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Authors

Taves, Ann

Asprem, Egil

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Event Cognition and the Study of (Religious) Experiences

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Authors:
Professor Ann Taves (taves@religion.ucsb.edu)
Department of Religious Studies, University of California Santa Barbara

Dr. Egil Asprem (easprem@religion.ucsb.edu)
Department of Religious Studies, University of California Santa Barbara (corresponding author)

Abstract: We argue that **EVENT** is a basic concept that humanists, social scientists and cognitive psychologists can use to build a consilient research platform for the study of experiences that people deem religious. Grounding the study of experience in event cognition allows us to reframe several classic problems in the study of "religious experience": (1) the function of culture-specific knowledge in the production of experiences, (2) the relationship between original experiences and later narratives, and (3) the relationship between experiences and appraisal processes. At the same time, construing experiences as events allows us to integrate disparate lines of research in CSR to create an integrated framework for studying both existing and emergent phenomena.

Key words: Event cognition; predictive coding; (religious) experiences; building block approach; complex cultural concepts (CCCs); appraisals.

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Experience as Event:
Event Cognition and the Study of (Religious) Experience

1. Introduction: Basic concepts for the study of experience

The cognitive science of religion (CSR) has created a platform that allows humanists, social scientists, and cognitive scientists to propose more refined and complex approaches to the study of religion. In doing so, it has had to translate some of the categories of religious studies into terminology that (1) can be operationalized with greater specificity in experimental work and (2) links up with existing bodies of research in the cognitive and behavioral sciences. The most important basic concept that CSR researchers have operationalized so far is that of REPRESENTATION. Drawing primarily on evolutionary cognitive psychology (Sperber, 1996; Boyer, 2001; Atran, 2002; cf. Tooby & Cosmides, 1992), research focused on the cognitive processes that constrain how religious representations are shaped, remembered, and spread has revolutionized the study of religious beliefs (e.g. Boyer, 2001; Barrett, 2004; Slone, 2004; McCauley, 2011). Together with ACTION, it has also been central to cognitive theorizing in the study of ritual and practice (e.g. Lawson & McCauley, 1990; McCauley & Lawson, 2002; Whitehouse, 2004; Boyer & Liénard, 2006; Sørensen, 2007; Nielbo & Sørensen, 2013; Schjoedt et al., 2013).

Religious experience, long a core aspect of the study of religion, has received considerably less attention. This has been due in part to a desire to stress ordinary and commonplace experiences rather than the unusual experiences that were of interest to William James and his heirs (McCauley and Cohen, 2010; Barrett, 2011), but also to the absence of a consistent basic-concept vocabulary that facilitates the integration of experience into other lines of research. The difficulties inherent in the use of first-person narratives, which traditionally provided most of our data, present further challenges.

In downplaying unusual experiences, CSR has not been able to investigate the kind of events – dreams, visions, voices, and appearances -- to which established representations and rituals are typically linked. As long as these originatory events are presupposed, but not investigated, we will know little about the cognitive processes involved in the emergence of new social formations and their attendant representations

and practices. We believe that time is ripe for CSR to incorporate experience in both its commonplace and unusual forms into its conceptual framework. In what follows, we argue that experiences are events and that research on event cognition not only allows us to reframe several classic problems in the study of "religious experience," but also to integrate the study of experience into frameworks for studying both existing and emergent representations, rituals, and social formations. Before moving on to these issues, however, we need to indicate why a more refined vocabulary for the study of experience is necessary.

The metatheoretical backdrop to our argument is a building block approach (BBA) that distinguishes between "complex cultural concepts" (CCCs), such as RELIGION, MAGIC, and MYSTICISM, and "basic concepts" (BCs), such as REPRESENTATION, ACTION, and EVENT (for earlier articulations see Taves 2009, 2013a, 2015; Asprem in press).[1] While we define CCCs as abstract nouns with unstable, overlapping, culturally determined meanings that vary within and across cultures and social formations, we assume that BCs are relatively simple and stable concepts (Sperber 1996, 67-70, 89). Unlike the CCCs that they enable, BCs are translatable across cultures because they are grounded in evolved mental architecture and embodied interactions with the environment.

The research process of the BBA is, first, to disassemble, fractionate, or reverse engineer[2] CCCs into more basic components (or "building blocks"), in order to see how they have been constructed from and supported by specific configurations of lower-level processes (Fig. 1). This means that the CCCs become our *explananda*, while basic

[1] For an overview of methods and terminology for the building block approach, see our website at: <INSERT>.

[2] Some anthropologists have used the term "fractionating" to identify "cognitively and behaviorally universal patterns" that are associated with a "folk category" such as "ritual" or "religion" or what we prefer to call CCCs (Whitehouse and Lanman, 2014: 675; Boyer and Bergstrom 2008: 119). Although we have no objection to the term "fractionating," we are not just searching for universals. We prefer "reverse engineering" because it is a term that is widely used for the process of taking apart something complicated in order to see how it was put together and, thus, envisions the reassembly side of the BBA. Essentially, though, reverse engineering is simply a form of analytic method (of the "decompositional" type that has been crucial to science and natural philosophy since the early modern period; see Beaney, 2015).

concepts, such as ACTION, REPRESENTATION, and EVENT, serve as *explanantia* at the behavioral level of analysis and provide consilient links to lower levels.[3] As *explananda*, CCCs should not be operationalized by scholars, but rather be taken as data. The point of the BBA, thus, is not simply to reduce CCCs to more basic components, but to reduce in order to understand how people individually or in groups have assembled them into various formations.

[FIG 1 GOES HERE]

[Caption: Fig. 1: **Fig. 1.** The BBA research process at behavioral level: disassembling CCCs into basic concepts, and using them to trace alternative pathways and set up comparisons across socio-cultural formations.]

Considered as a phrase, RELIGIOUS EXPERIENCE is a CCC that is easily disassembled into EXPERIENCES (a more basic concept) that people consider RELIGIOUS or MYSTICAL or PARANORMAL (all CCCs). Because these CCCs take on a plethora of meanings in different theological, scholarly, and popular contexts with boundaries between meanings that are often blurred in practice, classifying different experiential accounts as "religious", "mystical", "paranormal", or "supernatural" is not very helpful. The job of the scholar is to explain how experiences come to be generated, interpreted, explained and classified in specific ways in specific social formations, and to do so as far as possible with recourse to basic concepts. This is where we find event cognition to be a promising framework: it gives us relevant basic concepts for studying experience that work across different disciplines as well as different cultures; it links downward into a broader cognitive science literature; and it helps us refine existing research questions,

[3] Breaking down the doctrinal and ritualistic aspects of religion into basic elements of "representation" and "action" has a history that goes back to Durkheim, who wrote in *The Elementary Forms*: "Religious [and other] phenomena fall into two basic categories: beliefs and rites. The first are states of opinion and consist of representations; the second are particular modes of action" (Durkheim, 1995: 34). To these two "elementary forms," we are adding events. Durkheim's methodology of seeking elementary forms is a precursor of the building block approach (he even used the term "building block"). We are not assuming, however, that the elements "have the same objective significance and fulfill the same function everywhere" [Durkheim, 1995: 4]). Moreover, while these elements may be viewed as "primitives" at the level of behavior, they are further reduced at lower levels of analysis.

develop new methods, and formulate new hypotheses. We will discuss each of these aspects in separate parts, starting with a brief introduction to event cognition and a discussion of how we can use it to restructure the study of experience.

2. Event Cognition

2.1 *Inferring what's happening: Basic principles of event cognition*

The event cognition literature integrates a broad body of research covering perception, reading comprehension, attention, memory, and problem solving (see Radvansky & Zacks, 2014). Following Zacks and Tversky (2001), an "event" can be defined simply as "a segment of time at a given location that is perceived by an observer to have a beginning and an end". "Event cognition", then, refers to a set of mechanisms that allow us not only to form mental representations of what is going on around us and segment it into discrete, bounded events, but also to identify and store knowledge about specific types of events, predict what will happen next, and use these models to regulate action – from basic motor control to complex intentional action sequences (Radvansky and Zacks, 2014).

Central to this is the notion of an *event model*, a mental representation of the relevant information that comprises a given event. It will typically represent relevant entities and agents, the relations between them, and the place and time in which the event takes place, mapped from the point of view of the subject. Besides understanding what is going on around us, we also use event models to forecast future events, imagine hypothetical events, understand events that are narrated to us, and reconstruct memories of past events.

Event models are related to memory in complex ways. The *working model* of what is going on right now is actively maintained in working memory. It can however be stored as an episodic memory, which can be recreated later as a new mental model in the context of a new event of "remembering what happened". Furthermore, generic information about *types* of events is stored in semantic memory, which, together with non-declarative, procedural memory for motor tasks, forms a crucial part of *event*

schemata. This schematic information is, in turn, used actively to identify events and to make real-time predictions in event cognition.[4]

All three forms of memory -- episodic, semantic and procedural – are actively engaged in event processing and, hence, play a significant role in guiding both perception and action. These broad connections between memory, perception, and action are supported by recent studies in the neuroanatomical and functional characteristics of memory (see review in Ranganath and Ritchey, 2012), which suggest that the two large-scale cortical networks responsible for semantic familiarity on the one hand (the anterior temporal system) and episodic recollection on the other (the posterior medial system) both contribute to cognitive functions beyond the scope of memory as traditionally conceived, particularly to allow "memory-guided behavior" through the construction of event models.

The event cognition system should be understood in the context of a hierarchical predictive coding (HPC) framework, which conceives of the brain as a Bayesian inference engine that tries to explain the causes of its inputs as a means of predicting what will happen next (Hohwy, Roepstorff & Friston 2008; Friston, 2009; Bar, 2009; Huang & Rao, 2011; Clark, 2013). The framework is hierarchical in the sense that it generates inference-driven predictions relative to a series of nested levels of sensation, perception, and action. As Hohwy, Roepstorff and Friston summarize:

> The cognitive system is ordered hierarchically in levels. For any pair of levels, the higher level will have hypotheses that predict the driving bottom–up error signal from the lower level. The higher level will itself provide error signals for a yet higher level. The lower level of the pair will be higher level for a yet lower level. (Hohwy, Roepstorff & Friston, 2008)

[4] Radvansky and Zacks define an event schema simply as "a representation of knowledge about how a type of event typically unfolds" (2014, 7). While they connect schemata with abstract knowledge stored in semantic memory, we take a broader view. First, since we take "knowledge" to include not only learned representations, but also the evolved core knowledge systems studied by evolutionary psychologists, we hold that event schemata are never completely cultural, but constrained by evolved learning systems. Second, since we think event schemata are crucial not only for parsing events that people observe from the outside, but, more importantly, for events in which they themselves *participate*, procedural memory for the performance of tasks is another crucial component of event schemata and their acquisition

The process of matching up top-down predictions with bottom-up signals (error monitoring) can also be construed as a process of evaluating or appraising the overall significance of the stimulus event for the organism (Scherer 2001, 369-71).[5] An error signal, thus, indicates a *failed appraisal* at a given level, and is pushed upward in the processing hierarchy.[6] When error signals multiply, predictions will be updated and new inferences will be drawn. These predictive hypotheses are essentially "prior probabilities" for what will happen next, developed and constantly updated in a dynamic interplay between bottom-up information and top-down predictions.

It is important to keep in mind that predictive coding is an unconscious process in which "predictions" and "errors" are coded at levels below the threshold of conscious awareness – not a falsificationist testing of reflectively held hypotheses. Although it is not yet clear how far up the cognitive hierarchy predictive coding holds beyond sensory encoding and perception, event cognition takes place at the level just above perception and is thus still fairly basic. Percepts are the brain's current best hypothesis for the driving sensory input; on the next level, competing event models – influenced by learned and evolved schemata – try to explain the interactions between the percepts that the brain has inferred at time *t*. The model that best explains the scene becomes the *working model* at *t*. As lower-level hypotheses about objects and entities in the perceptual field are revised (e.g., due to changes in the driving stimulus) and the scene changes at *t'*, event-related prediction error propagates upwards in the system, eventually causing the working model at *t'* to be updated or replaced (thus, a "driving on the freeway" event can gradually change into a "parking the car" event due to a feedback between top-down predictions and bottom-up sensory stimuli). Researchers need to take the complex interactions between bottom-up expectations and top-down input into account at multiple

[5] Following the lead of Scherer (2001, 371) and other emotion researchers (for a recent overview, see Moors et al. 2013), we are using the term "appraisal" as "a general, albeit fuzzy, concept to describe the way organisms assign significance to external and internal events in order to prepare adaptive responses to deal with their consequences." It thus includes both automatic, unconscious and deliberate, reflective processes of evaluation that take place at different levels of processing and potentially imply very different mechanisms.

[6] On our view, error monitoring is in fact the most basic appraisal process, and hence the one that higher-order appraisals are built upon. See also footnote 11 below.

levels when attempting to explain how and why people understand their experiences the way they do.

[FIG. 2 GOES HERE]

[Caption: **Fig. 2. Event Cognition as Hierarchical Predictive System.** Event models receive information from event schemata (prior knowledge) and from prediction error signals that are created by the model's active predictions tested against input flowing from the body and the senses. Error monitoring is an appraisal process. Increased error signal (i.e., partial or complete appraisal failure) causes the current model to be revised or replaced by a new model that explains away the bottom-up signals. Based on Kurby & Zacks, 2008.]

This Bayesian perspective on how the cognitive system explains its environment provides us with a clearer view of the different components of event cognition. The working model is privileged above other event models because it predicts the current upstream information. *Event segmentation* is explained with reference to sudden increases in prediction error brought forward from the lower levels when old predictions no longer explain the driving sensory stream (Zacks et al., 2007). That is, event boundaries are traces of where the working model was updated or replaced, due, for example, to the perceiving subject entering or exiting a room, reacting to a new entity or agent, or starting or finishing an action sequence. Furthermore, we can understand event schemata as providing Bayesian prior probabilities that guide top-down predictions. As a result, prior probabilities, which are generated by our evolved minds interacting with our socio-cultural and natural environment, will influence how new events are segmented and processed in the future. Put in humanist terms, this is how "culture" – in the sense of culture-specific knowledge or patterned practice (Roepstorff et al. 2010) -- shapes our experience.

2.2 Experiences as Events

The language of event cognition allows us to be much more precise in the way we talk about experience. First, it allows us to specify the distinction between "experience" in the abstract and "experiences" in the plural. The former refers to the flow of information in so far as we are aware of it, whereas the latter refers to discrete events that have been segmented out of the flow of experience such that each experience is perceived to have a

beginning and an end.[7] Phenomenologically, what we refer to colloquially as "experiences" are simply personally experienced events that are particularly salient. Theoretically, they are associated with spikes in prediction error causing updates in the working model. We can think of these as "experience events" to remind ourselves that experiences *are* events.

Second, borrowing from social psychology we can distinguish between *intended* and *unintended* events (Malle, 2004). Intended events, whether initiated by ourselves or others, are ACTIONS (cf. Anscombe, 1959). At the level of folk psychology (Malle, 2005), people assume that actors have intentions and, thus, can give reasons as explanations for their actions. Unintended events just happen. We offer causes -- not reasons – as explanations for unintended events. Moreover both intended and unintended events may contain a mix of intended and unintended *subevents*, or segments. Thus, a "driving the car on a long trip" event might include an unintended "falling asleep at the wheel" subevent. Conversely, a dream – an unintended event – may contain many seemingly intended action subevents.

Third, the event cognition literature allows us to locate experience events along a continuum based on the proportion of information derived from *external* and *internal* sources. Although the event cognition literature has focused primarily on the parsing and processing of information flowing from the external environment through the sensory apparatus, the predictive activity of working models is not targeted directly on "the world" but rather on the groups of neurons that carry upstream information from further down the hierarchy (cf. Friston, 2005a). This means that strokes, drugs, electrical shock and other direct modulations of neural activity can produce "noise" that the event system will try to explain away, even in the absence of any "outside" stimulus propagating through the sensory system (Corlett, Frith, & Fletcher, 2009; Friston, 2005).

[7] Note that we are talking about "phenomenal experience" (e.g., "of something") as opposed to "accumulated experience" (as in "being experienced") – which is, roughly, the distinction that German captures with its two separate terms for experience, "Erlebnis" and "Erfahrung". Having an "Erlebnis," then, is to have an active working model (e.g., "I am currently typing on the keyboard"), while accumulated "Erfahrung" in a certain domain (e.g., being an experienced writer) is to possess well-developed event schemata for the activity in question. See also our discussion of skill in section 4.2.

Internal events include not only such anomalous neural phenomena, however, but also common events like dreams, internal dialogues, fantasies and daydreams, thoughts, and internal voices. People may experience these internal events as either intended (e.g., an internal monologue) or involuntary (a nightmare). This gives us a typology of four different event types (Table 1).

[TABLE 1 GOES HERE]
[Caption: **Table 1**: Event types (adapted from Malle 2004, 76)]

We can use dreams to highlight certain important features of event models. First, they illustrate that even the most internally generated event can draw upon stored information about past external events. Thus, neural activation during REM sleep may trigger episodic memories, activating stored event models and generating a new working model of what is happening now, which draws in turn on semantic knowledge about specific types of events. Second, it is important to distinguish between event models as *mental* models and the event *narratives* that are based on them. The former are mental representations, while the latter are externalized *public* representations (Sperber, 1996: 24-28, 61-66; cf. Sperber & Wilson, 1997).[8] So, for example, we generate (mental) event models when we dream, but we do not generate an event narrative – a public representation based on a remembered event model – until we attempt to recount the dream or write it down in a diary. When someone reads the diary or listens to an oral recounting of the dream, they grasp its content by forming a new mental event model to simulate what is being told. Based on Radvansky and Zacks's conclusion that the same basic principles for recognizing, processing, memorizing and retrieving events are at work when we create models of what is happening right now (the working model) and when we comprehend events that are narrated or presented to us orally, in text, or on the screen ("situation models"; cf. van Dijk & Kintsch, 1983), we infer that they are also at work when we actively narrate events, whether from memory, imagination, or what we observe.

[8] Sperber (1996: 61) distinguishes between "representations internal to the information-processing device – *mental representation*; and … representations external to the device and which the device can process as inputs – that is, *public representation*."

3. Reframing classic problems in the study of (religious) experience

Viewing experiences as events allows us to reframe several classic problems in the study of experiences that people deem "religious". In this section we show how research on event cognition can help us illuminate three key problem areas:

1. The function of culture-specific knowledge in the production of experiences.
2. The relation between "original" experiences and later narratives.
3. The relationship between experiences and appraisals.

3.1. The function of culture-specific knowledge

The literature on religious experiences has long been divided between "perennialists" and "constructivists" (Table 2). This divide concerns the role of culture-specific knowledge in shaping experiences.[9] Perennialists have traditionally held to the idea of a "core experience" that is superficially differentiated into variant depictions and interpretations as it is "filtered" through different cultural matrixes. By contrast, constructivists have argued that experiential accounts are wholly determined by cultural expectations: there is no raw experience, only appraisals all the way down. Constructionists have also been suspicious of experience on epistemological grounds. Even if there were actual experiences behind public experience narratives, there would be no way for the

[9] In the following paragraphs, we are assuming that the key aspect of "culture" at stake in the perennialist/constructionist discussion is the ability of *culturally-specific* schemata to structure human experience, the extent to which it happens, and the methodological implications of this for researching public representations of experiences (mental event models). However, since we follow Tooby & Cosmides's (1992, 119) definition of culture as "any mental, behavioral, or material commonalities shared across individuals, from those that are shared across the entire species down to the limiting case of those shared only by a dyad, regardless of why these commonalities exist," we are not assuming that all schemata belong to a *specific* culture. Some, such as learning how to walk or how to breast-feed a baby, are what Tooby & Cosmides would call metacultural schemata, built on maturationally natural dispositions that require little overt teaching, and are found with little variation across the world (cf. McCauley, 2011). Put differently, some schemata are acquired very easily through evolved learning systems, while others depend to a much larger degree on contingent cultural knowledge and patterned practice (Roepstorff et al., 2010).

(humanist) scholar to access them. It therefore seemed safer to stay with what could be empirically observed, namely the narratives and their institutional contexts.

[TABLE 2 GOES HERE]

While the essentialist notion of a stable core experience underlying the great disparity of "religious experiences" is unconvincing, the constructivist focus on discourse alone is also unsatisfactory. An event cognition framework allows us to view culture-specific knowledge as a subset of prior knowledge. Experiences, then, result from the interaction between input – in the form of perceptual and sensory cues – and prior knowledge. Thus, while we agree with the constructivists that experience is appraised – in the predictive coding sense -- all the way down, event cognition suggests we can know a lot more about the underlying sensory cues that are involved in what we call "real-time appraisals."

The distinction we are making between cues and prior knowledge was explicit in the earlier attributional theories embraced by constructivists (Proudfoot and Shaver, 1975; Proudfoot, 1985; Spilka, Shaver, and Kirkpatrick, 1985). However, they typically de-emphasized the cues relative to post-hoc appraisals and paid little attention to the real-time interaction between cues and tacit appraisals during experience events. The event cognition framework allows us to model those interactions between input cues and prior knowledge in all their variety much more precisely.

Conceiving of culture-specific knowledge as a subset of prior knowledge also allows us to recognize the interplay between culturally based and evolved prior knowledge in the construction of event models. Thus, not only are the processes of event segmentation and event model formation (which determine how we form, structure, store, and retrieve events) universally human, but our expectations with respect to events also rely heavily on evolved "core knowledge" systems (Tooby & Cosmides, 1992; Spelke & Kinzler, 2007). These are, essentially, evolved learning systems that allow us to acquire certain schemata with great ease. For example, very limited sensory cues are needed to identify biological systems in motion. Thus, when motion-information compatible with biological systems is detected, it will automatically trigger predictions of intentional

behavior (Radvansky & Zacks, 2014: 98-101). When perceiving humans, there are programs for moving from subtle behavioral cues (facial expressions, eye movement, posture, voice modulation) to inferences about specific mental states and action dispositions. All of this contributes to how we segment the event, what we pay attention to, and what we predict will happen next.

Knowledge that is truly culture-specific does, however, also play an important part in event processing. Such knowledge comes in two types: knowledge about event types (schemata), and knowledge about specific entities (e.g. objects, agents, places) – what Radvansky and Zacks (2014: 27-28) call referent-specific knowledge. For example, *knowing that* deceased people might manifest as ghosts in specific ways (e.g. as footsteps, sudden fluctuations in temperature, flash of blurry images) and at specific places (e.g., an attic, the cemetery) makes it possible to interpret ambiguous incoming sensory information (whether visual, auditory, tactile or olfactory) as confirming an apparition of a ghost. If the predictions generated by such a ghost-seeing schema successfully explain those inputs, the subject *experiences* a ghost.

Since event models are *partial* and *compositional* (ibid.: 25-28), in the sense that they only model those aspects of the scene that are causally relevant, what a person believes about the objects that are perceived will greatly impact on their place in the event model. For example, when entering a dim room, a light switch will be salient to anyone who possesses semantic knowledge of how electrically lit rooms are structured, but not to someone who has grown up without electricity. This effect can help us explain how "special objects," such as statues, talismans, or images that have been imbued with agent-like properties, can be causally relevant for people who "know" their special properties. In the presence of such objects, insiders to this cultural knowledge may predict and explain subevents in ways that outsiders would not.

These various forms of prior knowledge (evolved and learned, event-schematic and referent-specific) are tightly interwoven in real-time experience. We can illustrate this by returning to the ghost-seeing example. Referent-specific knowledge that a house is "haunted" can trigger a ghost-seeing event schema, which will guide one's attention in certain ways. The script draws attention to particular perceptions or sensations, which might not be salient in another script, and triggers evolved inference systems such as

agent detection, which heightens the likelihood of attributing agent-like properties to available cues. The inferred presence of an unseen agent will modulate the causal framework of the working model so that a slight temperature change, a weird smell, a gust of wind, and squeaking floor boards are no longer random (unintended) subevents but rather the intentional actions of a ghost.

Because event models are generated through an interaction between prior knowledge and a wide range of input cues that the subject senses and perceives in their environment and within themselves, intentions and causes can be *perceived* in an event rather than simply attributed *post hoc*. Once they are perceived, they may direct our attention in specific ways and determine what else we perceive as relevant in an event. Because implicit inferences about causality, intentionality, and meaning can be made as the working model is constructed, these inferences not only help determine the overall structure of the model in the moment of construction, but also shape post-hoc reflections on what happened. Event cognition, thus, offers a complex and nuanced theory of how event models (the working model of what is happening right now and, thus, our real-time experience) are related to cultural representations and event narratives.

Unfortunately, because event models are mental models, we cannot access them directly. If we are willing to take a more pragmatic and probabilistic approach, however, we can use research on event cognition, first, to rethink the relationship between original experience events and later narratives and, second, when sources are available, to distinguish between input cues and appraisals and in some instances specific causal attributions in order to reconstruct the relationship between post hoc event narratives and the initial working model. We will now consider each of these opportunities separately.

3.2. The relationship between the original experience and later narratives

Event cognition gives us a fresh perspective on the hard problem of how a narrative might relate to an original event. Although we acknowledge a definite methodological challenge here, we think that the notion of an event model helps us to state the problem more clearly and to suggest constructive, commonsense ways to deal with it.

The problem is how/whether we can make inferences about mental experience based on a textual account. Traditionally, this problem has been seen as one of

establishing reference between an experience ("what really happened") and a public representation of the experience. Apart from unusual situations where the public representation in some sense *constitutes* the experience (such as automatic writing and channeling), event narratives are always post-hoc and, thus, based on an event model (the remembered event) generated at the time of narration.[10] The historian's reconstruction must therefore proceed in two steps: first, moving from a public event representation (an event narrative) to the mental event representation of the narrator at the time of narration (a memory); and second, moving from this event model (of the remembered event) to a (hypothetical) earlier *working model* of the initial event, whether concerned with internal or external cues. The whole reconstructed sequence from input to event narrative can be represented as follows:

$$\text{CUES} \rightarrow \text{EvM}_{1\,(\text{WORK})} \rightarrow \text{EvM}_{2\,(\text{MEMORY})} \rightarrow \text{EvNarrative}$$

Considered as a *logical* problem, going from narrative to original cues is, of course, a formal fallacy (affirming the consequent). As with most scientific problems, however, it is not a question of logical inference but of making weighted abductive inferences to the best explanation. Considered as such, the first step is relatively easy while the second remains hard, because there are numerous pathways to the construction of an event model. Thus, a narrated event might originate in a working model of a personally experienced event, a situation model derived from something one has heard or read, or a *hypothetical* situation made up on the spot. Since the event cognition literature stipulates that the same principles will be at work in all these types of event processing, it does not help us determine the difference. However, it does specify a number of detailed mechanisms for how narratives are related to mental models. This allows us to infer a model from the narrative, which is what makes the first step relatively easy.

[10] When the experiencer produces a public representation directly from the working model – that is, narrating an event *as it is happening* as in the case of "automatic writing" and "channeling" or in response to the question "what do you see right now?" – the process can be formalized as:

$$\text{CUES} \rightarrow \text{EvM}_{1(\text{WORKM})} \rightarrow \text{EvNarrative}_1 \rightarrow \text{EvM}_{2(\text{MEMORY})} \rightarrow \text{EvNarrative}_2$$

Modest though this latter fact may be, we argue that it is nevertheless of great methodological significance for how we study experience narratives and relate them to real-time experience events. The research process will require us to first use our best historical-critical judgment to assess the text genre, authorial intent, and reliability of the source, but in cases where we feel justified in assuming that the narrative is based on an actual working model, we can use event cognition principles to backtrack from public to mental representations [see Fig. 3].

[FIG. 3 GOES HERE]

Many practical problems still remain, but we now have a framework for dealing with them more systematically. For example, while it is certainly true that memory fades with time and accounts of past events may be altered or even wholly invented, event cognition helps us distinguish elements of a narrative that are likely to be inventions or later elaborations from those that are more likely to be accurate.

Both externally and internally generated events come with a set of event boundaries that correspond to the initial segmentation of experience in the working model. These event boundaries are potent anchors in long-term memory: information that is located close to event boundaries is more richly coded than information far away from the boundaries (Swallow, Zacks, & Abrams, 2009; Swallow et al., 2011), and are recalled with greater precision on the longer term (cf. Radvansky & Zacks, 2014: 133-137). Furthermore, the causal integration of event elements is also central to how well it is remembered (Radvansky & Copeland, 2000). In contrast, surface information (e.g. physical properties of entities) that is poorly integrated fades quickly (Radvansky & Zacks, 2014: 137) and is easily fabricated.

Historians can use these features to assess the trustworthiness of experience narratives and gauge what might have been experienced at the time the working model was constructed. For example, they can infer that details at event boundaries are more likely to be accurate (that is, correspond with the original model) than details far away from such shifts. They may also assume that sudden, abrupt events will be particularly well remembered and faithfully narrated.

The event cognition literature also helps historians to hypothesize about specific sorts of distortions that may be of interest. For example, if information comes to light after initial event processing that would make certain kinds of surface details more relevant than they were during initial encoding, details may be highlighted or elaborated when the model is recreated post hoc. A person who learns an astrological correspondence system between planets and colors only after having had a particularly salient dream ("I was taken to a palace made of precious stones") may add astrologically significant color details during later recounting of the dream ("I think the walls had a greenish hue, like emeralds – this place belonged to Venus"). While building on a previous event (i.e., preserving basic segmentation), the resulting new event model is, however, less likely to have "recovered" an old property detail than to have invented it in a process of integrating new schematic knowledge (cf. Radvansky & Zacks, 2014: 138-139). Such invention would, however, not be evidence of deceit, but rather of a normally functioning system of event processing that pays attention to whatever it perceives as causally relevant information.

3.3. The Relationship between Experiences and Appraisals

Event models also allow us to conceptualize the relationship between experience and appraisal in a more nuanced fashion. As already discussed, appraisals, including attributions of causes and intentions, are not merely supplied post hoc, but also play a generative role in the segmentation of events, the selection of elements to be represented in the model, and memory traces for individual elements in the event. Because a causal framework is generated through a series of appraisals of a wide range of cues that the subject senses and perceives in their environment and within themselves, the cues are often represented in event narratives along with the tacit appraisals.[11]

[11] See Taves, 2009, 107-109, for examples. Scholars in the humanities usually refer to these claims about events as "interpretations"; sociologists analyze how interpretations "frame" events; and social psychologists analyze how people "attribute" meaning to events. Cognitive psychologists in turn use various methods to analyze the role of unconscious appraisal processes in arriving at these claims. Because all these levels interact when people make claims about events, we can refer to frames, attributions, and appraisals depending on our level of focus. But because the unconscious cognitive processes constrain the

Drawing inspiration from Bertram Malle's analyses of how people explain events (Malle 2004; Taves 2009, 100-111), we can use the distinction between cues and appraisals to analyze event narratives and, in cases where we have multiple accounts, to assess the relationship between the post hoc event narratives and the initial working model. If we have a detailed narrative of an event, we can divide the event into sub-events by asking "what happened" and "why it happened" from the point of view of the narrator as the event narrative unfolds. In many cases, this allows us to tease apart the cues that the subject sensed or perceived ("what happened"), the inferences they drew from them ("what it means"), and the causes or reasons they implicitly or explicitly gave for them ("why it happened").

The subject may view what happened as either intended or unintended. Intended action would involve an agent, while an unintended event would not. In the former case, they will presuppose reasons; in the latter case causes. Subjects may infer, however, that an event *that they did not intend was intended by an unseen other*, based on real-time cues that trigger schemata or post hoc reflection. In all cases, the linkages between what happened and why it happened that are built into the event model will attach corresponding agent or non-agent representations of varying degrees of specificity to the sensations or perceptions. Thus, for example, in the context of sleep paralysis, subjects often hallucinate the presence of intruders based on bodily and environmental cues, which they may upon reflection attribute to sleep paralysis or actual, albeit unverifiable, agents.

If we only have one account and it is narrated long after the event, it may be impossible to distinguish cues and appraisals that were built into the event from later insertions and reflections on the event. However, when we have multiple accounts of the same event recounted at different points in time, we can compare the versions by dividing the event into sub-events (as above) and interweaving the accounts so that we can compare the sub-events. Depicting the analysis in charts allows us to see what sub-events were added or deleted as the narrative was retold and analyze to what extent the

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way that we make these interpretations, we are using appraisal processes as an umbrella term to refer to the multi-level processes of event interpretation (for our definition, see note 5 above).

narrator altered the way they described the subevents over time (for an elaboration on this method, see Taves in press).

When the description of "what happened" remains stable across accounts, this allows us to identify a plausible early representation of the sensory cues that comprised the original event model. If some portions of the reasons subjects offer to explain the cues remain stable over time, this suggests that those reasons may have been closely connected to the initial spontaneous appraisal of the event. Reasons that change over time likely represent the subject's more conscious reflections on the experience and, thus, can be analyzed in relation to the context in which the narrative was retold (for an example and discussion of a particular case, see Taves and Harper in press). When sources are available, this method allows us to reconstruct events as subjects may have experienced them initially and trace how their depiction of what happened both in terms of cues and appraisals changed over time. Much like redaction criticism in biblical studies, this method can then be used to analyze the way in which individuals or groups turn experience events into "identity events," constituting themselves as a *special* group or person in relation to them.

4 Integrating Experience Events into CSR: Comparative and Experimental Implications

Viewing experiences as events not only allows us to advance solutions to classical problems in the study of (religious) experience; it also allows us to integrate disparate lines of research in CSR to create an integrated framework for studying both existing and emergent phenomena, using a mix of historical, ethnographic, and experimental methods. In this section we argue that the event cognition framework help us connect the study of experience with existing research on rituals and representations. A common theoretical framework of event segmentation, predictive coding, and cognitive resource depletion offers a foundation for robust comparisons of different types of event narratives that are of interest to scholars of religion, suggesting some common features of such events spanning ritual action, natural disasters, and experiences. An event cognition framework also allows us to expand and improve on existing lines of experimental research and

suggest specific hypotheses that should be tested empirically. We elaborate on the comparative and experimental potential in the next two sections.

4.1 Comparing (Religious) Experience and (Ritualized) Action as Events

The most direct point of integration between experiences as events and classical CSR lies with research on ritualized actions (Boyer & Liénard, 2006; Nielbo & Sørensen, 2011, 2013), which has already drawn on research in event cognition to identify changes in action parsing in ritualized as compared to ordinary action sequences. In the terms used here, an action sequence is a scripted goal-directed event comprised of a number of sub-(action)-events. Ritualized events, as depicted in these studies, generally have an overall goal, but prescribe a series of sub-events in order to reach the goal that are not connected to sub-goals as they are in ordinary action sequences (Boyer, 1994). Building on Boyer and Liénard's (2006) concept of goal demotion, Schjoedt et al. (2013: 45) distinguish between causal opaqueness – the lack of evident causal connections between sub-events – and goal demotion, which, like all goal-directed action, implies animacy and intentional specification.

Nielbo and Sørensen (2011) offer experimental evidence to confirm Boyer and Liénard's hypothesis that participants segment action events in which there is no obvious causal relation between the subparts into smaller units than they do when there is an evident causal connection between them. In commenting on this line of research, both Fessler (2006) and Schjoedt et al. (2013) hypothesize a link between these two features (causal opacity and goal demotion) and appraisal processes. Fessler (2006) suggests that non-functional sequences of sub-events generate "spurious associations," while Schjoedt et al. (2013, 45) hypothesize that these features deplete cognitive processing resources, thus limiting the capacity for action comprehension within the context of the event itself and allowing "the post-ritual construction of meaningful action representations."

Although not necessarily incompatible, Fessler's hypothesis would allow for the generation of associations as the event unfolds, while the cognitive resource depletion hypothesis would minimize intra-event associations (real-time appraisals) and emphasize post-event meaning construction. Segmentation and analysis of cues and appraisals in narratives collected at intervals after participation in a ritualized event would allow us to

assess and compare (1) segmentation rates when people are observing or participating in ritualized events and when they recount them after the fact, and (2) their appraisals in immediately and remotely recalled ritualized events. These comparisons would allow us to assess the relative weight of intra-event and post-event appraisals under different conditions and, thus, to better understand the unconscious and conscious appraisal processes through which meanings and, in some cases, social formations, are generated. This research could be combined with research demonstrating how small shifts in semantic linkages can trigger new social movements (Sørensen 2007; Taves 2014).

Recalling our typology of event types (Table 1), we can also make comparisons between representations of ritual actions and the other three types of events. Narrative accounts of unintended events, both external (e.g., natural disasters) and internal (e.g., dreams and other seemingly spontaneous subjective experiences) should provide illuminating comparisons with narratives of intended events and, at the same time, allow us to examine the conditions under which unintended events are (re)appraised as intended events. Natural disasters, such as earthquakes and forest fires, are events with causes (causally connected antecedents and sub-events) but no reasons (i.e., goals) unless they are attributed to agents. Dreams and other seemingly spontaneous subjective experiences also have no reasons (i.e., goals) unless they are attributed to agents. In contrast to intended events, which are always presumed to have agents, we can investigate the conditions under which people tend to attribute (unseen) agency to otherwise unintended events.

We hypothesize that we would find similar segmentation rates and processing demands in causally opaque event sequences, whether they are intended and unintended, and that casually opaque event sequences would increase cognitive load, generate "spurious" intra-event associations (i.e., real-time appraisals) that would in turn make the event more memorable, and lead to increased reflection in the wake of the event. Distinguishing carefully between "what happened" and "why it happened" in narratives of events allows us to assess the causal links between sub-events and, thus, to gauge their causal opacity. When we have evidence that allows us to reconstruct a plausible working model of causally opaque event narratives, we can distinguish those subevents for which subjects were able to offer implicit appraisals and those for which they were not and

consider to what extent these implicit appraisals informed subject's post-hoc assessments of the event. Finally, we can examine the circumstances under which the post-hoc reflection on experience events is taken up in interaction with others and, in some circumstances, viewed as "religious experiences".

4.2 *Experimental Manipulation of Working Models*

A dual-processing view of cognition that separates fast, online inferences made on the fly from slow, reflective reasoning (i.e., "System 1" vs. "System 2"; Kahneman, 2011) has become something of a default position in CSR work focused on explaining the epidemiology of religious concepts (e.g. Barrett, 2008; Barrett, Burdett, & Porter, 2009; Gregory & Barrett, 2009; McCauley, 2011; cf. Asprem, 2015). We hold that event cognition *is* online reasoning – that is, the quick inferences of System 1 take place in the construction of working models. This assumption lets us examine the relationship between representations, inferential processes, memory, and experience, using the framework of event cognition to formulate hypotheses that can be tested by a combination of ethnographic and experimental methods. In this final section, we discuss three lines of empirical research that can contribute to our understanding of how cultural schemata, representations, and evolved processing come together in the real-time construction of working models: inner sense cultivation, experimentally simulated experiences, and cognitive impairments.

Inner Sense Cultivation: One surprisingly under-research aspect of religious experiences (and, we might add, of CSR in general) is the question of *skill*. The common claim of "mystics" and recipients of "revelations" that their experiences "just happened to them" may have obfuscated the role of practice and skill-development in generating such experiences. The tendency to focus on "culture" in the abstract rather than on the *patterned practices* (Roepstorff et al. 2010) that produce differences in perception, cognition, and experience within societies (e.g. between musicians, cab drivers, chefs, and financial analysts in London) likely contributed as well. This hiatus is being filled by recent work on "inner sense cultivation" (Luhrmann, Nusbaum, & Thisted, 2010; Luhrmann & Morgain, 2012; Luhrmann, 2012, 2013; cf. Noll, 1985), which is a form of learning that is presumably at work in a wide range of culturally specific experiential

practices, from evangelicals hearing the voice of God (Luhrmann, 2012) to shamans visiting other worlds (Noll, 1985). These practices have usually been seen as operating on mental imagery in any perceptual modality (e.g. Kosslyn, Thompson, and Ganis 2006), such that they increase the vividness of imagery and, more importantly, change the ways that mental content is being appraised.

The event cognition framework can help us improve this work in two different ways, one theoretical and the other empirical. On the theoretical side, event cognition helps us explain how inner sense cultivation might work by pointing to specific mechanisms at the level of event model construction. Technically, we can reframe the learning process as modulating predictive models for event processing so that top-down expectations of agency and external causation are allowed to explain away internally generated bottom-up input, stemming from, e.g., the default mode network (e.g. Agnati et al., 2013), the motor system (e.g., the corollary discharge signals thought to generate internal speech; Scott, 2013), or from autonomic bodily functions and states (e.g. Seth, Suzuki, & Critchley, 2012). In other words, we suggest broadening the focus from "mental imagery" to a much wider set of internally generated signals, and focusing on how training processes guide attention to these subtle cues. By learning to recognize specific sensory and bodily signals as cues, these signals can modulate predictions and generate a working model that produces an "experience" (recognizing mental content and establishing automatic real-time appraisals). In short, the process can allow internal sensory data to be perceived as externally caused or related to an external agent.

On the empirical side, we suggest that event cognition and predictive coding can help us develop experimental approaches to inner sense cultivation. Tanya Luhrmann et al.'s (2010) use of psychological experiments to uncover individual differences in scores on the absorption scale that correlate with the capacity to cultivate mental imagery already constitutes a significant advance. Drawing on event cognition, we can expand this experimental dimension to the study of concrete psychophysical cuing techniques used in the wild. Working together, ethnographers and historians can sample a range of practices that use cuing to induce different types of experiences, while experimentalists can extract and reconstruct the cuing techniques in the attempt to reproduce a range of experiences under different test conditions. Here we suggest there is much to be gained from

consulting recent experimental work on how abnormal interoceptive processing may lead to unusual experiences of emotions, body-ownership, and sense of presence. For example, Seth, Suzuki, & Critchley (2012: 2) argue that disorders in the sense of presence (such as depersonalization disorder) result from a pathological imprecision in interoceptive predictive signals – that is, a failure of top-down models to successfully explain away the lower-level input. Since both the top-down predictions and the process of error monitoring can be manipulated by a range of techniques ranging from psychophysics to suggestion, illusions related to presence, agency, emotion, body-ownership and so forth can all be produced in healthy individuals (cf. van Elk, Lenggenhager, Heydrich, & Blanke, 2014). We should also expect them to be exploited in cultural practices aimed at producing certain extraordinary experiences, such as out-of-body experiences, which have a stabilizing effect on some religious representations (cf. Metzinger, 2009). These building blocks should be tested in a laboratory setting and related to the broader literature on normal and abnormal interoceptive processing.

Simulated Experiences: The above reflections bring us to the question of what event cognition offers to studies that simulate experiences in the lab. We suggest that the framework can be used to identify variables that should make a difference in the construction of the working model (i.e., the experience). We can illustrate this in relation to Andersen et al.'s (2014) innovative simulation of "sensed presence" under conditions of suggestion and sensory deprivation. While the experimental paradigm outlined in this study bears great promise, we think it pays insufficient attention to the multiple ways that culture and memory – through event schemata and referent-specific knowledge – play into the construction of working models. An analysis of the experimental setup in terms of event cognition can therefore help us refine the design and test more specific hypotheses about the experiential technologies we find in the wild.

Assuming a predictive coding framework, Andersen et al. acknowledged three principal ways in which experimentalists can modulate a subject's experiences: by targeting 1) top-down predictions, 2) bottom-up sensory input, or 3) the error monitoring process. In this study, the authors focused on top-down predictions through suggestion, demonstrating how the results of Persinger's famous "God helmet" experiments (Persinger, 2002; cf. Granqvist et al., 2005) could be reproduced without any transcranial

electromagnetic stimulation. The study used three different participant groups – spiritualists, new agers, and non-practitioners – chosen on the assumption that these groups would bring with them different prior expectations.

We can identify four variables in this setup that contribute to the construction of the working model (i.e., the experience), and hence ought to be isolated for the sake of hypothesis testing: 1) the subject's repertoire of event schemata ("cultural background"); 2) subject's referent-specific knowledge of stimulus (suggestion/prior knowledge related to helmet); 3) stimulus (the helmet); and 4) environment (removal of visual stimuli/sensory deprivation). Interpreted in this way, their paradigm allows us to investigate how internal(ized) event schemata and referent-specific knowledge, which attributes causally relevant properties to objects, can modulate the construction of working models, presumably by explaining away the "neural noise" that becomes salient under conditions of sensory deprivation (on this cf. Corlett, Frith, & Fletcher, 2009).[12]

Analyzing the setup this way points to a number of different mechanisms that might individually account for the reported experiences. For example, we should distinguish experimentally between the possible effect of pre-existing event schemata (1) and referent-specific knowledge (2). This is particularly important given the results of the study: while all three groups reported unusual experiences, only the spiritualists – who typically have event schemata for experiences that might be labeled "sensed presence" – significantly reported this type of experience. This suggests that event schemata were more crucial than suggestion for shaping the reported appraisals. Future experiments should tease apart the different effects: Would the spiritualists and new agers have performed the way they did even without suggestion (i.e., under conditions of sensory deprivation alone)? What if the referent-specific knowledge attached to the stimulus was not merely introduced as a suggestion in the experiment, but itself a part of the subject's prior background knowledge? What if, for example, some new agers were using "meditation helmets" in their practice that in turn triggered related schemata ("bliss",

[12] In other words, we are not convinced that the only effect of sensory deprivation is to inhibit error monitoring. It also has a "positive" effect, of bringing attention to bottom-up input from the default mode network that is drowned out during wakeful interaction with the external world. Thus there is a shift in the source of upstream input that the hierarchical model tries to predict.

"cosmic consciousness"), while spiritualists (say) made no use of this particular object? What would happen, then, if experimenters deliberately used culturally embedded objects, like crystals, Ouija boards, icons, or magical sigils, and pooled subjects who do and do not have referent-specific expectations attached to these material signs? The event cognition framework assumes that these forms of semantic memory for objects do matter, and that testing their relative influence on the production of quite specific experiential working models could make a serious contribution to understanding the cultural technologies for inducing experiences we find in the wild.

Cognitive Impairments: Finally, the event cognition literature enables us to pinpoint exactly *how* cultural schemata influence experiences, allowing us to formulate specific hypotheses about semantic knowledge, memory, and the interaction between schemata and cues. Since the event cognition literature specifies the kinds of memory systems that need to be at work in the processing of events (Radvansky & Zacks, 2014: 124-131; cf. Ranganath & Titchey, 2012: 720), we can formulate empirical hypotheses about the effects of different kinds of memory impairment on the capacity for having and reporting certain kinds of experiences. This line of research would contribute to work on how relevant cognitive impairments make religion baffling (e.g. Norenzayan, Gervais & Trzeniewski, 2012) by expanding from the realm of representations to the realm of experiences and memory impairment. For example, we would predict that subjects with impaired long-term event model access (i.e., episodic memory impairments), such as classic amnesiacs, and possibly some patients suffering from (early) dementia and Korsakoff's syndrome, will still have access to relevant event *schemata* (e.g., in the shape of semantic memories and non-declarative, procedural memories for specific types of events) that would enable them to generate new working models that predict religious content.[13] By contrast, people suffering from traumas that correlate more strongly with impairments of semantic memory, such as semantic dementia, herpes encephalitis, temporal lobe epilepsy and Alzheimer's disease (following Ranganath & Ritchey's [2012] discussion of two separate cortical networks for memory function), should be unlikely to produce such event models as they would lack access to the (semantic) event-

[13] Note, however, that some of these patient groups have semantic as well as episodic memory impairments. Empirical studies on these lines would have to refine the research questions beyond what we can do at present, and carefully select and screen its test groups.

schematic resources for making the necessary predictions. This population may certainly report experiences that seem bizarre (cf. Sacks, 2012), but they are unlikely to conform to any conceptual schema that would deem them religious. These two hypotheses should be sharpened and tested empirically by looking at experience narratives in people with different types of memory impairment, or by pooling them in the sort of experimental set-up discussed above.

A third problem, the effect of working memory impairments, should also be explored by this prospective research program. These impairments should affect the ability to construct working models in general, but it is less clear what alteration if any we should expect in terms of experiences deemed religious. One plausible hypothesis, consistent with our previous discussion of opacity, cognitive load, and real-time appraisal, is that working memory impairment (for example, in patients with ADHD) leads to the construction of *poorly integrated* event models, which should lead to increased prediction error, higher segmentation rates, and thus more frequent explanatory gaps between subevents. On this hypothesis, a deficit in working memory might make a person more susceptible to filling the explanatory gaps in everyday events with culturally available appraisals, in a fashion analogous to the effect of cognitive resource depletion studied in the context of particularly demanding rituals (Schjoedt et al. 2013). Impaired working memory might make for particularly good believers, who are more likely to rely on cultural content to explain their personal experiences.

5. Conclusion

For humanists and even social scientists to appreciate the value of the cognitive science of religion, we have to do more than reduce; we also have to reconstruct. As cognitively informed historians our goal is to take things apart in order to show how they have been put together, that is, ultimately to show that they are constructed from and supported by lower level processes. CSR to date has worked hard to identify the lower level processes, but is only beginning to explore how things have been put together. In presupposing and promoting a building block approach, we are embracing both.

Here we have argued that treating experiences as events allows us to integrate experience into an event cognition framework alongside representations and actions.

Doing so, we have argued, offers a framework for addressing old problems in the study of experience and integrating different strands of CSR research. Just as important, however, event cognition provides a basis for introducing a more rigorous, detailed analysis of first person narratives, including narratives of unusual experiences (dreams, visions, and so forth) into CSR. In doing so, we are creating a bridge from experimental work in CSR to narratives – the primary data of historians and ethnographers. Without these links, which we can then extend into micro-social interactions, small group processes, and the emergence of networks and other more complex social formations, we cannot effectively do the work of analyzing how complex formations have emerged from more basic processes.

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List of Figures and Tables

Figures

Tables

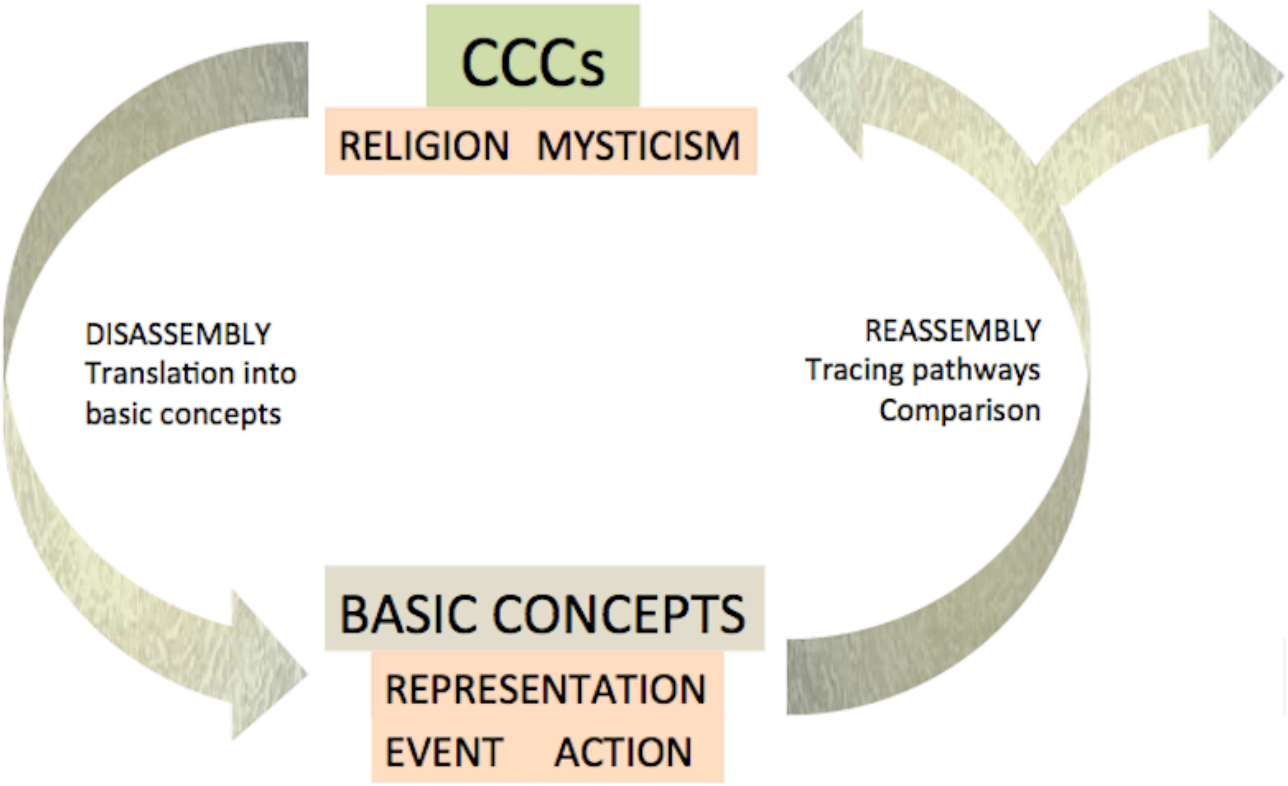
CCCs
RELIGION MYSTICISM
DISASSEMBLY
Translation into
basic concepts
REASSEMBLY
Tracing pathways
Comparison
BASIC CONCEPTS
REPRESENTATION
EVENT ACTION

Fig. 1

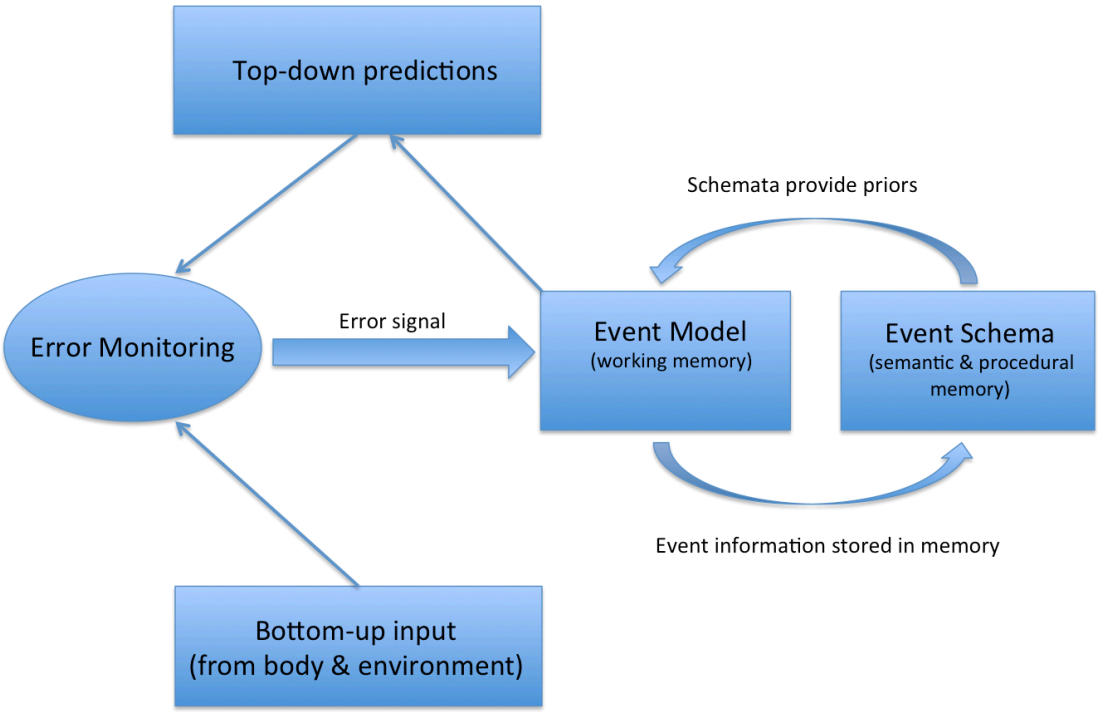
Top-down predictions
Schemata provide priors
Error Monitoring
Error signal
Event Model
(working memory)
Event Schema
(semantic & procedural memory)
Event information stored in memory
Bottom-up input
(from body & environment)

Fig. 2

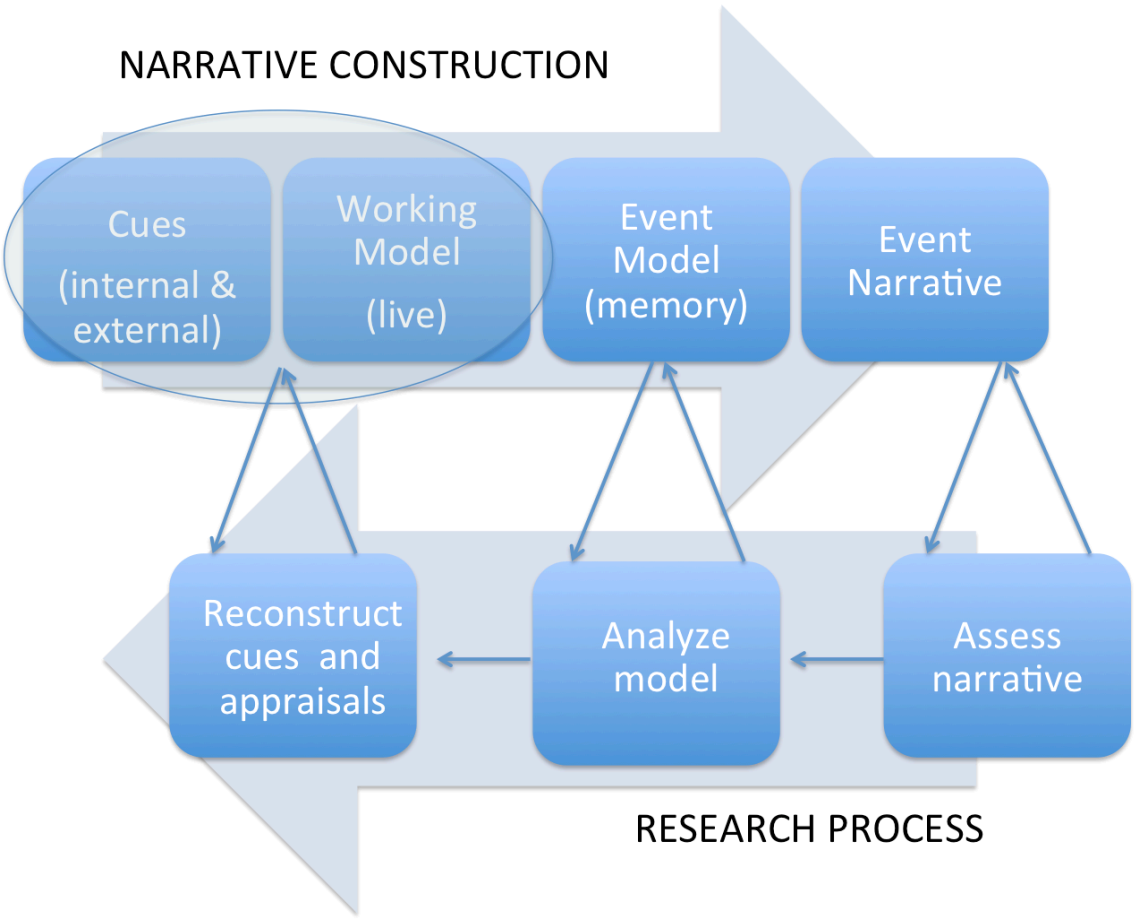
NARRATIVE CONSTRUCTION
Cues (internal & external)
Working Model (live)
Event Model (memory)
Event Narrative
Reconstruct cues and appraisals
Analyze model
Assess narrative
RESEARCH PROCESS

Fig. 3

Table 1: Event types

	EXTERNAL	INTERNAL
INTENDED	Public actions (agents doing things for reasons)	Private actions (reasoning, imagining)
UNINTENDED	Public events (e.g., natural phenomena, accidents)	Private events (e.g., dreaming, hearing voices, seeing things that aren't there)

Table 2: Three Positions on Accessing Experiences and Appraisals

	Theory Presupposes	Access to experience	Appraisals	Source of appraisals	Research investigates
Perennialist	Universal core experience, encoded in multiple narratives	YES	Post hoc	Core experience filtered through culture	Core experience behind divergent appraisals
Constructivist	Multiple experience narratives	NO	All the way down	Culture	Appraisals in cultural context
Event cognition	Multiple event models and experience narratives	When data permits, can reconstruct working model	Real-time and post hoc	Input (cues) combined with prior knowledge	Reconstructed real-time as well as post-hoc appraisals