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Twenty-five years in: Landmark empirical findings in the cognitive science of religion¹

Vinte e cinco anos depois: marcos empíricos na ciência cognitiva da religião

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ABSTRACT

Religious studies' collective advocacy on behalf of diversity and inclusion stands in poignant contrast to its persisting *exclusionary* ethos (within most quarters of the field) concerning questions of method. A legacy of prohibitions in religious studies about who can study religions and about how they must proceed when doing so has tended to curb innovation. Born of protectionism or special pleading or outright religious impulses, such prohibitions have skewed the field in favor of the idiosyncratic over the recurrent, of the idiographic over the systematic, and of the interpretive over the explanatory. My long-standing interest in the promise of the cognitive sciences for studying religion has been, in part, to redress those imbalances. Redressing imbalances, however, does not involve dismissing the idiosyncratic, the idiographic, or the interpretive, but only suggests, first, that they are not the whole story and, second, that greater attention to the recurrent, the systematic, and the explanatory will enrich – not eliminate – our understandings and our inquiries. The first of those two propositions follows from the second. My aim in this paper is to substantiate that second proposition.

Keywords: cognitive science of religion, explanatory pluralism, interpretive exclusivism, empirical findings.

RESUMO

A defesa coletiva dos estudos religiosos em favor da diversidade e da inclusão está em contraste pungente com seu ethos excludente persistente (dentro da maioria dos quadrantes do campo) em questões de método. Um legado de proibições em estudos religiosos sobre quem pode estudar as religiões e sobre como elas devem proceder ao fazer isso tendem a refrear a inovação. Nascidas do protecionismo ou de impulsos religiosos especiais ou articulados, tais proibições distorceram o campo em favor do idiossincrático sobre o recorrente, do idiográfico sobre o sistemático e do interpretativo sobre o explicativo. Meu interesse na promessa das ciências cognitivas para estudar religião tem sido, em parte, corrigir esses desequilíbrios. A correção dos desequilíbrios, no entanto, não envolve descartar o idiossincrático, o idiográfico ou o interpretativo, mas apenas sugere, primeiro, que eles não são a história completa e, segundo, que maior atenção ao recorrente, sistemático e explicativo enriquecerão – não eliminarão – nossos entendimentos e nossas investigações. A primeira

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destas duas proposições segue a segunda. Meu objetivo neste artigo é fundamentar essa segunda proposição.

Palavras-chave: ciência cognitiva da religião, pluralismo explicativo, exclusivismo interpretativo, achados empíricos.

Explanatory pluralism

The first broad line of philosophical argument in defense of my contention that systematic explanations about recurrent patterns in religious systems will enhance our understanding of religious phenomena (developed in Lawson and McCauley, 1990; McCauley, 2000, 2013; McCauley and Lawson, 1996) follows from general positions in the philosophy of science about the character and consequences of cross-scientific relations and their implications for explanations in science (McCauley, 1986, 1996, 2007). CSR and the cognitive sciences generally are but instances of cross-scientific investigations to which these general positions' verdicts apply.

Both CSR and the cognitive sciences, more generally, exemplify the *explanatory pluralism* that prevails in cross-scientific contexts throughout the sciences (McCauley, 2013). For new purposes pertaining to their own inquiries, scientists frequently enlist the conceptual, theoretical, analytical, methodological, experimental, and evidential resources developed within other sciences that are pursued at what are, sometimes, quite distant analytical levels. The various cognitive sciences span multiple analytical levels, generating and integrating insights from the biological, psychological, and social sciences – *from* cognitive neuroscience and comparative psychology at the biological level, *to* cognitive and cultural anthropology at the socio-cultural level, *and everything in between*. They have assembled an extensive collection of investigative techniques and developed pictures both of human behavior and of the structure and operations of the human mind that are far more penetrating and insightful than those available heretofore. Their impact has been transformational in linguistics and economics, and they hold comparable potential for the study of politics, for the study of society and culture generally, *and for the study of religion*.

The resulting integrative accounts of religious phenomena in CSR certainly *extend* our understanding of the variety of factors that may be influencing religious thought and action in diverse locales. Those accounts also increase the range of resources available for situating phenomena conceptually and theoretically. Explanatory pluralism highlights the many means by which scientific investigators exploit the varied resources of the sciences and scientists' opportunistic approach to evidence, in particular.

Explicitly aiming in cross-scientific settings to *supplant* prevailing theories and the approaches that inspire them (e.g., Bickle, 2003) ignores both the normative and historical considerations that animate explanatory plu-

ralism. In particular, it contravenes scientists' bountiful opportunism regarding evidence. The replacement of theories and approaches that these positions envision would only reduce the number and variety of assets available in cross-scientific inquiries. More importantly, perhaps, the history of science supplies few, if any, precedents for such aspirations, especially once the pertinent inquiries enjoy some measure of intellectual and institutional stability (McCauley, 2007, 2013).

This is *not* to say that the reduction or the elimination of theories in science never occurs. They sometimes do, but the consequences of the first, i.e., reduction, and the contexts in which the second, i.e., elimination, occur *carry no deleterious implications for the relationship between CSR and conventional religious studies*. With regard to the first, the smooth mappings between cognitive theories and interpretive proposals implicated in a scientific reduction serve to *vindicate* the interpretive account in the specific context it addresses. With regard to the second, the replacement, indeed, the outright elimination of theories and their accompanying ontologies is the outcome of intense competition *within* some science over time between clearly incompatible theories (McCauley, 1986, 1996, 2007). Historically, such intense competition between what Thomas Kuhn (1970) called "incommensurable" alternatives tends to be comparatively short-lived (often but a decade or two) in the experimental sciences (Thagard, 1992). Concentrated experimental research reveals the new competitor's strengths and liabilities relative to those of the prevailing theory, and either the relevant scientific community eschews the upstart or the field undergoes a scientific revolution that eliminates that previously prevailing theory and at least a few of its ontological commitments.

Crucially, the sorts of *cross-scientific contexts* in which any incompatibilities between cognitive theories and interpretive proposals would arise at some point in time are not, historically, situations that occasion scientific revolutions. Substantial conceptual and theoretical incompatibilities in cross-scientific contexts may generate selection pressures between analytical levels, but the history of science indicates that such inter-level pressures rarely, if ever, suffice to bring about such stark outcomes. No scientific consideration requires such a draconian approach to resolving theoretical incompatibilities *across* analytical levels in science. Instead of these selection pressures pushing in the direction of revolutionary upheaval at some analytical level, they may just as well ignite efforts to forge cross-scientific connections, especially when the research programs in question are pursued

within scientific disciplines that have long-standing intellectual and institutional legacies.

The consistent emphasis in CSR on *explicitly* formulating theories in detail is an unqualified virtue. It helps to clarify the points where, whatever their provenance, theoretical proposals may make contact as well as whether points of contact are likely to result in conflicts or connections.

Whether through providing speculative interpretive proposals, or counter-instances that challenge cognitive hypotheses, or recommendations for refining such hypotheses, or focused scrutiny on relevant phenomena, or through simply presenting basic findings to be made sense of, standard work in religious studies and the History of Religions can engage in myriad collaborative enterprises with cognitive scientists of religion. Historians' findings about both persisting and extinct religions, in particular, are a test-track on which, sooner or later, cognitive theories must run (Whitehouse and Martin, 2004; Pyysiäinen and Uro, 2007; Martin and Sørensen, 2011; Czachesz and Uro, 2013; Martin, 2015).

The sorts of findings in CSR that this paper surveys as well as those in the cognitive sciences generally offer scholars of religion plentiful resources for inspiring and refining interpretive proposals. The cognitive sciences have collectively uncovered grounds for contextualizing, qualifying, supplementing, and, in some circumstances, even superseding many of the stock assumptions of commonsense psychology that inform interpretive approaches to human mental life, discourse, and action. Presumptions that seeing is believing, that the conscious mind matters most, that the mind's operations can go on in comparative isolation from the body, that memory is retrieval of fixed snapshots of past events, that possessing false memories follows from either some functional impairment or intentional perversity, that we mean what we say, that people have privileged knowledge about the workings of their own minds, and so on must all be hedged in one way or another most of the time. That alone is probably not news to humanists. What the cognitive sciences deliver, though, are increasingly detailed accounts of why and when and how and how much they should be hedged – detailed accounts which have withstood exacting empirical scrutiny and experimental tests.³

The cognitive sciences pose no barriers to humanists' interpretive projects. Familiarity with those sciences' accomplishments should abet the sophistication of interpretive proposals (Lawson and McCauley, 1990, Chapter one).⁴

Avoiding the quandaries of interpretive exclusivism

The second line of philosophical argument defending CSR's potential to enrich inquiries addressing religious phenomena (developed in Lawson and McCauley, 1993, and McCauley, 2000) concerns its abilities to supply constructive responses to moral, epistemic, and metaphysical quandaries that other prominent approaches in the study of religion face. These include crises of conscience, riddles of identity, epistemic over-confidence, and metaphysical muddles.

E. Thomas Lawson and I (1993) pointed to the crisis of conscience in anthropology and to the inadequacies of interpretive methods for addressing it. In the subsequent two decades, scholars' moral sensitivities have appropriately expanded beyond questions of colonialism to include persisting forms of oppression of women, people of color, people of various racial, ethnic, and religious backgrounds as well as the poor, the disabled, and people with any of a variety of sexual and gender identities (who do not benefit from heterosexual privilege as a result), *wherever* they may reside. These forms of oppression no less merit our moral concern, but they are no better confronted by anti-scientific ideology than was colonialism in the mid and late twentieth century.

Anti-scientific enthusiasts' claims, first, that with scientific knowledge comes power to oppress and, second, that the interests of oppressors and scientists often coincide are both surely true. But stopping there neglects the further truth that no human undertaking and, certainly, no human undertaking on the scale that modern science is pursued comes close to the level of self-policing that science achieves. Of course, that self-policing pertains most directly to epistemic rather than moral matters,⁵ but, crucially, to the extent that scientific rationality and morality both turn on ideals about honesty and truth (however the latter should be characterized), they are of a piece. Its self-policing helps to ensure that science is unsurpassed as a tool for obtaining knowledge about the world of our experience and that, barring its obliteration (a fairly high price to pay for oppressors who putatively rely on science as a means to power), its verdicts are neither wholly nor finally subordinate to the powerful. Anti-scientific enthusiasts' suggestions – that the best response to the use of science to oppress is to abandon science and its ideals – are counter-productive. For example, the cognitive sciences can aid us, not least, in gaining a deep-

³ Oddly, many interpretivists do not object when psychoanalytically oriented thinkers make similar claims on the basis of far *less* evidence arising from carefully designed tests.

⁴ However pointed the criticisms, the controversies (Norenzayan, 2014; Staussberg, 2014) that have swirled around the synthetic proposals of Ara Norenzayan's *Big Gods* (2013) illustrate the sort of constructive exchanges that the interaction of CSR and religious studies can yield. None of the issues are settled. All of the auditors and, I suspect, all of the participants as well have benefitted.

⁵ That, however, is not to imply that the scientific community is unconcerned with the moral and political implications of its work. Organizations such as the Union of Concerned Scientists and the Center for Science in the Public Interest have played a valuable and constructive role in enhancing public understanding of scientific issues and in contributing to thoughtful public policies.

er understanding of human moral psychology (e.g., Graham *et al.*, 2013).

Over the last few decades scholars of religion have recognized that, to the extent that the field of Religious Studies has itself collaborated with cultural anthropology and pursued parallel projects, it has been something of an unindicted co-conspirator in these crises of conscience. Lawson and I argue, though, that religious studies has an additional problem concerning its identity as an intellectual project. Long wary of being categorized with either theology or the social sciences, Religious Studies programs have mostly sought a haven within the humanities. Traditionally, the principal defense for that position has maintained that religious studies has either a unique object of study, a unique method for studying that object, or both. Those assumptions, however, have undergone withering criticism from multiple quarters – not only from cognitive scientists of religion. Arguments about the exclusivity of religious materials and the methods for their study have faced at least two major objections.

The first objection concerns the very notion that distinctively *religious* materials even exist. Cognitive scientists of religion and many recent contributors to religious studies question the viability of ‘religion’ as an analytical category and its (metaphysical) status as an object of study. Although their reasons for skepticism that “religion” designates a unified body of phenomena differ, they are consistent and complementary grounds for that negative conclusion.

The by-product theory is the earliest and remains the most prominent theoretical orientation in the cognitive science of religion (Boyer, 1994, 2001; Guthrie, 1980, 1993; Lawson and McCauley, 1990; McCauley and Lawson, 2002; Whitehouse, 1992, 1995). The by-product theory holds that religions, like various other cultural arrangements from folklore to militaries, engage a host of ordinary cognitive systems (theory of mind, contamination avoidance, kinship recognition, linguistic competence, etc.) that are in place on the basis of considerations that have nothing to do with one another and, crucially for current purposes, considerations that have *nothing to do with religion*. Those cognitive capacities’ exercise in religious contexts results in *by-products* of their normal functioning. Whether they concern anthropomorphism (Guthrie, 1993), action representation (Lawson and McCauley, 1990), episodic and autobiographical memory (Whitehouse, 2004), or all of these and more (Boyer, 2001), these cognitive capacities exist in human minds because they enable people to deal with the species’ perennial problems. It follows that, at least from a cognitive perspective, neither religion nor religiosity is some stable, uniform sensibility or pattern of behavior.

Some dissidents in religious studies raise a different set of considerations for questioning the analytical purchasing power of talk about religion. They argue that ‘religion’ is a concept born of the scholarly enterprise of the modern western world. The dissidents (e.g., Fitzgerald, 2000) note that the concept is tarnished by virtue of its association with the crises of conscience. “Religion” is an analytical term deployed

by scholars in the west in an area of study that bolsters the projects of colonialists and capitalists, let alone the projects of proselytizers.

Their complaints, however, are not only moral. The sorts of features that receive scholars’ attention favor the arrangements of the religions of the book, primarily, and of the world religions, secondarily, without attention to the understandings, practices, contexts, and lives of the members of the myriad small-scale societies around the world and throughout human history. Dissidents point out that the concept of religion does not seem to exist in many cultures; nor, they note, is there a similar word in many languages. It is precisely the plethora of *apparently* relevant stories, beliefs, actions, practices, social arrangements, institutions, and more as well as the variety of ways that they are regarded from one setting to the next that foil scholars’ interminable attempts even to define “religion” (Saler, 2008).

From this point, the argument is straightforward. Dissidents regard the lack of consensus among scholars and their persistent failure to define the field and its primary object of study as grounds for the analytical vacuity of the concept ‘religion.’ Without any defensible, coherent grounds for identifying what should count as religion, the traditional proposal that “religion” and its cognates pick out exceptional phenomena, whose study requires exceptional methods, seems forlorn.

Casting the discussions at the level of *particular religions*, in order to circumvent the problems associated with religion construed as some general domain of human thought and endeavor, introduces its own metaphysical complexities (McCauley, 2000). What kinds of things are religions? Where, exactly, do they exist? How are their boundaries determined? What is the basis of their continuities over time? What, if anything, whether beliefs, practices, heritages, etc., is essential? Who counts as a Muslim or a Christian or a Buddhist and, more importantly, *who gets to decide?* The latter two questions have acquired considerable poignancy in a time when religiously motivated assaults routinely seize headlines throughout the world, yielding never-ending arguments about who should count as a *true* X, where “X” designates the name of some particular religious affiliation or other. Such talk about who is a “true” X (a true Muslim, a true Christian, etc.) or what makes for “true” X (true Islam, true Christianity, etc.) is transparently normative and that normativity is transparently theological. That leads straightforwardly enough to the second objection.

The second objection to the traditional claims about the unique character of religious materials and the necessity of extraordinary methods for their study holds that the positive case made in their behalf faces a dilemma. Either the arguments commit the fallacy of *petitio principii* (i.e., they assume what they set out to defend) or they depend upon what are, finally, fundamentally theological conceptions of religious matters, with repeated references to “the holy,” “the sacred,” “the transcendent,” etc. As a way around this dilemma, many scholars recruited broader (but, in most regards, parallel)

arguments deployed across the humanities typically about the singular character either of (human) subjectivity (e.g., Nagel, 1974) or of the meaningful (e.g., Geertz, 1973) or of both. These considerations were alleged, on the positive side, to require phenomenological and hermeneutic methods and, on the negative side, to constitute a barrier to scientific approaches. Without reviewing the academic culture wars of the past fifty years, let it suffice here to make four observations.

First, hermeneuticists' (and their post-modernist offspring's) preoccupations with *the text* and with its interpretation as the dominant metaphor for conceptualizing all meaningful materials – so that, for example, religion in all of its facets is construed as textual – leaves scholars not with matchless methods but with woefully deficient ones. That is because, whatever religion is, it is both much more and much less than texts.⁶ This seems transparent with regard both to the ancestry of religion in the prehistory of our species and to what appears to be religious goings-on among non-literate groups. But that is not the end of it. The myriad activities, items, and settings, let alone the mental states, experiences, and utterances that do not even remotely resemble texts but that play such vital roles in people's lives, in non-literate *and in literate societies*, operate far beyond the borders of the hermeneuticists' textual spotlight.

An emphasis on the textual also inspires a particular view of the past. History, on this view, is textually based. History is concerned with the production of texts that get to their interpretations of past events and agents primarily through reflections about texts – whether previous texts about those events and agents or texts that those agents produced themselves. With such an approach, the cultural traditions, the salient events, and the past lives of the non-literate risk *invisibility*. In a scholarly sphere in which both human origins and countless human groups are, in effect, invisible, the religions of large scale, literate societies and their textually documented traditions inevitably hog the attention. The imbalanced distribution of scholarly attention goes largely unnoticed, because, quite literally, the non-textual is mostly nowhere to be seen.

Second, it is worth noting that even if the positive conclusions about the special status of the subjective and the meaningful are sound, they render *religious* subjectivity and *religious* meaning nothing but sub-categories of far more sweeping considerations concerning humanistic pursuits overall. They provide no case (that does not circle back to covert theology) for picking the religious varieties out for special disciplinary treatment. The humanists who champion the subjective and the meaningful have far more ambitious aims than merely insulating religion. They intend to safeguard the researches of *all* of the humanities.

Third, the negative conclusions about the inabilities of the sciences to address such matters is an overreaction to a form of scientific exclusivism (scientism) and a conception of

the sciences (logical empiricism) that the cognitive sciences and their practitioners neither endorse nor exemplify. The rejection of unsatisfactory accounts of science and of its reach does not require the rejection of science generally, or of the cognitive sciences, or of CSR.

Fourth, as I noted at the outset, such an exclusionary ethos is ill-advised, because the cognitive sciences and CSR offer invaluable methods and findings for enhancing our understandings both of aspects of subjectivity and of the making, having, and using of meaning in human life in general and in religious contexts in particular. In the absence of compelling arguments for interpretive exclusivism or impenetrable subjectivity and in the face of the myriad successes of the cognitive sciences and of CSR, assertions about science's putative inability to further illuminate these matters begin to look like reactionary protectionism of a field, instead of profound insights about either human life or the limits of scientific inquiry.

In the sections that remain, I will situate and summarize some of those successes of CSR, i.e., new theoretical proposals, durable, replicated findings, and promising results in that field. The best evidence for the usefulness of these cognitive scientists' methods is the resilience and the fruitfulness of the ensuing research. A fair sample of the numerous methods that CSR has employed will emerge in the course of reporting on this research. Its explanatory pluralism will be transparent.

The development of CSR as a scientific enterprise with new experimental findings generating theories from the bottom-up

CSR arose from a range of theoretical proposals (Boyer, 1994, 2001; Guthrie, 1980, 1993; Lawson and McCauley, 1990; McCauley and Lawson, 2002; Whitehouse, 1992, 1995) that share at least three assumptions:

- (1) that employing the theories, methods, and findings of the cognitive sciences to study religious thought and behavior would yield valuable new insights,
- (2) that the mind has no department of religion, i.e., that the mind has no systems, structures, or processes specifically dedicated to managing religious materials, and
- (3) that many forms of religious cognition are by-products of the operations of cognitive systems that are in place for reasons having nothing to do either with one another or with how they figure in religious matters.

Consistent with the second and third assumptions, these various theoretical works address a wide variety of

⁶ Post-modernists' worries about the status of texts were not a mere coincidence.

religious matters and a comparable array of cognitive functions and systems.

CSR began very much as a top-down endeavor. To their credit theoreticians both welcomed attempts to test their hypotheses and explored relevant empirical evidence themselves (Boyer and Walker, 2000; McCauley and Lawson, 2002; Whitehouse and Laidlaw, 2004; Whitehouse and Martin, 2004; Whitehouse and McCauley, 2005). They also worked to bring empirical evidence to bear on the *comparisons* of theories (e.g., McCauley and Lawson, 2002). In doing so, they demonstrated that the research enterprise in which those theories figured qualified as *empirical science*. Still, most of this work involved appeals to ethnographies, case studies, and historical illustrations, which, because of their particularity, disclose only thin slices of the vast landscape of phenomena that pertain to the assessment of any particular theory and, because of origins independent of the theories in question, fail to illuminate many of the parts of that landscape that are of greatest interest. The original theoreticians saw that in addition to simply marshaling available empirical evidence, CSR would clearly benefit from taking the additional step of becoming an *experimental science* (Barrett and Lawson, 2001; Boyer and Ramble, 2001; Atkinson and Whitehouse, 2010).

Experiments not only *test* theories, they *produce* (new) empirical evidence. Testing theories experimentally helps to guard against the biases that may influence theoretical partisans' selections among already available, less systematic, empirical evidence that they cite in support of their theories. Experimentation enables scientists to target precisely those "parts of that landscape that are of greatest interest." The process of managing unexpected experimental results theoretically may not prevent confirmation bias in scientists, but it does tend to make it more conspicuous when it arises (McCauley, 2011).

Speculative theoretical ventures like CSR eventually require the kind of systematic support from the bottom-up that elaborate programs of experimentation furnish. Scientific theories should not only be able to fly. They should also be able to land. When theoreticians assemble existing evidence, they are, in effect, carefully selecting spots, surveyed from above, to bring their theoretical aircraft in for a landing. By noting this, I do not intend to be dismissive. Touching down on the hard surfaces of the facts like that is an accomplishment; however, experimentation forces theories to the ground at points of interest to those who are watching from below and negotiating conditions there. The more points on the map (i.e., the more facts designated by experimentation) where a theory can land safely, the more worthy it is.

Their common assumptions notwithstanding, these early theories in CSR have never been fully integrated. Still, as research has proceeded these theoretical proposals have been expounded in ways that have revealed plentiful points of contact and coincidences of views. What, finally, is of far greater usefulness, though, are their conflicts and disagreements both with one another and with other theories that have been proposed subsequently (e.g., Bering, 2006), for they serve as invitations to experimentalists to explore competing theories' implications in unusual settings that allow for the control of the theoretically interesting variables.

As noted, CSR began as a high-level, theoretical project. Over the subsequent twenty-five years many of the associated programs of research have secured their credentials not only as empirical science but, in many cases, as experimental science as well.⁷ Once experimentation commences in any science, it exhibits a dynamic of its own. Initial findings from experiments aimed at testing big theories inevitably spawn dozens of finer-grained hypotheses. Those hypotheses address what the experiments' findings hint about potentially relevant variables. Reliably, some of those phenomena prove to be, simultaneously, so complex and so theoretically suggestive that they become objects of sustained investigation on their own.

Within CSR various topics are receiving such on-going experimental investigation. These include such effects as theological incorrectness, promiscuous teleology, and characteristic patterns of reasoning about dead agents' minds as well as the mnemonic effects of minimally counter-intuitive representations and the consequences of ritual for building social cohesion and increasing cooperation within groups. (See the following sections below.) Beyond the sheer number of experimental papers that have appeared, perhaps the best evidence over the past fifteen years of CSR's status as a maturing experimental science is the emergence of such topics within its purview that have inspired this sort of prolonged and focused experimental scrutiny that takes on a life of its own. For more than a decade in each case these topics have attracted the attention of several groups of researchers from around the world, who have examined their various facets in considerable detail.

Further evidence of abundant fertile experimental research in CSR is the development of new theories built from the bottom-up. Possessing a collection of robust experimental results that appear to be disparate is what typically leads to constructing theories in such a fashion. Theoretically-minded experimentalists propose a non-obvious prin-

⁷ During that time, CSR has arisen as a recognized contributor in religious studies with formal representation in some of the world's largest professional societies (International Association for the History of Religions, American Academy of Religion), a professional society of its own (International Association for the Cognitive Science of Religion -- IACSR), and specialized journals (*Journal of the Cognitive Science of Religion*, *Journal of Cognition and Culture*, *Religion*, *Brain & Behavior*, *Journal of Cognitive Historiography*). At the same time, it has also become a notable subfield within cognitive science with the IACSR regularly meeting periodically with and receiving formal recognition and support from the Cognitive Science Society, with papers and posters in the field accepted at that society's annual meetings, and with relevant articles by eminent mainstream cognitive scientists appearing in its flagship journal, *Cognitive Science* (Astuti and Harris, 2008; Banerjee et al., 2013; Legare and Souza, 2014).

ciple underlying the apparent incongruities among the findings as a means of integrating them theoretically (McCauley and Lawson, 1998).

The parade case from recent work in CSR is the cognitive resource depletion theory (Schjoedt *et al.*, 2013). That theory proposes a unified treatment of the cognitive mechanisms undergirding religious ritual. It groups three apparently disparate phenomena pertaining to ritual:

- (1) the persistent occurrence for participants in rituals of goal-demotion and causal opacity (Boyer and Liénard, 2006; Liénard and Boyer, 2006; Nielbo and Sørensen, 2011);
- (2) the negative effect on memory of the requirement, especially in high-arousal rituals, that participants suppress their emotional responses (Morinis, 1985; Xygalatas *et al.*, 2013b), and
- (3) the deference participants show to charismatic ritual authorities about the performance and understanding of the rituals in question (Schjoedt *et al.*, 2011).

The theorists argue that each of these patterns involves the depletion of the cognitive resources that participants can bring to performing, remembering, and interpreting rituals. They maintain that, whether by swamping or by starving the relevant cognitive systems' processors during ritual performances, the resulting deprivations of processing resources create opportunities for religious authorities to proffer accounts, either before or after the rituals' performances, about what is transpiring. The theory proposes, in effect, that if people are daunted by mastering causally opaque details in their ritual actions or by controlling themselves in the face of profoundly stimulating sensory pageantry and community engagement or by the expertise of a charismatic ritual officiant, they have little time or energy for encoding ritual details or pondering ritual meanings.

The cognitive resource depletion theory readily squares with the supposition that religious ritual systems have evolved to exploit these cognitive vulnerabilities. Such arrangements are likely to reduce the variability in these rites, which creates a space for cultural authorities to prescribe and regularize their performances and interpretations.

Three effects

Basic empirical outcomes sometimes, all by themselves, elicit extended "normal" scientific treatment (Kuhn, 1970). Conditional reasoning, flashbulb memory, the false belief task, and change blindness are examples in mainstream cognitive science from the past few decades. Such continued research on these and other phenomena within the cognitive and psychological sciences is part of the reason why Robert Cummins (2000) has stressed that the psychological sciences' principal accomplishments are the discovery of *effects* (the von Restorff Effect [von Restorff, 1933], the Stroop Effect

[Stroop, 1935], the phoneme restoration effect [Warren, 1970], the SNARC effect [Dehaene and Mehler 1992], etc.), rather than the formulation of laws.

CSR offers illustrations of Cummins' (2000) observation that the sciences of the mind specialize in the discovery and articulation of effects. Effects are patterns in human performance that are pervasive, but about which people are often inattentive, if not unconscious. Effects supply insights about how human minds work. For example, the Spacing Effect (e.g., Madigan, 1969) is the finding that distributed practice with materials increases the probability of their long-term retention in memory more than the same amount of massed practice does. If occasions for rehearsal are spaced out over time, memory performance is likely to exceed that from employing some small number of massed practice sessions of comparable duration.

Effects also inspire extensive programs of experimental research.

Theological incorrectness

Perhaps the best-known effect arising from experimental research in CSR is the proclivity for theological incorrectness. Recondite theological formulations routinely feature counter-intuitive representations. Their counter-intuitiveness, however, is profuse, not minimal. The theologically correct Christian God, for example, is all-good, all-seeing, all-knowing, all-powerful, and all-present. The theologically-informed religiosity of educated participants in large-scale, literate societies regularly employs representations that are nearly, if not equally, as *radically* counter-intuitive as the representations scientific theories employ (McCauley, 2011).

Carefully formulated, theologically correct texts commonly issue from years of contestation and debate. Scholars may overplay their prominence, at least with regard to their influence on participants' religious understandings and inferential predilections. Justin Barrett and Frank Keil (1996; Barrett, 1998) furnish evidence that in on-line tasks, such as processing and recalling narratives, religious people overwhelmingly utilize conceptions driven by the implicit assumptions associated with various unconscious, task-specific systems that appear to underlie so much of popular religious cognition. They designed short narratives about interactions between people and God to be consistent with the theologically correct doctrines, which their experimental participants affirmed when they were directly queried about their beliefs. The participants offered up conventional, theologically-correct, non-anthropomorphic conceptions of God that constitute the orthodox beliefs of their doctrinal religious systems. Instead of deploying those theologically complex, ecclesiastically approved and policed concepts, which they endorsed when questioned directly, Barrett and Keil's experimental participants frequently revert to spontaneous, *theologically incorrect* conceptions in their recollections of these narratives. Participants reason about God on-the-fly

similarly to how they reason about Superman. Of course, Superman is an extraordinary character too. But being stronger than a locomotive, moving faster than a speeding bullet, leaping tall buildings in a single bound, and having X-ray vision still falls a good deal short of omnipotence, omnipresence, and omniscience. Barrett and Keil obtained the same findings when the task is merely to paraphrase, rather than recall, the narratives – *even when participants have full access to the texts* they are paraphrasing throughout the task! They obtained such findings with Christians and Jews in America and with Hindus in India. (Jason Slone [2004] outlined multiple lines of evidence for similar patterns in additional religions.) Religious participants explicitly affirm theologically correct propositions; they often memorize theologically approved doctrines and learn a good deal of theology themselves (Peterson, 2013), but it does not follow that any of this substantially influences how they think and reason *on-line* about religious matters in ordinary settings.

Emma Cohen in her ethnography (2007) and in her experimental work with Barrett (2008a, 2008b) marshals evidence indicating that theological incorrectness occurs even in unpretentious settings in which scholarly sophistication and ecclesiastical hierarchy are meager. They show that theologically incorrect ideas readily intrude in the thought of followers of a small Brazilian spirit-possession cult. In order to handle a variety of theological complications, such as a possessing spirit showing strikingly different personality traits when possessing different people at different times, the cult leader teaches that spirit possession involves the *fusion* of the possessing spirit with the mind of the host. Spirit fusion, however, neither squares with folk psychology nor delivers much inferential potential. It is a substantially counter-intuitive notion that does not comport very well with theory of mind. Cohen found that participants in the spirit-possession cult (and she and Barrett found that experimental participants in other cultures) virtually unanimously opted for the intuitive view (regularly portrayed in Hollywood movies) that the possessing spirit *displaces* the host's spirit, instead. Interestingly, people seem less troubled by the complications that accompany this view, such as what the host's spirit is up to and where it resides when it has been displaced.

The automatic intrusion of these maturationally natural intuitive mental systems guarantees the repeated eruption of theological incorrectness, no matter how humble the religious system. These are instances of a general pattern in which recurring intuitive assumptions connected with basement level cognitive systems intrude in thought and can trump painstakingly acquired reflective knowledge, whether theological or scientific (McCauley, 2011).

Promiscuous teleology

A second seminal finding in CSR, which has also sustained an on-going program of research, concerns an effect that Deborah Kelemen (1999a) has dubbed “promiscuous

teleology.” Kelemen first carried out experimental studies (1999a, 1999b) supporting the position that children find function, purpose, and design throughout the natural world. She documented pre-school age children's inclination to over-attribute functions to things as a result of their new facility with theory of mind and growing experience with purposeful agents pursuing goal-directed actions. Unlike educated American adults, most children this age are willing to attribute functions to entire organisms (e.g., tigers) as well as to natural objects (e.g., icebergs), their parts (e.g., a mountain protuberance), and their properties (e.g., the pointiness of rocks).

In subsequent research Kelemen and her colleagues have produced grounds for suspecting that the penchant for promiscuous teleology may extend beyond childhood. In experiments with Romani adults, Krista Casler and Kelemen (2008) provide evidence *against* the assumption that the discontinuities between children's teleological promiscuousness and adults' apparent abstemiousness are the inevitable outcomes of development. Like the children Kelemen has studied, uneducated Romani adults differ significantly from educated Romani adults and from educated American adults in their willingness to approve teleological explanations for natural objects.

Education matters, but does it suffice to extinguish promiscuous teleology? Kelemen and Evelyn Rosset (2009) obtained experimental evidence indicating that, at least under some conditions, it does not. They had educated participants, who had, on average, completed 2.5 college level science classes, assess the worthiness of proposed explanations for a range of natural phenomena. Participants who were forced to do the task fast (they had 3.2 seconds to read and respond to each item) proved significantly more likely to endorse incorrect teleological explanations than those not under such time-pressures. They did so, even though the speeded conditions had *no effect* on those participants' accuracy with regard to control items. They also found that similar percentages of participants assented to some unwarranted teleological explanations (e.g., “the earth has an ozone layer to protect it from UV light,” p. 140) in *all* conditions, time-pressured or *not*. An additional study revealed that educated adults with some experience of college level science appear to think that “natural phenomena exist to benefit each other...” and are “intrinsically directed towards survival [...] and maintaining the Earth's natural equilibrium” (p. 141). Crucially, they did *not* restrict such judgments to biological phenomena. Kelemen *et al.* (2013) found a similar proclivity for teleological explanation of non-biological natural phenomena in experienced, Ph.D. level, physical scientists with appointments at major American research universities, when they too had to make time-pressured assessments of explanations.

Assembling evidence from a wide array of developmental research in addition to that for children's teleological promiscuousness, Kelemen (2004, p. 295) has proposed that they are “intuitive theists,” i.e., that they are naturally inclined to re-

gard natural objects as “nonhuman artifacts” that reflect “non-human design.” She argues that by school age children possess the requisite mental capacities for thinking about intangible agents⁸, their mental states and design intentions, and the (possible) role of the latter in determining objects’ purposes. She notes that the view squares with Margaret Evans’ (2000, 2001) findings that up to the age of ten children prefer “creationist” explanations of natural objects, regardless of their upbringing or of their parents’ views about religion. It also comports with Barrett’s arguments that young children’s difficulties with the possibility of others having false beliefs, ironically, indicates that they are better equipped to understand infallible minds than they are the minds of humans (Barrett *et al.*, 2001; Barrett, 2012). Presumably, Kelemen’s subsequent research on promiscuous teleology in adults (outlined above) adds to the plausibility of her suggestion (2004, p. 299) that adults, at least in their own less cautious ruminations, are also inclined to presume design intentionally imposed on things throughout their natural surroundings.

Dead agents’ minds

Jesse Bering and David Bjorklund (2004) produced a body of findings that points to a third, hitherto unnamed effect concerning human reasoning about dead agents’ minds that points to intuitive presumptions about minds outliving bodies. They first demonstrated what might be dubbed the “Dead Agents’ Minds Effect” in preschoolers and kindergarteners. Although these young children held discontinuity views about biological functions concerning a dead mouse (for example, they did not think that the mouse would ever need to go to the bathroom again), large majorities spurned such discontinuities with regard to the mouse’s psychobiological or cognitive states. Substantial majorities of these young children thought that the mouse was still hungry (as he was when he died) and that he still wanted to go home (as he was attempting when he met his end).

It is not until late-elementary-school-age that clear majorities of Bering and Bjorklund’s participants affirmed discontinuity views about the psychobiological and cognitive states of dead agents’ minds. This group was, however, the only group in this study that showed a significant difference in their responses to these two question types. Significantly more late-elementary-school-age children certified discontinuities about psychobiological states than did so with regard to the cognitive states of dead agents’ minds.

Bering and Bjorklund’s work parallels Kelemen’s proposal about intuitive theism in at least two important respects. First, they supplied evidence that children’s inclinations toward continuity views about dead agents’ minds, although probably enhanced by religious indoctrination, did not de-

pend upon it (Bering *et al.*, 2005). Second, what, initially, looked like a pattern among youngsters proved, upon further experimental investigation, to be manifest in adults as well.

In a further experiment Bering and Bjorklund examined participants’ views about post-mortem organismic and mental states at a much finer grain than in their earlier studies, and they did so not only with kindergarteners and late-elementary-school-age children but also with college-age adults. In this experiment Bering and Bjorklund posed multiple questions about biological states (e.g., “Do you think that Baby Mouse will ever need to *drink water* again?”), psychobiological states (e.g., “Do you think that Baby Mouse is still *hungry*?”), perceptual states (e.g., “Do you think that Baby Mouse can *see* where he is now?”), desires (e.g., “Do you think that Baby Mouse still *wants* to go home?”), emotional states (e.g., “Do you think that Baby Mouse is still *sad* because he can’t find his way home?”), and epistemic states (e.g., “Do you think that Baby Mouse *knows* that he’s not alive?”). This experiment basically replicated the findings of Bering and Bjorklund’s earlier experiments with the kindergarteners and the late-elementary-school-age children.

The pivotal findings of the experiment, though, concerned the adults’ responses. First, like the late-elementary-school-age children, the adults were significantly more likely than the kindergarteners to support discontinuity views with regard to the biological, psychobiological, perceptual, and emotional states as well as with regard to desires. This was *not* true, though, with regard to the mouse’s epistemic states. Second, again like the late-elementary-school-age children, the adults were significantly more likely than the kindergarteners to be *consistent* discontinuity theorists, i.e., to give discontinuity responses to *every* question of a particular type.

Their findings with their adult participants provided evidence for two conclusions. First, discontinuity views about the organismic and mental states of dead agents would appear to be *learned*, as is, presumably, the view that death involves the *extinction* of the mind, from which such discontinuity views follow. Bering and Bjorklund found a significant effect for age group with regard to discontinuity responses. Late-elementary-school-age children gave more discontinuity responses than kindergarteners and adults gave more still and both differed significantly from the kindergarteners on this front.

Second, although large numbers of adults explicitly avowed extinctionist views about dead agents’ minds, many did not seem to subscribe to that view when making judgments about the possibilities pertaining to the more purely psychological states of dead agents’ minds. Only half of the adults were consistent discontinuity theorists with regard to epistemic states, in particular. Subsequent research has shown that what is, in effect, religious priming can amplify such effects (Harris and Giménez, 2005; Astuti and Harris, 2008). K. Mitch Hodge (2011) argues that both Bering and Bjork-

⁸ Exactly how direct the roles of such theory of mind capacities and of promiscuous teleology are in any such intuitive theism is a point of controversy (Lindeman *et al.*, 2015).

lund's findings as well as these priming effects depend, more fundamentally, on humans' abilities to carry out off-line social reasoning about absent agents.

Minimally counter-intuitive religious representations

Pascal Boyer's (1994, 2001) account of the cognitive bases of religious representations has inspired several studies exploring his contention that religions' minimally counter-intuitive representations enjoy a mnemonic advantage over unproblematic, intuitive representations (no matter how strange or unusual) and over substantially counter-intuitive representations.⁹

The diversity of religious representations can seem overwhelming. Boyer argues, however, that they are significantly constrained. Humans' unconscious inferences about "intuitive ontology" (2001) figure centrally in Boyer's explanation. Intuitive ontologies constitute foundational theories about kinds of things in the world.

Boyer maintains that religious ontologies follow a standard pattern. Religious concepts violate expectations associated with some member of a small set of intuitive ontological categories, *while preserving* all of that category's further default inferences. That set consists of ANIMAL, PERSON, TOOL, NATURAL OBJECT, and PLANT. Violations of physical, biological, or psychological properties yield concepts with *counter-intuitive* properties, exemplified by walking on water, immortality, and *knowing* other peoples' thoughts, respectively. Those violations are of two sorts. *Breaches* occur when something transgresses a principle of folk-physics, folk-biology, or folk-psychology that ordinarily applies. A person who passes through walls violates intuitive physics. A person who is the offspring of a lion breaches our folk biological expectations. *Transfers* occur when properties are assigned to items that do not possess them. Talk about a mountain that is alive transfers a collection of biological properties to a natural object. Claims about a snake that talks transfer a collection of sophisticated psychological capacities to an organism without them. Usually these representations involve only one violation in each instance; thus, they are *minimally* counter-intuitive (MCI).¹⁰

Boyer hypothesizes that MCI concepts enjoy an advantage from the standpoint of competition for humans' attentions, as they approximate a cognitive optimum. First, *all* counter-intuitive concepts are *attention grabbing*. Counter-intuitiveness is not the only way to get noticed, but it suffices. Second, MCI concepts retain substantial *inferential potential*. An MCI concept's single violation leaves its abundant infer-

ential power basically intact. Moses may have parted the Red Sea, but we can still infer that he would have made a splash had he jumped in, that his heart was beating throughout the episode, and that he would have expected that the subsequent inundation of the Egyptians would interrupt their pursuit. These are but three unsurprising inferences, which follow from this story that contains the concept PERSON WHO PARTED THE RED SEA. Boyer accentuates the instantaneousness and alacrity with which humans carry out such inferences and the wealth of inferences available.

The *memorability* of MCI concepts is a third consideration contributing to their selective advantage. MCI concepts not only fascinate, they tend to stick, which is necessary for their transmission. Various experimentalists have tested this hypothesis about MCI concepts' mnemonic advantages. Early studies obtained the predicted effects (Boyer and Ramble, 2001; Barrett and Nyhof, 2001). In assorted cultural and religious settings on four continents MCI concepts were remembered significantly better than

- normal, intuitive concepts (e.g., a person who delivers thoughtful sermons and sleeps at night),
- highly unusual but not counter-intuitive concepts (e.g., a chocolate table)
- substantially counter-intuitive concepts that involve many violations of intuitive assumptions (e.g., a statue that hears and answers prayers, weeps and bleeds, and flies around at night).¹¹

Researchers have examined what role other variables may play in facilitating the recollection of MCI concepts. Those variables include imagery (Slone *et al.*, 2007), causal integration (Harmon-Vukić and Slone, 2009), background knowledge and narrative context (Gonce *et al.*, 2006; Upal *et al.*, 2007), and the amount of cognitive processing the concept demands (Harmon-Vukić *et al.*, 2012). In each case, the mnemonic advantage accruing to MCI concepts generally stands. Moreover, in these and other studies (e.g., Norenzayan *et al.*, 2006) that advantage increases as retention intervals increase. This was especially true with retention intervals measured in months, which would seem to be the time frames most relevant to matters of cultural transmission (Barrett and Nyhof, 2001). Recent experiments indicate that the heightened memorability of MCI concepts holds for children as young as seven (Banarjee *et al.*, 2013).

Occasionally religious representations incorporate more than one violation of humans' ontological intuitions. Moses, for example, has a conversation with a burning bush that is not consumed. Thus, I have suggested that "MCI" might be better construed as *modestly* counter-intuitive (McCauley, 2011). Konika Banarjee and her colleagues (2013), in fact, have pro-

⁹ This includes the radically counter-intuitive representations in which the sciences traffic (McCauley, 2011).

¹⁰ For an extended, systematic treatment of the issues at stake, see Barrett (2008).

¹¹ Referring to these as "maximally counter-intuitive" representations is an unhelpful convention (e.g., Norenzayan *et al.*, 2006). Obviously, the number of violations exceeds one, but this hardly makes them *maximally* counter-intuitive.

vided experimental evidence that suggests that the mnemonic advantage for counter-intuitive concepts extends to two violations. They found that seven-to-nine year-old children showed significantly better recall both directly and after one week for concepts involving either one or two, but not three, violations of intuitive ontology, relative to intuitive concepts.

New directions

Like cognitive science more generally, CSR has expanded in a variety of new directions in the twenty-first century. The field has attracted greater numbers of researchers, and those researchers have simultaneously advanced new theoretical proposals and introduced many new ways to test them. They have enlisted methods from across the social, cognitive, and brain sciences. The following three subsections will briefly discuss empirical research that simultaneously exhibits: (a) three of these new methods (economic games, brain imaging, and physiological measures in the field) and (b) three of the most conspicuous new directions for research in CSR (evolutionary theorizing, cognitive neuroscience, and religious experience).

These three new directions for research are by no means unique to CSR. They echo research trends across the cognitive sciences.

Evolutionary theorizing

The many controversies they have provoked notwithstanding, the emergence of (1) sociobiology (Wilson, 1975), (2) theories of cultural evolution (Boyd and Richerson, 1985; Richerson and Boyd, 2006; Henrich, 2016), and (3) evolutionary psychology (Barkow *et al.*, 1992; Buss 2005), has reintroduced reflection on the evolutionary foundations of cognition and mental life that had, for various reasons, been largely moribund for more than seventy years. Because it connected so directly with an existing experimental paradigm of longstanding interest, viz., the Wason selection task (1966 and 1968), Leda Cosmides' (1989) discoveries about the crucial influence of social exchange on conditional inference in that task and the voluminous literature that it subsequently spawned thrust evolutionary considerations into cognitive science. The productive research programs associated with the alliance between evolutionary psychology (Barrett, 2015) and cultural group selection and cultural evolution (Henrich, 2016) ensure they will not be going away.

It is probably not a coincidence that all of the first generation contributors in CSR were by-product theorists. Among that group, it was Boyer (1994, 2001) who developed what was the most elaborate evolutionary account of religious cognition. Evolutionary psychologists' commitments to the

domain specificity of numerous cognitive systems, especially, have informed Boyer's proposals about religious cognition from the outset. Subsequent researchers (such as Bulbulia, 2004; Bering, 2006) have wedded their views of religious cognition more directly to natural selection, arguing on a variety of grounds that humans' have religious cognitive proclivities because those proclivities are individually adaptive. They maintain that religious sensibilities have aided individuals in passing on their genes.

Those hypotheses typically move in either or both of two directions. The first stresses the beneficial impact of religious participation on human health and well-being (e.g., Bulbulia, 2006). The second concerns the ways in which religious beliefs, especially those about the gods' concerns with human conduct, encourage behaviors that are likely to make individuals trusted members of their social groups (e.g., Bering, 2006). Whether their behaviors concern exhibitions of fidelity to the group and the group's gods, trustworthiness in moral matters, or both, the general proposal is that persons with such dispositions will, on average, have greater success obtaining resources and mates. Their compatriots will be more likely to enter into productive relationships – in all of the relevant senses – with such individuals, since their penchant for religious belief and deportment makes them good people with whom to cooperate. These circumstances should enable them to leave more copies of their genes, all else being equal, in the next generation.

Embracing explanatory pluralism inevitably produces pressures for broad interpretations of cognitive science, the fairly traditional conceptions of some theories in CSR notwithstanding (e.g., Lawson and McCauley, 1990). With regard to any particular explanatory question, how narrowly or how widely cognition and the scientific enterprises that study it should be construed should turn primarily on the productivity of theoretical proposals, the empirical findings those proposals motivate, and how those theories and findings bear on the range of questions inquirers wish to explore. There is no such thing as a *complete explanation* in science. Thus, principled arguments for or against narrower or broader conceptions of cognitive science are probably misplaced. Instead of casting cognitive explanations exclusively in terms of internal rules and representations, 4E cognitive science stresses that cognition is typically embodied, enacted, embedded, and extended (Menary, 2010). It surely is. For many purposes, including some that have arisen within CSR, however, 4E cognitive science is at least 1E too few.¹² The evidence that many forms of human cognition are *evolved* equals or exceeds that for any of the more celebrated E's (Buss, 2005).

CSR theorists, who construe at least some religious belief and behavior as adaptations at the individual level, have enlisted methodological, theoretical, and evidential resources from evolutionary research in the biological science-

¹² Arguably, it is probably 2E's too few. In addition to the importance of attending to cognition as *evolved*, it seems worthwhile to recognize how richly textured cognition is *emotionally* as well (Thagard, 2006).

es and, especially, in biological anthropology (e.g., Bulbulia and Sosis, 2011). A particularly influential study for subsequent cognitive theorists has been a collaboration between Richard Sosis, a behavioral ecologist, and Bradley J. Ruffle, an economist, exploring the role of religious ritual in forging intragroup cooperation to the benefit, presumably, of each of the cooperators (Sosis and Ruffle, 2003). The study exhibits how tools and methods from the social and cognitive sciences, viz., economic games, can be deployed to test such evolutionary hypotheses.

Sosis and Ruffle take advantage of existing arrangements in Israel to compare cooperation among members within religious as opposed to secular kibbutzim. They test the hypothesis that ritual participation builds cooperation. Current circumstances already lend indirect evidence to hypotheses about the beneficial effects of common religious affiliation. On virtually every relevant front (profitability, retention of members, longevity, etc.) religious kibbutzim on average fare better than do secular kibbutzim in contemporary Israel. Consequently, in order to have greater control on as many theoretically extraneous social and economic variables as possible, Sosis and Ruffle carried out the non-religious half of their study in some of the very most successful secular kibbutzim.

Sosis and Ruffle compared kibbutz members' performance in an economic game as a measure of their cooperativeness. They used real money in a common-pool resource dilemma game, in which two members of the same kibbutz play together anonymously. Both players know that the initial pool is one hundred Israeli shekels (equivalent to about twenty-five US dollars) and that each of them will propose to withdraw some amount. The rules are simple. If the sum of the two players' proposed withdrawals exceeds one hundred shekels, then neither player receives anything. If the sum of the two equals one hundred shekels, then each player receives exactly the amount that he or she proposed to withdraw. If the sum of the two withdrawals is less than one hundred shekels, then each player receives not only the amount that he or she proposed to withdraw but in addition three fourths times whatever remains from the one hundred shekels after both withdrawals have been made. Sosis and Ruffle presume that common-pool resource dilemma games are reasonably good models for the use of common resources, such as water or electricity, on a kibbutz. Crucially, both players stand to benefit more if they can trust one another to make small withdrawals from the original one hundred shekels.

Sosis and Ruffle's study revealed significant differences between the performances in this game of members from religious as opposed to secular kibbutzim. The members of religious kibbutzim withdrew significantly smaller amounts from the initial one hundred shekel pool than did members of the secular kibbutzim. The study supplied further evi-

dence, though, that this result may well have been the effect of participation in collective public rituals. In fact, the difference between the two groups was a function of the proposed withdrawals of the *male* members of the religious kibbutzim and, in particular, of the proposed withdrawals of the male members who participated in *collective, public*, ritual praying three times each day. Female players from religious kibbutzim did not propose withdrawals that differed significantly from those of players from secular kibbutzim. Although females in religious kibbutzim carry out rituals, those activities are mostly done domestically in private.

In some brief introductory comments Sosis and Ruffle frame their findings in terms of costly signaling theory (e.g., Irons, 2001). That theory proposes that participating in rituals communicates to other members an individual's commitment to the group. Basically, the more costly the ritual is, e.g., costly initiation rites that include adopting group markers (Whitehouse, 1996), the more convincing the signal is to the group. Participation in such rituals are hard-to-fake, high cost signals to the community that the participants are reliable group members, who will not defect. After all, by participating in such rituals participants have paid a non-trivial cost in time, energy, and material resources. Both participating in the ritual and adopting group markers, such as scarification, characteristic clothing, or food taboos, requires that group members surrender various opportunities to pursue their own interests.

Since evolutionary thinking examines changes in large-scale systems over the long-term (McCauley, 2009) rather than proximate cognitive mechanisms, much of that research is cognition-blind. The influence of Sosis and Ruffle's findings on subsequent research in CSR (e.g., Whitehouse and Lanman, 2014), notwithstanding, in fact, they do not discuss cognition. Joseph Henrich (2009) stresses, however, that costly signaling theory leaves questions about proximate mechanisms unaddressed. Henrich notes that costly signaling theory does not tackle either the group dynamics or the historical processes from which such patterns arise. It also offers no account of the underlying psychological processes involved. It explains neither why costly requirements will increase commitments to beliefs, nor why costly signals seem less costly to insiders, nor when or why the production of costly signals reaches a ceiling.¹³

Henrich argues for the pivotal psychological role of credibility enhancing displays (CREDs) in explaining the import of costly signals. In addition to the *content* biases in cognition, which Boyer deploys so effectively to explain the character of religious representations, Henrich (2016) argues that human beings also possess evolved *context* biases in cognition as well. Specifically, as *cultural learners*, Henrich proposes that human beings have an evolved disposition to attend to prestigious individuals (Henrich and Gil-White, 2001). Because pres-

¹³ Henrich's observations illustrate lessons of explanatory pluralism: science does not traffic in comprehensive explanations; the vindication of an explanatory theory simply occasions a new set of questions about its un-explicated details and its further implications.

tigious people have either expertise in some area of human endeavor or sound judgment or both, prestigious people are good people to model. Focusing on CREDs, Henrich suggests, constitutes a kind of cultural immune system in that CREDs signal to cultural learners the models' reliability with regard to their avowed commitments to the group, to the cause, to the beliefs, etc. Psychologically, the fact that everyone understands that cultural learners attend to models' CREDs (or lack thereof) decreases the possibilities that those models are self-interestedly manipulating cultural learners.

Certainly, costly signals are a variety of CREDs, but by no means do they exhaust the category. If prestigious models recommend some unfamiliar food and then, in fact, do such things as eat it themselves and feed it to their kin, they have not only exhibited a CRED, they and their kin have benefitted from the nourishment. Not all CREDs are costly. Preliminary experimentation with both adults and children indicates the value of CREDs for the cultural transmission of both practices and beliefs (Willard *et al.*, n.d.)

CREDs explain the prominence and influence that leaders, who have made costly sacrifices, possess. Religious leaders, who forego wealth and sex or, in some cases, even their lives, demonstrate their good faith, so to speak, and increase the probabilities of the transmission of their religions. As Henrich comments (2016, p. 330), "CREDs can turn pain into pleasure and make martyrs into the most powerful of cultural transmitters." An evolved psychology of prestige underlies cultural learners' willingness to follow religious leaders who consistently produce CREDs.

Cognitive neuroscience

In their landmark article on cognitive science in the twentieth century, William Bechtel, Adele Abrahamsen, and George Graham (1998) stress that different disciplines among the several cognitive sciences enjoyed particular prominence for intervals across the time period in question. For example, the advent of the digital computer and the advances in computational theory after the Second World War endowed work in computer science and artificial intelligence during the first two decades of cognitive science with a certain pride of place. The prominence of the neurosciences in twenty-first century cognitive science has also resulted from new technologies, though these have to do with brain imaging.

The ability to view structure and activity in human brains non-invasively has not only provided far more direct access to the central mechanisms of human cognition. It has also occasioned the development of inter-level theorizing and research integrating insights and findings from across the social, psychological, and brain sciences. These new imaging technologies have also furnished substantial, new bodies of evidence bearing on those hypotheses. Researchers from across the cognitive sciences have brought a variety of familiar tasks from experimental work in psychology and economics into the scanner to ascertain the impact of various stimuli

on cognition and decision-making. No work in CSR better illustrates such developments than Uffe Schjoedt and his colleagues' study (2011) of the influence of perceived charisma on the cognitive processing of believers noted earlier.

Employing functional magnetic resonance imaging (fMRI), the Schjoedt team explored the effect of different speakers' perceived (religious) qualifications on listeners' responses to those speakers' spoken prayers. The researchers examined participants' responses to the spoken intercessory prayers of three individuals, whom they were told differed in their religious statuses. One was described as a non-Christian; the second was described as a Christian, and the third was described as a Christian "known for his healing powers" (Schjoedt *et al.*, 2011, p. 120). (Assignments of these religious qualifications to the speakers were counter-balanced between participants.) Half of the participants were self-described Christian believers, while the other half were non-believers who were comparatively inexperienced with prayer and related religious matters. As a control the listeners also heard non-religious speech with the same structure as prayer. Participants also responded to two questionnaires. The first, which was administered before the scan, assessed the character and level of their religiosity and experience with religious matters. The second, which was administered after the scan, inquired about their experiences of the three speakers in the experiment and of God's presence while they were listening to the three.

Responses to the first questionnaire provided ample evidence for the religiosity of the religious participants, who held traditional beliefs with self-described conviction and who had considerable experience with standard religious forms and practices. By contrast, the secular participants did not believe in God and they did not pray.

Responses to the second questionnaire indicated that the Christian participants rated the charisma of the reputed Christian speakers known for their healing powers significantly higher than that for the alleged non-Christian speakers, whereas the secular participants showed no significant differences between their ratings of the various speakers. The two groups showed even greater disparity with regard to their feelings of God's presence during the various prayers that they heard during the experiment.

To ascertain whether the researchers' hypothesis that participants' views of the various speakers' religious qualifications would have an impact on their neural activity, they compared activity levels across a host of the participants' brain areas, as measured by the blood oxygen level dependent (BOLD) imaging of their brains in fMRI scans. Their study uncovered a number of striking patterns.

Only the Christian participants' neural activity showed significant differences in their responses to the speakers and only in the contrast between the supposed non-Christian speakers and the speakers who were putatively Christians known for having healing powers. To get a sense of the comparative size of the effects of these different speakers on the

Christian participants' neural activity, Schjoedt and his colleagues compared activations in the five areas of participants' brains that showed the most extreme differences in response to the two speakers with their measures of baseline activity for those areas, which they had also obtained. Crucially, in all five areas, levels of neural activity were *less* than baseline for the Christian speakers known for their healing powers and *more* than baseline for the non-Christian speakers. These patterns also held for the Christian participants' responses to the post-scan questionnaires. Deactivation also correlated inversely with participants' reports about their feelings of God's presence, and the Christian participants' post-scan ratings of God's presence and of the speakers' charisma were strongly positively correlated.

The brain areas (medial prefrontal cortex, the temporo-parietal junction, the temporopolar area, and the precuneus), which exhibited what the researchers described as "massive deactivation" in response to the reputed Christian speakers with healing abilities, concern social cognition and executive function. These are areas that are centrally involved in humans' negotiation of their complex social worlds and their experiences of decision-making in that domain and others. The researchers note that their study involved a "passive paradigm," in which participants simply listened to the speakers praying without knowing that they would be asked to assess them afterward. The Schjoedt team (2011, p. 126) proposes that participants' "trust in passive paradigms down regulate executive and social cognitive processing, because [they] suspend or 'hand over' their critical faculty to the trusted person." Their Danish Christian participants rated the alleged Christian speakers with healing powers significantly more charismatic than the alleged non-Christian speakers. Schjoedt *et al.* (2011, p. 127) suggest that such down regulation of neural activity in these brain regions may well be an earmark of followers' susceptibility to charismatic authority.

Religious experience

Submission to charismatic authority may not leap to mind as a paradigmatic illustration of religious experience, but it is often a salient dimension of what happens to many people in the course of their religious lives. Theorists (e.g., Stark and Bainbridge, 1996), besides Max Weber, accord considerable prominence to the influence of charismatic leaders in their general accounts of religion. Still, such features of people's religious experience seem pedestrian by comparison with the wondrous goings-on routinely reported by venerated religious figures, saints, and mystics.

The first theories in CSR, given their focus on the *transmission* of religious *ideas*, tended (at least compared to most other approaches in the study of religion) to downplay the importance of religious experience. The general contention (Sperber, 1996) was that no matter how exhilarating or inspiring participants' experiences might prove, their transmission is always subject to *cognitive* constraints on religious

representations' recognition, ability to attract attention, memorability, motivational impact, and communicability. Without packaging exhilaration and inspiration in a form that is readily transmittable, the relevant religious experiences are a good deal less likely to make any decisive differences in a religious system's fate.

Still, these theorists did not ignore religious experience altogether. Boyer (2001) noted that powerful emotions are frequently elicited automatically when engaging many of the domain-specific cognitive capacities that religions target -- from contamination avoidance, to kin detection, to fear of snakes, and more. Even if their principal concerns were mnemonic matters, both Whitehouse (1996) and McCauley and Lawson (2002) were particularly interested in the emotional experiences that various religious rituals elicit in ritual patients. Again, though, such aspects of religious experience seem inconsequential when compared with the confrontations with the Cosmos, with the Holy, with the *Mysterium Tremendum* that many religious people supposedly go through.

For a variety of reasons, CSR has, more recently, turned its attentions to religious experience (e.g., Taves, 2009). Beyond the traditional, widespread interest in the topic, ample evidence exists for package-able religious technologies (from rituals, to disciplines, to mind-altering drugs) that kindle some of those attention-grabbing experiences. Two considerations, however, are paramount. First, as the advocates of both 4E (and 6E!) cognitive science maintain, new tools and approaches (not just those of cognitive neuroscience) offer resources for understanding the experiential dimensions of our cognitive processing. Second, not only religious experience but its ability to intrigue are never going away. That the topic would resurface prominently in CSR was inevitable.

Dimitris Xygalatas, Ivana Konvalinka, and their colleagues' studies (Xygalatas *et al.*, 2011; Konvalinka *et al.*, 2011) of extreme rituals exemplify the sort of exciting new findings about the associated experiences that the tools of the cognitive sciences can produce. The Xygalatas-Konvalinka team studied a fire-walking ceremony that concludes the annual festival of San Juan in the small Spanish village of San Pedro Manrique. The fire-walking occurs at midnight on the summer solstice in an arena that was specially constructed for this ceremony and accommodates 3000 (approximately six times the population of the village). Earlier in the evening the twenty-eight fire-walkers have processed through the village to the venue, accompanied by the townspeople. Over a half-hour, one by one the twenty-eight, usually carrying a friend or loved one on their backs, walked across a seven-meter bed of hot coals, which reached temperatures of 677°C at the surface.

The Xygalatas-Konvalinka team recognized the exciting experimental opportunities in the natural (i.e., non-laboratory) setting that this fire-walking ceremony presents. After earning the trust of the village leadership, the local townspeople, and the fire-walkers themselves, they were per-

mitted to introduce into the ceremony a number of controls and measurements that were unobtrusive and unproblematic from the standpoints of all involved. These included video recording equipment for the purpose of memory research (Xygalatas *et al.*, 2013b), but, most importantly, for my purposes here, twelve fire-walkers as well as twenty-six spectators volunteered to wear heart-rate monitors. All of the volunteers wore the monitors during the roughly thirty minutes it took for the twenty-eight fire-walkers to traverse the coals as well as during a thirty-minute interval one to three hours before the event (in order to obtain baseline heart-rate measures on all of the participants). Nine of the twenty-six spectators who wore the heart-rate monitors were either relatives or friends of one or more of the fire-walkers, while the other seventeen, recruited at random, were unknown to the fire-walkers.

Studying the correspondences between the fire-walkers and spectators' heart rates permitted the researchers to tease apart the synchronization of arousal in ritual from the synchronization of bodily movements. Considerable experimental evidence (e.g., Cohen *et al.*, 2010) indicates that synchronized bodily movements create striking and similar responses among group members. Prolonged synchronous movements serve to align group members' cognitive states and levels of emotional arousal, which, in turn, are presumed to result in an elevated sense of group solidarity.

The empathetic projection hypothesis, at least in part, undergirds the second half of that story. That hypothesis holds that "it is the imagined responses of participants to focal events of the ritual that align their relevant cognitive states, without any strict need for orchestrated motor coordination" (Xygalatas *et al.*, 2011, p. 735). The suggestion is that synchronization of bodily movement is not necessary for such outcomes but is only a particularly popular means for orchestrating arousal in common among group members. However it is achieved, it is the common *arousal* that is the underlying mechanism for the sort of empathetic responses that build pro-social feelings *among members of a group*.

The study offers more fine-grained scrutiny of the dynamics underlying that process. The Xygalatas-Konvalinka team suspected that, for people *affiliated* with one or more of the fire-walkers, simply observing a fire-walker might suffice to produce similar arousal. The findings they obtained from their study furnished stunning corroboration for that speculation. Crucially, the data they obtained from the heart-rate monitors "revealed striking *qualitative* similarities during the ritual between the heart rates of fire-walkers and heart rates of relatives and friends, with no apparent similarity to nonrelated spectators" (Konvalinka *et al.*, 2011, p. 8515, emphasis added).

These findings are significant on at least two important fronts pertaining to the character of many people's religious experiences. First, they corroborated the empathetic projection hypothesis. Only the fire-walkers walked across the bed of hot coals, yet the heart-rates of the spectators who identified themselves as either a relative or friend of a fire-walker did not differ significantly from the heart-rates

of the firewalkers on all four of the heart-rate dynamics that the researchers measured. These affiliated spectators who participated in the study had no physical contact with the fire-walkers during their walks, but their heart-rates tracked those of the fire-walkers not only during their walks but throughout the entire ceremony and, it turns out, even to some extent during the baseline epoch as well (Konvalinka *et al.*, 2011, p. 8516-8517).

Second, the effect is, at least in part, a function of *social* relationships. It does *not* turn exclusively on the brain's mirroring capacities, which have attracted so much attention over the past two decades (Rizzolatti *et al.*, 2011). Even though all of the spectators witnessed the fire-walking, it was only the heart-rates of the spectators who were associates of a fire-walker that exhibited those qualitative similarities to the fire-walkers' heart-rates. The non-affiliated spectators who participated in the study were no less capable of mirroring the fire-walkers' levels of arousal, as measured by their heart-rates, but, in fact, they did not. Their heart rates on all four of the heart-rate dynamics that the researchers measured differed significantly from those of the fire-walkers.

The Xygalatas-Konvalinka team's study of the fire-walking at San Pedro Manrique provides a glimpse of the kinds of experimental controls, quantitative measures, descriptive precision, and *rich insights* that the theories and methods of CSR can supply for the study of at least some varieties of religious experience. On the one hand, their work contributes fundamentally to substantiating what are, in effect, theoretical proposals about religious experience from religious studies and the social sciences. On the other hand, this work and Xygalatas and his colleagues' subsequent work in Mauritius (e.g., Xygalatas *et al.*, 2013a) also model for experimentalists in the social, psychological, and brain sciences how to carry on fruitful experimentation utilizing physiological measures in the field.

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