

Articles

IS A COMPLETE BIOCOGNITIVE ACCOUNT OF RELIGION FEASIBLE?

by Lluís Oviedo

Abstract. The biological and cognitive approach to religion has matured somewhat and reveals interesting results. Nevertheless, some questions arise about its foundation and development. The essay offers a review of current research in the cognitive field, focusing on its conclusions, the internal discussions, and the problems that need more study or correction. Emphasis is placed on a more intricate account of the factors involved in religious experience, discussing the proper use of the discoveries of biocognitive research and the limits that should be placed on said conclusions.

Keywords: biology of religion; cognitive science; limits of science; religion and science; religious mind; religious studies

The title of this essay may seem pretentious, because completeness is a goal that even mathematics cannot achieve (at least after Kurt Gödel), let alone new sciences such as evolutionary psychology and cognitive science, which have many methodological problems and whose status as sciences is disputed. In a strict sense, completeness is an unattainable goal, perhaps too idealistic and off course at a time when science is becoming more humble and aware of its limitations and less prone to search for unified theories that can cover all aspects of reality or offer a complete account of at least one sector.

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The question is better understood on a more superficial level: Can biological and cognitive science render a satisfactory explanation of the human phenomenon of religious behavior without resorting to extranatural elements? If so, such an explanation should be able to meet the requirements characteristic of any other scientific approach—that is, being able to predict the evolution of religion, providing enough evidence for any advanced thesis, and at the same time outweighing other available theories—phenomenological ones, for example—about the meaning of religion. These conditions seem better adapted to the nature of scientific activity; indeed a more nuanced understanding of such tasks could deflect the greatly exaggerated expectations that sometimes arise in the field, which are not very helpful for the cause of the advancement of science. If it is to gain the favor of intellectual opinion, a scientific account of religion should require no more—and no less—than to meet the above-described conditions.

At the core of such an endeavor it is easy to devise a program that can be summarized as “naturalizing religion” or “disenchanted” it (Martin 2004). Such a program intends to offer a theory able to explain any dimension of religion as being only a natural disposition of the human mind and of social interaction without resorting to supernatural realities or transcending the realm of the material world. Yet this is a matter of contention. The question arises whether the goal of science is necessarily best identified as a complete naturalization of any subject under its scrutiny and whether one can make science admit transcendent causes or at least refuse a complete closure of the cognitive space within the limits of sheer materialism. The cognitive study of religion sets a clear test in order to verify the ability of science to exhaust such a subject. That attempt should check for the presence of insurmountable points, or holes in the explanation, and decide whether it is instead desirable to accept a statute of limitations in the scientific elaboration of such a subject.

Alertness to this may be best expressed at a trivial level. For example, in the case of the scientific study of music and musical perception, the knowledge obtained is not the same as the feeling or complex experience elicited by listening to, say, a Mozart symphony. Gaining some access to such an experience requires some sort of special hermeneutics, or aesthetics. By the same token, even if a complete knowledge of the psychosomatic mechanisms involved in romantic love were feasible, it could not take the place of the real experience and its significance for the persons feeling it. The psycho-evolutionary approach to the study of romantic love does not claim to decree the end of such an experience as simply an epiphenomenon of reproductive and mating strategies that have been codified during a long process of adaptive evolution.

In a similar way, even if science were to reach its objective of describing well the natural process involved in the origin and evolution of religion, it would not then intend to put an end to religion as a sheer epiphenomenon

of adaptive mechanisms in the personal and social realm. Presenting the argument in more technical terms, the scientific appropriation of a subject of study, and the identification of its elements, evolution, and internal dynamics, does not indicate its suppression or complete displacement from a social sphere of action, and the acquired knowledge justifies neither invading a different social system nor imposing on it a new logic (Luhmann 1990, 300). The interactions between diverse social systems—science and politics, affectivity, art or religion—raise the hermeneutical question of how to understand the results and progress of the new biocognitive science of religion. I propose a double hermeneutic—one placed inside the scientific realm and a second inside a religious tradition with an elaborate reflexive dimension or theology, which answers questions of a different kind (Haught 2006).

The point of view adopted to tackle this hermeneutical difficulty presupposes the overcoming of the assumed isolation of science, viewing it as a human and social activity closely related to other factors and variables, whose results are susceptible to being interpreted in different ways or to being appropriated by different agents with their own program—science being inevitably called to “negotiate” its results with other discourses and cultural settings (Campbell et al. 2002).

In this article I aim to review the actual state of research and show the achievements and the limitations of the cognitive attempt to understand religion in order to take stock of the present situation and address the underlying goal of the project. Two separate steps are proposed: to review the achievements and limitations of the present state of the field of study, and to identify specific points that require deeper reflection. At the same time, I intend to reopen the hot issue of the relationship between the so-called scientific and theological approaches to religion. Traditionally, the former has been characterized as more objective, value-free, and disengaged, while the latter has been perceived as more hermeneutic (as long as it depends on texts and traditions), value-laden, and clearly engaged. I agree on this point with several authors who affirm that this is not just a methodological question (McCutcheon 2001; Martin 2004) but also a political and cultural one. In short, the debate between science and theology is value-laden, and so it requires a broader hermeneutic that allows for a better understanding of the relationship between the two approaches, or at least a conversation pointing to a form of agreement or distribution of the field. Surely a kind of theory *super partes*, neutral and able to referee the role of each discipline, is lacking. It is hoped that science will at least not try to be both player and referee in the ongoing discussion and that a just role will be ascribed to other disciplines that traditionally have dealt with religion and that are invested with some degree of “wisdom,” or at least a long experience in the subject, and hence are better suited to a conversation with the disciplinary newcomers.

As a professional theologian, I consider myself entitled for the present endeavor. My approach to cognitive theory is rather different from the usual among anthropologists, the main practitioners of the new discipline. Nevertheless, my position qualifies me to observe and relate what is going on in this field.

UNCERTAIN ACHIEVEMENTS AND WORK IN PROGRESS

The project of a biocognitive science of religion is maturing and gathering consensus among its practitioners, a result that invites a better codification of the anthropological dynamics governing religious processes. We can identify many factors contributing to the origins and configuration of religious ideas, their expansion and pervasiveness among all human cultures. A kind of common mental mechanism allows for the processing of information by a "religious mind," involving several faculties: memory, reasoning, feeling enhancement, communication, and so on. The new knowledge clearly has an interdisciplinary orientation and involves sciences other than evolutionary biology and cognitive psychology such as anthropology, philosophy, linguistics, history, and sociology. All of these disciplines work together to better explain the very complex phenomenon of religious behavior.

The present situation, however, calls for a review of these achievements under a more critical eye and the taking into account of unresolved problems that arise in the ongoing research. The first questions that arise concern preexisting doubts (prior to the start of the project) and some general and methodological matters: the pending limitations of evolutionary theory to explain every dimension of human behavior; the recognized inability to give a satisfactory explanation of certain dimensions of the human mind closely related to religious experience, such as consciousness and intentionality; the very controversial nature of some concepts frequently rehearsed, such as the modular mind or the evolutionary adaptive schemes; the excessive number of variables involved in religious experience that renders its explanation an intricate task; and the difficulty of resolving the dualism between subjective religious experience and the attempt to provide an objective account (Oviedo 2006).

Besides these general questions, other problems emerge from the available theories dealing with religious phenomena. The degree to which the nature of religious ideas is adaptive is still an open question. The relationship between innateness and acquisition of such ideas is problematic. The role played by emotion or feeling, and how it interacts with cognitive representations, is far from clear. There is a lack of empirical evidence of the cognitive templates underlying religious schemas. Whether and by what mechanism religion plays a role in allaying the fear of death is not well known. Unresolved factors govern the ontogenetic evolution of religious concepts and views.

Despite all of these unsolved difficulties, it is beyond question that trying to better understand the biocognitive dynamics of religion has yielded many interesting fruits that are useful even to religionists and theologians and that the path followed thus far is promising and should be pursued. The problem, as I see it, is that all of these strengths could be more prolific if certain distinctions were maintained and if scientific efforts were confined to their area of expertise and avoided moving beyond this field to invade other areas. Science should rather try to do that for which it is best suited.

THE RESULTS SO FAR. After fifteen years of research in the field, it is fitting to summarize the achievements that have been gathering greater consensus. Prior to entering into a concrete analysis, however, I want to mention that the biocognitive study of religion has restored a new interest in religion as an object of study. I deem the tendency especially relevant at a time when more sociologists show strong secularizing tendencies that leave religion progressively further outside the general interest of politics, culture, and science. Some may take this as a kind of countertrend, in the sense that religion deserves a greater interest from science, provided it becomes less culturally relevant and socially influential. Others may interpret the trend as a typical symptom of product shortage. While an item is abundant and generally accessible, it remains less interesting; only when it becomes scarce and hard to find (clean air, oil, family stability) does it attract the attention of scholars. Religion has become scarce in recent years, at least within more advanced societies; therefore, it is not unusual that the situation should attract the attention of scientists who try to deal with the real, scientific meaning of religion, its reach, and ultimately the possibility of supplanting it with other means or agencies. In a paradoxical way, the general pervasiveness of religion is better observed when it loses status and social relevance. This statement preempts the hermeneutic question that I intend to reserve for the end of our inquiry but nonetheless helps to frame the meaning of the research to date.

What follows is an attempt to gather the results from the most relevant contributions in the ongoing research by various authors and from differing strategies into a kind of mosaic, forming a global theory.

1. The mainline research in the field of the biocognitive science of religion has established that religious behavior constitutes a natural phenomenon derived from biological and social abilities and supported by a structure of the human mind, which renders it viable and effective (Barrett 2004, 75–93). Naturalness, however, does not necessarily mean utility. At this early stage, the research splits into two different parties: the *adaptationist*, which maintains that religion has arisen and evolved because it improves survival chances in some measure (Dow 2006; Bulbulia 2006; Bering 2006a; Sjöblom 2007), and the *by-product theory*, which states that religion is just

an epiphenomenon of the evolution of other mental faculties that deal with different problems (Boyer 2001; Atran 2002; Kirkpatrick 2006). This split is fundamental and determines all further research strategies.

2. Adaptationists resort to different strategies in order to explain the success of religion and its pervasiveness in all human societies. Among the most quoted is that religion becomes a system of “costly signaling” that prevents cheating and increases solidarity or group cohesiveness (Sosis and Alcorta 2003; Sjöblom 2007; Dow 2006; Bering 2006a, b). Other “utilities” may be found, for example, as a kind of “healing mechanism” (Bulbulia 2006), and at the level of group selection, contributing to collective fitness (Wilson 2002), but here the issue is much disputed.

3. Scholars who claim that religion is just a by-product try to reconstruct the mental makeup and the anthropological conditions of human nature. According to this approach, functional explanations fail to meet the conditions of religious acquisition and expansion (Atran 2002, 717f.; Boyer 2001, 10ff.). What is necessary is the identification of mental structures and social processes that allow for a certain kind of belief and behavior. As Pascal Boyer puts it, “Religion concepts are probably influenced by the way the brain’s inference systems produce explanations without our being aware of it” (2001, 18). Indeed, forms of strong religious commitment sometimes challenge the sheer functional approach, as it requires sacrifices and costs beyond any rational account of benefits (Atran and Norenzayan 2004, 759f.). It is thought that the formation of religious concepts is therefore governed by unconscious dynamics and happens inside modules of the human mind specializing in survival-related activities, such as the agency-attribution mechanism and the theory of mind. Religious ideas arise as an unintended consequence of the functioning of these cognitive systems. Theories of “memes” and “epidemiology of ideas” help to explain the diffusion of such ideas despite their inutility.

4. Religion is a phenomenon common to all human societies beyond the differences arising from diverse religious cultural expressions. Being a natural predicament deeply rooted in the constitution of the human mind, its nature is better understood when compared with language, which is a common personal ability giving expression to many different tongues but with a deeply shared structure (Bulbulia 2005). From the biocognitive point of view, we are able to identify the deep structures common to all religious forms in human societies: All share a similar pattern, which can be explained with the help of scientific scrutiny.

5. The religious-cognitive pattern requires at least: (a) belief in supernatural agents; (b) some degree of counterintuitiveness in the way such agents are conceived and behave; (c) a causal schema of agency linking current life affairs and the role played by supernatural agents; (d) some primers to prompt religious mechanisms, feelings, or explanations, such as fear of death and certain emotions; (e) the ability of religious ideas to ad-

just to preexisting templates of the mind; and (f) the ability to memorize these ideas and to transmit them unchanged.

6. A central but contended issue in the by-product theory is that religious ideas are the outcome of an evolutionary process that has selected among many variants those that seem better adapted. I use *adapted* here in a rather different way than previously; it is not that religion improves survival but rather that religion—the individual religions that have survived—has adapted to the human mind and to the social structure, perhaps in a “parasitic” way (Dawkins 2003, 117f.). It means simply that the development of religious forms is governed by evolutionary dynamics, as happens in many other realms. The criteria of adaptation may sound tautological, as happens in many descriptions of evolutionary processes, but they are worthy of mention. It seems that, first, religious ideas survive and expand when they are well adapted to the cognitive constraints of the human mind, especially to memory and imaginative faculties, so ideas that are too costly or require too much cognitive strength probably will not survive in the long run (Whitehouse 2004, 49–59). By the same token, they should be suitable to the ontogenetic evolution of the infantile mind. Second, they should be adapted to social conditions of acquisition and transmissibility; consequently, religious ideas that are too hard to teach or to remember will disappear. It may be added (though this is disputed) that they should fulfill some personal and social functions better than their alternatives—for example, allaying anxiety, supporting nonkin altruism, or consolidating social coalitions. In this construct, rituals play a central role in mediating and enforcing religious responses (Lawson and McCauley 1990).

7. Other studies show intrinsic dynamics of religious knowledge. A good example is the distinction between “costly” and “optimal” forms of religion and the consequent tendency of costly religious forms to “decay” toward optimal or easier forms. The distinction helps to classify religious models, depending on whether a more doctrinal or a more imaginistic structure is adopted, to specify the advantages and costs of every model and to trace the evolution and changes inside every tradition (Whitehouse 2004, 129ff.). The theory implies a better account of the role played by rituals and other forms of religious enhancement (Lawson and McCauley 1990) and a more thorough understanding of the tendencies to “religious incorrectness” (Barrett 1999; Slone 2004) too often present even in the more sophisticated religious forms. All of this allows for a better knowledge of the dynamics presiding religious elaboration and processing, which frequently does not follow the logical paths described by its internal code—for example the Christian doctrine. Beliefs often are subjected to cognitive constraints working at an unconscious level. This could explain phenomena of “religious regression” or “spiritual laxity.”

The biocognitive study of religion provides much more than this. For example, there is an ongoing exciting discussion about how the adaptive

capacity of religion can be understood, under what conditions religion imposes costs that outweigh the benefits, and which are the concrete modules involved and which the “elementary” templates of religious thinking. Furthermore, some analyses have pointed to the central role played by the ability of metarepresentation in the qualification and fixation of religious ideas (Pyysiäinen 2004). It seems that, in broad terms, we are approaching quite a good picture of how the religious mind works, how it processes its relevant information, and even what neural areas and cognitive functions are involved in such a task (Saver and Rabin 1997; Azari et al. 2001). Even if the present situation can be described only as a work in progress, the general impression is that the accumulated evidence indicates how religious experience is enhanced, constrained, and channeled by our mental architecture and how it follows the processing logic at work in the normal functions of the human brain. It helps to better understand many religious forms and experiences and to identify their dynamics in the phylogenetic and ontogenetic evolutionary paths.

The new stream of information is useful for the many disciplines involved in the study of religion, even for philosophical and confessional theology; these data are increasing our knowledge of the religious experience. Here ends the positive and constructive part of this review.

THEORETICAL PROBLEMS AND AREAS IN NEED OF FURTHER INVESTIGATION. A correct appraisal of the new biocognitive science of religion requires an awareness of the limitations and blind spots of this evolving knowledge, which needs further development through critical assessment. There is no lack of criticism confronting the new propositions. Perhaps the difficulty is to organize all that has been said and written about the new paradigm in the scientific study of religion. We begin here with general questions concerning the more axiomatic principles or the theoretical foundations of this paradigm and continue with more detailed questions related to parallel research and to attempts at tackling the mysteries of human cognition and religious experience.

The purpose of this section is not to refute the entire project but to assess its merits more thoroughly and to address further research aimed at strengthening its weak parts. Moreover, as acknowledged above, a more careful assessment should allow for a better qualification of the theory so that it could be conveniently adopted by both the scientific and the theological viewpoint.

General Questions about Theoretical Foundations. Concerning the general axiomatic underlying the biocognitive science of religion, several doubts that call for a resolution have been raised in the last few years. First, many have challenged evolutionary theory (as it is commonly understood) and the way in which it applies to the human race. Critics remind us that

adaptation does not offer sufficient explanation of how something in the human frame functions, or even of what that something is (Dupré 2001, 82ff.; O’Hear 1997). The ongoing discussion is more concerned with the extent to which the evolutionary criteria of adaptation and selection can be used, especially when human nature and faculties are involved (as seems to be the case with cognitive functions). Thus far, the dispute remains unresolved, and a greater restraint is advisable in the application of such axioms, which should retain a more hypothetical status.

In defense of the new paradigm one could say that many of its main advocates oppose a view of religion as adaptation. As has been shown, this line of thought considers religion as an epiphenomenon—almost an accident in the evolutionary process. But this is not the point, because the entire theoretical context continues to be strongly evolutionary, and only in this context would such a qualification—or rather disqualification—be meaningful. The question is, first, whether evolutionary theory can still work as an omnicomprehensive pattern, a sort of “universal acid” (Daniel Dennett) capable of explaining everything that exists in the biological world when it is assumed that some features arise apart from adaptive-selective constraints; and, second, whether, as a consequence, some features of human behavior are better understood outside of this evolutionary model.

It should be taken into account that evolution may operate at different levels—genetic, individual, group, species—so placing religion into evolutionary dynamics requires a broader perspective, as David Sloan Wilson (2002) suggests, showing how religion improves the adaptive conditions of some populations, not just of individuals.

The cognitive paradigm is under critical scrutiny as well. From a rather philosophical point of view, some authors have illustrated the futility of a project trying to reduce the mind to a material entity; they claim that in the long run such a project misses the “real thing” (Cimatti 2004). Furthermore, it is not an easy task to conceive how the mind really works, so the simple computational models of the first attempts of cognitive science have been the object of much revision. In the last years more complex models have been introduced, which comprise dimensions such as fuzziness, holism, and interconnectedness, among others. New paradigms of cognition are arising that are better able to satisfy some essential requirements of the phenomenological mind. In any case, we are probably still far from a more satisfactory representation of human thought.

Problems with the Modular Mind. An example of this kind of revision concerns the modular model of mind, a model that is at the core of some versions of the cognitive approach to religion. Recently David Buller published an extensive study (2005) showing the main limitation of this approach: the lack of evidence for the existence of “specific domains” evolved to solve specific problems or to manage concrete survival tasks. The author

highlights a significant number of studies dismissing such an assumption. Among the scholars who subscribe to this criticism (Panksepp and Panksepp 2000; Atkinson and Wheeler 2004), perhaps the most vocal and destructive is still Jerry Fodor, who had been one of its first supporters, at least concerning the perceptual mind. He emphatically states his criticism in the title of one of his books: *The mind doesn't work this way* (Fodor 2000), in which he suggests that any syntactic mind model resorting to modular architecture is unable to solve the “frame problem” or the need to “abduct” the environmental conditions into the computational model because of their holistic dimension (p. 38). Of special interest is his warning about the error of linking cognition to the fixation of true beliefs (p. 68).

This second criticism undermines the scope of a theory based on the existence of specific domains and the almost parasitic character of religious belief. Religious ideas can perhaps be better understood independently of that theoretical framework and more in accordance with an open-ended representation of mind functions and of the ability to refer to external holistic conditions instead of very specific items. The problem presented by Fodor—that a modular schema of mind requires a kind of “central processor” or a “basic running program”—introduces a further factor of uncertainty especially relevant for the understanding of religious cognition. As is well known, the experience of radical religious conversion may be seen as a kind of change in the entire processing schema, a replacement of the “basic program.”

An Absent Self. A third a priori question has to do with the general difficulty cognitive science has in tackling the experience of consciousness and, from a methodological point of view, in linking the first- and third-person accounts of such an experience. From my point of view this limit is relevant to the subject at hand, the religious experience, because both religious and conscious experience are involved in the same pattern and share similar conditions. There is already a kind of alternative tradition in the field of consciousness studies that resorts to phenomenology and other kinds of new approaches to the subjective experience—consciousness is by definition subjective—trying to integrate it in the more objective account (Varela and Shear 1999). The general impression is that what emerges from these attempts is a different form of theory and not just traditional science, which perhaps is called to acknowledge its limitations.

Wanting to gain access to religious experience but at the same time neglecting its subjective dimension seems bold and insensitive, at least; nevertheless, this has been the approach among many practitioners of the new paradigm. However, a minority criticize this lack of consideration of the role of the conscious mind in the formation and persistence of religious beliefs. These complaints are more common among adaptationists. Jesse Bering, for example, states, “What is required to bridge this gap [between

the representation of supernatural concepts and the Darwinian currency of behavior] is the self, a conspicuously absent entity in the cognitive science of religion” (Bering 2006b, 460; Dow 2006, 84). Indeed, almost all of the studies in the field ignore the problem of the subjective (and therefore conscious) dimension of religion as an experience of even deeper awareness, a dimension the many religious traditions evidence. Such a result is quite surprising if we look at the general field of cognitive science, where no one would ignore the reach and the challenges that the experience of consciousness presents to any attempt to fix the human mind.

Looking at the present panorama of consciousness studies, several different positions are apparent, with direct relevance to the cognitive study of religion. At one extreme, some authors simply deny the entity of consciousness, which they reduce to an epiphenomenon (Dennett 1991). At the opposite end, many others defend its reality as a special dimension that gives us humans a different stance and a particular way of living in the world that is characterized by a sense of freedom and of strong personal identity. In other cases, the role of consciousness is stressed when the evolution of the mind is conceived as more dependent on “external processing units” and the use of symbols (Donald 2001). As a consequence, the most notable biocognitive representations of religion should be related to the most prominent approaches to consciousness. I suspect that some of the standard proposals, especially in the by-product party, run along the same lines as the eliminationist model, even if, as in the case of Dennett’s approach to religion, the question remains rather undecided (Dennett 2006).

If a significant correlation may be proven between the cognitive theories of religion and those of consciousness, a greater pluralism should be admitted in accordance with the several ways of conceiving consciousness; furthermore, a reductionist view could underpin some other possibilities more akin, for example, to a substantial version of consciousness and the respective role played by the first-person approach. In any case, if consciousness is acknowledged as a real predicament of the human mind and as playing a decisive role, religion should also be conceived as being constrained and channeled by the conscious mind and not only by unconscious deep mechanisms.

Too Few or Too Many Variables? The fourth preliminary question concerns another methodological point, namely, the need to consider so many variables in order to provide a more accurate model of what religion is and how it works. In my opinion, the biocognitive description of religion should take into account at least the following dimensions involved in channeling religious experience: a processor device able to attribute agency, linking effects to causes; memory or capacity to store relevant information; arousal mechanisms linked with feelings and emotions; linguistic and communicative skills to transmit and gather information; the mastery of

body expression and ritual language; imagination or “ability to think about fictional worlds” inside a “meta-representation mechanism”; a capacity for symbolism; and the reflexivity of consciousness guiding further development of a religious mind. The observation should at the same time distinguish between conscious and unconscious mechanisms, distributing the diverse functions concurring in the religious experience at the different levels of awareness. Furthermore, it seems naive to ignore the external dimension or the need to relate to factors outside the mind—familiar and cultural—in order to process an amount of relevant information. Finally, the research should not ignore the ontogenetic process of development of religious ideas, which explains the difference between the diverse stages of religious reasoning as a child grows into adulthood.

In short, the religious experience involves a number of factors that render it quite complex and hard to manage with or reduce to a simple schema. Certainly, just as science proceeds in other contexts, in this case also it should consider only a few variables at a time in order to look for correlations and causal links, keeping the rest under the methodological condition of *ceteris paribus* (all else being equal). A similar approach in many other areas of science does not appear to impede research. However, one must guard against the tendency to reduce the number of variables excessively in such a complex anthropologic problem. Higher complexity is a human predicament, more apparent in the study of the mind, and one that makes the distinction clear between humans and other animals. Concerning the study of religion, the awareness of such high levels of complexity should prevent too hurried a reduction and help to keep a broader view. The deeper question, whether it is possible to engage in a science without a sufficient reduction in the number of variables concurring in its object of study, should not justify a sacrifice of the other factors involved in it. The question rather suggests the need for a more interdisciplinary and dialogic enterprise and for a scientific method able to integrate other forms of understanding human nature. This seems the only way to ensure good science.

How Innate Is Religion? One of the main questions that still haunt the scientific study of religion is the possibility of determining its innateness and the extent to which it is influenced by environmental factors. This basic discussion must surely precede its concrete application to the biocognitive study of religion or at least offer a good case study for testing the theoretical frame. In broad terms, more of the opinions under scrutiny support some kind of innatist view. Usually cognitivists and evolutionists try to integrate more mental phenomena, such as language, into an innate schema (Pinker 1994). Religion should be no exception. The mental structures channeling religious perception and reasoning are, in the opinion of some authors, similar to the innate structures of language (Bulbulia 2005; Bering 2006a). In my view, innatism is more congenial to the adaptationist

party. The by-product party (also called spandrelist) presupposes some innate structures, but in a different or weaker sense that simply assumes the presence of ground mental structures that offer the occasion for religious concepts to “hook up” in a derivative form. Indeed, when more weight is given to epidemic processes and memes, the less religious ideas seem innate (Markusson 2007).

In any case, a more nuanced view should take into account the complexity of evolutionary processes, as already said. These happen at probably four different levels (Jablonka and Lamb 2005). Integrating innate and environmental factors seems to be a difficult and still desirable task for many who claim a balance with the externalist position (Baltes, Reuter-Lorenz, and Rosler 2006; Wilson 2004). The question remains how open the innatist model is to a more balanced insight of the factors that shape religious experience at the current stage in the scientific study of religion.

There are several attempts at revising too strong a concept of innateness. Some mature studies advocate that a revision of the modular model, less linked to the innate constitution of mind than to interaction and learning, should be integrated in the schema of religious cognition (Elman et al. 1998; Pyysiäinen 2001, 207ff.). A second way to assess the reach of the innate religious ideas has been proposed as a result of the psychological empirical research of Olivera Petrovich (2005), who states the existence of “core religious concepts” in a way that subverts the standard theory, as such concepts appear to be more central and less derivative in the child’s mind, thereby simply allowing for transcendence of the natural conditions and limits. Nevertheless, the most incisive and interesting suggestions come from two different directions: the external reference of mind computing task and the ontogenetic study of religious development.

Approaches to religious formation also challenge the standard model and try to broaden the spectrum of dimensions there involved. Starting from a theory of language formation, as given by Terrence Deacon, Van J. A. Slyke considers that the formation of religious ideas necessarily resorts to “external processing units” and “external memory,” an articulated religious language or tradition, that has become a “user-friendly interface” able to redesign one’s own religious ideas and to help to cope with vital issues in the same way that language becomes a user-friendly interface in the learning process of humans, helping to redesign the mind by resorting to external structures in order to complete many processing tasks (Deacon 1997; Slyke 2005).

Through the use of top-down causation a particular religious belief can guide behavior in important ways. By understanding religious cognition as a dynamic process, religion cannot be reduced to particular cognitive modules; instead it is both cognitive processes and systemic interactions which make religious cognition possible. . . . What this [top-down processing] essentially means is that environmental factors (such as languages, culture, and the environment) play a causal

role in the development of religious beliefs and experiences that cannot be explained by the bottom-up account of implicit cognitive systems. (Slyke 2005, 14)

The second strategy resorts to ontogenetic development in order to show that the configuration of a religious mind and schemas changes over time in a way that cannot simply be deduced from the innatist vision. Several versions describing such a process of growth and change are available, and in every case there emerges a kind of negotiation between the innate cognitive architecture, the pressures of the environment, and the regular process of learning (Oser 1991; Fowler 1991; Reich 1997; 2003). Of course, the innate patterns enable every single person to go on with further development of successive stages, but it is difficult to reduce all further expression to such innate categories or maps. This is quite an empirical perception, which arises from, among other causes, the variety of religious development in adult stages.

As a result of these contrasting perspectives, the standard view of religious innate templates should be corrected in order to make room for different hypotheses on the nature of such templates and their process of reelaboration through diverse kinds of interaction.

Metarepresentation, Decoupling, and Symbol Formation. A different set of questions emerges around the theories of metarepresentations, or the use of fiction, in order better to determine the role of religion in an evolutionary landscape. It seems that such products of imagination and conscious reflection play a significant role in this field, but it is unclear how they differ from other uses of imagination, such as art or entertainment. Among many other authors, Dan Sperber and the team of Leda Cosmides and John Tooby provide a good account of “meta-representational abilities” and their functions (Sperber 1996; 2000; Cosmides and Tooby 2000), which had been applied by Ilkka Pyysiäinen in his attempt to extend an excessively rigid model of religious cognition.

For Sperber “meta-representational abilities allow humans to process information which they do not fully understand, information for which they are not able, at the time, to provide a well formed representation” (1996, 71). A few pages later he states, “Religious beliefs develop not because of a disposition, but because of susceptibility” (p. 74), understanding this as some kind of secondary consequence of the selection of tested positive beliefs and the result of a metarepresentational assumption of ideas not fully understood but relevant for life management and easy to communicate or “contaminate.”

Cosmides and Tooby offer a more extensive account of metarepresentation and decoupling that points toward a solution to the problem of scope, or the need to determine the confines for the application of information (Cosmides and Tooby 2000). It appears that the strategies of decoupling and metarepresentation help to manage the amount of information avail-

able and to direct it as required. This same mechanism could help to configure religious ideas and define their field of application. Pyysiäinen has resorted to this mechanism to show how religious convictions result from a metarepresentation process that decouples some features from their original meaning or context and binds them to a new meaning or puts them inside a new context of revelation and supernatural agency, connecting the acquired knowledge to emotion and somatic markers often provided in the context of ritual (Pyysiäinen 2004, 72–80).

Nevertheless, some questions remain unresolved. One is about the level of consciousness of this mechanism. It seems that it is unconscious insofar as it explains religious ideas (Pyysiäinen 2004, 118), but as it becomes conscious it can drive some dangerous decoupling, leading to a removal of religious meaning. Nevertheless, it is far from clear whether such a mechanism works only in one direction, whether a conscious way to process religious information resorting to decoupling develops and metarepresentation is conceivable, and whether this alternative way can substantially modify the entire model. Indeed, following the ideas of Cosmides and Tooby, the interplay of decoupling and coupling may be read in a different fashion when religion is perceived in a more substantive and central way and not just as some unconscious mechanical process that follows certain fixed laws of channeling and enhancing.

In my view, the entire issue needs deep revision after the developments in the study of the process of symbolization, as has been highlighted by a group of well-known scholars taking a rather different path. When such alternative axioms are assumed, symbols—esthetic, moral or religious—play a clear role in the evolution of the human mind, following a specific dynamic of blending between different perceptions and ideas (Donald 1991; Deacon 1997; Tomasello 1999; Fauconnier and Turner 2002). I consider all of these contributions essential in completing the map of religious concept formation and development. Of course, to develop this point, much more space, and not a general revision of the paradigm, is required.

How Bad Is It to Be a “By-product”? A further step brings us into the thorny question of the epiphenomenalism of religion. In the standard version of the biocognitive science of religion, such a result comes from the modular representation of mind and computing and from an evolutionary view trying to discern which elements are more or less central to the urgencies of survival. In a broader sense, this way to perceive religion, reduced to a by-product of the adaptive process, can be understood as a criticism of strong functionalism, which becomes clearly detrimental for a more theological representation; religion may be seen as something natural, but not so natural as to make it unavoidable or necessary. On the contrary, religion seems to become, in this way, more secondary and avoidable, deprived of its true meaning. Again, such a standpoint requires an adequate hermeneutic.

To start with some observations, many functions of the mind present in modern humans clearly constitute by-products of more vital and survival-related functions; nevertheless, nobody deems them less important as constituents of human nature. A good example is provided by David Papineau, also a cognitivist, who resorts to the same axiomatic to explain certain other mental processes. He states that “theoretical rationality is a by-product of two other intellectual abilities which we have independent reason to regard as evolutionarily explicable, namely, understanding of mind and means-end thinking” (Papineau 2003, 41). He deems that condition of “derived product” not as a nonrational, useless, or inappropriate mental device but as a mechanism that appears to be very useful for further evolution, even if its origin is secondary. In a similar way, religion’s being a by-product of evolution does not necessarily mean that it is useless or even harmful; it can turn out to be a derived trait that becomes adaptive or at least can play a function of positive value for the entire species or for many of its members—as happens with art, for example.

Again, the question arising in this axiomatic is what kind of religion we are talking about—the unconscious and mechanical, or the conscious and freely chosen one? the one taken for granted in some primitive populations, or the developed system of beliefs professed by an intellectual Christian? the low-power one or the intense religious experience? It seems that reducing religious dynamics to some purely mechanical process does help us to understand some of its origins and evolutionary features but not all of its actual forms and characteristics. The same may be said about many other features of human nature that may have been affected by hard-to-grasp origins but are developing into full conscious functions.

Moreover, religion resolves the scope problem through a process of detachment or decoupling and metarepresentation. In many cases, it becomes a kind of central processor for people who have converted or who are driven by the more intense religious impulses. The origins and first evolution are not all that relevant for the further development of many functions. What counts is their influence and actual effectiveness in dealing with problems.

The elementary dynamics of religious behavior revealed through biocognitive reconstruction explain certain intrinsic tendencies and implicit orientations such as the channeling of the experience and the modeling of the religious mind inside flexible patterns. But those are broad and complex enough to allow for many types of development and versions. The biocognitive science of religion sheds light on the several patterns governing the religious way of comprehending reality, persons, and one’s own life. However, it only partly determines the process, which is often creative (as the phylogenetic evolution of religion shows), and reflects the flexibility and even plasticity of the human mind as it negotiates with other resources beyond the individual and sheer cognitive limits.

Certainly a deferred task of the new science is to discern to what extent the observed structures channel and determine any kind of religious experience and whether they operate as a sort of closure device that allows for a rich intrasystemic field of play with constant rules governing the whole game. Such a structure avoids the chaos that could deter development and enhances the testing of many possible forms. It is worth recalling that the theory of systems has shown the importance of such a closure mechanism not just as a limiting structure, constraining and reducing any real evolution, but also creating the conditions to make such evolution possible (Luhmann 1987, 357ff.; Nassehi 2003). When these structures are exposed, religion is not dismissed as a primitive epiphenomenon but rather made into a human and social process, shaping a creative system in the interplay between mind and social culture, which is even involved in a broader process of closure and opening of human progress in the course of history (Luhmann 1989, 259ff.).

How Much Does the Acquisition of Religious Ideas Cost? The list of problems concerning secondary proposals of the cognitive science of religion could grow longer, because, as it has been observed, we are still in a work-in-progress phase, and many questions have not yet been settled while others remain in the exploratory and hypothetical phase with few chances to verify them. But some of the suggested arguments deserve attention in order to show how far we still are from a good theory.

One point that has come under attack recently is the well-known thesis of Boyer and others about the “optimal costly religious ideas” that should involve some level of “minimal counterintuitiveness.” Gregory D. Alles has shown how inconsistent many of the arguments used to support that thesis are. His analysis of the standard procedures for concept activation in memory shows that counterintuitiveness does not contribute in a particular way to the retrieval of stored ideas. The argument is far more complex and deserves closer examination. He also introduces a model of “five requirements” necessary to explain the formation of religious concepts (Alles 2006, 341f.). This new model challenges the dominant paradigm in the cognitive science of religion. There is still a long way to go before a consensus is reached.

Counterintuitiveness is not just a religious predicament, however, but one that cosmologists (referring to dark matter), quantum physicists, and even evolutionary biologists entertain (see the passionate declaration of Richard Lewontin [1997, 28]). If things continue in this way, what is wrong with a model of thinking that resorts to counterintuitive ideas?

Concluding this critical review, I am convinced, along with other scholars in the field, that the cause of the cognitive science of religion would be better served if detached from the biological approach. Very often the evolutionary ideas are highly speculative, lack empirical evidence, and become misleading.

USER INSTRUCTIONS

This last section points to a more nuanced appraisal of the outcomes generated by the new science of religion, claiming a broader hermeneutical assimilation and a more open-ended application.

As in other contexts, the launching of a new product should be accompanied by some kind of instructions to avoid problems or flawed applications. Some sort of metarepresentation should guide its use and applicability. In order to offer some guidance, I propose to take into account the following points:

- to avoid contraindications, as the new theory is not appropriate for settling questions of philosophy of religion;
- to limit its application to its own field, as the new science explains only a part of the religious process and is not a placebo or a “unified theory” able to explain every aspect of the field;
- to accept some different uses, as it may become metarepresented either in a purely scientific or theological context; and
- to be aware of its therapeutic uses, or, in cognitive therapeutic terms, to be cautious about the results of its application.

Let us first address counterindications. Several authors draw forbidden conclusions from the premises of the new paradigm, as if revealing the hidden mechanisms governing religious commitment and action could explain away religion as a whole. This is unscientific and beyond the remit of any sensitive scholar working in the field. There are a great many examples of this attitude. One scholar simply identifies what others designate as “counter-intuitive agents” as “non-existent agencies” (Bulbulia 2005, 91), and frequently religion is deemed a “cognitive noise,” an “illusion,” or a form of “self-deception” (Bulbulia 2005, 84, 90). Another example is provided by Boyer (2004, 40), who explicitly rejects the existence of any substance to religious references: “Cognitive accounts of religion even suggest that there is no good *reason* for the existence of religious thoughts and behaviors. There is not even a single *cause* for them.” Still others designate as “cognitive errors” and “functional illusions” certain religious intuitions about afterlife or religious ideas tout court (Bering 2006b, 461; Bulbulia 2006, 93 ff.).

The problem arises precisely when these scholars decree that to do cognitive science of religion means to eliminate it, just as, by the same token, other cognitivists maintain that a neurocognitive account of consciousness means its elimination. Such a stance goes beyond the scope of scientific undertaking. The first reason is that it is at least conceivable to practice a cognitive approach to religion or consciousness without requiring a strategy of elimination. Obviously, there are many more cases in the study of

consciousness than in that of religion; many scholars exhibit a rigorous approach to this experience and call for a substantial account of it. In my opinion, the premises of the new science do not include that its development require a methodological exclusion of religion as something real or as a consequence of an axiomatic naturalism. If such were the case, it would be the first situation in which one is required to be an atheist in order to practice a scientific field of inquiry. Such a position would mean the end of scientific neutrality concerning metaphysical questions and a clear invasion of the territory of another field, that of theology.

There is a feeling of *dèjà vu* when one hears this sort of statement, repeated in modern developments of several scientific fields that were originally introduced as a definitive overcoming of religion. At least this is what has happened in sociology, anthropology, biology, and even modern history. Perhaps it is just a symptom of the lack of maturity of the new science. The problem goes beyond the boundaries of scientific endeavor. Of course any rational person, and still more a cognitive scientist, is entitled to discuss—ever from a rational point of view—the greater or lesser relevance of religious ideas, but such a discussion ought to take place inside a precise field of enquiry—philosophy of religion—where the arguments have been long in the making, and the question is not yet settled.

Deconstructing from a biocognitive point of view many human experiences may even be a salutary exercise, helping one better grasp the real conditions of individual existence; however, as with any deconstruction exercise of the modern or postmodern intellectual landscape, one should be aware of its limitations. Take, for example, the notorious case of paradoxical inclusion: Even biocognitive science may be deconstructed as a survival strategy and as a by-product of other cognitive domains that is aiming for a dominant position. Cognitive science cannot settle what ultimately stands and what falls without risking self-destructive consequences.

The second instruction concerns the limits of applicability of the new science. As already mentioned, there are several cases in which the biocognitive account of religion has little or nothing to contribute. Two obvious examples are the conscious dimension of religion and the way the religious mind interplays with “external memory units” in order to better process one’s own information. The argument goes as follows: The new science clearly is incomplete, in the sense that it explains only certain dimensions of the cognitive reality of religious experience, that which we could call the latent structures. It would be extremely reductionist to declare the conscious mind to be outside the realm of cognitive inquiry and even worse to ignore how cognitive skills interact with one’s own environment to process relevant information.

This appraisal drives any user of the biocognitive science of religion to a more nuanced application provided its development does not solve some of the mysteries of the more complex structure of the religious mind, which

includes numerous dimensions. The problem is that the new science is unable to take into account too many variables and needs to limit its area of inquiry to a few, leaving the rest in a condition of *ceteris paribus*. Such a strategy is proper from a scientific point of view, but in this case we should be aware that its findings have a limited reach and cannot settle all the multifarious phenomena encompassed by the vast territory of “religious experience.” As an example, a theory stressing the role of unconscious templates would hardly explain the very challenging experience of radical religious conversion, except by providing very simple accounts, short of the complexity of the real thing, which defies the very idea of mental determinism (Pyysiäinen 2004, 128).

The third point of our instructions suggests distinguishing between two possible applications of the new outcomes—one properly scientific, limited in scope, and the other theological. The question is more easily solved by resorting to the metarepresentation theory. In the scientific sphere, the results of the inquiry should be placed inside a scientific, objective, value-neutral representation of the world and, as such, should serve to reconstruct the deep structures governing the religious mind in order to obtain a better picture of human behavior. In the second case, the results are decoupled from the sheer scientific realm and are contextualized inside the religious representation of person and reality, where they are perceived as the marvelous structures allowing human beings to gain access to transcendence and to give meaning to their lives (Peterson 2003).

If the theory of metarepresentation is right—and I have no doubts in this respect—nobody could decide which metarepresentation is superior or more appropriate. We would need “meta-metarepresentation” to settle what the optimal or true form of coupling is, and the process could take the form of an infinite regression. It is better to admit that both forms of metarepresentation are possible and that there is not a superiority of one over the other except inside one’s personal realm: that is, scientific metarepresentation is best in the scientific system or code, and religious metarepresentation is best—the only one—inside this other system, which is governed by different requirements and resorts to the specific code of transcendence-immanence.

Finally, the therapeutic dimension of this theoretical approach should be considered. There is a well-known tradition of cognitive therapy that could help us to better appreciate the possible values of religious cognition. As has been stated repeatedly, for this therapeutic strategy “psychic suffering” is a symptom of distortions in our cognitive system and functions: wrong information processing, wrong judgments of events, over-generalizations, misplacements of emphasis. . . . In summary, the wrong functioning of our cognitive capacities is at the root of psychic suffering, and the aim of the therapy is to dismantle the negatively biased ideas and to replace them by more adequate ones, able to cope with present circum-

stances. My point is that any use of the biocognitive science of religion should integrate this pragmatic dimension and always ask what ideas and representations are more helpful in engaging with the struggles of life. The answer is not aprioristically decided, because, as everyone knows, religion can be a source of distress and great suffering. But in this case we are treading new ground, which has seen an interesting development in the last few years: the field of “religious coping” (Pargament 1997). The new science should be aware of such inquiries and integrate this field in the list of interdisciplinary subjects if it is to help determine what kind of religious ideas are not only better suited to dealing with the reality we live in but also which are healthier in contrast with other, less effective alternatives. At the same time, the pragmatic-therapeutic orientation should prevent any attempt to settle the question of the truth of religion in a hurried and aprioristic way (Rottschaefer 2004).

In closing, the scientific endeavor governing the biocognitive study of religion is very useful for both the scientific and theological fields. It is my hope that in the future such an endeavor will be carried out without extrapolations and with a greater awareness of its limitations. Certainly, theology can provide a kind of therapeutic input, as has recently been shown, to the development of biocognitive science, helping to avoid “misleading metaphors” (Murphy 2003, 86), a function that some authors attribute to philosophy and that I consider better accomplished by the corrective stances of other disciplines in the interdisciplinary relationship. The new science does provide a healthy therapeutic approach to theology, but the converse is also true—theology corrects wrongheaded and misleading metaphors in the scientific realm.

REFERENCES

- Alles, Gregory D. 2006. “The So-called Cognitive Optimum and the Cost of Religious Concepts.” *Method and Theory in the Study of Religion* 18:325–50.
- Atkinson, Anthony P., and Michael Wheeler. 2004. “The Grain of Domains: The Evolutionary-Psychological Case against Domain-General Cognition.” *Mind and Language* 19:147–76.
- Atran, Scott. 2002. *In Gods We Trust*. New York and Oxford: Oxford Univ. Press.
- Atran, Scott, and Ara Norenzayan. 2004. “Religion’s Evolutionary Landscape: Counterintuition, Commitment, Compassion, Communion.” *Behavioral and Brain Sciences* 27:713–70.
- Azari Nina P., Janpeter Nickel, et al. 2001. “Neural Correlates of Religious Experience.” *European Journal of Neuroscience* 13:1649–52.
- Baltes, Paul B., Patricia A. Reuter-Lorenz, and Frank Rosler, eds. 2006. *Lifespan Development and the Brain: The Perspective of Biocultural Co-Constructivism*. Cambridge, U.K., and New York: Cambridge Univ. Press.
- Barrett, Justin L. 1999. “Theological Correctness: Cognitive Constraints in the Study of Religion.” *Method and Theory in the Study of Religion* 11 (4): 325–39.
- . 2004. *Why Would Anyone Believe in God?* Walnut Creek, Calif., Lanham, Md., and Oxford, U.K.: Altamira.
- Bering, Jesse M. 2006a. “The Cognitive Psychology of Belief in the Supernatural.” *American Scientist* 94:142–49.

- . 2006b. "The Folk Psychology of Souls." *Behavioral and Brain Sciences* 29:453–98.
- Boyer, Pascal. 2001. *Religion Explained: The Evolutionary Origins of Religious Thought*. New York: Basic Books.
- . 2004. "Out of Africa: Lessons from a By-Product of Evolution." In *Religion as a Human Capacity: A Festschrift in Honour of E. Thomas Lawson*, ed. Timothy Light and Brian C. Wilson, 27–44. Leiden, Holland, and Boston, Mass.: Brill.
- Bulbulia, Joseph. 2005. "Are There Any Religions? An Evolutionary Exploration." *Method and Theory in the Study of Religion* 17:71–100.
- . 2006. "Nature's Medicine: Religiosity as an Adaptation for Health and Cooperation." In *Where God and Science Meet. Vol. 1: Evolution, Genes and the Religious Brain*, ed. Patrick McNamara, 87–121. Westport, Conn., and London: Praeger.
- Buller, David J. 2005. *Adapting Minds: Evolutionary Psychology and the Persistent Quest for Human Nature*. Cambridge: MIT Press.
- Campbell, Robert A., Yvonne Petry, Gary Diver, and William A. Stahl, eds. 2002. *Webs of Reality: Social Perspectives on Science and Religion*. Piscataway, N.J.: Rutgers Univ. Press.
- Cimatti, Felice. 2004. *Il senso della mente. Per una critica del cognitivismo* [The Meaning of Mind: A Critique of Cognitivism]. Torino: Boringhieri.
- Cosmides, Leda, and John Tooby. 2000. "Consider the Source: The Evolution of Adaptation for Decoupling and Metarepresentation." In *Metarepresentations: A Multidisciplinary Perspective*, ed. Dan Sperber, 53–115. Oxford and New York: Oxford Univ. Press.
- Dawkins, Richard. 2003. *A Devil's Chaplain: Reflections on Hope, Lies, Science and Hope*. Boston: Houghton Mifflin.
- Deacon, Terrence W. 1997. *The Symbolic Species: The Co-evolution of Language and the Human Brain*. New York: Norton.
- Dennett, Daniel. 1991. *Consciousness Explained*. Boston and London: Little, Brown.
- . 2006. *Breaking the Spell: Religion as a Natural Phenomenon*. New York: Viking.
- Donald, Merlin. 1991. *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition*. Cambridge, Mass., and London: Harvard Univ. Press.
- . 2001. *A Mind So Rare: The Evolution of Human Consciousness*. New York and London: W. W. Norton.
- Dow, James W. 2006. "The Evolution of Religion: Three Anthropological Approaches." *Method and Theory in the Study of Religion* 18:67–91.
- Dupré, John. 2001. *Human Nature and the Limits of Science*. Oxford: Clarendon.
- Elman, Jeffrey L., Elizabeth A. Bates, et al. 1998. *Rethinking Innateness: A Connectionist Perspective on Development*. Cambridge: MIT Press.
- Fauconnier, Gilles, and Mark Turner. 2002. *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. New York: Basic Books.
- Fodor, Jerry. 2000. *The Mind Doesn't Work That Way*. Cambridge: MIT Press.
- Fowler, James W. 1991. "Stages in Faith Consciousness." *New Directions for Child Development* 52:27–46.
- Haight, John F. 2006. *Is Nature Enough? Meaning and Truth*. Cambridge, U.K., and New York: Cambridge Univ. Press.
- Jablonka, Eva, and Marion J. Lamb M.J. 2005. *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life*. Cambridge: MIT Press.
- Kirkpatrick, Lee A. 2006. "Religion Is Not an Adaptation." In *Where God and Science Meet. Vol. 1: Evolution, Genes and the Religious Brain*, ed. Patrick McNamara, 159–79. Westport, Conn., and London: Praeger.
- Lawson, E. Thomas, and Robert N. McCauley. 1990. *Rethinking Religion: Connecting Cognition and Culture*. Cambridge: Cambridge Univ. Press.
- Lewontin, Richard C. 1997. "Billions and Billions of Demons." *New York Review of Books*, January 9.
- Luhmann, Niklas. 1987. *Soziale Systeme: Grundriss einer allgemeinen Theorie*. Frankfurt a.M., Germany: Suhrkamp.
- . 1989. *Gesellschaftsstruktur und Semantik: Studien zur Wissenssoziologie der modernen Gesellschaft. Band 3*. Frankfurt a.M., Germany: Suhrkamp.
- . 1990. *Die Wissenschaft der Gesellschaft*. Frankfurt a.M., Germany: Suhrkamp.
- Markusson, Gudmundur I. 2007. "The God Delusion by Richard Dawkins." *Journal of Cognition and Culture* 7:369–73.

- Martin, Luther H. 2004. "Disenchanting' the Comparative Study of Religion." *Method and Theory in the Study of Religion* 16:36–44.
- McCutcheon, Russell T. 2001. *Critics Not Caretakers: Redescribing the Public Study of Religion*. Albany: State Univ. of New York Press.
- Murphy, Nancey. 2003. "The Role of Philosophy in Theology-Science Dialogue." *Theology and Science* 1:79–93.
- Nassehi, Armin. 2003. *Geschlossenheit und Offenheit: Studien zur Theorie der modernen Gesellschaft*. Frankfurt a.M, Germany: Suhrkamp.
- O'Hear, Anthony. 1997. *Beyond Evolution: Human Nature and the Limits of Evolutionary Explanation*. Oxford: Clarendon.
- Oser, Fritz K. 1991. "The Development of Religious Judgment." In *Religious Development in Childhood and Adolescence*, ed. Fritz Oser and W. George Scarlett, 5–23. San Francisco, Calif.: Jossey-Bass.
- Oviedo, Lluís. 2006. "Religious Experience: First-, Second- and Third-Person Accounts." *Archivio di Filosofia* 1:391–401.
- Panksepp, Jaak, and Jules B. Panksepp. 2000. "The Seven Sins of Evolutionary Psychology." *Evolution and Cognition* 6:108–31.
- Papineau, David. 2003. *The Roots of Reason: Philosophical Essays on Rationality Evolution and Probability*. Oxford and New York: Oxford Univ. Press.
- Pargament, Kenneth I. 1997. *The Psychology of Religious Coping*. New York: Guilford.
- Peterson, Gregory R. 2003. *Minding God: Theology and the Cognitive Sciences*. Minneapolis: Fortress.
- Petrovich, Olivera. 2005. "Origins of Religion in Human Development: The Issue of Innateness." Unpublished paper delivered at Oriel College, Oxford, 10 February.
- Pinker, Steven. 1994. *The Language Instinct*. New York: HarperCollins.
- Pyysiäinen, Ilkka. 2001. *How Religion Works: Towards a New Cognitive Science of Religion*. Leiden, Holland, and Boston, Mass.: Brill.
- . 2004. *Magic, Miracles, and Religion: A Scientist's Perspective*. Walnut Creek, Calif., and Lanham, Md.: Altamira.
- Reich, K. Helmut. 1997. "Integrating Differing Theories: The Case of Religious Development." In *The Psychology of Religion: Theoretical Approaches*, ed. Bernard Spilka and Daniel N. McIntosh, 105–13. Boulder, Colo.: Westview.
- . 2003. "Cognitive Preconditions for Religious Development." *Research in the Social Scientific Study of Religion* 14:11–25.
- Rottschaefer, William A. 2004. "Religion's Evolutionary Landscape Needs Pruning with Ockham's Razor." Response to "Religion's Evolutionary Landscape: Counterintuition, Commitment, Compassion, Communion" by Scott Atran and Ara Norenzayan. *Behavioral and Brain Sciences* 27:713–70; 747f.
- Saver, Jeffrey L., and John Rabin. 1997. "The Neural Substrates of Religious Experience." *The Journal of Neuropsychiatry and Clinical Neurosciences* 9:498–510.
- Sjöblom, Tom. 2007. "Spandrels, Gazelles, and Flying Buttresses: Religion as Adaptation or as a By-Product." *Journal of Cognition and Culture* 7:293–312.
- Slone, D. Jason. 2004. *Theological Incorrectness: Why Religious People Believe What They Shouldn't*. Oxford and New York: Oxford Univ. Press.
- Slyke, Van J. A. 2005. "Religious Concepts and Explicit Cognitive Systems: Rethinking the Modular View of Mind and the Development of Religious Beliefs and Actions." Paper presented at the Annual Meeting of the Society for the Scientific Study of Religion (SSSR), Rochester, N.Y., 4–6 November.
- Sosis, Richard, and Candace Alcorta. 2003. "Signaling, Solidarity, and the Sacred: The Evolution of Religious Behavior." *Evolutionary Anthropology* 12:264–74.
- Sperber, Dan. 1996. *Explaining Culture: A Naturalistic Approach*. Oxford and Malden, Mass.: Blackwell.
- . 2000. *Metarepresentations: A Multidisciplinary Perspective*. Oxford and New York: Oxford Univ. Press.
- Tomasello, Michael. 1999. *The Cultural Origins of Human Cognition*. Cambridge, Mass., and London, U.K.: Harvard Univ. Press.
- Varela, Francisco, and Jonathan Shear. 1999. *The View from Within: First Person Methodologies for the Study of Consciousness*. Bowling Green, Ohio, and Thorverton, U.K.: Imprint Academic.

- Whitehouse, Harvey. 2004. *Modes of Religiosity: A Cognitive Theory of Religious Transmission*. Walnut Creek, Calif., Lanham, Md., and Oxford: Altamira.
- Wilson, Robert A. 2004. *Boundaries of the Mind: The Individual in the Fragile Sciences. Cognition*. Cambridge, U.K., and New York: Cambridge Univ. Press.
- Wilson, David Sloan. 2002. *Darwin's Cathedral: Evolution, Religion and the Nature of Society*. Chicago: Univ. of Chicago Press.