Neo-Darwinian Theories of Religion and the Social Ecology of Religious Evolution

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Abstract

Some neo-Darwinian theories of religion contend that the brain generates religious concepts as counterintuitive beliefs in supernatural entities, which often function as substitute attachment figures. Other neo-Darwinian theories explain religious rituals as "costly signals" designed to function as indicators of religious commitment. This paper develops and applies insights from these theories, along with elements of Weberian and rational choice theory, to explain the long-term evolution of religion. It seeks to identify the social conditions that have interacted with the religious architecture of the brain to produce widespread religious variation. Early shamanic and communal religions focused heavily on the practical concerns of acquiring subsistence, curing illness, and avoiding danger. Ecclesiastical religions emerged in more economically and politically complex societies. The first ecclesiastical religions, which evolved in chiefdoms and archaic states, were polytheistic; here people worshiped an array of human-like gods given great reverence and legitimating state rule. Monotheistic religions, which evolved mostly in complex states with literacy, began to replace polytheistic religions during the first millennium BCE (the Axial Age) largely as the result of massive increases in warfare and urbanization. These changes disrupted people's lives and led to heightened levels of ontological insecurity. A transcendent God capable of saving people's souls and releasing them from suffering replaced the human-like gods. The paper concludes by sketching a long-term process of religious "abstractification" that has been driven by the religious architecture of the brain in close interaction with a range of social, economic, and political conditions.

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In recent years there has been a flurry of work on the biological foundations of religion by evolutionary and cognitive anthropologists and cognitive neuroscientists (e.g., Guthrie, 1995; Ashbrook, 1997; Rolston, 1999; Persinger, 1999; D'Aquili and Newberg, 1999; Joseph, 2000; Newberg and D'Aquili, 2001; Giovannoli, 2001; Hamer, 2003; Boyer, 2001; Atran, 2002; Atran and Norenzayan, 2004; Whitehouse, 2004; Kirkpatrick, 2005). The most influential of these works argue that religion is a by-product of other cognitive structures, which are themselves adaptations, whereas others argue that religious beliefs and rituals evolved as part of the human mental architecture because they were adaptive in one or more ways. However, although taking note of the wide range of religious variation in time and space, such theories are of little help in explaining such variation because they fail to consider the environmental inputs that would produce it. The brain may be wired for religion, for either adaptive or nonadaptive reasons, but regardless it is still necessary to identify the range of social, economic, and political conditions – in the broadest sense, socioecological conditions – that influence the development of particular kinds of religious beliefs and practices in particular times and places. This paper is therefore an exercise in combining evolutionary psychology with evolutionary anthropology and evolutionary sociology. It seeks to understand how the mental apparatus predisposing humans to religious beliefs and practices interacts with socioecological conditions present at various times and

places to produce the major types of religion that we observe in the historical and social-scientific record.

We begin with the evolutionary psychological side, looking first at those theorists who see religious thinking as a nonadaptive cognitive byproduct.

Religion as a By-product of Other Cognitive Adaptations

In his *Religion Explained* (2001), Pascal Boyer, starts by rejecting some standard explanations of religion, in particular that

- religion *explains the otherwise unexplainable*: the origin of things, why there is evil and human suffering, etc.;
- religion *reduces anxiety and provides comfort*, it makes our mortality more bearable;
- religion *integrates society* and supports morality.

According to Boyer, these explanations are not entirely wrong, but they fail as *general explanations* of religion. They fail to tell us, he says, why religions have many of the particular features they do. For example:

- They fail to do us why there are so many different types of supernatural agents; religions may have god or many, or there may be no actual gods at all; some gods are eternal whereas others die; and whereas some gods are highly intelligent or even omniscient, others are very stupid and can easily be fooled or tricked.
- Salvation or release from suffering has not been a preoccupation of most religions in most societies across time and space.

- Official religion is not the whole of religion; for example, in Islam there is One True God, but many Muslims are also terrified of spirits, witches, and ghosts, and many Christians in the United States believe in ghosts and often claim to interact with them.

- Religion is often concerned with explaining evil, but not with *evil in general*, only *particular evils*.

- Religious explanations are often more puzzling than illuminating, i.e., they yield more questions than real answers.

- Religions often create more anxiety than they reduce. A world with religion can be just as terrifying as a world without it. Religions may offer reassurance, but they also frequently present people with a "thick pall of gloom." (In this regard Boyer specifically mentions Kierkegaard's *Fear and Sickness and the Trembling Unto Death*). Moreover, reassuring religion is often found in places where life is not particularly dangerous or unpleasant, such as in contemporary southern California; New Age Mysticism, for example, has flourished in perhaps the most secure and affluent societies in world history.

- In many societies mortality is not considered unbearable and death does not make existence seem pointless; the so-called unbearableness of mortality, Boyer contends, is culture specific and does not provide a universal motivation for religion.

According to Boyer, the key feature of religious concepts is that they are *counterintuitive* beliefs, which means that they consist of information that contradicts the information acquired through ordinary cognitions and the ordinary categories of

reality they produce. Gods or spirits are commonly conceived as being very much like persons, but with one or more counterintuitive features added. For example, the God of the monotheistic world religions is omniscient, yet does not have a brain or eyes or even any type of body. Boyer stresses that gods and spirits are portrayed everywhere as very much like persons; people anthropomorphize them.

Boyer argues that supernatural entities are for the most part structured by our natural intuitions concerning *agency*. Humans have cognitive adaptations for agency in the sense that they recognize that persons and animals have goals and pursue various means to reach them. They cause things to happen. However, humans have a very strong tendency to extend their natural intuitions about agency beyond persons and animals to many features of nature, such as the sun, moon, or wind. They seem to have a bias to assume that, if the wind blows, it is because there is some agent that is causing it to blow, and to blow for some reason or purpose.

One of humans' most important cognitive modules is therefore an *agency-detection module*, and this module is biased toward overdetection. Because of our evolutionary heritage, we need to be able to detect both predators and prey, and it is far better to overdetect than to underdetect because the costs of not detecting agents when they are around are much greater than the costs of detecting them when they are not around. In the ancestral environment, it was highly adaptive for humans to know what animals or other humans might be around and capable of doing them harm.

Religious concepts are very practical. They are activated when there is a special need for them. The things that humans need most are *information* about the world (the natural and social environment) and *cooperation* with fellow humans. These needs for

information and social cooperation are extended to supernatural entities. Whereas humans always have limited access to strategic information, supernatural agents have *full access to strategic information.*

For Boyer, in the evolution of the human brain there was no specific evolutionary selection for religious concepts. Thus there is no special religious center in the brain, no network of neurons that is specialized for handling thoughts about supernatural entities. He contends that religious concepts *are parasitic upon* other mental capacities; there is no reason to assume that there is some sort of special mode of cognitive functioning that is operating only when religious thoughts are being processed. Counterintuitive notions of supernatural entities simply piggybacked on other cognitive concepts, and they did so mainly because they were *easy to produce.* However, "human minds did not become vulnerable to just any odd kind of supernatural beliefs. On the contrary, because they had many sophisticated inference systems, they became vulnerable to a very *restricted* set of supernatural concepts: the ones that jointly activate inference systems for agency, predation, death, morality, and social exchange" (Boyer, 2001:324-325).

Boyer pays special attention to rituals and their significance. Rituals, he argues, have a common obsession with marking boundaries, and a very common theme is purity and purification. In fact, he notes that rituals seem quite similar to the actions of individuals with obsessive-compulsive disorder (OCD). It has been shown that the same themes occur repeatedly in OCD and religious rituals – the concern with purity and pollution, with performing certain actions over and over again and in highly stylized and stereotyped ways. Boyer thinks that some elements of rituals activate the what he calls the human *contagion-detecting system.* "Many elements in ritual scripts," he says, "activate this contagion system. The insistence on cleaning, cleansing, purifying, making

a particular space safer, avoiding any contact between what is in that space and the outside – all these are cues that indicate possible contamination" (Boyer, 2001:240). He goes on to say that the sense of urgency in many rituals may be connected to one of our cognitive systems that works to manage precautions against undetectable dangers. People have to perform rituals *in just the right way*, he says, and this is highly characteristic of people with OCD.

Boyer also points to the importance of sacrifice in ritual, which seems to contain the idea that misfortune can be staved off if people engage in some sort of exchange relation with supernatural powers. "The general ideology of sacrifice, the justification for its performance, is almost invariably the notion that misfortune can be kept away and prosperity or health or social order maintained if the participants and the gods enter into some mutually beneficial exchange relation" (2001:241). Boyer also stresses the *social effects* of rituals, and in this respect is close to Durkheim (1947[1912]) (but with a neurobiological foundation). Rituals are thought to produce beneficial social effects, the most important of which are social *cooperation* and *cohesion*.

Like Boyer, Scott Atran (2002) rejects theories that seek to explain religion in terms of coping with death or other existential anxieties, keeping social or moral order, or providing explanations where they are otherwise unavailable. He contends that these theories are at best partial, and thus cannot be necessary or sufficient causes of religious beliefs and practices. For Atran (2002:13), religion has four basic features:

1. Widespread counterfactual beliefs in supernatural agents (gods, ghosts, goblins, spirits, souls, witches).

2. Hard-to-fake public expressions of costly material commitments to supernatural agents, i.e., sacrifice (of goods, time, other lives, one's own life).

3. A central focus of supernatural agents on dealing with people's existential anxieties (death, disease, pain, catastrophe, loneliness, injustice, want, loss, etc.).

4. Ritualized and often rhythmic coordination of the first three – i.e., communion.

An adequate theory of religion, Atran convincingly argues, must account for all four of these.

Like Boyer, Atran argues that religious beliefs emerge from agent-based interpretations of complex events. Human brains appear to be programmed to look for agents as the causes of complex and uncertain happenings. The agent-detection schema or module of the brain is built for detecting predators, prey, and protectors. Our brains are wired to spot lurkers and seek protectors everywhere. In social interaction, people manipulate this hypersensitive cognitive aptitude so as to create the agents who order and unite the culture and the cosmos. The operation of this module makes snakes and many other dangerous animals just as reasonable objects of deification as kind and nurturant parents. People in all religions believe that the world has been deliberately created by unseen agents, that humans (and even some animals) have souls that live on after their bodies die, and that through rituals they can persuade gods or spirits to change the world for human betterment. The extremely adaptive evolutionary imperative to look out for predators, whether dangerous beasts or dangerously manipulative and deceptive humans, generates universal cognitions involving supernatural demons, ghouls, goblins, vampires, and the like. In many (perhaps all) religions, supernatural beings include monsters which, more often than not, have characteristics typical of animal predators. The human brain is "trip-wired" as an

agency-detection system. We recognize faces in the moon, see armies or dragons in clouds, insist that the image of Jesus exists in the Shroud of Turin, or are even sure we can spot the image of Mother Theresa in a cinnamon bun sold in a pastry shop in Tennessee!

Lee Kirkpatrick (2005) has recently applied John Bowlby's (1969) classic attachment theory to explain certain features of religious belief and behavior. Bowlby was combining psychoanalytic theory with Darwinism. He assumed that the human infant is primed to form a strong bond with its parents, its mother in particular, because parents are needed for nurturance and protection in an ancestral environment filled with predators. For Kirkpatrick, many religious notions are extensions or generalizations of the parent-child bond. Supernatural agents are seen as protectors from harm in much the way that parents are. God becomes a *haven of safety* and a *secure base*. Kirkpatrick points out that people in modern societies often turn to religion in times of psychological distress and crisis, such as personal catastrophes, serious illness or injury, and death and grieving. He notes that much of Christian scripture, for example, reveals the importance of God in providing "a shield" or "strength." He also reviews research showing that people who display strong attachments to God show better physical and mental health and report less loneliness and depression, fewer psychosomatic symptoms, and greater life satisfaction.

Kirkpatrick stresses that God or gods are primarily *substitute attachment figures* for natural attachment figures, i.e, fathers, mothers, and other close kin. The feeling of a relationship with God or gods is most likely to be activated, therefore, when an individual's sense of security, safety, and freedom from anxiety falls below a certain

threshold as a result of natural attachments being inadequate to life's challenges. Thus, children who fail to develop adequate attachments to parents should be more likely than other children to develop an attachment to God. Kirkpatrick calls this the *compensation hypothesis*. This language is particularly revealing because it shows how Kirkpatrick's argument dovetails with the sociological rational choice theory of Rodney Stark (1996, 1999; Stark and Bainbridge, 1987), who in the original version of his theory actually employed the term "compensator,"[1] as well as with some aspects of the sociology of religion of Max Weber (1978[1923]), who argued that what disprivileged classes seek most from religion is compensation. Here Kirkpatrick points to research on religious converts (Ullman, 1982, 1989) showing that 80 percent of converts reported poor attachments to their fathers and 53 percent poor attachments to their mothers compared to, respectively, only 23 percent and 7 percent of a control group, as well as to other research supportive of the compensation hypothesis. And in own society today, we see millions of people driving cars with bumper stickers saying "I love Jesus," "Jesus loves me," "God is My Co-Pilot," and so on, or otherwise making similar declarations of faith and attachment to God. Often people say how secure they are because they "have given their lives over to God," who then "takes charge of their lives."

Like Boyer and Atran, Kirkpatrick contends that there is no specifically religious module (or set of modules) in the brain and that religious beliefs are byproducts of cognitive modules for agency detection. He argues that the "default assumption" on the adaptiveness or nonadaptiveness of religion should be the assumption that it is nonadaptive. This seems highly questionable to me in view of the fact that Darwin's default hypothesis was adaptationist and that evolutionary psychologists (of which Kirkpatrick is one) generally start with adaptationist reasoning. On the other hand,

Kirkpatrick points out that, although religion seems to function in important ways to provide a sense of security, reduce anxiety, and improve physical and mental health, *these are not the currency of Darwinian selectionist thinking*. That currency is, as we very well know, *reproductive success*. As Kirkpatrick correctly notes, evolution by natural selection is not about increasing an organism's happiness, but about increasing the representation of its genes in present and future generations.

Some of the thinking of the sociological theorist Anthony Giddens (1990, 1991) converges with the attachment theory in that Giddens has argued that the need for *ontological security* is a fundamental human need. This involves a need to feel that one's life and the lives of kin are secure, safe, free from harm, stable, predictable, and so on. Giddens defines this concept as "the confidence that most human beings have in the continuity of their self-identity and in the constancy of the surrounding social and material environments of action. A sense of the reliability of persons and things, so central to the notion of trust, is basic to feelings of ontological security" (1990:92). In the ancestral environment the most important things that can diminish ontological security are danger from animal predators, natural forces, and manipulative and deceitful humans, and the types of religions found in this environment largely reflect these concerns. In more advanced societies, the sense of ontological security is most likely to be disrupted by rapid and massive social change, and in these societies we see very different kinds of religions that seem to reflect these new concerns. In such societies the problems of cosmological order and meaning and the fear of death also seem to loom larger, and thus it is unsurprising that their religions reflect these things.

Giddens's notion of ontological security actually dovetails even more precisely with the Bowlby/Kirkpatrick notion of attachment. Giddens notes that the first context of trust is the kinship system, "which in most pre-modern settings provides a relatively stable mode of organizing 'bundles' of social relations across time and space" (1990:101). In fact, he has virtually independently rediscovered attachment theory, as is evident in the following passage (1991:39-40; emphasis added):

The trust which the child, in normal circumstances, vests in its caretakers, I want to argue, can be seen as a sort of *emotional inoculation* against existential anxieties – a protection against future threats and dangers which allows the individual to sustain hope and courage in the face of whatever debilitating circumstances she or he might later confront. Basic trust is a screening-off device in relation to risks and dangers in the surrounding settings of action and interaction. It is the main emotional support of a defensive carapace or *protective cocoon* which all normal individuals carry around with them as the means whereby they are able to get on with the affairs of day-to-day life.

Giddens goes on to identify two other types of social relations that contribute importantly to ontological security, the local community and religion. Having a reliable network of acquaintances and friends that persists over time contributes much to ontological security, and (1990:103)

religious cosmologies provide moral and practical interpretations of personal and social life, as well as of the natural world, which represent an environment of security for the believer. The Christian deity commands us, "Trust in me, for I am the one true God." . . . Religion is an organizing medium of trust in more than one way. Not only deities and religious forces provide providentially dependable supports: so also do religious functionaries. Most important of all, religious beliefs typically inject reliability into the

13

experience of events and situations and form a framework in terms of which these can be explained and responded to.

Giddens is hardly engaging himself in debates about whether religion is an evolutionary adaptation or a byproduct, or even whether the human brain is predisposed to produce it. As a sociologist hardly receptive to evolutionary psychology, he remains entirely apart from such considerations. Nevertheless, he is clearly implying that the need for ontological security is a fundamental human need that, if unmet, leads to adverse psychological consequences for individuals.

Whether religion is adaptation or byproduct, we contend that Kirkpatrick's attachment theory and Giddens's related notion of ontological security provides us with a critical component to understand some of the features of religion, including the long-term evolution of different types of religion. We shall therefore return to it. But first let us consider evolutionary theories of religion that stress its adaptive character.

Religion as an Evolutionary Adaptation

In his book *On Human Nature* (1978), E.O. Wilson argued that religion was a biological adaptation, but his argument was never developed in an especially interesting or useful way. Somewhat later, the sociologist Joseph Lopreato (1984) explored similar territory. The concept of a soul, he said was a cultural byproduct of the biological evolution of the capacity for self-deception. Religion also address the "problem of meaning" and the "explanatory urge." About the same time, Vernon Reynolds and Ralph Tanner were developing an adaptationist understanding of religion. In 1983 they wrote *The Biology of Religion*, a book that was revised in 1995 under the title *The Social Ecology of*

Religion. Reynolds and Tanner start by noting that their approach differs from that of Durkheim (1947[1912]) and others who stress the role of religion in producing social cohesion. Their concern is religion's individual benefits. They produce considerable evidence that religion has benefits for health and survival and that it leads to greater reproductive success (see below).

Andrew Newberg and Eugene d'Aquili (2001) are brain scientists who have done brain scans for the purpose of producing a "photograph of God." They are especially interested in what is going on in the brain when individuals are engaged in intense prayer and meditation, and in the "mystical experience." They argue that four areas of the brain are important in mysticism: the visual association area, the orientation association area, the attention association area, and the verbal conceptual association area. Newberg and d'Aquili have done brain imaging showing that when individuals experience intense mystical states, certain areas of the brain are "deafferented," or deprived of neural input. The greater the deafferentiation, the greater the feelings of ecstacy, awe, rapture, and profound spiritual union.

Is there an evolutionary advantage to this ability to experience mystical states? Newberg and d'Aquili suggest that the brain did not evolve for spiritual transcendence. Rather, the neurobiology of transcendence piggybacked onto the neural circuitry that evolved for mating and sexual experience. The language of much mysticism – bliss, rapture, ecstasy, exaltation, etc. – is the same as the language of intense sexual pleasure. Mysticism is therefore not an adaptation, but a by-product of other adaptations. In this respect Newberg and d'Aquili are byproduct theorists.

However, the authors also point out that humans are myth-making creatures, and to understand the neurological foundations of religion we need an understanding of

myth. The mind has "cognitive operators" that work to reduce intolerable anxiety and help us make sense of the world. There is an irresistible need to make sense of things. People have existential worries: Why do we die and what happens after we die? How do we fit into the universe? Why is there suffering in the world? What is the origin of the universe and of humans? Newberg and d'Aquili point out "that in every human culture, across the span of time, the same mythological motifs are constantly repeated: virgin births, world-cleansing floods, lands of the dead, expulsions from paradise, men swallowed down the bellies of whales and serpents, dead and resurrected heroes, the primeval theft of fire from the gods" (2001:74). Newberg and d'Aquili contend that these myth-making and religious tendencies evolved because of their adaptive value in promoting survival and well-being. So in this respect the authors are adaptationists.

The authors also look at the evolutionary roots of ritual. Ritual, they claim, is about the transcendence of the self, its merging into some larger reality. Ritual unites worshipers and gives them a greater sense of reality and purpose. For example, in Buddhism meditative rituals have as their main goal encountering and experiencing the "ultimate oneness" of everything that exists. This argument is close to Durkheim's (1947[1912]) famous argument that religious ritual unites the group and creates greater cohesion. In worshiping gods or other sacred objects, individuals transcend themselves and are, in effect, really worshiping the power of their own society over them. Durkheim, however, never focused on any biological foundations of this behavior because it was not consistent with his strict antireductionist thinking.

What is the connection between ritual and myth? For Newberg and d'Aquili, ritual allows humans to resolve, at a neurological level, the "awe-inspiring distance" that

humans usually perceive between themselves and their gods. They say that establishing a unity between individuals and their spiritual sources is central to all or almost all systems of religious belief. In Christianity, Jesus provides the pathway to God; in Buddhism, following the teachings of the Buddha leads to oneness; and so on. The neurobiology of ritual turns thoughts into experiences that prove their reality to the participants. It tells believers that their beliefs are actually true. And all of this is evolutionarily adaptive. "The inborn physical compulsion to enact our thoughts may have an evolutionary purpose. By mentally rehearsing certain important actions – running, fighting, stalking, and killing prey – we might actually hone our abilities to perform those tasks in real life" (2001:94).

Newberg and d'Aquili summarize research showing that religious people tend to have better mental and physical health – less cardiovascular disease, better immunological functioning, lower blood pressure, and, in short, a longer life. There is also research showing that religious beliefs and behaviors contribute to lower rates of alcoholism, drug abuse, suicide, and depression and anxiety. The power of religion is that it alleviates "existential stress"; it decreases anxiety and uncertainty and gives us a greater sense of control in a terrifying world. Religion therefore seems highly adaptive, and thus Newberg and d'Aquili conclude that it did indeed evolve by natural selection even though it used the neural circuitry of sexual response. For them, religion is a true adaptation and (except for mysticism) not just some sort of byproduct.

An intriguing adaptationist type of argument for religious ritual has been developed by Richard Sosis (2003). Following up on William Irons's (2001) suggestion that religious rituals are "hard-to-fake" indicators of commitment, Sosis uses costly signaling theory (Zahavi and Zahavi, 1997) to explain why religious rituals are so

17

important in all religions. According to Sosis, ritual is the primary mechanism through which religious communities maintain beliefs among their members. Such communities, of course, can be arranged along a continuum from those with relatively relaxed and undemanding rituals to those that employ many rituals that are highly demanding. Since relaxed rituals are not especially costly to perform, they are "easy to fake," and this makes such communities easily invader by free-riders who seek to reap the benefits of religious membership while paying low costs. Demanding rituals on the other hand, are costly and thus much more difficult to fake. Muslims, for example, are expected to pray five times a day, engage in fasting, make an annual pilgrimage to Mecca, and so on. Members of Hutterite communities must engage in daily worship, fast, have communal meals three times a day, and refrain from playing musical instruments, using radios, wearing jewelry, using tobacco, dancing, and gambling. As Sosis points out, all of these are very real material and psychological costs.

When religious communities ask their members (including prospective members) to pay such costs, they are in essence asking them for clear signs of commitment. Using self-perception and cognitive dissonance theories, Sosis argues that continued participation in costly rituals actually serves to create or intensify religious belief. At the same time, strong believers come to evaluate ritual performances as less costly than those whose beliefs are weaker. For strong believers, ritual performance is seen as less of a burden, and, moreover, the opportunity costs of engaging in other behaviors are lower. They thus receive a large payoff in religious group membership, whereas those who cannot muster a sufficient level of belief and commitment tend to drop out. Thus, in enhancing belief and commitment, costly, hard-to-fake rituals contribute to

interpersonal trust and social cohesion. Sosis concludes by asking why we are not all Hutterites. His answer (2003:115-116):

> We are not Hutterites because we do not believe in the teaching of Hutterites, and the only way to perceive the *net* in-group benefits of the Hutterites is to truly believe in their way of life. This of course begs the question of why we do not believe in Hutterite theology. It seems that the only way to achieve this devoutness is to actually live like a Hutterite *and* initially possess either highly ambiguous beliefs or beliefs that are similar to those of the Hutterites. Otherwise, observing Hutterite religious obligations will be perceived as too costly, and hence will be avoided or discontinued if attempted. In other words, there are genuine gains to be achieved by joining the Hutterites, but without "belief" our assessment of these potential gains suggests significant costs.

Interestingly, Atran has made many of the very same points, but in the service of a byproduct rather than an adaptationist argument. Be that as it may, Candace Alcorta and Sosis (2005) have extended the arguments of Sosis. They note that research supports the argument that costly ritual does enhance cooperation (e.g., Sosis and Bressler, 2003; Sosis and Ruffle, 2003), but this research has failed to show how high levels of cooperation actually lead to gains in individual fitness. Nevertheless, they point to another body of research which does show that religious participation has beneficial consequences for physical and mental health and a longer lifespan (e.g., Hummer et al. 1999; Matthews et al., 1998, Murphy et al., 2000). Alcorta and Sosis are fully aware of the arguments of thinkers like Boyer and Atran, and actually seem to agree with many of them. They agree that religion is all about counterintuitive beliefs and rituals, and that religious systems engage mental modules regarding agency. However, they do not think that this precludes these counterintuitive beliefs from being adaptive.

A major means of determining whether something is an adaptation or a byproduct is to look for clear evidence of complex design. Alcorta and Sosis believe they can see such evidence in several features of religion. They agree that religion incorporates preexisting mental modules, as the byproduct theorists suggest, but more important religious beliefs go well beyond these modules. Natural category agents possess information, but that information is always limited and sometimes unreliable. Supernatural agents, by contrast, are perceived to be *full access strategic agents*, or agents that "possess knowledge of socially strategic information, having unlimited perceptual access to socially maligned behaviors that occur in private and therefore outside the perceptual boundaries of everyday human agents" (2005:327). They also point to accumulating research evidence suggesting "that humans exhibit a developmental predisposition to believe in socially omniscient supernatural agents, [one] appearing in early childhood and diminishing in adulthood" (2005:327). And they take note of cross-cultural research suggesting that children between the ages of 3 and 12 have a sort of "natural theism." They go on to say (2005:327; emphasis added):

> This developmental predisposition to believe in socially omniscient and declarative supernatural agents contrasts with evolved mental modules of folkpsychology for natural categories. It also goes far beyond natural agency-detection modules to encompass socially strategic agents with behaviorally motivating characteristics.
>
> . . . If religious beliefs are merely by-products of mental modules evolved to deal with the "natural world," *why do such beliefs consistently violate the basic cognitive schema from which they are presumed to derive*?

Alcorta and Sosis conclude that religion is an evolutionary adaptation and that its main evolutionary function is to enhance social cooperation and cohesion. However,

this is not a group selectionist or functionalist argument, since the authors go on to say that enhanced cooperation itself has individual benefits in terms of health and survival, if not actual inclusive fitness benefits. Such facts suggest that religion is a good deal more than simply a byproduct of other cognitive designs.

Adaptation vs. By-Product: Tentative Conclusions

There seems to be little doubt that religious thinking is a fundamental part of the mental architecture of the brain. This is suggested by the universality of religious beliefs and rituals, as well as by certain cross-cultural and cross-historical consistencies that these beliefs and rituals exhibit. But is it an evolutionary adaptation or a byproduct? It seems impossible to draw any definitive conclusion at this point, but we are inclined to lean toward the adaptationist side – that religion is a true evolutionary adaptation in its own right, not just something that is piggybacking on other cognitive structures. The adaptationist argument is testable mainly by asking two fundamental questions:

1. Does religion promote survival and well-being?
2. Do religious people have higher levels of reproductive success than nonreligious people?

As indicated previously, there is a large amount of evidence supporting an affirmative answer to the first question. Reynolds and Tanner (1995) review some older studies. One (Comstock and Partridge, 1972) showed that, for the United States in the 1960s, persons attending church once a week or more had approximately 50 percent lower rates of mortality from cardiovascular disease, emphysema, and suicide, and a 75 percent lower rate of mortality from cirrhosis of the liver, compared to less frequent

attenders. A much older study (Stussi, 1873-75) showed that members of the English and Welsh Protestant clergy in the nineteenth century had substantially lower mortality rates than the general male population, especially in the reproductive years between 25 and 45. More recently, Hummer et al. (1999), in a study of U.S. adults, found that persons who never attended church were nearly twice as likely to die in a followup period as persons who attended church weekly. They found that this translated into 7.6 fewer years of life expectancy at age 20 (for blacks, life expectancy at age 20 was shortened by 13.7 years). And recent work by McConnell and Boyatzis (2002) provides results that are consistent with previous research. They found that the more religious their cardiac patients were, the more they improved. And Stark (1996) has pointed out that the early Christians were in fact better than the members of other contemporaneous religions at nursing and comforting the sick, therefore producing at least slightly higher survival rates, and that this was one of the major reasons for Christianity's appeal.

As Kirkpatrick has reminded us, it is reproductive success rather than health and longevity that is the appropriate currency for identifying a genuine Darwinian adaptation, but it is almost inconceivable that people in better health would not also have higher reproductive success. People in better health are more likely to find mates, and to find good mates, than people in poor health, and thus to reproduce at higher rates. This would be true in all types of human societies. And even if the reproductive difference is marginal, we very well know that even tiny differences in reproductive success can have major evolutionary consequences over many generations.

Moreover, there is direct evidence that religion does promote reproductive success. All of the major world religions have been pronatalist to one extent or another,

and many religions have encouraged sexual intercourse between married couples during the wife's most fertile period (Reynolds and Tanner, 1995). Catholicism has long opposed birth control and is very "pro-life." Mormonism, one of the world's fastest growing religions, is also very pro-life, and Mormon fertility is often astonishingly high, with even well-educated, upper-middle-class Mormons sometimes having completed family sizes of 4-6 children. Reynolds and Tanner (1983) have taken a somewhat more nuanced view, contending that religions have favored either an r-selected or a K-selected reproductive strategy depending upon the environmental circumstances in which each strategy would be most apt to promote inclusive fitness. They summarize their argument as follows (1995:38-39):

> In environments where levels of disease and frequency of natural disasters were high, where poverty was great, expectation of life low, infant mortality rate high, and confidence in the future poor, then religious attitudes to child-bearing were pro-natalist: that is, religions fostered the view that it was altogether a good thing for parents to have many children. We found this kind of religious attitude to be prevalent in many Moslem countries, in Hindu India, and in rural African societies. In such cases, religions were . . . acting adaptively, because in promoting pro-natalist ideas they were ensuring the survival into maturity of at least a few children who would then be able to support their parents and continue the family line down the generations.

> Conversely, we showed that in environments where disease levels and frequency of natural disasters were lower, where affluence prevailed, expectation of life was high, infant mortality rate low, and people's confidence in the future strong, then religious attitudes to childbearing were anti-natalist: religions did not emphasize the production of large numbers of offspring by parents. This attitude we found to be characteristic of modern Westernized countries, whose primary religion is Christianity. Once again, . . .

this was adaptive because such ideas would tend to reduce family size and this would be in keeping with the high cost of rearing and educating even a small number of children. In fact, Reynolds and Tanner conclude that religions are "handbooks of parental investment."

Religion is also a major source of opposition to infanticide and abortion. Most of the major world religions have tolerated these practices only under very specific circumstances, and have usually been strongly opposed to them. Islam has forcefully condemned both, as has Orthodox Judaism. Catholics and Protestant evangelicals are also among the strongest anti-abortion advocates in the contemporary United States, and, of course, evangelical Protestants are among the leading profamily groups in the United States.

There is also empirical research linking religiosity to higher fertility. A brief search turned up several studies (there are likely quite a few more). Frejka and Westoff (2006) studied the fertility of women aged 18-44 in the United States and Europe. They found a significant contribution of religiosity to fertility. In the United States, women who attended religious services more than once a week had an average fertility of 1.65 children compared to 1.18 for women who never attended services. In terms of religious belief, women who regarded religion as very important in their lives had a fertility of 1.61 compared to women who regarded religion as unimportant, whose fertility was 1.04. for Western Europe, women who attended church more than once a week had an average fertility of 2.66 compared to 1.10 for women who never attended. Western European women who regarded religion as very important in their lives had an average fertility of 2.07 compared to 1.15 for women who regarded religion as unimportant. With respect to Southern Europe, women who attended services more than once a week had

an average fertility of 1.38 compared to women who never attended, whose fertility averaged 0.58. And Southern European women who regarded religion as very important averaged 1.25 compared to 0.67 for women who regarded it as unimportant.

In a study of ten Western European countries during the period 1981-2004 carried out by Eric Kaufmann (2006) and summarized on the Web, he claims to have found that, after a woman's age and marital status, the strongest predictor of her number of offspring was her religiosity. Saul Singer (2006) reports that in contemporary Israel the average fertility rate per Jewish woman is 2.7; among Orthodox Jewish women in the United States the fertility rate is 3.3 children, and among the even more devoutly religious Orthodox Haredim the rate is 6.6. These are much higher rates than the rate found among other American Jews, which is only 1.86. Only one study was uncovered that did not support the religiosity-fertility relationship (Mistry, 1999). In this study of fertility of Muslim women in India, it was found that married women aged 40-49 who were high in religiosity had an average of 6.16 children ever born, compared to 7.31 children ever born to women of moderate religiosity.

Note also that in many earlier religions religion and fertility were often linked. Numerous figurines have been found in many preliterate societies that represent fertility goddesses or spirits. Fertility cults have been common in a wide range of religions. Sir James Frazer (1922), for example, many years ago called attention to the ancient Roman goddess Diana, who was worshiped as a goddess of childbirth and was thought to bestow offspring on women and men. Other fertility goddesses have included Hathor in ancient Egypt, Aphrodite in ancient Greece, Freyja among the ancient Teutons, and Brigit among the ancient Celts. Frazer also pointed out the widespread practice of

theogony, or beliefs and rituals involving the marriage of gods and their ensuing reproduction.

Religion, then, seems to promote health and reproductive success, outcomes that would seem to be good evidence of its Darwinian adaptiveness. However, Atran insists that a genuine demonstration of adaptation depends upon finding clear evidence of complex design. This, of course, is a standard argument among evolutionary biologists, and it is quite legitimate. It is Atran's view that, unlike such mental capacities as language, religious beliefs generally do not reveal any unambiguous evidence of design. It is extremely difficult, he says, to "reverse engineer" religious concepts. However, as we read Atran (and Boyer), their constant linking of religion to matters of existential anxiety suggests to us that design may very well be involved. The abstract musings of theologians, both modern and ancient, do not seem particularly indicative of adaptive design, but these musings are only a minuscule part of human religious experience. For the overwhelming majority of religious people, religion is strikingly practical in its intents and effects.

We lean, then, toward the adaptationist position, but provisionally, and suspect that future research will eventually show that the various aspects of religious belief and ritual are a combination of adaptive and nonadaptive features. How large each will loom relative to the other is difficult to say. Nevertheless, there seems little doubt but that at least some of the more important features of religious belief and ritual are adaptive. Even if religion does not always lead to greater reproductive success, it does respond successfully to a range of human needs, and thus is clearly adaptive in a more general (i.e., non-Darwinian) sense.

The Biology of Religion and the Social Ecology
of Religious Evolution

Darwinian theories of religion are mainly devoted to explaining why religion exists at all, why it is universal, and why it exhibits certain cross-culturally and historically recurrent features. But can such theories shed light on the differences among religions, in particular the evolution of very different types of religion? We think the answer is yes. This involves showing how recurrent religious predispositions interact with the broader environment in which individuals find themselves. As Alcorta and Sosis point out, "Whether supernatural agents are envisioned as totemic spirits, ancestral ghosts, or hierarchical gods is very much dependent upon the socioecological context in which they occur." Alcorta and Sosis intend the term "socioecological" in broad fashion, and I shall use it in this way. The major types of religious beliefs and rituals, then, are "social constructions" upon universal mental modules in interaction with the ecological, demographic, technological, political, social, and economic conditions in which people find themselves.

The most useful typology of religious evolution is that formulated by Anthony Wallace (1966). According to Wallace, the religion of a society is a made up of what he calls *cult institutions*. A cult institution is "a set of rituals all having the same general goal, all explicitly rationalized by a set of similar or related beliefs, and all supported by the same social group" (1966:75). Wallace delineated four types of cult institutions: individualistic, in which individual persons perform their own private rituals; shamanic, in which a part-time religious practitioner (a shaman) performs special rites for others in return for a fee; communal, in which bodies of laypersons collectively perform

calendrical and other religious rites; and ecclesiastical, in which there are full-time priests who monopolize religious knowledge and perform highly specialized rituals before audiences of laypersons. Combinations of cult institutions yield four major evolutionary stages in the development of religion, shamanic, communal, Olympian, and monotheistic. Shamanic religions contain only individualistic and shamanic cult institutions; religious practice beyond the level of the individual focuses solely on the conduct of a shaman and there are no calendrical rites. Communal religions contain individualistic, shamanic, and communal cult institutions, and religious practice focuses primarily on the conduct of laypersons engaged in collective calendrical rites, although shamanic rituals still exist and remain important. Olympian religions contain all four cult institutions, especially specialized priesthoods; numerous gods, usually organized in a hierarchical pantheon, are worshiped and worship is led by full-time priests. Monotheistic religions are like Olympian religions, except that worship focuses on a single god rather than a pantheon of specialized gods.

In earlier research (Roberts and Sanderson, 2005), we carried out a study of the main predictors of religious evolution using an operationalized version of Wallace's typology and the Murdock and White (1969) Standard Cross-Cultural Sample (SCCS) of 186 preindustrial societies. The two best predictors were the mode of subsistence technology and the presence or absence of writing and records. Together, just these two variables explained 65 percent of the variance in stage of religious evolution. We regarded these variables as important social prerequisites of religious evolution. Ecclesiastical religions with professional priesthoods are not really possible until a society has developed a fairly intensive form of agriculture because large economic

surpluses are needed to support specialized religious functionaries. We found that many polytheistic religions are located in societies without writing, but the vast majority of monotheistic religions are found in societies with true writing. Priests are religious literati who form themselves into guilds and who monopolize religious knowledge and ritual. They preside over what Harvey Whitehouse (2004) has called a *doctrinal* form of religion, and for doctrines to become very elaborate and to be transmitted spatially and temporally they must be written down. However, we regard this study as identifying only the *social prerequisites* of more advanced religions. The data were not capable of explaining why communal religions generally follow shamanic ones, why polytheistic religions come later in social evolution and appear to constitute a worldwide stage in the evolution of religion, and why polytheism gave way to monotheism in much of the world in the first millennium BCE. Why do these specific religious transformations accompany major social transformations, and in what way or ways may the new forms of belief and ritual be adaptive? That is the subject of the remainder of this paper.

Shamanic Religions

Taking shamanic religions first, we see that in the SCCS they occur primarily in hunter-gatherer societies (63%) that are politically organized as bands or tribes (83%); 90 percent of shamanic religions are found in societies with no writing or records. It is this type of religion that would have characterized the vast majority of societies in the human ancestral environment.

Shamanic religions, recall, have individualistic and shamanic cult institutions, but nothing more. For example, the Inuuit believe in a host of human and animal souls, local spirits, trolls, and a few higher gods, mainly Sedna the Keeper of the Sea Animals,

the Sun, the Moon, and the Spirit of the Air. They have at least two individualistic cults, the Spirit Helper Cult (an individual's own guardian spirit) and the Game Animal Cult, both of which involve individual observances of taboos designed to avoid offending game animals. There is also a Shamanic Cult. Shamans make an annual trip to the bottom of the sea to get the Sea Goddess, Sedna, to release the game from her domain so the Inuuit can live through the coming year. Shamans also are called upon to diagnose illness and to try to cure it by supernatural means (Wallace, 1966).

The Lapps also have a shamanic religion. They believe in the existence of various spirits and recognize cosmological forces associated with animals, the weather, and space and time. There are shamans of both sexes who engage in healing practices and sorcery. Their most elaborate ritual is associated with the bear hunt (O'Leary and Levinson, 1990a). What seems most noteworthy about these and other shamanic religions is their overwhelmingly practical nature. The most important things shamans do is attempt to heal the sick, and the most important rituals are focused on curing and on vital subsistence activities. Shamanic religions are undoubtedly adaptive in the broader sense of the term. Shamans actually have been reported to have some actual success in healing (Harner, 1990; McClenon, 2002), and even when not successful they probably reduce anxiety and give psychological comfort. Rituals associated with subsistence activities reduce anxiety and provide confidence and may very well lead to improved subsistence outcomes. These forms of adaptiveness may be reproductively adaptive as well.

Communal Religions

Communal religions are most common in the SCCS societies that practice extensive agriculture (52%), that may be organized at the band or tribal level (52%) or into small chiefdoms (31%), and that have no writing and records and only mnemonic devices or unwritten records (81%). Here we find individualistic and shamanic cult institutions operating, but also communal cult institutions, which involve segments of a community coming together to engage in certain collective rituals. A good example is the Trobriand Islanders of Melanesia (Wallace, 1966), one of the best-known ethnographic cases of all time. The major communal cult institution is the Technological Magic Cult. Here persons carry out collective rituals presided over by a garden magician, who is likely to be the village chief, a canoe magician, and a fishing magician. The Trobrianders also have a Cult of the Spirits of the Dead, which carries out mortuary services. There are also professional sorcerers, who can cause or cure illness, and individuals have their own personal use of magic to help them in matters of love and to protect them against malevolent spirits, flying witches, and other evil spirits.

The Mbuti of the Ituri rain forest of Africa, though foragers, also have a communal religion. The Mbuti believe in a spirit who created the world, but who then withdrew from it and gave it no further attention. They also believe in a powerful forest spirit that has an influence on the souls of the dead. The Mbuti have shamans who are healers, and most Mbuti bands associate great hunting skill with supernatural abilities. Great hunters are thought to communicate with the supernatural and even make themselves invisible. The most important rituals are those associated with hunting, honey collection, and death. The frequency and intensity of hunting rituals relate to the uncertainty, danger, and difficulty of the hunt. The gathering of the first honey of the season leads to collective rituals involving music and dancing. Rituals performed after

someone has died involve the participation of the forest spirit (O'Leary and Levinson, 1990b).

Communal religions seem to have the same kind of practical significance that we noted for shamanic religions. Malinowski famously observed that the Trobrianders used canoe and fishing magic when they were fishing in the open sea but not in areas close to land. Open-sea fishing was in fact considerably more dangerous, and thus provoked much more anxiety. Malinowski argued that the canoe and fishing magic were designed to reduce this anxiety. This certainly looks like an adaptive kind of religious rite if ever there were one. Likewise, Mbuti religion emphasizes the practical. It is particularly noteworthy that hunting ritual increases in frequency and intensity as hunting becomes more dangerous and uncertain. The most important hunting rituals are performed when elephants are being hunted, and elephant hunting is unusually full of danger and uncertainty and requires a high level of group coordination. Another major dimension of most communal religions is *ancestor worship*. Indeed, the spirits of the dead ancestors are often the key supernatural entities in such religions. In evolutionary psychological terms, ancestor worship would seem to activate simultaneously human cognitive predispositions for "dualist thinking" and "kin selection" and blend them. (The universal tendency toward cognitive dualism is activated by all religions.) Ancestor worship is likely to become of increased important in communal religions because the societies in which such religions are most commonly found are usually organized into elaborate unilineal descent groups identified with a putative founding ancestor. Such groups require respect for ancestors, both living and dead. As authority figures, living ancestors

are the sources of both rewards and punishments. It is not good form to offend them when they are living, and when they pass into the realm of the dead the same applies.

One does not get the impression from Shamanic and Communal religions that humans are natural seekers of meaning, as Max Weber seemed to think. The simpler religions are overwhelmingly focused on practical needs and concerns, not on the meaning of the universe. The "meaning of things" is usually a secondary concern, or may not even be a concern at all in some religions. The idea of meaning does become important in the ecclesiastical religions, but it is associated much more with religious virtuosi and priests than with religious laypersons.

Olympian Religions

The majority of Olympian (polytheistic) religions in the SCCS are found in societies that practice intensive agriculture (50%), although almost as many (42%) are found in horticultural societies. Olympian religions may be found in bands or tribes (33%) or chiefdoms (25%), but many are found in states (42%). Two-thirds of Olympian religions do not have writing. Polytheistic religions have a pantheon of highly specialized gods, and they have professional priesthoods who monopolize religious knowledge and who lead elaborate rituals for a lay audience. The gods of polytheistic religions are almost invariably very much like humans in their nature. Some are considered good, others evil; some are highly competent at what they do, whereas others are considered fools; the gods usually eat and drink and often have great banquets; they usually like sex and often have orgies; they also fight and go to war. Like humans, polytheistic gods are finite and mortal; they can be killed and even eaten.

Another feature of polytheistic religions is their use of animal (and sometimes human) sacrifice in rituals. Indeed, this has been claimed as a universal feature of such religions (Armstrong, 2006). Marvin Harris (1977:119) comments that "Persians, Vedic Brahmans, Chinese, and Japanese all at one time or another ritually sacrificed domesticated animals. In fact, it would be difficult to find a single society in a belt across Eurasia and North Africa in which domesticated animal sacrifice was not part of state-supported cults." The animals sacrificed are almost always highly valued domesticated animals, wild animals rarely if ever being objects of sacrifice because they are a free gift of nature (Atran, 2002). In Arabia and much of North Africa, for example, camels were commonly sacrificed; bulls were important objects of sacrifice throughout the Mediterranean world, and pastoralists in Central Asia were noted for sacrificing horses (Harris, 1977).

Human blood has also been widely used in sacrifices (Atran, 2002) and, indeed, sometimes the animal being sacrificed is the human animal. Long ago Edward Westermarck (1906) pointed out that human sacrifice was actually much more common among "barbarian" and "semicivilized" societies than among "savages." Indeed, at the lowest stages of social evolution, he claims, it is virtually unknown. He notes the use of human sacrifice in the religious practices of the ancient Egyptians; in ancient India; among the early Greeks and the ancient Romans; among the Celts, Teutons, and Slavs; in aboriginal Tahiti and Fiji; throughout Africa; and among the Maya, Aztec, and Inca civilizations of the New World. The Aztecs sacrificed humans on a scale never seen in any other religion before or since.

Since the religions that emphasize animal sacrifice generally conceived of their gods as having the same traits as humans, such as the desire to eat meat, it logically followed that these gods had to be "fed." More significantly, however, the importance of animal sacrifice can probably best be explained as a costly ritual intended to intensify religious commitment. This is why valued domesticated animals rather than wild animals are used, why blood is so important to rituals, and why humans are sometimes used. Human sacrifices often involved prisoners of war, but they frequently involved humans of great value, such as one's own children. Sacrifices of one's own children would be the costliest of costly rituals. The reason the Aztecs practiced human sacrifice on such a large scale may have been their relative lack of domesticated animals available for sacrifice (Harris, 1977).

The most famous Olympian religions were those of the ancient Sumerians and Egyptians, the ancient Greeks (for whom they are named), the ancient Romans, the Maya, the Aztecs, and the Incas. There seem to be two evolutionarily different types of Olympian religion. Many Olympian religions are found among extensive agriculturalists who have no writing and who are politically organized into tribes, chiefdoms, or small states. For example, the Ashanti of West Africa were advanced horticulturalists organized politically at the state level. The Ashanti worshiped a supreme being known as Nyame, the Sky God, who was regarded as aloof and thus as having little direct role in human destiny. There was a series of lesser gods who were thought to have been delegated their power by Nyame. There was also an Earth God, but he was less well known than Nyame. In addition to medicine men and witchdoctors, the Ashanti recognized a special class of priests, who performed all ceremonies. The Ashanti

constructed temples and shrines dedicated to Nyame, but there were no temples dedicated to the Earth God.

The Inca of ancient Peru worshiped a creator god known as Viracocha, who was thought to have created the other supernatural beings. These included the Sun, the Weather God, and the moon, stars, earth, and sea. A specialized priestly class existed and was organized into a hierarchy that paralleled the political hierarchy. The highest priest was also a governmental official and a close relative of the emperor; there were various mid-level priests, and at the bottom of the priestly hierarchy were shrine assistants. Priests were diviners and confessors and interpreted oracles. The Incas built great temples and shrines and only priests were allowed to enter the holy temples. Sacrifice was an important part of all rituals.

Then there are more "advanced" Olympian religions found among intensive agriculturalists with more complex state organization and true writing. Here we find the religions of Eurasian antiquity. In East Eurasia, the Aryans who invaded India prior to the establishment of Hinduism believed in many gods, but four stood out in particular: Indra, the god of war and the weather; Varuna, who maintained morality and social order; Agni, the god of fire who had a close association with the priests who performed rituals using fire; and Soma, a plant god associated with a drink made from the soma plant and who was an integral part of another sacrificial cult (Smart, 1976).

The Aryans were probably organized at the chiefdom level, but in West Eurasia at about the same time there were complex states with polytheistic religions. The Egyptians believed in a supreme power, or *neter*, who created the universe and a number of lesser gods, or *neteru* (Zeitlin, 1984). These included Horus, the falcon god;

Re, the sun god; and Osiris, the god of vegetation (Smart, 1976). Egyptian religion was actually a confusing and somewhat inchoate mixture of gods, each with its own priesthood (McNeill, 1963). The ancient Greeks worshiped a pantheon that included Zeus at the top; Phoebus, the god of light; Poseidon, the sea god; Aphrodite, the goddess of love; and Dionysus, the god of vegetation (Smart, 1976). Polytheism among both the Egyptians and the Greeks was organized such that each city or city-state tended to focus its religious activity around one particular god. Thus, the Egyptian god Amon was the god of Thebes in Upper Egypt, and the Greek goddess Athena was the patron god of Athens. McNeill (1963:79) suggests, with respect to ancient Egypt, that the "survival of religious multiplicity can only be understood as a consequence of the survival of local shrines and priesthoods," and much the same is probably true of most polytheistic religions. If so, then this provides one answer to the question of why the earliest ecclesiastical religions were polytheistic. Polytheism may have been as much a matter of the power of priesthoods and the competition among them as of the inclination of the human mind to imagine many deities with specialized powers. However, this inclination should by no means be discounted, given that the multiplicity of supernatural beings is the rule rather than the exception in shamanic and communal religions.

At this point we might pause to ask, Where do religious specialists come from, and why do certain individuals rather than others attain these positions? Weber pointed out that there are always a few individuals in any society who are "religiously musical," i.e., who are deemed by others to have special religious skills, talents, or insights. In shamanic and communal religions these persons become shamans, diviners, sorcerers, or leaders of lay ceremonies. How then do we get from these part-time specialists to full-time specialists – to priests? In a manner similar to Weber, Boyer (2001:271) says that

"the presence of specialists clearly recognized as different from other people stems from a much more general tendency to create cooperation between individuals with different perceived abilities." This then leads to a minimal division of labor, and under the right set of conditions – in particular, advances in subsistence technology, communication, and political structure – these individuals will begin to see themselves as a distinctive group set apart from everyone else. They become monopolists of religious knowledge and influence and acquire new interests that have to be protected and promoted.

Monotheistic Religions

Monotheistic religions seem virtually to require a more intensive subsistence system, since only 1 of 37 Monotheistic religions in the SCCS was found at the hunter-gatherer or extensive agricultural level, whereas 78 percent were found in societies with intensive agriculture and another 19 percent in pastoral societies. The association between pastoralism and monotheism is quite interesting inasmuch as nearly half (7 of 15) of SCCS pastoral societies are monotheistic (see Kulke, 1986:390-392). As for writing, 87 percent of monotheistic religions in the SCCS societies have true writing (we know from historical data that writing seems to be a true prerequisite, since no monotheistic religion has ever evolved in a society without true writing). The 13 percent of monotheistic religions found in nonliterate societies have to be due to the effects of diffusion or conquest. For example, the Bambara, Fulani, and Hausa of West Africa were nonliterate peoples who became Muslims through conquest. In terms of political evolution, 60 percent of monotheistic religions are found in states and nearly all the rest

in chiefdoms; only 2 of 35 monotheistic religions are found in a band or tribe, undoubtedly the result of diffusion or conquest.

Historically, the major monotheistic religions all emerged during the period that Karl Jaspers (1953) has called the Axial Age, which he dates at about 600 BCE. It is at this time that Judaism shifted to the monotheism focused on the One True God Yahweh, and that we see the emergence of Hinduism and the Buddha in India and Confucius in China. Slightly later we see the emergence of Laozi and Taoism in China. Several hundred years later, of course, Christianity emerges out of Judaism, the result of messianic movements that had been occurring within Judaism for some two centuries. Islam is the last of the great monotheistic religions, but it is a bit of an outlier since it occurs so much later than the others, and to a large extent it was formed largely as a sect of Christianity. The West Eurasian peoples who developed Judaism, Christianity, and Islam were all intensive agriculturalists or pastoralists (or practiced some combination of the two), and all had writing. The same is true for the East Eurasian peoples who developed Hinduism, Buddhism, Confucianism, and Taoism.

What was new in the major world religions that evolved and spread during the Axial Age, and how may these new features have been adaptive under the altered socioecological conditions of the day? There were many important novelties, but we restrict ourselves here largely to three of the most critical new developments.

1. *The emergence of single omnipresent, omniscient, omnipotent, and transcendent God.* This is unambiguous and uncontroversial in the case of the West Eurasian religions, but slightly more problematic in the case of East Eurasia. In the case of Hinduism, there has been debate over whether it was truly monotheistic. Some have said there were two gods, Vishnu and Shiva, but others have said that these were really

two manifestations of a single God. Buddhism is often thought not to be even genuinely religious, since the Buddha spoke of no supernatural entities; however, Buddha later came to be deified and treated by the masses as a God.

In the polytheistic religions, the various gods were conceived in fairly concrete terms in that they had human characteristics and desires, but the God of the monotheisms was, in contrast, a *transcendent* god that was little like humans. Why a single God who is all-knowing, all-powerful, and beyond ordinary human needs and wants? Stark and Bainbridge (1987) suggest that there has been a general evolutionary trend from many gods to one extraordinarily powerful God because the latter can deliver much greater rewards than the former. This is an important insight, but Stark and Bainbridge do not really explain why polytheistic religions would be sufficient to meet people's needs for thousands of years and then give way to more rewarding religions. Something must have been changing in the social, economic, and political environments of the Axial Age peoples to create new needs that required new types of religion. What were these changes, and what were these new needs? Let us postpone an answer to these questions until we have considered an additional novel feature of the major world religions.

2. *An emphasis on salvation from this world and on God's love and mercy*. It was Max Weber (1978[1923]) more than anyone who emphasized that the core feature of the major world religions was their emphasis on *salvation*, which often took the form of a desire for *release from suffering*. That this was something new has also been recognized by William McNeill (1963), who points out that earlier religions "viewed the afterworld as essentially a continuation of life as lived on earth, perhaps with some

inescapable diminution of its fullness. The new religions of salvation, on the contrary, held that life beyond the grave involved radical change and improvement in society, so that only purged and purified spirits could share in life eternal" (McNeill, 1963:338n). Although earlier types of religion all postulated an afterlife that the spirit entered upon death – a concept of *soul* – the soul was not something that was usually in danger or that had to be "saved" from anything. Along similar lines, numerous scholars have suggested that the world religions were religions of love and mercy (Jaspers, 1962; Harris, 1977; Stark, 1996; Armstrong, 2006). What is it that people wanted to be saved from? Why was an emphasis on love and mercy such a critical feature of the world religions? A common answer invokes Marx's famous "opium of the people" argument: People turn to religion to escape from the suffering induced by class exploitation and oppression. However, as Stark points out, in ancient times the most oppressed and exploited classes were peasants and slaves, and yet Christianity at least was not a religion of peasants and slaves, but rather of urban dwellers. It was started by an urban Jew and spread almost entirely in the cities of the Roman Empire (Stark, 1996, 2006).

What was happening around 600 BCE that would have changed or intensified people's religious needs? It was not the formation of empires, since these had existed throughout the world for thousands of years prior to the Axial Age. This seems to falsify the argument, made by theorists such as Lerro (2000) that, in essence, a single powerful ruler requires a single powerful god to legitimize and reinforce his rule. However, there was a rather dramatic change in the *size* of empires during this time. In 1000 BCE, the world's largest empire (China) covered an area of approximately 174,000 square miles, and all of the world's empires together covered about 386,000 square miles. But by 600 BCE the world's largest empire (Persia) was much larger, covering some 2.12 million

square miles, and all the world's empires together covered approximately 3.03 million square miles. In 200 BCE the world's largest empire (Central Asia) was 2.2 million square miles, not much larger than the largest empire in 600 BCE, but the world's empires together nearly doubled in size by this time, to 5.85 million square miles. The figures remain about the same in 200 CE (Taagepera, 1978; Eckhardt, 1992).

Based on these figures, it might therefore be argued that *very large* empires require a single omnipotent god to legitimize and reinforce the rule of a single powerful ruler. To test this idea we summarize below the relationship between empire sizes and polytheism or monotheism for the "Long Axial Age," which can be said to begin with the rise of Zoroastrianism in Persia in the twelfth or thirteenth centuries BCE and end with the emergence of Islam in the seventh century CE. For good measure we discuss the Mongol Empire, which achieved its peak in the thirteenth century CE and was the largest empire the world has ever seen. All of the figures for empire size come from Eckhardt (1992:Table 3.4).

- In the fourteenth century BCE, prior to the Long Axial Age, the Egyptian pharaoh Amenhotep IV became a monotheist, imposing monotheism on his followers and banning the worship of the other gods of the Egyptian pantheon. This is the clearest, and perhaps the only, example we have in history of a ruler *creating* a monotheistic religion with the likely intention of symbolizing or justifying his rule. However, the whole experiment was abortive. Amenhotep's ideas were never popular, and after his death there was a complete reversion to polytheism.
- Although it was once thought that Zoroastrianism arose around 600 BCE, historians of religion now seem to think that it developed much earlier, probably

around 1200 BCE or perhaps even a century or two before then (Shahbazi, 1977; Kingsley, 1990; Boyce, 2001). At this time the Persian empire was approximately 38,600 square miles large and the smallest of five world empires. The Egyptian, Mesopotamian, Chinese, and Anatolian empires were much larger – from two and a half times to ten times larger – and in all of these other empires polytheism prevailed. Moreover, Zorastrianism remained largely a tribal religion and did not become the official religion of the Persian Empire until 549 BCE, with the rise of the Achaemenid Dynasty. And in adopting Zoroastrianism, the Persian rulers toned it down by removing its more apocalyptic features. Since Zoroastrianism, the first successful monotheism, was created by a prophet from a pastoral tribe, and since all of the empires of that time remained firmly polytheistic, it is extremely difficult to conclude that monotheism results from large empires.

- It was probably sometime during the seventh century BCE that Judaism became a monotheistic religion. But it was the product of a formerly largely pastoral people who never built an empire (large or small) and who had a best several small monarchies. Moreover, during the time that Judaism became monotheistic, large empires existed in Egypt, Mesopotamia, Anatolia, and Persia, and these were strictly polytheistic (although Persia was to become monotheistic in the next century).

- The Axial Age proper (i.e., à la Jaspers) begins in the sixth century BCE. This was the century of Confucius and the Buddha, and Hinduism also began around this time. But the empires that existed in China and India were not especially large (38,600 and 183,000 square miles, respectively) and were smaller than the polytheistic empires in Egypt (251,000 square miles) and Mesopotamia (232,000

square miles). Again, these facts are inconsistent with the Large Empire = Monotheism thesis.

- Somewhat more favorable to the thesis is the growth of the Chinese and Indian empires in the ensuing centuries. By the third century BCE the Indian empire had increased in size seven-fold (to 1.35 million square miles) and by the first century BCE the Chinese empire had grown even larger, to 2.39 million square miles. It could be argued that the East Eurasian religions spread because of larger empires. This is possible, although it should be noted that, of the four East Eurasian religions, only Confucianism had any official relationship to the state (it became the religion of state officials). However, Confucianism was more a secular philosophy than a true religion. Moreover, Buddhism and Hinduism are largely religions of world renunciation, hardly the kinds of religions that would be useful to political rulers. If the material world is the source of suffering and should be rejected, and if power is an integral part of the material world, then power should be rejected.

- By the second century BCE the empire in Central Asia (a predecessor of the Mongol Empire) had grown much larger, reaching 2.2 million square miles. But it remained predominantly polytheistic. It was not the source of a monotheistic religion.

- At the time Jesus was spreading his message in the first century CE, the Roman Empire was the world's largest empire at about 1.7 million square miles. But, of course, the Romans were polytheists who persecuted Jesus, other Jewish messiahs, and Christians generally for centuries. Rome only adopted Christianity

in 312 CE, when the Emperor Constantine converted and made it the official religion of Rome, but this was probably more a result of the political threat posed to the Empire by the now far more numerous and influential Christians than of anything else (in other words, it was an act of cooptation). Moreover, as the Empire declined and eventually disintegrated, Christianity only grew stronger.

- Islam arose in the seventh century CE, but by this time the Persian Empire had disappeared, and Islam emerged in an Arabian outpost.

- In the thirteenth century CE the largest empire the world has ever seen, the Mongol Empire, occupied a massive territory covering nearly 10 million square miles of Eurasia. But this empire gave rise to no monotheism.

- Monotheistic religions have been *appropriated* by empires for legitimating functions once they existed but, with the exception of the failed effort of Amenhotep IV, there is no evidence of any imperial rulers actually creating such a religion. A reading of the historical evidence will show, in fact, that the polytheistic religions were perfectly suitable as legitimizing ideologies for nearly all of the major empires up through the Axial Age. These religions were much more closely linked to the state and to political rule than the monotheistic religions, which were often engaged in *criticizing* or *opposing* the rule of some state (such as Jesus's and the early Christians' opposition to Roman rule). This makes the legitimizing political function of monotheism the social equivalent of a biological *exaptation* – something that originated for one purpose that eventually comes to serve another – rather than an adaptation. The political functions of polytheisms, by contrast, were adaptations for ruling elites. The Marxian view of religion thus has some validity, although it has to be heavily reformulated and

qualified (it cannot account for the origin of monotheism, for the nature of shamanic and communal religions, and for many features of polytheism – or indeed, for why humans everywhere are religious in some way).

So, in sum, the argument linking monotheistic religions to large empires needing moral legitimation and supernatural reinforcement seems strongly contradicted by a wide range of facts. Indeed, the monotheistic religions in their early forms were much more likely to be *threats* to the power of the state than useful arms of it. This was clearly the case with Judaism and early Christianity, the latter being both a religious and a political movement against the oppression of Jews in the Roman Empire (Harris, 1974). The Roman emperor Constantine converted to Christianity and made it the official religion of the Empire to neutralize it as a serious threat. And in the first millennium CE as Buddhism spread into China and won more and more converts, the state was increasingly alarmed and repeatedly took steps to prevent it from spreading further. As Harris points out (1989:458), "In A.D. 845, the T'ang Dynasty launched an all-out effort to destroy Buddhism's material base. The state confiscated millions of acres of land controlled by the monasteries, razed 40,000 shrines and 4,600 temples, and compelled 260,500 monks and nuns to return to productive lay occupations." China did have a state-supported religion, but that was Confucianism, a religion which was quite different from Buddhism in that it was not a world-rejecting other-worldly religion.

But empires may have been involved indirectly. One of the reasons empires form and grow larger is war (more war = bigger empires and bigger empires = more war, in a classic case of a positive feedback spiral). In the agrarian empires of the Axial Age, war was the main key to acquiring wealth, a huge business (Snooks, 1996), and there was a

massive increase in the scale of war during the period of the Axial Age. Empire and war were aided dramatically by the development of iron weapons, which became more widely disseminated after about 1200 BCE. The Assyrians had used a battering ram with an iron head, and Greek hoplite soldiers had bronze shields and helmets but iron swords and iron-tipped spears (Derry and Williams, 1960; Mann, 1986; Runciman, 1998). Gradually, iron weapons spread and helped to intensify warfare and greatly increase the number of war casualties because iron weapons dramatically increased the killing power of combatants. The number of war deaths soared shortly after the beginning of the Axial Age. More specifically, as Table 1 shows, between the sixth and the fifth century BCE the number of war deaths in the world increased from approximately 15,000 to 264,000 – an 18-fold increase. Between the sixth and first centuries, the increase was far greater, from 15,000 to 762,000, or 51-fold (Eckhardt, 1992).

It was the dramatic increase in warfare, we think, rather than in the size of empires, that was a crucial factor in the creation and spread of monotheistic religions. Here is where we think Kirkpatrick's attachment theory and Giddens's notion of ontological security must be brought back into the picture, and forcefully. As we know, war is a tremendously socially disruptive and psychologically anxiety-producing phenomenon. It is not hard to see how a dramatic increase in the scale of war and the number of people being killed as a result of it would create new needs for security and comfort. And not only do people die, but many are uprooted and displaced from their homes, which reduces ontological security and creates a greater need for a substitute attachment figure. Recall that one of the major themes of the emerging Axial Age religions was love and mercy: God's compassion. And not only was this one of the most prominent themes of the new religions, but there is hardly any indication from the Axial

Age prophets (Confucius being a partial exception) that they were religious extensions of the state. It was the people's need for ontological security and comfort in a time of massively increased human suffering that loomed much larger than any need that rulers may have had to justify and reinforce their rule.

This interpretation receives additional support from the fact that just around the time of the beginning of Zoroastrianism, 1200 BCE, there was also a brief but substantial upsurge in warfare that led to the destruction of many cities in Crete, Myceneae, Anatolia, and northern Mesopotamia. This has been called "The Catastrophe," and attributed by at least one scholar to changes in warfare associated with the use of iron weapons (Drews, 1995). Instead of relying on the chariot, as Bronze Age warriors did, fighting forces came to rely heavily on individual infantrymen using iron weapons in a manner that anticipated the hoplite warfare of the Greeks several centuries later. The Catastrophe occurred quite a distance from where Zoroaster was living, which is thought to be in eastern Persia (Cohn, 1993). Nevertheless, the similarity of the dates is striking, and there is evidence that one of Zoroaster's major concerns was the warfare he increasingly saw all around him. As one scholar has put it, "Zoroaster was not interested in theological speculation for its own sake. He was wholly preoccupied by the violence that had destroyed the peaceful world of the steppes, and was seeking for a way to bring it to an end" (Armstrong, 2006:8-9).

And consider the situation of the Hebrews. Marvin Harris (1974) points out that for centuries the ancient Israelites were located at a crossroads between empires and thus were often caught in the middle of wars between these empires. They also suffered direct destruction from warfare. In 721 BCE the Kingdom of Israel was overwhelmed by

the Assyrians, and many leading Hebrew families were forced into exile (McNeill, 1963). The related Kingdom of Judah survived, but only for a time. In 586 BCE King Nebuchadnezzar captured and destroyed Jerusalem, with much of its population being sent to live in exile in Babylonia (McNeill, 1963). These were both massive social and political crises. In a comparison to Zoroastrianism, William McNeill says that the Hebrews "had to wrestle with crushing national disaster and human suffering far greater than anything Zoroaster had to explain" (McNeill, 1963:157).

In the Marxian view of religion, the main role of religion for the masses is to provide comfort that comes from exploitation and oppression. In the agrarian societies of the Axial Age, the main exploited and oppressed groups would have been peasants and slaves. The shift from bronze to iron also affected the technology of subsistence, since the new iron plows were much more efficient cultivating instruments. Since iron plows would have increased economic productivity, this could have intensified the exploitation and oppression of peasants and slaves. Might this have played a role in the emergence of the new religions? Probably not much, if any. As Weber (1978[1923]) has pointed out, peasants are strongly tied to nature are commonly tied up in magic, superstition, and traditional nature religion. They are unlikely candidates as originators and carriers of such ethical and rationalized religions as Judaism and Christianity, unless they are threatened by enslavement or proletarianization. In Ancient Israel, peasants were in fact under threat of enslavement from both foreign powers and landed magnates, and this may help explain early Jewish eschatological and apocalyptic doctrines. However, "in the later development of Judaism and Christianity the peasants never appeared as the carriers of rational ethical movements" (Weber, 1978[1923]:469). Indeed, converts to Christianity were almost entirely concentrated in cities (Stark, 1996,

2006), and the peasants seemed largely oblivious to it. Moreover, "None of the more important religions of Eastern Asia had any such notion about the religious merit of the peasant. Indeed, in the religions of India, and most consistently in the salvation religion of Buddhism, the peasant is religiously suspect" (Weber, 1978[1923]:470).

Be that as it may, there was another major change that we see in the historical record in the time period after 600 BCE: a major increase in the level of urbanization. Tertius Chandler (1987) has attempted to estimate the size of cities of 30,000 or more inhabitants in all regions of the world from very ancient times to the present. In 2250 BCE Chandler estimates that there were only 8 cities in the world with a population of about 30,000 (total population of those cities = 240,000). By 650 BCE there may have been some 20 cities ranging in population from 30,000 to 120,000 (total population = approximately 1 million). That represents about a four-fold increase in 1,600 years. But in the 220 years between 650 and 430 BCE, the number of large cities (30,000-200,000) increased to 51 (total population = nearly 3 million), a three-fold increase in a much shorter period of time; between 430 BCE and 200 BCE, there were 55 cities of 30,000 or more (the largest being Changan, China, at 400,000) totaling almost 4 million people; and between 200 BCE 100 CE, the number of large cities (30,000-450,000) increased to 75 (total population = over 5 million) (Chandler, 1987). So in the centuries of the Axial Age urbanization occurred on a far greater scale than in the previous two millennia: There were many more large cities, and the largest of these became much larger.

What were these cities and where were they located? Table 2 shows that all of the 20 largest world cities in 650 BCE were located precisely in those regions where the

Axial Age proper was shortly to begin: Greater West Eurasia, Greater South Asia, and Greater East Eurasia. Table 3 shows that 50 of 51 of the largest cities in 430 BCE were located in the very same regions. The corresponding figures for 200 BCE and 100 CE (Tables 4 and 5) are 51 of 55 and 69 of 75, respectively. It seems extremely noteworthy that 62 percent of the population of these cities in 650 BCE lived in or around the very small region that produced both Judaism and Christianity (and that centuries earlier had produced the first true monotheism, Zoroastrianism); the figures for 430 BCE, 200 BCE, and 100 CE are, respectively, 57, 48, and 48 percent.

George Modelski (2003) has made a concerted effort to improve on Chandler's city size data, and his results for the Axial Age period are reported in Table 6. His methods and results differ from Chandler's in several respects: he uses intervals of a single century; for the time period we are considering, he sets a minimum city size of 100,000 (rather than Chandler's 30,000) as the operational definition of a world city; and rather than considering all of Greater West Eurasia, he considers only the smaller Mediterranean area within it. By and large Modelski tends to give higher estimates of city size than Chandler. For example, Modelski considers Alexandria to have had 600,000 inhabitants in 200 BCE compared to Chandler's estimate of only 200,000, and, for the same period, Modelski estimates Loyang in China at 200,000 compared to an estimate of only 60,000 by Chandler. But sometimes Modelski's estimates are lower; for example, he estimates Changan in China in 200 BCE at only 100,000 compared to Chandler's much larger estimate of 400,000. These are obviously wide discrepancies.

However, Modelski's data show the same overall pattern as Chandler's, which is a dramatic increase in the size of large cities during the Axial Age. In the case of Mediterranean cities, the increase between 600 BCE and 100 CE, which starts with the

Judaic shift to monotheism and ends with the rise and early spread of Christianity, is from 200,000 to 3,015,000, or 1508 percent. For South Asia, between 500 and 300 BCE (the period when Hinduism and Buddhism begin) the increase is from 100,000 to 700,000, or 700 percent. In the case of East Asia, between 600 and 300 BCE (the period that includes the emergence of Confucius and Laozi), there is an increase from 400,000 to 2,020,000, or 505 percent. Modelski's data show a significant decline in the population of large cities between 300 and 100 BCE, a large increase again between 100 BCE and 0 BCE, and then another decline between 0 BCE and 100 CE. Chandler's data, on the other hand, show no declines but rather continual (although slowed) increases in East Asia, but remember that unlike Modelski Chandler is including many cities between 30,000 and 100,000 in population.

Chandler's and Modelski's data are compared directly in Table 7. Here we see that, at this rather gross level, they are quite compatible. Chandler shows a 379 percent increase in population from the beginning of the Axial Age to 200 BCE, Modelski a 452 percent increase. For the longer period between 650/600 BCE and 100 CE, Chandler shows a 513 percent increase, Modelski a 714 percent increase. The correspondence should actually be considered very close when we realize that both scholars are making estimates based on certain broad assumptions and inferences for a time period when data are much more scanty and much less reliable than for more recent times. And the key point is that both Chandler's and Modelski's figures show large increases in urban populations during the Axial Age.

But how, exactly, would an increase in urbanization create new religious needs? The answer, we think, is much the same as what was said regarding the huge increase in

warfare: Rapid and large-scale urbanization was tremendously disruptive (cf. McNeill, 1963). But what was it that was being disrupted? The answer, we suggest, was primarily *people's attachments to kin and to other social intimates*. People were increasingly living in a world of strangers. This brings us back once again to Kirkpatrick and Giddens on the effects of the disruption of attachment bonds and the sense of ontological security. People turn to God, Kirkpatrick says, as a substitute attachment figure, especially when there has been some sort of disruption in their attachments to parents, and God functions psychologically as a safe haven and secure base. And, as noted earlier, Giddens also specifically mentions religion as a major source of ontological security. This, we submit, is what was happening to encourage the formation of the Axial Age religions of compassion, love, and mercy. Life increasingly in a world of strangers led to a much higher level of insecurity and anxiety, and it was this that generated new religious needs. An all-powerful, loving God was an excellent prescription for people's new sense of threat and danger. Humans evolved to live in small groups of kin, which they did in hunter-gatherer, horticultural, and even most intensive agricultural societies. They did not evolve to live in densely packed cities in which most of their social relations were carried on with nonkin and strangers (Massey, 2005). The monotheistic religions of love and mercy evolved to assist people in adapting to radically changed circumstances. William McNeill puts it almost perfectly (1963:352-353; emphasis added):

> Christianity, Hinduism, and Mahayana Buddhism provided perhaps the first really satisfactory adjustment of human life to the impersonality and human indifference that prevails in large urban agglomerates. Nature religions, personifying the forces of earth and sky, could meet the psychological needs of village farmers whose social ties to their

fellows were personal and close. State religions were adequate for the early civilized peoples, whose cultural inheritance was nearly uniform and who maintained a close personal identification with the body social and politic. But when such uniformity and cohesion in civilized society broke down . . . such official, state religions could not satisfy *the growing number of deracinated individuals whose personal isolation from any larger community was barely tolerable at best. . . .*

Something more than either nature religion or a religion of state was needed for peace of mind in a great city, where strangers had to be dealt with daily, where rich and poor lived in different cultural worlds, and where impersonal forces like official compulsion or market changes impinged painfully and quite unpredictably upon daily life. Knowledge of a savior, *who cared for and protected* each human atom adrift in such mass communities . . . certainly offered men *a powerful help in the face of any hardship or disaster*. In addition the religious community itself, united in a common faith and in good works, *provided a vital substitute* for the sort of primary community where all relations were personal, from which humankind had sprung and to which, in all probability, human instinct remains fundamentally attuned.

3. *A dramatic increase in the controlling, demanding, and potential punitiveness of God*. Virtually all religions have had evil spirits and gods who could do one harm, but the major world religions, especially the West Eurasian ones, constructed a God who, although loving and compassionate, had the power to inflict enormous punishment on those who failed to acknowledge him and to live up to his extremely demanding dictates. Thus we find the Ten Commandments, concepts of sin and eternal damnation for the failure to make amends for sin, and, for the damned, an afterlife filled with eternal pain and suffering on an unprecedented scale – hell. Indeed, God can inflict all sorts of horrible punishments in *this world* for failure to acknowledge and obey Him.

God's potential wrath is greatest in Old Testament fundamentalist Judaism and Christianity, but He can be even more horrible in Islam, and the everyday demands imposed on the average Muslim are very great.

How can we make sense of one and the same transcendent supernatural power being simultaneously compassionate and loving on the one hand and demanding and extremely punitive on the other? Kirkpatrick provides an answer based on his attachment theory. Considerable research shows that people form stronger attachments to authoritarian and demanding parents and thus will form a stronger attachment to an authoritarian and demanding God than to one who requires much less. This seems to be a perfectly plausible interpretation. However, an equally plausible alternative explanation can be constructed using costly signaling theory. As Sosis has shown, religions that require costlier rituals produce higher levels of commitment and potentially greater perceived benefits. The psychological principle at work here is that if something is easy to attain its perceived value is lower and, conversely, if something is difficult to attain its perceived value is greater. It is harder to imagine greater religious rewards than eternal bliss in a heavenly afterlife. It would seem to follow that for individuals to attain such rewards great sacrifices must be made in terms of commitment and ritual practice. Actually, these two explanations may be complementary rather than competing: The God of the West Eurasian religions is a stern and demanding but loving father whose love is not unconditional; He will love you and reward you, but first you must live up to His demands.

What then of the East Eurasian religions? They are salvationist religions emphasizing love and compassion, but the supernatural entities of these religions are somewhat different in that they are not as harsh or punitive. Nonetheless, the East

Eurasian religions required costly sacrifices in order for religious rewards to be attained. In Hinduism there is a continual cycle of births, deaths, and rebirths that can only be overcome by "attaining a liberation in a transcendental sphere where the self is freed from mental and bodily encumbrances. Typically, this is achieved by the practice of austerity and yoga: self-denial and self-discipline are means of destroying that which leads to rebirth" (Smart, 1976:88). The Buddha advocated the renunciation of the material world as the only way of overcoming suffering, and, of course, set forth the Noble Eightfold Path: right views, right aspiration, right speech, right conduct, right livelihood, right effort, right mindfulness, and right contemplation. And concepts of sin and hell were not altogether lacking in East Eurasia: "It should be recognized that Buddhism had its darker message. The Pure Land to which the faithful might be transported and the other paradises of popular teaching were complemented by the purgatories, often depicted in a most grisly and terrifying way, in which evil men would have to work off their sins" (Smart, 1976:183).

There were other novel features of the major world religions as well. Religious doctrines, for example, became much more elaborate. This is why, we think, that monotheism required a complex and intensive economy and true writing; the doctrines of the polytheistic religions were much less elaborate, and their priests less powerful and regal, so polytheism, although aided and abetted by a complex economy and true writing, frequently did not require them.

Another novelty was the sharp decline of animal sacrifice. If the animal and other sacrifices so characteristic of the polytheistic religions were costly signals, then why would such signaling decline or disappear, especially since the monotheistic religions

critically needed a way to separate the truly committed from the less serious? Harris (1977, 1989) has suggested that this decline was the result of growing population pressures and the increasing scarcity of domesticated animals. This might be a part of the story, but it can hardly be the whole of it. Since the new supreme God was a transcendent god with few human characteristics, such a god would not eat, and thus it would be illogical to offer Him food. But the decline of an old form of sacrifice would seem to require the creation of a new form, if indeed sacrifices are matters of costly signaling. The new form of sacrifice existed in the form of demands for unswerving allegiance and devotion to God and His commands and expectations, which were expected of each and every individual who wanted the benefits of the monotheistic faith. This was not only a new form of costly signaling; it was in many ways much more costly. It is hard to imagine, for example, anything much costlier than the five pillars of Islam: "There is no god but Allah and Muhammad is his prophet"; prayer five times daily facing toward Mecca; almsgiving; fasting during holy periods; and the annual pilgrimage to Mecca.

There was also a widening gap between elite and mass religion. This probably expressed the increasing power of priests and the theological elaboration of religious doctrines beyond the religious abilities or inclinations of the ordinary person. Weber emphasized that perhaps the most fundamental of all human needs is the need for meaning, but there is considerable evidence that this is not a universal human need; it does not seem to play a significant role in shamanic and communal religions. However, religious virtuosi and literati are people who do have such a need, and this probably contributed to the widening gap between elite and mass religiosity in the monotheistic religions. This gap was especially apparent in the East Eurasian religions; in the West

Eurasian religions the masses seemed to have had more involvement in the development and spread of doctrines.

Religious Modernity

Wallace's typology ends with the formation of the monotheistic religions, but obviously there have been a number of major changes in religion over the past two millennia. The first big change was the Reformation, the entry point into what Robert Bellah (1964) has called "early modern religion." Then there is religious modernity itself, on which there is a vast literature. Modern religious life reveals enormous complexity. The traditional monotheistic religions persist and continue to dominate, but usually in much altered form. There has been an enormous proliferation of sects and cults alongside mainstream religion, and some new religious movements, such as the Mormons and Jehovah's Witnesses, are extremely rapidly growing religions, even on a world scale. The United States has undergone a series of religious "Great Awakenings," and today is the most religious of the industrial countries; it has a large and influential evangelical religious and political right. Alongside these changes we have seen considerable secularization, especially in Western Europe, and most recently attacks on religion (accompanied by exhortations for its abolition) by people like Daniel Dennett (2006) and Richard Dawkins (2006). What can we say about these things?

In arguing against religion as an adaptation, Boyer says that reassuring religion is often found in places where life is not particularly dangerous or unpleasant, for example, in contemporary southern California with its New Age Mysticism, proliferation of sects and cults, and so on. Religion, he says, has flourished in perhaps the most secure

and affluent societies in world history. Indeed this is true, but Boyer overlooks the fact

that southern California is on the leading edge of some of the most psychologically

disruptive social changes that humans have ever had to contend with. Giddens (2002)

says that we live in a "runaway world" which is tremendously damaging to people's

sense of ontological security, and David Harvey (1989) has written at length about the

psychologically destabilizing effects of the various economic and social changes that

have occurred as the result of massive late-twentieth-century globalization. These

changes are responsible for what he calls "the condition of postmodernity," and in a

postmodern world "all that is solid melts into air." Postmodern culture is in many ways

an admission of confusion, incoherence, and impotence. So southern California is not

especially dangerous or unpleasant in the larger sweep of things, especially when

compared to life in premodern societies, but it is at the forefront of a highly globalized,

postmodern world that provides precisely the conditions in which new religious ideas

are very likely to incubate. Modernity, Giddens says, is a "high risk culture," and the

risks inherent in modernity are in some respects entirely new in world history. Giddens

explains (1991:4-5; emphasis added):

> [Although] modernity reduces the riskiness of certain areas and modes of life, yet at the
>
> same time [it] *introduces new risk parameters largely or completely unknown to*
>
> *previous eras. . . .* The late modern world . . . is *apocalyptic* [!]. . . . However much there
>
> is progress towards international negotiation and control of armaments . . ., the risk of
>
> massively destructive warfare will persist. Now that nature . . . has in a certain sense
>
> come to an "end" – as a result of its domination by human beings – the risks of ecological
>
> catastrophe form an inevitable part of our horizon of day-to-day life. . . .

In high modernity, the influence of distant happenings on proximate events, and on intimacies of the self, becomes more and more commonplace. The media, printed and electronic, obviously play a central role in this respect. Mediated experience, since the first experience of writing, has long influenced both self-identity and the basic organization of social relations. With the development of mass communication, particularly electronic communication, the interpenetration of self-development and social systems, up to and including global systems, becomes ever more pronounced. *The "world" in which we now live is in some profound respects thus quite distinct from that inhabited by human beings in previous periods of history.* It is in many ways a single world, having a unitary framework of experience (for instance, in respect of basic axes of time and space), yet at the same time one which creates new forms of fragmentation and dispersal. . . .

In the post-traditional order of modernity, and against the backdrop of new forms of mediated experience, self-identity becomes a reflexively organized endeavour. The reflexive project of the self, which consists in the sustaining of coherent, yet continuously revised, biographical narratives, takes place in the context of multiple choice as filtered through abstract systems. In modern social life, the notion of lifestyle takes on a particular significance. The more tradition loses its hold, and the more daily life is reconstituted in terms of the dialectical interplay of the local and the global, the more individuals are forced to negotiate lifestyle choices among a diversity of options…. Yet because of the "openness" of social life today, the pluralisation of contexts of action and the diversity of "authorities," lifestyle choice is increasingly important in the constitution of self-identity and daily activity.

And more pungently, Giddens adds that "*personal meaninglessness – the feeling that life has nothing worthwhile to offer – becomes a fundamental psychic problem in*

circumstances of late modernity” (1991:9; emphasis added). Little wonder, then, that modern society, American society in particular, seems to be in the midst of another Great Awakening. In much modern religiosity, especially in American society, we see a tremendous vindication of not only Giddens's notion of late modernity's disruption of the sense of ontological security, but especially of Kirkpatrick's argument that God is a substitute attachment figure. People look upon God as their “best friend” or “copilot,” and millions of cars display bumper sticks celebrating a personal relationship with Jesus Christ.[2]

Conclusions

According to Atran, the human tendency to spot predators and seek protectors everywhere renders such dangerous animals as poisonous snakes just as likely candidates for deification as nurturant parents. This may be true in the abstract, but a major lacuna in the evolutionary psychological theories of Atran, Boyer, and likeminded thinkers is that they provide little insight into the conditions under which supernatural entities are likely to assume the form of snakes on the one hand or loving parents on the other. It has been the main aim of this paper to situate the major evolutionary forms of religion in their socioecological contexts and to see how ecological conditions, broadly conceived, help to shape the nature of supernatural beings and rites. In Christianity, for example, there is both a snake and a caregiving God. The snake was evil and responsible for Original Sin, but God is compassionate and merciful and the source of redemption from Original Sin and life in an eternal paradise (although, if you cross Him, he can be far more evil than the snake!).

The evidence presented above shows, we think, that religion is an enormously practical human institution, one that is highly responsive to critical human needs for ontological security, comfort, anxiety reduction, and, under the right circumstances, for a sense of cosmological order and meaning, an understanding of the meaning of life and death, and a release from misery and suffering. It is of course true, as Boyer and Atran have pointed out, that religion itself is often a *source* of anxiety and suffering. But we do not think that this disqualifies religion from being an adaptation. Many biological and psychological adaptations are far from optimal. The human pelvis, for example, is responsible for death as well as life, but this not disqualify it as an adaptation. *On balance*, religion is more rewarding than costly.[3] And since religion seems to lead not only to anxiety reduction and better psychological health but to better physical health as well, it is difficult to imagine that this better health would not have positive consequences for reproductive success. And, indeed, several studies do show that more religious people, whether their religiosity is measured by belief or by practice, produce more offspring.

In his sociology of religion Weber stressed that there was a long-term process – dare we call it evolutionary! – of historical development in which religions became increasingly rationalized. This was especially true of the West Eurasian religions. What Weber seemed to be describing was a process of endogenous intellectual religious evolution that carried itself forward in response to the fundamental human need for meaning. There is much to recommend this view, so long as we realize that the process has been only partly independent of socioecological influences, and so long as we acknowledge that the search for meaning may not be a universal and therefore

fundamental human need. Socioecological influences have interacted in major ways with the cognitive or intellectual evolution of religion to produce the main types of religion that we observe in the world through the work of anthropologists, archaeologists, historians, and sociologists.

The kinds of religions characteristic of the human ancestral environment were variants of shamanic and communal religions. These religions often had Creator gods that were personifications of the physical environment – the sun, moon, sky, earth, wind, and so on – and sometimes of animals. In most cases these gods were rather remote from human affairs and did little or nothing to intervene in them. There were often many other supernatural beings, both good and evil, that were thought to be directly involved in human affairs and thus that people focused most of their attention on. Much religion was do-it-yourself religion in which individuals carried out their own rituals. There was also a lot of ancestor worship, and in communal religions there were group-oriented lay rites focusing heavily on matters of subsistence. Shamans were major practitioners in both types of religions, and their work was primarily devoted to healing the sick. In these religions people did not "love" their gods or usually form "attachments" to them.

As societies evolved economically and technologically many of the gods and spirits found in shamanic and communal religions were elevated in status such that people built shrines and temples to them and worshiped them in much more formal and regular ways, usually through the mediation of priests. These gods often dealt with questions of the meaning of things, and humans were usually in great awe of them.[4] These gods were often sky or earth or moon gods, but they also took on animal and, especially, human form. They were very much like humans in that they needed food,

drink, and sex, acted wisely or stupidly, and were mortal and died. These polytheistic religions existed all over the world for thousands of years after the evolution of chiefdoms and early states. They seemed adequate to meeting people's needs, rulers included.

But the enormously disruptive effects of large-scale and rapid urbanization and the intensification of warfare during the Axial Age created new human needs for ontological security, anxiety reduction, and release from suffering. The old polytheistic religions were not up to the task of meeting these new needs; their capacities were overwhelmed. As a result, people began to create new religions based on One True God – an omnipresent, omniscient, omnipotent and compassionate deity to which people could form strong personal and heartfelt attachments. A new kind of god entered the world, one who could provide salvation in a heavenly afterlife for anyone who professed the faith and followed the commands that this god laid down. This new god was not like anything in nature, as the old gods were, and not much like humans either. He was a Transcendent God, a suprahuman entity unlike anything people had previously been familiar with.

With the evolution of the monotheistic religions, a new realm of religious abstraction was reached. The overall process we have just been describing might be represented something like the four stages of religious abstraction identified in Figure 1.

Figure 1. Four Evolutionary Stages of Religious Abstractification

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1.Sun-Moon-Sky-    ━▶  2.Animal-like  ━▶  3.Human-like  ━▶
4.Transcendent
```

```
  Earth-Wind gods        gods (biotic        gods (human
God (supra-
  (physical world)       world)              world)
human world)
```

This process of increasing abstraction – for which we should like to coin the neologism *religious abstractification* – is similar to Weber's notion of religious rationalization, only more general and encompassing. Note that these stages represent Weberian ideal-types that correspond quite imperfectly to distinct religions. Shamanic and communal religions may have Creator gods of both the first and second type combined, so in actual religions the first two stages are not always clearly differentiated. In the polytheistic religions there are always Creator gods of the Stage 3 type, but there also may be gods that represent the sky, moon, or earth, as in early Egyptian and Mesopotamian religions. The true monotheistic religions always have One True God of the Stage 4 type. We are still in the fourth stage, although there have certainly been major developments, both various and sundry, *within* this stage (e.g., the Protestant Reformation, the proliferation of a multitude of sects and cults, Deism, increasing theological sophistication and elaboration). Perhaps it is the last ("highest") stage. At least it is the last ("highest") stage that we know of so far.

Increasing religious abstractification involves not only new kinds of gods, but new kinds of religious questions. At the highest stage of religious abstractification, which we find in the religions of high modernity, the question of *meaning* looms larger than it has in previous religions. The problem of the meaning of things, especially of life itself, was often of little significance in the earliest religions, although they did have

cosmologies. We see an increased emphasis on meaning with the development of ecclesiastical religions, and especially of the monotheistic world religions. Weber was right to think of the "problem of meaning" as important, but wrong to think that it was a universal human problem. People in simpler societies pretty much live their lives concerned primarily with the practical matters of bringing off successful hunts or harvests, being cured of illness, and avoiding danger from animal and human predators. Even in the ecclesiastical religions, the problem of meaning is primarily a concern of the religious virtuosi and literati, not of most people (at least not at a very deep or highly reflective level). Only in modern societies have everyday people become highly concerned with the meaning of things. Few hunter-gatherers, horticulturalists, pastoralists, peasant farmers, or ancient merchants or craftsmen ever asked themselves the question "Who Am I?" or wondered "What Is It All About?" These kinds of questions reflect evolutionarily much later religious concerns.

We still cannot say with any certainty whether the cognitive processes in the brain that produce religious thoughts and practices evolved by natural selection because they were adaptive, or whether they were simply byproducts of other cognitive adaptations. Probably they were a combination. But in a sense it almost does not matter, because it is clear that the human brain is indeed wired to think religious thoughts and engage in religious rituals. Even the leading byproduct theorists, Boyer and Atran, admit as much. Whether there is a specialized religious module or set of modules, or only a religious sensibility piggybacking on agency-detection modules, humans will still produce religious thoughts and rituals everywhere. But how they will do so will vary, often greatly, in time and in space as combinations and permutations of environmental

inputs change. And, since these inputs are the main concern of sociologists of religion, whether religion is an evolutionary adaptation or a byproduct does not really matter. For evolutionary biologists, psychologists, and anthropologists, however, it very much *does* matter. That is why the question must continue to be pursued until we get a satisfying answer.

Notes

1. In a revised version of his theory, Stark (1999) has dropped the term compensator in favor of "otherworldly rewards," giving his own somewhat idiosyncratic reasons for doing so. However, we think that the notion of compensation is still perfectly valid, and that this is mostly six of one and half a dozen of another.

2. The first author has often been struck by the fact that so much of the content of popular music is not only about love, and especially the lamentation of its failure, but also about the vital role that intimate romantic relationships play in psychological well-being. Male singers sing out "Help Me Make It Through the Night," female singers "You Are My Everything," and so on. This point pertains much more to the subject of modern intimate relationships (Giddens, 1992) than to religion, but it is mentioned because it is highly suggestive of the unique anxieties associated with modernity. Just as many people in modern times find a substitute attachment figure in religion, many people often seem to need a strong romantic attachment figure. People in premodern societies, or even in the recent preindustrial past, would not likely have thought of romantic relationships as necessary for the reduction of anxiety. For most of them, romantic relationships were all about production and reproduction within the mundane realm of day-to-day hand-to-mouth existence.

3. Using a similar kind of argument, Atran (2002) argues against Kirkpatrick's attachment theory on the grounds that many gods and spirits are the source of evil rather than love and protection. This is indeed true, but parents, who are the attachment figures *par excellence*, are themselves often the source of punishment and anxiety, yet this does not falsify Bowlby's attachment theory. Again, it is a case of *net benefits* produced by a structure or practice, and as long as a religion's supernatural entities provide more love and nurturance than fear and punishment that religion is operating adaptively.

4. In early religions, neither Creator gods nor lesser spirits appear to have been objects of any particular awe or deference. The shift to treating the gods with great awe and deference in the ecclesiastical religions was probably for the most part a reflection of the increasing stratification of society and hierarchization of social relations. Durkheim (1947[1912]) was right in the very general sense that the contents of religions are reflections of the underlying social order. In the kinds of societies most likely to have shamanic or communal religions, since most social relations are fairly egalitarian the relations between individuals and supernatural beings is much less hierarchical than what we finding in much more stratified societies. Spirits and gods are much more likely to be objects of awe and reverence when some individuals within the society expect this kind of behavior to be directed toward them. The Creator gods given the greatest amount of awe and deference are the monotheistic gods that were created in agrarian states, the most stratified societies that have ever existed. In these societies, individuals are always submitting to superiors even in the subtleties and nuances of everyday interaction (Collins, 1975).

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Table 1. War Deaths During the First Six Centuries BCE

Deaths Per Century

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Sixth BCE     15,000
Fifth BCE    264,000
Fourth BCE   428,000
Third BCE    630,000
Second BCE   371,000
First BCE    762,000
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Total Deaths 1500-500 BCE

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138,000
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Total Deaths 500 BCE-0 BCE

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2,455,000
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Source: Eckhardt (1992), Table 13.1.

Table 2. Twenty Largest World Cities, 650 BCE

Greater West Eurasia		Greater South Asia		Greater East Eurasia	
Ninevah (Assyria)	120,000	Kausambi	55,000	Lintzu (China)	80,000
Memphis (Persia)	80,000	Ayodhya	35,000	Loyang (China)	70,000
Babylon (Persia)	60,000			Kingchow (China)	42,500
Miletus (Greece)	50,000			Hsintien (China)	40,000
Sais (Egypt)	48,000			Changan (China)	35,000
Marib (Arabia)	45,000			Pyongyang (Korea)	30,000
Jerusalem (Persia)	45,000				
Ecbatana (Persia)	42,500				
Napata (Nubia)	42,500				
Calah (Assyria)	40,000				
Van (Persia)	35,000				
Susa (Persia)	30,000				
Totals	623,000		90,000		297,500

Grand Total = 1,010,500

Source: Chandler (1987), p. 460. Names in parentheses refer to the state, empire, or geographical location in which the city existed at this time period. Some Greek cities were in Greek colonies in Italy or elsewhere.

Table 3. Fifty-one Largest World Cities, 430 BCE

Greater West Eurasia		Greater South Asia		Greater East Eurasia		Rest of World	
Babylon (Persia)	200,000	Patna	100,000	Yenhsiatu (China)	180,000	Cuicuilco (Mesoamerica)	32,500
Athens (Greece)	155,000	Benares	54,000	Loyang (China)	100,000		
Syracuse (Syrac.)	125,000	Anuradhapura	47,000	Hsueh (China)	75,000		
Memphis (Persia)	100,000	Sravasti	47,000	Soochow (China)	60,000		
Ecbatana (Persia)	90,000	Vaisali	45,000	Lintzu (China)	60,000		
Corinth (Greece)	70,000	Kausambi	39,000	Lucheng (China)	50,000		
Susa (Persia)	70,000	Dantapura	37,000	Fenghsiang (China)	42,500		
Persepolis (Persia)	50,000	Rajagriha	32,500	Changsha (China)	40,000		
Carthage (Carthage)	50,000	Ayodhya	32,500	Champa (Vietnam)	37,000		
Jerusalem (Persia)	49,000	Trichinopoly	32,500	Pyongyang (Korea)	32,500		
Meroe (Nubia)	47,000			Taiyuan (China)	32,500		
Marib (Arabia)	45,000						
Ephesus (Persia)	42,500						
Sparta (Greece)	40,000						
Agrigentum (Greece)	40,000						
Argos (Greece)	40,000						
Tarentum (Greece)	40,000						
Messina (Greece)	38,000						
Sidon (Phoenicia)	36,000						
Sardis (Anatolia)	35,000						
Croton (Greece)	35,000						
Tyre (Phoenicia)	35,000						
Cyrene (Phoenicia)	35,000						
Corcyra (Greece)	35,000						
Rome	35,000						
Gela (Greece)	35,000						
Kerch (Greece)	32,500						
Damascus (Syria)	30,000						
Elis (Greece)	30,000						
Totals	1,665,000		466,500		709,500		32,500

Grand Total = 3,921,500

Table 4. Fifty-five Largest World Cities, 200 BCE

Greater West Eurasia		*Greater South Asia*		*Greater East Eurasia*		*Rest of World*	
Alexandria (Egypt)	200,000	Patna	350,000	Changan (China)	400,000		
Seleucia (Syria)	200,000	Ujjain	87,500	Pingcheng (China)	87,500	Cuicuilco (Mesoamerica)	36,500
Carthage (Cart.)	150,000	Anuradhapura	65,000	Soochow (China)	65,000		
Rome	150,000	Paithan	60,000	Loyang (China)	60,000	Izapa (Mesoamerica)	35,000
Antioch (Syria)	120,000	Taxila	60,000	Nanking (China)	51,000		
Syracuse (Rome)	100,000	Benares	51,000	Lucheng (China)	39,000		
Rayy (Syria)	87,500	Aror	51,000	Changsha (China)	38,000	Tres Zapotes (Mesoamerica)	30,000
Athens (Greece)	75,000	Vaisali	51,000	Kaifeng (China)	32,500		
Balkh (Bactria)	75,000	Tosali	51,000				
Corinth (Greece)	70,000	Kolkai	51,000			Vienne (Gaul)	30,000
Memphis (Egypt)	65,000	Broach	40,000				
Babylon (Syria)	65,000	Peshawar	39,000				
Ecbatana (Syria)	51,000	Kolhapur	36,500				
Jerusalem (Egypt)	51,000	Sopara	36,500				
Marib (Arabia)	51,000	Srinagar	32,500				
Rhodes (Greece)	42,000	Trichipology	32,500				
Ephesus (Persia)	40,000	Madurai	32,500				
Cirta (Algeria)	39,000						
Meroe (Nubia)	36,500						
Messina (Greece)	35,000						
Pergamum (Anatolia)	35,000						
Damascus (Syria)	32,500						
Amasia (Greece)	32,500						
Cyrene (Phoenicia)	30,000						
Sparta (Greece)	30,000						
Olbia (Sardinia)	30,000						

```
Totals            1,893,000              1,127,000                      773,000
131,500

Grand Total = 3,924,500
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Source: Chandler (1987), p. 462. Names in parentheses refer to the state, empire, or geographical location in which the city existed at this time period.

Table 5. Seventy-five Largest World Cities, 100 CE

Greater West Eurasia		*Greater South Asia*		*Greater East Eurasia*		*Rest of World*
Rome	450,000	Anuradhapura	130,000	Loyang (China)	420,000	
Cadiz (Spain)						
Seleucia (Persia)	250,000	Peshawar	120,000	Soochow (China)	95,000	
65,000						
Alexandria (Egypt)	250,000	Paithan	82,500	Changan (China)	82,500	
Lyon (Gaul)						
Antioch (Syria)	150,000	Patala	72,500	Nanking (China)	82,500	
50,000						
Carthage (Cart.)	100,000	Patna	67,500	Chengdu (China)	70,000	
Teotihucan						
Smyrna (Rome)	90,000	Dohad	62,500	Wuchang (China)	67,500	
(Mesoamerica)						
Ecbatana (Syria)	82,500	Kavery	55,500	Tonggoo (China)	55,500	
45,000						
Athens (Greece)	75,000	Broach	55,500	Kashiwara (Japan)	50,500	
Nimes (Gaul)						
Edessa (Anatolia)	72,500	Madurai	50,000	Kanchow (China)	47,500	
44,000						
Nisibis (Anatolia)	67,500	Kolhapur	47,500	Taiyuan (China)	42,000	
Seville						
Zafar (Arabia)	60,000	Aror	47,500	Peking (China)	38,500	
(Spain) 38,500						
Rayy (Syria)	55,500	Srinigar	47,500	Pingchang (China)	38,500	
London 30,000						
Syracuse (Rome)	55,500	Benares	47,500	Canton (China)	38,500	
Babylon	55,500	Ujjain	38,500	Kingchow (China)	38,500	
Ephesus (Anatolia)	51,000	Junnar	36,500	Namhan (Korea)	36,500	
Corinth (Greece)	50,000	Tosali	33,000	Keishu (Korea)	34,500	
Memphis (Egypt)	47,500	Jullundur	33,000	Hangchow (China)	33,000	

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Leptis (Libya)      47,500   Ayodhya       33,000   Changsha (China)  33,000
Balkh (Anatolia)    47,500                           Tunhuang (China)  32,000
Merv (Turkmenistan) 42,000
Stakhr (Persia)     42,000
Pergamum (Anatolia) 40,000
Apamea (Syria)      37,000
Capua (Rome)        36,000
Byzantium (Anat.)   36,000
Thessalonica (Gr.)  35,000
Oxyrhyncus (Egypt)  34,000
Angora (Greece)     34,000
Milan (Rome)        30,000
Petra (Jordan)      30,000
Gortyn (Greece)     30,000
Ostia (Rome)        30,000


Totals         2,513,500          1,060,000                 1,336,000
272,500

Grand Total = 5,182,000
```

Source: Chandler (1987), p. 463. Names in parentheses refer to the state, empire, or geographical location in which the city existed at this time period.

Table 6. Total Size of Cities 100,000 or Larger, 700 BCE-100 CE

Century	Mediterranean	South Asia	East Asia
700 BCE	200,000 (2)		200,000 (2)
600 BCE	200,000 (2)		400,000 (3)
500 BCE	500,000 (5)	100,000 (1)	1,000,000 (8)
400 BCE	670,000 (5)	200,000 (2)	1,650,000 (12)
300 BCE	1,550,000 (7)	700,000 (3)	2,020,000 (11)
200 BCE	1,510,000 (7)	700,000 (4)	500,000 (4)
100 BCE	2,025,000 (8)	550,000 (4)	900,000 (5)

```
   0 BCE                   2,160,000 (8)            600,000 (6)      1,860,000
(9)
100 CE                     3,015,000 (11)           750,000 (6)        520,000
(2)
```

Source: Modelski (2003), pp. 42, 44, 45, and 49. The number in parentheses is the number of cities with 100,000 or more inhabitants.

Table 7. Chandler's and Modelski's City Size Totals, 650 BCE-100 CE

Century	*Med./West Eurasia*	*South Asia*	*East Asia*	*Grand Total*
650/600 BCE	623/200	90/0	298/400	1,010/600
430/400 BCE	1,665/670	467/200	710/1,650	3,922/2,520
200 BCE	1,893/1,510	1,127/700	773/500	3,925/2,710

```
100 CE                  2,514/3,015         1,060/750       1,336/520
5,182/4,285
```

Total percentage increase 650/600 BCE to 200 BCE:
```
Chandler = 389 percent; Modelski = 452 percent
```

Total percentage increase 650/600 BCE to 100 CE:
```
Chandler = 513 percent; Modelski = 714 percent
```

Source: Modelski (2003), pp. 42, 44, 45, and 49. The number before the slash is Chandler's estimate, the number after the slash Modelski's. Numbers are expressed in thousands (e.g., 200 = 200,000).