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Cognitive Science of Religion: State-of-the-Art[1]

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Abstract

This article presents an introduction to the cognitive science of religion. It shows that CSR began with original theoretical approaches within the human sciences and has subsequently developed into a more empirical, interdisciplinary field of study. The field is growing rapidly with the appearance of several centers and projects. The most important theories, findings, and criticisms are presented. Also the various centers of study and recent projects are described.

Keywords
cognition, agency, sociality, ritual

Introducing the Cognitive Science of Religion

Epidemiology and intuitive ontology

In what follows, I will introduce the main theories, hypotheses, and results of the Cognitive Science of Religion and also briefly describe the main centers of study and their contributions. The term "Cognitive Science of Religion (CSR)" came into use gradually after the publication of Lawson and McCauley's *Rethinking Religion* (1990) and Boyer's *The Naturalness of Religious Ideas* (1994), although Guthrie (1980) had even earlier published a paper on a cognitive the-

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ory of religion. It remained relatively isolated, however, and focused somewhat narrowly on the ideas of animism and anthropomorphism (see Guthrie 1993; cf. Geertz 2004, 362–363; Barrett 2011b, 187, n.9). Two of the earliest anthologies on the CSR were edited by Boyer (1993) and Pyysiäinen and Anttonen (2002). The choice of the term CSR is obvious as the main idea is to use the tools of cognitive science and cognitive psychology to explore the cognitive foundations of religious concepts and beliefs (see Barrett 2011a, b). Anthropomorphic agency and agency detection still remain central in CSR, although the idea of constructing a general theory of religion is rejected by many CSR scholars.

Notwithstanding the somewhat misleading subtitle of his 1994 book (A cognitive theory of religion), Boyer argues that, although we can have theories *about* varying religious phenomena, it is impossible to develop a theory *of* religion as a whole. This would be like trying to explain all white objects, because "religion" names a very heterogeneous category without an essence. Thus, this simple grammatical difference is meant to capture the difference between grand theories of religion as a whole and more modest attempts at explaining some specific aspect of this supposed whole (Boyer 1994, 32). "The very existence of something called 'religion' is largely an illusion," because the various aspects and dimensions of what is called "religion" appear in human minds independently, not as a package (Boyer 2010; see Saler 2000). By the same token, cognitive scientists of religion have been less interested in the old issue of the origin of religion (see Anttonen 2002). The focus is rather on how the human mental architecture (Anderson 1983) "canalizes" the spread of religious traditions (Atran 2002).

The idea of religious transmission was first introduced in anthropology by Sperber (1975, 1985) and Atran (1987). Sperber (1975) seeks to replace symbolist anthropology and semiotic approaches to cultural and artistic symbolism by cognitive explanations of the mental mechanisms that make symbolic interpretation possible in the first place. Sperber (1985) then introduces the idea of an "epidemiology of beliefs," that is, a research program that focuses on how and why certain kinds of mental representations easily become widespread in human populations (see Sperber 1996).

The nature of human cognition explains why certain kinds of mental representations become "attractors" in a statistical sense. "(I)n a given space of possibilities, transformation probabilities form a certain pattern: they tend to be biased so as to favour transformations in the direction of some specific point, and therefore cluster at and around that point" (Sperber 1996, 112). We find recurrent patterns in concepts and beliefs within and across cultures because some ideas are more appealing to the human mind than some others; they are

"contagious" as it were (Claidière and Sperber 2007, 2010). Cultures consist of differential distributions of representations among individuals; thus, the cultural and the individual/psychological are not two different levels but rather measures of the spread of representations (Sperber 2006).

Atran (1987, 1990), for his part, introduces the idea of cognitive constraints on the semantics of living kinds: the nature of human cognition explains why people all over the world categorize living kinds (plants and animals) in roughly the same ways (see Atran and Medin 2008). Boyer (1994) picks up the ideas of epidemiology and cognitive constraints in developing a "catalogue of the supernatural" and a cognitive explanation of why certain kinds of supernatural beliefs are "contagious." Such beliefs correspond to our intuitive ways of thinking while yet including one minimal violation of intuitive expectations that make them attention-grabbing. These violations are counterintuitive in the sense that they are at odds with an intuitive ontology consisting of the categories of solid objects, living kinds, and agents together with three types of explanations: mechanical, biological and intentional (see Boyer 2001; Pyysiäinen 2009, 22–28). This idea of an intuitive ontology traces back to Keil's (1979, 1996) work in developmental psychology.

We use minimal cues to intuitively place a perceived or an imagined entity into an ontological category: if an entity can cry, for example, it must be an agent with the default properties of an agent; if it is being fixed, it must be an artifact (a solid object), and so on and so forth. Thus, all information need not be culturally transmitted; much of our knowledge and presuppositions come from non-conscious and automatic inferences based on intuitive ontology. Yet we are also capable of forming counterintuitive ideas by either deleting a default property or adding a property that violates intuitive expectations. An agent without a physical body exemplifies the first case, while a solid object that hears prayers is an example of the latter (Boyer, 1994, 91–124, 2001, 40–202, 2003). A combination of naturalness and minimal counterintuitiveness (cognitive optimality) makes a representation salient and yet easy to process in mind; by the same token such representations will become widespread in human populations. It may also be that teleo-functional reasoning biased towards seeing hidden intentions behind everything and interpreting agentive intentions as intrinsic properties of objects (without knowledge of the intending agent) is an independent characteristic of causal reasoning, not deriving from agentive intuitions ("promiscuous teleology") (Kelemen 1999a, b, 2004; Kelemen and DiYanni 2005; Kelemen and Rosset 2009).

The ideas of intuitive ontology and counterintuitiveness are central in CSR but there still remain disagreements on what counts as counterintuitiveness. Both

Pyysiäinen (2009, 22–28) and Barrett (2008a, 2011b, 61–69) have presented modifications and even Boyer himself offers slightly differing lists of intuitive categories in different publications (see also Atran 2002). Likewise, the idea of a cognitive optimum consisting of intuitive elements plus only one violation still lacks solid empirical foundation because, in practice, it is not always easy to tell different violations apart from each other. It has also been called into question whether people's actual supernatural agent concepts fit this model (Shtulman 2008, 1123; but see Barrett et al., 2009). Day (2007, 60), for example, argues that in reality religious concepts are hardly confined to cognitively optimal ones only.

In Shtulman's study subjects rated the likelihood with which nine human properties could be coherently attributed to fictional and religious supernatural agents. Fictional agents were anthropomorphized more than religious agents and both were anthropomorphized more in the domain of psychological properties as compared to biological and physical. Shtulman argues that there is little evidence for the claim that people actually represent supernatural agents as human agents plus or minus one counterintuitive property. Instead, there seems to be more variation in what kinds of properties are included or blocked in each case (Shtulman 2008). All this may be true (see Franks 2003), but it is difficult to test people's actual god representations along these lines because then explicit beliefs intrude on intuitive reasoning and one may never be able to access people's actual intuitions about supernatural agency.

Some problems notwithstanding, the basic idea that people have intuitive ontological ideas that then canalize the cultural transmission of concepts and beliefs (epidemiology) is an important step forward in the study of culture. Likewise, the idea of hypersensitivity to cues about agency (Barrett 2000; Guthrie 1993) is supported by such evidence as provided by Heider and Simmel (1944) and Guthrie (1993), for example. The idea of intuitive knowledge can be conceptualized with the help of the dual-process approach in social psychology, neuropsychology, and cognitive science (see Pyysiäinen 2004a, 2009, 6–8, 189–192; Tremlin 2006, 172–182). Humans clearly have two different reasoning strategies that have been variously labeled as intuitive and reflective, spontaneous and rational, systems 1 and 2, and so forth. These two systems can be differentiated on the basis of the neural processes and cognitive mechanisms involved and the kinds of contents processed (see Evans 2008).

The two systems or strategies can be distinguished by such criteria as their relative speed, amount of emotion involved, type of motivation, type of information consulted, the form of reasoning employed, and the amount of "extra-cranial" scaffolding needed. The intuitive system is responsible for fast, associative and emotionally colored thinking with purely practical goals, using "innate" infor-

mation together with information derived from the environment through analogical reasoning. It operates reflexively, not reflectively, drawing inferences and making predictions on the basis of temporal relations and similarity. It employs knowledge derived from personal experience, concrete and generic concepts, images, stereotypes, feature sets, and associative relations, relying on similarity-based generalization and automatic processing. It serves such cognitive functions as intuition, fantasy, creativity, imagination, visual recognition, and associative memory. Some authors also argue that it is a sub-symbolic pattern-recognition system that relies on connectionist, parallel distributed processing.

The intuitive thinking system proceeds from the immediate experience of individuals; aims at short-term, practical efficacy, not at creating general theories; seeks evidence and not counter-evidence; makes use of individual cases as evidence; personalizes values and ideals; makes use of abductive inference and presents arguments in the form of narratives. The reflective system serves such cognitive functions as deliberation, explanation, formal analysis, and verification. It seeks logical, hierarchical, and causal-mechanical structure in its environment, using information from language, culture, and formal systems. It is a rule-based system capable of encoding any information with a well-specified formal structure and relies heavily on external memory stores such as books and pictorial representations (see also Sperber 1997).

Other recent work in CSR includes Barrett and colleagues' studies on the mental representation of non-natural agent concepts, Boyer and Liénard's hazard precaution theory of ritualized behavior, Bering's experiments on the folk psychology of souls and afterlife, Cohen's studies on spirit possession, and Guthrie's theory of religion as a form of systematic anthropomorphism (Barrett 2004, 2007; Barrett et al. 2001; Bering 2006, 2011; Bering and Bjorklund 2004; Bering and Parker 2006; Cohen 2007; Guthrie 1993; Boyer and Liénard 2006; Liénard and Boyer 2006; Pyysiäinen 2009). The cognitive science of religion has gradually grown into a wide research program that draws from cognitive science, evolutionary and developmental psychology, neuroscience, computer science, ethology, and anthropology. It has also been introduced to a wider audience and applied in the history of religions (Beck 2006; Martin 2003, 2004; Martin and Sørensen 2011; Czachesz 2007; Luomanen et al. 2007; Geertz and Jensen 2011; Pyysiäinen 2001, 2004b, 2004c, 2009, 2012; Tremlin 2006; see Barrett 2007; Pyysiäinen 2008).

Rituals

The study of the mental representation of ritual structures as well as of the supposed effects of rituals forms an integral part of CSR. Lawson and McCau-

ley (1990) draw from Chomsky's idea of a universal grammar in developing a theory of how ritual action is mentally represented (see McCauley and Lawson, 2002). They focus on how the structure of religious ritual action is mentally represented in the same ways as any action: somebody does something to someone (using some instrument). Gods can be conceived of as either active agents doing something to humans via rituals (e.g. giving their blessing), or as patients of human action as in sacrifices, for example. In the first case, we have "special agent" rituals which are ideally not repeated for one and the same patient: people are baptized, married and buried only once, although certain controversial exceptions do exist (in Catholicism, annulment and remarrying are theological problems, for example). Divine actions have "superpermanent" effects. "Special patient" rituals, for their part, can be repeated time and again because human action cannot establish anything once and for all. What is important in all religious rituals is that they are collective and are meant to bring about some change in the religious world. Thus, praying silently alone is not a ritual in Lawson and McCauley's sense of the term. It does not have any commonly accepted and recognizable effects in the religious world.

Whitehouse has developed his modes theory of religiosity partly in an exchange of ideas with Lawson and McCauley (see Whitehouse and McCauley, 2005; Whitehouse and Laidlaw 2004; Whitehouse and Martin 2004). Rituals play an important role in the modes theory which distinguishes between imagistic religiosity with rarely performed high-arousal rituals and often repeated low-arousal rituals. These two have different kinds of psychological constraints and effects and lead to different kinds of socio-political organization (Whitehouse 1995, 2000, 2004). Recent evidence suggests that low dysphoric arousal, high-frequency rituals may have been tied to the advent of agriculture and the subsequent emergence of the first large-scale civilizations. Low-frequency highly dysphorically arousing rituals, for their part, typify small cohesive communities (Atkinson and Whitehouse 2011).

Also the idea of omniscient "big gods" with punitive abilities seems to be a relatively recent (5,000–10,000 years ago) innovation that has developed in large, complex societies (Atran and Henrich 2010; Shariff 2011; see Sanderson and Roberts 2008). There exists a wide discussion concerning the role of such beliefs in the evolution of intra-group cooperation. Religion supposedly has either contributed to the evolution of intra-group cooperation through group dynamics or has forced individuals to refrain from cheating because of a fear of supernatural punishment (Schloss and Murray 2011; Pyysiäinen 2010; Atran 2012). Congruent with this, nearly half of Americans believe that morality is impossible without belief in God; anti-atheist prejudice is characterized specifi-

cally by distrust and this distrust increases together with belief in God and is context-sensitive: the prejudice becomes manifest in situations requiring high levels of trust (Gervais et al. 2011). In the "standard model" of CSR (Boyer, 2005b), religion and "big gods" are not considered biological adaptations, however. Religion may have later assumed adaptive functions but evolutionarily it is a by-product of cognitive mechanisms that may be adaptations or at least adaptive and have spread culturally rather than genetically (Bell et al. 2009; Pyysiäinen and Hauser 2010).

This is so because the very existence of religion requires such cognitive mechanisms that also function outside of religion. These include (Boyer 2006):

- Reputation-monitoring by constructing databases about the reputational effects of one's own and others' actual behavior and inferred dispositions
- Commitment signals that evolved out of hard-to-fake signals and provide information about probable future behavior
- Coalitional psychology that helps maintain strong associations among non-kin and manage interaction with rival coalitions
- Strong in-group reciprocity that creates unselfish interaction
- Ethnic signals that help maintain strong in-group reciprocity
- Commitment gadgets that help people to tie their own hands in order to force non-selfish behavior
- Moral feelings motivating altruistic behavior

There are, however, a growing number of studies that view religion either as a biological adaptation or at least as being adaptive (see Pyysiäinen and Hauser 2010). Among the leading scholars are Joseph Bulbulia (2004a), Richard Sosis, and David Sloan Wilson (2002, 2008). Here one line of argumentation concerns religious practices as costly or at least hard-to-fake signals of genuine commitment (Irons 2001; Sosis 2000; Sosis and Alcorta 2003; Bulbulia 2004b; Bulbulia and Frean 2010; Bulbulia and Schjoedt 2010). Religious people also tend to have more offspring than nonreligious people (Frejka and Westhoff 2008), and on the average religious communities are more long-lasting than their secular analogues (see Irons 2001; Sosis and Alcorta 2003). Adopting the gene-culture coevolutionary approach (Richerson and Boyd, 2005), it is possible to argue that religion(s) persist because of a cultural group selection (see Henrich and Boyd 2002; Henrich and Henrich 2007).

The Hazard Precaution Theory of ritualized behavior and rituals offers a different kind of explanation of rituals. Ritualized behavior refers to the behav-

ior of an individual that is repetitive, rigid, stereotypical and noninstrumental. Ritual behavior, in contrast, refers to actions that take place in the context of a collective ceremony. Ritualized behavior is triggered by a *hazard precaution system* (or maybe several such systems?) geared to the detection of and reaction to inferred threats to fitness. Such threats pose a specific adaptive problem because (1) they are quite diverse; (2) there is no straightforward feedback demonstrating that a threat has been removed because such threats are not directly observable; (3) appropriate measures cannot be mapped one-to-one on to different classes of threats, since each type of threat may require different kinds of precautions. In ritualized action, behavior is partitioned into the smallest subactions which do not seem to have any immediate instrumental goals ("goal demotion"; Boyer and Liénard, 2006; Liénard and Boyer, 2006; Boyer and Bergstrom, 2008, 2011).

The activation of a hazard precaution system leads to an arousal and a feeling that *something* must be done, although one does not know why and what exactly. In the aroused state, attention is focused on low-level properties of action which thus is parsed in smaller units than normally. Such upper-level categories as "walking" are replaced by such lower-level categories as "walking-in-this-or-that-specific-manner." This manifests a "just right" syndrome: everything must be done very carefully, and yet one can never be sure that a goal has been reached. As the relationship of the low-level actions with the more general goal of the ritual comes close to a mystery, repetition of action follows as there is no satiety signal that would stop the repetition. The types of actions concerned relate to a few salient themes such as pollution and purification, danger and protection, as well as intrusion of others and the construction of an ordered environment. Interestingly, these themes also typify rituals as collective ceremonies: religious and magical rituals relate to purification (e.g. baptism, libations), protection (so-called crisis rites like rainmaking), and creation of social order (rites of passage such as initiations) (Boyer and Liénard 2006; Liénard and Boyer 2006).

Ritualization of action is found not only in cultural ceremonies but equally in children's rituals and in obsessive compulsive disorder. Cultural rituals, like the religious ones, feel compelling because they take place in a context that either triggers the hazard precaution system or at least memories of its previous triggering. Religious rituals are performed because neglecting them is felt to be dangerous, without the participants having any clear idea of what might happen if the proper rituals were left unperformed. Participants also have no clear idea of the supposed mechanism by which rituals bring about the desired result. Although a ritual may have a goal (healing a sick person, bring the rains, etc.), no one is able to explain how the constituent parts of the ritual relate to this general goal.

Why would for example crushing leaves in a pot bring the rains? (Boyer and Liénard 2006; Liénard and Boyer 2006; Boyer and Bergstrom 2008).

To the extent that other agents have been the most important threat to our ancestors, and an important function of large, solidary groups has probably been the protection from other human groups (Alexander 1979, 222–224), inferred threats are often interpreted as stemming from the presence of hostile agents. In such cases, not only the hazard precaution system but also hyperactive agent detection is triggered (Pyysiäinen 2009, 206). By the same token, religious rituals often involve protective superhuman agents. In large and complex societies they provide a means of creating a "family" of fictive kin that can span large geographical areas and can demarcate itself from other groups as in the case of Christianity and Islam, for example (see Atran 2010, 2012).

CSR scholars at the Religion, Cognition and Culture research unit (RCC) in Aarhus have developed new approaches to ritual that both deal with hypotheses in the standard CSR and with new experimental and neurocognitive hypotheses. Together with colleagues in MIND*Lab* at Aarhus and in New Zealand and elsewhere, research teams have engaged in three separate but interrelated areas: 1) the neurobiology of religion, 2) experimental science of religion and anthropology and 3) simulation approaches.

The first area consists of fMRI studies of participants engaged in different types of prayer. In controlled experiments, the team headed by Uffe Schjoedt hypothesized that different types of prayer activate different areas of the brain. They found that formalized prayer (the Lord's Prayer) activates the human striatal reward system, and personal prayers activate the classical social intelligence areas (Schjoedt 2009; Schjoedt et al. 2008; Schjoedt et al. 2009).

The second area of study is experimental anthropology, which introduces experimental paradigms and techniques in ethnographic fieldwork. RCC members have studied high arousal rituals such as fire-walking in Spain and the Cavadee ceremony in Mauritius. The results are groundbreaking and have raised a good deal of interest. For example, one study, led by Dimitris Xygalatas, measured the heart rates of fire-walkers, revealing shared patterns of arousal between active performers and related spectators, but not unrelated attendees (Konvalinka et al. 2011; Xygalatas 2008; Xygalatas et al. 2011).

The third area of research combines the experimental science of religion and simulation approaches. This consists of different teams applying computer tasks (Nielbo and Sørensen 2011) and economic games in the lab and in the field (e.g. Bulbulia 2004b; Bulbulia and Schjoedt 2010; Henrich et al. 2005; Henrich et al. 2006; Marlowe et al. 2008; cf. Wiessner 2009). Building on a conceptual model of ritual (Sørensen 2007) and drawing on new insights in action processing,

Kristoffer L. Nielbo and Jesper Sørensen conducted two experiments using an event segmentation paradigm eliciting differences in participants' response to functional and non-functional actions. They found that participants segmented non-functional action sequences into smaller units than functional sequences. The conclusion is that segmentation of ritual behavior indicates an attentional shift that is either due to a shift in the level of gesture analysis or to problems of integrating subactions into coherent event representations (Nielbo and Sørensen 2011). The experiments thus support the model presented by Sørensen (2007) as well as the importance of goal-demotion argued by Boyer and Liénard (2006).

Interdisciplinarity

As religion has no essence and has many and varying dimensions, it naturally calls for study from different angles in varying disciplines (see Saler 2000; Boyer 2010). Whereas in many religion departments philosophical and especially descriptive and hermeneutic approaches dominate, CSR is interdisciplinary and favors explanation, drawing from anthropology, cognitive science, co-evolutionary theories, cognitive and developmental psychology, evolutionary biology, agent-based modeling, and (socio-cognitive) neuroscience (see Sun, 2012; Stausberg 2009). Thus, it also differs from much of anthropology that is based on anecdotal evidence, description and interpretation (see Boyer 1994; D'Andrade 2000).

This has occasionally led to accusations of "reductionism": religion is not studied as religion and thus its *sui generis* nature is lost (see Pyysiäinen 2004b, 67–80). Van Slyke (2011; cf. Visala 2011), for example, is afraid that CSR will reduce and even replace religious explanations (see also Pihlström 2002, 2005). Yet no one is afraid that, for example, explaining how vision works would make people blind (see McCauley 2011). The argument is indeed weak and could even be considered itself reductionist as it reduces religion only to the presuppositions of Christian theology and "spirituality." For scholarly purposes, we need a more open concept of religion that covers all forms of human behavior, thinking, and experience generally deemed religious (Comstock 1981, 1984). Although CSR has focused heavily on the cognitive mechanisms of the individual mind, its naturalism and anti-essentialism have helped to realize the problems of closed, a priori theological or "spiritual" understandings of "religion" (especially Boyer 1994).

The sole focus on cognitive mechanisms that characterizes much of CSR is not necessary or even desirable, however. Jensen (2011) points out that there is no need to try to eliminate the category of "religion" just because there is no corresponding bounded entity; "religion" is an abstract concept just like

"sports" or "politics" and as such useful and even necessary. I am not suggesting that groups constitute individuals in the same sense that individuals constitute groups; rather, groups result from the actions of individuals but, importantly, individuals can think of themselves as members of groups, as Thagard (2012) puts it (see Tuomela 1995). Thus, the psychology of individuals cannot be understood without appreciating the centrality of the social to the self. Social phenomena cannot be simply derived from cognitive phenomena. Although culture is in the mind, it is not just in the mind (see Geertz 2010). Here Thagard (2012) briefly points to the idea of multi-level mechanistic explanation (from molecules up to culture) as a solution, an idea I have dealt with in more detail elsewhere (Pyysiäinen 2009, 201–204, 2012).

In this view, reality consists of differing levels and explanation means specifying the mechanisms that produce or support phenomena at differing levels (McCauley 1986, 1996; McCauley and Bechtel 2001; Craver 2007; Bechtel 2008). We can first distinguish between the levels of science (e.g., its products and units) and levels of nature (e.g., causation, size, composition). Second, the levels of composition include, for example, the levels of mechanisms (Craver 2007, 107–162, 170–195). Although the levels of mechanisms are levels of composition the composition relation is not spatial or material. X does *a* at a lower level compared to S doing *b*, if the *a* done by X is as a component in the *b* done by S (Craver 2007, 188–189, 196).

In causal-mechanical explanation, we describe the parts, operations, and organization of a mechanism and show how the mechanism realizes the phenomenon to be explained. We thus describe the internal organization or structure of the system in question in terms of lower-level entities and activities (Bechtel 2008, 49; Craver 2007, 5). No "covering laws" are needed; an explanatory generalization must only be stable in the sense that the specified relation between the cause and the effect holds under a range of conditions, although not universally (Craver 2007, 99).

Causality is here understood as causal relevance in the sense that any given X is causally relevant with regard to Y if an "ideal intervention I on X is such a change in the value of X that it also changes Y *only via* the change in X." Here I does not change Y directly; it does not change the value of some causal intermediate S between X and Y except by changing the value of X; and it is not correlated with some other variable M that is a cause of Y. I acts as a "switch" that controls the value of X, irrespective of X's other causes (Craver 2007, 95–96; see Woodward, 2003). Such ideal intervention need not be actually made by humans; it is enough that the intervention is conceptually possible and we can imagine what would have happened had the cause of the event been

manipulated by an ideal intervention (Woodward 2003, 94, 114, 127–133; see Hedström and Ylikoski 2010).

Mechanistic accounts of explanation and causality offer a way of exploring and conceptualizing what is involved in a scientific explanation of religion but they do not offer explicit methodological principles for empirical research. What they can do is to help scholars avoid the rather fruitless question about "reducing" religion or "explaining it away." The question is rather which kinds of questions can be answered at each level from molecular mechanisms, neural networks, cognitive structures and mind up to culture. The *explanandum* in question determines the level at which the *explanans* is sought. This naturally requires strong cross- or interdisciplinarity that can be understood in two differing ways: either many different disciplines contribute to the study of religion on their own or we actually try to get rid of the traditional disciplinary boundaries which do not neatly map on to the natural world (Boyer 2005a).

However, if religion can be profitably studied within many different disciplines, what place and role is left for traditional Religious Studies? What does it have to contribute? If all important questions can be answered at the cognitive level, the study of religion can be replaced by cognitive science. The study of religions has never had any methods or even theories of its own; what it has is accumulated knowledge of the varying forms of religious behavior and thinking. As other disciplines do not have such knowledge, it is understandable that, within CSR, there are only a few studies on the historical spread of particular religious concepts and beliefs (e.g. Beck 2006; Pyysiäinen 2009; Martin and Sørensen 2011). As Barrett puts it, cognitive theories have not been applied to *particular* problems; rather scholars study "why religious rituals appear the way they do *generally*, why people believe in gods generally," and so forth. This is also often accompanied by attempts at solving only theoretical problems by conceptual analysis alone (Barrett 2008b, 298). Jensen also (2011) points out that Boyer (2010) does not show such acquaintance with the recent study of religion as he does in other areas.

Thus, the study of religions could be understood as providing in-depth knowledge concerning the history of religions and of religion as it is currently manifested in various cultures. Other disciplines provide methods, theories and perspectives by which to analyze and explain the data that Religious Studies has to offer. Without such data CSR would be mere speculation *in abstracto*. On the other hand, also religious studies has its own ways of systematizing the data, but without the help from other disciplines the principles governing this systematization run the risk of remaining too speculative. It may then be difficult to operationalize such concepts as "myth," "sacred," "ritual" and so forth.

CSR serves as a reminder of the importance of operationalizing explanatory concepts and constructing hypotheses and theories that are empirically testable.

Centers of study

Important contributions to teaching and research in CSR have been made by, for example, Jesse Bering (Queen's University, Belfast), Pascal Boyer (Washington University, St. Louis), the founder of the *Journal of Cognition and Culture* (with Boyer) E. Thomas Lawson (Kalamazoo University, Michigan, now Queen's University, Belfast), Deborah Kelemen (Boston University), Robert N. McCauley (Emory University, Atlanta), and Ilkka Pyysiäinen (Helsinki University). Currently, CSR is taught and studied in several universities some of which have become important international centers of study.

Whitehouse launched the *Institute of Cognition and Culture* in Belfast, now headed by Paulo Sousa. He then moved on to Oxford University and founded the *Centre for Anthropology and Mind*. Justin Barrett, who worked at the Center, established the project *Cognition, Religion, and Theology* funded by the Templeton Foundation. The aim is to develop the cognitive science of religion by providing training, web resources, and research funding for scholars and students. Barrett has since moved to Fuller Theological Seminary in the USA as Thrive Chair and Professor of Psychology (see Barrett 2011b).

In 2007–2010, Whitehouse directed a project called *Explaining Religion* funded by the European Commission. It employed six postdoctoral researchers in Oxford and involved fourteen collaborating universities across Europe and North America. Recently, Whitehouse received funding from the Economic and Social Research Council for a project called *Ritual, Community and Conflict* which kicked off in June 2011; it involves researchers from thirteen universities worldwide. The project aims at examining both the acquisition of ritual and ritual's role in group cohesion, inter-group relations, and the evolution of political systems. The first part of the project explores the origins of the ritual stance by examining how children acquire and understand ritualized actions. The second part explores the effects of ritual participation on ingroup cohesion and outgroup hostility, while the third part focuses on the role of ritual in the evolution of socio-political systems (see Atkinson and Whitehouse 2011).

A third center for CSR is the *Religion, Cognition and Culture* Research Unit (RCC) established in 2004 by Armin W. Geertz and Jeppe Sinding Jensen at Aarhus University, currently in the *Department of Culture and Society*. The RCC collaborates with the Center for Functional Integrative Neuroscience (CFIN) funded by the Danish National Research Foundation, MIND*lab* (established in 2009) funded by the Danish Ministry of Science, Technology and Innovation,

and Interacting Minds (funded by the Danish National Research Foundation). These institutions consist of medical doctors, neuroscientists, psychologists and neuropsychologists, as well as of scientists from the humanities, social sciences, Aarhus Business School and the Royal Academy of Music. Armin W. Geertz is the leader of one of the five sections (Cognition and Culture) of MIND*Lab*. The latter provides the infrastructure and employees to run brain imaging machines, provide advisors on experimental paradigms and the practicalities of doing experiments, as well as a continual meeting place for national and international scientists from all disciplines to meet and discuss their experiments. The governing idea of RCC research is to use both a bottom-up and a top-down approach. Cognition is understood to be embrained, embodied, encultured, extended and distributed (Geertz 2010; see, e.g., Schjoedt 2009; Schjoedt et al. 2009). MIND-*Lab* leaders are also involved in the *Sino-Danish Center for Neuroscience and Cognition* (SiDa-NeC) in Denmark and Beijing, China.

Cognition and culture are also studied at *The International Cognition and Culture Institute* which was established in 2008 on the initiative of the Department of Anthropology of the *London School of Economics and Political Science* made possible by an initial grant from the LSE and support from the *Institut Jean Nicod* (ENS, EHESS, CNRS) in Paris. The Institute is directed by Dan Sperber, and the website is an important source for CSR scholars (http://www.cognitionandculture.net/).

The latest center for CSR is the Laboratory for the Experimental Research of Religion (LEVYNA) in Brno, an interdisciplinary center funded by the European Union and the Czech government to train young scholars in employing scientific methods in the study of religion, and to produce high quality research on religion through cross-disciplinary collaboration, methodological integration and innovation. Founded in 2011, LEVYNA is the world's first institution exclusively dedicated to the experimental study of religion. The center is directed by Dimitris Xygalatas and William W. McCorkle, Jr. in cooperation with David Václavík and Joseph Bulbulia. The center employs 18 staff members with backgrounds as diverse as Religious Studies, Anthropology, History, Psychology, and Neuroscience, who work collaboratively to investigate religious belief and behavior using experimental methods, both in laboratory and in field settings. Research at LEVYNA is primarily but not exclusively focused on ritual behaviour. Areas of particular interest include ritual and embodiment, ritual and pro-sociality, and ritual and emotion.

Other centers dedicated to the study of cognition and culture are the *Centre for Human Evolution, Cognition, and Culture* (HECC) at the University of British Columbia and Simon Fraser University in Vancouver, directed by Joseph

Henrich, Ara Norenzayan, and Edward Slingerland, among others. It was established to create an interdisciplinary and international research and training environment that advances the understanding of the human species within the framework of Darwinian evolutionary theory. At the University of California Santa Barbara, the *Department of Religious Studies* and *Department of Psychology* have established doctoral programs in the cognitive science of religion on the initiative of Ann Taves. The programs encourage cooperation with *Cognitive Science*, the *Sage Center for the Study of the Mind* and the *Center for Evolutionary Psychology* in Santa Barbara.

The *Centre for Religion and Cognition* (CRC), hosted by the University of Groningen since 2005, is an interdisciplinary initiative for scholars from different academic disciplines to study religion from the perspective of Cognitive Science. It is directed by István Czachesz, Tamás Bíró, and Ronit Nikolsky and maintains the *Archive for Religion and Cognition*, as well as the *Bulletin for Religion and Cognition* at their website. At Emory University, the *Center for Mind, Brain, and Culture* was created in 2007 and moved into its current location in the new Psychological and Interdisciplinary Sciences Building in 2009. It is funded primarily by a grant from Emory University and is directed by Robert N. McCauley and Laura L. Namy, assisted by Jared Rothstein. Finally, the *Culture and Cognition Program*, established at Western Michigan University by E. Thomas Lawson provides educational and research possibilities focusing on the dynamic interplay between socio-cultural processes and psychological processes. The program is conducted in cooperation between the Psychology and Anthropology departments and the Institute for Social Research.

The *International Association for the Cognitive Science of Religion* was established in 2006 and the *Journal for the Cognitive Science of Religion* is being launched in 2012. In 2011, another journal, Religion, Brain and Behavior, was published in association with the *Institute for the Biocultural Study of Religion* in Massachusetts, USA. There are also book series dedicated to CSR (published by AltaMira Press, Berlin Academic, Brill, and Equinox Publishing). In addition, CSR has been introduced in a number of review papers with considerable overlap (e.g. Barrett 2007, 2011a; Pyysiäinen 2008, 2012; also Boyer and Bergstrom, 2008). As one leading psychologist of religion put it in a conference, this is the wave of the future.

Conclusion

This article has presented an introduction to the cognitive science of religion. It was shown that it began with original theoretical approaches within the human sciences and has subsequently developed into a more empirical, interdisciplinary

field of study. The field is growing rapidly with the appearance of several centers and projects. As the number of graduates increases, we may in due course witness a veritable explosion of studies. It seems as if the struggling beginnings of this field have been replaced by solidification, expansion and institutionalization. We can only hope that this tendency will continue to enrich not only the cognitive science of religion but also the academic study of religion the world over.

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