PROBLEMS AND PROSPECTS FOR A COGNITIVE SCIENCE OF RELIGION:
MINIMAL COUNTERINTUITIVENESS, EPISTEMIC CONGRUENCY, SEX, AND
CONTEXT IN THE EPIDEMIOLOGY OF CULTURAL REPRESENTATIONS
IN SOUTH INDIA

by

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A THESIS

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ABSTRACT

The Cognitive Science of Religion (CSR), which emerged twenty years ago and explores how naturally occurring features of human mind/brains interact with features of human environments to encourage beliefs and behaviors associated with supernatural agents, has recently begun to mature and benefit from its strong interdisciplinary foundations because of critical questions offered from philosophers of science, anthropologists, and scholars in the study of religion. This thesis provides a brief introduction to the naturalness-of-religion thesis on which the CSR is built; surveys several of the recent criticisms and divisions of the CSR; explores several adaptive cognitive mechanisms purportedly involved in the transmission and retention of supernatural agential concepts; and attempts to resolve some of the problems of definition, scope, sex, context, and history that have marked CSR scholarship by submitting results from comparative cross-cultural data collected concerning the recall and retention of minimal counterintuitive (MCI) concepts among 74 university students in south India in 2009. These results are compared with the existing empirical literature concerning MCI theory, which is comprised of nine, largely Western-based studies. No empirical evidence is found in support of MCI theory, but females are shown to have a mnemonic advantage over males. Several theoretical refinements are offered for prospective MCI theory studies and an interactional model is proposed which would combine MCI theory with analyses of cognitive mechanisms related to agency to in order to thoroughly evaluate the differential mnemonic and, ultimately, cultural success of certain types of concepts.
DEDICATION

This thesis is dedicated to my family with love.
**LIST OF ABBREVIATIONS AND SYMBOLS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>ANOVA</strong></td>
<td>Analysis of Variance: a collection of statistical models that compares group means by analyzing comparisons of variance estimates</td>
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<tr>
<td><strong>CEC</strong></td>
<td>Contingently Epistemic Congruence</td>
</tr>
<tr>
<td><strong>CSR</strong></td>
<td>Cognitive Science of Religion</td>
</tr>
<tr>
<td><strong>HADD</strong></td>
<td>Hypersensitive Agency Detection Device</td>
</tr>
<tr>
<td><strong>MCI</strong></td>
<td>Minimal Counter-Intuitiveness</td>
</tr>
<tr>
<td><strong>NEC</strong></td>
<td>Necessarily Epistemic Congruence</td>
</tr>
<tr>
<td><strong>NEI</strong></td>
<td>Necessarily Epistemic Incongruence</td>
</tr>
<tr>
<td><strong>ToM</strong></td>
<td>Theory of Mind</td>
</tr>
<tr>
<td><strong>p</strong></td>
<td>Probability associated the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value</td>
</tr>
<tr>
<td><strong>t</strong></td>
<td>Computed value of t test</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>Mean: the sum of a set of measurements divided by the number of measurements in the set</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>Sample size</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>Standard Deviation: the square root of the variance of a given data set</td>
</tr>
<tr>
<td><strong>+</strong></td>
<td>In addition to</td>
</tr>
<tr>
<td><strong>&lt;</strong></td>
<td>Less than</td>
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<tr>
<td><strong>&gt;</strong></td>
<td>Greater than</td>
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<tr>
<td><strong>=</strong></td>
<td>Equal to</td>
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ACKNOWLEDGEMENTS

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CHAPTER 1
INTRODUCTION

The Cognitive Science of Religion (CSR) emerged twenty years ago to explore how naturally occurring features of human mind/brains interact with features of human environments to encourage beliefs and behaviors associated with supernatural agents. The CSR has recently begun to mature, benefitting from its strong interdisciplinary foundations because of critical questions offered from philosophers of science (e.g., McCauley & Cohen, in press), anthropologists (e.g., Barrett, 2008a; Bloch, 2008; Laidlaw, 2007; Whitehouse, 2007), and scholars in the professional study of religion (e.g., A. Geertz, 2004; Sinding Jensen, 2009; Martin, 2004; Sørensen, 2004). Many of the advances in the CSR have now received popular attention in film and print (e.g., BBC’s A Brief History of Disbelief, 2004; Boyer, 2001; Dawkins, 2006; Dennett, 2006; Pinker, 2002) as well as high levels of private support from the late philanthropist Sir John Templeton (McFadden, 2008).

Chapter 2 provides a brief introduction to the naturalness-of-religion thesis on which the CSR is built; it surveys several of the recent criticisms and divisions that have emerged since a tight-knit group of scholars from cognitive science and evolutionary psychology joined to form what is now known as the CSR (Laidlaw, 2007); it explores several adaptive cognitive mechanisms purportedly involved in the transmission and retention of supernatural agential concepts including the Hypersensitive Agency Detection Device (HADD), Theory of Mind (ToM), Naïve Physics, Naïve Biology, and Intuitive Morality. Chapter 3 attempts to resolve some of the problems of definition, scope, sex, context, politics, and history that have marked
scholarship in the CSR. Chapter 4 submits results from comparative cross-cultural data concerning the recall and retention of minimal counterintuitive (MCI) (i.e., cognitively optimal) concepts among 74 university students in south India in 2009. This study is designed to test the hypothesis that MCI or cognitively optimal category items will enjoy a recall advantage over necessarily epistemic congruent (NEC), contingently epistemic congruent (CEC), and necessarily epistemic incongruent (NEI) concepts in both immediate and delayed recall exercises, with the delayed recall exercise showing more significance as it more closely approximates natural forms of cultural transmission and cultural representational success.

Following the growing evidence that women are more religious than men (Thompson 1991; Stark 2002; Miller & Stark 2002; Sherkat 2002; Maselko & Kubansky 2006), it is further hypothesized that female respondents will demonstrate higher delayed recall means when compared to males because of a more active Theory of Mind (Barrett 2004b). These results are compared with the existing empirical literature concerning MCI concepts, which is comprised of nine, largely Western-based studies (Boyer & Ramble, 2001; Barrett & Nyhof, 2001; Pyysiäinen, Lindeman, & Honkela, 2003; Atran & Norenzayan, 2004; Norenzayan, Atran, Faulkner, & Schaller, 2006; Gonce, Upal, Slone, & Tweney, 2006; Tweney, Upal, Gonce, Slone, Edwards, 2006; Upal, Gonce, Tweney, & Slone, 2007; Gregory & Barrett 2009). No empirical evidence is found in support of MCI theory in either the immediate or delayed recall exercises. Contrary to previous empirical examinations of MCI theory (Gregory & Barrett, 2009), sex is shown to have a significant effect on the recall of MCI category concepts with females showing a mnemonic advantage over males.

Chapter 5 summarizes several theoretical refinements offered for prospective MCI theory studies in the maturing field of the CSR, including the need for future examinations of MCI
theory to 1) reduce the ambiguity of experimental public representations through extensive pre-testing, debriefing, and traditional ethnographic methods of participant-observation and language training; 2) test for cognitive optimum at different counterintuitiveness scores following Barrett’s (2008a) revised method of coding and quantifying counterintuitiveness; 3) test for the recall effect of various presentation exposure times; 4) create a timed computer-based experiment that allows respondents to choose how long they view and, therefore, encode a concept to determine if MCI concepts do take longer to encode than other test categories of concepts, as postulated by Gregory and Barrett (2009); 5) test for recall effect of peer groups versus individual respondents; 6) test for recall effect of various narrative contexts and genres by refining the methods employed by Upal et al. (2007); 7) employ a sampling strategy from a non-college sample that includes a wide age range following Gregory and Barrett (2009); 8) allow for individually-forwarded selective attention timing to control the potentially varied exposure time required for the successful coding of various categories of concepts; 9) test for differential recall success of counterintuitive versus counterschematic concepts in cultural representations; 10) extend delayed recall beyond one week or ten days by soliciting different sub-samples for a delayed recall task at intervals of 10, 30, 60, 90, and 120 days following Bartlett’s (1932) seminal serial reproduction studies; 11) test for the effect of various demographic factors (e.g., sex, gender, age, religion) on MCI concept recall levels; 12) widen the domain of inquiry to include a broader spectrum of cultural representations following McCauley (in press) and Barrett (2008a; 2008b); 13) administer ToM examinations and correlate ToM strength with MCI recall to test if preliminary studies which indicate a gendered divide in ToM strength influence the recall levels of MCI concepts; 14) continue to refine Barrett’s (2008a) intuitive ontological categories and expectation sets in light of advances in relevant fields [e.g., include numeric cognitive systems in Barrett’s
(2008a) method of coding and quantifying counterintuitiveness following Feigenson, Dehaene, and Spelke (2004); 15) employ a cross-cultural sampling strategy following the early MCI theory research of Boyer (2001); 16) code and score breach and transfer violations separately to determine if breaches and transfers constitute an equivalent violation of the expectation set of a given intuitive ontological category and, therefore, should be coded as equally counterintuitive in Barrett’s (2008a) method as Boyer and Ramble (2001) suggest; and, finally, 17) refine Barrett’s (2008a) “Simplicity Rule” by examining how a group of culturally-trained, hypothesis-blind research assistants would code a given concept according to Barrett (2008a). In addition to refining MCI theory in these myriad ways, this thesis illustrates the need from a more comprehensive examination of Boyer’s (1994) naturalistic study of religion and Sperber’s (1996) epidemiological approach to cultural representations through the creation of an interactional model that combines MCI theory with an examination of the cognitive mechanisms of HADD and ToM to explore the complex relationship between cognitive mechanisms and counterintuitive concepts and to better understand the role of agency detection and the ability to empathetically postulate the goals and intentions of agents in order to thoroughly evaluate the differential mnemonic and, ultimately, cultural success of certain types of concepts. Before these refinements of MCI theory are discussed, however, an overview of some of the major contributions and problems associated with the cognitive approach to religion and a survey of previous MCI theory experiments is presented.
CHAPTER 2
THE COGNITIVE SCIENCE OF RELIGION

While cognitive approaches have been around for over a century, the CSR emerged out of the development of computers, artificial intelligence, and analogical thinking in the 1950s and the neurological research of the early 1990s (A. Geertz, 2004, p. 7-8). Several scholars have recently offered surveys of the cognitive approach to religion (Barrett, 2007a; Barrett & Lanman, 2008; Boyer, 2008; Cohen, Lanman, Whitehouse, & McCauley, 2008; A. Geertz, 2008; A. Geertz, in press; Tremlin, 2010; Whitehouse & Laidlaw, 2007). While Tremlin (2010) has the benefit of being a more comprehensive introduction to the field, two of these recent surveys—Barrett’s (2007a) general description of the CSR’s potential and Geertz’s (2008) description of how not to do the cognitive science of religion today—stand out from the rest in their influence on the popularization and progression of the field.

Before concluding that “the CSR offers empirically testable, theoretically motivated scientific explanations for why religious thought and actions tend to develop and spread the way they do” (p. 13), Barrett (2007a) canvasses several of the most prominent contributions of the CSR since its inception twenty years ago. Barrett (2007a) begins by outlining his own (2004) theory of theological correctness (pp. 2-3). Citing a set of experiments that he conducted in the United States and in India (Barrett, 1998; Barrett, 1999; Barrett & Keil, 1996; Barrett & VanOrman, 1996), Barrett (2007a) demonstrates a significant divide between off-line cognitive processing in which respondents consistently responded with theologically correct responses when computational demands were low and on-line cognitive possessing in which respondents
consistently responded with anthropomorphic concepts of God when computational demands were high (p. 3). Barrett (2007a) then contextualizes the CSR within Sperber’s (1996) highly influential epidemiological approach to cultural representations writing, “our naturally developing mental tools readily generate certain kinds of ideas we call intuitive regardless of context” (Barrett, 2007a, p. 4). Boyer (2001) also stresses the importance of Sperber’s (1996) cultural epidemics as the mechanism of cultural transmission (Boyer, 2001, p. 46). Thus, in order for CSR scholars to “explain [religion, they] must understand the particular ways in which the human body reacts to the presence of this particular agent” (Boyer, 2001, p. 46). Barrett’s (2007a) survey of the most prominent contributions of the CSR continues with Boyer’s (1994, 2001) minimal counterintuitiveness theory (pp. 3-5) and an emphasis on counterintuitive agents (p. 5). Here, Barrett (2007a) summarizes Boyer’s (1994, 2001) MCI theory saying, “Boyer suggested that though fully intuitive concepts are readily transmitted, concepts that slightly deviate from the intuitive expectations of our mental tools might be transmitted even more successfully” (Barrett, 2007a, p. 4). Moreover, if these concepts, especially those involving counterintuitive agents, are more successful in the mind of an individual, then they “will tend to be better remembered and more faithfully transmitted” (Barrett, 2007a, p. 4). In all, Barrett (2007a) finds that our naturally emerging mental tools constrain the huge realm of potentially successful religious thoughts and actions (p. 5). Barrett (2007a) continues his introduction to the CSR by exploring Guthrie’s (1993) insight concerning the over-detection of human-like agency (pp. 5-6) and his own (Barrett, 2000; Barrett, 2004b) elaboration of Guthrie’s anthropomorphism theory before submitting evidence for the existence of a hypersensitive agency detection device (HADD) (Barrett, 2007a, pp. 6-7). Extending Guthrie’s (1993) argument that humans are cognitively predisposed to attend to other human-like beings, Barrett (2000; 2004b) suggests that
humans have a HADD, which produces a plethora of false-positives and could help motivate the
cognitive acceptance of god concepts when no other agent can be readily identified (Barrett,
2007a, pp. 5-6). Barrett (2007a) further suggests that HADD experiences combined with Boyer’s
(1994, 2001) MCI theory could account for the success and widespread acceptance of god
concepts (Barrett, 2007a, pp. 5-7). Barrett (2007a) analyzes a wealth of developmental
psychological evidence and suggests that children are intuitively inclined to be receptive to
certain god concepts and to perceive the world to be purposefully designed (pp. 7-8). Bering’s
(2006) simulation constraint theory concerning the intuitive characteristics presented by a belief
in an afterlife reaches a similar conclusion (Barrett, 2007a, pp. 8-9). Barrett (2007a) transitions
from a survey of the CSR’s contributions to religious belief to religious actions by discussing
Lawson and McCauley’s (1990) ritual form theory and Whitehouse’s (2004) critical revision of
it (Barrett, 2007a, p. 11) before noting Cohen’s (2007) novel cognitive treatment of spirit
possession (Barrett, 2007a, pp. 10-11) and Whitehouse’s (1995; 2000; 2004) modes of religiosity
theory, which makes a distinction between “imaginistic” and “doctrinal” modes of religiosity.

While Barrett (2007a) and others survey both what the cognitive science of religion has
done and should do in the future, Geertz (2008) outlines a method for persuading skeptics in the
academic study of religion and theology by showing them “what exactly the cognitive science of
religion is, what it can do and, more importantly, what it cannot do” (p. 8). In the process of
addressing just the sort of “combative” and “quixotic” anti-religious agenda that Barrett (2007a,
p. 12) denounces, Geertz (2008) outlines the limits of beneficial return for the cognitive science
of religion by denouncing the “hostile,” ineffective,” and overall “bad science” found in
Dennett’s (2006) *Breaking the Spell* (A. Geertz, 2004, p. 7) and in so doing marks the beginning
of a more mature CSR.
Religion in the CSR

Boyer’s (1994; 2001) cognitive explanation of religion and Whitehouse’s (2004) cognitive theory of transmission have had an enormous impact on the emerging Cognitive Science of Religion and will be summarized below. Both of these full-length monographs synthesize many of the relevant scientific debates concerning religion’s origins, distribution, and functions in cognitive terms. Boyer’s (2001) seminal cognitive anthropological introduction to religion creates the theoretical backdrop for much of the cognitive scholarship concerning the definition and categorization of “religion” produced over the last decade. He first evaluates many of the popular interpretations of religion’s origins before he “turn[s] the whole ‘origin’ explanation upside down [in order to] realize that the many forms of religion we know are not the outcome of historical diversification but of constant [cognitive] reduction” (Boyer, 2001, p. 32). A summary of Boyer’s treatment of some of the most popular and pervasive theories of religion including intellectualist explanations, emotive explanations, classic functionalist explanations, and rationalistic explanations are found in Tables 2.1 - 2.4.

Boyer (2001) provides an example for his critique of intellectualist approaches to religion, which is summarized in Table 2.1, by extending E. E. Evans-Pritchard’s famous account of the Zande people and their explanations for the collapse of the roof of a mud house (pp. 12-17). Here, the Zande people demonstrate their interest in the causation behind the collapse at that particular time, to those particular people, in that particular place, instead of any interest any general causation that may account for why roofs fall (Boyer, 2001, pp. 12-13). Thus, Boyer (2001) finds that “the mistake of intellectualism was to assume that a human mind is driven by a general urge to explain” (p. 16). Moreover, Boyer (2001) notes that religious ideas of witches or ancestors, like any other product of the mind, have at their foundations vast
amounts of assumed and unconscious characteristics (pp. 17-33). In the case of the Zande people, no one, including Evans-Pritchard, bothered to state that the witches involved in the mud house roof collapse had any number of reasons to cause to make the roof collapse because these characteristics of witches were assumed, self-evident, and dealt with unconsciously (p. 17). These unconscious aspects of witches and other religious concepts, argues Boyer (2001), influence how the brain attempts to explain and react to particular events through more generalized inference systems (pp. 17-19).

Table 2.1

<table>
<thead>
<tr>
<th>Religion provides explanations:</th>
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<tr>
<td>a) People created religion to explain puzzling natural phenomena.</td>
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<tr>
<td>b) Religion was created to explain puzzling mental phenomena.</td>
</tr>
<tr>
<td>c) Religion explains the origins of things.</td>
</tr>
<tr>
<td>d) Religion explains evil and suffering.</td>
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</tbody>
</table>

Cognitive Response:
1. The urge to explain the universe is not the origin of religion.
2. The need to explain particular occurrences seems to lead to strangely baroque constructions.
3. You cannot explain religious concepts if you do not describe how they are used by individual minds.

Cognitive Proposal: Religious concepts are probably influenced by the way the brain’s inference systems produce explanations without our being aware of it.

Boyer (2001) provides an example for his critique of emotive approaches to religion, which is summarized in Table 2.2, by noting the extreme positivity associated with New Age mysticism is limited to “one of the most secure and affluent societies in history” and citing his own fieldwork among the Fang people of Cameroon and their general consensus that, contrary to a multitude of emotive explanations for religion, “if religion allays anxiety, it cures only a small part of the disease it creates” (p. 20). Instead, Boyer (2001) suggests, emotions such as fear follow programmatic and, therefore, predictable patterns, which are cognitively salient and far more complex than the “diffuse angst” that characterizes many emotive explanations of religion.
It is noteworthy, however, that Spiro and other emotional functionalists do not argue that religion efficiently “allays anxiety” as Boyer (2001, p. 20) suggests, but contend that the emotional functions of religion provide just enough curative to be reproduced.

Table 2.2

*Popular Emotive Approaches to Religion and Cognitive Response (Boyer, 2001, pp. 4-23)*

<table>
<thead>
<tr>
<th>Religion provides comfort:</th>
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<tr>
<td>a) Religious explanations make mortality less unbearable.</td>
</tr>
<tr>
<td>b) Religion allays anxiety and makes for a comfortable world.</td>
</tr>
</tbody>
</table>

**Cognitive Response:**

1. Religious concepts do not always provide reassurance or comfort.
2. Deliverance from mortality is not quite the universal longing we assume.
3. Religious concepts are indeed connected to human emotional systems, which are connected to life-threatening circumstances.

**Cognitive Proposal:** Our emotional programs are an aspect of our evolutionary heritage, which may explain how they affect religious concepts.

Boyer’s (2001) critique of classic functionalist approaches to religion, which is summarized in Table 2.3, notes that “humans are by nature a social species [who] have sophisticated mental equipment, in the form of special emotions and special ways of thinking, that is designed for social life” (p. 27). Thus, Boyer (2001) concludes that we do not have gods because of their functional utility in society, but because we have mental equipment that makes both society possible and god concepts intelligible (pp. 27-28).

Table 2.3

*Popular Functionalist Approaches to Religion and Cognitive Response (Boyer, 2001, pp. 4-28)*

<table>
<thead>
<tr>
<th>Religion provides social order:</th>
</tr>
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<tbody>
<tr>
<td>a) Religion holds society together.</td>
</tr>
<tr>
<td>b) Religion was invented to perpetuate a particular social order.</td>
</tr>
<tr>
<td>c) Religion supports morality.</td>
</tr>
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**Cognitive Response:**

1. Religion cannot be explained by the need to keep society together or to preserve morality, because these needs do not create institutions.
2. Social interaction and morality are indeed crucial to how we acquire religion and how it influences people’s behavior.

**Cognitive Proposal:** The study of the social mind can show us why people have particular expectations about social life and morality and how these expectations are connected to their supernatural concepts.
Boyer’s (2001) critique of rationalistic approaches to religion, which is summarized in Table 2.4, begins by arguing that we could make up an endless supply of irrefutable beliefs, but we do not. Instead, only a limited catalogue of religious beliefs is successfully transmitted across time and space (p. 29). Only certain concepts or actions elicit strong behavioral responses and these concepts or actions are selected out of all the informational fodder for the mind (p. 30). This leads Boyer (2001) to think that people accept certain extraordinary claims because they have become plausible to them, not because they “relax their usually strict criteria for evidence and accept extraordinary claims” (p. 31).

Table 2.4

**Popular Rationalist Approaches to Religion and Cognitive Response (Boyer, 2001, pp. 4-31)**

<table>
<thead>
<tr>
<th>Religion is a cognitive illusion:</th>
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<tbody>
<tr>
<td>a) People are superstitious; they will believe anything.</td>
<td></td>
</tr>
<tr>
<td>b) Religious concepts are irrefutable.</td>
<td></td>
</tr>
<tr>
<td>c) Refutation is more difficult than belief.</td>
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</table>

**Cognitive Response:**

1. The sleep of reason is no explanation for religion as it is. There are many possible unsupported claims and only a few religious themes.
2. Belief is not just passive acceptance of what others say. People relax their standards because some thoughts become plausible, not the other way around.

**Cognitive Proposal:** We should understand what makes human minds so selective in what supernatural claims they find plausible.

Combined with a critical analysis of both Dawkins’ (1976) meme theory and Sperber’s (1996) epidemiological approach to culture, Boyer (2001): 1) defines “culture as the name of similarity” (p. 35); 2) abandons the search for a historical origin for the phenomenon of religion (pp. 35-50); and 3) replaces the “magic bullet” approach to defining religion as “a single factor that will explain why there is religion in all human groups and why it triggers such important social, cognitive, emotional effects” (p. 50) with an explanation of religion as the culmination of various unconscious cognitive mechanisms, which constrain the range of potentially successful concepts to those that “happen to connect with inference systems in the brain in a way that
makes recall and communication very easy[,] happen to trigger our emotional programs in particular ways[,] and] happen to connect to our social mind […] in such a way that they soon become plausible and direct behavior” (p. 50).

In Whitehouse’s (2004) refinement of Boyer’s (2001) cognitive account of religious transmission, he, too, approaches the definition of religion theoretically and, therefore, defines the category that many cognitive scientists over the last decade have accepted as their field of scientific inquiry. In so doing Whitehouse (2004) slightly modifies E. B. Tylor’s nineteenth century definition of religion as “the belief in Spiritual Beings” (as cited in Whitehouse, 2004, p. 2) to conclude that “religion consists of any set of shared beliefs and actions appealing to supernatural agency” (p. 2), which is largely the same definition employed by McCauley and Lawson (2002) in their influential book—Bringing Ritual to Mind. In his critique of Lawson and McCauley’s (1990) definition of “a religious system as a symbolic-cultural system of ritual acts accompanied by an extensive and largely shared conceptual scheme that includes culturally postulated superhuman agents” (as cited in Saler, 2008, p. 220), Saler (2008) extends this criticism by finding that this definition is not only substantive and essentialist, but also prototypical in that it implies that “religions that minimize or lack the necessary feature are less than authentic religion” (pp. 220-221). In so doing Saler (2008) simultaneously presents a problem and a solution to the problem of defining and conceptualizing the word “religion.” Like Boyer’s (2001) assertion that is there is no “magic bullet” to defining religion, but only an “aggregate relevance” that marks the category of religion (p. 50), Saler (2008) finds that “the postulation of [superhuman agents] is typical of what we usually mean by religions” (p. 221). Saler’s (2008) call for a definition of religion in general that includes several typical features, the
most typical of which is the postulation of superhuman agents who are invested in human affairs, while compromising and constructive, does not solve the problem of the definition of religion.

Whitehouse (2004), for example, quickly dismisses the fallacious and belabored notion that Buddhism does not have supernatural agents, a point which is driven home by Pyysiäinen (2003). Whitehouse (2004) makes a useful theoretical distinction between “imaginistic” and “doctrinal” modes of religiosity using recent insights from a multitude of disciplines including psychology, cognitive science, anthropology, and history. However, like Boyer (1994; 2001) he fails to define theoretically what gets to count as religion beyond his ill-defined perception of a folk taxon which contains “a range of exemplary features,” none of which “is necessary for the attribution of the label, but almost any combination [of these features] is sufficient” (Whitehouse, 2004, p. 1). Therefore, while Whitehouse (2004) and Boyer (1994; 2001) work extensively to define religion using rigorous naturalistic methods, their cognitive theories of religion and religious transmission are predicated on an amorphous set of “I-know-it-when-I-see-it,” or, more precisely, “most-people-know-it-when-they-see-it” characteristics for a defined object of study known as “religion.” For example, in Boyer’s (2001) exploration of the universality of religion, he first acknowledges the likely stereotypes held by his intended audience by stating, “it may seem obvious that gods are always thought to be eternal [and] this must be part of the definition of ‘god’” before arguing that “many Buddhists think that gods, just like humans, are caught in a never-ending cycle of births and deaths” (p. 7). Thus, Boyer’s (2001) logic in constructing his argument that in religion, taken as a whole, “some gods die” is predicated on the notion that what “many Buddhists think” (p. 7) should define the characteristics of what theorists of religion call “religion.” While Boyer (2001) offers evidence from a popular belief held by Buddhists in order create some diffuse set of universally shared
characteristics of religion scholars can reliably call “religious,” he is unwittingly disguising the fact that he is employing a popular and lay theoretical definition of religion before he even begins his attempt to define religion along naturalistic lines using his sophisticated knowledge of mental systems. In other words, Boyer (2001) tacitly acknowledges that what many Buddhists, Christians, and others do already counts as religious, which turns his cognitive analysis of religion into a post-hoc analysis for a category that is already decided upon and defined.

Like Boyer (1994; 2001), Whitehouse (2004) demonstrates his transparent reliance on a popular and amorphous definition of religion when he notes that “it is not at all clear that exemplars of the category religion used by, say, middle-class Americans would match those widely recognized by people in, say, rural Japan or South India” (Whitehouse, 2004, p. 1). Moreover, Whitehouse (2004) finds that “some traditional societies do not entertain the concept of having a religion at all, although certain of their activities may strike the visiting tourist as self-evidently ‘religious’” (pp. 1-2). However, it is not clear which “traditional societies” Whitehouse (2004, p.1) excludes from entertaining a religious concept. While Whitehouse (2004) calls for a “scientific theory of religion [that] must tell us what, for the purposes of that theory, constitutes religion” (p. 2), he ignores questions of the history of the category of religion and the politics involved in “religion’s” dissemination and popularization in favor of an analysis of a perceivably unique category of human thought and behavior that is found universally and can be treated scientifically. Likewise, when Boyer (2001) commits himself to answering the questions summarized in Table 2.5 using cognitive methods, he does so having already defined much of the range, scope, and conclusions of his inquiry using a definition of religion that, while popular in a strict historical and contextual moment, is ill-defined, poorly theorized, and in need of refinement. Saler (2008) follows Spiro (1966) in pointing out that “the word religion […] is a
term with historically rooted meanings” (as cited in Saler, 2008, p. 222) and, therefore, “our definition of religion ought to satisfy ‘the criterion of intra-cultural intuitivity’ as well as being cross-culturally applicable” (p. 222).

Table 2.5

*Summary of Boyer’s (2001) Post-Hoc Questions Concerning Religion (pp. 48-49)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Why do people have religion, more or less everywhere?</td>
</tr>
<tr>
<td>2.</td>
<td>Why does it come in different forms? Are there any common features?</td>
</tr>
<tr>
<td>3.</td>
<td>Why does religion matter so much to people’s lives?</td>
</tr>
<tr>
<td>4.</td>
<td>Why are there several religions rather than just one?</td>
</tr>
<tr>
<td>5.</td>
<td>Why does religion prescribe rituals? Why are rituals the way they are?</td>
</tr>
<tr>
<td>6.</td>
<td>Why do most religions have religious specialists?</td>
</tr>
<tr>
<td>7.</td>
<td>Why does religion seem to provide “truth”?</td>
</tr>
<tr>
<td>8.</td>
<td>Why are there Churches and religious institutions?</td>
</tr>
<tr>
<td>9.</td>
<td>Why does religion trigger strong emotions? Why do people kill for religion?</td>
</tr>
<tr>
<td>10.</td>
<td>Why does religion persist in the face of apparently more efficient ways of thinking about the world?</td>
</tr>
<tr>
<td>11.</td>
<td>Why does it lead to so much intolerance and so many atrocities? Or, if you prefer, why is it sometimes conducive to heroism and self-sacrifice?</td>
</tr>
<tr>
<td>12.</td>
<td>Why do some people believe?</td>
</tr>
</tbody>
</table>

Following a series of critiques concerning just these sorts of *sui generis* definitional strategies for the category of “religion” (McCutcheon, 1997; 2007), McCutcheon summarizes this critique saying “the common limits of the folk taxon ‘religion,’ naming a distinct domain, are reproduced; once again, then, a familiar folk discourse has been accepted by scholars and uncritically elevated to the analytic level, used as if it described actual states of affairs in the world that need to be explained” (personal communication, May 18, 2010). McCutcheon (personal communication, May 18, 2010) asks, “What if what attracted the scholarly imagination was not the taken-for-granted distinctness of religion (thus requiring a specific theory to account
for its existence) but, instead, the practitioners’ compulsion to represent one part of their social world as distinct, unique, set apart, etc.?“ In so doing, McCutcheon (personal communication, May 18, 2010) seeks to portray the emergence and persistence of the category of religion, not on some universal and naturalistic mental characteristic or set of mental constraints, but on religion’s utility as a “socio-political technique of management.”

In sum, McCutcheon’s (personal communication, May 18, 2010) call for a genealogical analysis of the non-phenomenal category of religion overlooks the utility found in developing a theory that accounts for a widely distributed social phenomenon, namely, beliefs and behaviors associated with supernatural agents. While a belief in supernatural agents does not sufficiently reflect the enormous historical and political motivating weight behind the use of the term religion, the category of religion serves as a convenient analytical category, but one that should be determined through scientific methods, not through post-hoc accounts of an ill-defined popular folk category. Cognitive approaches to religion can provide just this sort of scientific analysis for the presence or absence of supernatural agents in the minds of ordinary humans, but they must not limit the scope of their inquiry to a post-hoc naturalization of the contingent and historico-political discourse currently conceived as “religion” in the popular consciousness. Instead, cognitive scientists of religion must take the historical and political dimensions of the label “religion” seriously in order to contextualize their research. While cognitive scientists of religion, like Barrett (2008b), can “pretend for the moment that the historical factors are trivial details” (p. 150), they do so at their own peril. Before the human propensity for beliefs and behaviors associated with supernatural agents can be productively associated with a definition of religion, the analytical category of religion, itself, must be taken seriously. While cognitive approaches to religion can focus on the folk classificatory schemes that may account for the
preponderance of such things as a belief in supernatural agents, their scholastic analysis must reflect a critical understanding of the historical and political genealogies that mark the term religion if they wish to be taken seriously across the multitude of disciplines whose subject of inquiry involves religion.

**Cultural Eliminativism and the CSR**

Armin Geertz (2004) makes a similar call to action for cognitivists by writing the following:

We need to learn a new language and new methods. We need to brush up on our biology, chemistry and brain physiology. We need to learn strange technical terms. Colleagues in the health sciences are generally happy to help us here. We need to learn research design, how to formulate hypotheses and how to prove or disprove them. Colleagues in the natural, psychological and social sciences, but also, and perhaps more importantly, in the philosophy of science come to our rescue here. We need to learn statistics and how to determine levels of significance. Colleagues in psychology and sociology of religion can help us out with this too. We need to keep track of cognitive approaches and her sister disciplines such as linguistics, anthropology, history, archaeology, theology, philosophy, semiotics, literature, art history and so on. (p. 8)

If not, the cognitive science of religion unnecessarily limits its analytical domain and methods to post-hoc analytical validations of a relatively known historical discourse. In so doing, the potential for the cognitive science of religion to accomplish its goal of explaining religion is limited to a scientized reiteration of certain features of a hypothetical construct popularly known as religion. Instead, future examination in the cognitive science of religion must take culture seriously. Again, following Armin Geertz (2004):

Culture and social relationships and institutions are back again, center stage, in the story of cognition. Cognition is not just about the brain. It is more precisely and more correctly about interacting brains. It is about brains that cannot even use their highly evolved capacities without supportive cultural symbolic systems – language for one thing, but also the myriad of other symbolic systems, among them religious symbolic systems. In fact, culture may have played a central role in the physical development of the brain during the phylogenetic evolution of Homo sapiens. (p. 8)
It is this sort of analysis that will demonstrate the value of the cognitive science of religion to McCutcheon and other leading theoreticians in the field who understand the importance of cataloging the political and historical impact of the term religion in the human story. If not, while it is possible that “meaningful human phenomenon [will be] addressed” using a “piecemeal” approach to the category of religion (Barrett, 2007a, p. 1), both popular and more general definitions of “religion” and more technical scholastic definitions of “religion” will move in and out of the inadequate definitional strategies that have come to characterize the CSR and will continue to limit the widespread scholastic appeal of insights garnered from the cognitive science of religion. Cognitivists cannot simply “detail the basic cognitive structure of thought and action that might be deemed religious and [invite] historians, anthropologists, sociologists, psychologists and other religion scholars to fill in the hows and whys of particular religious phenomena” (Barrett, 2007a, p. 2) while limiting their domain to popular constructs of “religion” and publishing such titles as Religion Explained (Boyer 2001), as Barrett (2007a) suggests, because the utility of the cognitive approach to religion is not self-evident to scholars in these various other fields.

The CSR, therefore, must be more careful, conscious, and theoretically diverse in its conceptualization of the concept of religion in order to demonstrate its analytical power and potential. Thus, we see that neither Boyer’s (2001) attempt to emphasize the origin and persistence of religion as the result of continuous cognitive reduction instead of historical diversification (p. 32) nor McCutcheon’s (personal communication, May 18, 2010) attempt to emphasize the origin and persistence of religion as the result of continuous socio-political techniques of management instead of continuous cognitive reduction are quite right. Following Lincoln’s (1989) axiom concerning the dialectics of symbolic inversion “an order twice inverted
is an order restored, perhaps even strengthened as a result of the exercise” (p. 159), both Boyer (2001) and McCutcheon (personal communication, May 18, 2010) are simply confirming the theoretical status quo by forwarding their theoretical axioms to the exclusion of the other. The benefit of combining these theoretical positions is manifold and this thesis attempts to reconcile these seemingly contradictory approaches.

Bloch, a prominent anthropologist and religious theoretician, has acknowledged both the potential strengths of studying religion from a cognitive perspective from the very beginning of the field of the cognitive science of religion (1998) and the need for critical caution in the use of the term religion in evolutionary language (2008). Following Barrett (2004b), Bloch (2008) first finds that “it is odd to account for such central phenomenon in the history of mankind as religion in terms of minor cognitive malfunctions” (p. 2055). Stated a different way, Bloch (2005b) concludes that the “assumption that internal characteristics of human nature can be used correctly to account for specific cultures and histories […] is a bit as if someone proposed to account for the pattern of motor traffic in London with an explanation of how the internal combustion engine functions” (2005b, p. 14). Second, like Whitehouse (2004), Bloch (2008) is distressed by the fact that “anthropologists have, after countless fruitless attempts, found it impossible to usefully and convincingly cross-culturally isolate or define a distinct phenomenon that analytically be labeled ‘religion’” (p. 2055). Finally, Bloch (2008) takes exception to the fact that the explanation of religion as a product of core knowledge necessarily entails that we share this religious sense with our anthropoid relatives (p. 2055). While the problems Bloch (2005b; 2008) raises are quite germane, his proposed solution—that modern humans are unique in their possession of religion because of their unique ability to imagine other worlds—is not upheld by the relevant cognitive, historical, or political literature. Instead, Bloch’s major
contribution to the cognitive science of religion is his long-standing effort to re-anchor anthropology in the study of evolution, the unity of mankind, and, ultimately, “the study of human nature, the necessary core of [our] concerns and the point of contact between disciplines such as psychology and others, including ours, are conservative humans, with minds and bodies living in a natural environment” (2005b, pp. 12-18). Following what is popularly known as his “conversion” in 1990 from Durkheimian scholarship to cognitive approaches to culture, Bloch’s traditional fieldwork-based contributions to deference theory (2007, p. 76), Theory of Mind or “ToM” (2007, pp. 63-80), false belief tasks (2007, p. 71), minimal counterintuitiveness theory (2005b), and his ability to reconcile cognitive, historical, and political accounts of religion have established his position as a model for future cognitive scientific researchers concerned with religion.

While the methodological and theoretical contributions of Bloch are immense, four major insights must be considered before an analysis of Boyer’s (1994; 2001) MCI theory can be undertaken: 1) the rejection of Locke’s notion of the \textit{tabula rasa}, 2) Boyer’s (1994), Lawson and McCauley’s (1990), and Sperber’s (1996) naturalness-of-religion thesis, 3) McCauley’s (in press) refinement of Sperber’s (1996) typology of non-reflective beliefs to differentiate practiced naturalness from maturational naturalness, and 4) the effect of cognitive mechanisms and tools on the conceptualization, transmission, retention, and cultural success of certain religious beliefs and behaviors.

**The Refutation of the Blank Slate**

Pinker (2002) contextualizes the cognitive approach within the philosophy of science in his refutation of Locke’s empiricist concept of the \textit{tabula rasa} or what has come to be known as “the blank slate,” which he associates with Dryden and Rousseau’s romantic creation of the
noble savage in contrast to Hobbes’ call for a surrender to a leviathan as well as Descartes’ dualistic notion of what Ryle calls “The Ghost in the Machine” (as cited in Pinker, 2002, pp. 1-13). In contrast to Locke’s view of human nature as a product of experience, Pinker (2002) has popularized the cognitivistic notion held by Noam Chomsky and others, which holds that cognitive science, neuroscience, behavioral genetics, and evolutionary psychology provide a bridge between biology and culture (pp. 31-58). In so doing, Pinker (2002) and other cognitive scientists ipso facto refute the theories of human nature of generations of prominent social scientists, including Emile Durkheim, Alfred Kroeber, Ellsworth Faris, George Murdock, José Ortega y Gasset, Ashley Montagu, Ruth Benedict, Margaret Mead, Robert Lowie, Leslie White, and Clifford Geertz, each of whom forward some deviation from Locke’s seminal notion of the blank slate (pp. 23-27). In sum, “human minds are not blank slates or undifferentiated all-purpose processing machines that are wholly socially constructed” (Barrett, 2007a, p. 2). Instead, irrespective of any particular cultural context, human minds use “domain-specific inference systems or ‘mental tools’” (Barrett, 2007a, p. 2).

The Naturalness-of-Religion Thesis

With the refutation of Locke’s influential notion of the blank slate in place Sperber (1996) and Lawson and McCauley (1990) submit their naturalness-of-religion thesis, which serves as the backbone of the CSR. Figure 2.1, below, summarizes McCauley’s (in press) synopsis of the naturalness-of-religion thesis.

| Ordinary Cognition + Ordinary Social & Natural Environments = Belief in Gods (supernatural agents) |

*Figure 2.1. McCauley’s (in press) Synopsis of the Naturalness-of-Religion Thesis*
Stated slightly differently, Boyer (1994) finds that certain religious ideas are natural because of their widespread cross-cultural recurrence (pp. 3-4). Boyer (1994) attributes these recurrences to the fact that religious ideas spread because of “non-cultural properties of the human mind-brain,” not because of socialization (p. 3). Boyer’s (1994) naturalistic approach, however, fails to support his assertion that religious ideas are unique because he does not distinguish religious ideas from other widespread phenomena (e.g., the use of fire). McCauley (in press) builds upon Boyer’s (1994) calls for a naturalistic study of religion and Sperber’s (1996) typology of beliefs to refine the naturalness-of-religion thesis.

**A Typology of Beliefs**

According to Sperber (1996), “belief” can be dichotomized into “reflective” and “non-reflective beliefs” (pp. 89-97). Reflective beliefs being those ideas we explicitly and consciously hold such as “dogs are better than cats” (pp. 89-97). Non-reflective beliefs, on the other hand, are those thrifty ideas that are our default and tacit assumptions that do not require conscious, deliberate, reflective resources to inform them. Examples of these non-reflective beliefs include such basic concepts as “people have minds with goals and intentions” and “unsupported objects fall” (Barrett, 2004b, pp. 2-19). McCauley (in press) answers the question, “Where do non-reflective beliefs come from?” by splitting non-reflective beliefs into what he calls “practiced naturalness” and “maturational naturalness.” Practiced naturalness is acquired through the mastery of certain concepts or skills through intensive training, practice, and the use of special tools. Examples of practiced naturalness include playing chess and driving a car.

Again, McCauley (in press) differentiates between practiced naturalness and maturational naturalness, which arises through the ordinary functioning of human biological endowment in ordinary human environments and does not require any explicit instruction. Examples of
maturational naturalness include language acquisition and basic math skills. McCauley (in press) concludes that these maturationally natural beliefs inform and constrain the formation of our non-reflective beliefs, which, in turn, serve as defaults for when we do not have or employ a specific reflective belief. According to McCauley, our maturationally natural non-reflective beliefs play a significant role in the construction of religious beliefs.

Cognitive Mechanisms and Mental Tools

Several cognitive scientists of religion have suggested that certain cognitive mechanisms encourage belief in gods. These include the “Theory of Mind” or “ToM,” “hypersensitive agency detection device” or “HADD,” and our naïve sense of physics, biology, and morality. ToM and HADD have been particularly influential in the development of the CSR. Bloch, who has worked extensively among the Malagasy of Madagascar, defines ToM as our largely unconscious, hard-wired capacity to read the minds of others (2007). Through a series of cross-cultural experiments, Bloch (2007) has concluded that our ToM develops from the 12th month of life until its maturation around the age of four, when one can show that the child “knows” that other people act, not in terms of how the world is, but in terms of these other people’s beliefs or concepts. Stated a different way, Barrett (2004b) finds that before the age of 5, children assume that everyone’s beliefs about the world are infallible. For example, Bloch (2007) has constructed and tested a “false belief task” in which children of various ages are brought into a room where they are shown two hats. He then invites an adult or some other agent like a donkey into the room and demonstrates to the child and the agent that there is a sweet under hat A and not under hat B. He then asks or escorts the agent out of the room and moves the sweet from under hat A to hat B in front of the child. Next, he presents the child with a hypothetical scenario. Bloch (2007) asks the child, “If I were to invite the agent back into the room, would they guess that the
sweet is under hat A or hat B?” Before the age of 5, when one’s ToM is fully mature, children unfailingly assume the infallibility of the agent and guess that the agent will guess under hat B (Barrett, 2004b). After this age, however, when the child’s ToM is fully mature, they overwhelmingly answer that the agent will guess that the sweet is under hat A, since that is the last place the agent saw the sweet (Bloch, 2007). Thus, children with a mature ToM recognize that they live in a world in which agents other than themselves have limited knowledge and make decisions based on this limited knowledge. A cognitive mechanism that several cognitive scientists of religion suggest predisposes humans towards a belief in the existence of supernatural agents such as ancestors and, eventually, gods, when combined with a mature ToM is the “hypersensitive agency detection device” or “HADD” (Barrett, 2004b). Guthrie suggests that our HADD is an evolved better-safe-than-sorry cognitive mechanism that errs towards over-ascribing agency (Guthrie, 2007, pp. 37-62). Guthrie (2007) goes on to suggest that this hypersensitivity of our agency-detection system increases our survivability by ensuring that we do not make the costly mistake of failing to recognize the presence of an agent with goals and intentions contrary to our own. Guthrie (2007), and, later, Barrett (2007a), have suggested that every action that involves the agency-detection system also has the potential to trigger our ToM mechanism in order to empathetically postulate the goals and intentions of agents. Despite many of these prominent advances in the CSR, several common criticisms have come to characterize the CSR approach in the minds of many social scientists.

Problems in the CSR

While Cohen et al. (2008) address many of the common criticisms associated with the CSR—which are summarized in Table 2.6—several problems remain. These include the following criticisms: 1) the CSR uses overly complex scientific jargon, which limits its general
scholastic contribution and stifles the very interdisciplinary collaboration that gave birth to the field; 2) the CSR is guilty of cultural eliminativism; 3) the CSR was overly triumphant in its initial contributions to a scientific analysis of religion and lacks ethnographic depth; 4) the CSR employs an overly simplistic causal model in its isolation of the mind from its natural environment; 5) the CSR’s reliance on McCauley’s (in press) concept of “maturational naturalness” must be refined; and 6) the CSR must empirically demonstrate the difference between “counterintuitive” concepts and “counterschematic” concepts, which will be defined and explored below. While Cohen et al. (2008) offer a response to some of these problems—namely, the CSR takes history, culture, and politics seriously—more must be done to redress these common criticisms of the CSR.

The CSR uses overly complex scientific jargon, which limits its general scholastic contribution and stifles the very interdisciplinary collaboration that gave birth to the field. Since Lawson penned the phrase “cognitive science of religion” in 2000, many attempts have been made within the field to mark it as a purely scientific pursuit (Lawson, 2000). The development and use of acronyms and the supposed discovery of various cognitive mechanisms have gone a long way to scientizing the field. For example, Barrett’s (2000) intimate knowledge of the history of science plays an undeniably important part in the creation and general acceptance of the acronym “HADD” for the “hypersensitive agency detection device.” This preference for scientific signifiers has been so profound in the literature that since Barrett’s introduction of “HADD,” more than a dozen other acronymic cognitive mechanisms have been submitted with limited success (e.g., Blair’s “VIM” or violence inhibition mechanism) (Whitehouse, 2007, p. 257). A brief history of metaphorical references to the human mind/brain should also be surveyed. The mind-brain has been analogously associated with the most complex technologies
of the era (e.g., mind as mechanism, mind as engine, and now mind as computer). Proponents of this cognitive approach to religion must work to not erode their nubile general scientific credibility by creating an inaccessible technical language and overstating the reach of their modest, though rapidly emerging, contributions to the fields of cognitive science, cognitive and developmental psychology, neuroscience, anthropology, religious studies, and philosophy.
### Table 2.6

**Summary of Common Criticisms of the CSR (Cohen et al., 2008)**

<table>
<thead>
<tr>
<th>Criticism</th>
<th>Response</th>
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<tbody>
<tr>
<td>1. “The CSR is guilty of reductionism” (p. 112).</td>
<td>The CSR accepts both bottom-up approaches of checking reductionism through evidence for higher order phenomena through an examination of constituent mechanisms and top-down approaches of checking reductionism through an examination of experimental techniques and efforts toward consilience (pp. 112-113).</td>
</tr>
<tr>
<td>2. “The CSR is just another (culturally constructed/ethnocentric/male/heterosexual/middle-class/Protestant/colonial/insert as desired) ideology” (p. 113).</td>
<td>Contrary to the efforts of “hardline epistemological relativists” and “power polemists,” the mere act of “pointing to a similarity between certain theoretical models and the cultural systems in which their originators were nurtured is not enough” justification to reject any given methodology (p. 113).</td>
</tr>
<tr>
<td>3. “The CSR is irrelevant to the work of scholars who study particular religions” (p. 113).</td>
<td>CSR scholars readily acknowledge that cognition does not operate in a vacuum and fear that “without systematic investigation of the complex ways in which human minds interact with one another and with their environment, we risk mistaking predictable particulars for arbitrary idiosyncrasies” (p. 113).</td>
</tr>
<tr>
<td>4. “The CSR treats people as emotionless computers” (p. 113).</td>
<td>Several CSR researchers [...] emphasize emotional arousal and commitment in their research. CSR scholars do not limit their methodological scope to the analogical power of the computer, but they do demonstrate that “the mind-brain is a computational organ” in which emotions play a significant role in religious belief and behavior (p. 114).</td>
</tr>
<tr>
<td>5. “The CSR is just socio-biology/social evolution/diffusionism,functionalism/insert supposedly passé and defunct ‘ism’ as desired, in a new wrapper” (p. 114).</td>
<td>The CSR unapologetically stands on the shoulders of previous intellectual schools in the history of the social sciences in the hopes of bringing the most prudent tool to a given task (p. 114).</td>
</tr>
<tr>
<td>6. “The CSR is too narrow (the shaping/constraining effects of evolved psychological mechanisms are only at best one of the many factors influences religious innovation and transmission)” (p. 114).</td>
<td>The CSR’s emphasis on the role of psychological mechanisms is an admittedly partial explanation of religious innovation and transmission, but one that has not received adequate scholastic attention and, therefore, requires further investigation (p. 114).</td>
</tr>
<tr>
<td>7. “The CSR mistakenly tries to answer questions of interpretation and meaning in terms of causal mechanisms” (p. 114).</td>
<td>Questions regarding human thought or behavior must taxi between explanation and interpretation, but can never be resolved by either explanation or interpretation, alone (p. 114).</td>
</tr>
<tr>
<td>8. “The CSR is just a passing fad” (p. 114).</td>
<td>The CSR presents the study of religion with a fertile and novel approach to some of the field’s most persistent and significant problems (pp. 114-115).</td>
</tr>
</tbody>
</table>
The CSR is guilty of cultural eliminativism. Armin Geertz (2008) has found that some proponents of the CSR have begun to overemphasize the primacy of the brain in the naturalness-of-religion thesis, discussed above, and have neglected the very cultural environments and interactive systems which allow for ordinary cognition to develop. While proponents of the CSR ostensibly adopt D’Andrade’s seminal conceptualization of culture “as consisting of learned systems of meaning communicated by means of natural language and other symbol systems, having representational, directive, and affective functions, and capable of creating cultural entities and particular senses of reality” (D’Andrade, 1982, p. 116), Armin Geertz (2008) has criticized these proponents of the CSR for ignoring culture altogether. According to Armin Geertz (2008), “culture is assumed to be epiphenomenal to more basic cognitive and psychological processes” (p. 327). Indeed, he concludes that the “original triumphalism” and “cultural eliminativism” of the early proponents of the CSR are now untenable in light of more recent advances in psychology and neuroscience (A. Geertz, 2008, p. 8). Armin Geertz’s critique of the overemphasis of the brain is reminiscent of Clifford Geertz’s more general critique of the emerging field of cognitive science as a form of “psychological reductionism” (Clifford Geertz, 1973). Armin Geertz’s critique, however, is intended to instigate a refinement of theory and method in the CSR, while Clifford Geertz’s critique constituted an ill-formed polemic on cognitive science, which he framed as a part of his attempt to construct a non-reductionist anthropology founded upon interpretive anthropological theory. Instead of falling victim to what he calls “cultural eliminativism,” Armin Geertz calls for culture to be put back into the CSR: “culture and social relations and institutions are back again, center stage, in the story of cognition” (2004, p. 8) and “culture, social relations, and narrative are […] dialectically interrelated with cognitive processes” (2008, p. 327). While this overemphasis on the theory of
the “brain-as-an-island” may be the result of the CSR’s reaction against symbolic anthropology (e.g., Turner, 1964) and, more specifically, the Weberian “webs of significance” definition of culture forwarded by Clifford Geertz (1973), the CSR must not forget that ordinary cognitive structures of religion exist in social space with shared symbol systems. Instead, the “brain-as-an-island” metaphor that has permeated the CSR must be rejected in favor of approaches that recognize that language, social intercourse, and bodily communication play a causal role in cognition. Following Sørensen’s explicitly theoretical approach (2004), Armin Geertz’s critical insights about the future of the CSR appear to be gaining widespread acceptance. For example, in their forthcoming paper McCauley and Cohen conclude that “religion” in the CSR “only delineates superficial (indeed, accidental!) patterns that reveal little or nothing about the phenomena it designates, but only something about the perspective humans are inclined to take on these things prior to reflecting about them theoretically” (in press).

The CSR was overly triumphant in its initial contributions to a scientific analysis of religion and lacks ethnographic depth. Cohen et al. (2008) partially address this criticism in their refutation of many of the common criticisms of the CSR by asserting that the CSR uses both top-down approaches as well as bottom-up approaches, does not rely too heavily on explanatory approaches at the expense of interpretive approaches, and contributes only a fraction of the explanatory potential needed to account for questions concerning religious transmission and behaviors (pp. 112-115). The record left from the short history of the field, however, tells a different story. Recently, several cognitive scientists of religion have effectively employed cognitive approaches in their cross-cultural analysis of religious thought and action. These include McCorckle (2010), who analyzes historical Buddhism, Cohen (2007), who explores Afro-Brazilian spirit possession, and Whitehouse (2004), who traces the Pomio Kivung
movement in Papua New Guinea. Some scholars, however, are quick to conclude that their small samples of typically Western university students demonstrate conclusive empirical evidence that there are cognitive mechanisms, which are enacted by everyone everywhere for all time, that constrain and predispose people towards religious thought and action. Most significantly, there have been very few cross-cultural experiments to substantiate these claims in regard to MCI theory. In fact, prior to this study, only three non-Western samples exist to date (Boyer & Ramble, 2001; Pyysiäinen et al., 2003; Atran & Norenzayan, 2004). This lack of non-Western samples in MCI theory and a disregard for diffusionist forces has led some researchers, such as Barrett (2004b), to naturalize current historical contingencies and commit “historical eliminativism,” which is explored in more depth below.

Armin Geertz (2008) further criticizes the triumphalism that marks early scholarship in the CSR and encouraged researchers to use such book titles as Explaining Culture, Religion Explained, or Breaking the Spell. Such titles made waves and helped to raise money, but now those waves are rippling back towards their point of origin as many of the ambitious goals of the CSR are left unachieved. Proponents of the CSR have only made modest gains in elaborating the naturalness-of-religion thesis and must pay much more attention to recent advances in psychology and neuroscience in order to accomplish their ambitious goals.

The CSR employs an overly simplistic causal model in its isolation of the mind from its natural and social environments. McCauley’s (in press) view that “given ordinary cognition and ordinary social and natural environments, the belief in supernatural agents will come naturally” is overly simplistic if “ordinary cognition” (i.e., A) and “ordinary social and natural environments” (i.e., B) (as cited in Barrett & Lanman, 2008, pp. 112-115) are taken to be discreet entities (i.e., A + B) that combine to give rise to religious cognition (i.e., C), which gives
rise to the following overly simplistic equation: $A + B = C$. Instead, ordinary cognition and ordinary social and natural environments must be recognized as codependent categories (McCutcheon, 2007) whose relationship constrains the conceptual range of certain human cultural expressions, one of which may be our propensity to perceive, remember, share, and believe in supernatural agents (i.e., $A + B + AB = C$). For example, without the ordinary socio-linguistic contexts in which young language learners are repetitiously and consistently surrounded by language or a large set of neurological mechanisms and physiological components mechanisms, McCauley’s (in press) maturationally natural capacities for language acquisition and basic math skills would not emerge. Therefore, deterministic and causal references in which cognitive mechanisms are seen to simply “express” themselves in the social world are grossly oversimplified and should be discarded. Barrett (2004b), for example, concludes that Islam, Judaism, and Christianity are culturally successful, not because of any political or historical circumstance, but because of their strong conceptual control and the lack of practical, utilitarian aims in their central rituals (pp. 122-124).

This complete disregard for historical contingencies in favor of a forced reconciliation of current cognitive models with political and historical contingencies must be abandoned in favor of more holistic approaches that treat cognition and culture as codependent categories. As stated above, Bloch (2005b) gives a similar criticism of this overly simplistic model and cultural and historical eliminativism when he says, “most fundamental of all [in the CSR] is the assumption that internal characteristics of human nature can be used correctly to account for specific cultures and histories” (p. 14). Again, while McCauley (in press) and others have laid the foundation for an understanding of how cognition and culture interact to predispose groups of people toward
perceiving, remembering, encoding, and sharing a belief in supernatural agents, the connection between religion and cognition remains vague and largely untested.

CSR scholars’ reliance on McCauley’s (in press) concept of “maturational naturalness” must be refined. Barrett and Lanman (2008) speculates that some of the intuitive and relatively culturally invariant natural products of ordinary human maturation in ordinary human environments or what McCauley (in press) calls “maturationally natural beliefs” (e.g., walking, language acquisition, basic arithmetic) might be shown to belong to McCauley’s intuitive category of “practiced naturalness” (e.g., chess mastery or the ability to play the violin). McCauley’s (in press) concept of “practiced naturalness” is characterized by its intra- and inter-cultural variability and its requirement of explicit instruction and the use of special tools (as cited in Barrett & Lanman, 2008, pp. 112-115). McCauley’s (in press) example of certain basic math skills as “maturationally natural” beliefs is but one example of a belief in need of intuitive categorical refinement (as cited in Barrett and Lanman, 2008, pp. 112-115). While McCauley (in press) limits the reach of his description of intuitive basic math skills to the seemingly innocuous example of $1 + 1 = 2$, this seemingly modest description of a basic-level mathematical sense among children is not upheld in the relevant experimental psychological and neuroscientific research and should be refined. Research by developmental psychologists Le Corre and Carey (2007) extend the seminal research of the French neuroscientist Dehaene (1997) into children’s intuitive number sense by investigating the kinds of numerical values that young children encode and manipulate and why only certain kinds of entities are enumerated.

Dehaene’s (1997) comparative experimental research of Amazonian numerical cognition suggests that our cross-culturally recurrent intuitive number sense is not based on integers (e.g., the distance between one and two is equivalent to the distance between eight and nine) as
McCauley’s “maturationally natural” category of beliefs would suggest, but logarithms (e.g., the distance between one and two is far greater than the distance between eight and nine because one must double in order to create two while the ratio of eight to nine is only a ratio of 1.125:1).

Equations such as “1 + 1 = 2” and a sense of discrete integers, then, according to Le Corre and Carey (2007), are not only culturally bound abstractions, but are also slightly counter-intuitive to our intuitive cognition of numeracy. Carey demonstrates this by replicating an experiment designed by fellow psychologist Karen Wynn in which children are shown to be gradually socialized into their understanding of the integers one, two, three, and so on (2009, para. 2).

Instead, Feigenson et al. (2004) demonstrate that human infants and other animal species have one distinct core system of numerical representations for large, approximate numerical magnitudes and one distinct core system of numerical representations for the precise description of individual objects.

Neither of these numerical systems is shown to emerge through cultural transmission or individual learning and would, therefore, qualify as “maturationally natural” in McCauley’s sense. Following Barrett’s (2008a) system for coding and quantifying counterintuitive concepts, which will be explained in more depth below, integers can be coded as minimally counter-intuitive concepts because they represent a breach of our intuitive logarithmic sense of physicality through the intuitive expectation of continuity, which is coded as INTERGER and has a counterintuitive value of one. The classification of an integer within the ontological category of “Solid Object” within Barrett’s (2008a) method of coding and quantifying counterintuitiveness, however, is problematic because Barrett (2008a) restricted his method “to objects, […] thereby avoiding whether events (e.g., collision, a sunrise, a competition, an examination) substances (e.g., oxygen, water, metal), or abstractions (e.g., goodness, law,
brightness, a poem, an idea) might properly be considered intuitive or counterintuitive in the technical sense that Boyer has developed” (p. 313). If “numbers” are conceptualized and tested as variously constituted aggregations of objects, as tested by Dehaene (2009) and Feigenson et al. (2004) below, then they can be productively analyzed through Barrett’s (2008a) method. For example, following Spelke’s (1990) discussion of physicality, Barrett (2008a) contends that humans intuitively assume that in order for an object to “move from point A to point B, [it] must traverse the intermediate space (as opposed to teleporting) (pp. 317-318). Dehaene makes a similar point in his discussion of Amazonian logarithmic numerical cognition (2009). In one experiment, he drew a horizontal line and placed one object to the left of the line and nine objects to the right of the line and asked what number was exactly between one and nine (2009, para. 2). Dehaene’s (2009) Amazonian sample responded in a culturally unique way by concluding that three, not five, was exactly between one and nine because the ratio of 9:3 is equivalent to the ratio of 3:1. The common cross-cultural response of the integer “five” as the number equidistant between one and nine could be coded as a minimally counterintuitive public representation according to Barrett’s (2008a) method of coding and quantifying counterintuitiveness because the object “five” between one and nine breaches Dehaene’s (2009, para. 2) description of our intuitive assumptions about numeric cognition by failing to activate the appropriate intuitive expectation of continuity within the expectation set of Physicality.

Feigenson et al. (2004) conclude that Newton and Leibniz’s independent invention of calculus demonstrates two individuals’ ability to stretch “their systems of numerical and mechanical knowledge so as to reconcile them” (p. 313). “Number [and certain continuous properties],” according to Feigenson et al. (2004), “are active in infancy” and are, therefore, largely maturationally natural or “easy because [they are] supported by core systems of
representation with long ontogenetic histories,” while another sense of “number” is incredibly hard or a product of practiced naturalness because “it goes beyond the limits of these systems […] when one attempts to represent an exact, large value [by engaging] in a process of verbal counting and symbolic representation that children take years to learn, adults in different cultures perform in different ways, and that people in some remote cultures lack altogether” (pp. 312-313). This critical refinement of McCauley’s (in press) example of the basic arithmetic of “1 + 1 = 2” as “maturationally natural” knowledge (as cited in Barrett and Lanman, 2008, p. 112-115) more accurately disambiguates those systems of numeric cognition that require great conscious resources from those systems of numeric cognition that emerge in infancy and do not require individual learning or cultural transmission to emerge. It is suggested that integers could be productively coded as minimally counterintuitive concepts with the orthography of INTEGERS because of their single breach of the expectation set of Physicality within the ontological category of Solid Objects according to Barrett’s (2008a) method for coding and quantifying counter-intuitive concepts and Feigenson et al.’s (2004) examination of intuitive numeric cognition. Future empirical research in MCI theory must code and score breach and transfer violations separately to determine if breaches and transfers constitute an equivalent violation of the expectation set of a given intuitive ontological category and, therefore, should be coded as equally counterintuitive in Barrett’s (2008a) method as Boyer and Ramble (2001) suggest.

The CSR must also empirically demonstrate the difference between “counterintuitive” concepts and “counterschematic” concepts. Barrett and Lanman (2008) refine Boyer’s theoretical construct of minimal counterintuitiveness by employing McCauley’s (in press) distinction between maturational naturalness and practiced naturalness. McCauley’s distinction between maturational naturalness and practiced naturalness, in turn, is a refinement of Sperber’s
(1996) distinction between reflective and non-reflective beliefs and a response to Bloch’s (2005a) criticism that some supposedly counterintuitive ideas could attain the level of intuitive ideas through familiarization and repeated practice. Barrett (2008a) calls those ideas that are contrary to McCauley’s (in press) sense of practiced naturalness “counterschematic” (Barrett, 2008a, p. 312) as he includes cultural schemata and scripts within the category of “practiced naturalness.” This connection is between cultural schemata and scripts and practiced naturalness, however, is ill-defined and in need of refinement. Barrett (2008a) suggests, “cultural schemata and scripts (e.g., how one orders food in a restaurant) may acquire this practiced naturalness in people” (p. 311), but this is an empirical question worthy of further investigation. Future refinements of MCI theory should compare the recall of “counterschematic” (Barrett, 2008a, p. 312) or what might be more accurately described as “counterpraxis” ideas with “counterintuitive concepts.” Similarly, while Barrett (2008a) has designated a counterintuitiveness score of one as the determining factor in coding and quantifying counterintuitiveness, there is no empirical support for this designation. Just as Upal et al. (2007), Tweney et al. (2006), and Atran and Norenzayan (2004) attempt to operationalize the poorly constructed concept of maximally counterintuitive concepts (MXCI), future investigations of MCI theory should test the differential recall success of one, two, and three counterintuitive breaks instead of relying on Barrett’s (2008a) theoretical approximation of a cognitive optimum at a counterintuitiveness score of one.
CHAPTER 3
MINIMAL COUNTERINTUITIVENESS THEORY

Boyer’s (1994; 2001) MCI theory has been examined by many of the leading theorists in the CSR including Atran, Barrett, Bloch, Guthrie, Sosis, Sperber, and Whitehouse. Barrett, who has been the researcher most involved in MCI theory, summarizes Boyer’s MCI theory as follows: “Boyer hypothesizes that concepts with a small number of counterintuitive features are (generally) better remembered and more faithfully communicated than extremely counterintuitive concepts or comparable ordinary or even unusual concepts” (Barrett, 2007b, p. 309). Barrett (2007b) relates this hypothetical cognitive optimum to religion stating, “Boyer argues that cross-culturally many religious concepts are counterintuitive in this technical sense, facilitating their successful transmission, and hence, partly explaining their existence. In this way, cognitive architecture informs and constrains the scope of candidates for successful religious concepts” (Barrett, 2007b, p. 309). While many leading theorists in the CSR generally accept MCI theory, Bloch (2005a) remains an outspoken skeptic.

Problems with MCI theory

While Bloch (2005a) acknowledges the strong explanatory potential that MCI theory possesses, he takes exception to the fact that MCI theory has been applied to religious concepts, for he, like Bell (2002) and McCutcheon (personal communication, May 18, 2010), finds the category of religion to be ill-defined and, therefore, not conducive to any form of thorough, empirical examination (Bloch, 2005a, p. 104). Moreover, Bloch (2005a) notes that the potential
for ambiguous interpretation in these potential empirical examinations is high and largely problematic:

How any story will be heard, whether about dragons, blood thieves or stomach aches is an empirical question, which Sperber and Boyer do not address, perhaps because they assume an *a priori* way of knowing what kind of propositions are counter-intuitive in terms of their content. But, if content is context-dependent and the real contexts are as fluid, as changing and as uncertain as I have suggested, merely declaring a proposition to be counter-intuitive, on the basis of what they acknowledge is a highly speculative psychology, is not sufficient. (p. 107)

McCutcheon (personal communication, May 18, 2010) makes a similar criticism of the tacit use of correspondence theory in MCI experiments saying:

The moment we abandon the correspondence theory of meaning, the moment we view language as a culturally relative and historically dynamic closed system in which each signifier derives meaning from its arbitrary and infinitely variable relationship to all other signifiers within the system [...] then the theorist is back to square one, having no idea why the memory of [a given item] stuck out.

Irrespective of these criticisms of MCI, which will be explored in more depth below, MCI theory has received a significant amount of empirical investigation over the last decade.

**Previous MCI theory Experiments**

Twenty-four experiments have been conducted within nine sets of experiments (Boyer & Ramble, 2001; Barrett & Nyhof, 2001; Pyysiäinen et al., 2003; Atran & Norenzayan, 2004; Gonce et al., 2006; Norenzayan, 2006; Tweney et al., 2006; Upal et al., 2007; Gregory & Barrett 2009). Only three of these sets of experiments, however, have been conducted cross-culturally (Boyer & Ramble, 2001; Pyysiäinen et al., 2003; Atran & Norenzayan, 2004) and only one has emphasized the inclusion of non-college students in its sampling strategy (Gregory & Barrett, 2009). Each of these nine sets of experiments will be explored briefly and compared in turn below.
Boyer (2001) presents the first empirical treatment of MCI theory by following a number of anthropologists (Spiro & D’Andrade, 1958; Sperber, 1985; Lawson & McCauley, 1990; Bloch, 1992; Whitehouse, 1992; Guthrie, 1993; Dulaney & Fiske, 1994; Barrett & Keil, 1996) in noting that religious concepts “do not in fact constitute an autonomous ‘domain’ […] and can be investigated in the same way […] as other concepts” (Boyer, 2001, p. 536). Boyer (2001) then goes on to construct a cognitive account that would account for why certain types of concepts are more culturally successful and, therefore, more widespread and resilient than others (p. 536). In order to do so, he critiques Bartlett’s (1932) seminal experimental conclusion that memory “reframes exotic material in terms of familiar ‘schemata’” (as cited in Boyer & Ramble, 2001, p. 538) by suggesting that respondents in Bartlett’s (1932) experiments were simply failing to recall certain unfamiliar concepts because of their incredibly decontextualized and disruptive presentation, not because of mnemonic disadvantage for “expectancy-incongruent material in the social domain” (Boyer & Ramble, 2001, pp. 538-539). In fact, Boyer and Ramble (2001) argue that it is these very counter-intuitive elements that mark popular forms of religious narrative and may account for the differential mnemonic success of certain “religious” concepts and, ultimately, their cultural success. Thus, according to Boyer (2008), “the cultural success of gods and spirits stems from a memory bias” (p.1038) because “religious thoughts seem to be an emergent property of our standard cognitive capacities” and are subject to the same constraints as “music, visual art, cuisine, politics, economic institutions and fashion” (p. 1039). Boyer and Ramble (2001) test this hypothesis cross-culturally with a set of free-recall tests in which the religious concepts of “person” and “artifact” were set as target items in a set of stories adapted from Barrett (1996) (as cited in Boyer & Ramble, 2001, p. 540). These experiments and their results are summarized in Table 3.2 below.
Like Boyer and Ramble (2001), Barrett and Nyhof’s (2001) empirical treatment of MCI theory begins with a discussion of the limitations of schemas and scripts as discussed by Bartlett (1932), Brewer and Nakamura (1984), Rubin (1995), and Schank and Abelson (1977) in explaining the occurrence and prevalence of classes of concepts found cross-culturally (Barrett & Nyhof, 2001, pp. 71-73). Instead of following Boyer’s (1994) theory of pancultural, ontologically “counterintuitive” concepts, which, in turn, is predicated on a set of intuitive theories by Keil (1989) and Gelman and Markman (1986); Barrett and Nyhof (2001) contend that “what distinguishes many ‘religious’ and some cultural concepts from other concepts is that that religious concepts typically possess a small number of features that violate category-level expectations” (p. 72). While Barrett and Nyhof (2001) proceed to sketch a preliminary definition of counterintuitiveness, Barrett’s (2008a) method of coding and quantifying counterintuitiveness, found below, presents a refinement of these initial conclusions. Following Bartlett’s (1932) seminal serial reproduction experiments concerning an American Indian story, “The War of the Ghosts,” Barrett and Nyhof’s (2001) first experiment examines the recall of expectation-violating concepts versus standard concepts by presenting respondents with American Indian folktales containing target items and hypothesizing that those expectation-violating counterintuitive target items are recalled more accurately than common features. In subsequent experiments Barrett and Nyhof (2001) develop an original stimulus involving an alien ambassador’s visit to a museum in a world foreign to his own, but follows Bartlett’s (1932) general outline for serial reproduction exercises (Barrett & Nyhof, 2001, pp. 77-78). Barrett and Nyhof’s (2001) experiments and their results are summarized in Table 3.2 below.

Pyysiäinen et al. (2003), which is excluded from Barrett’s (2008a) survey of empirical MCI theory experiments, makes an interesting contribution to empirical MCI theory research by
attempting to test: 1) if respondents are more likely to classify counterintuitive statements as religious than intuitive statements and 2) if recall rates differed if the counterintuitive statements involved conscious agents who are invested in human affairs, conscious agents who are not invested in human affairs, or non-agents (e.g., “In the forest, there were trees that grew fruit made of finest gold”) (Pyysiäinen et al., 2003, pp. 349-350). While these experiments involving a cross-cultural sample of respondents seeks to find an explicit and, henceforth, illusive respondent-driven connection between the category of religion and counterintuitive concepts, the manner in which Pyysiäinen et al. (2003) operationalize MCI concepts is problematic and fails to overcome many of Bloch’s (2005a) criticisms concerning the construction of MCI concepts and their ambiguous presentation. Following Saler (2000), Pyysiäinen et al. (2003) rightly struggle to define the universal parameters of religion and reject any definition of religion that is constructed entirely on the basis of beliefs (p. 352). Instead, Pyysiäinen et al. (2003) follow Boyer (1994; 2001) in asserting that the scientific category of religion is best defined by its propensity to violate intuitive ontological expectations (Pyysiäinen et al., 2003, pp. 352-353). Pyysiäinen et al. (2003) note, however, that much more empirical cross-cultural research must be conducted before this hypothesis can be thoroughly tested. Pyysiäinen et al.’s (2003) experiments and results are summarized in Table 3.2 below.

Atran and Norenzayan’s (2004) treatment of MCI theory, while originally predicated on Boyer’s theory of a cognitive optimum and mnemonic and, therefore, cultural advantage for slightly counterintuitive concepts, presents a decidedly different empirical treatment of MCI theory that has sparked much controversy among religious theorists. In the peer commentary that follows the article, Barrett (2004a) contends that Atran and Norenzayan (2004) confound the terms counterintuitive and counterfactual and in so doing betray their fundamental

Norenzayan et al. (2006) tests MCI theory by asking, “What makes a narrative culturally successful?” (p. 531). After noting the importance that memory plays in cultural transmission and discussing the relevance of a psychology of cognition and memory to the anthropological study of belief, Norenzayan et al. (2006) hypothesize that “narratives combining mostly intuitive concepts with a minority of counterintuitive ones enjoy a memory advantage, and as a result
achieve cultural success” (pp. 531-532). In sum, Norenzayan et al. (2006) follow Boyer and Ramble (2001) in concluding the following:

[U]nusual story elements differ from supernatural elements in two important ways [1]) unusual story elements disrupt story structure, whereas supernatural elements in a folk-tale or religion are integral to the story structure [and 2]) whereas unusual elements in a story involve a schema or script violation that is otherwise consistent with intuitive theories, counterintuitive elements found in folks tales, myths, and religions involve ontological violations that are incongruent with intuitive theories. (p. 533)

In their unprecedented stimulus construction, Norenzayan et al. (2006) compare the potential mnemonic advantage MCI-only narrative stimuli versus intuitive-only stimuli, instead of including equal numbers of intuitive and counterintuitive target items within a single stimulus. Norenzayan et al.’s (2006) experiments and their results are summarized in Table 3.2 below.

Gonce et al. (2006), Tweney et al. (2006), and Upal et al. (2007) are all products of the short-lived research group, the “I-75 Culture & Cognition Group” of Bowling Green, Ohio (Tweney et al., 2006, p. 483). While each of these sets of experiments ask a slightly different question and propose a slightly different experimental methodology, they all seek to test the effect of narrative context on the recall of minimally counterintuitive (MCI), maximally counterintuitive (MXCI), and intuitive (INT) concepts. While MCI and INT concepts enjoy a rough theoretical definition, these authors’ use of MXCI is immediately problematic. First introduced by Atran and Norenzayan (2004) and Norenzayan et al. (2006), the concept of “maximally counterintuitive” is ill-defined and unconstrained. According to Barrett (personal communication, November, 11, 2009), “while minimal [counterintuitiveness] is easily specified (i.e., one counterintuitive feature), who is to say what is ‘maximally counterintuitive’? It certainly is not two or three counterintuitive features.” This method of scoring a concept as “minimally counterintuitive” if it has one and only one counterintuitive feature is explored in more depth below. Gonce et al. (2006), Tweney et al. (2006), and Upal et al.’s (2007) use of a
theoretically problematic experimental category, however, invalidates their results. Much is to be gained, however, from the questions posed by the “I-75 Culture & Cognition Group.” First, could respondents’ recall levels of target MCI, INT, and MXCI concepts be affected by a list presentation versus a contextualized presentation? Second, could respondents’ recall levels of target MCI, INT, and MXCI concepts be manipulated through the use of relevant and supportive narrative context and through the use of contradictory evidence? Third, following O’Reilly, Symons, and MacLatchy-Gaudet (1998), Upal et al. (2006) ask, could the experimenter’s instructions affect the recall of these various target categories (e.g., “why is this logical?” versus “what does this mean?”) (Upal et al., 2006, p. 423). For examples of the stimuli employed by Gonce et al. (2006), see Table 3.1 below. Unfortunately, because of the poor construct validity of the six experiments contained in these three treatments of MCI theory, these important questions concerning context and experimental design remain unresolved. A summary of the experiments conducted by the “I-75 Culture & Cognition Group” and their results are summarized in Table 3.2. Future empirical examinations of MCI theory must take up the question of context. Many of the problems endemic to Gonce et al. (2006), Tweney et al. (2006), and Upal et al. (2007) are explored by Barrett (2008a) and rectified in the experiments conducted by Gregory & Barrett (2009), which are outlined below.
Table 3.1

*Categorical Stimuli Adapted from Gonce, Upal, Slone, and Tweney (2006)*

<table>
<thead>
<tr>
<th>Contextualized Stimuli by Experimental Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intuitive (INT)</strong></td>
</tr>
<tr>
<td>Topic 1: Singing bird. According to the author of “animal communication,” Marc Hauser, male birds of various pair-bounding species have a small repertoire of songs that they sing in the morning to attract females.</td>
</tr>
<tr>
<td><strong>Intuitive with contradictory context (C-INT)</strong></td>
</tr>
<tr>
<td>Topic 2: Gossiping child. Gossiping child is a misnomer according to the well-known developmental psychologist Linda Hauser. Children cannot successfully start or spread any rumors because they have neither the number of friends required to pass on information nor do they have the mastery of communication media such as letters or telephones.</td>
</tr>
<tr>
<td><strong>Minimally counterintuitive with contradictory context (C-MIN)</strong></td>
</tr>
<tr>
<td>Topic 3: Flowering car. Flowering car is a grammatically incorrect combination because the adjective flowering cannot apply to the noun car. A car is an automotive machine designed to transport humans and does not blossom as a flower does.</td>
</tr>
<tr>
<td><strong>Maximally counterintuitive (MXCI)</strong></td>
</tr>
<tr>
<td>Topic 4: Giggling admiring horses. Giggling admiring horses is the oldest surviving children’s book from the classical Greek period. In it Arthepedius tells the tale of a group of horses who giggle and admire each other’s beauty.</td>
</tr>
<tr>
<td><strong>Minimally counterintuitive (MCI)</strong></td>
</tr>
<tr>
<td>Topic 5: Solidifying ladies. The novel solidifying ladies tells a story of a black mother and daughter who strengthen in character as they attempt to survive through the trials and tribulations of the civil war period.</td>
</tr>
</tbody>
</table>

*Omission in Gonce et al. (2006)*
Table 3.2

### Summary of Previous MCI Experiments

<table>
<thead>
<tr>
<th>MCI Theory Article**</th>
<th>Sample Size (N)</th>
<th>Reported Experiment Location</th>
<th>Stimulus Derivation</th>
<th>Empirical Support (YES/NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22</td>
<td>Lyon, Rhône-Alpes, France</td>
<td>Barrett (1996)</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Lyon, Rhône-Alpes, France</td>
<td>Barrett (1996)</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>81</td>
<td>Libreville, Gabon</td>
<td>Barrett (1996)</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>Katmandu, Tibet</td>
<td>Barrett (1996)</td>
<td>YES</td>
</tr>
<tr>
<td>Barrett &amp; Nyhof 2001</td>
<td>48</td>
<td>United States</td>
<td>Bartlett (1932); Erodes et al. (1984)</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>United States</td>
<td>Original</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Midwestern USA</td>
<td>Original</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Midwestern USA</td>
<td>Original</td>
<td>YES</td>
</tr>
<tr>
<td>Pyysiäinen et al. 2003</td>
<td>85</td>
<td>Finland; Republic of Ireland; Grand Rapids, Michigan, USA</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Lyon, Rhône-Alpes, France</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>Atlanta, Georgia, USA; New York, New York, USA</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td>Atran et al. 2004</td>
<td>44</td>
<td>United States</td>
<td>Original</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>107</td>
<td>United States</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>Yucatan, Mexico</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td>Norenzayan et al. 2006</td>
<td>108</td>
<td>Midwestern USA</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>Midwestern USA</td>
<td>Original</td>
<td>NO*</td>
</tr>
<tr>
<td>Gonce et al. 2006</td>
<td>39</td>
<td>Bowling Green, Ohio, United States</td>
<td>Norenzayan et al. (2006)</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>81</td>
<td>Findlay, Ohio, USA</td>
<td>Norenzayan et al. (2006)</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>Bowling Green, Ohio, United States</td>
<td>Norenzayan et al. (2006)</td>
<td>NO</td>
</tr>
<tr>
<td>Twenev et al. 2006</td>
<td>16</td>
<td>Midwestern USA</td>
<td>Gonce et al (2006)</td>
<td>NO*</td>
</tr>
<tr>
<td>Upal et al. 2007</td>
<td>63</td>
<td>Findlay, Ohio, USA</td>
<td>Norenzayan et al. (2006)</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>Findlay, Ohio, USA</td>
<td>Barrett et al. (2001); Boyer et al. (2001)</td>
<td>YES</td>
</tr>
</tbody>
</table>

*While these empirical results find support for the MCI thesis, their operationalization of “counterintuitiveness” is varied and problematic.

**Lisdorf’s (2001) non-experimental analysis of Roman prodigy lists is left out of this summary.
Shortcomings of Previous MCI Theory Experiments

Barrett (2008a) concludes that of the six articles that he surveyed regarding Minimal Counterintuitiveness (MCI) theory, three articles reported series of experiments in support of the theory’s predictions (Barrett & Nyhof, 2001, pp. 69-100; Boyer & Ramble, 2001, pp. 525-64; Upal et al. 2007, pp. 1-25) and three reported results “either inconsistent with the theory’s predictions or requiring substantive modification (Gonce et al., 2006, pp. 521-47; Norenzayan et al., 2006, pp. 531-53; Tweney et al., 2006, pp. 483-98)” (Barrett, 2008a, p. 309). Barrett’s (2008a) novel methodology for coding and quantifying counterintuitive concepts, Gregory and Barrett’s (2009) adaptation of Sperber’s (1996) epidemiological analysis to compare epistemological versus minimally counterintuitive concepts in cultural representations, Bloch’s (2005a) penetrating critique of Sperber and Boyer’s a priori classification of counterintuitive propositions (Bloch, 2005a, p. 107), and the non-Western cross-cultural comparative replication of Gregory and Barrett’s (2009) epistemology experiment found here, however, provide substantial evidence that all of the experiments regarding minimal counterintuitiveness theory require substantial modification and theoretical revision before any empirical evidence can weigh the merit of Boyer’s MCI theory (1994; 2001). Taken together, these nine sets of experiments represent the corpus of empirical scholarship regarding MCI theory. Each of them, however, operationalizes “counterintuitiveness” in a different way.

Coding and Quantifying Counterintuitiveness

Barrett (2008a) acknowledges the difficulties that are presented above and notes that there are significant differences in how “counterintuitive” concepts are operationalized in the various experiments and suggests that these differences alone may account for the differences in results (p. 309). In an effort to rectify these shortcomings in MCI theory research, Barrett
(2008a) develops a useful “heuristic for quantifying just how counterintuitive an idea is” (p. 309) by developing a formal scheme for coding and quantifying counterintuitive concepts, which is summarized below in Table 3.3. Following McCauley’s (in press) refinement of general intuitive cognition or what Sperber (1996) would call non-reflective beliefs into the two discrete categories of intuitive beliefs that are cognitively intuitive either because of their “maturationally naturalness” (e.g., walking) or their “practiced naturalness” (e.g., playing the violin) (as cited in Barrett and Lanman, 2008, 112-115), Barrett (2008a) synthesizes a vast array of cognitive scientific research in order first to define the ontological categories that characterize incredibly widespread, prevalent, and cross-culturally recurrent intuitive ideas before investigating how certain fictional, mythical, or religious ideas may be “minimally counter-intuitive” in the technical sense that Boyer (1994; 2001) has theorized (Barrett, 2008a, p. 311). Barrett (2008a) does this by first defining “intuitive” ideas in one of two ways. First, an idea may be intuitive because of its agreement with our maturationally natural cognitive systems (e.g., a dog that cannot pass through a solid object is maturationally natural because it does not break our default assumptions about the way the world works). Second, an idea may be intuitive in Boyer’s (1994; 2001) technical sense of intuitive thought because our maturationally natural systems do not supply us with expectations or limits for a given idea (e.g., a 700 pound watermelon is intuitive because there is no maturationally natural non-reflective belief that provides any parameters whatsoever for the limits or boundaries of a watermelon) (Barrett, 2008a, p. 312). For this discussion, the first form of intuitiveness is discussed as, simply, “maturationally natural,” while the second form of intuitiveness is discussed as “undefined maturationally natural.” With this distinction in place, Barrett (2008a) defines the parameters of his six-step process for coding and quantifying the counterintuitiveness of a concept, which is outlined in Table 3.3. Barrett (2008a)
limits his discussion of intuitive or counterintuitive concepts to “objects” as he finds “events
(e.g., a collision, a sunrise, a competition, an examination), substances (e.g., oxygen, water,
metal), or abstractions (e.g., goodness, law, brightness, a poem, an idea)” as problematic in
Boyer’s technical sense of minimal counterintuitiveness (p. 313). Furthermore, Barrett (2008a)
leaves room for future “empirical and theoretical research in developmental and cross-cultural
psychology” to determine the range and scope of intuitive—or what McCauley (in press) would
call “maturationally natural”—concepts (313). This observation is pivotal, of course, because
any theory of counterintuitiveness must rely on an up-to-date and thorough understanding of
intuitive ideas before it can be adequately evaluated.

Barrett (2008a) begins his attempt to code counterintuitiveness by following Sperber’s
(1996) coding of “public representations for their likely private representational structure” (314).
According to Sperber (1996), people try to recreate their own private representations in the
private representations of others through mediums of public representations (e.g., writing or
speech). Thus, an “unambiguous public representation [should] prompt similar private
representations in other individual conceptual systems” (Barrett, 2008a, p. 314). The difficulties
associated with creating and operationalizing such an unambiguous public representation,
however, are immense and will be explored in more depth below. For now, however, Barrett
(2008a) simply assumes that his examples of public representations “have a transparent
relationship between the public representation and private representations such that the stimulus
“a mountain that thinks” is likely to elicit “a similar minimally counterintuitive private
representation” in the minds of “all fluent, English speakers with normal conceptual systems”
(pp. 314-315). Barrett (2008a) suggests that one factor that limits the potential for a given public
representation to be ambiguously interpreted into a multitude of disparate private representations
should be dubbed the “Simplicity Rule” (p. 315). Following Sperber (1996) and others, Barrett (2008a) suggests that “given the option of a complex representation or a simple one,” human cognitive systems “generally prefer that which is more simple” (p. 315). Barrett (2008a) provides the example of a “chair with both the biology and the mind of a human” as immediately simplified into “a human form of a chair” because the relatively simple cognitive construct of a chair is subsumed by the more complex cognitive construct for a fully functioning biological and psychological human (p. 315). In sum, as indicated in Table 3.3, below, “the Simplicity Rule states that when coding concepts, assume the simplest (i.e., least counterintuitive) conceptual representation that captures the object’s properties” (Barrett, 2008a, p. 316). Thus, Barrett (2008a) begins his six-step process of coding and quantifying counterintuitiveness following Sperber’s (1996) distinction between reflective versus non-reflective beliefs and McCauley’s (in press) distinction between maturational naturalness versus practiced naturalness. Barrett (2008a) then limits his process to an analysis of the conceptual category of objects before inviting future researchers to refine his method’s use of intuitive concepts. Finally, Barrett (2008a) cautions against the use of potentially ambiguous public representations in MCI theory experiments by developing the “Simplicity Rule,” which underlies the entire six-step process.
Table 3.3

Stepwise Formula of Method for Coding MCI concepts from Barrett (2008a, p. 338)

<table>
<thead>
<tr>
<th>Simplicity Rule</th>
<th>When coding concepts, assume the simplest (i.e., least counterintuitive) conceptual representation that captures the object’s properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Identify the basic level membership. (Revision of identification may be required by the Simplicity Rule after considering Steps 3-6.)</td>
</tr>
<tr>
<td>Step 2</td>
<td>Identify the ontological category or categories. Candidate categories include Persons, Animates, Living Things, Solid Objects, and Spatial Entities. If the item in question does not obviously fall into one or more of these five categories (e.g., abstractions, events) do not proceed. (Revision of categorization may be required by the Simplicity Rule after considering Steps 3-6).</td>
</tr>
<tr>
<td>Step 3</td>
<td>Code transfers as superscript prefixes with capital letters, joined by + if necessary.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Code breaches as superscript suffixes with lowercase letters, joined by + if necessary.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Code breaches within breaches with parentheses.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Quantify counterintuitiveness by totaling the number of symbolic letters.</td>
</tr>
</tbody>
</table>

**Step One**

Step one of Barrett’s (2008a) six-step process for coding and quantifying counterintuitiveness begins with the identification of the object’s basic level membership. Following Rosch, Mervis, Gray, Johnson, and Boyes-Braem’s (1976) discussion of a “basic level concept,” which “is the level of object categorization that minimizes differences within members of a category while maximizing differences between categories” (as cited in Barrett, 2008a, p. 316), Barrett (2008a) describes a object’s basic level category as “the category membership that is first learned […] in the course of development and the first category to be linguistically marked” (p. 316). Barrett’s (2008a) heuristic for eliciting something’s basic level membership is the answer to the question, “In one word, what is it called?” (p. 316). For example, a “red delicious” is classed as an “apple” as it is the most “precise, the shortest, one word, common label for an object” (Barrett, 2008a, p. 316). Following Barrett’s (2008a)
orthographic system for coding counterintuitive concepts, which is explained in more depth below, the basic level category membership is coded in all-capital letters (e.g., APPLE).

**Step Two**

Step two of Barrett’s (2008a) method is to identify the ontological category or categories for a given object. This is the most complex and sophisticated process in Barrett’s (2008a) method as it synthesizes a wealth of cognitive scientific investigation into five intuitive ontological categories and five intuitive expectation sets. It is noteworthy that Barrett’s (2008a) use of “intuitive” here only refers to Sperber’s (1996) concept of non-reflective belief and McCauley’s (in press) concepts of maturationally naturalness, which is discussed above. Barrett (2008a) identifies the following five ontological categories: “Spatial Entities, Solid Objects, Living Things that do not appear to be self-propelled, Animates, and Persons” (p. 317). Barrett (2008a) petitions that these five ontological categories “arise from differential activation of [the following six] different intuitive expectation sets:” Spatiality, Physicality, Biology, Animacy, Mentality, and Universality” (pp. 317-322). Each of these six expectation sets are outlined in Table 3.4 and summarized in turn below.
Table 3.4

Summary of Properties for Intuitive Expectation Sets from Barrett (2008a, p. 335)

<table>
<thead>
<tr>
<th>Intuitive Expectation Set</th>
<th>Properties Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spatiality</strong></td>
<td>Specifiable location in space and time</td>
</tr>
</tbody>
</table>
| **Physicality**           | Cohesion (move as connected whole)  
                           | Contact (physical contact required for launching or changing direction of movement)  
                           | Continuity (movement is continuous in space)  
                           | Solidity (cannot pass through or be passed through by other solid objects)  
                           | Tangibility  
                           | Visibility |
| **Biology**               | Growth & development  
                           | Like begets like  
                           | Natural composition  
                           | Nourishment ((needs and processes to satisfy those needs (if animate, actively seeks to satisfy these needs)))  
                           | Parts serve the whole to sustain life  
                           | Vulnerability to injury & death (if animate, seeks to avoid injury & death)  
                           | Kind-specific essence |
| **Animacy**               | Goals  
                           | “Self-propelled” (including moving in space, changing appearance, emitting sounds, etc.) |
| **Mentality**             | Reflection & representational mental states (e.g., beliefs, desires) and standard relationships among them and limitations of them (e.g., limited perceptual access)  
                           | Self-awareness (including emotions and epistemic states)  
                           | Understand language & communication |
| **Universals**            | Consistency (assumption apply continuously; past was like present, future will be like present)  
                           | Time (and hence, causation) is unidirectional |

Barrett (2008a) separates Spelke’s (1990) and Spelke and Kinzler’s (2007) concept of Physicality from his first Expectation Set of “Spatiality” because certain objects such as clouds and shadows are not treated as if they are bounded physical objects. Moreover, Bloom’s seminal research into “intuitive dualism” encourages Barrett’s (2008a) distinction as Bloom (2004) finds that while minds have a specific location and spatial properties, they are represented as non-physical things (as cited in Barrett, 2008a). Thus, while all objects elicit the expectation set of
Spatiality, not all objects elicit the Expectation Set of Physicality. The Expectation Set of “Physicality,” however, includes the internal sub-expectation sets of “cohesion, solidity, continuity, and contact” (Barrett, 2008a, p. 317). This expectation set is alternatively referred to as naïve physics and is perceived visibly and tangibly in early infancy (Spelke, 1990; Spelke, 2007). Barrett’s (2008a) third Expectation Set of Biology or Folk Biology ascribes a form of “essence” to physical forms at the relatively early age of four or five (pp. 318-319). This intuitive Expectation Set has received strong theoretical support from Hatano et al. (1994), Inagaki et al. (2002), Inagaki et al. (2006), Keil (1989), Rosengren et al. (1991), Simmons et al. (1995), Slaughter (2005), and Springer et al. (1989) (as cited in Barrett, 2008a). Barrett’s fourth Expectation set of Animacy is distinct from Biology in that Animacy is characterized by an object’s “self-propulsion” or “force,” which enables the object to change appearance, demonstrate gold-directedness, and communicate (2008a, p. 318). Barrett’s (2008a) fifth Expectation Set of Mentality (i.e., folk psychology or Theory of Mind) extends his category of Animacy “to include assumptions that a thing’s activity is guided and guided by percepts, beliefs, desires, emotions, and perhaps personality” (p. 318). Barrett’s final and heretofore untested Expectation Set of “Universals” includes such assumptions “as time moves in one direction, laws and regularities are constant from moment to moment, and causes precede effects” (2008a, p. 319).

Taken together, these six Expectation sets are variously activated by the five intuitive ontological categories of Spatial Entities, Solid Objects, Living Things, Animates, and Persons, as outlined below in Table 3.5.
Table 3.5

*Expectation Set Activation by Ontological Category from Barrett (2008a, p. 336)*

<table>
<thead>
<tr>
<th>Intuitive Ontological Category → Expectation Set</th>
<th>Spatial Entities</th>
<th>Solid Objects</th>
<th>Living Things</th>
<th>Animates</th>
<th>Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universals (u)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Spatiality (s)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Physicality (p)</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Biology (b)</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Animacy (a)</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Mentality (m)</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>

For example, the intuitive ontological category of the Solid Object “rock” assumes and extends the Expectation Set of Universals and Spatiality found in the intuitive ontological category of Spatial Entities to include the Expectation Set of Physicality, while not eliciting the assumptions of Biology, Animacy, or Mentality, which can all be found in the intuitive ontological category of Persons. Contrary to Boyer’s (1994) discussion of counterintuitiveness, Barrett (2008a) observes that the intuitive ontological categories of Persons and Animates “do not automatically assume the biological and physical properties of animals” (p. 321). Instead, Barrett (2008a) follows Bloom’s (2004) emerging evidence for an “intuitive dualism” that predisposes children to differentiate between the mind-related properties and those relevant to physical objects. In sum, following Barrett’s (2008a) method for coding and quantifying counterintuitiveness, once an intuitive ontological category has been defined for a proposed test item, it must be analyzed in terms of its adherence to the assumptions found in the six Expectation Sets discussed above. This analysis is divided by Barrett (2008a) into steps three, four, and five.
Steps Three and Four

In steps three and four, Barrett (2008a) distinguishes between breaches and transfers of intuitive assumptions. Step three of Barrett’s (2008a) method dictates that a concept can be scored as counterintuitive if it “includes properties from a ‘non-native’ set of intuitive expectations” (pp. 322-323). For example, the concept “a cup that is singing” has had the entire Expectation Set of Mentality transferred following the Simplicity Rule. With reference to Table 3.5, “a member of an ontological category can have transfers limited to only the number of ‘NO’s’ listed” (Barrett, 2008a, p. 323). Therefore, the concept “a cup that is singing” has had a single transfer from intuitive ontological category of Persons to the intuitive ontological category of Solid Objects. According to Barrett’s (2008a) orthographic method, the basic level category of “cup” in this example is coded as “CUP” with a proceeding capitalized superscript “M” for Mentality as in $MCUP$. A concept may also be scored as counterintuitive if a “non-native property” for a given intuitive ontological category is found to “breach” its native Expectation Set (Barrett, 2008a, p. 323). Step four of Barrett’s (2008a) method dictates that any deviation from a given intuitive ontological category’s intuitive Expectation Set should be scored as counterintuitive and coded with a lowercase letter denoting the violated Expectation set or sets. For example, the concept “a fly that is immortal” is counterintuitive by virtue of a breach of the entire expectation set of Biology and should be coded as $FLY^b$. Barrett’s (2008a) method for coding and quantifying counterintuitive concepts becomes more useful when steps three and four are combined. For example, the concept “a cup that is invisible and is singing” contains both a breach of the Expectation Set of Physicality for Solid Objects and a transfer of the Expectation Set of Mentality from the intuitive ontological category of Person. Similarly, the concept “a fly that is immortal and speaks Spanish” contains both a breach of the Expectation Set of Biology
for the intuitive ontological category of Living Things and a transfer of the Expectation Set of Mentality from the intuitive ontological category of Persons. Therefore, following Barrett’s (2008a) nomenclature for coding counterintuitiveness, the concept “a cup that is invisible and is singing” is coded as \( M_{\text{CUP}}^b \), while the concept “a fly that is immortal and speaks Spanish” is coded as \( M_{\text{FLY}}^b \). Moreover, Barrett (2008a) codes multiple breaches of the same concept (e.g., “a column that can read minds and see through walls”) by using a ‘+’ sign (e.g., \( M_{\text{COLUMN}}^{m+m} \)).

**Step Five**

Step five in Barrett’s (2008a) method is an elaboration of step four and outlines a method for coding a concept that contains a breach of a breach using parentheses. For example, the concept “a fly that becomes invisible on weekends” contains a breach of the Physicality Expectation Set for the ontological category of Living Things on top of a breach of the Expectation set of Universality, which would assume consistency in the invisibility of the fly in this example. In this example, “a fly that becomes invisible on weekends” would be coded as \( (\text{FLY}^p)^a \) according to Barrett’s (2008a) method for coding and quantifying counterintuitiveness.

**Step Six**

The final step in Barrett’s (2008a) six-step process is the most simple—simply add up the number of superscript letters to determine the counterintuitive score of a given concept. For example, the concept “a column that can read minds and see through walls” or \( M_{\text{COLUMN}}^{m+m} \) has a counterintuitive score of three, while the concept “a fly that is immortal” or \( \text{FLY}^b \) has a counterintuitive score of one.

It is noteworthy that the efficacy of Barrett’s (2008a) method of coding and quantifying counterintuitiveness relies on several factors, some of which are listed below and subsequently
explored in more detail: 1) the intended private representation of a given concept must be
unambiguously presented as a public representation and interpreted as intended in the private
representation of the respondent; 2) the disproportionate empirical support for the intuitive
ontological categories and their respective expectation sets must be ignored as Barrett’s (2008a)
method quantifies each category and expectation set equally (e.g., if the intuitive ontological
category of Spatiality should, in fact, be collapsed into the category of Physicality, then Barrett’s
method would produce an inaccurate counterintuitiveness score); 3) there must not be any
depreciation/appreciation in the overall counterintuitiveness of a given concept if it contains few
or many counterintuitive breaches or transfers (e.g., the concept $^MCOLUMN^{m+m}$ must be three
times as counterintuitive in the minds of respondents as the concept $^MCOLUMN$); 4) breaches
and transfers must be equally counterintuitive with no cognitive optimum or disadvantage for
either type of counterintuitiveness (e.g., $FLY^b$ must be equivalently counterintuitive to $^MFLY$ in
the private representations of respondents). These quantitative requirements are essential
because Barrett (2008a) assigns “minimal counterintuitiveness” the counterintuitiveness score of
one. Therefore, if any of the above prerequisites for an accurate coding and quantification of
counterintuitiveness are not met, then future MCI theory studies could be inconsistently
operationalizing counterintuitiveness, which is the very problem that Barrett (2008a) intended to
redress in his method for coding and quantifying counterintuitiveness.

Gregory and Barrett’s (2009) experiment among the Oxford public applies many of the
insights found in Barrett (2008a) in their exploration of the analysis of the role and relationship
of epistemology and counterintuitiveness in the recall of cultural representations. Below,
Gregory and Barrett’s (2009) epidemiological analysis of cultural representations is adapted and
replicated in the context of south India, which produces an up-to-date empirical and cross-
cultural evaluation of MCI theory using original data. Chapter 4 presents comparative cross-cultural data collected among 74 university students in south India in 2009 concerning the recall and retention of minimal counterintuitive (MCI) concepts. These results are compared with the results collected from a sample of the Oxford public by Gregory and Barrett (2009).
CHAPTER 4
EPISTEMOLOGY VS. MCI CONCEPTS EXPERIMENT

In a replication with slight revision of Gregory and Barrett (2009), this experiment uses the epidemiology of cultural representations approach developed by Sperber (1996) to evaluate the differential mnemonic success of two categories of beliefs: 1) the form of conscious reasoning derived from experience and deduction known as epistemology and 2) Barrett’s (2008a) interpretation of Boyer’s (2001) conceptualization of those purportedly novel, attention getting, and particularly memorable beliefs likely to be culturally encoded and alternatively known in relevant CSR research as minimally counterintuitive (MCI) or cognitively optimal concepts. This study is intended to begin to fill the cross-cultural comparative void that has marked previous MCI theory studies by producing a sample that is readily comparable to Gregory and Barrett’s (2009) sample of 45 members of the Oxford public. Moreover, this study seeks to improve upon existing research designs by decreasing the ambiguity of cultural representations used as stimuli while simultaneously improving the range of sampling strategies employed in previous MCI theory studies. In sum, like Gregory and Barrett (2009), this study tests the possibility that certain concepts enjoy a mnemonic advantage and, therefore, cultural advantages because of these concepts’ epistemic incongruity or their minimal counterintuitiveness (p. 291). In order to do so, this study follows Gregory and Barrett’s (2009) categorical examination of items, which fall into one of the following four theoretical templates: 1) necessarily epistemic incongruence (NEI), 2) minimally counterintuitive concepts (MCI), 3)
contingently epistemic congruence (CEC), and 4) necessarily epistemic congruence (NEC).

Each of these test categories is defined in turn in Table 4.1, below.

**Table 4.1**

*Test Item Categories with Definitions from Gregory and Barrett (2009, p. 293)*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Necessary Epistemic Incongruence (NEI) template</strong></td>
<td>This type of concept is by definition false; it is analytically false. It is necessarily false in every logically possible world; it is impossibly true.</td>
</tr>
<tr>
<td>Epistemic Definition</td>
<td></td>
</tr>
<tr>
<td>Minimally Counterintuitive theory definition</td>
<td>The intuitive coding scheme does not include NEI.</td>
</tr>
<tr>
<td>Example of item</td>
<td>A triangle that is 4-sided</td>
</tr>
<tr>
<td><strong>Minimally Counterintuitive (MCI) template</strong></td>
<td>The intrinsic truth-value of this concept is contingent; there are logically possible worlds in which this concept could be either true or false. But, in this world, in the minds of people, this concept is most commonly held to have an intrinsic value of falsehood; it is synthetically false: experience determines its truth-value. It would otherwise be known as a concept of “contingent epistemic incongruence” (CEC).</td>
</tr>
<tr>
<td>Epistemic Definition</td>
<td></td>
</tr>
<tr>
<td>Minimally Counterintuitive theory definition</td>
<td>This type of concept is minimally counterintuitive in the intuitive coding scheme due to its violation of a single ontological expectation set.</td>
</tr>
<tr>
<td>Example of item</td>
<td>A fly that is immortal</td>
</tr>
<tr>
<td><strong>Contingent Epistemic Congruence (CEC) template</strong></td>
<td>The intrinsic truth value of this concept is contingent; there are logically possible worlds in which this concept could be either true or false. But, in this world, in the minds of people, it is most commonly held to have an intrinsic value of truth; it is synthetically true: like MCI items, experience determines its truth-value.</td>
</tr>
<tr>
<td>Epistemic Definition</td>
<td></td>
</tr>
<tr>
<td>Minimally Counterintuitive definition</td>
<td>This type is “intuitive” or “commonplace” in the intuitive coding scheme as it violates no ontological expectation set. According to the intuitive coding scheme there is no differentiation between CEC and “necessarily epistemologically correct” (NEC) items.</td>
</tr>
<tr>
<td>Example of item</td>
<td>A girl that is wise</td>
</tr>
<tr>
<td><strong>Necessary Epistemic Congruence (NEC) template</strong></td>
<td>This type is definition true; it is analytically true. It is true in every logically possible world; it is impossibly false.*</td>
</tr>
<tr>
<td>Epistemic Definition</td>
<td></td>
</tr>
<tr>
<td>Minimally Counterintuitive definition</td>
<td>This type is also ‘intuitive’ or “commonplace” in the intuitive coding scheme as it violates no ontological expectation set. According to the intuitive coding scheme there is no differentiation between NEC and CEC items.</td>
</tr>
<tr>
<td>Example of item</td>
<td>A circle that is round</td>
</tr>
</tbody>
</table>

*Correction from original
This study, IRB approval #09-OR-227 (Appendix), is designed to test the hypothesis that MCI or cognitively optimal category items will enjoy a recall advantage over necessarily epistemic congruent (NEC), contingently epistemic congruent (CEC), and necessarily epistemic incongruent (NEI) concepts in both immediate and delayed recall exercises, with the delayed recall exercise showing more significance as it more closely approximates natural forms of cultural transmission and cultural representational success. It is further hypothesized that the necessarily epistemic incongruent (NEI) category items will enjoy the highest mnemonic success of non-MCI test items. Following the growing evidence that women are more religious than men (Thompson 1991; Stark 2002; Miller & Stark 2002; Sherkat 2002; Maselko & Kubansky 2006), it is further hypothesized that female respondents will demonstrate higher delayed recall means when compared to males because of a more active Theory of Mind or “ToM” (Barrett 2004b, p. 42). The null hypothesis for this experiment is that each category of concepts will be consistently recalled at the same rate.

**Methods**

**Participants**

Seventy-four second-year MBA students at Gandhi Institute of Technology and Management (GITAM) took part in a controlled free-recall experiment, the second “minimal counterintuitiveness theory” study to control for participant selective-attention timing and to record concept inferential potential. Recall of counterintuitive ideas (MCI) was compared with recall of ideas expressing epistemic incongruence (i.e., analytically false), analytically true ideas, and ordinary control ideas.

A controlled group experiment was conducted to test the memorability of test items in the form of subject-predicate statements corresponding to the NEI, MCI, CEC, and NEC cognitive
templates. Participants were informed that they were about to take part in a memory task. A group of 74 students was exposed to 24 items on a computer projector without any other narrative or audiovisual equipment. The items were presented in a semi-random rotating block sequence according to their respective concept category to control against order effects and each item was presented for exactly seven seconds. After a brief distracter task consisting of three-minutes of basic arithmetic, participants were instructed to recall the stimulus items. In a second testing period, under the same testing conditions 10-days later, recall was measured again. Several hypothesis-blind research assistants aided in the collection and coding of the study to reduce any researcher bias. The mean recall scores for both immediate and delayed recall sessions have been analyzed and compared. The second testing period is seen as a more accurate reflection of cultural transmission and the group setting was intended to provide a social environment within which these concepts may be socially encoded through distributed cognition.

**Design**

Formula:

[ indefinite article ] + [ noun (subject) ] + [ pronoun (that) + verb (to be) ] + [ adjective/participle ]

Examples:

[A] + [ rock ] + [ that + is ] + [ sick ]

[A] + [ tree ] + [ that + is ] + [ growing ]

**Figure 4.1. Grammatical Stimulus Formula from Gregory and Barrett (2009)**

As outlined in Figure 4.1, the rigid grammatical formula found in Gregory and Barrett (2009) was adopted for this experiment as an improvement on the uncontrolled or overly simplistic grammatical structures of previous examinations of MCI theory. For example, a “sick blanket,” which would qualify as an MCI category concept, could be readily interpreted as a blanket that is used during times of sickness, while “a blanket that is sick” makes the intended
MCI category concept less ambiguous by stressing the sickness of the blanket, itself. While the subject-predicate statements found in this experiment decrease the level of analogical reasoning found in other MCI experiments, numerous metaphorical and analogical relationships still remain. The range of these potentially confounding metaphorical and analogical stimuli will be discussed in more depth below.

Following Gregory and Barrett (2009), the video stimulus contained a semi-random rotating item block sequence, which corresponded to the four categories (NEI, MCI, CEC, and NEC). This sequence is only semi-random because the randomization of the test items was constrained such that more than one category item in a row was rejected and each category was equally likely to appear at the beginning or the end of a four-item sequence. This semi-randomization technique was employed to avoid biases concerning conceptual priming, order effects, and related biases.

**Materials and Procedure**

Unlike Gregory and Barrett (2009), participants were tested collectively as a peer group. While participants in Gregory and Barrett (2009) “were not discouraged to talk about the contents of the test when away from the location, so as not to interfere with normal processes of cultural transmission that participants might engage in spontaneously such as narrative consolidation” with the intention that participants would tell “others about the most memorable aspects of their experience[,]” (p. 299) they shared no prior avenues through which this important and co-experiential form of transmission could naturally and spontaneously occur. Additionally, Gregory and Barrett (2009) prompted their individual respondents “not to divulge the contents of the test with people waiting for testing” (p. 299). As participation in this study was anonymous, participants were not aware of who may be included in the study and, therefore,
may have been discouraged from transmitting and recollecting the test items. This attempt at experimental control could have inhibited the very forms of cultural transmission and concept survivability that Gregory and Barrett (2009) intended to examine. This experiment improves upon the design of Gregory and Barrett (2009) by providing subjects with a pre-existing transmission group in which these categorical items could be potentially disproportionately shared, repeated, and, ultimately, culturally encoded. The ready-made social network of a peer group more accurately approximates distributed cognitive networks by facilitating the type of inter-subjective discourse that marks normal cultural transmission. This improvement in research design should avoid some potentially confounding factors found in earlier examinations of MCI theory by encouraging the disambiguation of public representations into private representations as suggested by Sperber (1996). Additionally, this experiment’s use of a natural peer group sampling strategy tests Gregory and Barrett’s (2009) empirical conclusion, which found no evidence in support of MCI concepts enjoying an advantage over any other test category as a result of Gregory and Barrett’s (2009) sampling strategy. Ultimately, this experiment’s use of a natural peer group should produce a more accurate epidemiological analysis of test cultural representations.

Testing was conducted in a lecture hall with a stimulus script and a strict and rehearsed experimental procedure. A hypothesis-blind research assistant aided in the distribution and collection of materials. After a participant recorded his or her name, age, gender, first language, religion, level of educational attainment, and generic caste, the experimenter began the scripted research prompt, which follows: “You are about to take part in a simple memory task. The following video will contain a series of short phrases. Each phrase will remain on the screen for seven seconds. You will see a total of twenty-four phrases. Please take care to consider each
phrase carefully. Do not pick up your pencil or make a mark of any kind.” With the help of a trained research assistant, the researcher began the video stimulus, which consisted of twenty-four, six-word phrases, which were presented using a semi-randomly generated four-item block. Following Gregory and Barrett (2009), the test items were displayed in “Calibri 48 point type, in white, on a contrasting blue background” (Gregory & Barrett, 2009, p. 299). Each test item (i.e., phrase) was visible for seven seconds before the next test item appeared. After two minutes and forty-eight seconds, the final test item disappeared and students were presented with a printed sheet of A4 paper and instructed as follows: “You are now being given two pages of arithmetic. Please complete as many of these arithmetic problems as possible in the allotted time. You have three minutes to complete as many of these problems as possible.” After three minutes, the participants were instructed to turn over the page containing their basic demographic data with the following prompt: “Please turn over the page which contains your name, age, and sex. Could you please write down any of the phrases you can remember from the screen? You have three minutes to write down as many as possible.” With the help of a research assistant, the researcher collected the participants’ immediate recall responses after three minutes and asked the participants to return ten days later for “a slightly different task.” The researcher returned ten days later to the same testing room at the same time for the second period of testing. Participants began the ten-day delayed recall phase of the experiment with the following prompt: “Please write down as many of the phrases that you remember from the screen ten days ago. You have three minutes to write down as many phrases as you can remember.”
In an improvement in design over Gregory and Barrett (2009), this experiment not only used hypothesis-blind research assistants to score each response according to its categorical membership, but also developed an item-by-item coding scheme, which enabled the researcher to achieve a much more accurate analysis of the data. NEI items are coded as A1 through A6, MCI are coded as B1 through B6, CEC items are coded as C1 through C6, and NEC items are coded as D1 through D6—see Table 4.2. In order to determine the mean of each category by item recall, each correctly recalled category item was scored as one point. Only complete subject-predicate statements scored a point. Two assistants coded and scored participants’ responses independently. Disputes between these two scores were discussed between the researcher and the research assistants until consensus was reached. Following Gregory and Barrett (2009), “the central concern with regard to the cultural transmission of test items and key elements facilitating it, was the semantic fidelity of a test statement’s basic concept and modifying property […] in recall; scoring was concerned with recall of semantic representations only, not linguistic properties or syntax” (p. 299). Again, following Gregory and Barrett (2009), as “semantic fidelity” was the most important element of this study, “synonyms, plural conjugations, or a poorly spelled version of the noun and adjective of a test item” were considered to be equally
valid as direct recollections of the test items, themselves (p. 300). No other points were recorded for any other reason.

Results

Immediate Recall

Following Gregory and Barrett (2009), the point totals for each participant were calculated according to the item categories of NEI, MCI, CEC, and NEC, and mean recall scores were calculated for both dependent measures of immediate recall and one-week delay. Figure 4.2 illustrates the mean scores for each item in the immediate recall task.

![Diagram of Immediate Recall](image)

Figure 4.2. Immediate Recall

Immediate Recall Cross-Cultural Comparison

Similar to Gregory and Barrett’s (2009) analysis of the epistemic hypothesis, a paired samples t-test detected a close to significant difference was found between NEI over MCI items, $M=1.86$ (SD=1.04) and $M=1.54$ (SD=1.1), respectively; $t(74)=1.98$, $p=.051$. In addition, a significant recall advantage of NEI over NEC was found, $M=1.86$ (SD=1.04) and $M=1.41$
(SD=1.15), respectively; \( t(74)=2.89, p=.005 \). No significant recall difference between NEI and CEC items, \( M=2.09 \) (SD=.94); \( t(74)=-1.486, p=.142 \) or between MCI items and NEC items, \( M=1.54 \) (SD=1.1) and \( M=1.42 \) (SD=1.16); \( t(74)=.816, p=.417 \). Figure 4.3, below, illustrates the comparison of means by category for both the Oxford sample and the India sample.

In line with Gregory and Barrett’s contrary evidence to MCI Theory predictions, a paired-samples t-test in the India study revealed a significant recall advantage of CEC items over MCI items, \( M=2.09 \) (SD=1.1) and \( M=1.54 \) (SD=1.1); \( t(74)=3.99, p=.000 \). In addition, a recall advantage of CEC items over NEC items was found, \( M=2.09 \) (SD=.938) and \( M=1.42 \) (SD=1.16); \( t=4.194, p=.000 \).

![Figure 4.3](image)  

Figure 4.3. Immediate Recall Comparison: Oxford Public vs. Coastal AP India Students. Gregory and Barrett (2009) rounded several means, which accounts for the graph’s disparities in the numeric length of the Oxford mean versus the AP India mean.
A subsequent paired samples t-test showed a significant advantage among the Oxford public in the immediate recall of NEC items over “AP” India students (i.e., Andhra Pradesh students or GITAM students) recall of NEC items, $M=1.8$ versus $M=1.42$ (SD=1.07); $t(48)=2.48$, $p=.017$. No significant immediate recall difference between NEI, $M=1.86$ versus $M=1.94$ (SD=1.08); $t(48)=.497$, $p=.621$; MCI, $M=1.47$ versus $M=1.54$(SD=1.03); $t(48)=.482$, $p=.632$; or CEC, $M=1.96$ versus $M=2.02$(SD=1.04); $t(48)=.405$, $p=.688$. While standard deviations are not provided in the Oxford study, the standard deviations are reported for the India study.

**Delayed Recall**

![Delayed Recall Chart]

*Figure 4.4. GITAM Delayed Recall.*

Figure 4.4, above, illustrates the means of the delayed recall exercise by category.

Statistical significance was found between five of the six paired-samples t-tests; the paired-samples t-test between the means of the NEI and CEC items, $M=1.33$ (SD=1.1) and $M=1.09$
A paired-samples $t$-test revealed a significant recall advantage of CEC items over NEC items, $M=1.1$ (SD=1.06) and $M=.84$ (SD=0.86), respectively; $t(61)=2.12$, $p=.04$, and also of NEI items over NEC items, $M=1.33$ (SD=1.1) and $M=.84$ (SD=0.86); $t(61)=4.08$, $p=.000$. Contrary to MCI Theory, a paired-samples $t$-test also showed a significant recall advantage of all items over MCI items, including NEI items over MCI items, $M=1.33$ (SD=1.1) and $M=0.51$ (SD=0.83); $t(61)=5.7$, $p=.000$; CEC items over MCI items, $M=1.1$ (SD=1.06) and $M=0.51$ (SD=0.83); $t(61)=4.92$, $p=.000$; and NEC items over MCI items, $M=.84$ (SD=.86) and $M=0.51$ (SD=0.83); $t(61)=3.08$, $p=.003$.

**Immediate Recall versus Delayed Recall**

![Figure 4.5](image)

*Figure 4.5. Scatterplot of Immediate Recall vs. Delayed Recall by Item*

Not surprisingly, the overall immediate mean recall levels were much higher than the delayed recall means. This is illustrated in Figure 4.5, above, which illustrates the relative mnemonic success of immediate recall concepts versus delayed recall concepts item by item.
This drop in delayed recall means is largely consistent with Gregory and Barrett’s (2009) sample of the Oxford public.

**Delayed Recall Cross-Cultural Comparison**

![Bar chart showing delayed recall comparison between Oxford public and AP India students.]

**Figure 4.6.** Delayed Recall Comparison: Oxford Public vs. Coastal AP India Students

A subsequent paired samples t-test showed a significant advantage among the Oxford public in the delayed recall of MCI items over AP India Student’s recall of MCI items, $M=1.15$ versus $M=0.52$ (SD=0.85); $t(47)=5.13, p=.000$. No significant immediate recall difference between NEI, $M=1.5$ versus $M=1.33$ (SD=1.14); $t(47)=.631, p=.531$; CEC, $M=1.15$ versus $M=1.1$ (SD=1.13); $t(48)=0.28, p=.781$; or NEC, $M=1.08$ versus $M=0.84$ (SD=0.90); $t(48)=1.74, p=.09$. Figure 4.6 compares the delayed recall means of the Oxford public (Gregory & Barrett, 2009) with AP India students.
Recall by Religion, First Language, Sex, and Age Set

Table 4.3, below, summarizes the five dependent variables of religion, first language, sex and age, which were self-reported by each respondent. The dependent variable of sex is emphasized below, as it shows a surprisingly significant and unprecedented role in the differential mnemonic success of the four test categories.

Table 4.3

<table>
<thead>
<tr>
<th>Summary of Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Recall (N=74)</td>
</tr>
<tr>
<td>Delayed Recall (N=61)</td>
</tr>
<tr>
<td>Immediate vs. Delayed:</td>
</tr>
<tr>
<td>Religion (Hindu vs. Other)</td>
</tr>
<tr>
<td>1st Language (Telugu vs. Other)</td>
</tr>
<tr>
<td>Sex (M vs. F)*</td>
</tr>
<tr>
<td>Age (21-25 vs. 26 vs. 27-28)*</td>
</tr>
<tr>
<td>Individual Item Frequencies</td>
</tr>
<tr>
<td>Religion (Hindu vs. Other)</td>
</tr>
<tr>
<td>1st Language (Telugu vs. Other)</td>
</tr>
<tr>
<td>Sex (M vs. F)*</td>
</tr>
<tr>
<td>Age (21-25 vs. 26 vs. 27-28)*</td>
</tr>
<tr>
<td>Individual Item Frequencies</td>
</tr>
<tr>
<td>India Immediate vs.</td>
</tr>
<tr>
<td>Delayed*</td>
</tr>
</tbody>
</table>

* significance (all p<.05)

While sex is shown to have a significant effect on both immediate and delayed recall levels, there is little evidence to suggest a relationship between age and religion and any categorical mnemonic advantage. Illustrated below in Figure 4.7, an independent samples t-test revealed a significant immediate recall advantage among females for NEI concepts, $M=2.4$ versus $1.5; \ p \le 0.000$. NEC concepts approached significance in the same direction, $M=1.73$ versus $1.2; \ p=0.053$. Figure 4.7 illustrates the immediate recall means by sex.
Illustrated below in Figure 4.8, a subsequent independent samples $t$-test of the delayed recall means, which are more indicative of cultural success than immediate recall samples, revealed a significant mnemonic advantage for females over males in every category (NEI $p=.000$; MCI $p=.047$; CEC $p=.008$; NEC $p=.002$).
Gender and MCI Theory: A Post-hoc Analysis

To check for the representativeness of results, differences in delayed recall performance based on age, religion, sex and first language were also analyzed. A one-way ANOVA (i.e., analysis of variance), whereby observed variance is broken down according to variance estimates to test for differences between the means of independent groups, detected no significant differences in religion or first language (all \( p > .05 \)). A one-way ANOVA for the factor of sex detected a significant difference in the delayed recall between males and females in every case. A subsequent independent samples \( t \)-test showed that women had a significantly higher recall than men in NEI items, \( \bar{M}=2.00 \) (SD=1.08) versus \( \bar{M}=0.86 \) (SD=0.87); \( t(36)=4.56, p=.000 \); MCI items, \( \bar{M}=0.76 \) (SD=0.97) versus \( \bar{M}=0.33 \) (SD=0.68); \( t(36)=2.03, p=.047 \); CEC items, \( \bar{M}=1.52 \) (SD=1.19) versus \( \bar{M}=0.81 \) (SD=0.86); \( t(36)=2.72, p=.008 \); and NEC items, \( \bar{M}=1.24 \) (SD=1.24) versus \( \bar{M}=0.56 \) (SD=0.81); \( t(36)=3.3, p=.002 \). Interestingly, Gregory and Barrett (2009) found no significant differences in delayed recall with the factor of sex in their sample of the Oxford public.

Conclusion

Unlike the Oxford sample, this experiment found significant differences in both immediate and delayed recall by sex with women showing a recall advantage over men in every category. Barrett and others have suggested that women have a stronger ToM, which could account for their significant recall advantage. The 2\(^{nd}\)-year female Indian MBA students may have higher proficiencies in English, which may account for their uniformly higher recall rates. Further research must be conducted to determine if this propensity towards higher recall rates is consistent.
Like Gregory and Barrett (2009), no results in support of the MCI theory hypothesis were found. Additionally, the use of a pre-existing group sample in contrast to Gregory and Barrett’s (2009) individual sampling strategy did not significantly improve either immediate or delayed recall. Perhaps the lack of narrative structural support or the limitation of each item to 7 seconds of exposure limited the contexts within which MCI concepts could have encoded at a higher rate. Future research must be conducted to determine if this is true.

Discussion

Item-by-item analysis

While Gregory and Barrett (2009) ostensibly controlled for intra-categorical mnemonic differences by controlling for inferential potential via a simplistic pre-testing exercise, they do not report whether their attempt to control for categorical parity was successful by reporting the means for each categorical item. Instead, Gregory and Barrett (2009) appear to assume that each item performed equally well and carried the mnemonic weight of its respective category equally. This may have been a product of their methodology for coding and scoring the responses by category. In an improvement of Gregory and Barrett’s (2009) method for using hypothesis-blind research assistants to code and score each respondent’s exercise, this study makes intra-categorical mnemonic differences an empirical question by including both the category of the recalled item and its reference number according to that indicated in Table 4.2. As evidenced in Figure 4.9, below, this study produced stark intra-categorical mnemonic differences with test items such as “A girl that is wise” or “C4ir1” dominating the category of contingently epistemic congruent (CEC) concepts and accounting for much of its mnemonic success in the immediate recall exercise.
Figure 4.9. Bubble Frequency of Coded Immediate Recall Items

Coding and Quantifying MCI concepts

Table 4.4

MCI Coding for Stimuli following Barrett’s (2008a) Method

<table>
<thead>
<tr>
<th>Breach MCI item</th>
<th>Type of Breach</th>
<th>Barrett’s MCI Coding Nomenclature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A fly that is immortal</td>
<td>biological breach</td>
<td>FLY(^b)</td>
</tr>
<tr>
<td>A camel that is invisible</td>
<td>physicality breach</td>
<td>CAMEL(^p)</td>
</tr>
<tr>
<td>A potato that is everywhere</td>
<td>spatiality breach</td>
<td>POTATO(^s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transfer MCI item</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A cup that is thinking</td>
<td>mentality transfer</td>
<td>(^b)CUP</td>
</tr>
<tr>
<td>A rock that is sick</td>
<td>biological transfer</td>
<td>(^p)ROCK</td>
</tr>
<tr>
<td>A cactus that is jumping</td>
<td>animacy transfer</td>
<td>(^\wedge)CACTUS</td>
</tr>
</tbody>
</table>

Surprisingly, Gregory and Barrett (2009) do not report the differential mnemonic success of breach MCI test items versus transfer MCI test items. This step is essential for future examinations of MCI theory because it provides a quality control for stimulus creation, which has been one of the most significant impediments for previous MCI experiments. Furthermore,
if either “breach” or “transfer” MCI concepts are shown to have a significant mnemonic advantage, Barrett’s (2008a) system for coding and quantifying MCI concepts must be refined. Following Barrett’s (2008a) methodology for coding and quantifying minimally counter-intuitive concepts, half of the stimulus’ MCI category items qualify as minimally counter-intuitive because of a singular intuitive breach, while the other half qualifies as minimally counter-intuitive because of a singular intuitive transfer. Table 4.4, above, illustrates these differences within the MCI categorical stimulus while adopting Barrett’s (2008a) nomenclature for coding MCI concepts. While both breach MCI concepts \((M=1.088)\) and transfer MCI concepts \((M=1.082)\) were recalled almost identically during the 10-day delayed recall response session, during the immediate recall session transfer MCI concepts \((M=1.197)\) were less successful than breach MCI concepts \((M=1.328)\). This surprising amount of parity between these two categories reinforces Barrett’s (2008a) complex method for coding and quantifying MCI category concepts by providing non-Western evidence that both breaches and transfers are recalled at nearly the same rate, especially during the more accurate approximation of cultural transmission found in the delayed recall measure.

If integers in certain contexts can be productively coded and analyzed as minimally counterintuitive concepts as concluded in the above discussion concerning the limitations of McCauley’s (in press) maturational natural construal of the basic arithmetic of \(1+1=2\), then the Necessarily Epistemic Incongruent (NEI) category concept of “A triangle that is 4-sided” could be coded as a minimally counterintuitive (MCI) category concept as well as a NEI category concept. As an MCI category concept, “A triangle that is 4-sided” might be considered as minimally counterintuitive because of a single breach of the Physicality Expectation Set according to Barrett’s (2008a) method for coding and quantifying counterintuitiveness and
would be coded as TRIANGLE°. Since the intuitive ontological category of Spatial Entities only includes the expectation sets for Universals (u) and Spatiality (s), however, the NEI category concept “A triangle that is 4-sided” should not be considered to be breach. Instead, “A triangle that is 4-sided” could be considered to be a MCI category concept because of singular transfer from another expectation set and should be coded as °TRIANGLE. If the NEI category concept could also be coded as an MCI category concept, the stimuli “A triangle that is 4-sided” must be discarded in future examinations of MCI theory because of the potential ambiguity that this dual category stimulus produces in public representations. While the unjustified and uncharacteristic use of the integer “4” instead of the written form of “four” provides a potential confounding characteristic for the use of this stimulus as an NEI category concept because of the potential mnemonic advantages or disadvantages that this Arabic numeral presents to the respondent, the use of an integer in this context is not minimally counterintuitive. While the integer “five” would be considered to be minimally counterintuitive in the statement “five [objects] are equidistant between one [object] and nine [objects],” the context of the NEI category concept “A triangle that is 4-sided” does not breach or transfer any expectation set for the intuitive ontological category of Solid Objects. While Gregory and Barrett (2009) may have abbreviated “four” with the Arabic numeral of “4” in an effort to control the number of characters of the stimulus “A triangle that is 4-sided,” this abbreviation is potentially more problematic than the slightly longer stimulus “A triangle that is four-sided” may have been. Future examinations of MCI theory should employ integers cautiously so as to avoid violating the continuity of the Physicality Expectation Set of our intuitive numeric cognition, as outlined by Dehaene (1994) and empirically demonstrated by Feigenson et al. (2004). Furthermore, future examinations of
MCI theory should avoid inconsistently employing disparate symbol systems (e.g., using Arabic numerals in the midst of text).

**Presentation Length**

While Gregory and Barrett (2009) attempt to improve upon previous examinations of MCI theory by controlling presentation length, they do not provide any empirical justification that supports the use of a presentation length of seven seconds. Perhaps seven seconds was chosen as the controlled presentation length in order to provide participants with enough time to thoroughly read and visualize each respective stimulus, but this is only speculative as no pre-testing was reported for this portion of the experiment. Gregory and Barrett (2009) speculate that the poor performance of MCI category items in their study could be attributed to participants’ inability to individually selectively attend to test items, which may have led to individuals spending more time attending to and encoding MCI category test items (p. 311). Moreover, Gregory and Barrett (2009) conclude that “maybe the same study repeated with longer measures of time for entertaining of test items would have produced different results” because their control of the presentation length of seven seconds “lacks ecological validity” (p. 311). Gregory and Barrett (2009) go on to speculate, “MCI concepts [may] require more time and attention to encode than other cognitive template types” (p. 311). This observation is entirely speculative as longer or shorter presentation lengths could just as easily hinder the rate at which MCI category concepts are encoded and, ultimately, recalled. Future MCI theory research should test the performance of MCI category concepts at various presentation lengths in order to test for ecological validity.
Recoding and Classifying Items by Agency and Spatial Relations

When these test items are coded a different way, however, a significant pattern emerges. First, however, it should be noted that the four item categories do not contain identical internal characteristics. Many of those non-agential concepts could fall under the category of spatial relations. For examples, the MCI-item “A potato that is everywhere” refers to spatiality, as do the NEI-items “A triangle that is 4-sided” and “A solid that is gaseous;” the CEC-item “A car that is nearby;” and the NEC-items “A circle that is round, “A tube that is hollow,” and, the most categorically transparent concept, “A space that is dimensional.” Thus, of the seven references to spatial relations, the MCI-item category and the CEC-item category have one, respectively, while the NEI-item category has two and the NEC-item category has three. This unequal sharing of internal category characteristics is further demonstrated by the unequal dispersion of agential concepts throughout the four categories. While the MCI category contains five items with a subject or adjective/participle with agential characteristics including “A fly that is immortal,” “A camel that is invisible,” “A cup that is thinking,” “a cactus that is jumping,” and “A rock that is sick;” the NEI category only includes two items with agential characteristics including “A bachelor that is married” and “An infant that is elderly.” The CEC category has four agential items including “A cat that is alive,” “A moth that is grey,” “A girl that is wise,” and “A bear that is running;” while the NEC category, like the NEI category, only has two agential items including “A human that is warm-blooded” and “A corpse that is dead.” This unequal distribution of agential concepts may confound this attempt compare the mean recall of NEI, MCI, CEC, and NEC category items.

The items with the highest delayed recall means (M=1.459)—“A girl that is wise” and “A triangle that is 4-sided”—represent the two item categories constructed above, the first agential
and the second spatial. These two items, however, may be further classified as subsets of their respective categories. “A girl that is wise” may represent a subset for the agential category above, however, because it contains an agential subject with a theory of mind and a reference to the ToM-only adjective/participle of “wise.” Unlike other items within this newly constructed “agential” category; “A girl that is wise,” “A bachelor that is married,” “An infant that is elderly,” “A cat that is alive,” “A bear that is running,” and “A corpse that is dead” are unique in that they all potentially enjoy the cognitive attention-getting effect of not only activating one’s HADD and ToM in either their subject or adjective/predicate, but both. Taken together, these items have a significantly higher recall rate than non-doubly agential items ($M=1.25$ versus $M=1.06$). The significant recall advantage of these items with double references to agency could potentially support the Guthrie, McCauley, Lawson, and others’ hypothesis that agential concepts are more attention-getting and memorable and, therefore, more likely to become culturally encoded. Similarly, items that contain other parallel and intuitive spatial characteristics also have a significant recall advantage over the average delayed recall mean ($M=1.23$). These include “A triangle that is 4-sided,” “A space that is dimensional,” “A circle that is round,” and “A tube that is hollow” from the more general spatial relations category and exclude “A potato that is everywhere,” “A car that is nearby,” and “A solid that is gaseous” ($M=1.07$). Other test concepts including “A rainbow that is colourless,” “A vowel that is numerical,” and “A tree that is growing” were placed in a non-spatial and non-agential category ($M=1.18$). Taken together, the doubly agential subset of the agential category and the doubly spatial subset of the agential category demonstrate a mnemonic preference for within-item domain parallelism. This delayed recall advantage for domain parallelism runs contrary to the MCI hypothesis and further questions its empirical efficacy.
Ambiguous Presentation and Metaphorical Interpretation

Barrett (2008a) outlines a wholly new and improved method of coding and quantifying minimally counterintuitive concepts after criticizing the poor construct validity of several previous attempts to empirically test the recall of MCI items. Barrett’s (2008a) improvements in the construction of MCI test item construction are three-fold.

First, in earlier examinations of MCI concepts by Boyer and Ramble (2001), Barrett and Nyhof (2001), Tweney et al. (2006), and Upal et al. (2006) embed MCI concepts in narratives, have subjects read these narratives and, subsequently, recollect them. Each of these studies adapts Bartlett’s seminal serial reproduction experiments concerning the Native American tale entitled “The War of Ghosts” (1932). This method proved problematic in that some subjects could select to focus on portions of the narratives where MCI concepts are not present and, therefore, would not have the opportunity to properly encode the target MCI concepts. Gregory and Barrett (2009), however, controlled stimuli presentation length at seven seconds per item is an attempt to potentially avoid this confounding factor.

Second, the aforementioned MCI narrative studies failed to randomize cognitive template categories and, therefore, potentially provided a mnemonic advantage for a certain target category or categories over others. For example, in experiment two of Barrett and Nyhof’s (2001) narrative concerning the arrival of a diplomat on the fictitious planet of the Ralyks the recall of “counterintuitive” category items, “bizarre” category items, and “common” category items were non-randomly presented with the “bizarre” or “counterintuitive” category items typically appearing before “common” category items. Moreover, the coding of certain target items as “common” (i.e., non-reflectively maturationally natural) is problematic in target narrative elements such as “a being that can see and hear things that are not too far away.” For
example, the being could make out the letters on a page in a book if it is no more than eight feet away, provided the line of sight is not obstructed” or “an object that is easy to see under normal lighting conditions from within about 50 feet away” are anything but common and mundane (Barrett & Nyhof, 2001, p. 79). These explicit references to exact distances and ideal contexts in these “common” category target items makes the mistake of turning the otherwise mundane sentence (e.g., “She can hear you if you don’t walk too far away”) and turning it into an abstract and bizarre expression concerning uncommon and unfamiliar references to “beings,” “species,” and “objects” that operate in a strangely quantifiable locale (Barrett & Nyhof, 2001, p. 79). Gregory and Barrett (2009) attempt to avoid these potential confounds and, therefore, control against any mnemonic bias by randomizing the presentation of each of the four categories according to a semi-random rotating block sequence. Such categorical randomization has not been incorporated into previous studies of MCI theory.

Finally and most significantly, Barrett criticizes a group of studies whose focus centered on the roles of narrative context in the recall of MCI items (personal communication, November, 10, 2009). In his critique, he finds that the use of context-free dyads—such as “thirsty door,” “drying comment,” and “sleeping car”—are problematic in that they are prone to be interpreted metaphorically by the subject. A thirsty door could simply require more coats of paint than normal, while a sleeping car could simply be a train car in which people sleep. While the rigid syntactic structure found in my replication of Gregory and Barrett (2009) helps to avoid the ambiguous presentation of Atran and Norenzayan (2004), Norenzayan et al. (2006), Gonce et al. (2006), Tweney et al. (2006), and Upal et al. (2006) in which an item which is intended to be interpreted as minimally counterintuitive, such as a “listening tree” could be metaphorically and intuitively interpreted as a place where one listens; the five word controlled syntactic formula of
[indefinite article] + [noun (subject)] + [pronoun (that) + verb (to be)] + [adjective/participle] does not completely alleviate this presentation ambiguity.

For example, in my debriefing sessions with participants, several of them noted that they interpreted the supposedly MCI category concept of “A potato that is everywhere” as a completely intuitive phrase which described a particularly popular and widespread strand of potato. Later discussions with local cultural experts revealed other potentially ambiguous stimuli, including “A rock that is sick,” “A solid that is gaseous,” and “A human that is warm-blooded.” The potential for this type of ambiguity is great. For example, if another potentially ambiguous MCI item, “A cactus that is jumping,” was presented in the context of the American Southwest or Northern Mexico, many participants may simply interpret this to be referring to the “jumping cholla” (Cylindropuntia fulgida) or “jumping cactus,” which derive their name from the ease with which microscopic barbs detach or “jump” when lightly brushed. In this instance, the item “A cactus that is jumping” could be recalled because of strong flight and avoidance responses to these spiny plants in which case the investigator may falsely interpret the success of intuitive concept as a minimally counterintuitive one. Similarly, one metaphorical interpretation of “A rock that is sick” among participants prone to incorporate the slang term “sick” to mean interesting, cool, helpful, or any number of things would preclude its inclusion as an MCI category item. Likewise, the NEC category item “A human that is warm-blooded” could be interpreted as a method of distinguishing between “cold-blooded killers” and “warm-blooded humans.” Moreover, scientifically minded respondents may interpret the NEI category item “A solid that is gaseous” as a indicative of a simple phase transition through the process of sublimation, which marks the transition of a solid to a gas, or the process of deposition, which marks the transformation of a gas to solid. Thus, the seemingly endless range of unintended
metaphorical interpretation still presents a serious challenge to those wishing to avoid ambiguous presentation.

One improvement to previous stimuli presentations would be to control the subject, or what Barrett (2008a) would call the “object,” across each category. For example, instead of paring the NEI category item “A triangle that is 4-sided,” the MCI category item “A fly that is immortal,” the CEC category item “A cat that is alive,” and the NEC category item “A circle that is round,” one could control each category by subject. The NEI category item could remain “A triangle that is four-sided,” while the MCI category item would change to say “A triangle that is thinking,” the CEC category item would change to “A triangle that is equilateral,” and the NEC category item would change to “A triangle that is three-sided.” Agential stimuli could also be constructed in the same way. The subject from the NEI category item “An infant that is elderly” could be used in the MCI category item “An infant that is immortal,” the CEC category item “An infant that is growing,” and the NEC category item “An infant that is warm-blooded.” Creative metaphorical interpretations of the stimuli will persist in some form regardless of these efforts and could continue to plague attempts to empirically test MCI theory. More qualitative pre-testing tasks must be undertaken in order to elicit cultural-specific linguistic knowledge and metaphorical predispositions. Otherwise, MCI theory, which serves as a theoretical axis mundi for much of the CSR, will continue to be plagued by poor construct validity, ambiguous stimuli presentation, and justified criticisms of “cultural eliminativism” and psychological reductionism.

While the CSR yearns for widespread scientific credibility, it must take cultural, historical, linguistic, and metaphorical contingencies into account before any connection between intuitive cognitive structures and religious thought and action can be empirically tested or demonstrated. Moreover, future MCI theory experiments should include a more comprehensive
interactional model to test the mnemonic advantages of certain types of privatized public representations. This approach would include the examination of other cognitive mechanisms and mental tools including HADD and ToM in combination with MCI theory to better understand the role of agency detection and the ability to empathetically postulate the goals and intentions of agents; agency is universally accepted to be an integral characteristic of mental and physical actions related to superhuman agents or, according to Barrett (2008b), a belief in gods. Barrett’s (2008b) analysis of cognitive characteristics that substantially constrain the pool of potential beings that might be considered to be gods is explored in more detail in chapter 5.
Several suggestions are offered for future empirical examinations of MCI theory below. Barrett’s (2008a) method for coding and quantifying counter-intuitiveness can be gainfully employed to analyze a wide array of cultural representations in search of minimally counterintuitive concepts. While Barrett (2008a) attempts to illustrate the utility of his method through the example of the concept of “god” in what he considers to be a unified set of “Abrahamic traditions,” this example has the effect of emphasizing many of the problems associated with his method instead of its potential (pp. 325-329). While Barrett (2008a) initially concludes that the Abrahamic God might have a counterintuitiveness score of 10 or more and would be coded as HUMAN\textsuperscript{X+p+p+p+b+b+b+m+m+m}, he eventually reckons that the Abrahamic God “as represented in real-time by non-specialists” (p. 328) might be coded as MIND\textsuperscript{m} and have a counterintuitiveness score of one, which would qualify the Abrahamic God as a minimally counterintuitive concept. He comes to this conclusion by noting the distinctly inhuman characteristics, omnipresence, and disembodied mentality of the Abrahamic God. A single counterintuitive breach of the intuitive Expectation Set of Mentality for the intuitive ontological category for Spatial Entities occurs in private representations of the Abrahamic God because god is assumed to possess the singularly counterintuitive characteristic of the ability to read minds as a well-distributed unbounded substance (Barrett, 2008a, p. 328).

Barrett’s (2008a) example of the counterintuitiveness of the Abrahamic god, however, is problematic for several reasons. First, Barrett’s (2008a) justification for coding the Abrahamic
God as $\mathrm{MIND}^m$ is based on his observation that “God is not commonly (intuitively) represented as omnipresent, but is conceptualized as having a single location [...] that is well-distributed (such as an enormous cloud or unbounded substance)” (p. 328). Barrett (2008a) provides evidence for this conclusion by citing Barrett (1998), Barrett and Keil (1996), and Barrett and VanOrman (1996). While Barrett’s (1998) experiment among 50 Hindus and Muslims in north India supports the notion that respondents view Brahman, Shiva, Vishnu, and Krishna as being situated in a single location, this evidence provides little or no support for Barrett’s (2008a) conclusion that the Abrahamic God should be coded as $\mathrm{MIND}^m$. Moreover, contrary to Barrett’s (2008a) conclusion that the Abrahamic God should be represented as a “disembodied Mentality” or “MIND” (p. 328), Barrett’s (1998) experiment concludes that the basic concept of god “appears to be anthropomorphic, having many physical and psychological properties of humans” (p. 616). Second, like Barrett (1998), Barrett and Keil (1996) and Barrett and VanOrman (1996) provide little support for Barrett’s (2008a) conclusion to code the Abrahamic God as $\mathrm{MIND}^m$ (p. 328). Barrett and Keil (1996) conclude the following: 1) “the overwhelming majority of subjects in all five studies used anthropomorphic concepts to process stories about God, Uncomp, Superman, or Mog, Beebo, and Swek” (p. 241); 2) “anthropomorphization in discourse-processing contexts is not restricted to God [since] other agents may be treated in a similar way” (p. 241); and 3) “[o]ne problem for future research is to find what properties are necessary for an anthropomorphic representation to be used. Perhaps it is the case that any intentional agent is conceptualized using an agent-concept based on people, thus yielding an anthropomorphic representation” (p. 241). Thus, Barrett’s (2008a) conclusion that the Abrahamic God should be coded as $\mathrm{MIND}^m$ is not justified by the relevant empirical data and Barrett’s (2008a) attempt to code and quantify the counterintuitiveness of the Abrahamic God
represents an overly ambitious application for his (2008a) preliminary method. Ultimately, Barrett’s (2008a) example of coding and quantifying the Abrahamic God concepts fails to demonstrate the potential of this new method and ignores Barrett and Keil’s (1996) suggestion that god concepts are not unique in their tendency to provoke “anthropomorphization in discourse-processing contexts” (p. 241).

Qualifying God Concepts

Similarly, while Barrett’s (2008b) analysis of the cognitive merit for conceiving of Santa Claus as a god enumerates five useful cognitive characteristics that substantially constrain the pool of potential beings that might be considered to be gods, his purportedly “suggestive evidence” for the exclusion of Santa Claus as a god concept is largely speculative, culturally-bound, and idiosyncratic. Following Boyer (2001), Barrett (2008b) argues that cognitive theories of religion presuppose that god or religious concepts must be 1) distributed and shared, 2) nothing special and grounded in various non-cultural cognitive factors, and 3) a product of biological evolutionary processes (p. 150). Additionally, Barrett (2008b) enumerates five cognitive qualifications for considering a concept to be a god (i.e., supernatural agent). These cognitive qualifications for a concept’s potential categorization as a god concept require the concept to “be 1) counterintuitive, 2) an intentional agent, 3) possessing strategic information, 4) able to act in the human world in detectable ways, and 5) capable of motivating behaviors that reinforce belief” (Barrett, 2008b, p. 149). In sum, Barrett (2008b) concludes that Santa Claus is not a potential god concept because his counterintuitiveness is inconsistently perceived by respondents, his possession of strategic information is weak and limited, and his motivation for reinforcing behaviors in those that believe in him are limited in their complexity and temporal scope (pp. 154-159). He specifically disqualifies Santa Claus as a god concept because of Santa
Claus’ reliance on magic to obtain or utilize his counterintuitive properties of flight in order to deliver presents regardless of obstacles and to spy on children.

**Problems with Qualifying God Concepts**

Barrett’s (2008b) method of qualifying god concepts is immediately problematic because it assumes that there is a unified and singular Abrahamic God concept, a singular Hindu Ganesha God concept, or codified Maya forest spirits God concepts. Moreover, like McCauley’s (in press) overly simplistic causal model of the naturalness-of-religion thesis, discussed above, Barrett (2008b) ignores the significant properties that arise when gods are viewed in relation to one another. For example, as Ramey (personal communication, June 10, 2010) suggests, “[w]hile Hindus worship Ganesha individually, they also view him in relation to Shiva and Parvati, especially his origin stories. Likewise, Rama and Hanuman are not seen in isolation but in relation to each other and other deities.” Additionally, Barrett (2008b) does not illustrate how any of his examples of successful god concepts uniformly fulfill these five cognitive criteria. This omission leaves several questions concerning this method to the reader to determine. For example, if, in fact, a singular unified God construct of Ganesha could be derived from the minds of Hindus, how might Barrett perceive his trident and axe? Moreover, many deities in the Hindu pantheon have origin stories that explain their transition to supernatural status through what Barrett might consider to be magical means (e.g., Rama or his loyal Hanuman). Would this not disqualify these deities as successful god concepts according to Barrett (2008b)?

Moreover, if Barrett (2008b) disqualifies “an animated cartoon character or a science fiction space alien” as potentially successful god concepts because they fail to live and act in the real world (p. 157), how could he explain the highly ritualized and popular embodiment of
various animated cartoon characters and science fiction space aliens during the festival of Halloween, children’s birthday parties, movie premiers, or annual comic conventions?

How could Barrett (2008b) dismiss Santa Claus as a potentially successful god concept because the behaviors of letter writing, stocking hanging, or tree cutting occur only seasonally (p. 158) when Vinayaka Chaturthi is equally seasonal and may also cause children to behave a little better “only around [Chaturthi] time”? Finally, how can Barrett (2008b) disqualify Santa Claus as a potentially successful god concept because a “belief in Santa fails to outlast childhood” (p. 158) when Saint Nicholas is widely considered to be the Patron Saint of Children and, therefore, attractive to children and children alone? Many widely accepted god concepts, too, are often limited in their popularity during different time periods in a given person’s life and in their popularity amongst various demographic sectors. For example, following Ramey (personal communication, June 10, 2010), “Hindu devotional foci often shift as people change life circumstances. Hanuman is particularly popular in North India among young men. Saraswati is popular among some students. Shiva is popular among some women, especially before marriage.” Taken together, Barrett’s (2008b) method for qualifying god concepts is largely speculative, culturally-bound, and idiosyncratic because it projects uniformity onto highly contested cultural concepts, overly simplifies the emergent properties associated with considerations of gods, unjustifiably disqualifies certain characteristics of concepts because of their “magical” origin, and ignores the temporality and demographically-specific popularity of many god concepts.

**The Counterintuitiveness of Superman**

Instead of replicating Barrett’s (2008a; 2008b) ambitious attempts to define the necessary characteristics and counterintuitiveness of god concepts, the more manageable example of
popular comic superheroes would suffice to illustrate the utility of Barrett’s (2008a) method to researchers interested in the cognitive science of religion. A preliminary example of coding and quantifying the counterintuitiveness of a popular comic superhero is proposed below.

Table 5.1

Counterintuitiveness Coding for Superman

<table>
<thead>
<tr>
<th>Superhuman Example</th>
<th>Categorical Superpowers &amp; Respective Breach/Transfer of Expectation Set</th>
<th>Counterintuitiveness Coding</th>
<th>CI Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superman</td>
<td>superhuman movement (Physicality breach)</td>
<td>HUMAN^p</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>superhuman growth (Biology breach)</td>
<td>HUMAN^p+b</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>unnatural composition (Biology breach)</td>
<td>HUMAN^p+b+b</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>no need for nourishment (Biology breach)</td>
<td>HUMAN^p+b+b+b+b</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>hypersensory ability (Biology breach)</td>
<td>HUMAN^p+b+b+b+b+b</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>accelerated healing (Biology breach)</td>
<td>HUMAN^p+b+b+b+b+b+b</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>omni-linguism &amp; eidetic memory (Mentality breach)</td>
<td>HUMAN^p+b+b+b+b+b+m</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 5.1, above, gives an example for coding and quantifying the counterintuitiveness of the popular superhero Superman. Following Barrett’s (2008a) Simplicity Rule found in Table 3.3 the coding for the concept of “Superman” should assume the simplest conceptual representation that captures the object’s properties. The basic level category for the concept of “Superman” is likely to be HUMAN in the private representations of non-specialists in real-time. The basic level category for Superman, therefore, is coded as HUMAN and would fall in Barrett’s (2008a) intuitive ontological category of Persons. Like Barrett’s initial analysis of the Abrahamic God, the concept of Superman presents several breaches of the intuitive Expectation Set for the intuitive ontological category of Persons, which include assumptions of Universals, Spatiality, Physicality, Animacy, and Mentality. Superman is counterintuitive because of his seven breaches according to Barrett’s (2008a) method: 1) Superman’s ability to pass through solid objects breaches the characteristic assumptions of Solidity within the Expectation Set of Physicality, 2) Superman’s ability to grow at a superhuman rate breaches the characteristic
assumption of growth and development within the Expectation Set of Biology, 3) Superman’s unnatural composition is a breach within the Expectation Set of Biology, 4) Superman’s ability to sustain himself without nourishment is a breach of the Expectation Set of Biology, 5) Superman’s super olfaction, vision, hearing, and breath constitute a breach of the Expectation Set of Biology, 6) Superman’s ability for accelerated healing breaches the characteristic assumption of vulnerability to injury and death within the Expectation Set of Biology, 7) Superman’s ability to understand all languages and his penchant to recall specific sights and sounds at a superhuman level constitutes a breach of the Expectation Set of Mentality.

Again, following the Simplicity Rule, however, Superman may be more simply and accurately coded as a human with the capacity for superhuman movement of an unnatural composition (i.e., HUMAN^{p+b}) in the working memory of non-specialists. Like Barrett’s coding of the Abrahamic God as MIND^{m}, this preliminary method of coding Superman with a counterintuitiveness score of two is only speculative, however, and requires empirical investigation. While the counterintuitiveness of Superman has been sketched above, it is noteworthy that Superman’s superhuman powers have changed over time in response to changes in technology. For example, in the 1940s the early Superman comic writer, Jay Morton, famously wrote the “faster than a speeding bullet, more powerful than a locomotive, able to leap tall buildings in a single bound” running introduction for the superhero (Kahn, 2004, para. 26).

It is also noteworthy that, like Superman’s superpowers, scientific metaphors (e.g., gears, engine, computer, software, neural network) for the mind have also changed throughout time largely with the emergence of new technologies. These metaphors for the mind lend themselves to yet other metaphors, such as the common cognitive scientific reference to our “hard-wired capacities,” which presupposes that other cognitive capacities are based on less intransigent
mediums such as “software.” While the “hard-wired” metaphor may be a descriptive and theoretically correct metaphor, its utility may very well outlive its accuracy. Thus, cognitive scientists of religion must be aware of both the advantages and the limitations that this popular metaphor conveys.

While it remains a largely speculative enterprise without empirical support, a preliminary analysis of Superman as a potentially successful god concept can also be analyzed using Barrett’s (2008b) five-part method for analyzing potential god concepts. First, as discussed above, Superman is counterintuitive, but not minimally counterintuitive. Barrett (2008b) argues that while minimally counterintuitive concepts have an advantage over the larger category of counterintuitive concepts in being selected as god concepts, concepts “having one or two counterintuitive properties helps the spread of a concept by helping it stand out against a background of ordinary concepts (p. 152). Thus, Superman passes the first criterion of counterintuitiveness. Second, Superman is obviously an intentional agent and, therefore, has high inferential potential. Third, several of Superman’s potentially counterintuitive properties including his hypersensory abilities, omni-linguism, and eidetic memory enable him to possess strategic information. Fourth, Superman’s numerous heroic actions present detectable actions in the human world. Fifth, Superman fails to motivate behaviors that reinforce belief. Thus, like Barrett’s (2008b) analysis of the Tooth Fairy, Superman characterizes only four of the five criteria for potentially successful god concepts and, therefore, does not qualify as a potentially successful god concept.

Once more, like the preliminary example of the counterintuitiveness of the popular American superhero Superman found above, Barrett’s (2008b) analysis of Santa Claus as a god can gainfully be employed to deduce the counterintuitiveness of widespread cultural characters
such as Mickey Mouse, the Tooth Fairy, Huckleberry Finn, Odysseus, or Methuselah. McCauley (in press) extends the list of potentially counterintuitive cultural representations even further to include the following:

Yogi Bear, talking wolves that can plausibly be mistaken for grandmothers, [...] Superman, [...] Lassie, Santa Claus, fairies, [...] leprechauns, [...] ghosts, ancestors, angels, and gods [before concluding that] 1) “not all counterintuitive concepts are religious (by any definition);” 2) “the eruption of religious representations in human populations relies neither on a uniquely religious set nor even on any integrated set of sensibilities or cognitive capacities;” and 3) “religion (along with such things as civil ceremonies and superstition, fantasy and folklore, and music and magic) largely results from the latent consequences of normal variation in the operations of fallible perceptual and cognitive heuristics enshrined in human minds that otherwise aid us in managing problems from a wide array of domains.

Like McCauley’s (in press) analysis, future examinations of MCI theory should not limit their investigations to Gods, ghosts, ancestor spirits, deities, or any other characteristics which are perceived to belong to the amorphous category of “religion,” for; as evidenced by Bloch (2008), Boyer (2008), McCauley and Cohen (in press), and McCutcheon (personal communication, May 18, 2010); “religion” is nothing special. Instead, like Barrett (2008b), future examinations of MCI theory should test the theoretical cognitive optimum of concepts popularly described and defined as religious against other popular cultural representations. Unlike Barrett (2008b), however, future examinations of MCI theory should not use a priori definitions of religion, gods, ancestor spirits, or ghosts to delineate their scope of productive inquiry for while practitioners of the cognitive science of religion can certainly shed light on concepts that are popularly described as “religious,” it would be impossible and counterproductive to limit the field to these concepts alone. Furthermore, while Barrett (2008b) admits to “conveniently ignor[ing] historical contingencies, the migration of people groups, the role of the Protestant Reformation, and the efforts of advertisers” in his attempt to “pretend […] that the historical factors are trivial details” (pp. 149-150), he unnecessarily limits his scope to
non-cultural cognitive features of human minds and commits the unfortunate “cultural eliminativism” that has marked cognitive methods of inquiry since their inception and continues to limit the reach of the CSR (A. Geertz, 2008).

**Prospects for MCI Theory and the CSR**

Table 5.2, below, summarizes the major recommendations for future examinations of MCI theory that are found throughout this work. Several of these suggestions would help to redress many of the common criticisms concerning the need for cross-cultural comparative fieldwork in the CSR, the need for a more complex theory of religion in the CSR, and the need to reduce presentation ambiguity and other potential confounds in MCI theory research. Additionally, these suggestions highlight the need to create an interactional model that combines Boyer’s (1994; 2001) MCI theory with an examination of the cognitive mechanisms of HADD and ToM to explore the complex relationships between cognitive mechanisms and counterintuitive concepts. This proposed interactional model would build upon Sperber’s (1996) epidemiological approach to provide the CSR with a better understanding of the role of agency detection and the ability to empathetically postulate the goals and intentions of agents in order to thoroughly evaluate the differential mnemonic and, ultimately, cultural success of certain types of concepts.

Taken together, the Cognitive Science of Religion provides a powerful and quickly emerging field of scientific inquiry into the most fundamental aspects of humanity. Previous experiments concerning MCI theory have suffered greatly from ambiguity, construct validity, cross-cultural applicability, and theoretical complexity; but new methods for coding and quantifying counterintuitive concepts provide researchers with powerful means of empirically evaluating the proposed mnemonic and cultural advantages of certain types of concepts.
Table 5.2

**Summary of Recommendations for Future Examinations of MCI Theory**

<table>
<thead>
<tr>
<th>Recommendation</th>
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<tbody>
<tr>
<td>1. Reduce ambiguity of experimental public representations through extensive</td>
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<tr>
<td>pre-testing, debriefing, and traditional ethnographic methods of participant-</td>
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<tr>
<td>observation and language training.</td>
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<tr>
<td>2. Test for cognitive optimum at different counterintuitiveness scores</td>
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<tr>
<td>following Barrett’s (2008a) revised method of coding and quantifying</td>
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<tr>
<td>counterintuitiveness.</td>
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<td>3. Test for recall effect of various presentation exposure times.</td>
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<td>4. Create a timed computer-based experiment that allows respondents to choose</td>
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<td>how long they view and, therefore, encode a concept to determine if MCI</td>
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<tr>
<td>concepts do take longer to encode than categories of concepts, as postulated</td>
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<tr>
<td>by Gregory and Barrett (2009).</td>
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<tr>
<td>5. Test for recall effect of peer groups versus individual respondents.</td>
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<tr>
<td>6. Test for recall effect of various narrative contexts and genres by refining</td>
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<td>the methods employed by Upal et al. (2007).</td>
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<tr>
<td>7. Employ a sampling strategy from a non-college sample that includes a wide</td>
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<td>age range following Gregory and Barrett (2009).</td>
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<td>8. Allow for individually-forwarded selective attention timing to control the</td>
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<td>potentially varied exposure time required for the successful coding of various</td>
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<td>categories of concepts.</td>
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<tr>
<td>9. Test for differential recall success of counterintuitive versus</td>
</tr>
<tr>
<td>counterschematic concepts in cultural representations.</td>
</tr>
<tr>
<td>10. Extend delayed recall beyond one week or ten days by soliciting different</td>
</tr>
<tr>
<td>sub-samples for a delayed recall task at intervals of 10, 30, 60, 90, and</td>
</tr>
<tr>
<td>120 days following Bartlett’s (1932) seminal serial reproduction studies.</td>
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<tr>
<td>11. Test for the effect of various demographic factors (e.g., sex, gender,</td>
</tr>
<tr>
<td>age, religion) on MCI concept recall levels.</td>
</tr>
<tr>
<td>12. Widen domain of inquiry to include a broader spectrum of cultural</td>
</tr>
<tr>
<td>representations following McCauley (in press) and Barrett (2008b).</td>
</tr>
<tr>
<td>13. Administer ToM examinations and correlate ToM strength with MCI recall to</td>
</tr>
<tr>
<td>test if preliminary studies that indicate a gendered divide in ToM strength</td>
</tr>
<tr>
<td>influence the recall levels of MCI concepts.</td>
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<tr>
<td>14. Continue to refine Barrett’s (2008a) intuitive ontological categories and</td>
</tr>
<tr>
<td>expectation sets in light of advances in relevant fields ((e.g., include</td>
</tr>
<tr>
<td>numeric cognitive systems in Barrett’s (2008a) method of coding and</td>
</tr>
<tr>
<td>quantifying counterintuitiveness following Feigenson et al. (2004)).</td>
</tr>
<tr>
<td>15. Employ a cross-cultural sampling strategy following the early MCI theory</td>
</tr>
<tr>
<td>research of Boyer (2001).</td>
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<tr>
<td>16. Code and score breach and transfer violations separately to determine if</td>
</tr>
<tr>
<td>breaches and transfers constitute an equivalent violation of the expectation</td>
</tr>
<tr>
<td>set of a given intuitive ontological category and, therefore, should be coded</td>
</tr>
<tr>
<td>as equally counterintuitive in Barrett’s (2008a) method as Boyer and Ramble</td>
</tr>
<tr>
<td>(2001) suggest.</td>
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<tr>
<td>17. Refine Barrett’s (2008a) “Simplicity Rule” by examining how a group of</td>
</tr>
<tr>
<td>culturally-trained hypothesis-blind research assistants would code a given</td>
</tr>
<tr>
<td>concept according to Barrett’s (2008a) method.</td>
</tr>
</tbody>
</table>
REFERENCES


July 30, 2009

Daniel Austin Mullins
Department of Anthropology
College of Arts & Sciences
The University of Alabama

Re: IRB # 09-OR-227 “Culture and Cognition: Recall of Counterintuitive Concepts”

Dear Mr. Mullins:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on July 28, 2010. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure Form. If you wish to modify the application, complete the Modification of an Approved Protocol Form. When the study closes, complete the appropriate portions of FORM: Continuing Review and Closure.

Please use reproductions of the IRB approved informed consent form to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Carpantau I. Myers, MSM, CRM
Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama
UNIVERSITY OF ALABAMA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying Information

Principal Investigator
Name: Mr. Daniel Austin Mullins
Department: Anthropology
College: Graduate School
University: The University of Alabama
Address: 45 University Ctr, Tuscaloosa, AL 35487
Telephone: 205-348-1947
FAX: 205-348-4835
E-mail: mull606@crimson.ua.edu

Second Investigator
Name: Dr. Michael Dean Murphy
Department: Anthropology
College: Arts & Sciences
University: The University of Alabama
Address: 45 University Ctr, Tuscaloosa, AL 35487
Telephone: 205-348-1947
FAX: 205-348-4835
E-mail: mdmurphy@crimson.ua.edu

Third Investigator
Name: 
Department: 
College: 
University: 
Address: 
Telephone: 
FAX: 
E-mail: 

Title of Research Project: Culture and Cognition: Recall of Counterintuitive Concepts
Date Printed: 9/14/09
Funding Source: None

Type of Proposal: 
X New

Revision
Renewal
Completed
X Exempt

Attach a revised application
Attach a continuing review of studies form

UA faculty or staff member signature: ________________________________ 6/15/2009

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):

Type of Review: 
X Full board

IRB Action:

X Rejected

X Tabled Pending Revisions

X Approved Pending Revisions

X Approved—this proposal complies with University and federal regulations for the protection of human subject

Approval is effective until the following date:

Items approved:

Research protocol: dated
Informed consent: dated
Recruitment materials: dated
Other: dated

Approval signature: ________________________________ 7/2/2009
UNIVERSITY OF ALABAMA
Informed Consent Form for a Research Study

You are being asked to take part in a research study. This study is called *Culture and Cognition: Recall of Counterintuitive Concepts*. The study is being done by Daniel A. Mullins, who is pursuing a master's degree at the University of Alabama, USA. Dr. Michael Murphy, who is a cultural anthropologist at the University of Alabama, USA, is supervising Mr. Mullins.

**What is this study about?**

The purpose of this study is to test the memory for different kinds of material you read and hear.

**Who is eligible?**

Only students from advanced English classes who are at least 19 years old are eligible to participate.

**Why is this study important—What good will the results do?**

This study will contribute needed cross-cultural data to current debates in the fields of anthropology, psychology, cognitive sciences, and sociology.

**Why have I been asked to take part in this study?**

You have been selected for this study because you are a university student who has demonstrated high levels of competency in the English language.

**How many people besides me will be in this study?**

Between 120-140 other people will be in this study.

**What will I be asked to do in this study?**

If you decide to be in this study, you will be asked to recall items that you have read or have been read to you.

**How much time will I spend being in this study?**

This study will take 30 minutes to complete.

**Will I be paid for being in this study?**

You will not be paid for being in the study but you will receive a University of Alabama pencil and a postcard from the state of Alabama for participating.
Will being in this study cost me anything?

There will be no cost to you except for your time in completing the interview.

Can the researcher take me out of this study?

No. The researcher will not take you out of this study for any reason.

What are the benefits (good things) that may happen to me if I am in this study?

There are no direct benefits to you.

What are the benefits to scientists or society?

This study will help social scientists, cognitive scientists, psychologists, and many others better understand the relationship between human cognition and culture.

What are the risks (dangers or harm) to me if I am in this study?

Participants in this study are not putting their identities at risk. The individual names of those who participate in this study will not be recorded. Responses will be kept secure and confidential. Responses will be kept without individual identifiers and the researcher has no link to participants. This research could not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

How will my confidentiality (privacy) be protected? What will happen to the information the study keeps on me?

No names or corresponding identifiers will be recorded, so there is no risk of compromised confidentiality.

What are the alternatives to being in this study? Do I have other choices?

If you are not interesting in continuing your participation in this study for any reason, you are free to drop out of the study at any time.

What are my rights as a participant?

Taking part in this study is voluntary—it is your free choice. You may choose not to take part at all. If you start the study, you can stop at any time. Leaving the study will not result in any penalty or loss of any benefits you would otherwise receive.

The University of Alabama Institutional Review Board (IRB) is the committee that protects the rights of people in research studies. The IRB may review study records
from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I contact if I have questions or problems?

If you have questions about the study right now, please ask them now or contact the individuals listed below. You will be provided a copy of this entire consent form. Please retain this form. This page contains the contact information for the researcher, his advisers, and University of Alabama Office of Research.

**Researcher:**
Daniel A. Mullins
Phone: 00-1-334-414-8285
Email: mulli006@crimson.ua.edu

**Research Advisor:**
Dr. Michael D. Murphy
Phone: 00-1-205-348-5947
Email: mdmurphy@tenhoor.as.ua.edu

If you have any questions about your rights as a participant in this study, please contact:

**University of Alabama Office for Research:**
ATTN: Ms. Tanta Myles – Participant Concern
Box 870104
Tuscaloosa, AL 35487-0104
Email: cmyles@fa.ua.edu
Phone: 00-1-205-348-8461

The study has been explained to me. I understand what I will be asked to do. I freely agree to take part in it.

Do you understand what has been explained to you and asked of you? If yes, please print your name, sign, and date below:

Please print your name:

______________________________

Please sign your name:

______________________________

Please record the date (day/month/year):

______________________________