Connecting events: experienced, narrated, and framed

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Experience as event: event cognition and the study of (religious) experiences

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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 role of appraisal processes in experience. At the same time, construing experiences as events allows us to integrate disparate lines of research in the cognitive science of religion (CSR) in a unified framework for studying both existing and emergent phenomena.

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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 (Atran, 2002; Boyer, 2001; Sperber, 1996; 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., Barrett, 2004; Boyer, 2001; McCauley, 2011; Slone, 2004). Together with ACTION, it has also been central to cognitive theorizing in the study of ritual and practice (e.g., Boyer & Liénard, 2006; Lawson & McCauley, 1990; McCauley & Lawson, 2002; Nielbo & Sørensen, 2013; Schjoedt et al., 2013; Sørensen, 2007; Whitehouse, 2004).

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 (Barrett, 2011; McCauley & Cohen, 2010), 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 such 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 the 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 allows us not only 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 Asprem, 2015; Taves, 2009, 2013, 2015). 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, pp. 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 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 (Figure 1). This means that the CCCs become our explananda, while basic concepts, such as ACTION, REPRESENTATION, and EVENT, serve as explanantia at the behavioral level of analysis and provide consilient links to lower levels. 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 BCs into various 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, 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 Radavansky & Zacks, 2011, 2014; Zacks, Kumar, Abrams, & Mehta, 2009; Zacks, Speer, Swallow, Braver, & Reynolds, 2007). Following Zacks and Tversky (2001), an “event” can be defined simply as “a segment of time at a given location that is conceived by an observer to have a beginning and an end” (Zacks and Tversky, 2001, p. 3). “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 (Radavansky & 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 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 (Radavansky & Zacks, 2014).

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.

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 & 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 infer the causes of its inputs as a means of predicting what will happen next (Bar, 2009; Clark, 2013; Friston, 2009; Hohwy, Roepstorff, & Friston, 2008; Huang & Rao, 2011). 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 et al., 2008, p. 689)

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 for the organism (Scherer, 2001, pp. 369–371). An error signal, thus, indicates a failed appraisal at a given level, and is pushed upward in the processing hierarchy. 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 upward 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 levels when attempting to explain how and why people understand their experiences in the way they do (Figure 2).

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, Niewöhner, & Beck, 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. 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 sub-events, or segments. Thus, a “driving the car on a long trip” event might include an unintended “falling asleep at the wheel” sub-event. Conversely, a dream—an unintended event—may contain many seemingly intended action sub-events.

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, 2005). 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).

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).
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, pp. 24–28, 61–66; cf. Sperber & Wilson, 1997). 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’ 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.

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

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 & Shaver, 1975; Proudfoot, 1985; Spilka, Shaver, & 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 (Barrett & Kurzban, 2006; Cosmides & Tooby, 1994; Spelke & Kinzler, 2007; Tooby & Cosmides, 1992). 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 (Radavansky & Zacks, 2014, pp. 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, pp. 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, a 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 (Radvansky & Zacks, 2014, pp. 25–28), in the sense that they only model those aspects of the scene that are causally relevant (Sperber & Wilson, 1995), 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 sub-events 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 heighten 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, or squeaking floorboards are no longer random (unintended) sub-events 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 attention in specific ways and determine what else is perceived 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. 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, 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.

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 Figure 3).

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 is recalled with greater precision in the longer term (cf. Radavansky & Zacks, 2014, pp. 133–137). Furthermore, the causal integration of event elements is also central to how well it is remembered (Radavansky & Copeland, 2000). In contrast, surface information (e.g., physical properties of entities) that is poorly integrated fades quickly (Radavansky & Zacks, 2014, p. 137) and is easily fabricated.

![Figure 3. Research process for analysis of event narratives.](image-url)
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. Radavansky & Zacks, 2014, pp. 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

Drawing inspiration from Bertram Malle’s analyses of how people explain events (Malle, 2004; Taves, 2009, pp. 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 narrator altered the way they described the sub-events 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 & Harper, 2016). 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 helps 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; Sørensen, Liénard, & Feeny, 2006), 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, p. 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, p. 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 or unintended, and that causally 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 sub-events 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 subjects’ 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, in press). 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.

4.2.1. Inner sense cultivation
One surprisingly under-researched 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 lacuna is being filled by recent work on “inner sense cultivation” (Luhrmann, 2012, 2013; Luhrmann & Morgain, 2012; Luhrmann, Nusbaum, & Thisted, 2010; 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, & 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, for example, the default mode network (e.g., Agnati, Guidolin, Battistin, Pagnoni, & Fuxe, 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. 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 et al. (2012, p. 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.

4.2.2. 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, Schjoedt, Nielbo, and Sørensen’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. (2014) 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) the 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 et al., 2009).12

Analyzing the setup in 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 (1) pre-existing event schemata and (2) referent-specific knowledge. 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 was 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,” “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.
4.2.3. 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 (Radavansky & Zacks, 2014, pp. 124–131; cf. Ranganath & Ritchey, 2012, p. 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. 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 and 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-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 setup 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 Attention Deficit Hyperactivity Disorder [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 sub-events. 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 (e.g. Slingerland & Collard, 2011). 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.

Notes

1. For an overview of methods and terminology for the building block approach, see our website at: religion.ucsb.edu/bba.

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 (Boyer & Bergstrom, 2008, p. 119; Whitehouse & Lanman, 2014, p. 675). 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 Beane, 2015).

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, p. 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, p. 4). Moreover, while these elements may be viewed as “primitives” at the level of behavior, they are further reduced at lower levels of analysis.

4. Radvansky and Zacks define an event schema simply as “a representation of knowledge about how a type of event typically unfolds” (2014, p. 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.

5. Following the lead of Scherer (2001, p. 371) and other emotion researchers (for a recent overview, see Moors, Ellsworth, Scherer, & Frijda, 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. In 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 note 11 below.

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 the German language 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.

8. Sterber (1996, p. 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.”

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 and Cosmides’ (1992, p. 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 breastfeed a baby, are what Tooby and 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).

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:

\[
\text{cues} \rightarrow \text{EvM}_1(\text{workm}) \rightarrow \text{EvNarrative}_1 \rightarrow \text{EvM}_2(\text{memory}) \rightarrow \text{EvNarrative}_2
\]

11. See Taves, 2009, pp. 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 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).

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.

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 their test groups.

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References


COMMENTARIES

Old problems die hard

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Taves and Asprem’s methodological agenda is a creative contribution to the study of religion. They claim that insights from event segmentation theory (EST) and predictive coding (PC) enable scholars to reconstruct original experience from public narratives by means of reverse engineering and thereby overcome a range of problems inherent to studying textual accounts of religious experience. The authors go on to suggest that EST and PC can expand and improve on existing lines of experimental research on religious experience. While we remain skeptical about the first claim, we are optimistic about the second.

The academic study of religious experience has traditionally been divided between essentialists and constructivists, the former claiming that religious experiences share a common core phenomenology, the latter seeing religious experiences as determined by cultural expectations. The reason this question remains open is because it is incredibly difficult to determine if written accounts reflect actual sensory experiences, post hoc interpretations influenced by cultural schemas, or even fabricated pieces of religious literature designed for proselytizing or discourse (Taves, 2009). To solve this problem, Taves and Asprem argue that EST and PC can be used to assess which details of a narrative are likely to refer to an original experience. It only requires that “[ … ] scholars are willing to take a more pragmatic and probabilistic approach [ … ],” and that the narrative in question is based
on a real experience and not simply a result of biased authorial intent, discourse, or genre (Keller, 1978). Exactly when such conditions are met is not clear, but it is fair to assume that the number of textual accounts that can be meaningfully studied, then, is vastly diminished. If these conditions are met, however, Taves and Asprem provide historians with a handy toolbox. For instance, EST can be used to infer that details at event boundaries in narratives are more likely to be accurate than details between event boundaries, and that “[…] sudden, abrupt events will be particularly well remembered and faithfully narrated.”

Taves and Asprem’s suggestion that EST is useful for analyzing purely internal events like dreams and fantasies is questionable (see the commentary by Nielbo, Andersen, and Schjoedt). But even in cases where narratives describe experiences of external events, Taves and Asprem run into serious problems. Obviously, people use event boundaries when they narrate events, but the idea that narrative event boundaries represent direct and honest echoes of what was once perceived and remembered by the individual is problematic; event boundaries in narratives are not necessarily fixed to original experiences. A subject may narrate an event in any number of ways using widely different event boundaries, depending on the aspect of interest, motivation, and communicative considerations at the time of narration. Narrative event boundaries are not magical keys that grant us privileged and direct access to honest and accurate information about event perception. Taves and Asprem’s attempt to solve the old problem of disentangling original experience from appraisals in narratives is not convincing.

We do appreciate Taves and Asprem’s suggestion that EST and PC provide a useful framework for studying religious experience using experimental methods (Andersen, Schjoedt, Nielbo, & Sørensen, 2014; Nielbo, Schjoedt, & Sørensen, 2013; Schjoedt et al., 2013a, 2013b). Indeed, such a framework may “[…] contribute to our understanding of how cultural schemata, representations, and evolved processing come together in the real-time construction of working models.” Likewise, we applaud the range of hypotheses set forth by Taves and Asprem which may indeed improve our current understanding of how, when, and why religious experiences occur. However, to fulfill their vision of studying working models of religious experience, we desperately need measures that take us beyond mere self-report. More precisely, we need to identify reliable and measurable proxies of individual predictions and prediction errors that can be used to analyze real-time experience and event boundaries in experimental settings.

Although neuroimaging techniques seem promising, current experimental paradigms include artificial settings, contrast conditions, and behavioral responses that challenge the authenticity of participants’ religious experiences (Schjoedt, 2009). Even if these issues can be overcome, a reliable interpretation of event-related potentials (ERPs) as prediction error signals is further challenged by the fact that neuroanatomical regions involved in prediction error processing, such as the Anterior Cingulate Cortex (ACC), serve multiple cognitive and affective functions (Bush, Luu, & Posner, 2000). Alternatively, one of the most promising proxies of predicted and unpredicted events may be eye movements (Wills, Lavric, Croft, & Hodgson, 2008), which often correspond more closely to conscious experience compared to neural ERPs. Eye movements have recently been used as a proxy for error monitoring (reading regressions) in a study of biblical exegesis (Schjoedt, Andersen, Nielbo, in review), and as a measure of the relationship between prediction errors and participants’ sense of agency in Ouija board sessions (Andersen et al., in preparation). We believe that eye tracking may prove ideal for studying EST and PC in real-time experience and advance Taves and Asprem’s research agenda.

From a methodological perspective, however, it is still questionable if eye tracking and neuroimaging can be meaningfully applied to all kinds of spiritual and religious experience. This issue points to a central problem in Taves and Asprem’s vision. No existing technique for measuring predictive processes allows us to study purely internal events of the kind they include in their vision, e.g., dreams. For now, experimentalists are limited to studying religious experiences that emerge in interaction with the environment.
Explaining religious experiences like dreams

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Taves and Asprem’s article makes a major contribution to the cognitive science of religion (CSR). The authors draw upon a promising area of research – event cognition – to highlight a variety of recurrent psychological features of religious and mystical phenomena. The conceptual tools provided by event cognition research enable Taves and Asprem to expand the explanatory range of CSR by including the study of religious experience, not just religious representations and actions.

In particular, Taves and Asprem emphasize the importance of greater CSR attention to unusual and anomalous types of experiences. While great progress has been made in CSR by focusing on ordinary forms of cognition, much can also be learned from a careful, systematic analysis of extraordinary cognitive activities. Taves and Asprem rightly observe that 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.

This is a welcome call for more research into the kinds of phenomena many people find most curious and compelling in religion.

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The event cognition model proposed by Taves and Asprem in their article has several other important advantages. It introduces Bayesian predictive modeling into CSR, which has potential relevance beyond its application in thinking about evolutionary pressures on human cognition. It offers a bridge with history and ethnography through its emphasis on the role of narrative expectations in perception and memory. And it encourages further research on the effects of practice and skill-building in religious experience. This last point deserves special attention because it opens the door to a much more dynamic future for CSR investigations. Recognizing that humans have a cognitive capacity to cultivate certain faculties in order to facilitate various kinds of unusual psychological states is an important insight that lends itself to more detailed study in many different historical and cultural contexts.

The “building block approach” has the virtue of conceptual simplicity, and Taves and Asprem strongly advocate for a CSR methodology that moves from reduction to reconstruction, from analyzing experiences into their constituent elements to showing how these elements are put together:

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.

It remains unclear whether this approach can achieve its stated goals. The methods of reduction work well, but the process of “reconstruction” is merely a theoretical possibility, with formidable obstacles standing in its way. Chief among these obstacles is the enormous multi-dimensional complexity of biological beings like ourselves. We can break a car down into its discrete pieces of machinery, then reverse the process and build the car back exactly as it was. The same is not true with biological systems, in which the whole is much more than the sum of its parts. The reconstruction process envisioned in this article does not seem to recognize the magnitude of the challenge involved in this kind of research, nor the ease with which limited findings can be inflated in their significance.

To be clear, the authors do an excellent job of grounding their claims in well-established findings. But the building block method crucially depends on the reliability of the blocks it deems building-worthy (in this article, the research literature on event cognition). This makes it imperative that those who use this method regularly revisit the empirical foundations of their building blocks to make sure that new findings have not undermined their apparent solidity. As everyone in this field knows, recent years have witnessed an increasing abundance of new research in cognitive science, and we have every reason to believe that this increase will accelerate in the years to come. The point is that CSR researchers should be very careful about what counts as a building block, because what seems solid today may no longer prove so sturdy tomorrow.

The article mentions dreaming several times as an ideal example of the kind of experience that (1) has been associated with religious representations and practices in cultures all over the world and throughout history, and (2) lends itself to illuminating analysis with the resources of event cognition. By making so many references to dreaming, Taves and Asprem are performing a kind of CSR public service announcement, encouraging researchers to consider the realm of sleep and dreaming as a legitimate and fruitful source of CSR investigation.

In that spirit, several questions arise regarding typical dream experiences and phenomena that may or may not have some relevance to the event cognition literature. For instance, how would event cognition help us sort out the various levels of intentionality involved in the practice of dream incubation? These are rituals in which people sleep in a special place and position and pray for a particular kind of dream, usually from some kind of divine being. The causal loops between mind, body, and culture become especially complex in these situations, and perhaps event cognition can shed light on some of their features.

Lucid dreaming poses another interesting question for event cognition, insofar as the locus of agency and consciousness in lucid dreaming no longer corresponds to what most people experience in either waking or ordinary dreaming. Research on lucid dreaming indicates a wide spectrum of awareness and volition, with a variety of metacognitive capacities available to people who cultivate
the practice in either secular or religious contexts. How would event cognition help explain these kinds of non-pathological variations in conscious and unconscious processing?

A final question regards religious beliefs in the healing power of dreams. This could be an important area for future CSR research in helping us explore the possibility that the active cultivation of specific dreaming skills could improve the perception of ordinarily subliminal physiological workings. Sleep researchers have known for many decades that during sleep the human immune system becomes very active, with a host of processes devoted to the repair and restoration of healthy cellular functioning. Perhaps there are religious practices that have taught people to recognize, via dreaming, the inner perceptual cues that correspond to the physiological activities within their own bodies. What might event cognition add to the analysis of this question?

These are only a few of the many interesting paths of inquiry stimulated in response to Taves and Asprem’s article, which is perhaps the best testament to the excellence of their work.

The event cognition “hammer” and the “nails” of experience

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Taves and Asprem’s article presents an admirable effort to promote consilience among researchers of religion, advocating a potential shared research platform that is focused on events and event cognition. While I am in broad agreement with their conciliatory goals and the call for cognitively informed research on religion to return to focus on religious experience, I have some reservations about the broader applications of the research framework they advocate.

Before discussing my reservations, I want to state clearly that I strongly agree with the usefulness of applying an event cognition approach when investigating unambiguous religious events, such as a specific festival or an ecstatic trance episode. For more ambiguous cases, such as events that endure for extended periods of time, the framework seems less directly applicable, but it still has the potential to provide insights. In both cases an event cognition framework places prominence on the processes that are constantly generating and updating our cognitive working models of events, and this is an effective means of emphasizing the multifaceted, subjective, and malleable nature of experiences. This in turn reminds researchers to consider the impact of previous experiences, expectations, and post-event reflection/elaboration and not to make the fundamental error of confusing pooled subjective responses as representing an accurate account of objective reality. These are factors that are widely recognized as important by all researchers of religion, cognitive and otherwise, but they are also often ignored in practice.

Taves and Asprem also rightly highlight the importance of developing a robust terminology and a shared theoretical framework for addressing religious experiences, to enable more effective collaborations across disciplines and the building of a cumulative body of research. Similar suggestions have been made recently in regards to the theoretical framework and terminology relating to religious representations (Purzycki & Willard, 2015). Both calls, if heeded, will help to increase rigor in the field.

However, I would like to raise three core criticisms that I hope will help to move things forward. The first is that, in seeking to illustrate the utility of event cognition as a unified framework, the authors utilize a (popular) definition so broad that it essentially enables all experience to be recast as “events.” My past week can be conceived of as “a segment of time [i.e., seven days] at a given location [i.e., Sapporo, Japan], that is perceived by an observer [i.e., me] to have a beginning and an end”; so can a birthday party, so can a trip to the bathroom, and so can a two-year tour of

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duty in Iraq. Indeed, as Taves and Asprem state in the target article, if we apply this definition, “experiences are events.” The concern here is that reframing experiences as events may obscure more than it illuminates. Is an autobiographical, narratively constructed life event best examined by categorizing it in the same group as a mundane daily event, such as riding an elevator that generates a procedural schema? I remain unconvinced. Especially when we have alternative established frameworks and existing terminology that draws important distinctions between these experiences, such as that utilized in the memory research literature. The event cognition approach does make use of this terminology but as the proposed alternative typology of events indicates, the distinctions are not prioritized.

Second, with all experience being potentially represented as events, the article then goes on to argue that event cognition should be the preferred analytical method for all research on religious experience. This strikes me as falling prey to the well-known adage of Maslow’s hammer: “if all you have is a hammer, everything looks like a nail” (1966, p. 15). In this case, the hammer of event cognition is advocated, but as a result an entire toolbox of other theoretical frameworks (e.g., social learning, ecological rationality, etc.) is potentially neglected. A counter-argument might be made that the event cognition framework can incorporate these other tools, as illustrated by the references to the differential models of memory and perception, but this returns us to the first issue identified whereby, in recasting things like procedural schema as just a part of an event, we potentially lose clarity.

The final issue is that in the sections addressing how an event cognition framework would improve comparative and experimental endeavors, some of the proposed innovations seem not to be innovations but rather represent existing best practices that are infrequently and imperfectly implemented. Take, for instance, the reanalysis of Andersen, Schjoedt, Nielbo, & Sørensen (2014) “God helmet” experiment. Taves and Asprem highlight that the stronger response detected among spiritualists suggests that the operation of event schemata was a more crucial factor than suggestion and offer a number of intriguing proposals for follow-up studies that could tease this and other issues apart. However, it seems that rather than failing to consider this, the Andersen et al. study actually anticipated the importance of differential experiences, which is why they categorized people into different groups. I agree fully that more rigorous pre-examination of experiences (and personality traits), through questionnaires or in-depth interviews (from a larger sample), would help to better identify associated factors, but such recommendations do not seem to require the adoption of an event cognition framework. Similarly, I would contend that research on witness reliability and perceptual biases could provide broader insight for historians assessing sources than the event cognition literature.

Despite these issues, I remain enthused about the program of research and the theoretical framework outlined, when it is considered as one useful tool for examining experience, as opposed to the only tool. Taves and Asprem provide a number of testable predictions and illuminate a wide range of new productive lines of research that should be pursued, particularly in regards to the role of cognitive impairment on religious experiences. Moreover, the framework’s ability to assimilate social and environmental influences, and address these together with top-down and bottom-up cognitive processing, offers a comprehensive model for examining experience that is both coherent and practical. Addressing external influences alongside internal cognitive processes also generates the potential for collaboration with similar social-cognitive approaches, such as ecological rationality (Todd, Gigerenzer, & the ABC Research Group, 2012), social cognitive neuroscience (Frith & Frith, 2010, 2012; Lieberman, 2007), and social or cultural learning (Laland, 2004; Tomasello, 2014). Whether such a framework will prove equally appealing to researchers of religious experience in the humanities, who are typically wary of cognitive framing, seems a less certain proposal, but I personally hope so as both groups will benefit from further collaboration.

References
Can predictive coding explain past experiences?

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In their target article, Taves and Asprem suggest disassembling religious experiences into events, and studying the formation and interpretation of religious experiences using the approach of cognitive science. We support such an approach and especially embrace using experimental methods to better understand how religious experiences can be generated. However, we are concerned with the feasibility of using first-person narratives to reconstruct “originatory events.” The study of unusual experiences has not been prominent in the cognitive science of religion (CSR), as the authors note, because of “the difficulties inherent in the use of first-person narratives.” Although Taves and Asprem try to address some of these difficulties (e.g., bias in recollecting past events), there is a host of remaining issues that might significantly impede the attempt to rehabilitate the first-person accounts as a prime data source for CSR. We identify and outline three crucial problems and suggest that clarifying these issues might advance the approach proposed by Taves and Asprem.

First, assuming that a patterned practice shapes one’s top-down generative models and helps to make sense of prediction errors (Clark, 2013; Roepstorff, Niewöhner, & Beck, 2010), we would need to be able to quantify the strength of an individual’s predictive models (priors) and their influence on particular experiences. However, such data are difficult to acquire from a first-person narrative. A person might be affiliated with a specific religious tradition, but we cannot really know how much his or her religious belief is internalized (Berger & Luckmann, 1991). Self-declared religiosity might give us a hint, but these declarations might be biased for various reasons (e.g., prestige; see Gervais & Norenzayan, 2012). In the words of hierarchical predictive coding (HPC), we cannot be sure of the predictive strength that such generative models would have in an individual mind. One’s patterned practice might predict the existence of ghosts in haunted houses, but such a hypothesis might have a very low posterior probability. Although the ghost explanation might indeed be selected by the individual, such an explanation might be just the best out of bad hypotheses. Prediction error caused by “the presence of a ghost” would probably lack both weight and precision and would not impact the top levels of cortical hierarchy. This uncertainty would make retrospective inferences difficult, because we would lack confidence in the main predictive models influencing real-time appraisals.
Second, given that one strongly believes in ghosts, it is reasonable to expect that a ghost’s presence will be inferred when triggered by specific cues. However, an inference process is not fully conscious, and tracing original cues back from a narrative to a real-time model will be constrained by a narrator’s focus of attention. Attention might be highly selective in isolating only some features in perception (Barsalou, 1999), and a person will report different factors in a haunted house when looking for a ghost (top-down sensory expectation) than, for instance, when looking for a treasure with no expectance of ghosts (see a discussion of inattentive blindness in Hohwy, 2012). Such a situation might be narrated in very different ways, highlighting different environmental cues. Moreover, research on the role of automaticity in behavior suggests that humans often make decisions based on unconsciously perceived cues (Bargh, Schwader, Hailey, Dyer, & Boothby, 2012). For example, a picture of an old man hanging on a wall might trigger the experience of ghost presence, but we will rarely know, because such a factor would most likely be left out from the narrative.

Third, it is unclear from the target article what experiences are to be studied. For instance, experiences deemed religious might span from participating in the Hajj to feeling a sense of unity during meditation or to talking with one’s ancestors. From the perspective of HPC, such experiences will have different causal mechanisms that might impact the construction of working models. When talking about religious experiences, Taves and Asprem usually refer to “dreams, visions, voices, and appearances,” suggesting that they are interested mostly in unusual perceptual experiences. However, the more unusual an experience is, the less confident we can be in reconstructing events promoting it, because we lose clear distinction between self-generated percepts and external inputs. The authors acknowledge that sometimes it will not be possible to distinguish between original cues and appraisals. But we are concerned that when studying “originatory events,” this scenario will be a regularity rather than an exception.

Consider again seeing a ghost in a haunted house. Such an experience might be a product of a very strong top-down generative models (hyper-priors) that fill in the sensory gaps caused, for example, by sensory deprivation in dark environments or by extremely noisy input comprising a number of predictive errors (Corlett, Frith, & Fletcher, 2009; Whitson & Galinsky, 2008). Or it could be a defect in self-monitoring that tags a self-generated visual stream as external (Fletcher & Frith, 2009). Any of these scenarios can make past reconstructions equivocal, because we would not be able to distinguish between self-generated perceptions and actual environments. A possible solution to this problem would be to assess proneness to such experiences as suggested by the models of positive symptoms in schizophrenia (Corlett, Krystal, Taylor, & Fletcher, 2009). For instance, we might be able to quantify the rigidity of a corollary-discharge inhibition that normally helps to suppress the self-generated sensory signals, assuming that people with more variable inhibitions will be more likely to experience the self-generated thoughts and actions as external (Fletcher & Frith, 2009). However, assessing the rigidity of corollary discharge retrospectively would just affirm the consequent, as Taves and Asprem note elsewhere in the target article.

In sum, we do not claim that the approach proposed in the target article is infeasible. But we conjecture that models of past religious experiences will have different confidence levels, and some will be very uncertain. It would be helpful to see a real application to historical data in order to estimate the utility of this approach. Such an analysis should show how to (1) ascertain that narratives were not purposefully constructed (i.e., made up) to reach specific goals; (2) identify and filter out effects of unconscious biases in a narrative construction; (3) reconstruct a past event’s environment; (4) assess the strength of predictive models that might have caused a religious appraisal; and (5) distinguish between self-generated percepts and external cues.

References


Methodological applications of an event cognition model for the study of religious experience

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Taves and Asprem’s explanatory framework for “experience” advances the cognitive science of religion by challenging scholars to provide explanations that both “deconstruct” and “reconstruct.” Developing their recent work on the building block approach (Asprem, in press; Taves, 2015) together with the literature on event cognition and predictive coding, they offer innovative strategies for moving beyond the stale debates between perennialist and constructivist approaches to the study of religious experience. Their approach is sufficiently precise to facilitate focused investigations into how complex cultural concepts (CCCs) recruit basic concepts (BCs), while also being sufficiently broad to allow for the integration of theories and data from multiple disciplines, including historical, ethnographic, qualitative, experimental, and neurobiological approaches.

Whether the Bayesian model of predictive coding is the right way to explain human perception, cognition, and behavior is the subject of ongoing debates that will be clarified through further empirical research (Clark, 2013; Marcus & Davis, 2013). Nevertheless, operationalizing (religious) experience as “event” entails a methodologically productive differentiation of the basic cognitive and perceptual architecture that potentially underlies a multitude of experiences from the cultural influences that inform discrete and meaningful events. Considering post hoc “event narratives” as being derived from real-time “event models” requires scholars of religion to account for the influence of culture at multiple time points. The public dimension of event narratives also demands an account of how events are situated in relation to disparate, and potentially competing processes of meaning making. These processes include basic causal explanations for events as well as the normative or polemical agendas that event narratives often support (Sharf, 1995).

Taves and Asprem additionally contend that under certain circumstances – ideally where multiple versions of event narratives are present – it may be possible to reconstruct the “original event.” However, if we take the model of predictive coding and event cognition seriously, the historian’s attempt to reconstruct the original event also requires a comprehensive understanding of the

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various schemas (cultural and behavioral) recruited in the real-time mental representation of a given event. While historians often do have access to data that would facilitate a rich description of the cultural context surrounding an original event, mapping the precise influence of cultural inputs on the schemas recruited during real-time event modeling remains a daunting task.

Scholars of religion have expressed skepticism over the prospects of disentangling the cultural influences that mediate experiences and their formulation as narratives from a pre-cultural or pre-linguistic phenomenology original to the event (Sharf, 2000). Depending on how it is engaged, the event cognition model and building block approach could also succumb to these criticisms. It is important to recognize the potential pitfalls in Taves and Asprem’s distinction between CCCs, which have “culturally determined meanings that vary within and across cultures,” and BCs that are “translatable across cultures because they are grounded in evolved mental architecture.” Reverse-engineering a CCC such as “mysticism” into BCs such as “event” and “representation” could be misconstrued as having sufficiently disambiguated the culturally mediated level from the culturally invariable or pan-human domain. Given that “events” also recruit early cognitive processes such as attention and perceptual processes such as vision, this begs the question, at what level of analysis is a BC posited as “translatable across cultures”? For instance, there is considerable disagreement over whether or not a potential BC such as visual perception is penetrated by concepts or culture (Nisbett & Miyamoto, 2005; Orlandi, 2011; Pylyshyn, 1999). To what extent or at what level such BCs are in fact translatable across cultures should remain an open question subject to empirical research.

The historian’s attempt to reconstruct original events from event narratives would also benefit from being placed in dialogue with experimental methods. Hypotheses generated from historical data could potentially be tested through experimental designs. If the stream of experience becomes segmented into salient and meaningful events when prediction errors cross a threshold that requires the revision of a working model, then researchers could attempt to predict which available cultural schemas would be recruited in order to render meaningful an anomalous experience induced at the perceptual, somatic, or cognitive level. Demonstrating that a specific anomalous experience recruits certain cultural schemas but not others in the formulation of real-time event models or post hoc event narratives could, in turn, further constrain the inferences that historians make in attempting to reconstruct original events from event narratives.

However, many scholars studying “religious experience” are attempting to explain verbal or written reports, not carefully controlled lab-based manipulations. Taves and Asprem’s event cognition model could also be applied in the context of qualitative research. For example, in an ongoing study of American Buddhist practitioners, we employ an interview protocol that separately queries descriptive reports of meditation-related events from reports of how such events have been interpreted according to the language, concepts, values, and worldview of the practitioners’ tradition. Through inductive content analysis, events reported by the practitioners are deconstructed in accordance with the descriptive language they use (Guest, MacQueen, & Namey, 2012). This allows us to identify patterns in event narratives across practitioners and establish reconstructive hypotheses about the role of various BCs and attributions in both the real-time appraisal of events and the post hoc interpretations of those events. Although a carefully designed interview protocol and subsequent content analysis may allow researchers to differentiate the primary attributions of an event from subsequent causal and meaning-driven attributions, this approach remains limited by the difficulty of confidently identifying the cultural schemas and appraisals that inform real-time event models.

The experience as event model also has the potential to facilitate the project of “vertical integration” from humanistic and social scientific to neuroscientific approaches (Slingerland, 2008). What serve as BCs for one research paradigm and methodological approach are the CCCs of another discipline. For example, while it would be productive for a historian to consider “attention” as a BC for “meditation,” for a neuroscientist, “attention” would be deconstructed into more basic concepts that are further grounded in neural correlates. In the process of reconstruction, neurobiological explanations can be employed to provide a more complete explanation of personal-level phenomena.
Similarly, Taves and Asprem’s experience as event model can potentially accommodate both these levels as well as the persistent influence of culture on human experience.

References


Segmentation and cultural modulation in perception of internal events are not trivial matters

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The application of perceptual and cognitive theories to religious phenomena has resulted in many interesting and productive models. Taves and Asprem propose to apply event segmentation theory (EST) to model religious experience. We agree with them that religious experience can and should be examined empirically despite several methodological challenges. In this commentary, however, we ask whether or not this can be done by applying EST. EST’s proper domain is external events, which makes it ideally suited for modeling religious phenomena such as ritual action (Nielbo & Sörensen, 2013, in press). Taves and Asprem’s extrapolation of the theory to internal events such as dreams, fantasies, inner voices, and visions is fraught with problems because the relationship between event segmentation and prior knowledge including cultural ideas is poorly understood in external events, and even less so, if at all, in internal events. The modulatory effects of cultural ideas on external event segmentation have proven to be quite subtle and exceedingly difficult to track experimentally (Nielbo, Schjoedt, & Sörensen, 2013; Nielbo & Sörensen, 2011). Before EST can be successfully applied to internal events, let alone religious experience, EST needs a better empirical handle on cultural modulation of external event segmentation.

EST is essentially an object perception and recognition theory that targets dynamic objects (as opposed to static objects) (Zacks et al., 2007). Events are dynamic objects, that is, objects that are
perceived to be bounded in time instead of space. Just as static objects have spatial contours, dynamic objects have temporal contours (so-called event boundaries) that correspond to external physical features, typically points of maximal change in a movement trajectory (e.g., Hard, Recchia, & Tversky, 2011). Event boundaries are information dense in that they identify the structural skeleton of an event and therefore provide the primary resource for classifying and predicting events in our external environment. Importantly, EST finds its empirical support in a small set of quantitative measures of event boundaries.

Using EST, Taves and Asprem propose to model subjective experience as discrete mental states or internal events. However, it is not a trivial matter to map an object perception theory onto internally experienced states that lack external objective features. When, for instance, we model how subjects perceive actions, we can compare their subjective segmentation rate and hierarchical alignment with the objective features of the stimuli and manipulate accessibility to event-relevant knowledge. This makes it possible to assert that (subjective) event perception is primarily driven by (objective) points of change in the event’s external correlate. Although EST has an experiential component in its definition of a basic event, “conceived of by an observer” (Zack & Tversky, 2001, p. 3), this does not make EST more suited for modeling subjective experience than any other perceptual theory that relies on a perceiver. EST is optimized for human perception and understanding of external events, primarily actions, that have manipulable physical properties. EST and its methodological counterpart, the event segmentation paradigm, do not provide any guidance for applying their models and measures to internal events.

Evidence has to a large extent supported EST’s claim that similar computational principles are used to process events across different cognitive systems (e.g., Bailey et al., 2013; Sargent et al., 2013; Speer, Reynolds, Swallow, & Zacks, 2009; Swallow et al., 2011; Zack et al., 2007). Event boundaries are, for instance, focal points of both attention and memory. According to Taves and Asprem, humans also use these principles during processing of internal events such as dreams and visions. Humans most certainly use markers of event boundaries when they narrate a dream or a vision (e.g., the dream started with this and ended with that) (c.f. Kurby & Zacks, 2013), but it is not necessarily obvious what these boundaries correspond to in the original internal event. Given the lack of external input, how are we to model event perception of internal events? Since the bottom-up signal is underspecified, we must assume that internal modulatory resources, such as culturally based prior knowledge, are essential to internal event perception. Although it is assumed by EST that cultural schemas and referent-specific knowledge modulate event segmentation top-down, it has proven hard to identify the actual modulation process. Several experiments have shown that people tend to place and hierarchically align event boundaries independent of prior knowledge (Nielbo et al., 2013; Nielbo & Sørensen, 2011). It has therefore been suggested that event segmentation happens at an automatic level where culturally based priors have minimal influence (Nielbo & Sørensen, 2011). An alternative explanation is that the effect of priors is more subtle. Since people utilize the same external physical features, they segment a dynamic object identically (e.g., the barista and coffee novice utilize the same physical discontinuities and relations to segment the act of coffee brewing), but priors modulate the degree of surprise differentially (e.g., both respond to the loud sound of the steam wand, but the coffee novice more so than the barista). A recent computer simulation of event segmentation supported this explanation by showing that cultural priors did not modify the frequency of the segmentation signal (i.e., the number of event boundaries), but rather the amplitude (the magnitude of the event boundaries) (Nielbo & Sørensen, 2015). Lacking a direct measure of the amplitude makes it complicated to model modulatory effects of internal resources and by extension almost impossible to apply EST to internal events that must rely heavily on these resources.

In summary, while Taves and Asprem’s ambition of modeling real-time religious experience is important, we are less convinced by their application of EST. Before EST can be generalized outside its domain, let alone deliver core principles for Taves and Asprem’s methodology, more research will be needed to adequately model the effect and weight of culturally based priors in external event
perception (i.e., to allow for parameter estimation and model comparison). At this early stage, the application of EST to internal events leaves us only with pure conjecture.

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**Religious experience and the cognitive science of religion**

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Taves and Asprem’s article is a valuable contribution to the building block approach to the study of religious experience introduced in Taves (2009). The authors draw on research in event cognition to relate the cognitive study of religion to current work in social psychology and to address outstanding issues in the study of religious experience. The event cognition literature centers on a subject’s model of an event and suitably takes account of prior event schemata, sensory input, his or her prediction of the event, and corrective feedback.

Taves and Asprem properly emphasize the role played in religious experience by the concepts a subject brings to an experience and the ways in which he or she understands it. At the heart of their
approach is a distinction between basic concepts and complex cultural concepts, and another between core knowledge and culture-specific knowledge. Basic concepts are relatively simple and stable concepts and are identical across cultures and social formations because they are “grounded in evolved mental architecture and embodied interactions with the environment.” Complex cultural concepts are to be explained by reference to basic concepts such as action, representation, and event. Core knowledge is universal and is contrasted with culture-specific knowledge.

The event cognition framework allows Taves and Asprem to distinguish between and to examine “the interplay between culturally specific and evolved prior knowledge in the construction of event models.” They argue that core knowledge derives from evolved learning systems that allow easy acquisition of certain schemata, for instance predicting intentional behavior and attributing agency. Culture-specific knowledge comes in two kinds, knowledge about types of events and referent-specific knowledge.

Each of these distinctions is helpful for identifying different concepts and different kinds of knowledge available to a person to describe and explain an event. I worry, though, that they might be used to reinstate the distinction prominent in so many twentieth-century theories of mysticism between a core experience and its varying interpretations in different cultural traditions. Interest in that kind of separation is understandable in order to be able to say something about what kind of experiences are likely to be deemed religious. That is a reasonable question to ask, but I think we should be careful about how we answer it. Experiences are events, but they are events that are constituted, in part, by having been deemed religious.

Taves and Asprem write that constructionists claim that “even if there were actual experiences behind public experience narratives, there would be no way for the (humanist) scholar to access them,” so it would be better to stay with empirically observable narratives. Katz (1978) and I (Proudfoot, 1985) argued against a separation between a core experience and its interpretations not because a core was inaccessible, but because it failed to capture the experience. A felt sense of the presence of God may be experienced in a glimpse of a sunrise over a mountain pass, being fortunately spared a potential disaster, a poem or painting, or a regimen of spiritual exercise. The distinguishing mark of a religious experience is that the event is deemed religious. The experience cannot be captured by an account of the event in the absence of that description.

Theorists in the cognitive science of religion have argued that agent detection, or a propensity to identify certain motions in the presence of biological cues as intentional, is an evolved core response, invariant across different cultures. Scholars of mysticism in the first half of the twentieth century identified a core as a sense of oneness and the dissolution of boundaries. That dissolution may or may not be an evolved core response, but Sigmund Freud argued on psychoanalytic grounds that such an “oceanic feeling” is independent of particular cultures and social forms. Neither the propensity for agent detection nor a sense of boundless unity is religious, though, apart from the cultural designation of it as religious.

One might think that the idea of agent detection, or as David Hume wrote, our tendency to see “figures in the clouds, our face in the moon,” is naturally related to religion (Hume, 1993, p. 26). Experimental psychologists have shown that this propensity for identifying moving objects as agents is universal across cultures and across religious orientations. The fact that we take this propensity to be intrinsically religious, though, is due to conceptions of religion that derive from biblical theism or a focus on spiritual agency. A sense of boundless unity is widespread, if not universal, but the idea of mysticism, with that sense as a common core, developed only during the last couple of decades of the nineteenth century. Both the sense of unity and agent detection may be events or experiences likely to be deemed religious, but this deeming is a result of history and culture, not of core knowledge. I think Taves and Asprem would agree, but I want to underline the point.

The emphasis Taves and Asprem give to religious skills and practices is excellent. The sense of oneness and the ability to see the work of God in one’s life and the broader world are often the aim and the result of careful and elaborate spiritual exercises. One could study religious experience chiefly by examining manuals and guides for those exercises in different traditions. This also might
shed some light on the relatively sharp distinction the authors make between “experience” and “experiences.” Religious meditations and spiritual exercises are not always aimed at attaining particular religious experiences, where those are understood as events with a beginning and end. We may view them that way because of a propensity to view religious experience as episodes. This may seem to be a legacy of James’s *Varieties of Religious Experience* because of the focus he gives to conversion and some of the experiences cited in the chapter on mysticism, but much of the rest of *Varieties* is not limited to experiences as events.

I find it ironic that, although cognitive psychology as developed in the middle of the twentieth century was a reaction against the behaviorism that had dominated the field, “cognitive science of religion” today has come to refer to work that, like behaviorism, deliberately excludes reference to the particular thoughts of the people being studied and of the cultures of which those thoughts are a part. Taves’ approach is a good counter to the resultant theories of religion.

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The foundational nature of events

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In their target article, Taves and Asprem suggest that the study of the cognitive science of religion can be aided and more effectively addressed by incorporating the principles and ideas of event cognition theory (Radvansky, 2012; Radvansky & Zacks, 2011, 2014). This is not how we imagined or intended event cognition theory to be used, and Taves and Asprem are right to extend it into this domain. Although event cognition theory primarily developed in the areas of visual perception, language comprehension, and memory, it is a theoretical framework that can have broad appeal and usage across a number of domains in cognitive science. Taves and Asprem’s application is in keeping with this spirit.

There are a number of elements of event cognition theory that were identified as important for their argument. This includes the elements of event models, such as the spatial-temporal framework, the relevant entities, their properties, and most importantly, the causal/functional relations among the various event elements, as well as how events are related to one another. The set of causal relations among events and elements is the backbone of our comprehension and memory. This follows on from the idea that events that are causally connected to a greater number of other events are rated as being more important (Trabasso & Sperry, 1985; Van den Broek, 1988) and are remembered better than other events (Radvansky & Copeland, 2000; Radvansky, Copeland, & Zwaan, 2005). Thus, the value and importance of a religious experience can be quantitatively indexed in terms of how it is viewed as being causally connected to other events in a person’s life.

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Taves and Asprem also point out the importance of event boundaries. Event boundaries are points where prediction breaks down and a person closes up one event model and moves onto another. Because of the change in mental processing that occurs at these points, people are more likely to be able to remember those experiences and find them important, rather than the duller, constant stuff that occurs between those joints. Religious experiences are defined by large changes in what is expected, which is a critical point in event cognition theory. This ties into the causal structure of experienced events because it is at the event boundaries that causal influences are most likely to be observed.

This is all important because the knowledge that we create and hold in event models is very durable. It is retained over long periods of time, with much less forgetting compared to other types of information, such as verbatim memory (Kintsch, Welsch, Schmalhofer, & Zimny, 1990; Radvansky, Zwaan, Curiel, & Copeland, 2001). Event model processing is also less affected by changes in cognitive processing that accompany aging (Radvansky & Dijkstra, 2007). One could suppose that, from an evolutionary point of view, event cognition is very robust and fundamental, and is likely to be used, in some form, by a wide variety of other animals. This likely fundamental nature highlights the need for event cognition to play a major role in theorizing about how people interpret, remember, and act on their experiences.

Using event cognition as a basis for theory development also opens up avenues into other theories that are relevant for the cognitive science of religion, such as autobiographical memory, episodic future thinking, and spontaneous memory. Autobiographical memory is relevant in part because it takes the event models and relations derived from experiences and weaves them into a life narrative that gives meaning and direction to a person’s life. Religious experiences, how they are represented in event models, and how they are retrieved from memory in constructing the life narrative would be of vital importance.

Another area, along with event cognition, that can help the cognitive science of religion is episodic future thinking (Atance & O’Neill, 2001; Szpunar, 2010). Episodic future thinking is when a person imagines what will happen in the future. Episodic future thoughts are created using both information in semantic memory, such as schemas, and prior episodic memory experiences (Schacter, Addis, & Buckner, 2007; Szpunar & McDermott, 2008). In fact, anterograde amnesiacs who have trouble memorizing new episodic event experiences also have trouble imagining future events (Klein, Loftus, & Kihlstrom, 2002). Given that how we imagine what will happen in the future is so grounded in our experiences in the past, how one forms event models of experience will serve as a touchstone for guiding our thoughts of what will happen in the near and distant future. Thus, how one conceptualizes and experiences religious events will color how we will expect the future to unfold.

A third line of theory that can be of relevance is that of involuntary memories (Berntsen, 1996, 2010). These are instances in which some element of an experience brings to mind, without a deliberate effort, some memory of a person’s past. Like episodic future thinking, these occur very often during one’s day, and are more likely to be viewed by the person as being positive rather than negative. By viewing these involuntary memories as event models, we can then more effectively identify the various types of information that would be part of these memories, as well as a person’s subjective experiences of those unbidden memories of events. This is especially likely to be true of events that are distinctive in some way and important to the person. These will help color how people are viewing their immediate experience, and help guide the choices and actions they take.

So, in sum, there is great promise in Taves and Asprem’s suggestion that event cognition theory can effectively quantify and organize theorizing in the domain of the cognitive science of religion. Event cognition provides a means of understanding the experience of the person within the event as it unfolds, the later memory of that experience, and types of narratives that are constructed in which these events are embedded as people derive meaning from their experiences.

References
Taves and Asprem propose an integrated theory of event cognition and predictive coding and they apply their framework to the study of religious experience. We would like to commend the authors for their excellent initiative in further integrating the fields of religious studies and cognitive science. However, we also note two important challenges for the model related to (1) the precise role of predictive processing in religious experience and (2) readers’ bias and the reconstruction of situation models (Radvansky & Zacks, 2011).

First, in Taves and Asprem’s article, classical theories of event cognition are extended and integrated within a predictive coding framework, according to which event models are updated based on prediction error signals. The authors propose that these event models are hierarchically organized, which applies well to event models for concrete actions (e.g., coffee making) that are characterized by a highly structured sequence of goals and sub-goals (e.g., van Elk, van Schie, & Bekkering, 2014). Eventually, religious ritual actions could also be considered as hierarchically organized such that a high-level goal (e.g., becoming a full member of the church) is achieved through a number of
sub-goals (e.g., baptism, first communion), which in turn consist of low-level concrete actions (e.g., pouring water). However, when it comes to experiences, and even more specifically religious experiences, it is less clear that these are governed by hierarchically organized event models. Religious experiences differ in important ways from religious actions (i.e., experiences are often more passive, less structured, and less spatially and temporally constrained than actions), and do not entail a hierarchical organization of the features involved (e.g., such as “hearing God’s voice,” “loss of self,” “feeling ecstatic,” etc.). We argue that, although predictive coding indeed provides a powerful framework to account for a wide range of different effects and experiences, more specific predictive neurocognitive models are needed to account for key aspects of religious experiences instead. Specifically, predictive neurocognitive models of hallucinations (Fletcher & Frith, 2009), of the bodily self (Apps & Tsakiris, 2014), and of interoceptive inference and emotion (Seth, 2013) may be applied and extended to a religious context. For instance, auditory hallucinations in schizophrenia have been associated with decreased precision in efferent copy signals in association with self-generated inner speech (Fletcher & Frith, 2009). The accompanying difficulty in dissociating self-generated from externally generated effects could play a role in self-transcendent experiences as well (van Elk, 2015), which are often characterized by a blurring of the distinction between self and others. As a consequence of this proposed extension of the model, there is no unitary predictive coding account of religious experiences, but different aspects of experiences (e.g., feeling connected, ecstatic emotions, etc.; cf. Piedmont, 1999) call for specific neurocognitive explanations that do not necessarily entail a hierarchical structure.

Second, the authors argue that event models account for the role of culture-specific knowledge and effects of prior expectations on the emergence of religious experiences. For instance, an auditory hallucination may be interpreted as the “hearing of a ghost” in a religious context but as a clinical symptom of schizophrenia in a medical context. Furthermore, the authors propose that, based on narratives, the original event working model can be (partly) reconstructed through a process of integrating historical and contextual information and by relying on information about the event boundaries. The authors envisage the historian’s reconstruction as proceeding in two steps. The first step is to reconstruct from a public event representation (an event narrative) the mental event representation of the narrator at the time of narration (a memory). The second step is to reconstruct from this event model (of the remembered event) a (hypothetical) earlier working model of the initial event. However, rather than reconstructing an event working model of the original experience, we suggest that during language and text comprehension readers construct a situation model, involving a representation of the actors, and the space and time of the event (Zwaan & Radvansky, 1998). The distinction between event and situation models is crucial: the event model represents a first-person account of a specific experience interpreted based on relevant background knowledge. A situation model represents a reader’s understanding of a specific situation as related by an author. The situation model is based in part on information conveyed by the text itself and, importantly, in part by the reader’s background knowledge. Thus, situation models are highly dependent on the prior expectations and expertise of the reader. For instance, expectations regarding the genre of a text (e.g., literary story vs. news story) impact the type of information that is subsequently memorized (e.g., surface vs. situational information; Zwaan, 1994). In elementary school students, for instance, domain expertise was a stronger predictor of text recall than grade level (Schneider & Körkel, 1989). Also, when reading about sports events, only athletes showed evidence of engaging in a sports-specific mental simulation of the events described (Holt & Beilock, 2006). Accordingly, the notion that original event working models can be reconstructed through a process of “inference to the most likely event model” that was at the basis of the narrative overlooks the role of personal expertise, and thus bias, in constructing situation models. Given the idiosyncratic nature of religious experiences, different readers will likely arrive at different situation models of the experiences described, building on their own relevant background knowledge and experiences that best approximate the situation described.
In sum, we suggest that the proposed model is too unspecific regarding (1) how religious experiences come about through predictive processing and (2) how readers’ biases affect the reconstruction of a situation model of religious experience. To remedy the inherent difficulty in tracing back the origins of reported religious experiences, a multidisciplinary approach may be necessary involving neuroscientists, religious scholars, and linguists. Only then could one hopefully arrive at an account of which core experiences and which neurocognitive mechanisms may ultimately have been at the basis of the events described in a text.

References


RESPONSE

**Connecting events: experienced, narrated, and framed**

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We are grateful to the commentators who took the time to respond to our target article and think they raised a number of important concerns. Before discussing them, however, we were pleased to note that there was little opposition to the general idea of viewing experiences as events. Although Radvansky (as well as Zacks) did not envision this use of their theory, we were particularly gratified that Radvansky not only affirmed but offered means of extending our application of their research into the realm of experience.

Our response to the concerns raised falls under four headings: (1) opening clarifications, (2) issues related to the use of first-person narratives, (3) concerns related to extending event segmentation theory (EST) to internally experienced states, and (4) the effects of cross-event integration.

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1. Opening clarifications

Experience as event. Kavanagh worries that our definition of events is too broad and suggests that event cognition is the “preferred analytical method to employ for all research on religious experience.” We adopted the definition used in the event cognition literature (Zacks & Tversky, 2001). Researchers in this field intentionally define it broadly, recognizing that people view events in multiple timeframes from the micro to the macro and can readily switch between perspectives. In referring to “experiences as events,” our intention was to distinguish between experience as the flow of information and experiences, which reflect the chunking of the flow of information into events with a beginning and an end. This framework not only gave us a starting point for recasting some traditional problems in the study of “religious experience” but also, as we will discuss below, provides a means of integrating disparate lines of research. Thus, we do not view event cognition as “a tool” but as a theoretical framework that embeds the study of experience in current neurocognitive research on how people generate models of what is happening.

[Religious] experience. Both Proudfoot and van Elk and Zwaan raise concerns about our reference to “(religious) experience” (RE). In placing “religious” in parentheses in the title, we meant to signal our embrace of an attributional approach (Taves, 2009) in which we assume that no experiences are inherently religious (or spiritual) and that their characterization as such is a matter of appraisal, both conscious and unconscious. Thus, we were presupposing from the outset that there is, as van Elk and Zwaan conclude, “no unitary predictive coding account of RE, but different aspects of experiences … [that] call for specific neurocognitive explanations.” Similarly, we are not seeking – with respect to Proudfoot’s concern – “to reinstate the distinction … between a core experience and its varying interpretations in different cultural traditions” (emphasis added). We would hold, however, that there are a range of internal sensations (e.g., a sense of the self leaving the body, a sense of the self dissolving, hearing voices, or vivid mental images) that may give rise to religious (or psychopathological) appraisals depending on context and previous learning.

Levels and mechanisms. Lindahl indicates that viewing experiences as events has the potential to facilitate the project of “vertical integration” from humanistic and social scientific to neuroscientific approaches (Slingerland, 2008), but worries that “reverse-engineering a CCC [complex cultural concept] such as ‘mysticism’ into BCs [basic concepts] such as ‘event’ and ‘representation’ could be misconstrued as having insufficiently disambiguated the culturally mediated level from the culturally invariable or pan-human domain.” This is an important concern that is exacerbated by the multiple meanings associated with the term “levels.” In this regard we find Craver’s “Field Guide to Levels” (2007, pp. 163–195) immensely helpful. As Lindahl rightly notes, “events” and “representations” do not as such disambiguate culturally mediated and pan-human “levels.” For explanatory purposes, however, Craver argues that we should focus not on levels of scientific analysis (e.g., biological, psychological, socio-cultural), but on levels of mechanisms.

Although a variety of definitions have been proposed for mechanisms, a consensus is emerging among philosophers of science around minimalist definitions, such as this: “A mechanism for a phenomenon consists of entities (or parts) whose activities and interactions are organized in such a way that they produce the phenomenon” (Glennon forthcoming, Ch. 2, cited in Craver & Tabery (2016)). Relative to this definition, an “event” (that is, “a segment of time recognized by an observer to have a beginning and an end”) is the phenomenon of interest. Research on event cognition and more specifically on the components that are integrated into event models allows us to identify “the entities (or parts) whose activities and interactions are organized in such a way that they produce the phenomenon [i.e., the event].” Components not only interact at a given level, but each component can be viewed as a phenomenon of interest made up of components that interact to produce it. The components that interact to produce an event are, as Lindahl suggests, a mix of pan-cultural processes and culture-specific content. Given this interplay, Lindahl argues that the extent to which a basic concept, such as an “event,” is “in fact translatable across cultures should remain an open question subject to empirical research.” We agree, and note that research in progress on the relationship
between language and events promises to paint a subtler picture of their interaction within an event cognition framework (see Papafragou, 2015).

In sum, we are suggesting that there is value in starting with sources of data accessible to historians and ethnographers (event narratives and the social contexts in which they are generated) and using research on event cognition as a means of identifying potential components that interact to produce the event narratives. A focus on levels of mechanisms rather than levels of disciplinary analysis in turn makes it clear that the components interacting to produce an event include pan-cultural processes, such as those that inform social communication, interaction, and learning processes; and culture-specific content (e.g., culture-specific schemas). Focusing on the components that interact to produce events thus allows us to integrate lines of research that are often pursued in disciplinary isolation. This admittedly ambitious goal leads directly into the concerns raised regarding the use of first-person event narratives.

2. Concerns related to the use of first-person narratives

Lang and Kundt, Lindahl, and van Elk and Zwaan all raise important issues regarding the use of first-person narratives. We recognize and share most of their concerns and will offer an actual application and test of the method that illustrates both the value and limits of the approach. But first, to highlight the particularity of this example, we want to stress that we are assuming (1) we can use the method to study a variety of types of experiences, (2) different types of experiences will have different causal mechanisms, and (3) the nature and extent of the sources will vary in relation to particular experiences and that this will in turn give rise to models with vastly different confidence levels. We also recognize, as Lang and Kundt point out, that the historian’s access to “original cues” based on subsequent narratives is “constrained by a narrator’s focus of attention.” We agree that models cannot be comprehensive in this regard. With respect to the analysis of historical narratives, however, we think that it is an advance on existing practice simply to identify the cues that were the narrator’s focus of attention. The identification of specific cues, e.g., visual hallucinations or a sense of the self leaving the body, in so far as they can be ascertained with a reasonable level of confidence, allows us to bring specific neurocognitive models to bear on the sensations described, in keeping with the suggestion offered by van Elk and Zwaan. Furthermore, distinguishing between cues and appraisals may allow us to identify sub-events defined by changes in cues within an event narrative and, thus, in some cases demonstrate more structure than van Elk and Zwaan are envisioning within experiences. Again, subject to determinations of confidence, we may then want to invoke specific neurocognitive models in relation to each of these unfolding sub-events.

Similarly, we agree with Lang and Kundt that ideally we should “be able to quantify the strength of an individual’s predictive models (priors) and their influence on particular experiences.” We recognize that “such data are difficult to acquire from a first-person narrative,” but historians, as Lindahl points out, often have other “data that would facilitate a rich description of the cultural context surrounding an original event.” Still, as Lindahl indicates, “mapping the precise influence of cultural inputs on the schemas recruited during real-time event modeling remains a daunting task.” We agree and, as historians, we are aiming for greater precision, coupled with estimates of confidence, rather than quantitative perfection.

The example that we want to discuss – accounts of Joseph Smith’s alleged first vision – presents many of these difficulties. We have multiple accounts of the event – at least four from Smith himself and several from contemporaries who heard Smith relate the event. All, however, were narrated more than a decade after the alleged event took place. Still, for historians and Latter-day Saints (LDS), these are important accounts, since Joseph Smith’s 1839 version has been canonized by the LDS Church and, as described in that version, is understood to depict Smith’s calling as a prophet. In order to test the method outlined here, one of the authors (Taves) approached an LDS historian who had published on the first vision with the idea of applying the methods to the narratives and then discussing what the methods revealed. In this case, the methods involved creating a chart that analyzed the first
three of Smith’s narratives and the two earliest accounts of listeners, teasing apart descriptions of sub-events based on (1) what happened (whether intended or unintended) and (2) explanations of why it happened (implicit reasons or causes) that seemed integral to the narrative based on textual analysis (rather than interpolated commentary or reflection on the narrative). The first was intended to see if we could identify cues and the second appraisals. The accounts were then interleaved in the chart so that versions of each sub-event, including any embedded appraisals, could be compared between the various versions. The whole exercise was premised on the assumption that we have a new event each time an experience is recounted and that each recounting has a new event context and a new reason for recounting the event. The event could be an oral recounting or a textual recounting. In either case, the account of the event is embedded in a larger frame. We then discussed to what extent the chart allowed us to reconstruct an originary event based on a comparison of the accounts and historical evidence of the situation that prompted the recall and recounting of the original event.

In the end, we did not arrive at an agreed-upon reconstruction of a hypothetical original event and this is, thus, clearly an instance where any one reconstruction must be advanced tentatively. Nonetheless, we both felt that the method offered a significant advance over previous approaches. Here are four points from our reflections on the method (Taves & Harper, 2015, pp. 75–76, quoted with minor modifications):

(1) Constructing the chart: the chart was easy to construct. We had no trouble distinguishing the sub-events and teasing apart cues and any embedded appraisals. While historians should test this further with more elaborate validation methods, we did not find this aspect of the analysis particularly challenging or controversial.

(2) Discussing the chart: we discovered how important it was to surface each other’s assumptions, in our case assumptions about memory and our ability to reconstruct the way a subject most likely viewed or would have recounted an event close to the time it occurred. Until we did this, we had difficulty following each other’s arguments. Once we did, however, we were able to narrow and nuance those differences significantly by attending to the framing of narratives and specifically to the contextual factors that we thought might have cued, and thus shaped, what was recalled when the event was recounted.

(3) Comparing accounts: once we had our assumptions on the table, having the chart as a point of reference allowed us to identify similarities and differences between the accounts. Although our initial reading of similarities and differences differed at times, we didn’t have much difficulty reaching an agreement based on the evidence in the chart. Referring to the chart allowed us to separate our analysis of similarities and differences between the accounts from our explanations of the similarities and differences.

(4) Explaining similarities and differences: a relatively clear distinction between the evidence in the chart and our interpretations of the evidence allowed us to focus on articulating the reasons for our explanations. This was an exciting part of the back-and-forth between us.

Van Elk and Zwaan’s comments on the reader’s role in constructing situation models provide further insight into our test. Both of us (Taves and Harper) approached the historical texts as readers who formed situation models with respect to the events in question. Although we did not think of what we were doing in these terms, the discipline offered by the chart allowed us to surface and question some of the assumptions that governed our situation models.

3. Concerns related to extending EST to internally experienced states

The commentaries by Andersen et al. and Nielbo et al. both raise an important methodological question that surfaces when we turn from historical to experimental applications of event cognition. While Nielbo et al. agree that humans draw on event segmentation when narrating and interpreting events, they question the capacity of this framework to say anything useful about the processing of
subjective, internal events. They remind us that “E[vent]S[egmentation]T[heory] is essentially an object perception and recognition theory that targets dynamic objects,” and warn that “it is not a trivial matter to map an object perception theory onto internally experienced states that lack external objective features” (our emphasis).

While we certainly recognize the problem, we think that it is better expressed as a challenge to specify the “external objective features” of internally experienced states. These will not be the physical features of “external objects,” to which internal representations “correspond,” but rather a set of measurable physiological properties that are involved in the construction of the event model and thus can act as proxies for internally generated input into the event model. The key to understanding internally experienced states in terms of EST lies in the predictive coding framework in which EST is firmly embedded. Building on recent research into predictive coding in dreaming (e.g., Hobson & Friston, 2012, 2014), we assume that models of internally experienced events (such as dreams) are generated through the same computational principles as models of external events—that is, through the interplay of feed-forward prediction signals, activity in the sensory system, and prediction error feedback. The methodological challenge is to triangulate physiological data and phenomenological self-report. Thus, Andersen strikes the right chord when he writes, “we desperately need measures that take us beyond mere self-report. More precisely, we need to identify reliable and measurable proxies of individual predictions and prediction errors that can be used to analyze real-time experience and event boundaries in experimental settings.”

How can we do that? While it would certainly be premature to suggest definite answers, we wish to highlight some lines of research that give reason for being more optimistic than Nielbo et al. For example, mismatch negativity (MMN) has been suggested as a direct proxy for error signaling, and is easily measured by EEG (see Garrido, Kilner, Stephan, & Friston, 2009). This measure will, however, not be available for certain internally experienced events, such as dreams, where top-down predictions (e.g., oculomotor and visual) are sequestered from sensory as well as motor constraints (i.e., there is no proprioceptive prediction error). However, we appear to have a physiological proxy for the feed-forward signaling in REM sleep through ponto-geniculo-occipital (PGO) waves (Hobson & Friston, 2012), which, like MMN, are recorded by EEG. PGO activity would thus be a way to track the dreaming brain’s active and unrestrained inferences (that is, internally generated imagery). Presumably, eye-tracking measures can also be developed for this purpose, as oculomotor activity is a direct proxy of active inference in visual perception—whether internal or external. REM sleep appears to involve dishabitation of the startle response (Hobson & Friston, 2012, p. 86), making startle response measures, such as those used to study infants, another viable physiological proxy for phenomenological changes in dreams. In addition, we should not underestimate the potential of emerging methods that combine brain-imaging techniques with machine learning and self-report data in order to model and predict the phenomenological content of the dreaming brain. Researchers at the Advanced Telecommunications Research Institute in Kyoto (Horikawa, Tamaki, Miyawaki, & Kamitani, 2013) recently published a promising pilot study, which heralds the eradication of the public vs. private experience distinction. The implications of such methods would clearly go well beyond the study of dreaming.

While the modeling and measurement of subjective experiences, such as visual perception in dreams or hallucinations under the influence of psychoactive agents and sensory deprivation, remains no mean task, there are (and will be) physiological proxies that experimentalists can use to take us forward. This brings us back to the point made by both Lang and Kundt and van Elk and Zwaan regarding the need for “more specific predictive neurocognitive models.” Since the study of experiences/events that are sometimes deemed religious leads us to examine a broad range of events (internal/external, spontaneous/intended, visual, auditory, somatosensory, affective, etc.), the active inferences postulated by the predictive coding framework will be implemented by a range of different mechanisms. The call for closer attention to these specific neurocognitive mechanisms is, in our view, intimately connected to the question of identifying proxies, since these will naturally vary with the relevant mechanisms involved— which, again, vary with the specific events.
we are studying. Thus, for dreaming we may focus on PGO waves emanating from the pons, while MMN may be crucial for studying techniques for the induction of out-of-body experiences.

4. Cross-event integration

Bulkeley’s question regarding dream incubation, that is, practices intended to shape the practitioner’s dreams, raises important issues regarding the effect of practices that extend beyond the “dream experiences” themselves. Thus, he notes, “[t]he causal loops between mind, body, and culture become especially complex in these situations, and perhaps event cognition can shed light on some of their features.” Dream incubation is an interesting case, because it highlights the interplay between events that we normally consider spontaneous, internal, and unintended (dreams) and practices that are characterized by goal-directed actions and strong prior beliefs (rituals and prayers designed to receive revelations in dreams). In the framework that we have sketched, it is crucial to note that the phenomenon of interest in this instance is the whole practice of dream incubation. The dream itself is but a sub-event in a dream incubation event. Thus, while the dream itself may lack intentionality, its appraisal will be heavily dependent on the intentional action sequence in which it is embedded and the prior beliefs it activates, e.g., in relation to internalized event schemata, knowledge of special locations, invocation of gods, and meditation on objects and images. In other words, to have a satisfactory explanation of the practice of dream incubation, we must include the microsociological processes that frame individual events as a component, along with the psychological and neurocognitive processes.

Conclusion

In conclusion, we would like to return to the distinction that van Elk and Zwaan make between experiences and actions and their statement that experiences, unlike actions, are not necessarily governed by hierarchically organized event models. Here we think it is important to recognize that narrating and recounting are actions, and that narrators may recount an individual event or a series of linked events. Thus, although most experiences pass unremarked, those that are recorded or recounted are, by virtue of that fact, embedded in a recording or recounting event that hierarchically frames the initial event. People may link recounted events with other remembered events to create a larger narrative (e.g., a story, an autobiography, or an origin account). The upshot of our attributional approach is that much rests on how an event is framed and why an event is recounted. This highlights the importance of cross-event integration. As Radvansky suggests in his comment, “the value and importance of [an] … experience can be quantitatively indexed in terms of how it is viewed as being causally connected to other events in a person’s life.” Integration across events is key, and whether and how events are incorporated into larger narratives will be a major variable in appraisal processes.

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