

# RELIGION AND RELIGIOUS BELIEFS AS EVOLUTIONARY ADAPTATIONS

*by Konrad Szocik*

*Abstract.* Scholars employing an evolutionary approach to the study of religion and religious beliefs search for ultimate explanations of the origin, propagation, and persistence of religious beliefs. This quest often pairs in debate two opposing perspectives: the adaptationist and “by-product” explanations of religion and religious beliefs. The majority of scholars prefer the by-product approach, which is agnostic and even doubtful of the usefulness of religious beliefs. Despite this pervasive negativity, it seems unwarranted to deny the great usefulness of religious beliefs—particularly concerning their past utility. Instead, adaptationist explanations of religion and religious beliefs must be re-established as interesting and useful approaches to the study of religious beliefs.

*Keywords:* adaptation; cognitive science of religion; cultural evolution; evolutionary biology; natural selection; religion

---

## COGNITIVE SCIENCE OF RELIGION AND THE BY-PRODUCT APPROACH

Even after serving as the subject of study for thousands of years, religion and religious beliefs remain of great interest to researchers, especially in philosophy and cognitive science of religion (CSR).<sup>1</sup> The experimental approach toward religious and moral issues is gaining increasing attention as well. This trend could be related to the fact that the majority of human beings accept some religious beliefs. People are usually strongly convinced that these beliefs are real, important, and useful. It seems that, from the religious point of view, the most important of these convictions are bound up with a sense of the truthfulness of these religious beliefs.

However, the approach of CSR is not interested in explanations of religious beliefs in epistemic terms. From the evolutionary perspective, it is not necessarily important that the reality of religious beliefs and

Konrad Szocik is an assistant professor, University of Information Technology and Management, Rzeszow, Poland; email: [kszocik@wsiz.rzeszow.pl](mailto:kszocik@wsiz.rzeszow.pl).

religions is understood in the epistemic terms of true and false. For CSR, the most interesting consideration does not concern the possible usefulness of religions and religious beliefs. The field focuses instead on the proximate explanations of their genesis independent of truthfulness and utility, focusing on the importance and the origin of religious beliefs.

This is generally accomplished through the use of what is called the “by-product” approach. It posits that religious beliefs are the by-products of cognition. In the case of the by-product hypothesis, it is worth keeping in mind that religious beliefs probably are not exaptations of beliefs in general. Instead, once the ability to form beliefs evolved—a very old ability in terms of phylogeny—religious beliefs became merely another kind of general belief. The cognitive approach assumes that cognitive mechanisms or models shaped by evolutionary processes affect or even favor the acquisition of religious beliefs (Bulbulia 2005). In addition to the cognitive basis of religious beliefs, religious rituals also are attractive and easily transmitted because they are compatible with the nature of the mind that prefers a particular kind of sequence of actions, the domain of religious rituals (Boyer and Bergstrom 2008). When Pascal Boyer points out that religious beliefs are affected by given cognitive models and not by “looking for tools that are needed for decreasing fear against death and suffering,” he questions the adaptationist approach (Boyer 2003, 119). A by-product approach excludes the evolutionary functionality of religious beliefs (Boyer, 1994). If CSR scholars find functional implications, they interpret them as secondary and accidental features of religious components. Ara Norenzayan and his collaborators present a standard CSR approach that explains religious beliefs and practices as the by-products of cognition. They interpret their usefulness as a domain of cultural, not biological, evolution. They exclude the impact of genes on the evolution of cooperation at the level of large groups dating back to the Holocene, because these social changes appear to have been too fast to make a biological imprint (Norenzayan et al. 2016a).

Cognitive explanations reject functionalism and do not take into account the main evolutionary features of religious phenomena like explanation of the world, psychological consolation, or social functions (the evolution of cooperation and in-group markers). An important argument is found in the ontogeny of religious beliefs and in the default religiosity of children (Richert and Smith 2009). Norenzayan et al. reveal some kind of religious ontogeny of humanity when they show that small hunter-gatherer groups shared the concept of gods, even though their gods played no social role, unlike the gods of large sedentary groups. They suggest that religious or supernatural beliefs in small groups were affected by cognitive models without looking for any purpose. Religious beliefs were not adaptive originally, and only the further cultural evolution has promoted the predictable

emergence and establishment of a set of religious components that had group-beneficial social functions (Norenzayan et al. 2016a). It seems that adaptive character is identified here with social functions. Religious or supernatural beliefs could not play social roles because biological mechanisms like kin selection and direct reciprocity probably worked efficiently at the level of small groups. Social problems, if any, were solved by biology itself. However, with the cultural evolution of small foraging groups religious/ or supernatural beliefs could work as psychological adaptations (consolation, hope, longing for the dead). Norenzayan et al. (2016a) present one of the main ideas of Norenzayan's concept of "Big Gods": cultural evolution of secular phenomena introduced new social mechanisms that replaced religious ones. Even if they are right, it seems that they underestimate other adaptive functions of religious phenomena, that is, psychological functions or the role of in-group markers. Some adaptive functions of religious components disappear, like prosocial outputs in secular societies, but some remain. The key idea of Norenzayan et al. is as follows: cultural evolution has promoted the development of phenomena that were compatible with the mechanisms of intergroup competition and were used to increase the chances of success for a given group at the level of a between-groups competition (Norenzayan et al. 2016a). If I understand this approach correctly, it seems they assume that natural selection can shape only the cognition that plays a role during the intergroup competition. In their approach, religious components, even if they can be adaptive, are random and accidental phenomena that can coexist or be replaced by nonreligious ones. They assume that religious components are the products of cultural group selection. I assume that they are, at least partially, the products of multilevel natural selection.

Atheism can be explained in a similar way. Within the by-product approach atheism seems to be a phenomenon that is difficult to explain because cognition has religious/theistic inclinations. Norenzayan et al. interpret atheism as some kind of aberration of cognitive processes (Norenzayan et al. 2016a). However, like religious beliefs, disbelief can also be explained in an evolutionary way as a result of new adaptations that—as nonreligious phenomena—work better and more efficiently in a new ecological niche. The adaptationist explanation is more convincing not only in the case of the origin of religious beliefs, but especially of atheism that could work as a product of heritable variation of fitness instead of religious beliefs. It is easy to find adaptive functions of atheism that could be a matter of positive selective pressure of biological or/and cultural evolution.

The adaptationist approach argues that some religious beliefs evolved under selective pressure (Barrett 2007). In contrast to the by-product approach, the adaptationist approach tries to explain not only how (by intuitive physics, biology, psychology, ontology, hypersensitive agency detection device [HADD], and so on) but why this cognitive architecture

favors and affects the development and transmission of religious beliefs. It is true that cognition provides a framework and forms, but an evolutionary approach that is looking for adaptation or something that contains adaptedness can explain why a given kind of cognition and its products are preferred. The examples of such an adaptive approach include the one developed by David Sloan Wilson. Wilson proposes the concept of natural group selection as the most appropriate theoretical framework of the explanation for the origin of religious beliefs and religions in an evolutionary perspective, which that looks for the adaptive roles of religious beliefs and religions today or in the past (Wilson 2002; Barrett and Trigg 2014). Among other adaptationist theories we find the theory of economic regulation, which claims that religion is a symbolic power that controls relations between people and environment; or commitment theory, which underlines the meaning of the costly signaling nature of religion used to enhance in-group cooperation and avoid the free-rider problem (Dow 2008).<sup>2</sup> Probably the most important evolutionary function that is found by proponents of the adaptationist explanation of religious beliefs is the enhancing of in-group and sometimes intergroup cooperation and avoiding the free-rider problem, especially through religious rituals (Ferretti and Adornetti 2014).

Like others engaged in the evolutionary and cognitive study of religion, I will not refer to the epistemic values of religious beliefs. Given the merits of each of the perspectives mentioned above, it is worth considering a third way to explain religion and religious beliefs as *both* an adaptation and a cognitive by-product (Marsh 2016). Such an incorporated approach adequately addresses the interaction between genetic and cultural evolution, the naturalness of religious belief mechanisms, and the utility of religious beliefs. It is worth keeping in mind that the application of a strictly biological evolutionary perspective to the study of religion or the entire human culture requires special care. In opposition to almost all other animal species, in humans information is not only transmitted by genes but also by cultural traits (Richerson and Newson 2008). In the nonhuman animal world there are very few examples of any kind of cultural evolution. Rhesus monkeys and chimpanzees pass learned behavior across generations through social learning. Among humans cultural evolution is commonly shared, and it is problematic to try to separate the impact of genes from the impact of culture (Lewontin 1974; Ferretti and Adornetti 2014).

It appears that religious beliefs are not specific kinds of beliefs and do not differ from other similar nonreligious traits. I accept the main idea of CSR that there are no completely distinct religious contents: such beliefs are comprised of natural, nonreligious mechanisms, models, and biases. They may be explained by the same mechanisms and processes as nonreligious phenomena (Boyer and Bergstrom 2008). There are many

general principles involved in religious behaviors and beliefs, such as general tendencies to behave and believe.

If religious beliefs are interpreted as adaptations, their semantic content is irrelevant. Semantic content is culturally acquired. One adaptationist approach, the concept of group-level adaptation, assumes that religious beliefs evolved as tools to develop cooperation. They can be interpreted as a complex adaptation which involves adaptive models important or necessary for cooperation in large societies (Sosis 2009, 317). The opposite approach claims that religious beliefs are the by-product of another non-religious adaptation and possibly could become adaptive traits (Pyysiäinen and Hauser 2010). I do not identify religions with religious beliefs, because religious beliefs are a part of religion and it is possible that some of them are adaptive even when the given religious system is nonadaptive.

The cross-cultural ubiquity of religious beliefs usually associated with social moral norms and obligations may be the result of convergent evolution that has favored a belief system attractive for survival and reproduction. This attractiveness, or perhaps necessity, at the early stages of human social evolution is perhaps the ultimate explanation and reason for the emergence of religious beliefs. The cognitive explanation is simply a proximate and mechanistic explanation that indicates a direct biological background which is the same for many other belief systems. As Boyer points out, evolved systems are learning systems, and this learning aspect causes their environmental plasticity (Boyer 2010). Theoretically, such systems can produce different strategies in different ecological niches, depending on which strategy may most effectively maximize fitness. It is possible that the commonality of the same or very similar religious phenomena is not the result of cognition, but the product of the natural selection that has led to the production—in different ecological niches—of religious phenomena. Similar religious phenomena are interpreted as selectively advantageous features that, at a particular stage of human evolution—and also during the individual lifespan of a believer—were the best evolutionary response. This way of thinking is, of course, one of the possible and, in some sense arbitrary, assumptions that are made to solve the problem of interaction between biology and culture.

Here it is assumed, as Francesco Ferretti and Ines Adornetti have suggested, that culture works as adaptation that not only is the result of biological evolution but itself can work as a niche that affects evolution—that is, a biological environmental niche (Ferretti and Adornetti 2014). This co-evolutionary scenario assumes that religious components are not the by-products of cognition. They emerge as selectively advantageous phenomena that shape cognition to favor some religious contents. Consequently, as Jay Feierman (2009) has suggested, some cognitive elements can be the products of religious beliefs. Culture is not the only frame for

viewing biological adaptations. Culture creates the necessity to look for the new adaptations that could guarantee survival and reproduction under given cultural conditions. I find useful this concept of niche construction, which assumes that individuals are not only the passive products of natural selection but also agents who can modify their environment and create a new selective pressure by using cultural tools (Ferretti and Adornetti 2014). I assume that this model can describe the way in which religious components (especially beliefs and behaviors) can work. Religious beliefs are not only the products of natural selection; they create a new selective pressure that can affect the further evolution of cognition. If we assume that religious beliefs are biological adaptations and/or that they are sometimes a buildup of the ecological niche that affects the evolution of new adaptations, the concept that they are the by-products of cognition is not a full explanation.

As scholars engaged in the cognitive and evolutionary study of religion know, the above-mentioned issue is one of the core topics of scholarship in the field. They are also aware of the substantial criticism of CSR, and they are looking for a new approach to the scientific study of religion. Almost all of the recently published work in the field critically analyzes the current state of the art (Dawes and Maclaurin 2013; Fraser Watts and Turner 2014; Kundt 2015; de Cruz and Nichols 2016; Jones 2016). Authors underline the necessity for a wider approach and combine various theoretical paradigms within evolutionary cognitive science of religion (ECSR) (Turner 2014). Important advances include the critique of the concept of strong modularity that could be replaced by the concepts of cognitive tool-kits and devices (Turner 2014), and nonlinear dynamics and wholism rooted in a neurophysiological approach (Jones 2016). I think the concept of cognitive models that some CSR scholars assume evolved in the past (mostly in the Pleistocene) as adaptations is a wrong approach because cognition is not a matter of natural selection but rather works as a by-product of other adaptations like those in the brain and neuronal systems. Natural selection operates on physiological structures, not on cognition that is the result of these structures. If I am right, the starting point of CSR is wrong. However, it seems that the dominant approach, despite the aforementioned critique of CSR, is still the by-product hypothesis. In this approach such terms as adaptation and natural selection are applied only to cognition/cognitive models, but they stop working in contact with religious components. I reject the former because I interpret cognition as a by-product of the evolution of the brain/neuronal system, and reject the latter because I assume that some religious components are adaptations; that is, inherited structural design features. CSR authors sometimes modify their theories, but they do not usually change their by-product paradigm. I think that the following sentence from one of Justin Barrett's recent essays

(with Matthew Jarvinen) accurately describes the essence of the by-product approach:

The cognitive equipment that gives rise to religious expression is presumed to have evolved under selection pressures unrelated to religion or religious entities. Whereas the ease with which humans acquire fear of snakes presumably evolved in response to snakes themselves as a survival threat, the ease with which humans acquire belief in gods is not thought to have evolved in response to gods. Under these accounts religious thoughts are an evolutionary byproduct and not an adaptation *per se*. (Barrett and Jarvinen 2015, 173)

In this article I will try to show why the opposite, the adaptationist approach, seems to be a better (and in my estimation correct) way to explain the cross-cultural presence, meaning, and importance of religious components.

#### HOW TO APPLY THE EVOLUTIONARY APPROACH TO RELIGIOUS MATTERS

The concept of modifications developed from one common ancestor or a small number of common ancestors is basic to the evolutionary approach proposed by Charles Darwin and Alfred Russel Wallace. They adopt the Malthusian concept of a struggle for existence and apply it to explain the nature of all species, not only human beings. The result of this struggle is natural selection, which produces features useful for survival and advantage over others (Garson 2015). This process is not consciously planned. Taking advantage of others is not always the most successful behavioral strategy. It can be useful in a short time scale but not necessary in a long-time perspective. Instead, it is generally those who cooperate with others who triumph in the long run. There is also a difference between the various levels of competition, especially in-group and intergroup, that favor different behavioral strategies. It is worth keeping in mind the different approaches to evolutionary theory developed by V. C. Wynne-Edwards and George Williams. Wynne-Edwards developed the concept of group selection leading to group adaptations. Natural selection operates in a long-term perspective and favors the benefit of the group over the benefit of the individual. Williams proposed the opposite view: he suggested that the main level of natural selection is the individual level; dynamic and fast individual changes are the main drivers of natural selection (Futuyma 2009). For Darwin, natural selection means to be naturally selected by better features that guarantee greater chances for survival (Darwin [1874] 1896). Natural selection involves variation, fitness, heredity (Garson 2015), and environmental conditions conducive to the stable development of a given trait (Burian 2010). Natural selection means differences in reproductive

success, especially in terms of fitness maximization measured by the number of offspring (Futuyma 2009).

This conceptual framework leads to basic concepts which will be used to analyze religious beliefs in terms of evolution. The concept of natural group selection may be a useful approach because religious beliefs were and are a domain of groups (not simply individuals) and produce benefit for the whole groups from the level of very small tribal societies to complex modern communities. Group benefit sometimes requires individual cost or even sacrifices that seem to be contrary to individual selection. Such expense can suggest that natural selection affects the development of religious phenomena, in that their applications are fruitful for the entire group in terms of its survival and reproduction even in opposition to the individual will and individual cost-to-benefit ratio. For this reason, the concept of natural group selection as a useful evolutionary approach in the study of religion is preferable to the by-product approach that suggests the uselessness of religious beliefs.

A parallel phenomenon is evident in the evolution of altruism, which guarantees an advantage for an altruistic group over a selfish one at the level of intergroup competition (Garson 2015). David Sloan Wilson calls altruism a kind of “group level functional organization” (Wilson 2015, 16). Religious beliefs could also be interpreted in terms of inclusive fitness theory because of religious motivation; individuals tend to maximize not only their own fitness measured by their own offspring, but also the offspring of their siblings or cousins (this is the core idea of inclusive fitness theory as opposed to the concept of fitness that refers only to one individual and her own offspring) (Hamilton 1964). In the religious framework, fictive family and kin ties are extended to genetically unrelated members of the group. This parallel is imperfect because in biological inclusive fitness we find natural genetic motivation to maximize inclusive fitness. In the religious case, this motivation is forced by external beliefs. External beliefs may become second nature and can be determined by conscience analogously to genetically motivated behaviors. To improve this parallel, we can take a broad definition of adaptation that does not require genetic inheritance.

Similar to genetic evolution, cultural evolution features unplanned development, albeit to perhaps a lesser degree. Cultural evolution generally occurs when two different structural design features compete for dominance. There is some kind of struggle for existence among cultural traits, and some of them have greater chances for “reproductive” success than others. Some features of religious beliefs described by CSR—such as the minimal counterintuitiveness (MCI) hypothesis or the concept of HADD—have statistically much more chances for survival and “reproduction” than nonreligious beliefs. Religious beliefs, unlike more intentionally created theological beliefs, develop spontaneously with adaptive natures. In this sense, we could assume that the origin of religious beliefs is a domain of



biological evolution and blind adaptation (Garson 2015). Perhaps theological claims also can be adaptive. Helen de Cruz and Johan de Smedt developed a cognitive science of theology and found that cognition and intuitions affect not only religious beliefs but also theological claims (de Cruz and de Smedt 2015). However, it seems that the main difference between religious and theological beliefs from the evolutionary point of view rests upon their point of origin. Religious beliefs can be affected by selective pressure. Theological beliefs are the result of cultural evolution and can be rather exaptations than adaptations—which does not exclude that they can be good candidates for a successful transmission when they collaborate with some cognitive models in a teleological design. Cultural impact seems to be important and it affects the further transmission of a given trait that can become instinctive or natural after some generations. It is worth keeping in mind that cultural selection is rarely a structural design feature; that is, it is not more adaptive than its competitors. These differences between genetic and cultural evolution lead to the awareness that religion and religious beliefs are often not interpreted as adaptation.

However, I assume, like Feierman, that a cognitive capacity to believe in God can be interpreted as a phylogenetic adaptation (Feierman 2009). This approach suggests that the cognitive mechanisms that are enumerated by CSR can work as species universal traits that exist and are genetically inherited from generation to generation by their beneficiaries. These benefits do not refer to the old evolutionary profits that the standard model of CSR assumes. They mean that current benefits are provided by religious beliefs. William Irons (2008) and Feierman suggest that theoretically it is possible to apply a reversal of the CSR approach that explains religious beliefs as the by-products of cognition. They point out that some cognitive models can be the by-products of belief in God. If we assume that belief in God was beneficial for our ancestors, such beliefs can be favored by natural selection, which could modify brain structures in a way that favors easy production and/or acquisition of these beliefs (Irons 2008; Feierman 2009). This refers especially to religious behavior that opposes the make-oneself-smaller-or-more-vulnerable (LSV) behaviors could affect the evolution of brain structures if they could provide selective advantages for their bearers (Feierman 2011, 256).

The critique of the adaptationist explanations of the origin and evolution of religious beliefs seems incorrect in the light of the approach of Richard Lewontin. Lewontin notes that it is almost impossible to find strict boundaries between the impact of genes and environment. Phenotype is the result of genotype and environment (Lewontin 1974). To Lewontin, it seems obvious that religious beliefs must use a natural psychological and physiological background that does not have an explicitly religious nature.

Nonetheless, the supporters of the by-product theory of religion exploit this fact when they in some sense identify a cognitive proximate explanation

with a noncognitive ultimate explanation. However, this identification is too wide and too general because, in this paradigm, one could argue that any adaptation is a by-product if some of its components evolved for other or more general functions. Natural selection assumes the integration of genes and environment. It is possible to assume that religious beliefs are the products of natural selection because environmental pressure favored religious beliefs as adaptations. Then, these adaptations were inherited in cultural and educational ways, sometimes in the same effective way as genetically inherited features. Adaptation should contain a structural design feature that is inherited genetically or epigenetically. Not all religious components have a structure and, consequently, they cannot be defined as adaptations even if they provide some adaptive results (they can have adaptiveness, but they are not adaptations). Only structural design features can be the objects of natural selective pressure (Feierman 2009). Feierman's study shows that only certain behaviors, beliefs, and values are religious components that contain structural design features and work as adaptations that are inherited genetically or culturally. Other religious components like moods and feelings are not adaptations but they can have adaptiveness (Feierman 2009). Feierman notes that a structural design feature that is probably commonly shared by the world's religions is "LSV behavior": "the make-oneself-lower-or-smaller-or-more-vulnerable behavior" (Feierman 2011, 244).

Lewontin finds that many dynamic changes in the human species should be interpreted as the results of cultural and social evolution because they develop too rapidly to suit the criteria appropriate for genetic evolution (Lewontin 1974). Therefore, how might one interpret the evolution of religious beliefs in this context? There are two main facets to this question: the evolution of religious beliefs in general, and the evolution of specific religious beliefs.

The slow process of genetic evolution is not required to generate special religious genes. It seems that behaviors generated or enhanced by religious beliefs and practices that become an instinctive nature (after some generations) create genetically inherited tendencies. When we observe religious people, we find among them deeply rooted convictions, which show that some behaviors or words are not appropriate. Robert McCauley calls this a phenomenon of practiced naturalness, when some feature becomes human second nature even if it requires a cultural and educational impact (McCauley 2011).

When I apply the terms "natural" and "naturalness" as well as their opposites to religious matters, I am not referring to the counterfactual content of religious beliefs; most religious beliefs contain counterfactual propositions. I mean the behavioral patterns favored by religious beliefs that could lose their adaptive nature today but perhaps might have been adaptive in past environments. These behaviors and tendencies which were affected by religious beliefs and practices probably provided in the past the

environment for some kind of advantage for religious groups. Looking for possible past benefit seems appropriate (Ayala and Arp 2010). However, it can be assumed that some features are potentially functional even when they fail to realize their functions in contemporary environments (Perlman 2010).

It is possible to apply these concepts to religious beliefs and behaviors and look for their positive, negative, or neutral impact on the opportunity of survival and reproduction. Wilson and William Green claim that the adaptive nature of religious beliefs may apply at either a group or individual level. It seems that at both group and individual levels, religious beliefs and practices probably were and sometimes still are evolutionary adaptations because we can observe their positive impacts on a group or individual in the sense of natural selection and in-group or intergroup competition. Another approach assumes that some features can be selectively neutral and cannot be applied to religious phenomena because it seems very improbable that religious beliefs are the result of genetic drift (Wilson and Green 2007). Such counterintuitive phenomena in the ultimate sense and cost mechanisms like religious beliefs and practices should have pragmatic functions for survival that can be described as adaptations. However, I am aware of the critique of the adaptationist approach that has been proposed by Lee A. Kirkpatrick. Kirkpatrick's critique is not based on a dichotomy—adaptive cognition/cognitive models vs. religious components as their by-products—which seems to be a core idea of cognitive approaches such as Barrett's. Kirkpatrick (2006) finds that religious components are too complex and too unnatural to meet the criteria of adaptation. Consequently, there are other more natural traits that can in the same or more efficient way fulfill adaptive functions that are assigned to religion. He points out that adaptation and natural selection are domains of reproduction but religion is a domain of survival rather than reproduction. If we posit this criterion of adaptation, we cannot take into account all non-reproductive positive functions of religious components. But even in this case we find that there is a commonly known and empirically grounded positive correlation between the rate of religiosity and the rate of fertility and reproduction. It is unclear if other phenomena could motivate for reproduction in the same efficient way as religion, by specific tools of religious cultural (sexual) policy. I mean especially religious values (this is the case in which they can work as adaptations) like human life as sacred or God as the lord of life and death. In the Roman Empire, secular values were negatively correlated with rate of fertility and reproduction, in opposition to early Christianity (Wilson 2002). Kirkpatrick's case shows the importance of the ways of understanding some key concepts. He deplores the practice of sacrifice as a useless loss of resources. However, we should underline a preferred given level of analysis. Priests have almost always been a privileged caste. We can say that natural selection works efficiently at the priest

group level. Even the practice of human sacrifice was useful for the purpose of social cohesion, order, and social submission (J. O. Watts et al. 2016).

To strengthen my adaptationist claim, we can find today that religious people have more successful survival, and more often have reproductive success, than secularists (Blume 2009). This insight is a strong argument for the adaptive nature of religious beliefs when we agree that one of the main features of adaptation is fitness maximization. Therefore, an interpretation that assumes religious beliefs can be understood as adaptations, if not necessarily as current adaptations but as traits which were adaptations in past environments, is a more accurate interpretation of religious beliefs than the by-product interpretation (Wilson 2002). However, this topic seems to be highly context-dependent, because different religious beliefs in different times and periods could play and can play various roles today—from very adaptive to maladaptive or neutral.

#### RELIGION AS ADAPTATION

Independently from preferred methodological conditions, religions and religious beliefs could never be interpreted as adaptations. Adaptationist approaches like the ones used here only state that structural design features can be adaptations. Religion is not a structural design feature. It is a heterogeneous complex like "war" that is useful but not fixed or specific. A functional approach permits us to explain religions and religious beliefs and behaviors alike as adaptations. I focus on the pragmatic context because evolution favors pragmatism. To underline the crucial role played by different applications and understandings of the same concepts I briefly discuss the approach proposed by James Dow.

Dow proposes a correspondence between a phenomenon and reality as a criterion for adaptation. He suggests that to yield adaptive features, natural selection should favor the feature that expresses reality in the most accurate way (Dow 2008). However, the essence of natural selection is not truth-tracking but fitness maximization. It is possible, especially in the case of the human species, that nonreal beliefs could be useful for survival and reproduction. If beliefs bias behavior in a predictable way, the truth value is irrelevant. However, this does not exclude the idea that truth tracking could be interpreted as one of the tools that are used to achieve fitness (Wilkins and Griffiths 2013, 138). Nicolas Baumard and Pascal Boyer point out that some intuitive cognitive models work to predict and avoid threats and dangers in the natural environment. Intuitional reflection allows us to look for solutions that can have an unreal nature (Baumard and Boyer 2013, 2). Natural selection does not require a realistic approach to the environment and this is why religious phenomena are not necessarily incompatible with natural selection. The more desirable features of natural selection are adaptation and pragmatism rather than knowledge about facts

or rationality, which are often in contrast to religious beliefs. Religious content exists despite its irrational nature and the scientific criticism it engenders. This suggests that religious beliefs do not require a factual approach to reality; rather, it is their adaptive nature, for example, their coping function, that counts. The coping and psychotherapeutic functions of religious components require unreal nature for their efficient work.

Stephen K. Sanderson claims that real communication between phenomena and reality is basic to natural selection and refers directly to predators and food (Sanderson 2008). This approach seems simplistic, because religious beliefs and religions—domains of unreal communication—involve many direct referrals to survival and reproduction. There are instructions pertaining to what, how, and when believers should or could eat and drink (for instance, the practice of kosher food), how to treat the natural environment and the animal world (for instance, the hierarchy of beings in Genesis), and how to treat in-group and out-group members (as in the ten commandments). These religious communications are strictly correlated with survival. Even if some of them in some religions are not adaptive today, it seems highly likely that they were adaptive in the past. At least, religious components worked and/or work as in-group markers and do not directly affect any particular behavioral patterns.

Religious beliefs understood as adaptations are interpreted in terms of survival and reproduction in the sense of ultimate, functional explanations. This means that they developed in order to determine behaviors that have been useful for survival and reproduction on both the in-group and out-group levels of competition (Crespi and Summers 2014). Adaptation enhances beneficial effects and maximizes fitness (Sanderson 2008). Eckart Voland points out that adaptation, as the inherited product of historical selection, enabled the fulfillment of particular adaptive functions now or in the past (Voland 2009).

At least three adaptationist approaches emphasize the biological usefulness of religious components. One claims that religion is a group-level adaptation (Wilson 2002)—religious beliefs increase the chances of survival and reproduction of the whole group that shares them. However, religion is too broad to be an adaptation. Being religious in some circumstances can confer adaptedness or adaptiveness on individuals and, consequently, on the entire group, though such a description may not be accurate. I apply this approach in some conditions to interpret given phenomena as adaptations, even in the awareness of the contrary points of view that strictly use concepts like adaptation or by-product.

In another approach, religious beliefs can be interpreted as a result of a cognitive model dedicated to creating illusory forms with an adaptive nature selected by environmental pressure (Pyysiäinen and Hauser 2010). Such a model suggests that cognition has a tendency to create nonreal representations that, regardless of their non-truth oriented nature, are

useful adaptations. This example suggests that natural selection is not truth-oriented. Natural selection results in either truth orientation or utility orientation. Truth has little to do with religious beliefs, because most religious beliefs are false. In the context of the adaptation versus by-product debate, truth versus nontruth is really a nonissue. However, Dominic Johnson and his colleagues analyze the issue of the truthfulness and reliability of religious beliefs within an evolutionary framework. They correctly point out that the evolutionary approach does not exclude the possible truthfulness of religious claims (Johnson, Lenfesty, and Schloss 2014). However, it can be assumed that true religious beliefs could question the adaptationist explanation because they do not have to be useful. The possible usefulness of a given truth can work randomly. In this context it can be said that perhaps the evolutionary study of religion does not threaten religious beliefs but rather that true religious beliefs could threaten the evolutionary adaptationist explanation of them. To summarize this approach: to correctly adapt an individual to some ecological niche, a given (religious) belief does not have to be true but it can be. However a (religious) belief that has to be true, like a scientific belief (or religious beliefs if someone assumes that sacred texts are true), is not necessarily an adaptation.

I am not sure if Johnson et al. (2014) present their question correctly. They point out that the evolutionary study of religion does not explore the question of the truth of religious beliefs and thus can reduce its explanatory value. How can evolution verify or falsify the truth of religious beliefs? I think that this topic—if we assume that it is a domain of scientific exploration—should be tested rather by history or by archeology than by evolution. For instance, the resurrection of Jesus Christ is not an object of evolutionary study. An evolutionary approach can find this belief useful and adaptive if it is understood as strengthening in-group cohesion, especially at times when military or political ventures distinguished Christians from other competitive groups by particular religious content and markers. Religious coalitional signals bind groups together more effectively than a common language or nationality because they have a universal power to connect various cultures and nations. A given religious sign (like the aforementioned concept of resurrection) does not have to be true. What is important is that people believe in it and that they can connect and work, fight, and pray together.

This lack of connection between adaptation, belief, and truth engenders the concept of adaptive misbeliefs (Johnson et al. 2014). Their utility and adaptive nature is obvious if we have in mind the positive psychotherapeutic impact of various illusions and self-deceptions. It is not possible to prove the falsity of religious beliefs, even if one takes a naturalistic point of view. Unverifiable religious beliefs nonetheless have positive psychological power in that they evoke the existence of a supernatural agent that has privileged access to human life and can shape it. I refer to the issue of religious coping.

It is possible that this kind of belief was under positive selective pressure from biological or/and cultural evolution and had a selective advantage over alternative beliefs. This becomes even more probable when we learn that so-called optimistic strategies can in fact improve our situation (Johnson et al. 2014). Independently of the possible truthfulness or falsity of religious beliefs, here it is assumed that a given group that shares adaptive religious beliefs acquires important benefits that provide an advantage at the level of intergroup competition (Feierman 2009).

Another adaptationist approach to the origin of religion is the commitment theory, the key idea of which is the concept of the costly signaling mechanism. This approach assumes that religion and religious beliefs evolved to avoid the problem of free riders: persons who want to participate in the benefits of the group without the necessary level of cooperation and sometimes altruism or some kind of sacrifice for the group. Religion has specific tools that theoretically can be useful to identify these free riders who do not want to participate in religious rituals and other requirements (Pyysiäinen and Hauser 2010). It seems that we can find some kind of a parallel in the phenomenon of warning calls or cries among some animal species. In nonhuman animals these behaviors are probably genetically motivated. Religious beliefs and behaviors could play the role of culturally sustained warning calls against free riders.

These kinds of religiously motivated control mechanisms could prevent morally wrong behaviors, which are punished and thus costly for wrongdoers (Volland 2009). Richard Sosis finds at least four religious signals which should be shared by the members of the same religious community: beliefs, behaviors, badges, and banes (Sosis 2009, 327). Matt J. Rossano suggests that costly signaling religious forms exist today, such as church attendance in the case of a wedding ceremony—a practice suggesting that a spouse will be a good mate and that accept monogamy and fidelity (Rossano 2006).

However, a costly signaling mechanism may be maladaptive and not associated with increase in cooperation, as in the case of the great costs of religious buildings in the Roman Catholic Church (Richerson and Newson 2008). In this case, there is probably no (or a very low) correlation between the expensive contribution of the members of the religious community and the reputation theoretically guaranteed by this costly signal. Independent of the unavoidable presence of a certain number of free riders in each group, and the maladaptive nature of particular religious beliefs and behaviors, some religious beliefs and practices that have an adaptive nature in the sense of enhancing survival and reproduction do recur. Sanderson finds four adaptive features: shamanism, health benefits, reproduction benefits, and propagation of love and mercy. Shamanism can be explained as an adaptation in the ancestral environment because shamanistic practices could be useful for some elements associated with healing and stress reduction. However, an opposite point of view rejects this interpretation because

it implies that, although shamanism can contain adaptiveness, it cannot be an adaptation because it is not a structural design feature. The cross-cultural presence of shamanism is interpreted as a result of its reinvention, which is a kind of proof of its adaptive nature (Sanderson 2008). The therapeutic nature of shamanism leads to its interpretation as not only a part of the history of religion but also as a domain of the history of medicine, suggesting the beneficial impact of religious beliefs and practices for health (Voland 2009). The medically beneficial impact refers to lowered levels of anxiety and stress that have good physical consequences for the health of believers (Sanderson 2008). Religious components fit here one of the criteria of adaptation, which is the provision of benefits.

The most important element of adaptation seems to be related to the opportunity to maximize fitness by increasing chances for survival and reproduction. Religious beliefs usually have a “pro-natalist” nature, and their members have a higher level of fertility than the inhabitants of secularized regions. This approach was very adaptive in the past when the environment was characterized by a very low level of existential safety. This “pro-life” orientation is seen also in the critique of abortion and euthanasia. It is worth bearing in mind that the defense of life, which is understood as a sacred value, can be interpreted as a defense of biological life, which is the essential background for any possibility of reproduction. However, we can wonder whether a high level of reproduction is adaptive when we consider the high cost of offspring care and education. Under conditions of overpopulation and limited resources, natural selection continues to be at work, but it is not clear if adaptive mechanisms evolved by this pressure will be desirable and useful for the entire group. We know that a high reproduction rate is often correlated with a high level of criminality and social problems.

Besides this theoretically adaptive function (if we assume that from the genetic point of view motivation to reproduce is always adaptation) we find probably the most adaptive feature of religious beliefs. I mean the feature strengthened by attachment theory that claims that religious figures provide existential and psychotherapeutic support for their believers, especially in difficult situations where support from others is sparse or nonexistent. In addition to offering beneficial psychological effects, religions underline the role played by love and mercy in providing help and support for the ill and the poor (Sanderson 2008).

These and other features of religions and religious beliefs cause Voland to interpret them as adaptations. He finds some cognitive by-products in metaphysical matters not directly associated with survival and reproduction. For Voland, the most important parts of religion are its adaptive features, that is, their impact on cohesiveness and group identity, increasing social bonding, or punishing antisocial behaviors. Religious practices as well as religious metaphysics fit the criteria for biological adaptation



(Volland 2009). Johnson underlines the role played by the concept of the fear of God in making religion a special and unique cultural tool for providing social cohesion and cooperation (Johnson 2016). His approach can be interpreted as an evolutionary adaptationist account. For Johnson, religious components are very useful and important tools for the further cultural evolution of humanity. We can find some common points between his approach and Norenzayan's concept of "Big Gods." I understand and appreciate this point of view, but I doubt if the fear of God really plays such an important role. More important factors, I suspect, are the fear of other humans, fear of a group, and fear of social isolation. Some authors point out that fear is more significant than the impact of a religious leader or belief system (Wenegrat 2010, 553). The concept of a God that causes fear is a part of a religious system that works less efficiently than a desire to avoid social isolation. One of the forms of the adaptationist explanation of religious beliefs states that such beliefs solve the problem of the rational analysis of cost and benefit related to decisions about reproduction. Religious beliefs underlie motives for the creation of marriages, families, and cooperation, and consequently provide greater reproduction rates (Blume 2009).

Another adaptive function, the practice of human sacrifice, has likely served to increase the authority of religious agents. One of the possible social functions of these rituals was increasing the "fear of social elites" and "demoralizing underclasses" (Ball 2016, 1–3). These practices could be useful for elites, and in this narrow sense they were a particular kind of group-level adaptation.

#### DAVID SLOAN WILSON'S ADAPTATIONIST APPROACH

Before continuing to the approach developed by David Sloan Wilson it is worth mentioning a similar view presented by E. O. Wilson, who underlines the usefulness of religious beliefs in the context of the human tendency to cultivate fear (E. O. Wilson 1998). Fear is one of the most important motivational mechanisms, but when it is overestimated it can work as a costly false positive. It appears biologically important to be able to reduce fear. If religious beliefs can fit this function they could be treated as some kind of adaptation. It is worth considering if religious content is or is not impossible to replace and necessary for further evolution. I especially mean the approach developed by Norenzayan and his concept of "Big Gods." I interpret Norenzayan's approach as a by-product account in the light of the criteria of biological, not cultural, adaptation, despite the fact that his approach can be and often is considered as an adaptationist one (Norenzayan 2013). However, it is not clear whether human evolution from the level of small to large groups could be possible without religious content, rituals, and institutions.

E. O. concludes that the human mind evolved to believe in gods because these beliefs were very useful adaptations when humanity was developing. These religious beliefs provided an advantage. Their great impact on decisions and actions can be strengthened by a conviction that biological evolution has equipped humans with ability to accept only one truth (E. O. Wilson 1998). This explanation is an argument for the by-product hypothesis or, at least, provides a proximate explanation.

When we connect the emergence and development of religious and supernatural beliefs with evolution of the brain we can assume that religious beliefs are not the by-products of cognition but adaptations (at least in the past, but sometimes in current societies), depending on the kind of religious beliefs, region, and epoch. This point of view is studied in depth by David Sloan Wilson. The core idea of “Darwin’s cathedral” is the assumption that religion can be seen as a super-organism that has evolved for the purpose of competition with other groups (Bulbulia and Frean 2009, 173). David Sloan Wilson claims that some features have a natural background and potential but can be activated by particular environmental conditions. One of his examples is the ability to speak honestly. The ability to speak is naturally a human ability. But the ability to communicate honestly is not because speaking falsely may be more useful or easier. The ability to speak honestly is in some sense a natural human capacity but it had to be enhanced by the environment. By environment, Wilson means Judeo-Christian beliefs, especially Calvinism. Belief systems such as these are the factors which have enabled the evolution of a natural communication toward honest and frank speaking by identification of false testimony with sin (Wilson 2002).

Calvinism is one of the examples of religion explained as adaptation. Wilson defines adaptation as a feature that motivates groups to share behaviors that turn a group into an adaptive unit. The term “adaptive unit” means that a given group is adequately fit to environmental conditions, especially in terms of survival and reproduction. Religious faith can be interpreted as an adaptation if it possesses this motivational power. Functionalistic approaches claim that reference to God or gods focuses on some useful goals. An evolutionary explanation of this religious impact is the concept of motivational physiology that effectively inspires individuals to realize particular behaviors (Wilson 2002).

Wilson has used a historical and evolutionary approach to look for examples of religious beliefs and religions as adaptations. Besides Calvinism, one is the water temple system in Bali that uses extraterrestrial beliefs for strictly pragmatic purposes—enhancing chances for survival by water resources management and food supplies (Wilson 2002). Another example is found in Judaism. According to Wilson, Judaism’s main adaptive feature is providing integrity and genetic separateness by strict isolation rules.

He finds, in addition to a high level of isolation, a high level of genetic relatedness among the members of the Jewish community and natural and cultural group selection as other adaptive features. These features meet the criterion of being an in-group marker for a breeding population that inhibits gene flow.

Wilson also underlines the adaptive nature of early Christianity, which he views especially in context with the culture and the legal system of the Roman Empire. In this period and place, Christian beliefs were adaptive in terms of survival and reproduction because they motivated reproduction and defended the value of life in opposition to Roman culture. This greater level of fertility was strengthened by the motivation toward mercy and charity. This kind of behavior was useful in a period of great epidemics, when chances for survival depended on mutual help. Religious beliefs were adaptive not only from the genetic point of view but also from society's. However, it is not clear if a high reproduction rate always can be interpreted as adaptation beyond the genetic level.

Wilson defends the adaptive nature of religions and religious beliefs by their evolutionary costliness, which is not natural and normal in the sense of natural selection that looks for the cheapest and easiest solutions. Religions and religious beliefs exist, and in the past especially were commonly shared. This may mean that they evolved by natural selection because it would be difficult to explain their presence as nonuseful but very expensive tools otherwise. It seems that in this context other explanations, such as by-product hypothesis, being a product of phylogenetic history or genetic drift, are less reliable.

In this evolutionary manner, Wilson explains the origin of forgiveness as the altruistic version of the "tit for tat" rule. This ability to forgive is very adaptive because it enables cooperation despite certain acts of selfish behavior. Wilson suggests that religious beliefs that affect the tendency to forgiveness should be conditional, because unlimited forgiveness would not be adaptive and would lead to exploitation of the group. However, the negative attitude toward the Jews could have been adaptive (from the Christian community's point of view) in the period of early Christianity. After the political domination of Christianity lost its adaptive nature, this negative attitude did not disappear, and this fact suggests that Christianity could be understood as a group level adaptation in the past but not later and not today.

David Sloan Wilson's approach notes that religion can be analyzed as a belief system focused on the connection of people in an adaptive group. This evolutionary goal can be achieved by nonreal contents because the evolutionary criterion is adaptation and pragmatic realism, not factual realism or rationality as in the case of science (Wilson 2002).

## RELIGIOUS BELIEFS AND INCLUSIVE FITNESS THEORY

One of the biological approaches toward the study of religion is the implementation of inclusive fitness theory in the study of the evolutionary origin of religion and religious beliefs. Bernard Crespi and Kyle Summers state that religious beliefs can be interpreted as motivational systems attractive for maximization of the inclusive fitness of individuals. This paradigm, influenced by William Hamilton's concept of inclusive fitness and kin selection (Hamilton 1964), interprets religious beliefs as a coefficient of relatedness, the impact of parental manipulation, and mutualism (Crespi and Summers 2014). The most important factors in human natural history are the family and the kin circle—the basic model that was and still is necessary for survival and reproduction. Richard Alexander finds the same emotions associated with the concept of God, that is, love and the respect for cooperation, in the kin circle (Alexander 2007).

Alexander suggests that the religious tools that theoretically could be useful for increasing survival by promoting cooperation include religious stories, which tend to favor behavioral patterns that are desirable for in-group order and cooperation and for appropriate relations with members of other groups. Crespi and Summers refer to an unpublished manuscript of Alexander's comparing God with the nature of evolutionary biology. Here, God can be understood as a metaphor of life and of the natural tendency to increase chances for survival and reproduction (Crespi and Summers 2014).

RELIGION AS A BY-PRODUCT AND A CHALLENGE  
OF COOPERATION

Drawing on all of the above, it seems that two different approaches are available in analyzing the beneficial impact of religions and religious beliefs on health. One, appropriate for CSR, assumes that they are the by-products and results of nonreligious cognitive mechanisms and processes. People share similar or the same religious beliefs in different epochs and cultures because these beliefs are affected by common cognition, that is, nonreligious cognitive models and mechanisms associated with agency detection and mind reading (Sanderson 2008). This approach, the basic one for CSR, states that religious beliefs overlap or emerge from cognition, which has been favored by natural selection to increase chances for survival. This explanation refers to the concept of similarity by homology.

Cognition is not truth-oriented. This enables the claim that it is possible to generate nonreal religious content that, although it may not be true, can theoretically be useful if cognition is focused on increasing fitness.

The evolutionary criterion is not truth but usefulness; pragmatic realism and adaptation are its most important aspects. Factual realism is not the main feature favored by natural selection. This can be confirmed by the mechanism of “signaling through falsity,” which assumes that one of the best ways of signaling group commitment is the common sharing of false beliefs that are unique and exclusive (Johnson et al. 2014, 217).

However, the ubiquitous nature of religious beliefs may be interpreted in other ways than those proposed by CSR. It is possible to explain it in terms of natural selection and adaptation. When we refer to the concept of convergent evolution, we may assume that religious beliefs evolved in different cultures and environments according to their adaptive nature as influenced by the same or similar selective pressures. The concept of convergent evolution assumes that there is analogous similarity in the natural world, and features that have the same function may have different evolutionary histories. In this way, there is a correlation between civilizations and religious systems that have played an adaptive role (Richerson and Newson 2008). We can say that this evolutionary explanation refers to the concept of similarity by analogy.

Ilkka Pyysiäinen and Marc Hauser claim that an empirical approach in moral psychology can justify the concept of religion as a by-product of earlier nonreligious adaptations. It is assumed that prosocial mechanisms introduced by religions and religious beliefs are not new qualities but emerge from evolutionary prosocial mechanisms like reputation-monitoring, in-group strong reciprocity, or ethnic signals. Pyysiäinen and Hauser reject the adaptationist hypothesis because they suggest that humans share nonreligious moral intuitions that are a background for the ability to cooperate. In their view, religious beliefs and religions can be only proximate, not ultimate explanations of the possibility of cooperation (Pyysiäinen and Hauser 2010). It seems that they are focused on the pragmatic evolutionary functions of religious components. In their view, the psychological applications associated with stress reduction and hope are the most important and primary functions of religious or supernatural beliefs, and then, when human groups increased their size, being in-group markers, as Feierman (2009) suggests.

The cooperational function of religious beliefs seems to be very important because natural biological mechanisms like kin selection and direct and indirect altruism seem to be limited to small groups. It appears that human beings without religious beliefs and religion, living only on the basis of these natural mechanisms, probably would not have evolved into large groups (Sterelny et al. 2013). This may indicate that religious beliefs are adaptations strictly designed to realize particular functions (in this case, social cooperation) because natural mechanisms do not work at the higher level of social organization. However, it is possible to explain the evolution of cooperation at the level of large groups by the “tribal social instincts

hypothesis” of Richerson and Newson. This hypothesis fits the criteria of the by-product hypothesis. It assumes that groups evolved in isolation and generated distinct cultural evolution-marking boundaries between groups (Richerson and Newson 2008, 63). Religious beliefs and religions interfered with these mechanisms and became useful especially in regulating the framework of cooperation. Religious beliefs can thus be interpreted as in-group markers for a breeding population (Feierman 2009). Feierman connects this role with “assortative mating” that shapes framework of favored phenotypic features among possible mates (Feierman 2011, 252). Religious components work as mechanisms of sexual selection. The evolution among males of preferred female features can favor sharing by possible mates religious components like behaviors, beliefs, and values (Feierman 2011). The communality of religious components works as a signal that a potential mate has appropriate respect for social and economic mechanisms that can guarantee success in survival and reproduction. Human religious signals do not differ from the genetic signals of sticklebacks, whose females prefer bright red mates. Bright color means a better genetic quality (Futuyma 2009). Boyer calls this function of religious beliefs (accidental in his opinion, necessary for Feierman and for me) a “signal of coalitional affiliation” (Boyer 2003, 120). Norenzayan et al. also point out that cultural evolution has affected and strengthened tribal psychology and in-group boundaries. Religious phenomena evolved as a cultural response to the pursuit of the best tools for marking members of a given group (Norenzayan et al. 2016a). In this context I find useful the concept of “religio-species” (Wunn and Grojnowski 2016, 23, 30). Religious groups work as biological species that are isolated breeding populations. Members of a given species can reproduce only with members of their own species. We find this behavioral pattern in some religious traditions that inhibit gene flow between various religious traditions by strict rules of sexual policy. This approach shows that religious components can work in the framework of not only natural but also sexual selection.

Boyer and Bergstrom refer to William H. Durham’s thesis that within evolutionary framework religious phenomena seem to be maladaptive or selectively neutral (Boyer and Bergstrom 2008). If we assume that the main evolutionary function of religious beliefs or practices is the in-group marking that provides or/and enhances cohesion and cooperation, any religious phenomena cannot be called maladaptive or neutral in terms of survival and reproduction. Even the strangest and most useless beliefs or practices seem to be selectively advantageous, if they make possible mutual recognition, trust, trustworthiness, and other in-group functions like uncalculating cooperation that can be found when personal reputation is at stake (Jordan et al. 2016). Sharing the same beliefs and rituals—no how important, strange, irrational, or useless they can be—is an effective signal to other believers that the performer can be trusted to engage in

altruistic or cooperative acts. Consequently, the communality of beliefs and rituals provides and justifies a sense of mutual aid, cooperation, and even self-sacrifice. This seems especially important if we agree that human evolution works by competition, given that such communality can lead to group extinction if it inhibits a gene flow between groups by way of a restrictive sexual policy toward members of other groups. In this context, Boyer and Bergstrom probably are wrong when they interpret religious rituals as nonpragmatic actions (Boyer and Bergstrom 2008). Although ritual itself sometimes does not have any direct benefit, practicing rituals can have a positive psychological function if it improves mental health. The main function of rituals, against the uselessness alleged by Boyer and Bergstrom, is the enhancement of in-group cohesion. Rituals mark members of a given group and publicly show their coalitional affiliation. In this sense, perhaps no rituals and beliefs can be called nonpragmatic, even if they are irrational and strange and do not imply any particular behavior. Boyer points out that this religious activity is a kind of “coalitional affiliation” that within a given religious framework is used as a proof of in-group loyalty (Boyer 2008, 1039). Boyer interprets this and perhaps all other religious phenomena as by-products of nonreligious cognitions and psychology. However, it is possible to interpret the same phenomena as adaptations or features that have adaptedness. In-group cohesion and group support is evolutionarily beneficial for the individual as well as the entire group, and all mechanisms and features that strengthen this cohesion can be called adaptation or adaptive traits. In this context, a proximate cause like the particular mental or cognitive model that is at work does not matter for the final evolutionary explanation.

The key function of religious elements is the provision of a system of mutual recognition that allows for the forecasting of the behaviors of other members of a given group. This concept assumes that religious beliefs are used to bind people together (Bulbulia 2005, 85). It is assumed here that religious beliefs can promote morally right patterns and neutralize such natural selfish tendencies as cheating or defection. However, it seems that the social binding affected by religious elements does not necessarily mean that it will determine the right patterns. Groups that are bound by religious beliefs can cooperate to compete with other groups (Norenzayan, 2013) by heroic mercy or brutal fighting, like Christianity at particular periods of its history. In this sense religious phenomena are plastic, and they can work as biological adaptations that are determined by current environmental conditions that can favor “caution or violence” at the level of intergroup competition (Bulbulia 2005, 92). A given religious content is affected by environmental factors (adaptation-like phenomenon), not by any cognitive models (by-products of cognition). Here I find useful the concept of co-evolution: when an ecological niche affects the evolution of given religious components, these new components

create the new environment that in turn causes selective pressure for new adaptations.

It is worth noting that the prosocial impact of religious beliefs is not evident and is under discussion in CSR (Oviedo 2015). In theory, religious beliefs exert a specific power to affect morally right patterns, because they evoke the existence of agents that have privileged access to human life and mind. The concept of an afterlife can transmit questions of reward and punishment to future reality (Bulbulia 2005) and in this way can strengthen hope and fear in the context of cooperation and defection. However, Norenzayan and collaborators find that religious beliefs probably are not sufficient to work alone as a unique, necessary, and sufficient source of prosocial patterns and cooperation. They point out that religious phenomena can interact randomly with other cultural tools (Norenzayan et al. 2016a; Norenzayan et al. 2016b).

Sosis rejects the main idea of the by-product approach that religious beliefs are produced by cognitive mechanisms, not evolved for religious purposes. He notes that an appropriate point of view should focus on the analysis of a religious system as a whole. This holistic approach toward complex religious system provides an opportunity to analyze religious systems as adaptations independent of the evolutionary origin of its particular features (Sosis 2009). Norenzayan does not accept this point of view. He argues that the basic functions of religious beliefs and religions are social, addressing anxiety and defection. These functions are provided by cultural evolution because the development of religion does not meet the criteria of natural selection. He interprets religion as a complex of culturally evolved phenomena rooted in psychological models. These nonreligious models are the background for the future evolution of different contents. He claims that religion is only one of the many cultural forms of reducing such negative feelings and states as “fear of death, loss of control, and the threat of social defection.” The universality of religious beliefs, despite cultural differences, is not proof of their adaptive nature in the sense of natural selection. Human psychology is looking for adaptive solutions which could be useful tools for reducing commonly shared negative emotions (Norenzayan 2010, 59–60).

## CONCLUSION

Many researchers in the field of CSR and the evolutionary study of religion claim that one of the main sources of misunderstandings and differing opinions is the misinterpretation of basic concepts like natural selection, adaptation, or adaptive traits. I turn to Darwin’s thoughts about higher social values like patriotism or fidelity. He interpreted them as tools favored by natural selection despite the absence of any direct connection with survival and reproduction:



A tribe including many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy, were always ready to aid one another, and to sacrifice themselves for the common good, would be victorious over most other tribes; and this would be natural selection. (Darwin [1874] 1896, 132)

Religious beliefs could be understood in a similar way. The core of this dispute between the by-product approach and the adaptationist theory lies in the following question: could the evolution of a large social group be possible without religious beliefs? This evolution could be impossible in the same way that it was made possible by religious beliefs and religions. For this reason, religious beliefs can be interpreted as adaptations specially designed by natural selection to realize particular social functions, despite natural selection's lack of consciousness or purpose. I suppose that religious beliefs and religion should not be interpreted in the same way as the white fur of a polar bear that is useful but not necessary for survival. I favor the approach that claims that religious beliefs were necessary for the evolution of humanity in the Holocene. I assume that the main function of religious components, being the in-group markers that are realized by religious behaviors, beliefs, and values, are products of natural selection and constitute a structural design feature (adaptation). The main function of this feature was providing cohesion, binding, and cooperation between unrelated individuals when biological tools like kin selection and direct reciprocity stopped working. In particular regions and epochs, religious components created ecological niches in which sometimes mercy and sometimes crusades and burning at the stake worked as adaptations to these niches.

It is worth bearing in mind that this approach is strictly dependent on environmental conditions, especially on conditions in particular epochs and regions. When considering an approach like David Sloan Wilson's, it becomes clear that Christianity today can functionally fit the criteria of adaptation in particular regions where a Christian minority is threatened. Examples could be found in Syria, Iraq, or Egypt. In the general sense, Christianity is not an adaptation at the group level, but in the case of particular groups these beliefs could be adaptations. Perhaps we should not interpret Christianity as an adaptation but assume that it can confer adaptedness (or adaptiveness) upon its members.

We can also consider the current function of Judaism as a belief system associated with patriotism, nation, and integrity. Another example is the case of Islam and its integrational and motivational power. It seems that the presence of religions and religious beliefs is not only an accidental by-product but the effect of design by natural selection which is still looking for the best belief system for enhancing the chances for survival and reproduction.

I believe that this evolutionary adaptationist account can work as an efficient way of building a bridge between religion and science. I mean that

evolution is not only a theory but also a fact (Dawkins 2009). CSR took an important step when it began to explain religious beliefs as a variety of normal human beliefs and as a result of normally functioning cognition. However, someone (especially a scientist) could ask what beliefs of this nature are for. If we take CSR's rejection of the functions of religious beliefs (as opposed to earlier naturalistic explanations like the Enlightenment philosophy of religion), the existence of religion itself seems strange and puzzling. A scientist, especially a naturalist, can feel strengthened in a negative or neutral attitude toward religion. Consequently, a cognitive explanation could present religion as some kind of aberration that may be necessary and common but not useful. I think that the evolutionary adaptationist account goes a step further because it can explain religious components as integral parts of a living world that were/are useful for survival and reproduction, like many other human and nonhuman biological phenomena. This account should be much more attractive for scientists who are not interested in religion than merely a cognitive explanation. I believe that the evolutionary adaptationist account is also more attractive from the theistic point of view. Indeed, the CSR approach does not exclude theistic interpretation. Aku Visala points out that CSR can even strengthen theism when it finds a natural tendency to belief or to acquire religious beliefs (some kind of cognitive *sensus divinitatis*) (Visala 2014). Nevertheless in any event, the adaptationist account can show that religious components have sense, are useful, and, perhaps, were necessary for the human transition from kin ties to the current level of large groups.

#### ACKNOWLEDGMENTS

I would like to thank Jay Feierman (University of New Mexico, retired) for all his useful comments, Melanie McConnell (University of Edinburgh) for her great contribution to this article, and Łukasz Cywiński and Olga Chernenko (University of Information Technology and Management in Rzeszów).

#### NOTES

1. Although I use the term "CSR," I am aware that it is not a single entity and everyone in this field can propose their own research approach to analyzing beliefs and behaviors in cognitive terms.
2. The question of the evolutionary study of religion in different fields is discussed in Voland and Schiefenhovel (2009).

#### REFERENCES

- Alexander, Richard. 2007. *Have God and Evolution Constructed Humans Jointly?* Unpublished manuscript.
- Ayala, Francisco J., and Robert Arp, eds. 2010. *Contemporary Debates in Philosophy of Biology*. Chichester, UK: Wiley-Blackwell.

- Ball, Philip. 2016. "How Human Sacrifice Propped Up the Social Order." *Nature* 4 April. doi:10.1038/nature.2016.19681
- Barrett, Justin L. 2007. "Cognitive Science of Religion: What Is It and Why Is It?" *Religion Compass* 1: 768–86.
- Barrett, Justin L., and Matthew J. Jarvinen. 2015. "Evolutionary Byproducts and *Imago Dei*." In *The Emergence of Personhood: A Quantum Leap?*, edited by Malcolm Jeeves, 163–83. Grand Rapids, MI: William B. Eerdmans.
- Barrett, Justin L., and Roger Trigg. 2014. "Cognitive and Evolutionary Studies of Religion." In *The Roots of Religion: Exploring the Cognitive Science of Religion*, edited by Roger Trigg and Justin L. Barrett, 1–16. Farnham, UK: Ashgate.
- Baumard, Nicolas, and Pascal Boyer. 2013. "Religious Beliefs as Reflective Elaborations on Intuitions: A Modified Dual-Process Model." *Current Directions in Psychological Science* 22: 295–300.
- Blume, Michael. 2009. "The Reproductive Benefits of Religious Affiliation." In *The Biological Evolution of Religious Mind and Behavior*, edited by Eckart Voland and Wulf Schiefen-hovel, 117–26. Berlin, Germany: Springer.
- Boyer, Pascal. 1994. *The Naturalness of Religious Ideas: A Cognitive Theory of Religion*. Berkeley: University of California Press.
- . 2003. "Religious Thought and Behaviour as By-Products of Brain Function." *Trends in Cognitive Sciences* 7(3): 119–24.
- . 2008. "Religion: Bound to Believe?." *Nature* 45(7216): 1038–39.
- . 2010. "Why Evolved Cognition Matters to Understanding Cultural Cognitive Variations." *Interdisciplinary Science Reviews* 35: 377–87.
- Boyer, Pascal, and Brian Bergstrom. 2008. "Evolutionary Perspectives on Religion." *Annual Review of Anthropology* 37: 111–30.
- Bulbulia, Joseph. 2005. "Are There Any Religions? An Evolutionary Exploration." *Method and Theory in the Study of Religion* 17: 71–100.
- Bulbulia, Joseph, and Marcus Freen. 2009. "Religion as Superorganism: On David Sloan Wilson. *Darwin's Cathedral* (2002)." In *Contemporary Theories of Religion: A Critical Companion*, edited by Michael Stausberg, 173–94. Abingdon, UK: Routledge.
- Burian, Richard, M. 2010. "Selection Does Not Operate Primarily on Genes." In *Contemporary Debates in Philosophy of Biology*, edited by Francisco J. Ayala and Robert Arp, 141–64. Chichester, UK: Wiley-Blackwell.
- Crespi, Bernard, and Kyle Summers. 2014. "Inclusive Fitness Theory for the Evolution of Religion." *Animal Behaviour* 92: 313–23.
- Cruz, Helen de, and Ryan Nichols. 2016. *Advances in Religion, Cognitive Science, and Experimental Philosophy*. London, UK: Bloomsbury.
- Cruz, Helen de, and Johan de Smedt. 2015. *A Natural History of Natural Theology: The Cognitive Science of Theology and Philosophy of Religion*. Cambridge, MA: MIT Press.
- Darwin, Charles. [1874] 1896. *The Descent of Man, and Selection in Relation to Sex*. Second edition. New York, NY: D. Appleton.
- Dawes, Gregory W., and James Maclaurin, eds. 2013. *A New Science of Religion*. New York, NY: Routledge.
- Dawkins, Richard. 2009. *The Greatest Show on Earth: The Evidence for Evolution*. Chatham, UK: Bantam Books.
- Dow, James. 2008. "Is Religion an Evolutionary Adaptation?" *Journal of Artificial Societies and Social Simulation* 11(2). <<http://jasss.soc.surrey.ac.uk/11/2/2.html>>
- Feierman, Jay R. 2009. "How Some Major Components of Religion Could Have Evolved by Natural Selection" In *The Biological Evolution of Religious Mind and Behavior*, edited by Eckart Voland and Wulf Schiefen-hovel, 51–66. Berlin, Germany: Springer.
- Feierman, Jay R., ed. 2011. *The Biology of Religious Behavior: The Evolutionary Origins of Faith and Religion*. Santa Barbara, CA: Praeger/ABC-CLIO.
- Ferretti, Francesco, and Ines Adornetti. 2014. "Biology, Culture and Coevolution: Religion and Language as Case Studies." *Journal of Cognition and Culture* 14: 305–30.
- Futuyma, Douglas J. 2009. *Evolution*. Sunderland, UK: Sinauer.
- Garson, Justin. 2015. *The Biological Mind: A Philosophical Introduction*. New York, NY: Routledge.

- Hamilton, William J. 1964. "The Genetical Evolution of Social Behavior." *Theoretical Biology* 7(1): 1–16.
- Irons, William. 2008. "Why People Believe (What Other People See as) Crazy Ideas." In *The Evolution of Religion: Studies, Theories and Critiques*, edited by Joseph Bulbulia, Richard Sosis, Erica Harris, Russell Genet, Cheryl Genet, and Karen Wyman, 51–60. Santa Margarita, CA: Collins Foundation Press.
- Johnson, Dominic. 2016. *God Is Watching You: How the Fear of God Makes us Human*. Oxford, UK: Oxford University Press.
- Johnson, Dominic D. P., H. Lenfesty, and Jeffrey P. Schloss. 2014. "The Elephant in the Room: Religious Truth Claims, Evolution and Human Nature." *Philosophy, Theology and the Sciences* 1(2): 200–31.
- Jones, James W. 2016. *Can Science Explain Religion? The Cognitive Science Debate*. Oxford, UK: Oxford University Press.
- Jordan, Jillian J., Moshe Hoffman, Martin A. Nowak, and David G. Rand. 2016. "Uncalculating Cooperation Is Used to Signal Trustworthiness." *Proceedings of the National Academy of Sciences of the United States of America* 113(31): 8658–63.
- Kirkpatrick, Lee A. 2006. "Religion Is Not an Adaptation." In *Where God and Science Meet*, edited by Patrick McNamara, vol. 1, 159–80 London, UK: Praeger.
- Kundt, Radek. 2015. *Contemporary Evolutionary Theories of Culture and the Study of Religion*. London, UK: Bloomsbury.
- Lewontin, Richard C. 1974. "The Analysis of Variance and the Analysis of Causes." *American Journal of Human Genetics* 26: 400–11.
- Marsh, Jason. 2016. "Introductory Remarks to the Topical Issue 'Cognitive Science of Religion'." *Open Theology* 2: 133–34.
- McCauley, Robert. 2011. *Why Religion Is Natural and Science Is Not*. Oxford, UK: Oxford University Press.
- Norenzayan, Ara. 2010. "Why We Believe: Religion as a Human Universal." In *Human Morality and Sociality: Evolutionary and Comparative Perspectives*, edited by Henrik Høgh-Olesen, 58–71. Basingstoke, UK: Palgrave Macmillan.
- . 2013. *Big Gods: How Religion Transformed Cooperation and Conflict*. Princeton, NJ: Princeton University Press.
- Norenzayan, Ara, A. F. Shariff, W. M. Gervais, A. K. Willard, R. A. McNamara, E. Slingerland, and J. Henrich. 2016a. "The Cultural Evolution of Prosocial Religions." *Behavioral and Brain Sciences* 39: 1–19.
- . 2016b. "Authors' Response: Parochial Prosocial Religions: Historical and Contemporary Evidence For a Cultural Evolutionary Process." *Behavioral and Brain Sciences* 39: 43–55.
- Oviedo, Lluís. 2015. "Religious Attitudes and Prosocial Behavior: A Systematic Review of Published Research." *Religion, Brain and Behavior*. doi: 10.1080/2153599X.2014.992803
- Perlman, Mark. 2010. "Traits Have Evolved to Function the Way They Do Because of a Past Advantage." In *Contemporary Debates in Philosophy of Biology*, edited by Francisco J. Ayala and Robert Arp, 53–71. Chichester, UK: Wiley-Blackwell.
- Pyysiäinen, Ilkka, and Marc Hauser. 2010. "The Origins of Religion: Evolved Adaptation or By-Product?" *Trends in Cognitive Sciences* 14(3): 104–09.
- Richerson, Peter J., and Leslie Newson. 2008. "Is Religion Adaptive? Yes, No, Neutral, but Mostly, We Don't Know." In *The Evolution of Religion: Studies, Theories and Critiques*, edited by Joseph Bulbulia, Richard Sosis, Erica Harris, Russell Genet, Cheryl Genet, and Karen Wyman, 51–60. Santa Margarita, CA: Collins Foundation Press.
- Richert, Rebekah A., and Erin I. Smith. 2009. "Cognitive Foundations in the Development of a Religious Mind." In *The Biological Evolution of Religious Mind and Behavior*, edited by Eckart Voland and Wulf Schiefelhovel, 181–94. Berlin, Germany: Springer.
- Rossano, Matt J. 2006. "The Religious Mind and the Evolution of Religion." *Review of General Psychology* 10: 346–64.
- Sanderson, Stephen K. 2008. "Adaptation, Evolution, and Religion." *Religion* 38: 141–56.
- Sosis, Richard. 2009. "The Adaptationist-Byproduct Debate on the Evolution of Religion: Five Misunderstandings of the Adaptationist Program." *Journal of Cognition and Culture* 9: 315–32.

- Sterelny, Kim, Richard Joyce, Brett Calcott, and Ben Fraser, eds. 2013. *Cooperation and Its Evolution*. Cambridge, MA: MIT Press.
- Turner, Léon P. 2014. "Introduction: Pluralism and Complexity in the Evolutionary Cognitive Science of Religion." In *Evolution, Religion, and Cognitive Science: Critical and Constructive Essays*, edited by Fraser Watts and Léon P. Turner, 1–20. Oxford, UK: Oxford University Press.
- Visala, Aku. 2014. "The Evolution of Divine and Human Minds: Evolutionary Psychology, the Cognitive Study of Religion and Theism." In *Evolution, Religion, and Cognitive Science: Critical and Constructive Essays*, edited by Fraser Watts and Léon P. Turner, 56–73. Oxford, UK: Oxford University Press.
- Voland, Eckart. 2009. "Evaluating the Evolutionary Status of Religiosity and Religiousness." In *The Biological Evolution of Religious Mind and Behavior*, edited by Eckart Voland and Wulf Schiefenhover, 9–4. Berlin, Germany: Springer.
- Voland, Eckart, and Wulf Schiefenhover, eds. 2009. *The Biological Evolution of Religious Mind and Behavior*. Berlin, Germany: Springer.
- Watts, Fraser, and Léon P. Turner, eds. 2014. *Evolution, Religion, and Cognitive Science: Critical and Constructive Essays*. Oxford, UK: Oxford University Press.
- Watts, J., O. Sheehan, Q. D. Atkinson, J. Bulbulia, and R. D. Gray. 2016. "Ritual Human Sacrifice Promoted and Sustained the Evolution of Stratified Societies." *Nature* 532(7598): 228–31.
- Wenegrat, Brant. 2010. "Evolutionary Psychiatry: Mental Disorders and Behavioral Evolution." In *Human Evolutionary Biology*, edited by Michael P. Muehlenbein, 551–65. Cambridge, UK: Cambridge University Press.
- Wilkins, John S., and Paul E. Griffiths. 2013. "Evolutionary Debunking Arguments in Three Domains: Fact, Value, and Religion." In *A New Science of Religion*, edited by Gregory W. Dawes and James MacLaurin, 133–46. New York, NY: Routledge.
- Wilson, David Sloan. 2002. *Darwin's Cathedral: Evolution, Religion, and the Nature of Society*. Chicago, IL: University of Chicago Press.
- . 2015. *Does Altruism Exist?* New Haven, CT: Yale University Press.
- Wilson, David S., and William S. Green. 2007. *Evolutionary Religious Studies (ERS): A Beginner's Guide*. Unpublished draft manuscript.
- Wilson, E. O. 1998. *Consilience: The Unity of Knowledge*. New York, NY: Alfred A. Knopf.
- Wunn, Ina, and Davina Grojnowski. 2016. *Ancestors, Territoriality, and Gods: A Natural History of Religion*. Berlin, Germany: Springer.