Cultural Neurophenomenology of Psychedelic Thought: Guiding the “Unconstrained” Mind Through Ritual Context

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Abstract and Keywords

This chapter explores psychedelics as catalysts of spontaneous thought. Classic serotonergic psychedelics such as psilocybin, LSD, and ayahuasca can induce potent alterations in cognition and perception. The chapter reviews research on these substances through the lens of cultural neurophenomenology, which aims to trace how neurobiology and sociocultural factors interact to shape experience. After a decades-long hiatus, the scientific study of psychedelics is rediscovering the potential of these substances to promote creative insight, evoke mystical experiences, and improve clinical outcomes. Moreover, neuroimaging experiments have begun to unravel the influence of psychedelics on large-scale connectivity networks of the human brain. Tapping perspectives from the social sciences, the chapter underscores how culture and context constrain the flexible cognitive states brought about by psychedelics. This integrative approach suggests that seemingly spontaneous psychedelic thought patterns reflect a complex interaction of biological, cognitive, and cultural factors—from pharmacology and brain function to ritual, belief, and expectation.

Keywords: psilocybin, LSD, ayahuasca, psychedelic, cognition, mystical experience, neurophenomenology

Psychedelic substances can profoundly alter the phenomenology of thought. The term *psychedelic* (from the Greek *psychē*, ψυχή, meaning "spirit" or "self," and *dēloun*, δηλοῦν, meaning "to reveal") denotes a broad range of natural and synthetic substances that evoke a variety of culturally mediated experiences, including atypical visual and auditory phenomena, shifts in temporal and spatial perception, and intense emotions ranging from terror to wonder. Although the empirical study of psychedelics began in earnest only in the twentieth century, cultural groups have consumed psychedelic plants in ritualized contexts for millennia (Schultes, 1972). The use of these substances may pose social and psychological risks when ingested without prudence, but they can also be consumed safely (Johansen & Krebs, 2015; Nutt, King, Saulsbury, & Blakemore, 2007). Indeed, psychedelics continue to play a vital role in many spiritual and healing practices around the world (Goldsmith, 2010).

Throughout the history of experimental research on psychedelics, scholars have often emphasized the capacity of these pharmacological agents to loosen the hold of habit over patterns of thought (Busch & Johnson, 1950; Cohen, 1964; Huxley, 1977). A growing body of empirical evidence lends support to this view: experimental findings indicate that classical serotonergic psychedelics such as psilocybin (found in over 200 species of mushrooms), ayahuasca (an Amazonian plant-based brew (p. 574) containing dimethyltryptamine—i.e., DMT— and monoamine oxidase inhibitors), and lysergic acid diethylamide (LSD) can increase the flexibility of human brain function, promote creative insights, foster therapeutic outcomes, and engender mystical experiences (Carhart-Harris, Leech, et al., 2014; Chambers, 2014; Fadiman, 2011; Richards, 2015).

Subjective reports of experiences with psychedelic substances frequently highlight the unconstrained, spontaneous nature of the phenomena, which are often described as involuntary, surprising, and profoundly different from ordinary experience. However, the anthropological literature suggests that psychedelic experiences are strongly constrained by social factors related to culture, context, and individual disposition (Dobkin de Rios, 1972; 1984; Labate & Cavnar, 2014; Langlitz, 2012). Indeed, ethnographic research documents a wide range of ritual practices among diverse cultural groups that aim to evoke specific experiences or to strategically direct the flow of thought stimulated by psychedelics to achieve personal and social benefits (Calabrese, 2013).

In this chapter, we focus on classical psychedelics, which act primarily on the serotonin receptor system, and leave out discussion of other neighboring classes of substances, including dissociative psychedelics (e.g., ketamine) and entactogens (e.g., MDMA). While these other substances are sometimes referred to as psychedelics, they involve distinct albeit overlapping alterations in phenomenology, display different neurochemical binding properties, and likely exert their behavioral and experiential effects through separate mechanisms (Nichols, 2004).

We approach classical serotonergic psychedelics in terms of *cultural neurophenomenology*, which aims to trace how neurobiology and sociocultural knowledge and practice interact to give rise to experience. We synthesize quantitative experimental

data with qualitative accounts, including from ethnographic fieldwork by one of the lead authors of this chapter studying a transnational religion centered on the ritual consumption of the ayahuasca brew (Oda Sheiner, 2016). We begin by reviewing research that examines how psychedelics impact functional organization among brain networks related to perception, higher-order control, and spontaneous thought. We then explore the implications of this supposedly unconstrained cognitive state by examining psychedelic effects on creative thinking, mystical experience, and therapeutic practice. In the final sections of this chapter, we incorporate ethnographic and social scientific perspectives to illustrate how culture and context constrain the flexible cognitive states brought about by psychedelics. This approach allows us to explore nuances of interactions between phenomenology and ritual context that complement laboratory findings grounded in behavioral, cognitive, and neuroscientific investigation. The integrative perspective we present suggests that seemingly spontaneous psychedelic thought patterns reflect a complex interaction of biological, cognitive, and cultural factors—from pharmacology and brain function to ritual, belief, and expectations.

Historical Context

Research on psychedelics has been strongly influenced by prevailing cultural attitudes toward substance use. The theoretical models, assumptions, and goals that researchers have historically brought to bear to examine psychedelics have shaped the very experiences they aimed to understand. For example, researchers in the mid-twentieth century typically viewed psychedelic experiences as models or mimics of psychoses, hence the designation of "psychotomimetics" (Dyck, 2006; Hoffer, 1970; Osmond, 1957). Research on psychedelics was pursued because it might shed light on schizophrenia or other psychiatric disorders. Some researchers even encouraged clinicians to try LSD themselves in order to empathize with their patients and obtain a deeper understanding of psychotic experience (Dyck, 2006; Sessa, 2005; Pahnke, Kurland, Unger, Savage, & Grof, 1970).

Although the study of psychedelics as a model for psychosis persists to this day (e.g., Geyer & Vollenweider, 2008; Steeds, Carhart-Harris, & Stone, 2015), it was not long before researchers emphasized important differences between psychedelic and psychotic experiences—most notably, that judicious psychedelic use often yields toward positive experiences, while psychosis is more often marked by distress (Osmond, 1957; for a contemporary study addressing these issues, see Carhart-Harris, Muthukumaraswamy, et al., 2016). Around the same time, researchers began to note the potential for psychedelics to catalyze vivid spiritual and mystical experiences (Huxley, 1954; Panhke, 1963). Moreover, positive subject reports, as well as overlaps between psychedelic experiences and clinical conditions, inspired clinicians to begin experimenting with the use of these substances in therapy (Osmond, 1957; Pahnke et al., 1970).

(p. 575) The striking variety of responses induced via pharmacologically identical agents led early theorists to emphasize the role of contextual factors in shaping psychedelic outcomes (Mogar, 1965). As described in a guidebook penned by a group of Harvard scholars—including Timothy Leary—that promoted psychedelic culture, therapy, and spirituality: "the nature of the experience depends almost entirely on set and setting. Set denotes the preparation of the individual, including his personality structure and his mood at the time. Setting is physical—the weather, the room's atmosphere; social—feelings of persons present towards one another; and cultural—prevailing views as to what is real" (Leary, Metzner, & Alpert, 1964/1971, p. 9).

By the 1960s, more than 40,000 subjects had participated in studies on psychedelics, and more than 1,000 clinical papers had been published (Grinspoon & Bakalar, 1979). Access to psychedelic substances trickled from university and hospital laboratories into the public. Excessive claims and misuses began to surface from both researchers and recreational users, and associations between psychedelics and countercultural movements became increasingly salient. Eventually, prominent members of the medical establishment urged government agencies to tighten regulation of psychedelics. For example, psychiatrist Roy Grinker, then-president of the American Medical Association, accused researchers of "using uncontrolled, unscientific methods. In fact, these professionals are widely known to participate in drug ingestion, rendering their conclusions biased by their own ecstasy. . . . The psychotomimetics are being "bootlegged," and as drugs now under scientific investigation they are being misused" (Grinker, 1964, pp. 768). By the end of the 1960s, recreational use of psychedelics was largely illegal, and research on these substances entered a hiatus (Grinspoon & Bakalar, 1979; Grob, 1994). Following almost three decades of silence, the past 20 years have witnessed a revival of empirical research on psychedelics, with rigorous demonstrations of safety and therapeutic effects, and a growing body of work exploring cognitive and neurobiological mechanisms (Langlitz, 2012; Pollan, 2015; Sessa, 2012).

Spontaneity, Flexibility, and Constraints

Many prominent theoretical models frame psychedelics as substances that loosen or unconstrain cognition by promoting novel, spontaneous connections among thoughts, emotions, and sensations that are typically disparate (Carhart-Harris, Leech, et al., 2014). For example, a hallmark feature of psychedelic phenomenology is synesthesia-like experience, in which perception in one sensory or cognitive modality activates sensation in a different modality (e.g., tasting sound, or seeing colors in response to digits; Luke & Terhune, 2013; Shanon, 2002). Compared to congenital synesthesia, however, synesthesia-like associations induced via psychedelics seem less consistent and not as specific to the triggering stimulus (e.g., after taking LSD, seeing the number seven might sometimes trigger a sense of the color green, but might other times trigger the sense of a

different color or no sense of color at all; Terhune et al., 2016). Historically, some psychodynamic clinicians viewed psychedelic substances as "psycholytic" (i.e., mind-loosening) to emphasize their value for unlocking latent associations essential to the course of therapy (Gasser, 1994; Madsen, Øyslebø, & Hoffart, 1996). Contemporary approaches continue to emphasize the fluid associative quality of psychedelic experiences (Letheby, 2015; Majić, Schmidt, & Gallinat, 2015; Shanon, 2002).

But what do we actually mean when we call thought "spontaneous" or "unconstrained"? In the context of the present volume, the notion of spontaneous thought arises from ongoing work in cognitive science that recognizes the importance of studying what the mind and brain do in the absence of, or when tuning out, external stimuli or task demands (Andrews-Hanna, Smallwood, & Spreng, 2014; Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Mason et al., 2007). One leading perspective defines "self-generated" thought as "mental contents that are not derived directly from immediate perceptual input" (Smallwood & Schooler, 2015, p. 489). Cognitive scientists have proposed a variety of terms to delineate this inner world of cognition: spontaneous thought, daydreaming, self-generated thought, mind-wandering, undirected thought, stimulus-independent thought, task-unrelated thought—the list goes on. As the diversity of contributions to this volume attests, these terms encompass a wide spectrum of experiences, from recalling memories and imagining the future to thinking creatively and dreaming. The editors of this book propose a helpful taxonomy that further specifies the spontaneity of thought in terms of types of constraint (Christoff et al., 2016). This framework describes two main types of constraint on the content and flow of thought: (1) *deliberate constraint* by cognitive control, such as when (p. 576) effortfully attempting to recall the name of your first love; and (2) *automatic constraint* operating involuntarily, such as when thoughts about the object of your infatuation intrude during attempts to write a chapter.

How does psychedelic phenomenology map onto this framework? While psychedelic substances may be deliberately ingested, the subsequent thought patterns and sensory experiences are often viewed as unpredictable and largely involuntary. However, as we shall discuss, in many instances of ritualized or therapeutic use a measure of deliberate constraint or control is exerted by explicit instructions or other situational factors. For instance, listening to music plays a key role in many rituals of psychedelic healing (Kaelen et al., 2016; Shanon, 2002). Such external constraints may drive specific content, emotional tone, or even the impression of having no control over the experience. In general, psychedelics likely reduce both deliberate and automatic constraints over the content and flow of thought, as well as over the processing and interpretation of outside stimuli. In terms of phenomenology, psychedelics tend to impede the ability to voluntarily control the content and progression of thought (Shanon, 2002). The stream of psychedelically mediated visions, sounds, and associations is typically experienced as less deliberate and predictable than everyday thinking, sometimes to the point that it seems to flow from an outside source (Oda Sheiner, 2016; Strassman, 2000). As we will see later in this chapter, the reduction of such voluntary and automatic constraints may help foster

novel associations in creative thinking, open a space for atypical modes of subjectivity in mystical experience, and help overcome maladaptive patterns of behavior in therapy.

Of course, even when constraints may appear low, our thoughts are inexorably bound to our personal histories and broader sociocultural surroundings. Ethnographic and enactivist perspectives in cognitive science argue that our experiences and expectations —embedded in the narratives, symbols, body practices, and scripts of specific social and cultural contexts—influence the content and process of thought at the most basic levels of attention, sensation, and perception (Barsalou, 2008; Han et al., 2013; Hinton, Howes, & Kirmayer, 2008; Kay & Kempton, 1984; Ramstead, Veissière, & Kirmayer, 2016). No matter how seemingly spontaneous, no thought is completely free from such situational constraints. For example, although psychedelic experiences often involve seemingly self-generated perceptions, the specific content of these manifestations tend to reflect personal stories and cultural concerns—as in the case of religious psychedelic users in Canada, who sometimes report visual and auditory phenomena ascribed to local Aboriginal spirits (Oda Sheiner, 2016). While the influence of individual and cultural context likely holds for most forms of human thinking, it is particularly pertinent in the context of psychedelics. Paradoxically, by virtue of being less constrained by voluntary control and certain automatic cognitive patterns, the psychedelic mind may in fact become more susceptible to the influence of cues arising from individual history and social environment. The psychedelic mind, we propose, is akin to a clay sculpture that, when wet, becomes more pliable and therefore more readily shaped by the forces of culture and context.

Neuroplasticity is basic to learning and adaptation. Many practices of healing may function by inducing cognitive flexibility or an enhanced ability to shift psychological sets (Kashdan, 2010). Flexibility as such, however, is not enough. Interventions that heal seem to do so by at once enhancing flexibility and providing symbolic ritual frameworks that encourage shifts to more positive mental states marked by openness and optimism (Hinton & Kirmayer, 2017). In the case of psychedelics, the unconstrained mental state may be highly labile or volatile. Feelings of overwhelming anxiety, isolation, and confusion surface as readily as experiences of peace, empathy, and insight (Masters & Houston, 2000; Shanon, 2002). While popular notions of spontaneity may bring to mind states of hedonic, free-and-easy play, the spontaneity induced by psychedelics is more capricious. Psychedelic spontaneity is not inherently pleasant, creative, or beneficial; it can at times involve intensely negative imagery and emotions, or the disorganized thought patterns characteristic of psychotic distress (Carhart-Harris, Kaelen, et al., 2016; Osmond, 1957). Thus, promoting healing with psychedelics likely requires constraining the unconstrained mind through symbolic situational cues and embodied rituals that emphasize the potential to move from maladaptive patterns toward constructive states and behaviors. We will return to such rituals later in this chapter. First, we will flesh out the notion of unconstrained cognition in empirical terms, beginning at the level of neurobiology and

working our way up to its expression in domains of creativity, mystical experience, and therapeutic practice.

(p. 577) Psychedelics Unconstrain Cognitive Brain Function

A mounting body of neuroscientific evidence supports the general theory that psychedelics unconstrain cognition. In this section, we provide a selective review of the emerging cognitive neuroscience of psychedelics, focusing on findings that concern the flexibility, disorganization, and integration of brain function (for a concise review of these findings accessible to non-experts, see Carhart-Harris, Kaelen, & Nutt, 2014; for more in-depth reviews, see Carhart-Harris, Leech, et al., 2014; Halberstadt, 2015). At the molecular level, converging work with both animal and human models indicate that classical psychedelics (such as psilocybin, LSD, and ayahuasca) function primarily as agonists at the serotonergic 5-HT_{2A} receptor (Nichols, 2004; Vollenweider, Vollenweider-Scherpenhuyzen, Bäbler, Vogel, & Hell, 1998). Studies have associated 5-HT_{2A} receptor signaling with cognitive flexibility (Boulougouris, Glennon, & Robbins, 2008; King, Martin, & Melville, 1974), associative learning (Harvey 2003; Romano et al., 2010) and cortical neuroplasticity (Gewirtz, Chen, Terwilliger, Duman, & Marek, 2002; Vaidya, Marek, Aghajanian, & Duman, 1997). As noted by Carhart-Harris et al. (2015), such findings support the proposal that 5-HT_{2A} signaling via psychedelics may promote the plastic reorganization of neural circuits.

At the systems level, a number of neuroimaging studies have converged on the notion that psychedelics dampen key hubs of cortical integration that are closely tied to self-generated thought processes. In particular, recent studies from multiple independent groups using a variety of imaging techniques (i.e., functional magnetic resonance imaging (fMRI), magnetoencephalography (MEG), and electroencephalography (EEG) have linked serotonergic psychedelic effects (i.e., intravenous psilocybin and LSD, as well as ingested ayahuasca) to alterations within the default mode network (DMN; Bouso et al., 2015; Carhart-Harris et al., 2012; Carhart-Harris et al., 2016; Kometer, Pokorny, Seifritz, & Vollenweider, 2015; Muthukumaraswamy et al., 2013; Palhano-Fontes et al., 2015). The DMN is a network of brain regions that show increased activity when the person is "at rest" in the scanner, that is, in the absence of external stimuli or task demands (Buckner, Andrews-Hanna, & Schacter, 2008). Behavioral and neuroimaging reports reveal that, when attention is free from external demands, the mind tends to wander spontaneously through internally-directed thoughts that often converge on the sense of self (for a review, see Smallwood & Schooler et al., 2015). DMN activity correlates with such mind-wandering (Mason et al., 2007; Christoff et al., 2009; Hasenkamp, Wilson-Mendenhall, Duncan, & Barsalou, 2012; Andrews-Hanna et al., 2014; but see Fox, Spreng, Ellamil, Andrews-Hanna, & Christoff, 2015). In addition, the DMN activates in response to tasks that recruit an internal locus of attention, including self-referential thought, social cognition, metacognition, and moral decision-making (Buckner et al., 2008). Based on these findings, some theorists have proposed the DMN as a potential neural substrate of

narrative selfhood (Qin & Northoff, 2011) or even of the Freudian ego (Carhart-Harris & Friston, 2010).

In line with such perspectives, an MEG study examining the acute effects of psilocybin found that decreases in alpha power localized to the posterior cingulate cortex (a key DMN hub) correlated with first-person reports endorsing the "ego-dissolution" item, "I experienced a disintegration of my 'self' or 'ego' " (Muthukumaraswamy et al., 2013). A more recent multimodal (i.e., MEG and fMRI) imaging study replicated this result with LSD, and further showed that ratings of ego-dissolution were correlated with DMN disintegration—that is, the extent to which regions of the DMN became less functionally connected (Carhart-Harris, Muthukumaraswamy, et al., 2016). In a separate account from the same group, LSD was found to reduce mental time travel to scenarios from the past, and this reduction correlated with the degree of DMN disintegration (Speth et al., 2016). As we will see in more detail later in the chapter, such alterations in self-related thinking and dissolutions of ego boundaries are important facets of classical psychedelic-induced mystical experiences.

Imaging findings examining the effects of ingested ayahuasca are largely consistent with the results concerning intravenous psilocybin and LSD. An fMRI study with the Amazonian brew showed decreased activity within the DMN, as well as decreased connectivity within the posterior cingulate cortex (Palhano-Fontes et al., 2015). However, this study did not replicate the reduction in connectivity between medial prefrontal and posterior cingulate DMN nodes observed in experiments with LSD and psilocybin. A separate morphometric study reported that long-term ritual ayahuasca users displayed thinning of gray matter in posterior cingulate structures, and that the degree of (p. 578) thinning correlated with self-report scores of self-transcendence (Bouso et al., 2015). It is worth noting that the posterior cingulate cortex and other structures of the DMN consume more energy (Raichle & Snyder, 2007) and receive more blood flow (Zou, Wu, Stein, Zang, & Yang, 2009) than any other regions of the brain. Furthermore, the posterior cingulate houses the richest density of cortico-cortical connections in the brain (Hagmann et al., 2008) and has been proposed as a cortical hub facilitating communication among large-scale networks (van den Heuval, Kahn, Goni, & Sporns, 2012). Thus, converging evidence from multiple imaging modalities, pharmacological substances, and methods of administration associates the serotonergic psychedelic experience with decreased activity and connectivity in one of the most important integrative networks of the human brain, the DMN (Bouso et al., 2015; Carhart-Harris et al., 2012; Carhart-Harris, Muthukumaraswamy, et al., 2016; Kometer, Pokorny, Seifritz, & Vollenweider, 2015; Muthukumaraswamy et al., 2013; Palhano-Fontes et al., 2015; Speth et al., 2016; although at least one fMRI report was unable to replicate this predicted DMN effect: Lebedev et al., 2015). At first glance these findings might seem to indicate that psychedelics render the brain less associative (because the DMN connects disparate regions) or less prone to self-generated thinking (because such thinking typically correlates with DMN activity); however, the findings we survey in the next paragraphs

suggest that the dampening of activity in this core default network may in fact free up other brain processes related to self-generated thought and encourage the brain to adopt more novel connectivity states.

Cognitive neuroscientists have begun to draw functional distinctions between the DMN core (i.e, posterior cingulate and medial prefrontal cortex) and its subsystems (i.e, medial temporal lobes and lateral parietal regions). Christoff and colleagues (2016) recently proposed that the DMN core may implement automatic constraints on internally oriented thought, which would suggest that reduced activity and connectivity in this core network should result in weaker automatic constraints on thought. This prediction aligns with the imaging results reviewed in the previous paragraph, which reveal that psychedelic states are associated with dampening and disintegration of the core DMN. On the other hand, Christoff and colleagues (2016) propose that the medial-temporal lobe (MTL) subsystem of the DMN may actually be a source of variability in self-generated thought. The MTL—made up of the amygdala, hippocampal and parahippocampal regions, entorhinal cortex, and septal nuclei—plays an important role in memory, thought, and affect. Altered activity in MTL regions has been implicated in REM sleep, psychosis, depersonalization, and dreamlike experiences such as déjà vu and waking hallucinations (see Carhart-Harris, 2007; Carhart-Harris & Nutt, 2014; Zmigrod, Garrison, Carr, & Simons, 2016). In addition, studies dating back to the 1950s and 1960s used intracranial depth-electrodes in humans to demonstrate that ingestion of serotonergic psychedelics including LSD and mescaline was associated with altered activity in the MTL (e.g., Monroe & Heath, 1961; Schwarz, Sem-Jacobsen, & Petersen, 1956).

More recent neuroimaging studies corroborate the link between the MTL and psychedelic experience. One experiment found that psilocybin ingestion led individual brains to show increased temporal variance in the fMRI signal from MTL structures; these MTL changes, moreover, correlated with reports of a feeling of dreaminess (Carhart-Harris, Leech, et al., 2014). In another study, reports of mental imagery while listening to music on LSD were associated with increased effective connectivity (calculated via Bayesian Dynamic Causal Modeling) between the parahippocampus (a key hub of the MTL system) and the primary visual cortex (Kaelen et al., 2016). This specific result accords with the more general finding that reports of mental imagery while under the influence of LSD correlated with increased connectivity between primary visual cortex and a strikingly wide swath of cortical regions (Carhart-Harris, Muthukumaraswamy, et al., 2016). Two additional studies from the same group showed that, following infusion of either psilocybin or LSD, MTL structures functionally decoupled from a variety of neocortical regions including those involved in a sensorimotor network, frontoparietal control network, and salience network (Carhart-Harris, Muthukumaraswamy, et al., 2016; Lebedev et al., 2015). Crucially, in both studies the degree of decoupling between the MTL and neocortical regions correlated with self-reported ratings of ego dissolution (Carhart-Harris, Muthukumaraswamy, et al., 2016; Lebedev et al., 2015).

Based on their findings, Carhart-Harris and colleagues hypothesized that psychedelics may soften constraints implemented by higher-order control regions over activity in the MTL subsystem (Carhart-Harris, Leech, et al., 2014; Lebedev et al., 2015). According to this theoretical proposal, the decoupling of MTL (p. 579) processes from control regions—including from the DMN core—may promote flexibility among thought patterns and may contribute to the sense of ego dissolution common in psychedelic experiences. Another research group recently proposed a related model of psychedelic brain function that also centers on a shift in top-down control mechanisms, albeit operationalized in different brain regions (Alonso, Romero, Mañanas, & Riba, 2015). This group used EEG and a computational measure of information flow called "transfer entropy" to compare brain activity following ayahuasca ingestion versus placebo. They found that during the ayahuasca experience, anterior brain regions reduced their influence (computed in terms of "information transfer") over more posterior regions, while posterior regions increased their influence over frontal regions. Moreover, reductions in information transfer from anterior to posterior regions correlated to subjective ratings of overall intensity of experience. Based on these results, the researchers proposed that ayahuasca may interrupt neural information-processing hierarchies by reducing top-down control (ostensibly implemented in anterior regions) over lower-level perceptual and thought processes (ostensibly implemented in posterior regions). While such theoretical proposals are intriguing, they remain largely speculative.

Beyond alterations in regional and network-localized activity, converging evidence suggests that psychedelics catalyze a more global brain state that is simultaneously disorganized yet highly associative. Multiple analyses indicate that psilocybin and LSD disrupt functional brain architecture by *reducing* connectivity and activity *within* typically robust cortical networks (Carhart-Harris et al., 2012; Carhart-Harris, Muthukumaraswamy, et al., 2016; Lebedev et al., 2015; Muthukumaraswamy et al., 2013). Further supporting the notion of a global functional disorganization, a recent study showed that psilocybin decreased connectivity between cerebral hemispheres (Lebedev et al., 2015). At the level of brain oscillations, which provide a more direct and temporally sensitive index of neural activity, MEG studies showed that psilocybin and LSD desynchronized neuronal populations across multiple frequency bands in a broad array of cortical regions, including anterior and posterior nodes of the DMN (Carhart-Harris, Muthukumaraswamy, et al., 2016; Muthukumaraswamy et al., 2013). On the other hand, psychedelics appear to globally *increase* communication *between* disparate cortical regions and networks (Muthukumaraswamy et al., 2013; Petri et al., 2014; Roseman et al., 2014) and enhance the flexibility of dynamic interactions between networks (Tagliazucchi, Carhart-Harris, Leech, Nutt, & Chialvo, 2014). Altogether, these results suggest that psychedelics cause cortical networks to become functionally less differentiated, more communicative, and more spontaneous in their functional properties.

While potentially illuminating, extant neuroimaging studies of serotonergic psychedelics have important methodological limitations. For one, psychedelics tend to generate a high degree of motion during brain scans. While researchers usually apply stringent compensatory algorithms, motion artifacts nonetheless may systematically influence

results. Moreover, sample sizes are small, and most participants in these imaging assays have extensive experience with psychedelics; thus, it remains to be seen how such brain responses generalize to, say, participants and patient populations naïve to these substances. Despite such caveats, the available evidence indicates that serotonergic psychedelics simultaneously disorganize the configuration of large-scale brain networks and increase the extent and variability of communication between these networks. Moreover, some of the key neural indices of these effects correlate with self-reports of ego dissolution and dreamlike imagery during the psychedelic experience. Thus, psychedelics appear to render the brain more flexible and prone to adopting novel patterns of functional integration that may be linked to the classic phenomenological hallmarks of the "unconstrained psychedelic mind" (for reviews of these findings framed in the formal terms of *integrated information theory* and the *free energy principle*, see Gallimore, 2015, and Carhart-Harris, Leech, et al., 2014, respectively).

Such findings may hold important implications for applied domains. Particularly striking is the finding that the unpredictability of the fMRI time series associated with acute LSD experience (i.e., sample entropy—a way of formally measuring the spontaneity of brain function) predicts subsequent increases in the personality trait of Openness two weeks later (Lebedev et al., 2016). Other intriguing findings concern the relationship between the DMN and so-called task-positive attention networks that are normally anti-correlated with the DMN in their temporal fluctuations. One study indicated that four classic task-positive networks (the dorsal attention, salience, right frontoparietal, and auditory networks) become less anti-correlated following psilocybin infusion (Carhart-Harris et al., 2013), similar to patterns observed in individuals at (p. 580) high risk for psychosis (Shim et al., 2010), as well as during certain forms of meditation (Josipovic, Dinstein, Weber, & Heeger, 2012). An independent study examining ayahuasca ingestion, however, was unable to replicate this reduction of anti-correlation between networks (Palhano-Fontes et al., 2015). The discrepancies between the results of these studies (Carhart-Harris et al., 2013; Palhano-Fontes et al., 2015) may reflect the use of different psychedelic substances (ayahuasca vs. psilocybin), analysis methods (seed-based vs. independent component analysis), or regions of interest (focusing exclusively on the frontoparietal control network vs. analyzing a number of task-positive networks). If this anti-correlation finding holds up in other replications, it may prove relevant for modeling aspects of psychosis (Carhart-Harris et al., 2013) as well as in the treatment of depression, where an aberrant relationship between the DMN and frontoparietal network has been linked to maladaptive rumination (Hamilton et al., 2011; Whitfield-Gabrieli, & Ford, 2012; for a general review of psychedelic neuroscience pertaining to the treatment of mood disorders, see Vollenweider & Kometer, 2010). In addition, a few recent studies have reported reduced DMN/frontoparietal network anti-correlation during moments of creative insight and artistic performance (for a review, see Beaty et al., 2016; also Beaty & Jung, Chapter 21 in this volume). Thus, alterations in brain function offer intriguing clues as to the mechanisms that may link psychedelics with creative insight, contemplative experience, as well as pathology and healing (see Fox, Girn, Parro, & Christoff, 2016).

Applying the Unconstrained Mind: Psychedelics in Creativity, Mystical Experience, and Therapy

Creativity

Links between psychedelics and creativity abound in the popular imagination. These substances owe their visibility in mainstream culture to the traces they have left on the work of many of the most prominent artists and personalities of the twentieth century, from the Beatles to Steve Jobs (Rothstein, 2008). Indeed, ethnographic research documents extensive use of psychedelics around the globe in many traditions of spiritual or religious practice that have creative or artistic components (Langlitz, 2012; Schultes, Hofmann, & Rätsch, 2001; Taussig, 1987). Cognitive scientists broadly define creativity as the generation of ideas or novel associations that are at once original or innovative and useful or effective (leading to developments such as scientific theories, solutions to problems, or musical compositions; Sessa, 2008). The creative process also connotes the capacity for divergent thinking, or the ability to produce multiple alternative solutions to a question or problem. This stands in contrast to the application of specific knowledge to achieve a singular, correct solution to a problem—sometimes referred to as convergent thinking (Frecska, Móré, Vargha, & Luna, 2012; Guilford, 1966).

The most comprehensive phenomenological investigation of a psychedelic substance to date documents the stimulating effects of ayahuasca in creative disciplines, including music and art (Shanon, 2002). Unfortunately, the majority of experimental studies investigating the link between psychedelics and creativity were conducted before the 1960s hiatus on research, and thus many of these studies fall short of the methodological standards of contemporary research (e.g., lacking adequate control groups and experimental blinding). Notwithstanding the lack of rigor in early empirical studies, findings from a variety of experimental conditions suggest that psychedelics may bolster associative thought and creativity (for a review, see Krippner, 1985).

An early paradigm designed to probe psychedelic creativity involved recruiting visual artists and asking them to produce art under the influence of specific substances (Berlin et al., 1955; Dobkin de Rios & Janiger, 2003). Subsequently, art critics or instructors would subjectively evaluate the artists' work produced before, compared to during, the psychedelic experience. In one study, an experimenter administered LSD to a diverse group of 60 visual artists over the course of seven years (Dobkin de Rios & Janiger, 2003). These artists submitted over 250 drawings, created before and during the LSD experience, that were evaluated by a professor of art history who judged that the LSD-related works were more impressionistic and aesthetically adventurous, conveyed a heightened sense of emotional excitement, displayed a keener use of color, and were less

bound by typical artistic conventions. Janiger also collected numerous qualitative reports from his subjects, who reported without exception that the LSD experience had been both artistically and personally profound (Dobkin de Rios & Janiger, 2003).

Another early study enlisted individuals working in creative disciplines to identify problems of professional interest that required a creative solution, and subsequently administered LSD or (p. 581) mescaline to those individuals in a supportive setting. All participants then completed three objective tests of creativity (Purdue Creativity Test, Miller Object Visualization Test, and Witkin Embedded Figures Test), and attempted to solve the professionally relevant problems they had identified earlier. Participants performed significantly better on all tests of creative ability when under the influence of the psychedelics compared to an earlier baseline assessment (Harman, McKim, Mogar, Fadiman, & Stolaroff, 1966). In addition, participants reported enhancements in their creative process with respect to the problems identified in their professional lives, and attributed these improvements to the psychedelic substance. Creative solutions included a commercial building plan that was subsequently accepted by the client, a new approach to the design of a vibratory microtome, an engineering improvement to a magnetic tape recorder, and the invention of a linear electron accelerator beam-steering device, among other innovations (Harman et al., 1966).

After a half-century hiatus, more recent studies probing the impact of psychedelics on associative thinking and creativity have implemented better experimental designs and measures (Frecska et al., 2012; Humphrey, McKay, Primi, & Kaufman, 2014; Kuypers et al., 2016). For example, a pilot study recruited 40 participants in a two-week-long ayahuasca retreat to complete visual components of the Torrance Tests of Creative Thinking before and two days after the completion of the retreat. The Torrance Tests ask responders to rapidly generate creative images based on a series of geometric shapes. Compared to a control group who did not participate in the retreat, and who did not receive any alternative training, participants who ingested ayahuasca demonstrated a significant increase in the number of highly original solutions to the tests of creative thinking (Frecska et al., 2012). However, one substantial limitation of this study is that, compared to participants in the control group, those in the experimental group were recruited from a different population using different inclusion criteria.

Another recent study recruited 26 participants from two ayahuasca workshops to complete creativity tests before and during the acute psychedelic experience (Kuypers et al., 2016). The researchers found that ayahuasca improved scores of divergent thinking and reduced scores of convergent thinking on one of the two creativity measures—the picture concepts test, which asks participants to identify associations between color images. However, the other creativity measure—the pattern/line meanings test, which asks participants to assign meanings to gray-scale configurations of patterns and lines—yielded no differences in divergent thinking and did not measure convergent thinking. Moreover, the researchers included no control condition and informed participants ahead

of time about the aims of their experiment; thus, placebo effects and demand characteristics likely influenced the reported findings.

A recent placebo-controlled study directly tested the influence of LSD on semantic associations using a picture-naming task (Family et al., 2016). In this task, participants saw pictures of objects presented in sequence, and had to name the objects as quickly and accurately as possible. Under the influence of LSD, participants made more naming errors and were more likely to mistakenly substitute semantically related words (e.g., to mistakenly respond "arm" when viewing a picture of a "leg," both of which arise from the semantic category "body parts"). This pattern of results indicates that LSD increased the spread of semantic network activation in a manner that promoted associations between closely related concepts. These preliminary findings align with earlier evidence suggesting that psychedelics may enhance indirect semantic priming, reduce the predictability of speech patterns, and promote free-association (Amarel & Clark, 1965; Landon & Fischer, 1970; Spitzer et al., 1996).

Despite improvements, many recent studies of psychedelic creativity still lack methodological rigor especially in terms of implementing adequate experimental controls. Nevertheless, the cumulative evidence from observational, phenomenological, and preliminary experimental studies suggests that psychedelics can promote creative, associative thinking in a variety of domains (Family et al., 2016; Frecska et al., 2012; Kuypers et al., 2016; Sessa, 2008). Moreover, the connection between psychedelics and creativity may have a plausible neurobiological foundation. As we discussed earlier in this chapter, brain network dynamics associated with psychedelic experience appear to overlap, in some respects, with patterns of brain activity observed in moments of creative insight (see Beaty, Benedek, Silvia, & Schacter, 2016; Fox, Girn, Parro, & Christoff, 2016).

Mystical Experiences

The unconstraining of cognitive patterns via psychedelics can lead to "mystical" experiences (p. 582) that encompass feelings of sacredness, interconnectedness with the world at large, joy, peace, collapse of time and space, ineffability, and a sense of numinous truth (Barrett, Johnson, & Griffiths, 2015; Hood, 2003; Richards, 2015; Stace, 1960). Phenomenological and religious descriptions typically characterize such experiences in terms of a revelatory breakdown of habitual cognitive frameworks that divide the world into categories such as self and other, body and mind, or space and time (Richards, 2015; James, 1902; Roberts, & Winkelman, 2013; Walsh & Vaughan, 1993). An influential early study, referred to by psychedelic researchers as the "Good Friday Experiment," sought to test whether psilocybin could catalyze mystical experiences in a controlled setting at the Marsh Chapel of Boston University (Pahnke, 1963). In this randomized double-blind trial, 20 divinity students received a capsule of either placebo or psilocybin in a single group session. While a retrospective follow-up account identified methodological drawbacks to the original study (including likely breaking of the double-blind due to the use of an active placebo with different physiological side effects), it

confirmed and validated many of the original findings—namely that eight of 10 subjects in the psilocybin group reported having a mystical experience, compared to only one subject in the control group (Doblin, 1991; Pahnke, 1963). Moreover, those participants who had a mystical experience reported that significant positive changes in attitude and behavior had persisted on six-month follow-up (Pahnke, 1963). Twenty years after the original findings were published, Rick Doblin—the founder of the Multidisciplinary Association for Psychedelic Studies (MAPS)—tracked down and interviewed seven of the 10 divinity students who had received psilocybin (Doblin, 1991). All seven affirmed that their psychedelic Good Friday experience had made uniquely valuable contributions to their spiritual lives, with positive changes persisting or deepening over time (Doblin, 1991).

Building on these tentative yet promising early efforts, a more recent and rigorous double-blind, placebo-controlled study reported that administering a single moderate-to-high dose of psilocybin in a supportive setting led to full-blown mystical experiences in over half of participants, all of whom had spiritual inclinations but no previous experience with psychedelics (Griffiths, Richards, McCann, & Jesse, 2006). Moreover, these mystical experiences were associated with positive changes in self-reported mood and values over a year later (Griffiths, Richards, Johnson, McCann, & Jesse, 2008). When the researchers pooled data from this study and a subsequent follow-up replication (Griffiths, Johnson, Richards, Richards, McCann, & Jessse, 2011), they observed that a high proportion of participants who reported mystical-type experiences demonstrated enduring changes in the personality factor of Openness (MacLean, Johnson, & Griffiths, 2011). This shift is particularly intriguing given that theorists typically construe such factors as enduring traits that persist in a largely stable manner throughout adulthood (McCrae, 2009; Terracciano, McCrae, Brant, & Costa, 2005; cf. Roberts & Mroczek, 2008). Thus, research raises the possibility that psychedelics can influence structures of cognition and engender mystical-type experiences that appear, in many cases, to leave lasting imprints on core features of personality.

Therapeutic Prospects

The capacity for psychedelics to catalyze dramatic changes in cognition, affect, attitudes, and personality, coupled with emerging psychopharmacological research, suggests that these substances have potential therapeutic applications (for reviews, see dos Santos et al., 2016; Majić et al., 2015). Several independent research groups are currently investigating the prospect of using psychedelic experiences as therapeutic adjuncts in the treatment of clinical conditions including substance addiction, depression, anxiety, and obsessive-compulsive disorder.

In the case of substance use disorders, a meta-analysis of six randomized controlled trials published between 1967 and 1970 found evidence of a beneficial effect of a single-dose LSD session in the treatment of alcoholism (Krebs & Johansen, 2012). More recently, two pilot studies revealed the potential benefits of psilocybin in the treatment of tobacco and alcohol use disorders. When administered moderate-to-high doses of psilocybin in three

separate sessions in conjunction with cognitive behavioral therapy, 12 of 15 tobacco-addicted individuals demonstrated smoking abstinence at six-month follow-up, as measured by self-report and urinary cotinine test (Johnson, Garcia-Romeu, Cosimano, & Griffiths, 2014). Similarly, in a proof-of-concept study, 10 alcohol-dependent participants receiving either one or two moderate-to-high-dose psilocybin sessions in addition to motivational enhancement therapy showed significant increases in abstinence 36 weeks later (Bogenschutz et al., 2015).

Beyond addiction, studies have been exploring the potential benefits of psychedelics in the (p. 583) treatment of conditions including anxiety, depression, and obsessive-compulsive disorder. A recent double-blind placebo-controlled study employed a single moderate dose of psilocybin to address anxiety in patients with advanced-stage cancer (Grob et al., 2011). The 12 patients who received psilocybin demonstrated a significant reduction in anxiety at one and three months after treatment and an improvement in depressive mood that reached significance six months after treatment. A study by another group obtained similar placebo-controlled results using two moderate-dose LSD sessions paired with ongoing intensive psychotherapy to treat anxiety associated with terminal cancer (Gasser et al., 2014; Gasser, Kirchner, & Passie, 2015). The 12 participants in the LSD group reported significantly less anxiety and enhanced quality of life compared to the 12 participants in the control condition, with improvements persisting one year after treatment. Another pilot study (which lacked a control group) measured the effectiveness of two psilocybin sessions escalating from low to moderate dosage in 12 patients with moderate-to-severe, treatment-resistant depression (Carhart-Harris, Muthukumaraswamy, et al., 2016). Patients registered no serious or unexpected adverse events in response to the psilocybin, and reported significant reductions in depressive symptoms both one week and three months after treatment. However, the open-label nature of the study limits the conclusiveness of the findings, and about half of the patients still demonstrated significant depressive symptoms at three-month follow-up (see Cowen, 2016; Dikkstra, Jacobs, & Cohen, 2016; Hendrie & Pickles, 2016). Psilocybin has also been explored as a tool for the relief of symptoms of obsessive-compulsive disorder: in a pilot study, nine subjects received psilocybin in up to four sessions of varying dosages ranging from low to high (Moreno, Wiegand, Taitano, Delgado, 2006). Participants showed marked decreases in OCD symptoms, with improvements persisting for 24 hours after ingestion, long after the psychoactive effects had worn off.

While the evidence is promising, we are still in the early stages of establishing the therapeutic value of psychedelics. Results must be interpreted with caution because most data come from small pilot studies that often lack adequate control groups and blinding procedures. As clinical evidence accumulates, however, it becomes easier for researchers to obtain the research funding and ethical approval necessary to conduct further trials. Recent work therefore sets the stage for larger, double-blind, placebo-controlled trials in the near future.

The literature on psychedelic therapy includes substantial debate on the relative contributions to treatment outcomes of pharmacological and psychological mechanisms. In one camp, some researchers suggest that psychedelic substances can generate clinical benefits when given at doses below the threshold for inducing psychedelic experiences (Sewell, Halpern, & Pope, 2006). In the treatment of addiction, for example, researchers have proposed that serotonergic psychedelics exert anti-addictive effects by altering brain circuitry that connects limbic and frontal regions (Ross, 2012). These researchers hope that better understanding the neural and molecular mechanisms of action of these drugs will eventually allow for the development of medications that would provide therapeutic effects while obviating the need for any psychedelic experience as such—especially experiences, including dissociation and depersonalization, that might be undesirable for certain patient populations who could otherwise benefit from the direct pharmacological action of psychedelics (see Vollenweider & Kometer, 2010). In the other camp, many researchers and clinicians attribute the benefits of psychedelic substances to psychological processes that depend on or are marked by specific experiences, including restructuring of pathological cognitive patterns, enhanced empathy or self-understanding, and the adoption of constructive attitudes to one's life circumstances (Majić et al., 2015). Although the debate has tended to frame these as opposing alternatives, it seems likely that pharmacology and psychology interact through bodily, psychological, and social feedback loops to facilitate the therapeutic outcomes associated with psychedelic substances (Raikhel, 2015).

Constraining the Unconstrained Mind Through Ritual and Culture

While a growing body of experimental research has begun to explore how psychedelics reorganize cognition and promote associative, spontaneous dimensions of thought, such scientific approaches have given much less empirical attention to the role of context in shaping the psychedelic experience. When attempting to isolate and examine neurocognitive mechanisms in controlled experiments, scientists often seek a "neutral" setting that avoids biasing participants with expectations about their experience. Of course, any situation conveys (p. 584) suggestions or expectations that may influence outcomes. Thus randomized clinical trials—the gold standard of evidence-based medicine—employ a placebo comparison group to experimentally control for the effects of context or setting on expectations and attitudes (Kaptchuk, 2001; Servick, 2014). The emerging science of placebos underscores how psychosocial parameters such as contextual cues, beliefs, expectations, and empathic rapport profoundly influence many pharmacological outcomes (Brody & Miller, 2011; Finniss, Kaptchuk, Miller, & Benedetti, 2010; Kaptchuk & Miller, 2015; Kirmayer, 2015; Wager & Atlas, 2015). In the rest of this chapter we will explore how such sociocultural variables may influence psychedelic experiences.

A recent meta-analysis highlighted a variety of non-pharmacological factors that shape experiences with psilocybin. Pooling data from 23 controlled experiments involving 409 psilocybin administrations among 261 healthy participants, this analysis revealed that positive and mystical-type experiences were more likely among individuals who scored highly on the personality trait of Absorption, were emotionally excitable immediately before ingestion, and had experienced few psychological problems in the past weeks (Studerus, Gamma, Kometer, & Vollenweider, 2012). Another recent study found that LSD renders individuals acutely more suggestible, intimating that psychosocial influences may play an especially prominent role in determining the effects of psychedelics (Carhart-Harris, Kaelen, et al., 2014). While the neurocognitive mechanisms of suggestion remain poorly understood, neuroimaging findings from the domain of hypnosis implicate altered activity in attention and control processes, including the DMN (Deeley et al., 2012; Jiang et al., 2017; Mazzoni, Venneri, McGeown, & Kirsch, 2013; McGeown, Mazzoni, Vannucci, & Venneri, 2015; McGeown, Mazzoni, Venneri, & Kirsch, 2009)—a pattern that overlaps in some respects with the altered DMN activity associated with psychedelics including psilocybin, LSD, and ayahuasca (Carhart-Harris et al., 2012; Carhart-Harris, Muthukumaraswamy, et al., 2016; Palhano-Fontes et al., 2015). Thus, experimental findings seem to support the idea that the unconstrained neurocognitive state induced via psychedelics may render individuals especially susceptible to the influences of *set* (expectations, mood, or state of mind) and *setting* (including the physical and social environment) on drug experience (Zinberg, 1984).

The Ritual Use of Psychedelics

Social scientific studies of psychedelics place as much emphasis on aspects of historical, cultural, political, and environmental context as they do on the pharmacological properties of a given psychedelic substance (Beyer, 2012; Fernandez, 1982; Labate & Cavnar, 2014). According to ethnographic accounts, traditional and contemporary ritualized uses of psychedelics provide interpretive frameworks that are key to harnessing the pharmacological effects of these substances (Calabrese, 2013; Dobkin de Rios, 1984). The metaphors employed by ritual practitioners corroborate the notion of unconstrained cognition; for example, in the Santo Daime religion we will discuss at length in the following, psychedelics are often said to "open" or "reveal" one's mind (Oda Sheiner, 2016). Moreover, most traditions, including most contemporary approaches to psychedelic therapy, recognize that the states of mind evoked by psychedelics can expose participants to a range of difficult and intimidating emotional and cognitive experiences (Barrett et al., 2015; Strassman, 1984). To mitigate or prevent negative experiences and enhance positive outcomes, many practices use highly structured rituals to guide participants' encounters with psychedelic substances.

In the late 1950s, anthropologist Anthony Wallace noted a discrepancy between the experiential reports of individuals who were administered mescaline in a laboratory environment and the accounts of participants in Native American rituals centered on the consumption of the sacred mescaline-cactus peyote (Wallace, 1959). Based on these observations, Wallace proposed to supplement placebo-controlled pharmaceutical trials with a "method of cultural and situational controls" (1959, p. 84), whereby researchers would modulate the environment and instructions to participants as well as pre-select individuals based on personality, attitude, and cultural background (Langlitz, 2010). While Wallace's notion of culture controls never came to fruition in pharmacology, his early proposal highlights the value of incorporating a more social approach to psychopharmacological research in general, and to the study of psychedelics in particular. In line with this perspective, we will now turn to a discussion of ethnographic data collected by one of the authors of this chapter (Oda Sheiner) to consider how the specific context of a contemporary ayahuasca religion constrains the spontaneity of psychedelic experience through structured rituals and frameworks of interpretation.

(p. 585) Santo Daime and the Ritual Structuring of Psychedelic Experience

Psychedelic substances, consumed as plants or plant decoctions, are central to many cultural practices around the world. Knowledge of the peoples and practices that incorporate these psychedelics is largely a product of twentieth-century scholarship (Schultes, 1972). Yet, ethnobotanists and anthropologists have found evidence in the oral histories and archaeological records of indigenous cultures of the use of a variety of these substances for hundreds, if not thousands, of years (Schultes, 1969). For example, carbon

dating suggests that some Native American peoples of North America have used peyote, a psychedelic cactus, for over 5,000 years (El-Seedi, De Smet, Beck, Possnert, & Bruhn, 2005). In discussions of this history and current cultural practices, there is a tendency to portray the psychedelic experience as monolithic—that is, to understand ayahuasca healing or the peyote ceremony as enacted in the much the same way, from one generation to the next, by indigenous healers throughout the global south (cf. Atkinson, 1992). In fact, practices are highly diverse, not only in the use of different plant combinations, but also in terms of the structure of rituals and desired outcomes.

Contemporary ritualized modes of psychedelic practice reflect a blending of traditional cultures and current contexts that influence the psychedelic experience in complex ways. This is well illustrated by Oda Sheiner's (2016) ethnographic analysis of Santo Daime, a Brazilian ayahuasca religion imported to a North American cultural context. Santo Daime is a syncretic Christian religion that originated in the northwestern region of the Brazilian Amazon in the early twentieth century (Dawson, 2013). Members of the religion imbibe a beverage, also called Santo Daime—an ayahuasca decoction made from the *Psychotria viridis* leaf and the *Banisteriopsis caapi* vine, as a sacrament in rituals called *Trabalhos*, or "Works." Although Santo Daime emerged in poor, *mestiço* (indigenous and European mixed-ethnicity) communities in the Amazonian state of Acre, today it is practiced primarily by white, middle-class participants living in cosmopolitan areas throughout Brazil. The religion maintains congregations in more than 30 countries across the world, and as of 2012, an estimated 20,000 individuals participate regularly in Santo Daime Works (Dawson, 2013; Feeney & Labate, 2014). Collaborations between researchers and ayahuasca-using communities such as the Santo Daime have stimulated a growing literature on health outcomes related to ayahuasca use, which report beneficial effects pertaining to substance abuse, psychiatric health, and general well-being (Barbosa, Giglio, & Dalgalarrondo, 2005; Doering-Silveira et al., 2005; Fábregas et al., 2010; Halpern, Sherwood, Passie, Blackwell, & Ruttenber, 2008). Interestingly, in contrast to participants in clinical research with other psychedelic substances, the subjects in studies investigating ayahuasca are typically drawn from communities where highly structured conventions for ayahuasca use are already in place. As such, the efficacy of ayahuasca in these studies is deeply entwined with the effectiveness of the ritual and social contexts in which it is consumed.

The Santo Daime religion hybridizes practices from ayahuasca traditions of South American *mestiço* or *mestizo* communities, Amazonian indigenous ayahuasca rituals, Afro-Brazilian beliefs and practices, European esotericism and, most prominently, Catholicism (Dawson, 2013). Drawing strands from all of these religious traditions, Santo Daime rituals offer adherents a highly structured psychedelic experience designed to reflect the spiritual aspirations of its membership. The structuring of Works ceremonies includes the segregation of participants by gender, and the seating of individuals according to hierarchy within the religious community. Senior members of Santo Daime are typically seated at a central table, while more novice *daimistas*—members of Santo Daime—form separate rows of women and men that radiate outward from a central table. Understood in socio-cognitive terms, this spatial configuration focuses joint attention on the most

experienced practitioners, increasing their motivation to enact behaviors commensurate with the expectations of the congregation and providing performative models for less-seasoned practitioners. Ordering the ritual on a visual level, *daimistas* wear simple uniforms with modest symbolic adornments, serving to de-emphasize personal differences in terms of social class or income and to accentuate a sense of collective identity. Ritual spaces are often decorated with images and objects derived from the contributing religious traditions (with a particular emphasis on Christian symbolism). The cues provided by ritual decorations foster expectations among participants as to the character and contents of visions experienced while under the influence of the Daime brew.

Beyond the physical structuring of space, Works follow a regimented timeline. While different Works entail a degree of variation in the contents and sequencing of events, at a rudimentary level, rituals involve the recitation of inaugural prayers, (p. 586) consumption of Daime, silent seated meditation, singing of hymns, coordinated dance, and concluding prayers. Not all Works require these basic elements; still others include additional practices. Beyond the deliberate chronological arrangement of ritual events, participants are expected to sustain a degree of synchrony throughout the Works—whether staying in harmony while singing hymns, keeping the rhythm during dances, or more broadly, maintaining a minimum level of consistency in behavior with other *daimistas* throughout the ritual.

The ordering of ritual time and space structures the psychedelic experience along multiple modalities. On a pragmatic level, it provides the framework and repeatability required for regular religious practice, and codifies Santo Daime such that it can spread to new locations while preserving its core features. On a social level, Santo Daime's structure creates a meritocratic hierarchy of religious seniority, which rewards individuals for their personal growth and their ability to maintain and contribute to the congregation's co-development. On a metaphysical level, according to adherents, the ritual structure allows for the creation of a collectively generated spiritual current, nourished by the combined efforts of *daimistas*, that brings about the individual and communal efficacy of Santo Daime practice, whether it be personal insight, spiritual growth, emotional or physical healing, or any number of other reported benefits. Finally, at the experiential level, Santo Daime hymns and rituals provide *daimistas* with an interpretive framework through which experiences during Works can be constructed, explicated, and integrated into everyday life. Although Santo Daime has developed its idiosyncratic constellations of practice to reflect the values and aspirations of its membership, many other ayahuasca traditions employ analogous customs to help adherents navigate the vagaries of psychedelic experience (Labate & Cavnar, 2014).

Agency, Spontaneity, and Novel Psychedelic Experiences of Intersubjectivity

One of the most striking and ubiquitous sets of phenomena associated with the ritualized ingestion of ayahuasca involves alterations in the sense of control over the stream of consciousness (Shanon, 2002). Under the influence of psychedelics, individuals often experience thoughts and visions as emanating from external sources (Shanon, 2002; Strassman, 2000). In the specific context of Santo Daime, spiritual entities are not only "believed-in" by *daimistas* to the extent that they represent important components of their cosmologies, but they are also experienced as tangible, non-human others in the ritual setting. In-depth interviews collected by Oda Sheiner (2016) support the notion that practitioners relate to the Daime brew as an agent—as a participant in and subject of intersubjective encounters—rather than as an inanimate object. Describing the subject of these perceived relations, participants evoked notions of a being, a spirit, plant voices, and a range of proper nouns referring to specific entities. Many participants identified the specific force who ostensibly animates the Daime decoction as *Juramidam*, a central figure who recurs frequently in Santo Daime hymns and doctrine.

Experienced relations with non-physical entities under the influence of the Daime brew manifest across a range of sensory modalities, including visual apparitions, heard voices, or the felt presence of an entity (cf. Luhrmann, 2011). Oda Sheiner (2016) noted a proclivity among interviewees to use verbs that mark volition when describing experiences with Daime. Participants regularly mentioned being "shown," "told," "instructed," or having "received" information from the brew. This tendency was apparent even among participants who professed an overt skepticism toward the notion of Daime as a sentient being, separate from oneself. For instance, one participant advocated against overly entrenched beliefs about beings encountered in the Daime by way of describing Daime's ability to "bring you out of your belief system, and the more you believe strongly in something, the more it will bump it out for you." Still, whether reflecting implicit beliefs or an adherence to the conventions of the Santo Daime community, the participant later employed locutions that attributed awareness and agency to the Daime decoction by positioning its own intentions as a steering force in the religion's precarious political and legal viability in the future. Beyond the individual sense of agency, therefore, these ethnographic interviews highlighted the importance of Daime, figured as an agent, in collective decision-making in the larger community. When interviewees elaborated on the specifics of different rituals or on the reasons that the Santo Daime congregation adopted a particular stance, the causal chain could often be traced back to an instruction understood to be received by a *daimista* in a vision. It remains an open question whether such alterations in the attribution of agency to thoughts and sensations (p. 587) reflect an intrinsic property of the psychedelic brew, or emerge out of specific interactions with the ritual milieu and doctrines of ayahuasca traditions. Nonetheless, the discourses of Santo Daime, as well as those of other codified ayahuasca practices, normalize and de-stigmatize experiences of altered agency relating to the stream of thought. Indeed, these interpretive frameworks position such experiences as assets for individual and communal growth—and as an experiential fulfillment of the sacrament.

The Culture of Psychedelic Science

Medical and scientific studies of psychedelics do not exist "outside" of culture, but rather represent a response to specific contemporary issues and preoccupations. Recent research tends to operate within the framework of biomedicine, relating psychedelics to other psychopharmacological research questions and priorities, in an effort to legitimize psychedelic substances to relevant regulating agencies (Anderson, 2012; Doblin, 2016; Pollan, 2015). As such, experiments tend to focus on individual therapeutic efficacy, safety, mechanism, and reproducibility, even when the underlying interests may concern broader social or spiritual implications (cf. ongoing studies beginning to explore psychedelics as tools for the study of religion: http://csp.org/religiousleaderstudy). As these laboratory paradigms become popularized through mainstream scientific and popular news outlets, psychedelic research contributes to social and cultural contexts that in turn shape psychedelic experiences through looping effects (Kirmayer & Raikhel, 2009).

Proponents of psychedelic therapy have long appreciated the importance of appropriately framing the experience by way of physical setting, social support, and personal intention (Johnson, Richards, & Griffiths, 2008). A meta-analysis of early trials examining the efficacy of LSD as an adjunct to addiction treatment, for example, emphasized the supportive presence of a therapist as a crucial factor in determining which trials led to beneficial outcomes (Krebs & Johansen, 2012). Dominant therapeutic models of contemporary research on psychedelics are based on an individual-centered approach in which trained guides orient participants (many of whom have little or no experience with psychedelics) by helping them set their expectations and intentions before the experience and subsequently assisting with post-session integration (Majić et al., 2015). During the acute psychedelic experience, guides tend to adopt a passive role and encourage participants to become immersed in their own experience, while remaining physically present and available to intervene when help is needed or requested. Participants typically undergo the experience one at a time, reclining quietly on a couch in a comfortable, living-room style setting while wearing an eyeshade mask and listening to music through headphones. This individualistic, introspective approach stands in stark contrast to many traditional and contemporary psychedelic rituals in spiritual or religious contexts, such as the Santo Daime Works described earlier, which feature a more dynamic environment involving coordinated group activity and an explicit invocation of shared symbols, beliefs, and aspirations.

The peculiarity of psychedelic research contexts becomes even more apparent when we turn from psychotherapy to more basic scientific work centering on cognitive and neurobiological mechanisms. Here, participants (who are typically more seasoned users of psychedelics) spend the peak moments of their experience in a sterile laboratory environment, surrounded by computers, electrical devices, and other accoutrements of modern science. In neuroimaging experiments, participants often sit strapped with scalp electrodes or otherwise lie on their backs, unable to move, in the loud bore of an fMRI

scanner. These uncomfortable environments likely influence the psychedelic experience. Whereas one study showed that some of the broad phenomenological characteristics of the psilocybin experience persist in a neuroimaging setting (Carhart-Harris et al., 2011), another study found that neuroimaging contexts increased the likelihood of unpleasant or anxious experiences (Studerus, Gamma, Kometer, & Vollenweider, 2012). Other contextual factors may also influence outcomes; for example, recent findings by Lifshitz and colleagues indicate that body postures (typically supine in fMRI neuroimaging and upright with methods like EEG) alter resting-state brain activity (Lifshitz, Thibault, Roth, & Raz, 2017; Thibault, Lifshitz, Jones, & Raz, 2014; Thibault, Lifshitz, & Raz, 2016). Moreover, the very expectation that one is undergoing a neuroimaging experiment can bias thought patterns and limit critical judgment—a phenomenon we have termed "neuroenchantment" (Ali, Lifshitz, & Raz, 2014). This kind of expectancy effect emphasizes that, far from being neutral, modern clinical and scientific experimental contexts convey a complex set of symbols that have significant cognitive and affective impacts on subjects.

While such contextual considerations may not make their way into the methods sections of (p. 588) cognitive neuroscience papers, they seem to guide, albeit often implicitly, the practices and outcomes of contemporary psychedelic research. For example, in his rich ethnographic work investigating the research practices of a prominent European laboratory studying the neuroscience of psychedelics, anthropologist Nicolas Langlitz (2010, 2012) documents how scientists rearrange and redecorate the space of the laboratory and experimental stimuli, through trial-and-error self-experimentation, to prevent participants from undergoing distracting negative experiences and hence tarnishing their neurocognitive data. Thus, the relevance of context and culture extend beyond traditional ritualistic uses of psychedelics to suffuse even the most "objective" contemporary scientific examinations of these substances. This points to the need for research that approaches these contextual factors not as nuisance variables, but as clues to the dynamics of psychedelic experience in real-world settings.

Conclusion

In this chapter we explored classical serotonergic psychedelics as catalysts of spontaneous thought. Emerging from a decades-long, politically charged hiatus, the scientific study of psychedelics is beginning to rediscover the potential for these pharmacological agents to promote creative insight (Frecska et al., 2012), evoke mystical experiences (Griffiths et al., 2006), and improve clinical outcomes (Majić et al., 2015; dos Santos et al., 2016). Moreover, neuroscientific studies have made some progress in unraveling the brain processes underlying the profound alterations in consciousness associated with serotonergic psychedelics. In particular, a recent series of neuroimaging studies indicates that psychedelics profoundly reconfigure functional brain architecture in a manner that promotes novel connectivity patterns among large-scale cortical

networks (Carhart-Harris, Leech, et al., 2014; Carhart-Harris, Muthukumaraswamy, et al., 2016; Kometer et al., 2015; Palhano-Fontes et al., 2015). Preliminary reports are beginning to unravel how such alterations in acute neural function may mold the enduring structure of the brain and personality (Bouso et al., 2015; Lebedev et al., 2016). Thus, the flexibility attributed to psychedelic cognition may be reflected at the level of neurobiology, providing clues for better understanding the mechanisms that underlie the use of these substances in creative, spiritual, and therapeutic domains (Vollenweider & Kometer, 2010).

Contemporary approaches, however, have a long way to go in terms of addressing the contributions of context, suggestion, and culture in co-determining the quality, content, and outcome of psychedelic experiences. Moving beyond psychological and neuroscientific models, we have argued that anthropology and other social sciences can clarify the nature of psychedelic thought as pharmacologically mediated cognition embedded in social and cultural contexts of ritual and community. Ethnographic fieldwork in religion, healing, and ethnobotany point to the importance of personal preparation as well as environmental factors (i.e., set and setting) in shaping psychedelic experiences (Blainey, 2015; Labate & Cavnar, 2014). We illustrated the value of this contextual approach by summarizing some results from an ethnographic study of the use of a psychedelic brew, ayahuasca, in the contemporary syncretic religion of Santo Daime. Our analysis showed how ritualized practice constrains the psychedelically unconstrained mind to limit the volatility of the ayahuasca experience and optimize desired personal and communal outcomes (Oda Sheiner, 2016).

Traditions of psychedelic practice have long recognized that responsible use requires careful preparation and attention to context; with the right preparation and support, even difficult experiences can, at times, contribute to growth and healing (Gow, 1996; Naranjo, 1974; Pendell, 2005). Part of the value of psychedelics stems directly from their ability to reduce habitual constraints on the mind, thereby opening a space for new insights and vivid experiences of great power. The influence of psychedelic substances on thought provides a rich case study for exploring the complex interplay of brain, mind, culture, and neurochemistry. Approached with care, psychedelics may prove to be allies in illuminating the dynamics of spontaneous thought and promoting flexibility of mind in health and illness.

References

Ali, S. S., Lifshitz, M., & Raz, A. (2014). Empirical neuroenchantment: From reading minds to thinking critically. *Frontiers in Human Neuroscience*, *8*, 1–4.

Alonso, J. F., Romero, S., Mañanas, M. À., & Riba, J. (2015). Serotonergic psychedelics temporarily modify information transfer in humans. *International Journal of Neuropsychopharmacology*, *18*(8), 1–9.

Amarel, M., & Cheek, F. E. (1965). Some effects of LSD-25 on verbal communication. *Journal of Abnormal Psychology, 70*(6), 453–456.

Anderson, B. T. (2012). Ayahuasca as antidepressant? Psychedelics and styles of reasoning in psychiatry. *Anthropology of Consciousness*, *23*(1), 44–59.

Andrews-Hanna, J. R., Smallwood, J., & Spreng, R. N. (2014). The default network and self-generated thought: Component (p. 589) processes, dynamic control, and clinical relevance. *Annals of the New York Academy of Sciences*, *1316*(1), 29–52.

Atkinson, Jane M. (1992). Shamanisms today. *Annual Review of Anthropology*, *21*, 307–330.

Barbosa, P. C. R., Giglio, J. S., & Dalgalarrondo, P. (2005). Altered states of consciousness and short-term psychological after-effects induced by the first time ritual use of ayahuasca in an urban context in Brazil. *Journal of Psychoactive Drugs*, *37*(*2*), 193–201.

Barrett, F. S., Bradstreet, M. P., Leoutsakos, J. M. S., Johnson, M. W., MacLean, K. A., Jesse, R., & Griffiths, R. R. (2015). The challenging experience questionnaire: Characterization of acute adverse reactions to psilocybin. *Drug & Alcohol Dependence*, *146*, e218.

Barrett, F. S., Johnson, M. W., & Griffiths, R. R. (2015). Validation of the revised Mystical Experience Questionnaire in experimental sessions with psilocybin. *Journal of Psychopharmacology*, *29*(11), 1182–1190.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*, 617–645.

Beaty, R. E., Benedek, M., Silvia, P. J., & Schacter, D. L. (2016). Creative cognition and brain network dynamics. *Trends in Cognitive Sciences*, *20*(2), 87–95.

Berlin, L., Guthrie, T., Weider, A., Goodell, H., & Wolff, H. G. (1955). Studies in human cerebral function: the effects of mescaline and lysergic acid on cerebral processes pertinent to creative activity. *The Journal of Nervous and Mental Disease*, *122*(5), 487–491.

Beyer, S. V. (2012). Special Ayahuasca issue introduction: Toward a multidisciplinary approach to Ayahuasca studies. *Anthropology of Consciousness*, *23*(1), 1–5.

Blainey, M. G. (2015). Forbidden therapies: Santo Daime, ayahuasca, and the prohibition of entheogens in Western society. *Journal of Religion and Health*, *54*(1), 287–302.

Bogenschutz, M. P., Forcehimes, A. A., Pommy, J. A., Wilcox, C. E., Barbosa, P. C. R., & Strassman, R. J. (2015). Psilocybin-assisted treatment for alcohol dependence: A proof-of-concept study. *Journal of Psychopharmacology*, *29*(3), 289–299.

Boulougouris, V., Glennon, J. C., & Robbins, T. W. (2008). Dissociable effects of selective 5-HT2A and 5-HT2C receptor antagonists on serial spatial reversal learning in rats. *Neuropsychopharmacology*, *33*(8), 2007–2019.

Bouso, J. C., Palhano-Fontes, F., Rodríguez-Fornells, A., Ribeiro, S., Sanches, R., Crippa, J. A. S., . . . & Riba, J. (2015). Long-term use of psychedelic drugs is associated with differences in brain structure and personality in humans. *European Neuropsychopharmacology*, *25*(4), 483–492.

Brody, H., & Miller, F. G. (2011). Lessons from recent research about the placebo effect: From art to science. *Journal of the American Medical Association*, *306*(23), 2612–2613.

Buckner, R. L., Andrews-Hanna, J. R., & Schacter, D. L. (2008). The brain's default network. *Annals of the New York Academy of Sciences*, *1124*(1), 1–38.

Busch, A. K., & Johnson, W. C. (1950). LSD 25 as an aid in psychotherapy: Preliminary report of a new drug. *Diseases of the Nervous System*, *11*(8), 241–243.

Calabrese, J. D. (2013). *A different medicine: Postcolonial healing in the Native American Church*. Oxford: Oxford University Press.

Carhart-Harris, R. (2007). Waves of the unconscious: The neurophysiology of dreamlike phenomena and its implications for the psychodynamic model of the mind. *Neuropsychoanalysis*, *9*(2), 183–211.

Carhart-Harris, R. L., Bolstridge, M., Rucker, J., Day, C. M., Erritzoe, D., Kaelen, M., . . . & Taylor, D. (2016). Psilocybin with psychological support for treatment-resistant depression: An open-label feasibility study. *The Lancet Psychiatry 3*(7), 619–627.

Carhart-Harris, R. L., Erritzoe, D., Williams, T., Stone, J. M., Reed, L. J., Colasanti, A., . . . & Hobden, P. (2012). Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. *Proceedings of the National Academy of Sciences*, *109*(6), 2138–2143.

Carhart-Harris, R. L., & Friston, K. J. (2010). The default-mode, ego-functions and free-energy: A neurobiological account of Freudian ideas. *Brain*, *133*(4), 1265–1283.

Carhart-Harris, R. L., Kaelen, M., Bolstridge, M., Williams, T. M., Williams, L. T., Underwood, R., . . . & Nutt, D. J. (2016). The paradoxical psychological effects of lysergic acid diethylamide (LSD). *Psychological Medicine*, *46*(7), 1379–1390.

Carhart-Harris, R. L., Kaelen, M., Nutt, D. (2014). How do hallucinogens work on the brain? *The Psychologist*, *27*(9), 662–665.

Carhart-Harris, R. L., Kaelen, M., Whalley, M. G., Bolstridge, M., Feilding, A., & Nutt, D. J. (2015). LSD enhances suggestibility in healthy volunteers. *Psychopharmacology*, *232*(4), 785–794.

Carhart-Harris, R. L., Leech, R., Erritzoe, D., Williams, T. M., Stone, J. M., Evans, J., . . . & Nutt, D. J. (2013). Functional connectivity measures after psilocybin inform a novel hypothesis of early psychosis. *Schizophrenia Bulletin*, *39*(6), 1343–1351.

Carhart-Harris, R. L., Leech, R., Hellyer, P. J., Shanahan, M., Feilding, A., Tagliazucchi, E., . . . & Nutt, D. (2014). The entropic brain: A theory of conscious states informed by neuroimaging research with psychedelic drugs. *Frontiers in Human Neuroscience*, *8*, 1–22.

Carhart-Harris, R. L., Muthukumaraswamy, S., Roseman, L., Kaelen, M., Droog, W., Murphy, K., . . . & Leech, R. (2016). Neural correlates of the LSD experience revealed by multimodal neuroimaging. *Proceedings of the National Academy of Sciences*, *113*(17), 4853–4858.

Carhart-Harris, R., & Nutt, D. (2014). Was it a vision or a waking dream? *Frontiers in Psychology*, *5*, 1–3.

Carhart-Harris, R. L., Williams, T. M., Sessa, B., Tyacke, R. J., Rich, A. S., Feilding, A., & Nutt, D. J. (2011). The administration of psilocybin to healthy, hallucinogen-experienced volunteers in a mock-functional magnetic resonance imaging environment: A preliminary investigation of tolerability. *Journal of Psychopharmacology*, *25*(11), 1562–1567.

Chambers, T. (2014). Editor's introduction: Psychedelic resurgence—research and therapeutic uses, past and present. *Journal of Psychoactive Drugs*, *46*(1), 1–2.

Christoff, K., Gordon, A. M., Smallwood, J., Smith, R., & Schooler, J. W. (2009). Experience sampling during fMRI reveals default network and executive system contributions to mind wandering. *Proceedings of the National Academy of Sciences*, *106*(21), 8719–8724.

Christoff, K., Irving, Z. C., Fox, K. C., Spreng, R. N., & Andrews-Hanna, J. R. (2016). Mind-wandering as spontaneous thought: a dynamic framework. *Nature Reviews Neuroscience*, *17*(11), 718–731.

Cohen, S. (1964). *The beyond within: The LSD story*. New York: Atheneum.

(p. 590) Dawson, A. (2013). *Santo Daime: A New World Religion*. London: Bloomsbury Academic.

Cowen, P. (2016). Altered states: Psilocybin for treatment-resistant depression. *The Lancet Psychiatry*, *3*(7), 592–593.

Deeley, Q., Oakley, D. A., Toone, B., Giampietro, V., Brammer, M. J., Williams, S. C., & Halligan, P. W. (2012). Modulating the default mode network using hypnosis. *International Journal of Clinical and Experimental Hypnosis*, *60*(2), 206–228.

Dijkstra, F. M., Jacobs, G. E., & Cohen, A. F. (2016). Question-based drug development for psilocybin. *The Lancet Psychiatry*, *3*(9), 806–807.

Dobkin de Rios, M. (1972). *Visionary vine: Hallucinogenic healing in the Peruvian Amazon*. San Francisco: Chandler.

Dobkin de Rios, M. (1984). *Hallucinogens, cross-cultural perspectives*. Albuquerque: University of New Mexico Press.

Dobkin De Rios, M., & Janiger, O. (2003). *LSD, spirituality, and the creative process: Based on the groundbreaking research of Oscar Janiger, MD*. Rochester, VT: Park Street Press.

Doblin, R. (1991). Pahnke's "Good Friday Experiment": A long-term follow-up and methodological critique. *The Journal of Transpersonal Psychology*, *23*, 1–28.

Doblin, R. (2016, June). *Regulatory challenges involved in developing psychedelic-assisted psychotherapy through the FDA/EMA process.* Talk presented at the Interdisciplinary Conference on Psychedelics Research.

Doering-Silveira, E., Grob, C. S., de Rios, M. D., Lopez, E., Alonso, L. K., Tacla, C., & Da Silveira, D. X. (2005). Report on psychoactive drug use among adolescents using ayahuasca within a religious context. *Journal of Psychoactive Drugs*, *37*(2), 141–144.

dos Santos, R. G., Osório, F. L., Crippa, J. A. S., Riba, J., Zuardi, A. W., & Hallak, J. E. (2016). Antidepressive, anxiolytic, and antiaddictive effects of ayahuasca, psilocybin and lysergic acid diethylamide (LSD): A systematic review of clinical trials published in the last 25 years. *Therapeutic Advances in Psychopharmacology, 6*(3), 193–213.

Dyck, E. (2006). Prairie psychedelics: Mental health research in Saskatchewan, 1951–1967. In J. E. Moran & D. Wright (Eds.), *Mental health and Canadian Society: Historical perspectives* (pp. 221–244). Montreal: McGill-Queen's University Press.

El-Seedi, H. R., De Smet, P. A., Beck, O., Possnert, G., & Bruhn, J. G. (2005). Prehistoric peyote use: Alkaloid analysis and radiocarbon dating of archaeological specimens of Lophophora from Texas. *Journal of Ethnopharmacology*, *101*(1), 238–242.

Fábregas, J. M., González, D., Fondevila, S., Cutchet, M., Fernández, X., Barbosa, P. C. R., Alcázar-Córcoles, M. A., Barbanoj, M. J., Riba, J., & Bouso, J. C. (2010) Assessment of addiction severity among ritual users of ayahuasca. *Drug and Alcohol Dependence*, *111*(3), 257–261.

Fadiman, J. (2011). *The psychedelic explorer's guide: Safe, therapeutic, and sacred journeys*. Rochester, VT: Inner Traditions & Bear.

Family, N., Vinson, D., Vigliocco, G., Kaelen, M., Bolstridge, M., Nutt, D. J., & Carhart-Harris, R. L. (2016). Semantic activation in LSD: Evidence from picture naming. *Language, Cognition and Neuroscience*, *31*(10), 1320–1327.

Feeney, K., Labate, B.C. (2014). The expansion of Brazilian Ayahuasca religions: Law, culture and locality. In B.C. Labate and C. Cavnar (Eds.), *Prohibition, religious freedom, and human rights: 111 regulating traditional drug use*. Berlin: Springer-Verlag.

Fernandez, J. W. (1982). *Bwiti: An ethnography of the religious imagination in Africa*. Princeton, NJ: Princeton University Press.

Finniss, D. G., Kaptchuk, T. J., Miller, F., & Benedetti, F. (2010). Biological, clinical, and ethical advances of placebo effects. *The Lancet*, *375*(9715), 686–695.

Fox, K. C. R., Spreng, R. N., Ellamil, M., Andrews-Hanna, J. R., & Christoff, K. (2015). The wandering brain: Meta-analysis of functional neuroimaging studies of mind-wandering and related spontaneous thought processes. *NeuroImage*, *111*, 611–621.

Fox, K. C. R., Girn, M., Parro, C. C., & Christoff, K. (2016). Functional neuroimaging of psychedelic experience: An overview of psychological and neural effects and their relevance to research on creativity, daydreaming, and dreaming. arXiv preprint arXiv: 1605.07153.

Frecska, E., Móré, C. E., Vargha, A., & Luna, L. E. (2012). Enhancement of creative expression and entoptic phenomena as after-effects of repeated ayahuasca ceremonies. *Journal of Psychoactive Drugs*, *44*(3), 191–199.

Gallimore, A. R. (2015). Restructuring consciousness: The psychedelic state in light of integrated information theory. *Frontiers in Human Neuroscience*, *9*, 346.

Gasser, P. (1994). Psycholytic therapy with MDMA and LSD in Switzerland. *MAPS Newsletter*, *5*(3), 3–7.

Gasser, P., Holstein, D., Michel, Y., Doblin, R., Yazar-Klosinski, B., Passie, T., & Brenneisen, R. (2014). Safety and efficacy of lysergic acid diethylamide-assisted psychotherapy for anxiety associated with life-threatening diseases. *The Journal of Nervous and Mental Disease*, *202*(7), 513.

Gasser, P., Kirchner, K., & Passie, T. (2015). LSD-assisted psychotherapy for anxiety associated with a life-threatening disease: A qualitative study of acute and sustained subjective effects. *Journal of Psychopharmacology*, *29*(1), 57–68.

Gewirtz, J. C., Chen, A. C., Terwilliger, R., Duman, R. C., & Marek, G. J. (2002). Modulation of DOI-induced increases in cortical BDNF expression by group II mGlu receptors. *Pharmacology Biochemistry and Behavior*, *73*(2), 317–326.

Geyer, M. A., & Vollenweider, F. X. (2008). Serotonin research: Contributions to understanding psychoses. *Trends in Pharmacological Sciences*, *29*(9), 445–453.

Goldsmith, N. M. (2010). *Psychedelic healing: The promise of entheogens for psychotherapy and spiritual development*. Rochester, VT: Inner Traditions & Bear.

Gow, P. (1996). River people: Shamanism and history in Western Amazonia. In N. Thomas & C. Humphrey (Eds.), *Shamanism, history, and the State* (pp. 90–113). Ann Arbor: University of Michigan Press.

Griffiths, R. R., Johnson, M. W., Richards, W. A., Richards, B. D., McCann, U., & Jesse, R. (2011). Psilocybin occasioned mystical-type experiences: Immediate and persisting dose-related effects. *Psychopharmacology*, *218*(4), 649–665.

Griffiths, R. R., Richards, W. A., Johnson, M. W., McCann, U. D., & Jesse, R. (2008). Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. *Journal of Psychopharmacology*, *22*(6), 621–632.

Griffiths, R. R., Richards, W. A., McCann, U., & Jesse, R. (2006). Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology*, *187*(3), 268–283.

(p. 591) Grinker, R. R. (1964). Bootlegged ecstasy. *Journal of the American Medical Association, 187*(10), 768–768.

Grinspoon, L., & Bakalar, J. B. (1979). *Psychedelic drugs reconsidered*. New York: Basic Books.

Grob, C. (1994). Psychiatric research with hallucinogens: What have we learned? *Yearbook for Ethnomedicine and the Study of Consciousness*, *3*, 91–112.

Grob, C. S., Danforth, A. L., Chopra, G. S., Hagerty, M., McKay, C. R., Halberstadt, A. L., Greer, G. R. (2011) Pilot study of psilocybin treatment for anxiety in patients with advanced-stage cancer. *Archives of General Psychiatry*, *68*, 71–78.

Guilford, J. P. (1966). Measurement and creativity. *Theory Into Practice*, *5*(4), 185–189.

Hagmann, P., Cammoun, L., Gigandet, X., Meuli, R., Honey, C. J., Wedeen, V. J., & Sporns, O. (2008). Mapping the structural core of human cerebral cortex. *PLoS Biology*, *6*(7), e159.

Halberstadt, A. L. (2015). Recent advances in the neuropsychopharmacology of serotonergic hallucinogens. *Behavioural Brain Research*, *277*, 99–120.

Halpern, J. H., Sherwood, A. R., Passie, T., Blackwell, K. C., & Ruttenber, A. J. (2008). Evidence of health and safety in American members of a religion who use a hallucinogenic sacrament. *Medical Science Monitor*, *14*(8), SR15–SR22.

Hamilton, J. P., Furman, D. J., Chang, C., Thomason, M. E., Dennis, E., & Gotlib, I. H. (2011). Default-mode and task-positive network activity in major depressive disorder: Implications for adaptive and maladaptive rumination. *Biological Psychiatry*, *70*(4), 327–333.

Han, S., Northoff, G., Vogeley, K., Wexler, B. E., Kitayama, S., & Varnum, M. E. (2013). A cultural neuroscience approach to the biosocial nature of the human brain. *Annual Review of Psychology*, *64*, 335–359.

Harman, W. W., McKim, R. H., Mogar, R. E., Fadiman, J., & Stolaroff, M. J. (1966). Psychedelic agents in creative problem solving: A pilot study. Monograph Supplement 2-V19. *Psychological Reports*, *19*(1), 211–227.

Harvey, J. A. (2003). Role of the serotonin 5-HT2A receptor in learning. *Learning & Memory*, *10*(5), 355–362.

Hasenkamp, W., Wilson-Mendenhall, C. D., Duncan, E., & Barsalou, L. W. (2012). Mind wandering and attention during focused meditation: A fine-grained temporal analysis of fluctuating cognitive states. *Neuroimage*, *59*(1), 750–760.

Hendrie, C., & Pickles, A. (2016). Psilocybin: Panacea or placebo?. *The Lancet Psychiatry*, *3*(9), 805–806.

Hinton, D. E., Howes, D., & Kirmayer, L. J. (2008). Toward a medical anthropology of sensations: Definitions and research agenda. *Transcultural Psychiatry*, *45*(2), 142–162.

Hinton, D. E., & Kirmayer, L. J. (2017). The flexibility hypothesis of healing. *Culture, Medicine, and Psychiatry*, *41*(1), 3–34.

Hoffer, A. (1970). Treatment of alcoholism with psychedelic therapy. In B. Aaronson & H. Osmond (Eds.), *Psychedelics: The uses and implications of psychedelic drugs* (pp. 357–366). New York: Doubleday

Hood, R. W. (2003). Conceptual and empirical consequences of the unity thesis. *International Series in the Psychology of Religion*, *13*, 17–54.

Humphrey, D. E., McKay, A. S., Primi, R., & Kaufman, J. C. (2014). Self-reported drug use and creativity:(Re) establishing layperson myths. *Imagination, Cognition and Personality*, *34*(2), 179–201.

Huxley, A. (1954). *The doors of perception and heaven and hell*. London: Harper & Brothers.

Huxley, A. (1977). *Moksha: Writings on psychedelics and the visionary experience (1931–1963)*. New York: Stonehill.

James, W. (1902). *The Varieties of Religious Experience*. London: Longman.

Jiang, H., White, M. P., Greicius, M. D., Waelde, L. C., & Spiegel, D. (2016). Brain activity and functional connectivity associated with hypnosis. Cerebral Cortex, *27*(8), 4083–4093.

Johansen, P. Ø., & Krebs, T. S. (2015). Psychedelics not linked to mental health problems or suicidal behavior: A population study. *Journal of Psychopharmacology*, *29*(3), 270–279.

Johnson, M. W., Richards, W. A., & Griffiths, R. R. (2008). Human hallucinogen research: Guidelines for safety. *Journal of Psychopharmacology*, *22*(6), 603–620.

Johnson, M. W., Garcia-Romeu, A., Cosimano, M. P., & Griffiths, R. R. (2014). Pilot study of the 5-HT2AR agonist psilocybin in the treatment of tobacco addiction. *Journal of Psychopharmacology*, *28*(11), 983–992.

Josipovic, Z., Dinstein, I., Weber, J., & Heeger, D. J. (2012). Influence of meditation on anti-correlated networks in the brain. *Frontiers in Human Neuroscience*, *5*, 183.

Kaelen, M., Roseman, L., Kahan, J., Santos-Ribeiro, A., Orban, C., Lorenz, R., . . . & Wall, M. B. (2016). LSD modulates music-induced imagery via changes in parahippocampal connectivity. *European Neuropsychopharmacology, 26*(7), 1099–1109.

Kashdan, T. B. (2010) Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878.

Kaptchuk, T. J. (2001). The double-blind, randomized, placebo-controlled trial: Gold standard or golden calf? *Journal of Clinical Epidemiology*, *54*(6), 541–549.

Kaptchuk, T. J., & Miller, F. G. (2015). Placebo effects in medicine. *New England Journal of Medicine*, *373*(1), 8–9.

Kay, P., & Kempton, W. (1984). What is the Sapir-Whorf hypothesis? *American Anthropologist*, *86*(1), 65–79.

King, A. R., Martin, I. L., & Melville, K. A. (1974). Reversal learning enhanced by lysergic acid diethylamide (LSD): Concomitant rise in brain 5-hydroxytryptamine levels. *British Journal of Pharmacology*, *52*(3), 419–426.

Kirmayer, L. J. (2015). Unpacking the placebo response: Insights from ethnographic studies of healing. In A. Raz & C. S. Harris (Eds.) *Placebo talks: Modern perspectives on placebos in society* (pp. 119–143). New York: Oxford University Press.

Kirmayer, L. J., & Raikhel, E. (2009). From *Amrita* to Substance D: Psychopharmacology, political economy, and technologies of the self. *Transcultural Psychiatry*, *46*(1), 5–15.

Kometer, M., Pokorny, T., Seifritz, E., & Vollenweider, F. X. (2015). Psilocybin-induced spiritual experiences and insightfulness are associated with synchronization of neuronal oscillations. *Psychopharmacology*, *232*(19), 3663–3676.

Krebs, T. S., & Johansen, P. Ø. (2012). Lysergic acid diethylamide (LSD) for alcoholism: Meta-analysis of randomized controlled trials. *Psychopharmacology*, *26*(7), 994–1002.

Krippner, S. (1985). Psychedelic drugs and creativity. *Journal of Psychoactive Drugs*, *17*(4), 235–246.

Kuypers, K. P. C., Riba, J., de la Fuente Revenga, M., Barker, S., Theunissen, E. L., & Ramaekers, J. G. (2016). Ayahuasca enhances creative divergent thinking while decreasing conventional convergent thinking. *Psychopharmacology*, *233*(18), 3395–3403.

Labate, B. C., & Cavnar, C. (Eds.). (2014). *Ayahuasca shamanism in the Amazon and beyond*. Oxford: Oxford University Press.

(p. 592) Landon, M., & Fischer, R. (1970). On similar linguistic structures in creative performance and psilocybin-induced experience. *Confinia Psychiatrica*, *13*, 115–138.

Langlitz, N. (2010). The persistence of the subjective in neuropsychopharmacology: Observations of contemporary hallucinogen research. *History of the Human Sciences*, *23*(1), 37–57.

Langlitz, N. (2012). *Neuropsychedelia: The revival of hallucinogen research since the decade of the brain*. Berkeley: University of California Press.

Leary, T., Metzner, R., & Alpert, R. (1964/1971). *The psychedelic experience: A manual based on the Tibetan Book of the Dead*. London: Academy Editions.

Lebedev, A. V., Kaelen, M., Lövdén, M., Nilsson, J., Feilding, A., Nutt, D. J., & Carhart-Harris, R. L. (2016). LSD-induced entropic brain activity predicts subsequent personality change. *Human Brain Mapping*, *37*(9), 3203–3213.

Lebedev, A. V., Lövdén, M., Rosenthal, G., Feilding, A., Nutt, D. J., & Carhart-Harris, R. L. (2015). Finding the self by losing the self: Neural correlates of ego-dissolution under psilocybin. *Human Brain Mapping*, *36*(8), 3137–3153.

Letheby, C. (2015). The philosophy of psychedelic transformation. *Journal of Consciousness Studies*, *22*(9–10), 170–193.

Lifshitz, M., Thibault, R. T., Roth, R. R., & Raz, A. (2017, online first). Source Localization of Brain States Associated with Canonical Neuroimaging Postures. *Journal of Cognitive Neuroscience*.

Luhrmann, T. M. (2011). Hallucinations and sensory overrides. *Annual Review of Anthropology*, *40*, 71–85.

Luke, D. P., & Terhune, D. B. (2013). The induction of synaesthesia with chemical agents: A systematic review. *Frontiers in Psychology*, *4*, 1–12.

MacLean, K. A., Johnson, M. W., & Griffiths, R. R. (2011). Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Journal of Psychopharmacology*, *25*(11), 1453–1461.

Madsen, J. D., Øyslebø, T., & Hoffart, A. (1996). A follow-up study of psycholytic therapy with the aid of LSD. *Nordic Journal of Psychiatry*, *50*(6), 487–494.

Majić, T., Schmidt, T. T., & Gallinat, J. (2015). Peak experiences and the afterglow phenomenon: When and how do therapeutic effects of hallucinogens depend on psychedelic experiences? *Journal of Psychopharmacology*, *29*(3), 241–253.

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science*, *315*(5810), 393–395.

Masters, R., & Houston, J. (2000). *The varieties of psychedelic experience: The classic guide to the effects of LSD on the human psyche*. Rochester, VT: Inner Traditions & Bear.

Mazzoni, G., Venneri, A., McGeown, W. J., & Kirsch, I. (2013). Neuroimaging resolution of the altered state hypothesis. *Cortex*, *49*(2), 400–410.

McCrae, R. R. (2009) The five-factor model of personality traits: Consensus and controversy. In P. J. Corr and G. Matthews (Eds.), *The Cambridge handbook of personality psychology* (pp. 148–161). Cambridge: Cambridge University Press.

McGeown, W. J., Mazzoni, G., Vannucci, M., & Venneri, A. (2015). Structural and functional correlates of hypnotic depth and suggestibility. *Psychiatry Research: Neuroimaging*, *231*(2), 151–159.

McGeown, W. J., Mazzoni, G., Venneri, A., & Kirsch, I. (2009). Hypnotic induction decreases anterior default mode activity. *Consciousness and Cognition*, *18*(4), 848–855.

Mogar, R. (1965). Current status and future trends in psychedelic (LSD) research. *Journal of Humanistic Psychology*, *5*(2), 147–166.

Monroe, R. R., & Heath, R. G. (1961). Effects of lysergic acid and various derivatives on depth and cortical electrograms. *Journal of Neuropsychiatry*, *3*, 75.

Moreno, F. A., Wiegand, C. B., Taitano, E. K., & Delgado, P. L. (2006). Safety, tolerability, and efficacy of psilocybin in 9 patients with obsessive-compulsive disorder. *Journal of Clinical Psychiatry, 67*(11), 1735–1740.

Muthukumaraswamy, S. D., Carhart-Harris, R. L., Moran, R. J., Brookes, M. J., Williams, T. M., Errtizoe, D., . . . & Feilding, A. (2013). Broadband cortical desynchronization underlies the human psychedelic state. *The Journal of Neuroscience*, *33*(38), 15171–15183.

Naranjo, C. (1974). *The healing journey*. New York: Ballantine Books.

Nichols, D. E. (2004). Hallucinogens. *Pharmacology & Therapeutics*, *101*(2), 131–181.

Nutt, D., King, L. A., Saulsbury, W., & Blakemore, C. (2007). Development of a rational scale to assess the harm of drugs of potential misuse. *The Lancet*, *369*(9566), 1047–1053.

Oda Sheiner, E. (2016). Culling the spirits: An exploration of Santo Daime's adaptation in Canada. In Beatriz C. Labate, Clancy Cavnar, & Alex K. Gearin (Eds.), *The World Ayahuasca diaspora: Reinventions and controversies* (pp. 79–97). Farnham, UK: Ashgate.

Osmond, H. (1957). A review of the clinical effects of psychotomimetic agents. *Annals of the New York Academy of Sciences*, *66*, 418–434.

Pahnke, W. (1963). *Drugs and mysticism: An analysis of the relationship between psychedelic drugs and the mystical consciousness*. PhD dissertation, Harvard University.

Pahnke, W., Kurland, A. A., Unger, S., Savage, C., & Grof, S. (1970). The experimental use of psychedelic (LSD) psychotherapy. *Journal of the American Medical Association*, *212*(11), 1856–1863.

Palhano-Fontes, F., Andrade, K. C., Tofoli, L. F., Santos, A. C., Crippa, J. A. S., Hallak, J. E., . . . & de Araujo, D. B. (2015). The psychedelic state induced by ayahuasca modulates the activity and connectivity of the default mode network. *PloS One*, *10*, e0118143.

Pendell, D. (2005). *Pharmako gnosis: Plant teachers and the poison path*. San Franscisco: Mercury House.

Petri, G., Expert, P., Turkheimer, F., Carhart-Harris, R., Nutt, D., Hellyer, P. J., & Vaccarino, F. (2014). Homological scaffolds of brain functional networks. *Journal of The Royal Society Interface*, *11*(101), 1–10.

Pollan, M. (2015, February). The trip treatment. *The New Yorker*. **https://www.newyorker.com/magazine/2015/02/09/trip-treatment**

Qin, P., & Northoff, G. (2011). How is our self related to midline regions and the default-mode network? *NeuroImage*, *57*(3), 1221–1233.

Raichle, M. E., & Snyder, A. Z. (2007). A default mode of brain function: A brief history of an evolving idea. *NeuroImage*, *37*(4), 1083–1090.

Raikhel, E. (2015). From the brain disease model to ecologies of addiction. In L. J. Kirmayer, R. Lemelson, & C. Cummings (p. 593) (Eds.), *Re-visioning psychiatry: Cultural phenomenology, critical neuroscience, and global mental health* (pp. 375–399). New York: Cambridge University Press.

Ramstead, M. J. D., Veissière, S. P., & Kirmayer, L. J. (2016). Cultural affordances: Scaffolding local worlds through shared intentionality and regimes of attention. *Frontiers in Psychology*, *7*, 1090.

Richards, W. A. (2015). *Sacred knowledge: Psychedelics and religious experiences*. New York: Columbia University Press.

Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current Directions in Psychological Science*, *17*(1), 31–35.

Roberts, T. B., & Winkelman, M. J. (2013). Psychedelic induced transpersonal experiences, therapies, and their implications for transpersonal psychology. In H. L. Friedman & G. Hartelius (Eds.), *The Wiley-Blackwell handbook of transpersonal psychology* (pp. 459–479). Oxford: John Wiley & Sons.

Romano, A. G., Quinn, J. L., Li, L., Dave, K. D., Schindler, E. A., Aloyo, V. J., & Harvey, J. A. (2010). Intrahippocampal LSD accelerates learning and desensitizes the 5-HT2A receptor in the rabbit. *Psychopharmacology*, *212*(3), 441–448.

Roseman, L., Leech, R., Feilding, A., Nutt, D. J., & Carhart-Harris, R. L. (2014). The effects of psilocybin and MDMA on between-network resting state functional connectivity in healthy volunteers. *Frontiers in Human Neuroscience*, *8*, 1–11.

Ross, S. (2012). Serotonergic hallucinogens and emerging targets for addiction pharmacotherapies. *The Psychiatric Clinics of North America*, *35*(2), 357.

Rothstein, E. (2008, May 8). A mind-altering drug altered a culture as well. *New York Times*. **http://www.nytimes.com**

Schultes, R. E. (1969). Hallucinogens of plant origin. *Science*, *163*(3864), 245–254.

Schultes, R. E. (1972). An overview of hallucinogens in the Western Hemisphere. In Furst, P. T. (Ed.), *Flesh of the gods: The ritual use of hallucinogens*. New York: Praeger.

Schultes, R. E., Hofmann, A., & Rätsch, C. (2001). *Plants of the gods: Their sacred, healing, and hallucinogenic powers*. Rochester, VT: Healing Arts Press.

Schwarz, B. E., Sem-Jacobsen, C. W., & Petersen, M. C. (1956). Effects of mescaline, LSD-25, and adrenochrome on depth electrograms in man. *American Medical Association Archives of Neurology & Psychiatry*, *75*(6), 579–587.

Servick, K. (2014). Outsmarting the placebo effect. *Science*, *345*(6203), 1446–1447.

Sessa, B. (2005). Can psychedelics have a role in psychiatry once again? *British Journal of Psychiatry*, *186*, 457–458.

Sessa, B. (2008). Is it time to revisit the role of psychedelic drugs in enhancing human creativity? *Journal of Psychopharmacology*, *22*(8), 821–827.

Sessa, B. (2012). Shaping the renaissance of psychedelic research. *The Lancet*, *380*(9838), 200–201.

Sewell, R. A., Halpern, J. H., & Pope, H. G. (2006). Response of cluster headache to psilocybin and LSD. *Neurology*, *66*(12), 1920–1922.

Shanon, B. (2002). *The antipodes of the mind: Charting the phenomenology of the ayahuasca experience.* Oxford: Oxford University Press.

Shim, G., Oh, J. S., Jung, W. H., Jang, J. H., Choi, C. H., Kim, E., . . . & Kwon, J. S. (2010). Altered resting-state connectivity in subjects at ultra-high risk for psychosis: an fMRI study. *Behavioral and Brain Functions*, *6*(1), 1.

Smallwood, J., & Schooler, J. W. (2015). The science of mind wandering: Empirically navigating the stream of consciousness. *Annual Review of Psychology*, *66*, 487–518.

Speth, J., Speth, C., Kaelen, M., Schloerscheidt, A. M., Feilding, A., Nutt, D. J., & Carhart-Harris, R. L. (2016). Decreased mental time travel to the past correlates with default-mode network disintegration under lysergic acid diethylamide. *Journal of Psychopharmacology*, *30*(4), 344–353.

Spitzer, M., Thimm, M., Hermle, L., Holzmann, P., Kovar, K. A., Heimann, H., . . . Schneider, F. (1996). Increased activation of indirect semantic associations under psilocybin. *Biological Psychiatry*, *39*, 1055–1057.

Stace, W. T. (1960). *Mysticism and philosophy*. London: Macmillan Press.

Steeds, H., Carhart-Harris, R. L., & Stone, J. M. (2015). Drug models of schizophrenia. *Therapeutic Advances in Psychopharmacology*, *5*(1), 43–58.

Strassman, R. J. (1984). Adverse reactions to psychedelic drugs: A review of the literature. *The Journal of Nervous and Mental Disease*, *172*(10), 577–595.

Strassman, R. (2000). *DMT: The spirit molecule: A doctor's revolutionary research into the biology of near-death and mystical experiences*. Rochester, VT: Inner Traditions/Bear.

Studerus, E., Gamma, A., Kometer, M., & Vollenweider, F. X. (2012). Prediction of psilocybin response in healthy volunteers. *PLoS One*, *7*(2), e30800.

Tagliazucchi, E., Carhart-Harris, R., Leech, R., Nutt, D., & Chialvo, D. R. (2014). Enhanced repertoire of brain dynamical states during the psychedelic experience. *Human Brain Mapping*, *35*(11), 5442–5456.

Taussig, M. T. (1987). *Shamanism, colonialism, and the wild man: A study in terror and healing*. Chicago: University of Chicago Press.

Terhune, D. B., et al. (2016) A placebo-controlled investigation of synaesthesia-like experiences under LSD. *Neuropsychologia, 88*, 28–34.

Terracciano, A., McCrae, R. R., Brant, L. J., & Costa Jr, P. T. (2005). Hierarchical linear modeling analyses of the NEO-PI-R scales in the Baltimore Longitudinal Study of Aging. *Psychology and Aging*, *20*(3), 493.

Thibault, R. T., Lifshitz, M., Jones, J. M., & Raz, A. (2014). Posture alters human resting-state. *Cortex*, *58*, 199–205.

Thibault, R. T., Lifshitz, M., & Raz, A. (2016). Body position alters human resting-state: Insights from multi-postural magnetoencephalography. *Brain Imaging and Behavior*, *10*(3), 772–780.

Vaidya, V. A., Marek, G. J., Aghajanian, G. K., & Duman, R. S. (1997). 5-HT2A receptor-mediated regulation of brain-derived neurotrophic factor mRNA in the hippocampus and the neocortex. *The Journal of Neuroscience*, *17*(8), 2785–2795.

van den Heuvel, M. P., Kahn, R. S., Goñi, J., & Sporns, O. (2012). High-cost, high-capacity backbone for global brain communication. *Proceedings of the National Academy of Sciences*, *109*(28), 11372–11377.

Vollenweider, F. X., & Kometer, M. (2010). The neurobiology of psychedelic drugs: Implications for the treatment of mood disorders. *Nature Reviews Neuroscience*, *11*(9), 642–651.

Vollenweider, F. X., Vollenweider-Scherpenhuyzen, M. F., Bäbler, A., Vogel, H., & Hell, D. (1998). Psilocybin induces schizophrenia-like psychosis in humans via a serotonin-2 agonist action. *Neuroreport*, *9*(17), 3897–3902.

(p. 594) Wager, T. D., & Atlas, L. Y. (2015). The neuroscience of placebo effects: connecting context, learning and health. *Nature Reviews Neuroscience*, *16*(7), 403–418.

Wallace, A. (1959). Cultural determinants of response to hallucinatory experience. *Archives of General Psychiatry*, *1*(1), 58–69.

Walsh, R. E., & Vaughan, F. E. (1993). *Paths beyond ego: The transpersonal vision*. Los Angeles: Perigee Books.

Whitfield-Gabrieli, S., & Ford, J. M. (2012). Default mode network activity and connectivity in psychopathology. *Annual Review of Clinical Psychology*, *8*, 49–76.

Zinberg, N. E. (1984). *Drug, set, and setting: The basis for controlled intoxicant use*. New Haven, CT: Yale University Press.

Zmigrod, L., Garrison, J. R., Carr, J., & Simons, J. S. (2016). The neural mechanisms of hallucinations: A quantitative meta-analysis of neuroimaging studies. *Neuroscience & Biobehavioral Reviews*, *69*, 113–123.

Zou, Q., Wu, C. W., Stein, E. A., Zang, Y., & Yang, Y. (2009). Static and dynamic characteristics of cerebral blood flow during the resting state. *Neuroimage*, *48*(3), 515–524.

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Cultural Neurophenomenology of Psychedelic Thought: Guiding the “Unconstrained” Mind Through Ritual Context

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