opposed to fish (whose visual system is sensitive to the color red). Guppy spots *could* have been selectively neutral or a byproduct of some other trait, but that's not the way the facts fell.

Richard Dawkins and Stephen Jay Gould: Strange Bedfellows

The late Harvard evolutionary biologist Stephen Jay Gould famously criticized his colleagues for seeing adaptations where they don't exist. His metaphor for a byproduct was the spandrel, the triangular space that inevitably results when arches are placed next to each other. Arches have a function but spandrels do not, even though they can acquire a secondary function, such as providing a decorative space. Gould accused his colleagues of inventing "just-so stories" about traits as adaptations, without good proof, and being blind to the possibility of byproducts and other non-adaptive outcomes of evolution.

Gould had a point, but he failed to give equal time to the opposite problem of failing to see adaptations where they do exist. Suppose that you are a biologist who becomes interested in explaining the bump on the nose of a certain species of shark. Perhaps it is just a byproduct of the way that shark noses develop, as Gould speculated for the human chin. Perhaps it is a callous that forms when the sharks root around in the sand. If so, then it would be an adaptation but not a very complicated one. Perhaps it is a wart, formed by a virus. If so, then it might be an adaptation for the virus but not the shark. Or perhaps it is an organ for detecting the weak electrical signals of prey hidden in the sand. If so, then it would be a *complex* adaptation.

Few experiences are more thrilling for a biologist than to discover a complex adaptation. Myriad details that previously defied explanation become interpretable as an interlocking system with a purpose. Non-adaptive traits can also be complex, but the functional nature of a complex adaptation guides its analysis from beginning to end. Failing to recognize complex adaptations when they exist is as big a mistake as seeing them where they don't exist. Only hard empirical work — something equivalent to the hundreds of person-years spent studying guppy spots from an evolutionary perspective — can settle the issue.

Dawkins argued on behalf of adaptationism in his debates with Gould and would probably agree with everything I have said so far. For religion, however, he argues primarily on behalf of non-adaptation. As he sees it, people are attracted to religion the way that moths are attracted to flames. Perhaps religious impulses were adapted to the tiny social groups of our ancestral past, but not the mega-societies of the present. If current religious beliefs are adaptive at all, it is only for the beliefs themselves as cultural parasites on their human hosts, like the demons of old that were thought to possess people. That is why Dawkins calls God a *delusion*. The least likely possibility for Dawkins is the group-level adaptation hypothesis. Religions are emphatically *not* elaborate systems of beliefs and practices that define, motivate, coordinate and police groups of people for their own good.

For the Good of the Group?

To understand Dawkins' skepticism about the group-level benefits of religion, it is necessary to trace the history of "for the good of the group" thinking in evolutionary theory. Groups can be adaptive only if their members perform services for each other, yet these services are often vulnerable to exploitation by more self-serving individuals within the same group. Fortunately, groups of individuals who practice mutual aid can out-compete groups whose members do not.

According to this reasoning, traits that are "for the good of the group" require a process of between-group selection to evolve and tend to be undermined by selection within groups. Darwin was the first person to reason this way about the evolution of human morality and self-sacrificial traits in other animals.

Unfortunately, his insight was not shared by many biologists during the first half of the 20th century, who uncritically assumed that adaptations evolve at all levels of the biological hierarchy — for the good of the individual, group, species, or ecosystem — without requiring a corresponding process of natural selection at each level. When the need for group selection was acknowledged, it was often assumed that between-group selection easily prevailed against within-group selection. This can be called The Age of Naïve Groupism, and it ended during the 1960s and 1970s, thanks largely to two books: George C. Williams' 1966 *Adaptation and Natural Selection* and Richard Dawkins' 1976 *The Selfish Gene*.

In *Adaptation and Natural Selection*, Williams affirmed the logic of multi-level selection but then added an empirical claim: Even though between-group selection is *theoretically* possible, in the real world it is invariably trumped by within-group selection. Virtually all adaptations evolve at the individual level and even examples of apparent altruism must be explained in terms of self-interest. It was this empirical claim that ended The Age of Naïve Groupism and initiated what can be called The Age of Individualism, which lasted for the rest of the 20th century and in some respects is still with us.

Another theme developed by Williams was the concept of the gene as the fundamental unit of selection. In sexually reproducing species, an individual is a unique collection of genes that will never occur again. Individuals therefore lack the permanence to be acted upon by natural selection over multiple generations. According to Williams, genes are the fundamental unit of natural selection because they have the permanence that individuals (much less groups) lack.

In many respects, and by his own account, Williams was interpreting ideas for a broader audience that began with Darwin and were refined by theoretical biologists such as Sewall Wright, Ronald Fisher, and J.B.S. Haldane. The concept of the gene as the fundamental unit of selection, for example, is identical to the concept of average effects in population genetics theory, which averages the fitness of alternative genes across all of the individual genotypes and environmental contexts experienced by the genes. A decade later, Dawkins played the role of interpreter for an even broader audience. Average effects became selfish genes and individuals became lumbering robots controlled by their genes. Group selection became a pariah concept, taught only as an example of how not to think. As one eminent evolutionist advised a student in the 1980s, "There are three ideas that you do not invoke in biology: Lamarckism, the phlogiston theory, and group selection."

Scientific Dogmatism

In retrospect, it is hard to fathom the zeal with which evolutionists such as Williams and Dawkins rejected group selection and developed a view of evolution as based entirely on self-interest. Williams ended *Adaptation and Natural Selection* with the phrase "I believe that it is the light and the way." Here is how Dawkins recounts the period in his 1982 book *The Extended Phenotype*:

The intervening years since Darwin have seen an astonishing retreat from his individual-centered stand, a lapse into sloppily unconscious group-selectionism ... We painfully struggled back, harassed by sniping from a Jesuitically sophisticated and dedicated neo-group-selectionist rearguard, until we finally regained Darwin's ground, the position that I am characterizing by the label 'the selfish organism...'

This passage has all the earmarks of fundamentalist rhetoric, including appropriating the deity (Darwin) for one's own cause. Never mind that Darwin was the first group selectionist. Moreover, unlike *The Selfish Gene*, *The Extended Phenotype* was written by Dawkins for his scientific peers, not for a popular audience!

In reality, the case against group selection began to unravel almost immediately after the publication of *Adaptation and Natural Selection*, although it was difficult to tell, given the repressive social climate. In the first place, calling genes “replicators” and “the fundamental unit of selection” is no argument at all against group selection. The question has always been whether genes can evolve by virtue of benefiting whole groups and despite being selectively disadvantageous within groups. When this happens, the gene favored by between-group selection replaces the gene favored by within-group selection in the total population. In the parlance of population genetics theory, it has the highest average effect. Re-labeling the gene selfish, just because it evolves, contributes nothing. The “gene’s eye view” of evolution can be insightful in some respects, but as an argument against group selection it is one of the greatest cases of comparing apples with oranges in the annals of evolutionary thought.

The same goes for the concept of extended phenotypes, which notes that genes have effects that extend beyond the bodies of individual organisms. Examples of extended phenotypes include a bird’s nest or a beaver’s dam. But there is a difference between these two examples; the nest benefits only the individual builder, whereas the dam benefits all of the beavers in the pond, including those who don’t contribute to building the dam. The problem of within-group selection is present in the dam example and the concept of extended phenotypes does nothing to solve it. More apples and oranges.

The Revival of Group Selection

Much has happened in the four decades following the rejection of group selection in the 1960s. Naïve groupism is still a mistake that needs to be avoided, but between-group selection can no longer be categorically rejected. Claims for group selection must be evaluated on a case-by-case basis, along with the other major evolutionary hypotheses. Demonstrations of group selection appear regularly in the top scientific journals.

As one example reported in the July 6, 2006 issue of *Nature*, a group of microbiologists headed by Benjamin Kerr cultured bacteria (*E. coli*) and their viral predator (phage) in 96-well plates, which are commonly used for automated chemical analysis. Each well was an isolated group of predators and their prey. Within each well, natural selection favored the most rapacious viral strains, but these strains tended to drive their prey, and therefore themselves extinct. More prudent viral strains were vulnerable to replacement by the rapacious strains within each well, but as groups they persisted longer and were more likely to colonize other wells. Migration between wells was accomplished by robotically controlled pipettes. Biologically plausible migration rates enabled the prudent viral strains to persist in the total population, despite their selective disadvantage within groups.

As a second example reported in the December 8, 2006 issue of *Science*, economist Samuel Bowles estimated that between-group selection was strong enough to promote the genetic evolution of altruism in our own species, exactly as envisioned by Darwin. These and many other examples, summarized by Edward O. Wilson and myself in a forthcoming review article, are ignored entirely by Dawkins, who continues to recite his mantra that the selective disadvantage of altruism within groups poses an insuperable problem for between-group selection.

Individuals as Groups

Not only can group selection be a *significant* evolutionary force, it can sometimes even be the *dominating* evolutionary force. One of the most important advances in evolutionary biology is a concept called major transitions. It turns out that evolution takes place not only by small mutational change, but also by social groups and multi-species communities becoming so integrated that they become higher-level organisms in their own right. The cell biologist Lynn Margulis proposed this concept in the 1970s to explain the

evolution of nucleated cells as symbiotic communities of bacterial cells. The concept was then generalized to explain other major transitions, from the origin of life as communities of cooperating molecular reactions, to multi-cellular organisms and social insect colonies.

In each case, the balance between levels of selection is not fixed but can itself evolve. A major transition occurs when selection within groups is suppressed, making it difficult for selfish elements to evolve at the expense of other members of their own groups. Selection among groups becomes a dominating evolutionary force, turning the groups into super-organisms. Ironically, during the Age of Individualism it became taboo to think about groups as organisms, but now it turns out that organisms are literally the groups of past ages.

Dawkins fully accepts the concept of major transitions, but he pretends that it doesn't require a revision in his ideas about group selection. Most important, he doesn't pose the question that is most relevant to the study of religion: Is it possible that human genetic and cultural evolution represents the newest example of a major transition, converting human groups into the equivalent of bodies and beehives?

Selfish Memes and Other Theories of Cultural Evolution

Dawkins' third claim to fame, in addition to selfish genes and extended phenotypes, was to coin the term "meme" to think about cultural evolution. In its most general usage, the word "meme" becomes newspeak for "culture" without adding anything new. More specific usages suggest a variety of interesting possibilities; that culture can be broken into atomistic bits like genes, that these bits are somehow represented inside the head, and especially that they can evolve to be organisms in their own right, often spreading at the expense of their human hosts, like the demons of old.

As with religion, Dawkins has not conducted empirical research on cultural evolution, preferring to play the role of Mycroft Holmes, who sat in his armchair and let his younger brother Sherlock do the legwork. Two evolutionary Sherlocks of culture are Peter Richerson and Robert Boyd, authors of the 2005 book *Not By Genes Alone: How Culture Transformed Human Evolution*. One of the sleights of hand performed by Dawkins in *The God Delusion*, which takes a practiced eye to detect, is to first dismiss group selection and then to respectfully cite the work of Richerson and Boyd without mentioning that their theory of cultural evolution is all about group selection.

Consider genetic evolution by itself. When a new mutation arises, the total population consists of one group with a single mutant and many groups with no mutants. There is not much variation among groups in this scenario for group selection to act upon. Now imagine a species that has the ability to socially transmit information. A new cultural mutation can rapidly spread to everyone in the same group, resulting in one group that is very different from the other groups in the total population. This is one way that culture can radically shift the balance between levels of selection in favor of group selection. Add to this the ability to monitor the behavior of others, communicate social transgressions through gossip, and easily punish or exclude transgressors at low cost to the punishers, and it becomes clear that human evolution represents a whole new ball game as far as group selection is concerned.

In this context, the human major transition probably began early in the evolution of our lineage, resulting in a genetically evolved psychological architecture that enables us to spontaneously cooperate in small face-to-face groups. As the great social theorist Alexis de Tocqueville commented long ago in *Democracy in America*, "the village or township is the only association which is so perfectly natural that, wherever a number of men are collected, it seems to constitute itself." As the primate equivalent of a beehive or an ant colony, our lineage was able to eliminate less groupish competitors. The ability to acquire and socially transmit new behaviors enabled our ancestors to spread over the globe, occupying hundreds of ecological

niches. Then the invention of agriculture enabled group sizes to increase by many orders of magnitude, but only through the cultural evolution of mechanisms that enable groups to hang together at such a large scale. Defining, motivating, coordinating, and policing groups is not easy at any scale. It requires an elaborate system of proximate mechanisms, something akin to the physiological mechanisms of an individual organism. Might the elements of religion be part of the “social physiology” of the human group organism? Other than briefly acknowledging the abstract possibility that memes can form “memeplexes,” this possibility does not appear in Dawkins’ analysis.

Bring on the Legwork

It is absurd, in retrospect, that evolutionists have spent much more time evaluating the major evolutionary hypotheses for guppy spots than for the elements of religion. This situation is beginning to remedy itself as scholars and scientists from all backgrounds begin to adopt the evolutionary perspective in their study of religion.

An example from my own research will show how empirical legwork can take us beyond armchair theorizing. Here is Dawkins on the subject of whether religion relieves or induces stress in the mind of the religious believer:

Is religion a placebo that prolongs life by reducing stress? Possibly, although the theory must run the gauntlet of skeptics who point out the many circumstances in which religion causes rather than relieves stress ... The American comedian Cathy Ladman observes that “All religions are the same: religion is basically guilt, with different holidays.”

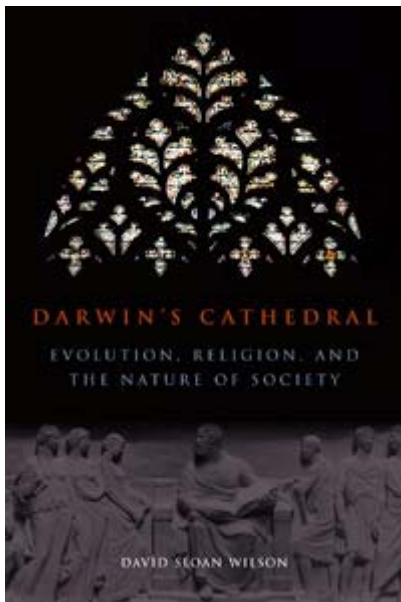
One of my projects is a collaboration with the psychologist Mihaly Csikszentmihalyi (pronounced shick-sent-me-hi), who is best known among general readers for his books on peak psychological experience, such as *Flow* and *The Evolving Self*. Csikszentmihalyi pioneered the Experience Sampling Method (ESM) which involves signaling people at random times during the day, prompting them to record their external and internal experience — where they are, who they are with, what they are doing, and what they are thinking and feeling on a checklist of numerical scales. The ESM is like an invisible observer, following people around as they go about their daily lives. It is as close as psychological research gets to the careful field studies that evolutionary biologists are accustomed to performing on non-human species, which is why I teamed up with Csikszentmihalyi to analyze some of his past studies from an evolutionary perspective.

These studies were performed on such a massive scale and with so much background information that we can compare the psychological experience of religious believers vs. nonbelievers on a moment-by-moment basis. We can even compare members of conservative vs. liberal protestant denominations, when they are alone vs. in the company of other people. On average, religious believers are more prosocial than non-believers, feel better about themselves, use their time more constructively, and engage in long-term planning rather than gratifying their impulsive desires. On a moment-by-moment basis, they report being more happy, active, sociable, involved and excited. Some of these differences remain even when religious and non-religious believers are matched for their degree of prosociality. More fine-grained comparisons reveal fascinating differences between liberal vs. conservative protestant denominations, with more anxiety among the liberals and conservatives feeling better in the company of others than when alone. Religions are *diverse*, in the same way that species in ecosystems are diverse. Rather than issuing monolithic statements about religion, evolutionists need to explain religious diversity in the same way that they explain biological diversity.

These results raise as many questions as they answer. We did not evolve to feel good but rather to survive and reproduce. Perhaps religious believers are happily unaware of the problems that nonbelievers are anxiously trying to solve. As a more subtle point, people pass back and forth between the categories of “nonbeliever” and “believer” as they lose and regain faith. Perhaps some nonbelievers are psychologically impaired because they are the recent casualties of religious belief. Only more scientific legwork can resolve these issues, but one thing is sure: Dawkins’ armchair speculation about the guilt-inducing effects of religion doesn’t even get him to first base.

Natural Historians of Religion

Hypothesis testing does not always require quantification and the other trappings of modern science. Darwin established his entire theory on the basis of descriptive information carefully gathered by the naturalists of his day, most of whom thought that they were studying the hand of God. This kind of information exists in abundance for religions around the world and throughout history, which should be regarded as a fossil record of cultural evolution so detailed that it puts the biological fossil record to shame. It should be possible to use this information to evaluate the major evolutionary hypotheses, which after all represent radically different conceptions of religion. Engineering principles dictate that a religion designed to benefit the whole group will be different from one designed to benefit some individuals (presumably the leaders) at the expense of others within the same group, which in turn will be different from a cultural disease organism designed to benefit itself at the expense of both individuals and groups, which in turn will be different from a religion for which the term “design” is inappropriate. It would be odd indeed if such different conceptions of religion could not be distinguished on the basis of carefully gathered descriptive information.



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Of course, it is necessary to gather the information systematically rather than picking and choosing examples that fit one’s pet theory. In *Darwin’s Cathedral*, I initiated a survey of religions drawn at random from the 16-volume *Encyclopedia of World Religions*, edited by the great religious scholar Mircea Eliade. The results are described in an article titled “Testing Major Evolutionary Hypotheses about Religion with a Random Sample,” which was published in the journal *Human Nature* and is available on

my website. The beauty of random sampling is that, barring a freak sampling accident, valid conclusions for the sample apply to all of the religions in the encyclopedia from which the sample was taken.

By my assessment, the majority of religions in the sample are centered on practical concerns, especially the definition of social groups and the regulation of social interactions within and between groups. New religious movements usually form when a constituency is not being well served by current social organizations (religious or secular) in practical terms and is better served by the new movement. The seemingly irrational and otherworldly elements of religions in the sample usually make excellent practical sense when judged by the only gold standard that matters from an evolutionary perspective — what they cause the religious believers to do. The best way to illustrate these points is by describing one of the religions in the sample — Jainism — which initially appeared the most challenging for the group-level adaptation hypothesis.

Jainism is one of the oldest and most ascetic of all the eastern religions and is practiced by approximately three percent of the Indian population. Jain ascetics filter the air they breathe, the water they drink, and sweep the path in front of them to avoid killing any creature no matter how small. They are homeless, without possessions, and sometimes even fast themselves to death by taking a vow of “santhara” that is celebrated by the entire community. How could such a religion benefit either individuals or groups in a practical sense? It is easy to conclude from the sight of an emaciated Jain ascetic that the religion is indeed a cultural disease — until one reads the scholarly literature.

It turns out that Jain ascetics comprise a tiny fraction of the religion, whose lay members are among the wealthiest merchants in India. Throughout their long history, Jains have filled an economic niche similar to the Jews in Western Europe, Chinese in Southeast Asia, and other merchant societies. In all cases, trading over long distances and plying volatile markets such as the gem trade requires a high degree of trust among trading partners, which is provided by the religion. Even the most esoteric (to outsiders) elements of the religion are not superfluous byproducts but perform important practical work.

For example, the ascetics must obtain their food by begging but their religion includes so many food restrictions that they can only accept food from the most pious lay Jain households. Moreover, the principle of non-action dictates that they can only accept small amounts of food from each household that was not prepared with the ascetics in mind. When they enter a house, they inspect the premises and subject the occupants to sharp questions about their moral purity before accepting their food. It is a mark of great honor to be visited but of great shame if the ascetics leave without food. In effect, the food begging system of the ascetics functions as an important policing mechanism for the community. This is only one of many examples, as summarized by Jainism scholar James Laidlaw in a 1995 book whose title says it all: *Riches and Renunciation: Religion, Economy, and Society Among the Jains*.

How then, is it possible to live by impossible ideals? The advantage for addressing this question to Jainism is that the problem is so very graphic there. The demands of Jain asceticism have a pretty good claim to be the most uncompromising of any enduring historical tradition: the most aggressively impractical set of injunctions which any large number of diverse families and communities has ever tried to live by. They have done so, albeit in a turbulent history of change, schism, and occasionally recriminatory “reform,” for well over two millennia. This directs our attention to the fact that yawning gaps between hope and reality are not necessarily dysfunctions of social organization, or deviations from religious systems. The fact that lay Jains make up what is — in thoroughly worldly material terms — one of the most conspicuously successful communities in India, only makes more striking and visible a question which must also arise in the case of the renouncers themselves.

This example illustrates a phenomenon that I call *the transformation of the obvious*. Jainism appears obviously dysfunctional based on a little information, such as the sight of an emaciated ascetic or beliefs that appear bizarre when taken out of context. The same religion becomes obviously functional based on more information. This is the kind of “natural history” information that enabled Darwin to build such a strong case for his theory of evolution, and it can be used to build an equally strong case for the group-functional nature of Jainism. As for Jainism, so also for most of the other enduring religions of the world.

An Emerging Consensus?

I recently attended a conference on evolution and religion in Hawaii that provided an opportunity to assess the state of the field. It is *not* the case that everyone has reached a consensus on the relative importance of the major evolutionary hypotheses about religion. My own talk included a slide with the words SHAME ON US! in large block letters, chiding my colleagues for failing to reach at least a rough consensus, based on information that is already at hand. This might seem discouraging, until we remember that all aspects of religion have so far received much less attention than guppy spots from an evolutionary perspective. The entire enterprise is that new.

There was, I believe, a convergence taking place during the short period of the conference. Richard Sosis, whose previous research includes a detailed comparison of religious vs. non-religious communal movements, presented new research on the recitation of psalms among Israeli women in response to terrorist attacks. William Irons and several other participants developed the concept of hard-to-fake signals as a mechanism for insuring commitment in religious groups. Dominic Johnson reminded us that inter-group conflict, as much as we might not like it and want to avoid it, has been an important selective force throughout human genetic and cultural evolution and that some elements of religion can be interpreted as adaptations for war. In my response to this paper during the question period, I largely agreed with Johnson but pointed out that most of the religions in my random sample did not spread by violent conflict (e.g., Mormonism). Johnson is currently examining the religions in my random sample in more detail with respect to warfare, a good example of cumulative, collaborative research. Peter Richerson and I gave a tutorial on group selection, which was especially useful for participants whose understanding of evolution is grounded on the Age of Individualism.

Lee Kirkpatrick delivered a lecture titled “Religion is Not an Adaptation” that might seem to oppose the adaptationist accounts mentioned above. What he meant, however, is that he doubts the existence of any genetic adaptations that evolved specifically in a religious context. He is sympathetic to the possibility that more general genetically evolved psychological adaptations are co-opted by cultural evolution to form elaborately functional religious systems. Similarly, other psychologically oriented talks about minimal counter-intuitiveness (beliefs being memorable when they are weird but not too weird), hyperactive agent detection devices (our tendency to assume agency, even when it does not exist), and the ease with which children develop beliefs about the afterlife, *might* be interpretable as non-adaptive byproducts, but they might also be the psychological building blocks of highly adaptive religions. In evolutionary parlance, byproducts can become exaptations, which in turn can become adaptations.

No one at the conference presented a compelling example of a religious belief that spreads like a disease organism, to the detriment of both individuals and groups. The demonic meme hypothesis is a theoretical possibility, but so far it lacks compelling evidence. Much remains to be done, but it is this collective enterprise that deserves the attention of the scientific research community more than angry diatribes about the evils of religion.

Real-World Solutions Require a Correct Diagnosis of the Problems

Explaining religions as primarily group-level adaptations does not make them benign in every respect. The most that group selection can do is to turn groups into super-organisms. Like organisms, super-organisms compete, prey upon each other, coexist without interacting, or engage in mutualistic interactions. Sometimes they form cooperative federations that work so well that super-super-organisms emerge at an even larger spatial scale. After all, even multi-cellular organisms are already groups of groups of groups. In a remarkable recent book titled *War and Peace and War*, Peter Turchin analyzes the broad sweep of human history as a process of cultural multilevel selection that has increased the scale of human society, with many reversals along the way — the rise and fall of empires. Religion is a large subject, but the explanatory scope of evolutionary theory is even larger.

American democracy can be regarded as a cultural super-super-organism. The founding fathers realized that religions work well for their own members but become part of the problem at a larger social scale. That is why they worked so hard to accomplish the separation of church and state, along with other checks and balances to prevent some members of the super-super-organism from benefiting at the expense of others. In this context I share Dawkins' concern that some religions are seeking to end the separation of church and state in America. I am equally concerned that the checks and balances are failing in other respects that have nothing to do with religion, such as unaccountable corporations and extreme income inequality.

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David Sloan Wilson

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I also share Dawkins' concern about other aspects of religions, even after they are understood as complex group-level adaptations. Religions can be ruthless in the way that they enforce conformity within groups. Most alarming for a scientist, religions can be wanton about distorting facts about the real world on their way toward motivating behaviors that are adaptive in the real world. We should be equally concerned about other distortions of factual reality, such as patriotic histories of nations and other non-religious ideologies that I call “stealth religions” in my most recent book, *Evolution for Everyone*. Finally, I agree with Dawkins that religions are fair game for criticism in a pluralistic society and that the stigma associated with atheism needs to be removed. The problem with Dawkins' analysis, however, is that if he doesn't get the facts about religion right, his diagnosis of the problems and proffered solutions won't be right either. If the bump on the shark's nose is an organ, you won't get very far by thinking of it as a wart. That is why Dawkins' diatribe against religion, however well-intentioned, is so deeply misinformed.

On Scientific Open-Mindedness

Toward the end of *The God Delusion*, Dawkins waxes poetic about the open-mindedness of science compared to the closed-mindedness of religion. He describes the heart-warming example of a scientist who changed his long-held beliefs on the basis of a single lecture, rushing up to his former opponent in front of everyone and declaring “Sir! I have been wrong all these years!”

This inspiring example represents one end of the scientific bell curve when it comes to open-mindedness. At the other end are people such as Louis Agassiz, one of the greatest biologists of Darwin’s day, who for all his brilliance and learning never accepted the theory of evolution. Time will tell where Dawkins sits on the bell curve of open-mindedness concerning group selection in general and religion in particular. At the moment, he is just another angry atheist, trading on his reputation as an evolutionist and spokesperson for science to vent his personal opinions about religion.

It is time now for us to roll up our sleeves and get to work on understanding one of the most important and enigmatic aspects of the human condition.