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Darwinian Bases of Religious Meaning: Interactionism, General Interpretive Theories, and 6E Cognitive Science

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Abstract

Interactionism holds that explanatory and interpretive projects are mutually enriching. If so, then the evolutionary and cognitive science of religions' explanatory theories should aid interpretive projects concerning religious meaning. Although interpretive accounts typically focus on the local and the particular, interpreters over the past century have construed Freud and Marx as offering *general* interpretive theories. So, precedent for *general* interpretive theorizing exists. 4E cognitive science, which champions how cognition is *embedded* in natural and cultural settings, *extended* into external structures, *enacted* via motor routines, and *embodied* via representations rooted in human bodily form, has encouraged interpretive researchers. Theories of embodied cognition especially have embraced a sweeping view of meaning that attends to the emotions' role and to their evolutionary origins. That inspires a *6E cognitive science* that attends to the *emotional* and *evolved* dimensions of cognition too and opens up the possibility of general interpretive theories of broadly Darwinian character. Evolved cognitive systems qualify as maturationally natural cognition, which exhibits a distinctive constellation of features. The by-product theory holds that religious representations' engagement of maturationally natural cognition fosters religions' success. Representations with some minimal violation of intuitive expectations concerning some ontological category grab attention, stick in memory, and preserve the many automatic inferences accompanying the category. The empirical evidence for this and other elaborations of the by-product view suggests that it discloses dynamics of evolved cognition and associated emotions that tend to guide the pursuit of religious meanings systematically toward well-worn grooves in the semantic landscape.

Keywords

interactionism – general interpretive theories – embodiment – maturationally natural cognition – 6E cognitive science – by-product theory

1 Prologue

Meaning is a mess or, at any rate, a muddle. Ironically, the contemporary ubiquity of the meaningful has threatened to render meaning meaningless. After an era in philosophy, in which some schools of thought attributed meaning to nothing but a subset of sentences, now there seems to be nothing which people are unanimously unwilling to attribute it. As long as some intentional auditor is around to note it, *anything* has the potential to be meaningful.

That all-embracing conception is driven, among other things, by a concern with common usage, where the term “meaning” and its cognates are employed nearly indiscriminately. Nothing is ineligible. Not only are language and its use capable of carrying meaning, so are events, times, places, substances, actions, interactions, personal relationships, organizations, institutions, social arrangements, artifacts, and psychological states and processes, to note but some of the most prominent candidates.

At the head of that list, though, are an individual’s *experiences*. This generous conception of meaning resonates with the contemporary celebration of diversity. No two persons are identical and not even identical twins have the same life histories, therefore no two persons have exactly the same realms of meaning. Each individual’s lived experience serves to differentiate exactly what the world means for him or her from what it means for everyone else. On this wide-ranging conception, meaning has an inherently idiosyncratic dimension. The personally meaningful has displaced meaning for a community as the prototype of the meaningful.¹

1 I am grateful to Charles Nussbaum for pointing out that we can, presumably, still differentiate kinds of meanings. So, for example, an action is deemed meaningful when it is purposeful, whereas an experience is meaningful when it has an emotional impact (perhaps after the fact). By contrast, symbolic materials, including statements, and representations have meaning by virtue of their contents. Thus, my focus in this paper on meaningful experiences is not because experiences are the sole repositories of meanings, but because accounting for the meaningfulness of experiences has been the principal project of efforts at forging general interpretive theories within cognitive science. That said, the line of argument advanced herein in terms of the influences of evolved, maturationally natural cognitive systems on the

Besides accommodating profligate everyday usage and the preeminence of individuals' experiences, this expansive view of meaning also squares with the current popularity of elevating *contextual* considerations in accounts of the behaviors of complex systems. Such systems' sophisticated functioning can turn as much or even more on the influences of the vast range of varying circumstances in which they might be situated and their differential responsiveness to those circumstances as on any intricacies of their underlying organization that might inform that responsiveness. So, anything may be meaningful, but not only *not* in every situation but sometimes in hardly any situation. A corollary of the dictum "context matters" is that context matters for meaning.

Still, because of what seems the limitless range of possible meaning attributions, very nearly any coherent analytical proposal would seem to have a solid probability of catching some of the truth. In these circumstances, such analytical proposals risk little. What follows, however, is a proposal for advancing a specific class of *general* interpretive hypotheses (viz., what might be broadly construed as Darwinian ones) in the face of this near anarchy of significance. Their aim is to delineate general patterns of meaning attribution. In contrast to most interpretive proposals, the generality of their scope, the details of their analyses, and their resulting empirical culpability put a good deal at risk.

2 Introduction

More than three decades ago, Tom Lawson and I (1990) argued for an interactionist approach to the sociocultural and, thus, to religions. In this regard, we opposed the prevailing interpretive exclusivism of so much recent religious studies and cultural anthropology, which claims that interpretive approaches are the *only* viable approaches to studying religious and cultural matters. Instead, we endorsed *both* interpretive and explanatory approaches to religions. Interactionism holds, in short, that interpretive and explanatory projects are mutually enriching and partially dependent upon one another (Thagard, 2019, 224, 250). It underscores how fertile interpretations provide a wealth of categories for initiating new explanatory theorizing, while successful explanatory theories present frameworks for (tentatively settled) facts that constrain subsequent interpretive ventures.

attribution of religious meanings seems no less applicable to purposeful religious actions or the contents of religious symbols.

This paper develops and extends those claims in what is, I suspect, an unexpected direction. Here I will propose that some empirically accountable, explanatory theories (concerning evolutionary and cognitive matters) and their abstract, thin² descriptions of religious phenomena offer valuable resources for systematically elucidating some bases of religious meaning. The aim here is to suggest how explanatory theorizing about such matters can serve to generate hypotheses pertaining to religious meanings that are simultaneously *general and substantive*. My thesis, in short, is that explanatory theories can contribute *directly* to interpretive endeavors.

The first section maintains that, although the contemporary interpretive focus is on the particular and the local, nothing rules out the possibility of formulating systematic interpretive theories that might prove generally applicable. Painting with an extremely broad brush, it then raises two families of examples from the past as precedents for this proposal. The second section explores 4E cognitive science's resources for offering general interpretive theories. 4E cognitive science stresses how cognition is so regularly *embedded* in specific natural and cultural settings, *extended* into external structures, *enacted* via motor routines, and *embodied* via cognitive representations rooted in aspects of human bodily form. I argue in this section, first, that a proposal in the cognitive science of religions (Whitehouse, 2021) furnishes ample resources for distinguishing types of contexts in which cognition can be embedded, extended, or enacted, but second, that, among the 4E's, it is theories of embodied cognition that have most clearly motivated and embraced a sweeping view of meaning and demonstrated the greatest promise for generating interpretive theories with general applicability. The third section emphasizes that accounts of embodied cognition inevitably involve attention to the emotions and that any satisfactory account must encompass many of those emotions' evolutionary origins. Those considerations inspire a case, then, for a *6E cognitive science* that gives equal attention to the *emotional* and *evolved* dimensions of cognition. Picking up on that suggestion, the fourth section introduces the prospect of general interpretive theories of a broadly Darwinian character that look to evolved aspects of cognition. The workings of such evolved cognitive systems qualify as maturationally natural perception, cognition, and action, which, collectively, exhibit a distinctive constellation of features. The by-product theory in the cognitive science of religions holds that it is precisely religious representations' engagement of such mental systems that is one of the keys to religions' success. The last section enlists Pascal Boyer's (1994) contention that popular

² For an account of thin descriptions, their virtues, and the contrast between them and thick descriptions, see McCauley (in press).

religious representations approximate a cognitive optimum. Representations with some minimal violation of intuitive expectations concerning some ontological category simultaneously grab attention and stick in memory, while preserving the complex of automatic inferences accompanying the category. The empirical evidence in support of this and other elaborations of the by-product view suggests that it discloses dynamics of evolved cognition and associated emotions that tend to guide the pursuit of religious meanings systematically toward well-worn grooves in the semantic landscape.

3 Generally Applicable Interpretive Theories

Although interpretivists' proliferation of meanings continually generates more things than are dreamt of in our philosophies, those things are typically local and particular, especially in an era that celebrates diversity and lived experience. When meanings hang on the subject and the locale, in all of their particularity, interpretations are unlikely to furnish much that is generalizable.³ Under such circumstances, everything risks remaining little more than details.

What is the connection between interpretations of the local and particular *in terms of thick descriptions of the local and particular* and the pursuit of more generalizable accounts of human conduct, mental life, social arrangements, and *meanings*? In the decades since Lawson and I defended interactionism, many philosophers of science have endorsed similar positions that reject the interpretivists' (and, I would add, the logical empiricists') strong distinction between interpretive and explanatory projects, between the *geisteswissenschaften* and the *naturwissenschaften*.

Mark Risjord (2000) holds that interpretations proffer what are, in effect, local and particular *explanations* of individuals' behaviors and mental lives in some set of temporally and culturally bounded circumstances. Both considerations of internal consistency and, as Lawson and my case for interactionism argues, considerations of general coherence with what else is known constrain these interpretive explanations.

On what Kareem Khalifa (2019, 287) describes as a "thin account of explanation," the understanding that an interpretation produces is a species of

3 Sometimes, as with some great works of art, the *objects* of interpretations elicit intimations of the perennial. These art works' signal accomplishments, in what are often straightforward portrayals of particularity (e.g., Prince Hamlet and his turmoil in the face of familial crises) and locality (e.g., the court of Denmark at Elsinore at a time of royal and national upheaval and transformation), are that they offer glimpses, if not of the universal, then, at least, of consistently recurrent dimensions of the human condition.

scientific understanding.⁴ This lays the groundwork for a conception of interpretation and explanation that construes them both as activities for enhancing our (scientific) understanding of the world.

Of a piece with that contention, nothing in principle precludes *general* interpretive theories. Paul Thagard (2019, 229) comments that while interpretive accounts, proposing connections between particular events, often take the form of narratives that lay out what happened, general interpretive theories aim to show *why* it happened, i.e., why such connections hold between (types of such) events. Nothing about the prominence of particularity and locality in interpretations disallows the possibility of more systematic interpretive analyses.

Before proceeding further, I should note that I am using the term “theory” and its cognates here in a very wide sense, in which *any scheme of ordering and categorizing things*, in effect, constitutes a (usually tacit) theoretical orientation toward the world. In this expansive sense of the theoretical, interpreters (just like everyone else) make theoretical presumptions all of the time (whether they realize this or not). Their interpretive activities display theoretical commitments in this sense on at least two prominent fronts.

First, the thing that prevents interpretations from lapsing into nothing more than just listing details is interpreters’ decisions about which details to list. The details are endless, and interpreters (e.g., fieldworkers) *must* make choices about those most worthy of scrutiny. Presumably, those decisions are not arbitrary. Whatever cognitive or intellectual factors influence their choices are, in effect, theoretical influences on the shape and content of their interpretations. In their research reports interpreters’ selections of targets for discussion among the details of the religions or cultures that they study reflect what are often unrecognized, implicit interpretive theories that stand behind those decisions. Those theoretical presumptions identify the details that matter, i.e., the details that should be selected or sought out (if they yet remain undisclosed or undiscovered).

The second activity of interpreters that exposes their implicit theoretical commitments is their attempts at using (often quite familiar) abstract concepts (‘religion,’ ‘ritual,’ ‘priest,’ ‘sacrifice,’ ‘shaman,’ ‘initiation,’ ‘altar,’ ‘divination,’ and so on) *consistently* to categorize and characterize those religious details. Even

4 Contrary to interpretive exclusivists, Khalifa thinks that interpretive understanding does not involve anything that differs fundamentally from the varieties of scientific understanding that arise in the natural sciences. He suggests (2019, 294–95) that to think otherwise is, among other things, to rely on unrealistically narrow views of explanation in the natural sciences or to fail to recognize the diverse forms of understanding that the natural sciences support. (Also see Thagard, 2019, 250–51.)

the most specific and focused interpretations of religious materials inevitably use concepts of lesser and greater abstractness (Johnson & Tucker, 2021, 260–64). Interpreters' preferred interpretations of the religious materials that interest them and the concepts those interpreters employ reveal their tacit theoretical commitments about what things there are and how they work.

We do not customarily think of these concepts as steeped in theory because they are so familiar.⁵ The assumptions underlying such well-worn categories are mostly tacit, which is to say that, at least most of the time, we do not entertain them either reflectively or even consciously. Tacit theoretical assumptions tend to remain that way. They mostly go unexamined so long as the resulting interpretations do a tolerable job of making sense of things.

Interpretations, just like the explanations of science, utilize thin descriptions that operate with abstract, theoretically infused concepts. Thin descriptions and the theoretical frameworks that they reflect pinpoint *the details that matter* either by highlighting recurrent patterns, or by delineating the causal processes that figure in those patterns, or by characterizing the mechanisms that are responsible for both.

The continuities between, on the one hand, such implicit theoretical assumptions that stand behind interpretations and the thin descriptions that they deploy and, on the other hand, the well-articulated explanatory theories in the sciences that explicitly commend abstract, thin descriptions of their objects of study, opens up the possibility of explicit, generally applicable, *interpretive* theories. To repeat, of a piece with Risjord, Khalifa, and Thagard's positions, nothing stands in the way of formulating general interpretive theories similar to general explanatory theories in the sciences. At least two families of candidates come to mind from interpretive work in religious studies and cultural anthropology across the previous century.

Freudian and Marxist interpretations of religious forms and other cultural materials (including literary works) are examples of theoretical positions used for interpretive purposes that aspire to general applicability. Their broadest proposals that human sexuality and people's material circumstances, respectively, influence what those people take to be meaningful *are* promising starting points for fashioning systematic interpretive theories. These auspicious suggestions about sexuality and the material infrastructure have led to a considerable variety of Freudian and Marxist descendants. That both Freud and Marx are members of the club of dead, white males that so many contemporary interpretivists eschew does not undercut the central point here, viz., that

5 I subscribe to Karl Popper's (1992, 119) claim that "all terms are theoretical to some degree, though some are more theoretical than others."

the work and influence of both constitute important precedents for envisioning general interpretive theories.

Although these two general interpretive theories (and their progeny) have enjoyed considerable currency over the past hundred years, problems hobble ambitions in their behalf for providing systematic accounts of human conduct and sociocultural arrangements – let alone meanings. The first problem is that both prove insufficiently precise about their empirical consequences so that they usually remain safely insulated from telling empirical testing. Advocates for Freudian or Marxist accounts have touted the sweeping explanatory scope of those interpretive theories and cited the positions' explanatory power. As Karl Popper (1992) argued nearly a century ago, however, the crucial questions for interrogating theories concern what kinds of empirical findings (if any) those theories bar, for theories that explain everything explain nothing. Since they rule little or nothing out, they can hardly be tested, and if they can hardly be tested, they are unlikely to ever be falsified. If they cannot be falsified, then, Popper argued, they lack empirical content. It is the answers to questions about what these theories *preclude* that provide direction to scientists about how to test these general interpretive theories' explanatory power. Freudians and Marxists are, by no means, the only theorists to display confirmation bias, but they have tended to focus on all that their theories (appear to) explain.

A second problem in Freud's case is that where the empirical consequences of his position appear to be susceptible to empirical tests, they do not prove to be especially well-supported. Although Freud's general contention that unconscious mental processing is causally influential has received extensive support from research in cognitive science (Reber, 1993; Reber & Allen, 2022), where his detailed psychological proposals about such processing present clear empirical predictions, they have largely failed to accord with researchers' findings (Grünbaum, 1984).

The situation with Marx is different. Certainly, Marx's expectation that socialism would arise first in Western Europe and America was incorrect. Notwithstanding both the aptness of many of Marx's criticisms of capitalism in his own time (no less than their aptness today) and the clear relevance of their material circumstances to the fates of human societies (Diamond, 1998), at least two factors have overshadowed Marx's position. Neither need undermine its explanatory power, but in conjunction with the first problem above, they have tended to steer scientists in other directions. The first factor is the problematic (at best) character of the putatively Marxist regimes of the last hundred years. Even if intellectuals often disavow them – maintaining that they involve mis-readings, if not outright perversions of Marx's views – the collapse of most of those regimes three decades ago, the oppressive character of all of them, and the eventual divergence from Marxist principles (with

the widespread revival of market mechanisms and concentrations of wealth) in the most sizable of them, viz., the People's Republic of China, inevitably leave nagging questions about ambitious claims for Marxist accounts of events. The second factor is, quite simply, that impressive empirical evidence mounts for the causal salience of an array of alternative variables for explaining great swaths of the behavior of individuals and societies that have no obvious connections to the considerations that Marx championed (Boyer, 2018; Henrich, 2020).⁶

To be clear, though, *none* of these reservations about these positions constitute a complaint about these theorists' (or others') aspirations to advance *general* interpretive theories.

4 4E Cognitive Science

Some researchers in the cognitive sciences over the past few decades have also aimed at providing general theories bearing on the project of interpretation. Expanding, in the last two decades of the twentieth century, beyond its earlier focus on formalisms and on an analogy between the mind and digital computers, cognitive science has witnessed the ascent of more wide-ranging conceptions of cognition (Johnson & Tucker, 2021, pp. 105–110). Reference to “4E” cognitive science has become one of the standard conventions in the field (Menary, 2010).

4E cognitive science argues that accounts of the workings of the mind/brain's mechanisms do not exhaust all that can be captured *systematically* about cognition and human behavior (e.g., Clark, 2008). The 4Es headline the fact that cognition is also typically

- *embedded* in a physical and sociocultural environment (e.g., what is involved in knowing how to square dance)
- *extended* by means of offloading and ordering information in external structures in the environment (e.g., the coded coordination between books' locations on the shelves and a library's catalogue)
- *enacted* through practice and the development of motor routines that can facilitate and even initiate complex cognitive accomplishments (e.g., learning arithmetic operations on an abacus)⁷

6 I am grateful to Jorge Lizarzaburu for his clear-eyed view of Marx's intellectual legacy on these fronts and for his wise counsel.

7 When performing in new productions of Wagner's operas at Bayreuth after World War II, in which Wagner's grandson Wieland had eliminated Wagner's prescribed choreography, the German dramatic, bass-baritone, Hans Hotter had to “unlearn how I used the spear when I

– *embodied* to the extent that concepts are rooted in humans having bodies that have characteristic configurations and orientations (as reflected, for example, by the plethora of bodily-based metaphors in ordinary language – from the *foot* and *head* of a bed to the *mouth* of a *body* of water).

Of course, these four categories overlap. Both an abacus and a library's catalogue, for example, are technological elements of sociocultural environments. Square dancing and knowing how to do so hang on enacting and embodying patterns in concert with other people (who are doing the same thing) in conjunction with appropriate music in a large, but limited, range of physical settings.

Embedded and extended cognition primarily concern ways in which *context* matters. As Geertz's (1973) famous discussion of an account of an episode of the theft of sheep in early twentieth century Morocco illustrates, the sociocultural context sometimes makes a significant difference in how some behaviors are best interpreted. The salient point for now is that something like a satisfactory characterization of this case involves, precisely, citation of "early twentieth century Morocco," i.e., *local* references regarding time and place.

These same factors can entangle enacted cognition in the local and the particular. To the extent that the candidate movements and actions underlying cognitive states depend upon the sociocultural context, enacted cognition is also wedded to the peculiarities of cultures. Actions connected with culturally distinctive technologies (e.g., a sliderule) are among the most conspicuous illustrations of such context-bound cognitive enactment.

Contexts unquestionably matter; however, mostly focusing on context is the quintessence of interpretation that is driven by locality and particularity. The insights wrought from attention to cognition as embedded and extended in the physical and cultural environs will inevitably rely on those environs' details, i.e., on their particular features. Such emphases do not completely preclude general theorizing, but they can limit the thinness of the descriptions of contexts that they might encourage.

By approaching such contexts via the cognitive forms that they engage, the cognitive science of religions has generated theoretically informed, abstract categories concerning *types of contexts*. Specifically, a theoretically productive categorization of contexts hinges on the *learning strategies* that different sociocultural circumstances elicit. Harvey Whitehouse (2021, p. 25) distinguishes between learners having to deal with the causal opacity of teachers' actions that turns on the learners' (and sometimes *even the teachers'*) lack of understanding

sang" Wotan, as he had originally learned the role with not only all of Wagner's words and music but all of his prescribed *gestures* as well (Mauceri, 2022, 26).

of the underlying causal structure at stake (e.g., in the Tukuanoans' processing of manioc, which renders this toxic plant edible⁸ – Henrich, 2016, pp. 97–100), as opposed to that which turns on some “random normative convention” connected to a group's identity (e.g., in initiations – Barth, 1975). Learners in the first sort of setting take an “instrumental stance,” whereas in the second sort they take a “normative” or “ritual stance.”

Of course, in *both* contexts it seems prudent to imitate, and that is what people do. On the surface, then, learning basically looks the same in both contexts. Differentiating instrumental and ritual contexts on the basis of their surface features is often not easy. That is especially so when not even the teachers are clear about the causal processes that lie behind complex instrumental accomplishments. Whitehouse argues, in effect, that the most practical way to distinguish these two types of contexts is to look to the differences in the kinds of cognition that they give rise to.

So, one theoretically salient question concerns any evidence that children (as paradigmatic *learners*) draw this distinction, at least implicitly, between instrumental contexts, on the one hand, and normative or ritual contexts, on the other. Cristine Legare, Whitehouse, and their colleagues' (2015) experiments supply evidence that they do. Their findings show that young children are already sensitive to cues that indicate whether contexts and behaviors call for adopting the instrumental or the ritual stance and that that determination influences both their cognition and behavior and, it seems reasonable to assume, *what they find meaningful* in and about each kind of case. Experiments they conducted with 4- to 6-year-olds reveal that when they take the normative, ritual stance, children are (1) more faithful and comprehensive imitators, (2) more sensitive to deviations, and (3) less likely to introduce new elements than when they take the instrumental stance. This was true whether the cues about the stimuli were verbal (e.g., “this is how we do it”) or not (e.g.,

8 Manioc (cassava) is a hearty tuber that serves as a major crop in many tropical environments in the South Pacific, South America, and West Africa (where the Portuguese brought it in the seventeenth century). Bitter varieties of manioc thrive even in forbidding environments with poor soil, in part, because they contain cyanogenic glucosides, which ward off creatures that try to eat it by producing poisonous hydrogen cyanide. If humans consume unprocessed manioc it can produce either acute or chronic poisoning, depending upon the levels of cyanogenic glucosides that the particular variety contains. Henrich (2016, 97) states that “chronic poisoning, because it emerges only gradually after years of consuming manioc that tastes fine, is particularly insidious and has been linked to neurological problems, developmental disorders, paralysis in the legs, thyroid problems (e.g., goiters), and immune suppression.” To minimize the chances of such chronic poisoning, a week-long, highly labor intensive method involving more than a half dozen procedures for processing manioc that rids it of more than 95% of its cyanogenic glucosides has evolved among the Tukuanoans of Columbia.

behaviors that are causally opaque but simply end up returning things to just as they were at the beginning). These findings suggest that humans have an early-developing *norm psychology* that is driven by affiliative goals and that is every bit as fundamental to thriving as the psychology underlying the management of instrumental challenges.

Four points matter here.

- (1) The thin theoretical characterizations of these two types of contexts, in which cognition can be embedded and extended, hang, in no small part, on features of the cognitive processing involved.
- (2) This cognitive account of these two types of contexts constitutes a general interpretive theory that is eminently *testable*.
- (3) Of a piece with point (2), Whitehouse (2021, chapter 1) cites a few dozen experimental studies in cognitive science that test, corroborate, and extend this theory's implications for people's judgments and behaviors, which signals
- (4) that this general hypothesis, utilizing thin, cognitively based descriptions of instrumental and ritual stances and contexts, provides conceptual tools that offer both behavioral predictions and *interpretive power* about trends pertaining to the meanings participants are likely to associate with each.

Among the 4Es, however, it is in treatments of embodied cognition where scholars have pursued the most ambitious projects for developing general interpretive theories. They are ambitious, first, in the sense that they argue that embodied cognition is both comprehensive and foundational. For example, Mark Johnson and Don Tucker (2021, 116) assert that “all our meaning is rooted in and grows from our bodily transactions with our world.” They do not confine the scope of this assertion to linguistic meaning. On their view linguistic meaning certainly arises from human embodiment (Johnson, 1987), but linguistic meaning is not the only thing that counts as meaningful. (See footnote 1 and Gallagher, 2005; Johnson, 2007). For them embodied meaning “underlies all of the other nonlinguistic meaning processes involved in symbolic, communicative activities” (2021, 255) including everything from gesture to the arts to ritual. Johnson and Tucker employ a conception of meaning that is simultaneously expansive and personal. They affirm that something's meaning is a function of “the experience [that] it evokes ... Meaning is relational – it involves relations among experiences *for a person*” (2021, 10). They stress that the pertinent processes of meaning-making are overwhelmingly implicit, operating below the level of consciousness.

A general commitment to 4E conceptions of cognition and the overlap of the four categories notwithstanding, accounts of embodied cognition are

ambitious in a second sense. They stand apart from the other three E's as bases for general interpretive theories, since in at least one noteworthy regard embodied cognition and the meanings that flow therefrom do *not* rest on the sociocultural context. That holds precisely to the extent that the distinctive underlying biology of *Homo sapiens* determines the character of embodied cognition (Barsalou, 1999). Of course, it is crucial to note straightaway that that determination is neither complete nor absolute. Culture has myriad influences on embodiment – from preferred foods to physical alterations of people's bodies (scarification, foot binding, surgical interventions, etc.). Therefore, culture has myriad influences on the character of embodied cognition. But *not everything* about embodied cognition is culturally specific. Most of the considerations that theorists like Johnson and his collaborators raise concern what our experiences of our bodies have in common. That includes such things as spatial relations (e.g., containment), orientations, and directions as well as motions, paths, forces (and barriers and counterforces), balance, and so on.

Most of the evidence these theorists cite in support of their accounts of embodied cognition is linguistic. That is consonant with long-standing practice in those quarters of cognitive science concerned with the relationship between language and mind, where, until this work's appearance, the principal focus had been on syntax. Theorists concerned with embodied cognition, by contrast, have discussed their theories' abilities to make sense of a wider range of linguistic phenomena, including issues of discourse and pragmatics and especially semantics (categorization, metaphor, framing, conceptual blending, etc.). They also explore how their accounts of embodiment accord with research in neuroscience and computational modeling (Lakoff & Johnson, 1999). Although these theorists' arguments and analyses mostly focus on their theories' consilience, i.e., their abilities to organize and make sense of linguistic and psychological patterns and phenomena, resourceful experimentalists have also ascertained ways of testing various of their empirical consequences (e.g., Gibbs, 1994; 2005). Their comparative success in the face of such experimental tests helps to substantiate their aspirations to serve as *general* interpretive theories.

5 Embodied Cognition Calls for a 6E Cognitive Science

Any plausible account of embodied cognition must allow for emotions and the (bodily) feelings that they cause. In *The Meaning of the Body*, Johnson (2007, 53) comments that “emotion and feeling lie at the heart of our capacity to experience meaning.” This claim does at least two kinds of work. First, it

specifies that, on the broad conception of meaning under consideration here, any situation that elicits an emotion and its associated feelings is a candidate for something that can count as meaningful. Second, as Antonio Damasio (1994, 1999, 2003; also see Thagard, 2006) has argued at length on the basis of research in both clinical neurology and neuroscience, *all* cognitive processing has an affective dimension.

Emotions, in effect, disclose humans' *appraisals* of the various circumstances in which they find themselves. They are "our most elementary way of taking the measure of our current or anticipated situation and responding to it" (Johnson, 2018, 636). Five aspects of those emotionally driven appraisals stand out.

(1) The appraisals and the responses that they initiate are *automatic*. They happen "before you know it" (Johnson, 2007, 57). Their automaticity is a way of conserving cognitive resources. If humans had to consciously attend to all of the matters that bear on maintaining homeostasis and consciously undertake all of the adjustments required, they would never get anything else done.

(2) Emotions should be *distinguished from the feelings* that usually follow them. The feelings are at least as much *effects* of the emotions as the automatic (action) responses are. The emotions and the responses are, however, not just automatic, they are immediate, whereas the feelings may not be. The emotional appraisal and the response are initiated *before* any feelings that might occur. The feelings may be delayed; they may also be faint. Feelings do not always rise to the level of consciousness, and when they do, people may, for any number of reasons, ignore or deny them. Although feelings, often strong feelings, characteristically accompany emotions, they are not necessary either for those emotions or for their associated automatic responses.

(3) Those automatic responses are not mere passive, *post hoc* registrations of inputs. These automatic responses *often constitute the springs of actions*. Johnson emphasizes that those actions are "geared to produce fluid functioning within our environment" (Johnson, 2007, 61). They constitute what are typically appropriate behavioral responses to emotion-laden situations in which humans find themselves, e.g., rapidly withdrawing from an agitated rattlesnake.

(4) Appraisals of situations' probable impact on individuals' well-being stand at the core of *what those situations mean* for their lives. Johnson (2007, 66) observes that "our world (our situation) stands forth meaningfully ... due primarily to processes of emotion and feeling over which we have little control. *And yet the situation is meaningful to us in the most important, primordial, and basic way that it can be meaningful – it shapes the basic contours of our experience.*" As noted, this is a generous conception of meaning aimed at capturing most, if not all, of the ways in which that term is appropriated in contemporary

discourse, including, of course, most, if not all, of the ways in which it is appropriated in religions.

(5) Talk of the role of the emotions in assuring humans' "fluid functioning," their "appropriate behavioral responses," and their "well-being" assumes that the emotions are *adaptations*. To assume, as Johnson does, that the emotions operate for our benefit⁹ is to hearken to their *evolutionary heritage*. Johnson (2007, 60, 58) states that the emotions "are mostly conducive to our survival" and that they "evolved to evoke changes within the organism and motivate it to act in ways that tend to be conducive to its welfare." The focus on individuals' welfare alone may be too narrow, since the pan-human emotions, many of which other species share, evolved to lead animals, more pointedly, to reproductive success, but under most circumstances that closely approximates individuals' welfare in the sense Johnson intends.

Pondering the respects in which cognition is embodied will inevitably implicate its emotional dimensions, and the key to understanding cognition's emotional dimensions is to examine their evolutionary foundations. It is in the light of such considerations that both Johnson (2018) and (McCauley, 2020) have argued that the 4E conception of cognition is at least 2E's too few.¹⁰ A 6E conception of cognition, which gives *emotion* and *evolution* their due, will offer a richer account of cognition. Given the *pervasiveness* of the emotional coloring of cognition that Damasio stresses and given the *entrenchment* of evolved dispositions of mind (Wimsatt, 2007, 134–44), these two E's deserve no less attention than the original 4E's and, arguably, more than the first three (as listed earlier).

6 General Interpretive Theories of a Darwinian Sort, Maturationally Natural Cognitive Systems, and the By-Product Theory

4E cognitive science and an emphasis on embodiment, in particular, inevitably implicate emotion and evolution in cognition, but both also merit attention on grounds independent of anything having to do with the 4E's. My goal, however,

9 Johnson (2007, 58, fn. 2) recognizes that emotional responses can sometimes lead to counterproductive or even self-destructive behaviors. He mentions agoraphobia as an example. Still, he thinks that generally the "emotions tend to preserve the flourishing of the organism."

10 More accurately, Johnson (2018) makes a case for 7E cognitive science. He advocates adding not just emotion and evolution, but exaptation as well. Exaptation concerns issues that its inventors straightforwardly construed as evolutionary (Gould & Vrba, 1982). Consequently, Johnson (personal communication) agrees that it is simpler to include it within the purview of evolutionary considerations.

is not to contribute to those research programs here. Scholars have already pursued such projects with regard to both emotion and evolution in depth and at length (Barrett et al., 2017; Buss, 2005). Instead, I want to briefly explore the prospects for accounts of evolved cognition and its emotional dimensions to spawn general interpretive theories that will systematically illuminate aspects of religious meanings.

It seems fair to say that such general interpretive theories will be Darwinian in spirit, since first, Charles Darwin's (1979 [1859]) account of biological evolution by means of natural selection in *The Origin of Species* has framed all lasting, subsequent work on evolution and, second, Darwin (1965 [1872]) brought together the fifth and sixth E's himself when he took up questions of the expression of emotions in humans and other animals. Beyond Darwin's introductory comments in *The Expression of Emotions in Man and Animals* about the polemical context in which he situates that project, the evolutionary character of this work is mostly revealed indirectly. Darwin signals his evolutionary presumptions throughout the book in, among other things, his discussions of (1) the applicability of the same or similar principles to both humans and other animals, (2) various continuities between matters relevant to the expression of emotions in humans (for example, the physiology of the facial muscles) with those of other animals (for example, apes), and (3) characteristic, pan-human expressions of emotions.

Undoubtedly, any accounts of religious meanings that follow from general interpretive hypotheses of a Darwinian sort will differ on some counts from traditional interpretive approaches in religious studies and cultural anthropology and even from other general theories of Freudian or Marxist lineage. Unlike all of these, Darwinian theories address large scale phenomena (concerning populations and species) on a very long-term time scale, far in excess of the lifetimes of individual humans and of most historically identifiable human societies (McCauley, 2009). Darwinian proposals examine wide-spread patterns across populations over hundreds, thousands, or even tens of thousands of years and across species over hundreds of thousands, millions, or even tens of millions of years. The sheer scope of Darwinian analyses informs the aspirations to generality of any interpretive theories that they might inspire.

Any insights that such Darwinian theories might offer about religious meanings are also guaranteed to be probabilistic and partial. Their probabilistic character is an inevitable consequence of their generality when addressing vast populations. Darwinian theories can identify, explain, and predict *trends* in human thought and action that can helpfully direct and constrain candidate interpretations. Still, agreement is widespread concerning the many and varying factors that might influence human minds, behaviors, groups, and

what they might take as meaningful, thus, talk of “trends” seems appropriate. A host of additional variables – natural and cultural – may dampen, interfere, forestall, or upend even the most systematic influences in some individuals in some circumstances (McCauley & Graham, 2019, 2020). To propose that *any* explanatory theories, not just ones of Darwinian heritage, that cognitive science encompasses can offer interpretive insight does not necessitate expectations about universally applicable principles that are deterministic about meanings, in contrast to recurrently suitable principles that are probabilistic about meanings (Johnson & Tucker 2021, 230). On the other hand, none of this precludes such probabilistic principles from often cutting right to the heart of what individuals find meaningful in specific cases.

Their partiality is neither surprising nor unique. All interpretations are incomplete (Sperber, 1975), but the grounds for the partiality of interpretations arising from well-corroborated, testable explanatory theories in science have much more to do with the partiality of *all* of our knowledge seeking pursuits and the proposals they engender than they do with the inherent limitations of relatively less constrained interpretive approaches (McCauley, 2017).

At least one further feature of such Darwinian theories matters here. Although I am concerned with the implications of evolved cognition for *religious* meanings, the patterns of thought and feeling in question are not peculiar to religions for two reasons.

First, a host of other cultural stimuli are capable of eliciting similar responses in humans. Plenty of other cultural arrangements, besides religions, including political and fraternal organizations, guilds, folklore, and the various arts, to name some of the more prominent examples, can activate the same cognitive operations. They are no less able than religions to cue automatic inferences about situations that increase the probabilities that those situations will prove ones that people will deem meaningful along specific, well-worn channels of significance.

Second, the evolved cognitive capacities in question are not in place because of anything having to do with religions (or with one another). This is a key insight of the *cognitive by-product* view of religious representations that characterized the earliest works in the cognitive science of religions (Guthrie, 1980, 1993; Lawson & McCauley 1990; Boyer, 1994). These early proposals all maintain that those cognitive capacities’ exercise in religious settings are by-products of their normal functioning. The capacities are in place because their normal functioning effectively addresses any of a number of basic problems members of our species faced, from recognizing different individuals’ faces and voices, to knowing intuitively what to do in the presence of an environmental contaminant.

The workings of all of these evolved cognitive systems qualify as types of maturationally natural cognition (McCauley, 2011). Besides addressing basic challenges that early humans faced in a natural world of predators and prey and in a social world that includes both competition for resources and mates and cooperation in hunting, gathering, food sharing, and defense, maturationally natural cognitive systems exhibit other telling features.

- Most of these systems are up and running *early in human development* and readily functioning by the time children have reached school age. They are largely in place before humans can remember. So, for example, people recall when they learned to read or ride a bicycle, but they do not recollect when they learned to talk or walk.
- Although culture tunes many of these systems' operations – from what language a child learns to what things she or he comes to regard as disgusting, the emergence of these maturationally natural systems *does not depend on any culturally distinctive support*.
- Nor, ordinarily, does their establishment turn on instruction or schooling. These perceptual, cognitive, and motor capacities *do not need to be taught*. They concern matters that human minds are poised to *learn easily* – sometimes on the basis of a single trial.
- Their emergence is *partly definitive of what counts as normal development*. If infants require instruction or remediation in such matters, they have recognizably diverged from what is regarded as normal development.
- If not in their beginnings, then plainly in their fullness maturationally natural systems are *domain specific*. They address multifarious areas of life that pose specific problems pertaining to fundamental physical and biological matters including the basic physics of solid objects and differentiating biological kinds, socially important things including using language and recognizing faces, agents (and their minds), others' emotions, kin, and fairness, natural hazards including contaminants, snakes, and spiders, and more.
- Maturationally natural systems *launch on the basis of a few diagnostic cues*, and their operations are *mandatory*. Their activity does not depend on gathering evidence. The associated intuitive cognition is not under conscious control. We cannot stop it from happening. We have such mandatory intuitive perceptions, beliefs, and actions that come so easily and so instantaneously that we quite literally do not even notice them – from the perceptual recognition of faces to the cognitive discrimination of syntactic distinctions, to automatic action responses to environmental contaminants. As Daniel Kahneman (2011, p. 24) states, “we can be blind to the obvious, and we are also blind to our blindness.” It is this *transparency of the capacities* in question that makes it so difficult for many scholars who are unfamiliar

with an evolutionary approach to cognition, first, to understand what is being explained and, once they do see that, second, to understand why such capacities need explanation.

Maturationally natural systems concern issues that humans need to deal with rapidly and unreflectively, thus these automatic systems operate below the level of consciousness. For example, experimental evidence suggests that *unconscious* detection of nothing more than eyes in constructed environments will elicit *unconscious* inferences about being watched and, thus, produce greater levels of honesty (Bateson et al., 2006).

Such rapid and unreflective information processing includes automatically and effortlessly carrying out any of a vast complement of default inferences appropriate for the disparate materials from the many domains in question. Humans spontaneously carry out speculative inferences about diverse matters, including causal connections, with regard to which they have little or no direct experience. For example, people instantly draw inferences about animals' innards or their food acquisition patterns on the basis of learning their diets.

The by-product theory of religious representations simply holds that religions' success hangs, in part, on their having evolved so as to propagate cultural materials – from myths and rituals to sacred objects and spaces, to icons and glossolalia – that cue the operations of such maturationally natural cognitive systems.¹¹ Much about the evolutionary advantages of such representations follows from features of the maturationally natural systems reviewed above. In particular, these cultural representations constitute stimuli that human beings cannot help themselves from responding to. Their minds are built that way. Additionally, their responses to such representations are automatic and require no conscious reflection. The relevant features of those representations (that the gods have minds, that some object is set apart because of concerns with contamination, that glossolalia is language use, etc.) feel instantly familiar and allow the auditors of such representations to draw plentiful inferences effortlessly (that the gods have purposes, that the object should not be touched because it is sacred, that the glossolalia is meaningful speech, etc.). In short, all of this is intuitive.

11 To repeat, it is not just religions that so proceed. From fiction, fantasy, and folklore to comic books, commercials, and cartoons, cultural items of all sorts reliably engage the same maturationally natural dispositions of mind, often utilizing representations that are quite similar to those religions employ (Nichols, 2021).

7 How Evolved Cognitive Capacities Influence the Meanings Attributed to Minimally Counter-intuitive Religious Representations

The exploitation of humans' maturationally natural dispositions of mind, however, is not enough, by itself, to get much meaning, for the operations of the mental systems in question are automatic, unconscious, frequent, and utterly familiar. Consequently, as noted earlier, they also tend to be *seen through*, rather than seen. Humans apprehend the world by means of such transparent mental systems, but, mostly, they do not notice them.¹²

Boyer (1994, 2000) has argued that, in addition to activating maturationally natural cognitive systems, many religious representations tend to approximate a cognitive optimum. By attributing what is, almost always, a single counter-intuitive feature to a standard ontological category – for example, a man who also happens to walk on water – religious representations achieve an auspicious balance between grabbing people's attention and sticking in their memories (both, presumably, necessary conditions for a representation's subsequent transmission), while preserving virtually all of the default inferences associated with the category. To take the last point first, a minimally counter-intuitive (MCI)¹³ religious representation involving a single violation of the intuitions, which maturationally natural systems supply, grabs attention *without overthrowing the plentiful default inferences* (save one) associated with the ontological category in question. So, regardless of the fact that this man walks on water, the inferences that he sees with his eyes, that he needs food and sleep to survive, that, all things being equal, he carries out actions to achieve his goals, and so on all still hold. Multiple violations of our intuitive understanding (e.g., a man who not only walks on water, but also hears people's thoughts, was born of a wolf, and can become invisible when he chooses) will certainly also grab people's attention, but such a representation is less easy to remember and tends to undermine the ontological category's wealth of intuitively available inferences, since figuring out which of the standard

12 The mandatory operations of maturationally natural systems on the basis of minimal cues can produce persisting illusions, e.g., the Müller-Lyer Illusion (McCauley & Henrich, 2006). Recognizing such experiences as *illusory* can alert people to the operations of mental systems about which they were previously unaware. (See footnote 15.).

13 A minimally counter-intuitive representation (Joshua commanding the sun to stand still in the sky) involves a single violation or other (stopping) of some single feature or other (the sun's apparent diurnal motion) associated with some single event or other (Joshua's public commandment to the sun to this effect) pertaining to the intuitive ontologies that humans presume in light of their maturationally natural dispositions of mind.

default inferences continue to hold requires *just that*, i.e., *figuring such matters out* as opposed to knowing them intuitively.

As noted, that auspicious balance also encompasses representations' memorability. Boyer (Boyer & Ramble, 2001) contends that religious representations' MCI character not only enhances their ability to grab humans' attention but renders them more memorable as well. They are more easily recalled than normal everyday representations (a cow that eats grass), odd but intuitive representations (a chocolate table), and *radically* counterintuitive representations (the wolf-man who can disappear, walk on water, and hear people's thoughts). Multiple experimental studies have corroborated that conjecture, while exploring alternative variables that might bear some responsibility for the mnemonic advantages that attach to MCI representations (Barrett & Nyhof, 2001; Tweney et al., 2006; Slone et al., 2007; Harmon-Vukić & Slone, 2009; Banerjee et al., 2013). In these studies, the dominant impact on representations' memorability of minimal counter-intuitiveness prevails throughout.

All of this is to suggest that the body of theorizing and empirical research surrounding the by-product theory's elaboration and extension has supplied analyses about aspects of religious representations that it is reasonable to suspect systematically influence the meanings that humans make of their experiences with them. For anything to be meaningful for anyone, after all, it must (at some point) attract someone's attention and remain in someone's memory. These also seem to be necessary conditions for meaning attributions. On the reigning expansive view of meaning that I have been considering, they may be sufficient, since on that view meaning is, primarily, personal. And since it is always personal, it may also remain private.

A prominent factor that funds the richness of a meaningful experience is the emotions associated with that experience. Recall that Damasio argues that all cognition is soaked in emotion. Thus, emotion (per section three above) merits promotion to the first rank among the (*six*) efficacious dimensions of cognition. Among cognitive scientists of religions Boyer (2001) has put the greatest stress on the emotions connected with the functioning of maturationally natural cognitive systems. These capacities address fundamental problems humans faced in our species' ancestral environments, when human groups were smaller, when technologies were far less sophisticated, and when everyone was far, *far* more vulnerable to the slings and arrows of outrageous fortune.

Many emotions are natural alarm bells connected with the cuing of relevant maturationally natural systems. That is most plain with regard to dangers concerned with predation and other hazards (contaminants, perilous heights, evidence of intrusions, etc.) that here and now imperil the lives and welfare of the self and kin. These alarms sound *before* there is any time for conscious

reflection because such situations often require action straightaway. Jerry Fodor (1981, p. 70) made this point colorfully by citing Ogden Nash's advice that "if you're called by a panther, don't anther." Fodor noted that "we want the perceptual identification of panthers to be very fast and to err, if at all, only on the side of false positives. ... panther-identification ... had better be insensitive to much of what one knows." Panthers constitute urgent threats. Action cannot await the retrieval of assorted panther information from the vast stores of long-term memory and that information's subsequent assessment concerning its pertinence to current circumstances. That is to say such systems' operations, including the emotions they occasion, the appraisals those emotions reflect, and the actions they may trigger need to be automatic and instantaneous. Recall Johnson's comment that they happen "before you know it." They happen before we even register the feeling of what happens.

The parallels between Johnson's description of the emotions and the features of maturationally natural cognitive systems are patent. That is because frequently they are directly connected. Some maturationally natural cognitive systems are accompanied by *strong* emotional responses (e.g., jealousy). Both the maturationally natural cognitive systems and their associated emotions are aspects of evolved programs for pre-reflective, automatic responses to the detection of salient stimuli via the satisfaction of a few diagnostic cues. Their operations are unconscious and fast, and they prompt preparations for action that (often) lead to "fluid functioning."

Experiences with religious representations that are simultaneously capable of

- (1) cuing the operations of maturationally natural cognitive systems and, thereby,
- (2) eliciting their associated emotions in addition to
- (3) grabbing conscious attention,
- (4) sticking in memory, and
- (5) facilitating a multitude of snap inferences

is one formula (among many, no doubt) for making meanings. The point is certainly not that the topics maturationally natural systems address, and which religious representations engage, exhaust the meaningful – far from it! As already noted, on the far-reaching view of meaning in play, nothing is inherently unsuitable.

Rather, my two substantive proposals are, first, that those topics and the religious representations that exploit them are probable foci for meaning making and, second, that the meanings that get made are likely to follow a limited set of furrows through the semantic terrain that have been shaped by these evolved dispositions of mind. My methodological proposal is that it is precisely because an ample body of empirical and experimental research in

the cognitive science of religions bearing on and corroborating the by-product theory and associated hypotheses (e.g., regarding the attributes of MCI representations) buttresses this view that it constitutes a viable *general* approach to interpretive matters pertaining to religious phenomena.

Three further points deserve mention. First, although my focus has been on religious meanings, nothing about the cognitive systems and operations I have been discussing or about their influences on human meaning making is confined to religions. This is a corollary of what has been a guiding principle in the cognitive science of religions from its birth, viz., that religions require nothing special from a cognitive point of view. That means at least that religious cognition is not different in kind from ordinary cognition and that the unusual representations religions involve are not unique to them. (See footnote 11.)

Second, what things people tend to find meaningful are often far more directly connected to their maturationally natural dispositions of mind than they are to the actual states of affairs in which they find themselves. This is just why religions have evolved to be populated by representations that so readily engage those dispositions.

This is most strikingly illustrated by the fact that people are quite keen regarding several hazards that threatened our ancestors, yet they are commonly insensitive to dangers in modern environments. Very young children readily attend to spiders and snakes and easily learn to fear them (compared, for example, to mushrooms or flowers) (Rakison & Derringer, 2008; Rakison, 2009; DeLoache & LoBue, 2009).¹⁴ As every vigilant parent knows, very young children are, by contrast, basically oblivious to the dangers that electrical sockets present, but not greatly more so than most urban pedestrians' obliviousness to the dangers that the cars that whiz by them pose.

In 2021 it was "Shark Week" and "Shark Fest" that attracted more than fifty million viewers between them to the Discovery Channel and the National Geographic Channel (respectively), not "Toaster Week" or "Toaster Fest." That is true, even though accidents with toasters kill nearly ten times more people on an annual basis than shark attacks do. Similarly, neither toasters nor electrical appliances have proven prominent candidates for religious representations.¹⁵

14 Such sensitivities are confined neither to the young only nor to *Homo sapiens* only (Cook & Mineka, 1990; Öhman & Mineka, 2001, 2003).

15 Toast itself, however, is another matter. Recognizing the faces of Jesus, various saints, and Elvis in toast (face pareidolia) is fairly common. It appears that the right fusiform face area (rFFA) "plays a specific role not only in processing real faces but also in illusory face perception" (Liu et al., 2014, 60). The rFFA is a critical mechanism that underlies the maturationally natural capacity to distinguish faces. Like religious icons, toast is a cultural

By contrast, sharks¹⁶ (Beckwith, 1917) and dangerous animals more generally (snakes, bears, tigers, lions, leopards, panthers, etc.) routinely figure in religious systems.

Third and finally, besides the related emotions, another prominent factor that funds the richness of meaningful experiences are the inferences they encourage. The inferences associated with representations of sacred objects and spaces as well as of superhuman agents of all sorts, their states of mind, their resulting actions, humans' varied relationships with them, and the many narratives and the rituals in which they figure, are not merely the many readily available inferences that come for free with the cuing of maturationally natural cognitive systems, but the uncountable collection of possible *explicit* inferences that an individual might draw on the basis of such stimulating cultural materials. Most religions offer for contemplation entire worlds of representations of the sorts under discussion, most of which swirl around themes and topics of our species' evolutionary heritage and the sensitivities it informs. Collectively, those sensitivities supply myriad directional guideposts that, most of the time, steer most participants' searches for religious meanings down neatly cleared pathways leading to what are not-so-new discoveries after all that, nevertheless, reliably impress.

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product (with an obvious touch of randomness involved) that is sometimes capable of cuing that system's operations, producing, in these cases, illusions of faces.

16 Besides sharks, many natural objects and animals (including *spiders*) can serve as *aumakua* in the traditional Hawaiian religious system (Beckwith, 1917, 506). In addition to shark *aumakua*, Beckwith also lists forty-one shark gods in traditional Hawaiian religions.

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