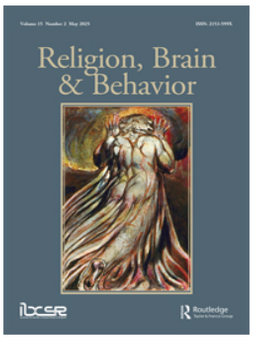

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The cognitive science of religion: past, present, and possible futures

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ABSTRACT

This paper provides an overview of research in the Cognitive Science of Religion over more than three decades and considers where the field might be headed in the future. The perspective we bring draws on the experiences of some of the field's founders (Barrett, Boyer, Lawson, McCauley, and Whitehouse) and on insights from the author of the field's first single-authored introductory textbook (White).

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CSR; ritual; religion; evolution

1. Introduction and overview

1.1. Origins of the cognitive science of religion

More than thirty years ago, a small group of scholars from different fields sought to rescue the academic study of religion from interpretive exclusivism – the dogma that culture in general, and religion in particular, is an autonomous domain that can only be studied on its own terms (Lawson & McCauley, 1990; McCauley & Lawson, 1996). This group of scholars argued that many features of religious thinking and behavior could be explained in terms of cross-culturally recurrent cognitive processes that can be studied scientifically in much the same way as any other ways of thinking and behaving shaped by our species' evolutionary heritage. They dubbed this new approach the "Cognitive Science of Religion" (CSR).

Inspired by the broader cognitive revolution in the psychological and social sciences, early exponents of CSR argued that the theories, methods, and scope of research dominating the study of religion were insufficient at best, and at worst, impeding progress in answering basic research questions. These basic questions included: Why are gods so often imbued with human characteristics (Boyer, 1994, 2001; Guthrie, 1980, 1993)? Why do communities with predominantly intense, once-in-a-lifetime rites have different socio-political systems than those centered on mundane, often-repeated ceremonies (Whitehouse, 1995, 2000, 2004)? And why do collective religious rituals take on strikingly similar forms across cultures (Lawson & McCauley, 1990; McCauley & Lawson, 2002)?

CSR today continues to reflect the theoretical and methodological ambition of its founders, as well as its transdisciplinary character. CSR encompasses scholars from diverse fields, such as cognitive, cultural, and evolutionary anthropology; evolutionary, developmental, cognitive, and social

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psychology; religious studies; sociology; philosophy; neuroscience; biology; behavioral ecology; archaeology; and history; among others. Importantly, while cognitive scientists of religion adopt theories and methods from their respective disciplines, they remain united by a focus on the role of human cognition in religious thought and behavior. CSR scholars recognize that how humans attend and respond to religious representations is not random but influenced and constrained by cognitive processes. These processes are, in turn, shaped by our evolutionary history and (recurrent) features of developmental environments.

The aim of CSR is to explain how the human mind influences the kinds of information attended to, the contexts in which information is attended to, and how information is stored, processed, and acted upon, in ways that give rise to ideas and practices that are commonly described as religious. CSR scholars build explanatory frameworks based on the formulation of precise hypotheses that are testable by means of empirical studies deploying techniques of measurement and methods of statistical analysis appropriate for experimental, developmental, and longitudinal studies aimed at establishing causal relationships. Despite the diversity in research questions pursued, the goal of CSR remains the same: to explain how religious ideas, beliefs, and behaviors arise and spread in human populations by integrating insights about evolution, cognition, brain, and behavior. As we pass the thirty-year mark since CSR was established, and in the spirit of an evolving scientific enterprise, we take this opportunity to reflect critically on the evolution of the field, and to ponder future directions.

1.2. Thirty years of CSR: theories, methods, and debates[1]

CSR has made notable progress in explaining the cognitive basis of religious ideas and behaviors, in such areas as:

- The transmissive potential of religious ideas that minimally violate our natural assumptions about the world (Boyer & Ramble, 2001; Gregory & Greenway, 2017), especially when compared to radically counterintuitive scientific concepts (McCauley, 2000, 2011; Shtulman, 2017);
- How and why people reason about the agentic design and origin of the natural world – including the tendency to adopt creationist narratives (Evans, 2001; Järnefelt et al., 2015; Kelemen, 2004);
- Teleological reasoning about life events (Banerjee & Bloom, 2014; Heywood & Bering, 2014; Kelemen, 1999; White et al., 2019);
- Registering the presence of non-human agency (Barrett, 2004; Guthrie, 1993);
- Multiple, simultaneous types of reasoning about misfortune (Legare, 2012);
- The forms, functions, and neurological correlates of prayer (Barrett, 2007; Schjoedt et al., 2009);
- Common representations of gods and other supernatural agents (Barlev et al., 2017; Barrett & Richert, 2003; Bering, 2002; Heiphetz et al., 2016; Knight, 2008; Lane et al., 2012; McKay et al., 2011; Piazza et al., 2011; Purzycki, 2013);
- Representations of the others during spirit possession (Cohen, 2007; Cohen & Barrett, 2008) and following reincarnation (White, 2016a);
- Assumptions about life after death (Astuti & Harris, 2008; Bering, 2006; Bering & Bjorklund, 2004; Bering et al., 2005; Harris & Richert, 2006) and life before life (Emmons & Kelemen, 2014);
- The representation and recurrent features of rituals and their effects on participants (Atran, 2002; Boyer & Liénard, 2006; Cohen et al., 2014; Fischer et al., 2014; Henrich, 2009; McCauley & Lawson, 2002; Xygalatas et al., 2011; Watson-Jones et al., 2016; Whitehouse, 2004, 2011; Whitehouse & Lanman, 2014); and
- The relationship between religiosity and prosociality (Johnson, 2016; McKay & Whitehouse, 2015; Norenzayan, 2014; Shariff, 2015; Sosis, 2004; Sosis & Handwerker, 2011; Turchin et al., 2023).

One reason for such rapid progress in a relatively short period of time is due to the interdisciplinary breadth of CSR. This breadth is partly a consequence of the fact that early proponents of a

cognitive approach to the study of religion were trained in a variety of methods across many disciplines including religious studies, philosophy, anthropology, and psychology. Religious thought and evolution are complex clusters of phenomena and thus no single method is sufficient to explain them.

Researchers have employed numerous methods, including:

- Brain imaging to understand the neural correlates of religious cognition and experiences (Schjoedt et al., 2009; Schjoedt et al., 2011; as well as projects in the Institute for the Bio-Cultural Study of Religion's lab at Boston University, Andersen et al., 2014);
- Computer modeling, to predict and explain religious dynamics both past and present (e.g., Cragun et al., 2021; Whitehouse et al., 2012; Wildman et al., 2020);
- Textual analyses (Nichols et al., 2021; Slingerland, 2013);
- Experimental and quasi-experimental cross-cultural fieldwork (e.g., the "Experimental Anthropology Lab" at the University of Connecticut; Astuti & Harris, 2008; Cohen, 2007; Emmons & Kelemen, 2014; Malley, 2004; White, 2016b; Whitehouse, 2011);
- The creation of new large datasets (such as Seshat; Global History Databank, Turchin et al., 2020; and the Database of Religious History (DRH); Slingerland & Sullivan, 2017); and
- Philosophical and theological treatment of CSR theories (e.g., De Cruz & De Smedt, 2014; Geertz & Jensen, 2014; McCauley, 2014; Nichols, 2007; Nicholson, 2014; Pyysiäinen, 2001; Schloss & Murray, 2011; Slone, 2004)
- Historical and archaeological treatment of CSR theories (e.g., Whitehouse & Martin, 2004; Whitehouse & Hodder, 2010)

Within this scientific and naturalistic framework, diverse research in CSR is characterized by the integration of disciplines and methods to answer questions about religion (see Table 1).

This integration has been made possible in part because scholars with expertise on religions learned about the methods and deliverances of psychological, cognitive, and evolutionary sciences. In some cases, these scholars even collaborated with psychologists to conduct experimental studies (e.g., Barrett & Lawson, 2001; Cohen et al., 2011; Whitehouse et al., 2017). A particularly illustrative case is Pascal Boyer, who was initially trained in anthropology but re-tooled himself as a psychologist and now holds affiliations in both departments at Washington University in St. Louis. Some of this cross-disciplinary integration was excelerated through a program led by psychologist Justin Barrett and philosopher Roger Trigg at the Centre for Anthropology and Mind at Oxford University to train humanities scholars with interest in religious expression in psychological research methods and in basic CSR theory. Participants in the program, which ran from 2007 to 2011, have gone on to make empirical and theoretical contributions to CSR in part because of these new empirical research skills. Examples include Emma Cohen (Cohen et al., 2011), Elisa Järnefelt (Järnefelt et al., 2015), Ryan Nichols (Nichols et al., 2021), and Bradley Wigger (Burdett et al., 2021).

CSR has also benefitted from the contributions of scientists whose primary interests were not necessarily religious but who found religious phenomena important cases to consider given their theoretical interests. Perhaps the most prominent example is the work of psychologist Deborah Kelemen, whose primary research are a was teleological and functional reasoning of children concerning artifacts and natural things, which began to show important connections to explaining some religious thought within a CSR framework (e.g., Kelemen, 2004). Another example is developmental psychologist Paul Harris who has made considerable contributions to understanding how children use the testimony of others to learn. Religious beliefs provided a good topic for Harris to challenge the receptivity of children to testimony, contributing to CSR (e.g., Astuti & Harris, 2008; Harris & Richert, 2006). Such examples are numerous.

Many theories in CSR have been contested, falsified, supported, or revised in the light of new evidence. These include the extent to which theories concerning cognitive mechanisms such as an agency detection device explain belief in supernatural agents (e.g., Willard, 2019); the extent to which theories concerning transmission biases such as minimally counterintuitive theory explain

Table 1. Examples of research questions and methodologies employed in CSR.[6]

Question	Methods	Design	Basic Findings and sample citation
How do assumptions about speakers' charismatic abilities change how information is processed?	Neuroscience, questionnaires.	Functional magnetic resonance imaging (FMRI) in response to speakers who Christian participants believed had healing abilities.	Participants' recognition of charismatic authority enhances their susceptibility to charismatic influence by reducing the activity of brain-systems responsible for guarding against suspect ideas (Schjoedt et al., 2011).
How do people represent spirit possession?	Ethnography, experiments.	Participant-observation and interviews in an Afro-Brazilian Religious Tradition in Northern Brazil. Experiments in the UK.	Intuitive ideas about bodies and minds facilitate the spread and appeal of popular ideas about spirit possession (Cohen & Barrett, 2008).
How and why do people identify someone who has been reincarnated?	Ethnographic database, cross-cultural studies.	Coding and collecting ethnographic data from the Human Relations Area Files (HRAF). Cross-cultural perspective taking studies in the UK and India.	Intuitive ideas about personal continuity and default strategies used to recognize people every day facilitate the spread of identification practices (White, 2015).
Why do gods care about the things they do?	Surveys in naturalistic contexts.	Free-list data, a variety of metric scaling techniques, cross-cultural comparisons.	Cross-culturally, gods care about and punish a relatively narrow set of concerns. When directly asked, however, locally salient deities appear to care about and punish for moral transgressions (Purzycki, 2013).
How does the human cognitive system process ritualized actions?	Experimental studies.	Examining how participants divide up and represent actions when observing functional and non-functional (ritual) behavior.	People process ritual behaviors in a way that heightens cognitive load and hampers memory encoding.
How do people integrate natural and supernatural explanations for the same events?	Experiments, studies, ethnography.	Experiments with individuals and groups in multiple settings, vignette studies, surveys, focus group discussion, key informant interviews, ethnography.	People reconcile natural and supernatural explanations by using them to understand multiple levels of causality. Natural explanations are often used to explain *how* something happened; supernatural explanations are often used to explain *why* something happened (Gelman & Legare, 2009).
How do emotionally intense "imagistic" rituals bond groups?	Mathematical models, online experiments.	Mathematical models generated predictions that a team of psychologists then tested in collaboration with experts on a variety groups (e.g., military, extreme sports, twins) and via online experiments.	Conditioning cooperation on past experiences (e.g., undergoing painful rituals with other group members) produces identity fusion (Whitehouse et al., 2017).
How do the special features of ritual influence memory formation?	Field experiments.	Field experiments involving on-line measurement of excitement, video-recoding and post hoc recollection by participants.	Participants' memory encoding of highly exciting ritual action is impeded, which facilitates post hoc social (re-) construction of events as well as potential meaning (Xygalatas et al., 2013).
Must young children think of God the same as a human being?	Developmental cross-cultural research.	Three – to six-year-old children participated in a version of the classic surprising contents "false-belief" task.	Though preschoolers may mistake God for a human being, they do not have to. Children in four different cultures distinguished between God's knowledge and their mother's even before they had a stable understanding of what their mom knows and does not know (Burdett et al., 2021).

(*Continued*)

Table 1. Continued.

Question	Methods	Design	Basic Findings and sample citation
What are the functions of ritual?	Developmental and cross-cultural research.	Experiments with individuals and groups in multiple settings, vignette studies, surveys, focus group discussion, key informant interviews, ethnography.	Rituals serve a variety of functions; practical, psychological, and social (Wen et al., 2020).
How can we understand ancient initiation rituals in the Roman cults of Mithras	Historical texts and images.	Review of the description of Mithraic initiation rituals based mostly on depictions, such as images.	Throughout history, initiates are subject to "rites of terror." These rites are memorable, but their significance is locally construed (Martin, 2015).
Is mind-body dualism present in ancient China?	Philosophical analysis, qualitative and quantitative textual analyses.	Three different machine-based techniques – word collocation, hierarchical clustering, and topic modeling analysis of ancient Chinese texts.	Chinese thought is often portrayed as radically different from Western thought. Textual evidence provides support against strong mind-body holism (Slingerland et al., 2017).
What is the historical development of different forms of religious systems in Austronesia?	Phylogenetic methods.	Coding and collecting ethnographic sources. Evaluating causal connections between the evolution of supernatural concepts and the evolution of political complexity.	Beliefs in supernatural punishment, but not in moralizing Gods, come before political complexity in Austronesia. Beliefs in moralizing Gods follow rather than drive political complexity (Watts et al., 2015).
What is the cultural evolutionary history of modes of religiosity?	Ethnographic, historical, and archaeological data.	Quantitative analysis of data from regional and global samples of ethnographic, historical, and archaeological sources.	Imagistic practices are associated with small-scale group bonding, whereas doctrinal practices are associated with increasing agricultural intensity and the rise of larger and more complex social formations (Atkinson & Whitehouse, 2011).

belief in supernatural agents (e.g., Barrett, 2016; Willard et al., 2016); how early formulations of the limitations and empirical needs of the modes theory (Barrett, 2004) subsequently shaped decades of critical debate, new empirical research, and theoretical modifications (Whitehouse, 2011); the relationship between theological correctness and folk concepts of religion (e.g., De Cruz, 2014); the cognitive mechanisms and structure of common representations of the afterlife and supernatural agents (e.g., Hodge, 2008); and the relationship between big gods and the cultural evolution of large-scale societies (Norenzayan et al., 2016), which has sparked considerable debates within CSR (e.g., Baumard & Boyer, 2015; Turchin et al., 2020; Whitehouse et al., 2023).

1.3. Institutional embedding of CSR

CSR is now established at many universities, particularly those that recognize the value of bringing cognitive and evolutionary approaches to bear on the study of culture. One of the earliest such institutionalized homes for the cognitive study of culture that included what has come to be known as CSR was the University of Michigan's Institute of Culture and Cognition, but the first such institute explicitly designed to build the CSR field was the Institute of Cognition and Culture (ICC) established by Harvey Whitehouse and assisted by Tom Lawson at Queen's University Belfast in 2004. Many others have followed suit. These include: at Aarhus University, the Religion, Cognition, and Culture research unit (RCC); at the University of Oxford, the Centre for Anthropology and Mind (CAM), the Institute of Cognitive and Evolutionary Anthropology (ICEA), and the Centre for the Study of Social Cohesion (CSSC); at the London School of Economics and the Institut Jean Nicod in Paris, the International Cognition and Culture Institute; at the University of British Columbia, the

Centre for Human Evolution, Cognition, and Culture (HECC); at the Centre for Mind and Culture in Boston, the Institute for the Biocultural Study of Religion; at Emory University, the Center for Mind, Brain, and Culture; at Masaryk University, the Laboratory for the Experimental Research of Religion (LEVYNA).

CSR is also represented in a diversity of academic disciplines. In addition to festschrifts (Light & Wilson, 2004; Pachis & Wiebe, 2014; Petersen et al., 2018), there are publications in specialist journals spanning a range of academic fields (e.g., psychology, anthropology, archaeology, history, neuroscience, and evolutionary biology). Work by cognitive scientists of religion also feature in edited volumes, journal editions, and book series such as *The Oxford Handbook of the Cognitive Science of Religion* by Oxford University Press; *Advances in Religion, Cognitive Science, and Experimental Philosophy* at Bloomsbury Publishing; *Advances in the Cognitive Science of Religion series at Equinox*; the Religion, Cognition and Culture Series at Routledge; the Cognitive Science of Religion Series at Alta Mira Press; and specialized journals, including the *Journal of Cognition and Culture* (JOCC), *Religion, Brain and Behavior* (RBB), and *Journal for the Cognitive Science of Religion* (JCSR). The year 2021 saw the publication of an introductory textbook to CSR written specifically for undergraduates and newcomers to the approach, *An Introduction to the Cognitive Science of Religion: Connecting Evolution, Brain, Cognition and Culture*. CSR also has an established professional society, The International Association for the Cognitive and Evolutionary Sciences of Religion (IACESR), and representation in leading professional organizations on religion such as the American Academy of Religion, International Association for the History of Religions, and in other disciplines, such as psychology and cognitive science.

Though the boundaries between CSR and other scholarly studies of religion are blurry at times, CSR cannot be identified as simply part of any other field. Some specific contributions to CSR would be at home in journals and conferences specializing in the psychology of religion or neuroscience of religion, but CSR differs from these disciplines in terms of level of explanation. CSR is primarily concerned with group-level religious expression and not the individual-level focus that characterizes most research in the psychology and neuroscience of religion. Anthropology of religion shares CSR's group-level explanandum but (typically) lacks the appeal to underlying cognitive and other psychological dynamics to account for this group-level expression. Perhaps evolutionary studies of religion share the most common ground with CSR, but evolutionary accounts can (and often do) skip cognitive and psychological mechanisms as part of their explanatory strategy. Though CSR sometimes borrows insights from all of these ways to study religious phenomena, it is not equivalent to any one of them.[2]

In sum, CSR is a now a well-established transdisciplinary field of research, spanning a diversity of research questions, employing a broad range of methods, and embedded institutionally in universities, publishing outlets, and professional associations.[3] In the next section, we consider what we have collectively learned from all this field-building activity and new research.

2. The cognitive foundations of religion

Much research in CSR aims to explain recurrent features of religious thinking and behavior with reference to the shaping and constraining effects of evolved cognitive predispositions and susceptibilities (Barrett, 2000). CSR scholars have pointed out that while human minds in different contexts might give rise to a seemingly endless variety of ideas, many are broadly similar across cultures, such as: the idea that significant misfortune happens for a reason, life continues following biological death, minded supernatural agents impact the world, and ancestors need to be pleased or appeased. Cognitive scientists of religion are concerned with understanding why ideas like these are widely recurrent.

2.1. Is there a universal religious repertoire?

The cognitive science of religion does not generally propose an original "definition of religion," as a set of phenomena with unique features.[4] In the cognitive science of religion, most practitioners are

happy to accept as religious any cultural phenomena that either local participants or external observers have identified as such. Taking as its subject matter all phenomena labelled "religion" in everyday usage does not mean that the CSR field regards religion as a natural kind. On the contrary, those working in the field have argued that the term denotes an historically contingent cluster of features of thinking and behaviour that might just as easily not have been categorized together – indeed have not always been formulated as a distinct category in many cultural systems, past and present (Boyer, 2001; McKay & Whitehouse, 2015).

What falls under the purview of the religion label in academic disciplines such as anthropology, history, and comparative religion, is thus somewhat arbitrary. And since the contents of the religion category are arbitrarily assigned, they often turn out to have less in common with each other than with phenomena that are not typically labelled "religious" at all. For example, the same constructs used by CSR researchers to study the psychology of participation in world religions (Kavanagh et al., 2020) and initiation cults (Buhrmester et al., 2020) have also been shown to be central to domains as diverse as football fandom (Newson et al., 2023) and birthing experiences (Tasuji et al., 2020).

When cognitive scientists of religion consider such a domain, already identified and labeled by others before they start their inquiries, they have to consider two questions: Do the phenomena labelled in this way (e.g., "religion," "political power," "moral norms," "economic exchanges") actually have *common* features? And, are these common features *unique* to the domain considered?

Researchers engaged in the cognitive study of religion consider these two questions of commonality and uniqueness as empirical questions that can be best addressed by the combination of psychological, anthropological, historical, and archaeological evidence that characterizes the field.

Concerning the first question of commonalities, much research in CSR has focused on identifying recurrent features across times and places – for instance, the postulation of agents with counterintuitive physical properties (Barrett, 2000; Boyer, 2001), the syntax of actions that underlies rituals (Lawson & McCauley, 1990), correlations between cooperation and religious belief (Shariff et al., 2010), and many more (White, 2021). Each of these features may be common but not universal in the many systems called "religious." For instance, some literate versions of Buddhism may not include sentient deities – whether these systems should therefore be considered "religions" is a purely terminological matter; it does not help us understand either Buddhism or the more common systems focusing on supernatural agents.

In practice, identifying recurrent features often involves fractionating or breaking down religious systems into aspects that seem to recur across cultures. For example, one such feature may be explanations of misfortune by reference to supernatural forces and deities. Cognitive scientists of religion identify the underlying cognitive foundations that give rise to these recurrent features across disparate contexts. For instance, the transmission of cultural information about both karma in one tradition and moralizing supernatural agents in another both ultimately depend upon intuitions of interpersonal fairness (i.e., proportionality bias) that are enlisted in culturally contingent ways. CSR does not privilege any method or theory for studying religions as whole systems, but particular theories or methods may prove especially effective in accounting for specific aspects of religious ideas and practices.

The second question, concerning uniqueness, is also an empirical one. Is there evidence that beliefs and practices that we call religious constitute a special set, unique among various forms of cultural expression in terms of their biological, psychological, or social causes? So far, scholars in CSR have generally assumed that one can explain the psychological and social aspects of religious phenomena in terms of processes that apply in many other domains of mental life (Barrett, 2000). Religion may be central but is nothing special (Bloch, 2008). This assumption is, first, a matter of parsimony. As in other scientific endeavors, we should not postulate special processes where common ones are sufficient. That parsimonious assumption is also a reaction to the persistent belief, especially in religious studies, that something about religious thought or behavior is unique. For instance, many have postulated that religious experience possesses unique features, while most

social scientific studies suggest that the salient features of such experience are in fact found in other domains as well (Taves, 1999, 2009). In the same way, showing that religious beliefs have common features does not require that they are unique to what are usually called religious traditions (McKay & Dennett, 2009). Claims about the specialness or uniqueness of religious expression, then, carry the burden of proof from a CSR perspective.

2.2. What are some cognitive foundations of religion?

The term "cognitive foundations" is used by CSR scholars to capture a variety of psychological predispositions, cognitive biases, content processing tendencies, and psychological constraints that enable or facilitate the representation of ideas. For instance, much research in CSR emphasizes the automaticity of humans' attribution of mental states to others and their generation of explanations and predictions for behavior based on these mental states, such as beliefs, desires, and percepts. This is an ability commonly captured by terms such as mindreading, mentalizing, and theory of mind, and it can be easily extended to supernatural agents (e.g., Baron-Cohen, 1997; Barrett et al., 2001). Other cognitive foundations often cited in CSR research are listed in Table 2, below. These cognitive foundations readily appear in other domains and everyday social interactions.

As mentioned above, the psychological foundations that give rise to religious concepts are part of our typically developing cognition and are not distinct from those that underpin their non-religious counterparts. Because of this causal ordinariness, religious ideas and behaviors do not require special cultural conditions but emerge with minimal instruction and spread readily when introduced in social environments. Much like music, art, dance, or language, religious expression is cognitively natural, and so we are not surprised to find it in all human societies.

2.3. Born believers? The status of the naturalness thesis

The proposal that religion is cognitively natural is often referred to as the "naturalness thesis." This thesis includes the idea that the cross-cultural recurrence of beliefs and practices deemed religious

Table 2. Examples of some psychological foundations that underpin religious ideas.[7]

Cognitive Foundation	Brief Description
Teleofuctional reasoning	Seeing things in the world as having a purpose and being made for that purpose.
Psychological essentialism	Members of a category share deep commonalities that make them what they are.
Immanent justice reasoning	Reasoning as though good things happen to good people and, conversely, that bad things tend to happen to bad people.
Folk-dualism	Perceiving minds/persons as separate and independent from bodies in certain contexts.
Simulation constraints	The inability to imagine something. For example, imagining not having mental states, because imagination depends upon thinking.
Offline social reasoning	The ability to think about a person as continuing in another realm when they are not physically present.
Embodiment	The tendency to think about people as physically embodied in certain contexts.
Anthropomorphism	Attributing human-like properties, including mental states and characteristics, to non-human things.
Minimally counter intuitive transmission advantage	Attending to, and remembering, ideas that meet most of our default expectations about the world and counter a few others.
Proportionality bias	Representing actions and consequences as being proportionate in magnitude.
Imitative fidelity	A social learning strategy where we imitate some behaviors more closely than others.
Action representation system	Ritual actions are handled by the same cognitive system that processes everyday actions; actions are distinguished from mere events.
Mnemonic effects (of ritual)	The frequency of ritual performance impacts how the behaviors are processed.
Hazard precaution system	Spontaneous ritualized behavior occurs when unseen threats are thought to be in the environment.
Kinship detection and identity fusion	Recognizing and calibrating kinship, and by extension, fusing identity with imagined kin.

are partially explicable in terms of how well they fit with how ordinary human cognitive systems – working in ordinary human environments – predictably give rise to and sustain their transmission (e.g., Atran, 2002; Barrett, 2011; Bering, 2011; Guthrie, 1993; Pyysiäinen, 2001). In other words, popular forms of religious thought (and associated behaviors) are the conceptual path of least resistance (Boyer, 2001); they are "intuitive" (Kelemen, 2004), or cognitively "natural" (Boyer, 1994; McCauley, 2011). This emphasis on the naturalness of religious belief and practice stands in contrast to the notion found in various forms across other approaches to the study of religion that such cultural expression is exclusively or in combination, the product of extraordinary social engineering, peculiar brain activity, or rigorous indoctrination.

While cognitive scientists of religion acknowledge that both cognition and culture account for the recurrence of religious beliefs and behaviors, diverse viewpoints remain concerning how to best account for this apparent naturalness, and how strongly religious thought and behavior conform to these natural tendencies. Is religious thought like language, a near-inevitable feature of being human, or more comparable to music or dance, likely to arise in nearly every cultural group but also likely to be irregularly expressed across individuals? The answer will surely depend upon the specific type of belief or practice under consideration, and debates are ongoing.

Barrett (2012) has proposed one version of this naturalness thesis, arguing that humans are "born believers." Specifically, he proposes that children have natural receptivity to cross-culturally recurrent forms of religious thought and action. Rather than special conditions being required to bring about these recurrent forms of religious thought, special conditions are required to discourage such thinking arising in human groups. Barrett supports this case via a number of observations and empirical research: for example, that

- Children commonly attribute to other people, imaginary friends, and gods greater knowledge or perceptual abilities than are strictly the case in humans (Burdett et al., 2021);
- Attributing something like psychological immortality to others appears to be a default stance in children (Bering & Bjorklund, 2004); and
- Tendencies to see design and purpose in the natural world (teleofunctional reasoning) and attach that perceived purpose to the actions of one or more intentional beings (Järnefelt et al., 2015).

Cultural ideas that map closely enough to these early-developing belief tendencies are easily acquired, transmitted, and used. Those cultural ideas that map most closely of all are sometimes referred to as "cognitively optimal" beliefs and practices (Whitehouse, 2004) taking the form of "wild religions" (Boyer, 2020) – that is, clusters of cultural representations that spread naturally without requiring elaborated mnemonic supports or other institutional scaffolding to sustain. Many religious traditions are predominantly "wild" in this sense, or at least incorporate many cognitively optimal elements.

The term "natural" is used here primarily in the sense of some things being *easier* than others for human minds; thus "natural" does not mean inevitable, and cognitive biases alone explain only part of the transmissive potential of religious ideas. CSR scholars are also interested in the combinations of cognitive and cultural inputs that lead to the successful spread of religious ideas. When intuitive ideas become explicit, cognitively elaborated upon, and supported by others, they become widely endorsed. For instance, the idea that consciousness continues after death is common amongst religious systems. Such ideas are often reflective elaborations on unquestioned intuitions about the world, while the Buddhist doctrine of non-self (i.e., anatta or anātman) requires an explanation that considers historical and context-dependent factors of that tradition. Disagreements have arisen in CSR about the optimal amount of intuitiveness that it takes for an idea to spread rapidly.

For instance, an unsettled question is the degree to which the belief that ghosts, ancestors, or spirits of deceased humans exist and can observe or interact with the mundane world is a product of natural cognition (e.g., Astuti & Harris, 2008; Bek & Lock, 2011; White, 2021). Are ghosts wholly intuitive or slightly counterintuitive? A related debate concerns whether thinking of disembodied

minds is a developmental default and, hence, fully intuitive or maturationally natural, or is minimally counterintuitive (Barlev & Shtulman, 2021). Notice, however, that even opponents in these debates regard the widespread distribution of such beliefs as a function of natural human cognition doing ordinary work in ordinary human environments. They affirm that ghost-concepts are easily acquired and transmitted and thus natural in an important sense. None of these cognitively-oriented scholars construe belief in ghosts as primarily the product of intensive indoctrination.

Explaining the recurrence of ghosts, spirits, and gods in terms of their cognitive naturalness does not challenge or affirm the existence of superhuman beings. CSR was not developed to advance or challenge the truth claims of religious beliefs or commitments. Yet scholars have considered whether the theories and findings of CSR have epistemological implications for religious beliefs (e.g., Barrett et al., 2010; Barrett & Church, 2013; Clark, 2019; Trigg & Barrett, 2014; Schloss & Murray, 2010; Van Eyghen, 2021). The cognitive scientific study of religious thought is like the contemporary cognitive scientific study of other repertoires of humanity, such as moral thought, probabilistic reasoning, or even perception: in response to what explanations scientists offer, philosophers and others will explore their epistemological implications. CSR findings and theories do not appear to either undermine or support the epistemic status of any given religious belief, let alone all of them (e.g., Barrett & Trigg, 2014; Van Eyghen, 2021). To think that they will is, among other things, to underestimate the creativity of religious thinkers (McCauley, 2020). Whereas CSR findings may contribute to broader philosophical arguments, they cannot simply replace such arguments.

2.4. Examples of the contributions of CSR: two theories

Ritual has long been the target of extensive scholarly inquiry, especially from the disciplines of anthropology and religious studies. CSR has advanced the scholarly understanding of rituals, including a general explanation of what they typically entail, and testable hypotheses on broad features of rituals such as how and why rituals are learned, represented, and transmitted.[5] CSR portrays rituals as natural behavior, bound by both cognitive and sociocultural constraints that have measurable psychological and social consequences.

Cognitive scientists of religion are not primarily concerned with documenting the many locally distinctive meanings that can be attributed to the performance of rituals as were some earlier approaches to ritual (e.g., Geertz, 1996). Instead, CSR scholars tend to focus on explaining why rituals take the distinctive forms that they do and ascertaining their consequences for group cohesion, scale, and structure. In what follows, we outline the contribution and contemporary advancements of two theories about rituals that were the hallmark of CSR research in the 1990s: The ritual form hypothesis and the theory of divergent modes of religiosity.

E. Thomas Lawson and Robert N. McCauley's *Rethinking Religion: Connecting Cognition and Culture* (1990) advanced the first contemporary testable cognitive theory about religions. Inspired by the similarities between ritual participants' intuitions and sensitivities to the well-formedness of ritual performances (and their implications), on the one hand, and by native speakers' similar intuitions and sensitivities pertaining to linguistic strings in their languages, on the other hand, Lawson and McCauley present a theory of religious ritual competence, on an analogy with Noam Chomsky's (1965) proposals about native speakers' linguistic competence. The explanatory target for both is the mostly unconscious, tacit knowledge (revealed by their sensitivities to and intuitions about ill-formed items, in particular) that participants possess (regarding religious ritual systems and native languages, respectively) but about which they are routinely inarticulate (Hook, 1969; Reber, 1993).

Religious ritual competence theory proposes that an underlying action representation system informs those sensitivities and intuitions. Following a principle that most subsequent work in CSR employs (e.g., Boyer, 2001), Lawson and McCauley maintain that standard cognitive processes and machinery – here, concerning action representation – give religious representations their shapes. Action representation, including distinguishing agents from other things and actions

from other events, is critical not just for human animals' survival. The human action representation system, however, goes beyond just detecting goal-directed behaviors pertaining to predation. It figures in a sophisticated complex of cognitive capacities devoted to managing full-blooded intentional agency, theory of mind, and complicated social worlds.

Religious ritual competence theory offers formal means of characterizing action representation (again on an analogy with linguists' formal accounts of the grammars of natural languages), supplemented by principles concerning superhuman agents' roles. That principled formal apparatus clarifies how even the most elementary dimensions of action representation constrain representations of rituals and judgments about their relations and inform the regularities that participants' intuitions, sensitivities, and judgments exhibit (See Nielbo & Sørensen, 2011, 2012). An elaboration of religious ritual competence theory, the ritual form hypothesis (McCauley & Lawson, 2002), maintains that participants' representations of religious rituals' forms determine many of those rituals' properties, including their repeatability (or not) with all of the same persons in all of the same roles, their reversibility (or not), and their levels of sensory pageantry, which are connected with issues of emotional arousal, memory, and social cohesion (Whitehouse, 2011).

Religious ritual competence theory and the ritual form hypothesis are precise proposals addressing a subset not of actions that people have been inclined to call "rituals" but only a subset of those typically characterized as "religious rituals." Their technical notion of religious ritual involves a focus that more ambitious theorists about rituals, religions, and more may find uncomfortably narrow. That focus and precision, however, render these theoretical proposals testable in clear and straightforward ways. Researchers have produced numerous studies that have either applied or tested religious ritual competence theory and the ritual form hypothesis. They have furnished evidence from archaeology (Feldman, 2011; Moser, 2014; Williamson, 2014), anthropology (Abbink, 1995; Sørensen, 2007), literary studies (Gragg, 2004a; McCauley, 2012), history of religions (Chalupa, 2011; Gragg, 2004b; Larson, 2016; Martin, 2014; Vial, 2004), and several types of empirical and experimental research (Barrett & Hornbeck, 2020; Barrett & Lawson, 2001; Barrett et al., 2017; Malley & Barrett, 2003; Sørensen et al., 2006).

The theory of divergent modes of religiosity meanwhile proposes that in religious groups around the world both ancient and modern, collective rituals tend to cluster around two contrasting poles: imagistic and doctrinal (Whitehouse, 2000, 2004, 2011). Imagistic systems are characterized by emotionally intense but rarely enacted rituals and very intense cohesion in localized relational groups. Examples of the imagistic mode of religiosity include systems of initiation in ancient hunting and feasting cults (Whitehouse & Hodder, 2010) and contemporary tribal societies (Whitehouse, 1996), hazing systems in military groups and university fraternities (Whitehouse et al., 2017), and various local cults in the world religions that involve sporadic ordeals, ranging from fire walking (Xygalatas, 2012) to ritualized whipping (Kavanagh et al., 2019). At the other pole are doctrinal systems, characterized by frequently enacted rituals and more diffuse cohesion in "imagined" communities (Anderson, 1983) – groups too large for all members to know each other personally. Examples of doctrinal practices include the daily or weekly rituals of the world religions and their myriad offshoots (e.g., Whitehouse & Laidlaw, 2004).

The divergent modes of religiosity theory rapidly became associated with a fast-spreading interest in CSR approaches among humanities scholars. One of the reasons for this was that, although the theory was grounded in experimental data from the cognitive sciences, especially pertaining to the operation of human memory systems, its core predictions related to bodies of knowledge painstakingly assembled by historians, ethnographers, and archaeologists. As such, it was one of the few theories in CSR that humanities scholars could work with directly, by providing evidence to support or refute it. Moreover, the divergent modes of religiosity theory was itself originally inspired by qualitative research on a new religious movement in Papua New Guinea (Whitehouse, 1995), which later served as a lens through which to view similar movements throughout the region and, via early efforts at cross-cultural comparison, late medieval Christianity and the Protestant Reformation in Europe (Clark, 2004; Hinde, 2005; Whitehouse, 2000). Interest in this comparative

project mushroomed as increasing numbers of religion scholars, historians, and archaeologists started to ask whether the divergent modes of religiosity theory might help to make sense of observations from a much wider range of contemporary cultural systems across human history and prehistory (e.g., Beck, 2004; Berner, 2004; Gragg, 2004b; Mithen, 2004; Martin & Pachis, 2009; Pyysiäinen, 2004) and around the contemporary world (e.g., Bayly, 2004; Howe, 2004; Laidlaw, 2004; Peel, 2004; Shankland, 2004).

Close consideration of case study material helped to establish more clearly the boundaries between doctrinal and imagistic systems and their distinctive socio-cognitive pathways to the formation of group identities (Whitehouse, 2004), or wild traditions (Boyer, 2019). What makes doctrinal and imagistic practices distinctive is that, in contrasting ways, they involve rituals and associated meanings and narratives that are group-defining (Whitehouse, 2011). By contrast, cognitively optimal beliefs and practices – i.e., those that spread and stabilize with minimal instruction or institutional support – often lack this identity-marking function. To the extent that such practices are aimed at preventing or ameliorating misfortune, they may function primarily as quasi-magical technologies, desired for their imagined benefits to individuals and families rather than because they cause the groups adopting them to compete more successfully with other such groups via the evolutionary process of cultural group selection (Richerson et al., 2016; Whitehouse, In Press). In many world religions, as observed "on the ground", the doctrinal mode governs processes of group alignment and cultural group selection in the "great tradition" (Redfield, 1955, 1989), whereas the "little traditions" of the laity may be more focused on cognitively optimal religious beliefs and practices resulting from intra-group selection (for an illustration in the case of Theravada Buddhism, see Stanford & Whitehouse, 2021).

The relative dominance of modes dynamics versus cognitively optimal forms in a given religious tradition appears to be a consequence of transmission dynamics. Imagistic practices promote long-term reflection on personally transformative and group-defining experiences (e.g., Jong et al., 2015; Muzzulini et al., 2021; Richert et al., 2005), generating highly elaborated and idiosyncratic bodies of esoteric knowledge (see Whitehouse, 2011). Meanwhile, doctrinal dynamics based on routinized practices facilitate rote learning and other forms of high-fidelity doctrinal transmission, making it easier to detect unauthorized deviation from the orthodoxy and allowing increasingly elaborate and counterintuitive doctrinal systems to stabilize, systemize and spread (e.g., Lane, 2019). Thus, both imagistic and doctrinal modes foster representations that do not transmit efficiently.

By contrast, beliefs and practices that are not formed via those kinds of modes dynamics are more prone to transmitting "catchy" (i.e., more intuitive) cultural variants. As noted above, this tendency of religious representations to be formulated in simpler or catchier forms is the essence of a "cognitive optimum effect" (Whitehouse, 2004). These catchier variants have been described as a form of "wild religion", because of their tendency to spread without need for buttressing by institutions and technologies that make them easier to preserve and transmit.

The establishment of doctrinal religions is thus analogous to the cultivation of elaborately manicured gardens (highly elaborated and often counterintuitive esoteric beliefs or orthodoxies sanctioned by ecclesiastical hierarchies), which require regular tending to maintain their regimented structure and which, if neglected, rapidly become overgrown with weeds (rapidly propagating variants of the religious tradition that flourish in almost any local ecology). Doctrinal practices are typically cultivated via the efforts of scribes, theologians, gurus, and priests, leading to relatively stable orthodoxies enforced by means of centralized hierarchies and systems of top-down quality control. By contrast, imagistic practices achieve their more elaborated and maximally counterintuitive characteristics through the lengthy process of "exegetical reflection" that participants undergo slowly and painstakingly over the course of a lifetime of analogical thinking and revelatory meaning making (Barth, 1975; Whitehouse, 2000). While small-scale societies provide a niche for both cognitively optimal beliefs and practices and the imagistic mode of religiosity (see Lewis, 2004), doctrinal religiosity is only fully systemized as religions become more routinized, a hallmark of larger-scale cultural groups (Whitehouse, 2004, 2011).

Statistical analyses of patterns of variation on these parameters in the ethnographic record suggests the solidification of doctrinal religiosity increases not only with group size but also with agricultural intensity (Atkinson & Whitehouse, 2011), an insight that has also prompted statistical analysis of archaeological data across the agricultural transition, supporting the hypothesis that doctrinal religions emerge alongside the invention of farming and the evolution of larger-scale societies (Whitehouse et al., 2014; Gantley et al., 2018). Efforts to track the evolution of modes dynamics across world history since the Neolithic have focused on changes in the moral domains emphasized by doctrinal religions as societies pass a certain threshold in social complexity and internal ethnic diversity (Whitehouse et al., 2019). Religious systems emphasizing deference to authority and loyalty to group at the expense of principles of fairness and reciprocity were widespread in the archaic states, often legitimating extreme forms of inequality such as mass slavery and the practice of human sacrifice. But religions endorsing top-down coercion fared poorly in intergroup competition as societies become more internally heterogenous through the absorption of ethnically diverse populations via territorial expansion and warfare. New "ethical religions" associated with the so-called Axial Age (Jaspers, 1948; but see also Mullins et al., 2018) – including the forerunners of today's world religions – became embedded in the empires that eventually flourished and spread most effectively in world history (Turchin et al., 2023).

While the above research on modes has tended to focus specifically on religious systems, the theory of doctrinal and imagistic dynamics bears equally on a much broader range of cultural groups, ranging from sports fans and military groups to conservationists and political parties (for an overview, see Whitehouse, 2011). The theory of imagistic mode group bonding proposes that unique, emotionally intense experiences transform the autobiographical self, as constructed in episodic memory, in a way that – when such experiences are shared with other group members – leads to a visceral sense of oneness with the group, which group psychologists have dubbed "identity fusion" (Swann et al., 2012). When personal and group identities are fused together in this way, group members are willing to engage in extreme forms of pro-group action, including violent self-sacrifice, to protect their fellows. It is hardly surprising, therefore, that imagistic rituals fostering feelings of fusion in the group are common in military groups (Whitehouse et al., 2014) and terrorist cells (Whitehouse, 2018) but also non-military groups with a strong "tribal warrior" ethos such as extreme football fans (Newson et al., 2018).

Not all imagistic groups engage in intergroup violence, however, and the same psychological processes that lead to fusion in military grups could be harnessed to achieve peaceful prosocial outcomes such as donating blood (Buhrmester et al., 2015) and supporting wildlife conservation (Buhrmester et al., 2018). Groups formed through the imagistic pathway to fusion range from first time mothers (Tasuji et al., 2020) to supporters of particular public policies (Muzzulini et al., 2021). Much work has also been done to explore the ways in which doctrinal systems of various kinds, from political parties (Kapitány et al., 2018) to evangelical churches (Lane, 2019), and from civil war armed groups (Whitehouse & McQuinn, 2012) to hardline Islamists (Kavanagh et al., 2020) incorporate aspects of the imagistic pathway to create "extended fusion" (Swann et al., 2012). In this way, large scale groups based on categorical ties forged through doctrinal practices can generate strong forms of group cohesion based on the projection of personally transformative experiences onto a more encompassing identity (e.g., nation, religion, ethnic group, etc.).

The ritual form hypothesis and the theory of divergent modes of religiosity have many points of agreement and overlap but also points of divergence and disagreement. The ritual form hypothesis holds that special agent rituals, where the gods do things (usually to participants) typically have higher levels of sensory pageantry that elicits higher arousal. Such rituals motivate participants, enhancing commitment and loyalty. The problem in the ritual form hypothesis, however, is that for each ritual patient, these rituals are virtually always done only once. McCauley (2012) proposes that cultural selection would favor religions that include schemes for circumventing this limitation. Special agent rituals could be repeated with the same patient if the earlier performance failed (as with the splinter group described by Whitehouse) or was reversed (e.g., a divorce), but neither

option portrays the gods or their servants flatteringly. It might be better to simply let special agent rituals proliferate with, for example, multiple degrees of initiation (Barth, 1975; Gragg, 2004a). Arguably, the best innovation is special agent rituals where participants can periodically serve as substitutes for other ritual patients. McCauley (2012) proposes that the LDS Church's ritual of the baptism of the dead, which does just that, is an under-appreciated engine of that religion's striking success (Stark, 2005).

McCauley and Lawson's (2002; McCauley, 2001) study of Whitehouse's (1995) ethnographic findings concerning a Pomio Kivung splinter group both demonstrates their proposals' precision and has driven subsequent theorizing. They argue that ritual form hypothesis explains (1) the forms exhibited by all of the splinter group's innovative rituals that Whitehouse documents, (2) the rationale for incessantly repeating the group's ring ritual over a six-week period, and (3) the high and ever-increasing levels of sensory pageantry attached to those performances. They argue that neither Whitehouse's ritual frequency hypothesis nor his more general theory of modes of religiosity address these three issues and, thus, do not explain them.

Even though the frequency hypothesis predicts that rituals will tend to coalesce around low-frequency/high-arousal and high-frequency/low-arousal attractor positions, it does not rule out the possibility that some imagistic rituals will be repeated or become higher in sensory pageantry, such as the splinter-group rituals of the Kivung. In other words, the ritual form hypothesis and the theory of divergent modes of religiosity could, in principle, both be correct and fruitfully integrated. McCauley and Lawson acknowledge that the modes theory is far more sweeping in scope than their own theory (Whitehouse, 2004) and is well-supported empirically (Whitehouse, 2011), so synthesizing the two theories successfully would extend and fortify both.

3. New questions for CSR

When CSR initially emerged as a field its focus was on the way cognitive processes shape and constrain the transmission of religious beliefs and practices. Over the years, this focus has expanded to include a much broader range of questions about developmental pathways, historical constraints, evolutionary dynamics, and a host of other dimensions. As we look to the future, however, three areas stand out as particularly ripe for consideration, building on much of the work that has been done so far. One such area is the study of how cognitively optimal religiosity interacts with more highly organized and institutionalized systems of belief and practice. Whereas the latter often wield the power to enforce orthodoxies, the former have an even more potent secret weapon – namely, that their underlying blueprint is naturally recreated each time a child is born. How does the battle between the two dimensions of religion play out in real life and over the course of cultural evolution? Relatedly, how do different motivations influence the kinds of religious constructs that people find compelling and useful, rather than simply memorable or repeatable? And finally, what can we do with all that we have learned from the cognitive science of religion to make the world more peaceful, sustainable, and just? Although there are many other questions that CSR might address in the future, we believe these are among the most important from both a scientific and practical perspective.

3.1. Varieties of religious systems, wild and modal kinds

Most scholars of religion grew up in cultural environments influenced by "world religions" (e.g., Christianity, Islam, Hinduism, Buddhism). Thus, it may seem natural to view religious systems as typically based on a stable and coherent body of doctrine, with an organization of similarly trained specialists, and a set of standardized rituals. Such highly organized forms of religion, however, are the exception, rather than the rule – as many anthropologists and historians of religion have pointed out – (see Bellah, 2011; Bellah & Joas, 2012). Indeed, most religious activities for most people, throughout most of history and in many societies today, are not directly shaped by

organized doctrinal religions. These more informal organizations include shamanism, interactions with ghosts and ancestors, anti-witchcraft activities, protection against mystical harm, and divination (Boyer, 2019, 2020).

If we consider the diversity of religious systems in the world, then there seems to be a contrast between two kinds of systems – wild or folk systems on the one hand, and modes dynamics (doctrinal and imagistic systems) on the other. The distinction between wild religions and doctrinal systems, at least, is not new (Redfield, 1989), but a cognitive perspective can help refine and empirically demonstrate such contrasts more precisely (Whitehouse, 2000, 2004), in terms of several salient differences.

First, the representations associated with a tradition are either assembled in a coherent and explicit doctrine or not. In contrast to most world religions, people who interact with spirits and ghosts often have no specific, agreed upon understanding of what that implies. Shamans can contact spirits, but most people are content with the vaguest description of how that is done, what language spirits speak, or other details of that kind.

Second, the religious specialists may be trained, in a highly standardized way, by a special organization, or emerge from individual training and experience with another specialist (Winkelman, 1986, 1990). Christian ministers or Muslim *ulema* are recognized by virtue of their learning and certification from a religious organization. By contrast, people explain shamans' skills at interacting with superhuman agents in terms of individual qualities, which give them special access to spirits or gods. That explains why we can often observe in wild systems a great variety of practices and competition between specialists.

Third, the motivations of practitioners are very different. It may seem obvious to us, familiar as we are with world religions, that religious activity is centered on moral concerns, on the salvation of the soul, on the ultimate purpose of existence. But these concerns are typical of doctrinal systems, and of Axial Age systems particularly (Baumard & Boyer, 2013; Baumard et al., 2015). In what we call wild systems here, the motivations are generally local and pragmatic – to ensure good crops or successful hunting, and most importantly, to prevent or palliate misfortune, in the form of illness, accidents, social strife, or economic failure. These systems may also convey some mythical or metaphysical beliefs, but those are not central to religious activity.

Do wild and cultivated expressions of religiosity constitute two different kinds of "religion"? That would be a misunderstanding. It may be more useful to see them as two different kinds of processes, notably in terms of transmission (Whitehouse, 2000, 2004), that can co-exist in a particular community, perhaps in a tradition, and certainly within an individual. Doctrinal and imagistic practices involve the activation of religious representations as a set of highly elaborated beliefs, often of cosmic scale. In doctrinal systems, these are articulated by scholarly specialists, often in organizations supported by state power. Wild practices, by contrast, engage specific explanations of specific events, misfortune in particular, as the outcome of interactions with local superhuman agents (spirits, ghosts, local deities), as revealed in a piecemeal manner by specialists.

It would make little sense to try to classify religions as belonging to one kind or the other, as many include both processes. An analogy may help here. The distinction we draw between the two kinds of systems (e.g., wild versus modal) is analogous to a distinction between trade, when sellers and buyers agree on a price, and the circulation of gifts and favors in a community. These are two different kinds of exchange processes. No economy in the world is exclusively trade-based or gift-based, so we would not want to classify them in that way. A particular good or a service may circulate in some contexts in a process, and in other contexts in a gift-exchange process. A particular set of people may sometimes engage in trade and sometimes in gift-exchange, but the processes are still distinct.

Distinguishing between doctrinal and imagistic traditions, on the one hand, and wild ones on the other, is not just a matter of taxonomy. It can help us focus empirical research in more productive ways. First, a consideration of how wild traditions address various agents' needs and goals may help fight the strong intellectualist leaning of most theories of religion that consider beliefs as the central

point of religious activity. Second, the distinction between processes may help us understand that the connection between religious practices and identity is not as direct as is often assumed. For instance, consider that practices like participation in shamanistic rituals translate into a sense of belonging to a community, or translate into a shared identity. Having Muslim beliefs and practices makes you a member of the umma but consulting a shaman does not necessarily make you a member of a community, any more than consulting a dentist or a plumber would do, in modern contexts. Finally, most important, systems more clearly centered on the wild process are typical of all observed communities before states and large-scale societies. So these wild systems are probably a more relevant source of intuitions and hypotheses concerning the evolutionary processes that shaped human religious dispositions during prehistory than recently emerged doctrinal organizations (Boyer, 2019).

3.2. Motivations and the production of culture

The processes described so far (section 3.1. above) concerned the way religious representations are received by people, transformed, and re-constructed in ways that shape overall cultural trends. But cognitive models are also relevant to understanding why some people produce those representations in the first place.

In order for religious representations to spread and persist in a population, they not only need to be appealing to those encountering them, but people also need to be motivated to produce and pass on those religious representations in the first place. Thus, the study of cultural transmission and evolution must be as much about the motivations of innovators and spreaders as about the cognitive predispositions and susceptibilities of receivers and adopters. By innovators and spreaders, we do not mean only the identified founders of traditions, prophets, leaders of cults, etc. but also the people who simply communicate with others about religious representations, and thereby contribute to the spread of particular themes. For instance, any individual who tries to persuade others that the ancestors frown upon adultery, is contributing to an increased spread of the particular connection between superhuman agents and individual morality. Why anyone would want to do that, that is, modify the distributions of mental representations in one's social environment, is not yet systematically studied in CSR.

The goal of the study of cultural evolution is to provide explanations for cultural trends as patterns in the distribution of mental representations among human minds. Why, for instance, are there roughly similar Cinderella-like folk-tales in so many different places in the world (knowing that they did not diffuse from one original source)? Over the last few decades, social scientists have developed models of cultural evolution that mostly consider these distribution patterns as the effect of the reception and transformation of information by human minds. Roughly similar Cinderella stories have arisen in many cultures because of the combined effects of selection and reconstruction. Selection means that, when people are given many different narratives, only some are retained and re-told while others are not, and the Cinderella plot happens to be among the narrative-survivors, because of how our minds work (and that "way" can be studied experimentally). The reconstruction approach would predict that in many cases, even people who only heard distorted versions of Cinderella (and – by extension, religious narratives), will tend to modify their memories of what they heard in a manner that, in the aggregate, constitutes the most frequent Cinderella plot. That of course applies to all materials transmitted through human communication, including stories or theories in what we call religious traditions. So, the task is to describe the psychological processes that affect reconstruction and can therefore explain that convergence towards common patterns.

The main focus of cultural evolution models used in CSR research so far is on consumption, investigating the ways in which the reception of particular cultural material (stories, norms, gestures, artifacts, etc.) affects their distribution. A general assumption in such models is that, even if the production of cultural material were entirely random, we would still observe differential

reception (by selection and reconstruction) so that we would in the end get some recurrent forms (e.g., of Cinderella stories). Naturally, we know that stories or tunes or religious ideas are not produced randomly by human beings. Cultural evolution based on consumption can partially explain many properties of cultural materials, from stories to moral norms, and aesthetic preferences to religious thought and behavior; but reception processes are insufficient to account for all of what we observe.

It may be worth considering, as well as the consumption of cultural productions, the necessary complement of their production, and specifically of the motivations engaged in that production. As mentioned, religious statements are not produced randomly. Diviners or mediums can expect to derive prestige and other tangible welfare increases from their reputation for competence in such domains, and this too will have important consequences for the cognitive study of such cultural dynamics (Henrich, 2016). The point here, though, is not just that people have something at stake in social interaction, which would hardly count as a discovery, but that these stakes are mentally represented, by producers and consumers, in ways that affect the cultural productions themselves. For instance, Singh recently carried out a cross-cultural survey of shamanistic beliefs and practices (including mediums, healers, and anti-witchcraft specialists), which raises the question, why do such specialists so often resort to trance or possession, when other ways to approach mystical harm are available? (Singh, 2018).

One possible answer is that the capacity to engage in trance or possession is both attention-grabbing and rare in humans. As a consequence, such performances may strengthen the participants' intuition that the shaman does possess unique, essential qualities not found in ordinary people. That in turn would provide an explanation for the shaman's claim to interact with spirits, in contrast to ordinary people. If valid, this explanation would be an example of the process whereby production constraints – the shaman needs to demonstrate some specialness, and not all human behaviors can fulfill that role – influence the recurrence of a particular religious theme. In a similar way, diviners may be motivated to foster the notion that misfortune is caused by mystical harm, and that each occurrence of misfortune is unique, which justifies resorting to a diviner for each particular case (Boyer, 2020). These examples only bear on the wild traditions of small-scale societies, and the motivations of producers are likely to be very different for the specialized personnel of religious organizations as they may also be motivated, for instance, by the need to establish authority within their organization, or the desire to increase the influence of that particular organization.

More generally, this perspective suggests that we may be able to complement current cultural evolution models, focused on reception and consumption, by adding descriptions of the way people's goals affect the patterns of cultural evolution. This would give us better accounts of why cultural patterns are the way they are – including patterns of religious systems.

3.3. Applying CSR research to real-world problems

As the range of research in CSR has grown, the possibility of applying the approach, theories, and findings to address practical problems has become increasingly realistic. These include matters such as developing best practices for educating children about science and religion; harnessing the positive individual and group effects of ritual performance; managing sacred values and intergroup conflicts; understanding the relationship between religion and morality; fostering tolerance between rival religious communities and creating more peaceful and just forms of religiosity in the future.

In contrast with popular media accounts of religion by the "new atheists" (e.g., Richard Dawkins, Sam Harris, and Christopher Hitchens), who take a uniformly negative view of religion and argue the case for its elimination, CSR researchers suspect that religions are here to stay. People are unlikely to be argued out of commitments that they never held on the basis of arguments in the first place. Part of the reason for this stance from cognitive scientists of religion is pragmatic.

Researchers in CSR observe that the prospect of eliminating religion is unrealistic given the ever-growing evidence for the naturalness of many of the intuitive beliefs undergirding notions of supernatural agency, afterlife constructs, creationism, ritual efficacy, and other recurring constructs

associated with religions. Historically, religiosity has changed rather than disappeared in the wake of secularization. For example, more people in the United States now identify as "spiritual" than ever before, even if numbers describing themselves as "religious" are declining. One important question CSR scholars can address in the future is how religious beliefs and practices are likely to change over time. Greater understanding of these processes may enable leaders to influence current trajectories in ways that might foster more peaceful prosocial outcomes in consensual ways (Whitehouse, 2021a).

Examples of the way in which the cognitive processes in question could be harnessed positively to address real-world problems are suggested by research on the divergent modes of religiosity theory discussed above. Emotionally intense rituals have been linked to identity fusion – and fusion has in turn been linked to extreme forms of pro-group action, with wide-ranging practical consequences. Many studies have demonstrated how the imagistic pathway to fusion can give rise to intergroup violence by generating identity fusion and the willingness to fight and die to protect the group against perceived enemies (Whitehouse, 2018a). Such actions become violent when the group itself is thought to be under threat. Researchers have been exploring this fusion-plus-threat model of intergroup hostility to develop ways of identifying at-risk populations and individuals before they engage in violence (Ebner et al., 2022). This kind of research could also lead to practical interventions aimed for example at de-fusing violent extremist inclinations or harnessing the fusion of embattled groups to achieve more peaceful prosocial outcomes (Whitehouse, 2021b). Such approaches differ fundamentally from deradicalization programs, which focus more on challenging ideological commitments, rather than the deeper motivations to engage in violence, rooted in evolutionarily ancient group psychology (Whitehouse, 2018b).

Researchers have also been exploring possible implications of fusion in religious communities to act on environmental issues (Baimel et al., 2023). All the world religions endorse the idea that humanity should take care of God's creation or take responsibility for stewardship of the earth. In fact, this seems to be a point of at least rough agreement across most large-scale religions and many indigenous and traditional ones. In theory, therefore, extended fusion in the world religions could in theory be harnessed to address environmental issues (Whitehouse, 2021a). Other ways of applying the modes theory to real world problems include efforts to explore how imagistic bonding could be used to strengthen the resolve of ex-prisoners to adopt healthier, law-abiding lifestyles and to reduce rates of recidivism (Newson & Whitehouse, 2020; Whitehouse & Fitzgerald, 2020), as well as to foster forms of barrier-crossing leadership that heal divisions and promote peaceful intergroup cooperation (Buhrmester et al., 2022).

4. Summary and conclusions

CSR has come a long way over the past thirty years. It started out as an effort to provide an alternative to the interpretive exclusivism that dominated departments of religion at the time. A central insight was that many of the phenomena we think of as religious could be explained as natural predictable consequences of our evolved cognitive predispositions and susceptibilities. Building on the theories, methods, and findings of the cognitive and evolutionary sciences, CSR has also broadened in scope. It includes research agendas focusing on topics as diverse as charismatic influence, spirit possession, reincarnation, supernatural causation, and social synchrony. And these topics are now being studied using an ever-growing diversity of methods, ranging from brain scans to quantitative analysis of historical databases, and from lab- and field-based experiments to cross-cultural surveys. Alongside these scientific developments, we have witnessed the flowering of new institutions supporting the development of CSR research, vital for the long-term sustainability of the field – ranging from new journals and professional associations to new centers, institutes, textbooks, and dedicated research posts. We have surveyed some of the core findings of CSR to date, illustrating this with examples of how our own theories have been developed and improved in the light of new empirical research since the field was first established. And we have ended by looking to the future by

suggesting some of the key directions in which we hope CSR will develop in the years to come. Among the many legacies of CSR, the most important of all is the number and quality of scholars and scientists it has attracted over the past thirty years. Many of those who started as students in the 1990s are now full professors and they in turn are training its future leaders. Although those of us who were there at the beginning inevitably have our views of how the future might fruitfully unfold, the destiny of CSR lies in the hands of those who joined the field after us, and those yet to come.

Notes

1. The references cited in this section are illustrative – for a more exhaustive list, see White, 2021.
2. More on the relationships between CSR and neighboring interdisciplinary efforts can be found in Barrett (2022a), and Schjoedt and van Elk (2022).
3. The funding sources for CSR have also become fairly diverse. As White (2021) notes, multi-million dollar grants have been awared to CSR projects from the European Commission, the UK's Economic and Social Research Council, and the John Templeton Foundation. We can add that CSR projects have also been funded by such government and private sources as the British Academy, the National Science Foundation (U.S.), the Pew Charitable Trusts, Templeton Religion Trust, the Templeton World Charity Foundation, and even Canadian and United States military research sources.
4. That may seem surprising, as many frameworks in anthropology or religious studies often begin with definitions of the domain. But those are not really definitions in the usual sense (that is, pointers to what is and what is not included in the set of things considered), but rather compressed theoretical statements. When Clifford Geertz "defined" religion as "a system of symbols […] clothed with an aura of factuality", etc. (Geertz & Banton, 1973), that was not a definition in a strict sense, but a research program, enjoining anthropologists to study religious phenomena *as* "systems of symbols … ", etc.
5. See Chapters Nine, "Rituals Part 1: How are rituals learned, represented, and transmitted;" and Ten, "Rituals Part 2: What are the function of rituals?" in White (2021) for an overview of these contributions.
6. Reprinted and adapted with permission from Routledge Press.
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