

FIVE Ayahuasca Shamanic Visions

..... INTEGRATING NEUROSCIENCE,
PSYCHOTHERAPY, AND
SPIRITUAL PERSPECTIVES

..... **Frank Echenhofer**

Spontaneous imagery narratives—or, more precisely, spontaneous waking visual and kinesthetic transformative imagery narratives—have been widely reported in many cultures throughout recorded history. Our research findings¹ concerning the experiences reported after ingestion of the Amazonian psychoactive brew ayahuasca, which has its origins in shamanism, agree with prior research literature that ayahuasca often elicits spontaneous imagery narratives that are reported to be very intense and meaningful, and often related to psychological and physical healing, problem solving, knowledge acquisition, creativity, spiritual development, divination, community cohesion,² and encounters with disincarnate entities or beings.³

Although ayahuasca recipes differ, the most widespread and well-studied brew combines the leaves of *Psychotria viridis*, containing the psychoactive agent N,N-dimethyltryptamine (DMT), with the pulverized *Banisteriopsis caapi* vine, which contains beta-carboline alkaloids (MAO inhibitors). DMT is not orally active, but when it is combined with the caapi vine, the resulting brew stimulates an altered state of consciousness that usually lasts from three to five hours. Reviews of the history of the ethnobotanical⁴ study and neuropharmacology⁵ of ayahuasca are available, and later in this chapter some of the brew's bodily correlates will be described.

Because ayahuasca has been reported to reliably facilitate profound healing and creative and spiritual experiences, and because it can be studied in neuroscience laboratory settings, it offers extraordinary opportunities for the kind of research bridging neuroscience and the humanities that is advocated in this book. This chapter offers an example of ayahuasca research as a part of this new meta-field. The central question of the inquiry is: How can the spontaneous imagery narratives that are so prominent during the use of

ayahuasca produce the widely reported benefits? To answer this question I will draw from neuroscience, psychology, anthropology, religion, and my own research. Recent neuroscience evidence and theory offer exciting new insights into the specific brain processes that possibly occur, and this may lead to enhanced applications in psychotherapy, creative activity, and spiritual development.

I will present my own model of the nature and function of spontaneous imagery narratives; this model incorporates both previous and new views, and uses imagery from a variety of religious traditions to depict the creative psychophysiological and spiritual processes involved. One new hypothesis that ayahuasca research clearly supports is an ancient idea placed in a new content: *that creative human activities are a blending of deliberative thought processes and spontaneous experiencing.*

To begin the discussion, I will first very briefly summarize the anthropological ayahuasca literature, relying on anthropologist Michael Harner's review of reports gathered from indigenous informants.⁶ Harner reports that across indigenous Amazonian peoples, the common visionary themes that emerged during ayahuasca use were of geometric designs, one's own death, constantly changing shapes, jaguars, snakes, birds, entity encounters, distant cities, divination, and descriptions of the shamanic journey. Harner relates a quote from the anthropologist Milciades Chaves that recounts the ayahuasca journey experience of a Siona Indian from eastern Colombia (*yagé* is the Siona name for ayahuasca):

But then an aging woman came to wrap me in a great cloth, gave me to suckle at her breast, and then off I flew, very far, and suddenly I found myself in a completely illumined place, very clear, where everything was placid and serene. There, where the *yagé* people live, like us, but better, is where one ends up [i.e., on a *yagé* trip].⁷

The Chilean psychiatrist Claudio Naranjo administered ayahuasca to thirty-five nonindigenous volunteers from Santiago, Chile, to examine how their visions compared to those in ayahuasca reports from the indigenous respondents. Naranjo reports that the common visionary themes were of a geometric grid with a central focus, a rotating vision with a central focus,

eyes, a perceiving central eye or other form, caves, prehistoric scenes, monstrous or sardonic masks, going unconscious, being devoured, and dying. Other themes were of serpents, large felines, and birds of prey. Themes related to the shamanic journey to other worlds were of ascending, leaving the body, flying, landscapes and cities, pearls, devils and angels, Jesus Christ, and heaven and hell. Naranjo suggests that these visions share a pervasive mythic-religious quality of life and death, of the human drama unfolding, and of accepting everything in existence, including evil and death, as well as a sense that by this acceptance, evil and death were transformed.⁸ He proposes that the complex relations between these themes are significant, and he provides an example of this complexity in the following ayahuasca journey experience of a twenty-five-year-old female research participant born of European parents, who had lived in Chile since late in her childhood. She says:

At first, many tiger faces. . . . Then *the* tiger. The largest and strongest of all. I know (for I read his thought) that I must follow him. I see the plateau. He walks with resolution in a straight line. I follow; but on reaching the edge and perceiving the brightness I cannot follow him.⁹

The young woman says that later she is able to follow the tiger, and that she looks into the abyss of hell: it is round, it looks like fluid fire, and people swim in it. She goes on to say:

The tiger wants me to go there. I don't know how to descend. I grasp the tiger's tail and he jumps. Because of his musculature the jump is graceful and slow. The tiger swims in the liquid fire as I sit on his back. . . . All kinds of lizards and frogs begin to appear now. And the pond gradually turns into a greenish swamp of stagnant waters, though full of life: primitive forms of life. . . . I rise on the tiger on the shore. . . . I go onwards with the tiger. I walk next to him, my arm over his neck. We climb the high mountain. . . . There is a crater. We wait for some time and there begins an enormous eruption. The tiger tells me I must throw myself into the crater. I am sad to leave my companion but I know that this last journey I must travel. I throw myself into the fire that comes out of the crater. I ascend with the flames towards the sky and fly onwards.¹⁰

The reports of Harner and Naranjo suggest a surprising commonality in the thematic content of ayahuasca experiences. It further appears, however, that there is less commonality when shamanic journeys to other worlds are described; cultural variances in religious belief may explain these differences.

Benny Shanon, a cognitive psychologist, offers the most recent, comprehensive, and systematic phenomenological analysis of ayahuasca experiences, which he has described in terms of content,¹¹ theme,¹² and typological structure.¹³ Some of his content categories include personal autobiographical material; human beings; naturalistic and non-naturalistic animals; plants and botanical scenes; beings that are neither human nor animal; cities; architecture; art; vehicles of transformation; symbols and scripts; landscapes; historical and mythological beings; and scenes of creation, evolution, and heaven. Some of Shanon's thematic categories include psychological understanding; birth and death; masculine and feminine; health; the majesty and mystery of nature; forces in the physical world; the life force; royalty; the divine and praising the divine; philosophy and metaphysics; and the ambience-related themes of enchantment, rapture, and love. Shanon has also created a typology of the structural types or forms in which ayahuasca visions occur, and he "aims at the discernment of internal patterns and regularities as well as lawful relationships."¹⁴ His eighteen typological structures, in the order in which they arise during a session, are "visions without semantic content, primitive figurative elements, images-scenes-visions of light, bursts-puffs-splashes, repetitive non-figurative elements, patterned geometric designs, rapid figural transformations, designs with figures, kaleidoscopic images, presentation of single objects, serial images, snapshots, glimpses, full-fledged scenes, grand scenes, virtual reality, geometric compositions, coloured visual space, darkness, the spider web, and supreme light."¹⁵ Shanon also suggests that with just a few exceptions, there is a progression over the course of the ayahuasca session towards the more "figurative, well-defined and well-formed, stable, global, content rich, encompassing scope, powerful and real, psychologically significant, spiritually important, integrative, interactive, narrative complexity, insightful, learned, and veridical."¹⁶

Shanon's analyses are largely congruent with my own research results. My thematic and narrative approach complements his more typological ap-

proach to examining ayahuasca experiences, and I fully endorse his more personal view that

ayahuasca visions are exceedingly beautiful. The universal feeling that drinkers of the brew have is that the beauty revealed in the visions surpasses any thing seen, dreamt or imagined. The colourings of the geometrical designs can be richer than any perceived in the physical world, the palaces and artistic objects appearing in the visions (often, constructed or made out of gold, crystal and precious stones) are sheer marvels, celestial and heavenly scenes are wondrously sublime, and what I referred to as supreme light may shine as strongly as the sun.¹⁷

In this chapter I will incorporate and refer to the work of Harner, Naranjo, and Shanon as I present a new model of spontaneous imagery narratives which aims to integrate fresh insights from neuroscience and the humanities that might help explain a number of unanswered questions raised in prior research about ayahuasca. My focus is on the subset of ayahuasca experiences that I call spontaneous waking transformative imagery narratives; I will attempt to demonstrate that the sequence of specific kinds of imagery and related processes within these narratives is most relevant to the experiential change processes that are reported during ayahuasca use. The purpose of this model is not to answer any of the unresolved questions, but rather to develop more refined testable hypotheses. A multidisciplinary approach was used to integrate fresh insights from neuroscience and the humanities. The following two primary questions guide this investigation: (1) How might ayahuasca facilitate the reported benefits in healing, creativity, and spiritual development? (2) What might be the neural image processing mechanisms that underlie the sequence of imagery and benefits related to ayahuasca experiences?

Although this model focuses upon ayahuasca experiences, it may also apply to other spontaneous imagery narrative processes. My model will attempt to demonstrate (1) that it is the impact of a sequence of specific kinds of imagery and related processes within these narratives that is most relevant to the experiential change processes reported during ayahuasca, and (2) that

these same processes are involved in successful psychotherapy and in spiritual development.

I use three approaches in devising this model. One approach is to work from the most common themes relative to the questions above, in order to identify specific lines of related research in psychotherapy, psychology, anthropology, and religion that have been found to include experiential transformational change processes. This comparative method can be used to reveal the common imagery, concepts, and processes that may be occurring in all of these examples.¹⁸ A second approach is to view the ayahuasca experience as a specific state of consciousness and determine what features it shares with other states of consciousness, such as dreaming, mind wandering, and spontaneous thought. I have adopted neuroscience findings on these other states of consciousness as this model's account of spontaneous narrative processes in general, using them to explain what happens during ayahuasca use.¹⁹ A third approach is to use the multidisciplinary approaches of dynamical systems and embodied cognitive science to reexamine the relationship between ayahuasca experience, consciousness, and brain function.²⁰ The model will first be presented in a brief overview without supportive evidence, so that it can be seen quickly as a whole. Then, each part will be introduced in more depth with supportive citations.

A Model of Spontaneous Imagery Narratives

What I have called “spontaneous imagery narratives,” Harry H. Hunt, a dream researcher and consciousness theorist, refers to as *dreaming*—but Hunt's definition of *dreaming* expands the range of mental processes typically associated with that word. This has important theoretical implications regarding the functions of these processes:

Dreaming involves far more than the specific conditions of the REM (rapid eye movement) state. Dreaming appears not only in the higher levels of non-REM (NREM) sleep and in the hypnagogic period of sleep onset, but also under hypnosis (where dreams can be directly suggested), in “daydreaming” as studied under laboratory conditions, and in the “waking dreams” or guided fantasies characteristic of various therapeutic traditions.²¹

Evidence of the potential value of experiences that appear spontaneously and effortlessly in the mind can be traced at least as far back as Freud's introduction of his free-association technique. Of all the many ways to explore what Hunt (1989) calls *dreaming* states, the research approach using ayahuasca offers the greatest range of spontaneous narrative experiences. I have found that ayahuasca readily elicits transformation narratives in many individuals, making systematic collaborative multidisciplinary neuroscience and phenomenological research possible.

My research suggests that although the experiences that occur in each ayahuasca session are quite varied, three overarching and sometimes overlapping foci frequently emerge: healing, creative processes, and spiritual development. Beginning sessions often are primarily about healing processes, whereas later ones tend to be more creative and spiritual. (I will discuss the significance of these observations following presentation of the model.)

Many initial ayahuasca session reports, like the one above, seem related to unresolved memories of difficult childhood experiences. Ayahuasca reports vary widely, and it may be that if an individual has significant unresolved difficult memories, initial sessions with the brew are likely to "excavate" them in narratives that seemingly strive towards healing and meaning-making. The excerpt below, reported in John Heuser's research, is from an early session of a Western-educated man's ayahuasca experience in which psychological healing is prominent:

[I] . . . began to feel even more intense grief . . . for my mother's sadness and my inability to connect with her and help her when she was alive . . . for the lack of mothering I received from her. . . . Much more weeping and sobbing. . . . More nausea. . . . Every time I would get distracted from my emotions . . . the nausea would surge up to unbearable levels. . . . As soon as I could get back to the feelings, it would subside. . . . Eventually [vomited] . . . [found] myself lying on the floor . . . with racking sobs. After . . . [an] hour . . . start[ed] to settle down. Still very sad. Saw [image of] my mother. . . . She could see me and spoke but no sound . . . could not read her lips. She looked about same age as when she died but not sick. . . . I could tell she was very sad about what had happened in the past and extremely happy about what I was doing now and felt freed and released by it.²²

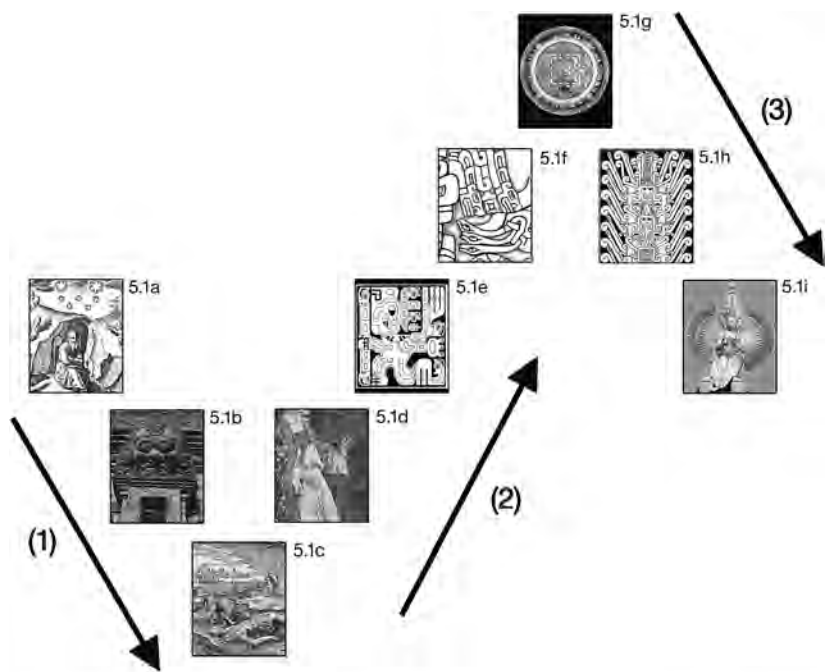
After reviewing hundreds of ayahuasca reports involving psychological healing, it quickly became apparent that, along with the powerful imagery content, there clearly was a structure of experiential movement from negative affect, to intensified negative affect, to a relational exchange, and finally to resolution. This process is not so different from an experience we all know, of first being unable to cry, then finally breaking down and crying, and finally, hopefully, feeling some relief. I believe that the structuring these narratives is spontaneous because, depending upon circumstances, the many layers of innate bodily process can be experienced consciously.

To provide a conceptual context for the material to come, I will first briefly present my model of the imagery and process changes that occur during spontaneous waking transformative imagery narratives. The model (see figure 5.1) suggests that there are three major sequential stages of imagery and physiological process change that occur. In the first stage, forms of imagery spontaneously arise that reflect the healing of difficult unresolved memories.

Once those memories have been relatively resolved, a second stage can begin, in which the imagery reflects creative processes. If those processes are sufficiently complex, a third stage builds upon that complexity to generate more coherent and meaningful ways of experiencing the self and the world. These experiences are reported as spiritual or aesthetic experiences, depending upon the individual's worldview. Figure 5.1 presents the model in the shape of a sine wave to suggest a general pattern of experiential movement which first descends, then ascends, and finally returns to the place of origin. This pattern will later be related to mythological themes, ayahuasca imagery, sacred art, and brain correlates. The wave's repetitive movement suggests that any passage through the cycle may be repeated. Each of the cycle's three major stages is subdivided into three substages containing different imagery and change processes.

Form Dismantling and Healing Processes

The model proposes that in spontaneous waking transformative imagery narratives during the first major stage, *form dismantling and healing*, forms of imagery and physiological changes arise spontaneously that reflect a process of



(1) Form Dismantling and Healing Processes	(2) Form Creation Processes	(3) Form Expression Processes
Fig 5.1a Enhanced conflicting energy	Fig 5.1d Enhanced inner attunement	Fig 5.1g Enhanced field complexity
Fig 5.1b Tolerating overwhelming experiences	Fig 5.1e Enhanced form fluidity	Fig 5.1h Enhanced vertical attunement
Fig 5.1c Dismantling of self- schema	Fig 5.1f Enhanced compressed complexity	Fig 5.1i Enhanced horizontal attunement

FIGURE 5.1. Main model stages and substages of form dismantling, creation, and expression for spontaneous waking visual and kinesthetic transformative imagery narratives.

healing difficult unresolved memories. This first major model stage has three substages, the first of which is felt as numbness, depression, and/or agitation and is called *enhanced conflicting energy* (figure 5.2a). The second substage is often experienced as fear of the unknown in oneself or in the world, and is called *tolerating overwhelming experiences* (figure 5.2b). The third substage is



FIGURE 5.2. Upper left: (a) alchemist in the nigredo state: enhanced conflicting energy. Upper right: (b) “Face of Glory”: tolerating overwhelming experiences. Lower left: (c) king dying and being reborn: dismantling of self-schema.

experienced as a painful, deathlike fragmentation called the *dismantling of self-schemas* (figure 5.2c).

The rationale behind the labels for these three substages will be explained below. I believe that because spontaneous waking, dismantling, and healing imagery narratives unfold through innate bodily processes, it is possible to delay and avoid them; but once they are surrendered to, the many layers of memory content, thoughts, feelings, and physiological sensations can potentially be brought together into consciousness. Then, if reflective awareness is present, healing can occur as new meaning is created from old experiences. Depending upon circumstances, unconscious layers of incoherent content are made meaningful to the extent that they are incorporated into more encompassing and coherent life narratives.

The posthumously published autobiography of the Swiss psychologist Carl Jung contains many classic examples of spontaneous transformative imagery narrative. Sigmund Freud had chosen Jung as his successor, and had

given him significant responsibilities just as his understanding of the unconscious as being the creative source of spiritual truths was increasingly diverging from Freud's views. Jung realized that he could never develop his own ideas if he remained with Freud, and so in 1912 he terminated his role and relationship with him. Jung says of his experiences at this time:

After the parting of the ways with Freud . . . inner uncertainty . . . a state of disorientation²³. . . One fantasy kept returning: there was something dead present, but it was also still alive. For example, corpses were placed in crematory ovens, but were then discovered to be still living²⁴. . . I lived as if under constant inner pressure. At times this became so strong that I suspected there was some psychic disturbance in myself.²⁵ [I] . . . often felt as if gigantic blocks of stone were tumbling down upon me. One thunderstorm followed another . . . [it was] helpful . . . to . . . find the particular images which lie behind emotions²⁶. . . In order to grasp the fantasies which were stirring in me . . . I had to let myself plummet down into them . . . [but] I was afraid of losing command of myself and becoming a prey to the fantasies . . . I saw that there was no other way out. I had to take the chance²⁷. . . I was sitting at my desk . . . thinking over my fears. Then I let myself drop. Suddenly it was as if the ground literally gave way beneath my feet, and I plunged down into dark depths. I could not fend off a feeling of panic . . . my eyes grew accustomed to the gloom . . . like a deep twilight. . . Before me was the entrance to a dark cave, in which stood a dwarf with leathery skin, as if he were mummified. I squeezed past him through the narrow entrance. . . .²⁸

Jung's response was to both endure these experiences and intensify his study of mythological and spiritual symbolism, particularly sixteenth-century European alchemy, in search of imagery that seemed to intuitively match the qualities of his disturbing inner experiences. He believed that some alchemists had explored the spiritual transformation processes they depicted in their alchemical illustrations.

Marie-Louise Von Franz, perhaps Jung's only peer in regard to her understanding of alchemy, suggests that a necessarily difficult beginning stage of the alchemical transformation is the nigredo state. Figure 5.2a is an engraving from the German alchemist J. D. Mylius's 1622 alchemical work *Philosophia*

reformata, which von Franz suggests represents the psychological equivalent to the nigredo state: a situation of psychological conflict and depression.²⁹ From his alchemical studies, Jung was gaining confidence that “the purpose of the descent . . . of the hero is to show that only in the region of danger can one find the treasure hard to attain.”³⁰

In communicating his inner experience, Jung uses the words *uncertainty*, *disorientation*, *inner pressure*, *disturbance*, and the image of blocks of stone tumbling down, all of which are congruent with the first substage, where I suggest that a process involving *enhanced conflicting energy* is occurring and influencing spontaneous imagery similar to that seen in figure 5.2a. It appears that a transformation requires an increase of conflicting energy. Jung was afraid of “losing command,” yet had “to take the chance,” and so he chose to let himself “drop” to suddenly be “plunged down”—all congruent with the second substage, *tolerating overwhelming experiences* (figure 5.2b). Empirical research regarding the crucial importance of this same psychophysical process has been identified by the psychotherapy process researchers Eugene Gendlin³¹ and Lesley Greenberg.³² Greenberg labeled this stance towards experience “allowing and accepting,”³³ and found that psychotherapy clients who could allow and accept their experience in the moment noticed that a dynamism arose within them which allowed them to feel more alive and experience more fully.

If we compare the excerpt from Jung’s autobiography with the above-quoted account by the Western-educated man reported in Heuser’s research, it can be seen that in both cases the substages of *enhanced conflicting energy* and *tolerating overwhelming experiences* occur, but that only in the account reported by Heuser does the third substage of *dismantling of self-schemas* appear, in which unbearable nausea, vomiting, and sobbing is experienced. Figure 5.2c is an illustration from *Atalanta fugiens*, by the German physician Michael Maier (1568–1622). For both von Franz and Jung, this alchemical illustration depicts the symbolic death of the hero king in the foreground, and can be seen as the kind of imagery that spontaneously arises as part of the *dismantling of self-schemas* substage. For many people, such experiences can rarely be consciously approached and “allowed and accepted,” but they can be endured if they occur spontaneously. This may be why ayahuasca is so effective in the healing of seemingly unbearable unresolved childhood memories: it brings

about an unfolding of spontaneous visual and kinesthetic waking transformative imagery narrative that otherwise is very difficult to bring oneself to experience. (The later rebirth of the new hero king in the background of figure 5.2c represents another substage of spontaneous imagery, to be discussed below.)

Mythological narratives may be maps of transformation processes that explain why difficult truths must be faced — such as why our sense of self, if it is too rigid, must sometimes be dismantled. Joseph Campbell told of the myth of Kirtimukha,³⁴ the fierce Face of Glory that appears over many doorways leading into many Hindu and Buddhist temples. Figure 5.2b is a photograph of the thirteenth-century Hindu temple of Candi Kidal in East Java. A certain King Jalandhara was foolhardy enough to send the giant Rahu to try to steal Shiva's bride, but Shiva became so enraged that from his brow a terrifying monster with insatiable hunger emerged to devour Rahu, whereupon Rahu begged for mercy and Shiva relented. The monster screamed that he was ravenous and asked what he was to do, and Shiva, looking at him for a moment, said that he could devour himself. So the monster ate all of himself but his head, and Shiva said, "This is my most magnificent creation ever! Henceforth it shall be known as Kirtimukha, the Face of Glory, and must always remain at the entrance of my door. From now on, nobody comes before me unless they first bow to Kirtimukha."

There are, of course, many interpretations of this myth, but I will select and amplify those elements that suggest why negative affect must be intensified for transformation to occur. We can all be frustrated and depressed raging monsters, hungry for what we feel we must have but must avoid. To reach Shiva, however, we must directly face our own raging feelings without protest; in doing so we enter into a self-consuming symbolic dying-like process that is required if we are ever to become truly alive and creative.

Neuroscience Research Models of Dreaming and Waking Spontaneous Thought

When asked which other experiences were most similar to their ayahuasca experiences, my research participants reported that ayahuasca was most like dreaming or waking spontaneous experience, but that it lasted longer (from

two to four hours), and that it was more intense and bizarre, yet highly meaningful. Given these consistent reports, it is instructive to search for common underlying physiological processes in the recent neuroscience research literature. (It is important to note, however, that although this literature documents extensive research into the bodily correlates of dreaming, it has much less information regarding spontaneous thought and ayahuasca experiences.)

The model I propose suggests that for spontaneous waking transformative imagery narratives that occur after ayahuasca ingestion, or during normal dreaming and waking spontaneous thought, there are three major sequential stages of imagery and physiological process change that I have called *form dismantling and healing processes*, *form creation processes*, and *form expression processes*. This section will summarize the research on the bodily correlates of dreaming and spontaneous thought with an emphasis on the model's first major stage, *form dismantling*. The subsequent sections will emphasize the second and third major stages, *form creation processes* and *form expression processes*.

A very recent neuroscience review of the literature suggests that the REM state and dreaming function to self-regulate the kinds of higher arousal experiences that are required for daytime learning:

During the REM state and dreaming human emotional memory processing takes place . . . REM sleep reactivates previously acquired affective experiences from the day and decreases the emotional anxiety that was present at the time of the learning . . . REM offers large-scale network cooperation at night, allowing the integration and, as a consequence, greater understanding, of recently experienced emotional events in the context of pre-existing semantic memories stored in the neocortex. . . . This model suggests that if this process is not achieved, the magnitude of "affective charge" remaining within autobiographical memory networks will persist, resulting in the potential condition of chronic anxiety.³⁵

It is also suggested that while REM sleep may offer a neurobiological state that is especially well suited for the preferential processing of emotional experiences, it is also quite possible that various kinds of waking states could

serve the same purpose, modulating affective experiences by similar underlying mechanisms.³⁶

Usually, important experiences are incorporated into long-term memory because we pay focal attention to them during the day; and then memory consolidation occurs during REM sleep at night. This normal process of daytime experiencing and dreaming-assisted memory consolidation can be disrupted, however, if the daytime experiences are intolerably stressful. In such situations our attention focus diminishes, possibly as a part of a protective mechanism. Without sufficient focal attention only the gist or implicit memory of the traumatic situation is remembered, and that traumatic memory remains in an unstable state where it can be “reactivated” if the present environment has cues similar to the gist of the implicit memory. A “reactivated” implicit traumatic memory does not include the sense of a memory being recalled. It merely recreates the experience of emotion, behavior, and perception of the original traumatic memory as though it were occurring in the present moment.³⁷

The state of consciousness called spontaneous waking thought shares some features of ayahuasca experiences, and recent neuroscience research on spontaneous thought, or mind wandering, has dispelled the notion that this state is an undesirable or wasteful distraction. We spend a third of our waking lives in thoughts unrelated to present tasks, and spontaneous thought seems to be as necessary for semantic memory formation as sleep. It has been found to be crucial in emotional processing and decision making, and it should be viewed as an essential part of human cognition.³⁸

Many reports from our research participants suggest that ayahuasca may serve functions similar to those of dreaming and spontaneous thought. One of the most obvious and intriguing aspects of these reports is how often they recount the resolution of old painful memories in a process that has a spontaneous narrative structure and often is described as healing. My view is that because both ayahuasca-elicited narratives and other kinds of waking spontaneous imagery narratives combine a dreamlike experience with conscious awareness, the power of the meaning-making process is greater than in normal dreaming. This view is supported by reports of lucid dreamers, who also are conscious in their dreams, and who attest to the value of lucid dreams for

meaning-making. It is also noteworthy that many spiritual traditions have specific meditation practices to develop lucidity in the dream state. Further, even the dream state itself is considered in these traditions to be a more subtle state of consciousness than the waking state.

Daniel Siegel suggests that the “theory of nonlinear dynamics of complex systems,” or “complexity theory,” has been applied to living systems in order to understand the often “unpredictable but self-organizing nature of complex clusters of entities functioning as a system.”³⁹ A driving force of human development is the movement from simplicity towards complexity.⁴⁰ The complexity of mental states is “enhanced by a balance between the continuity and flexibility of the system,” where continuity refers “to the strength of previously achieved (mental) states,” the probability of their repetition, or their familiarity and predictability. Flexibility is a measure of the system’s “sensitivity to environmental conditions”; thus, it is a measure of the system’s “capacity for variability, novelty, and uncertainty.”⁴¹ Organisms adapt by automatically self-regulating their internal environments and their behaviors toward the outer environment. This self-organization includes emergent enhancements to regulatory systems at the neural network and synaptic levels, allowing the system to shift toward maximal complexity. All self-regulatory mechanisms such as those regulating core temperature or sense of well-being necessarily have limitations or constraints.⁴² From this perspective, dysfunctions in self-organization are seen as any pattern of constraint modification that does not allow movement towards complexity. Siegel gives as an example the intrusions from memory that occur in post-traumatic stress disorder, which create fragmented and low-complexity mental states.

So that some additional ideas can emerge, I will now reexamine the first three substages of my model in light of the previously discussed neuroscience theory and evidence on spontaneous thought, dreaming, memory, the narrative process, and complexity theory. The model’s first three substages—enhanced conflicting energy, tolerating overwhelming experiences, and dismantling of self-schemas—all seem to involve the identification and elimination of protective or limiting conditioning so that unresolved implicit memories can be reexperienced, and new meaning made. Memories consolidated into long-term memory result in more coherent and complex life narratives.

These same processes would also be seen as removing the constraints upon

the system that block enhanced complexity. In short, old and outworn ways of being, experiencing, and expressing must make room for new ways. I suspect that these three substage processes are accompanied by spontaneous imagery which reflects the gist of unresolved memory content and new dismantling experiences. Every stage model must explain the mechanism that is hypothesized to move the process from stage to stage; in this model that mechanism is the system's constant bias toward higher complexity, which works to develop states that are maximally flexible while still maintaining the system's continuity.

The protective conditioning created in childhood serves to limit the damage caused by overwhelming experiences, but later in life this protective conditioning overly constrains the mind's complexity. This protective conditioning often contains implicit fearful memories of unresolved experiences. Because they are implicit, they have no link to a prior time; thus, they feel not like a memory, but like something occurring in the present. When this memory content is activated, it becomes the content of the spontaneously arising imagery narrative and is initially reexperienced as overwhelming and happening in the present, yet related to the past. A mental state is created with ayahuasca in which the waking spontaneous imagery narrative and lucidity are both displayed in consciousness. During a series of ayahuasca sessions, a capacity to successfully "navigate" difficult experiences may develop. Often these developing skills are called navigation skills. Were it not for the enhanced lucidity that ayahuasca provides, simply reliving a traumatic experience intensely could be retraumatizing. But enhanced lucidity allows the adult's mind to make meaning by reflecting with focal attention upon what is happening, which in turn makes possible the encoding of new consolidated memories regarding the meaning of these experiences within the life narrative.

Not every unresolved memory is resolved in dreams or ayahuasca experiences, so there are limits to the meaning-making process. Depth psychotherapy and ayahuasca make overly rigid protective barriers more porous, thus providing a situation in which the allowing and accepting of experience is possible, though this cannot be guaranteed. But in my view, the movement in each dream cycle and ayahuasca session, driven by the system's bias towards enhanced complexity, is towards more coherent and complex life nar-

ratives, and experiences that are described as healing. During the ayahuasca experience, if the previous two substages have been successfully navigated, the third substage, *dismantling of self-schemas*, can unfold. This is when nausea, vomiting, and sobbing often occur. Figure 5.2c depicts this symbolic death in the alchemical illustration of the dying and resurrecting king. While the experience of losing one's old sense of identity can be frightening, it also creates an experiential situation of openness and a readiness to experience a sense of self conditioned not by past suffering, but by creative processes outside conscious awareness that manifest themselves during the next substages of this unfolding process.

A question not yet discussed about healing-stage imagery facilitated by ayahuasca concerns the sources of the specific form, content, and dynamic properties of the visual and kinesthetic images. In dreaming or any kind of spontaneous imagery, the imagery could well be based upon memories of the previous day or on more distant memories. Many ayahuasca reports suggest, however, that the most memorable and valuable imagery exceeds what has ever been experienced in the waking life or in dreams. What, then, could be its source?

One possible answer may be found in Mark Johnson's work on image schemas. Johnson suggests that human beings interact with and understand the world through a basic structures of sensorimotor experience called image schemas. Johnson characterizes an image schema as "a dynamic, recurring pattern of organism-environment interactions," and suggests that to sense the range of image schemas is to "ask yourself what are the most fundamental structures of perception, object manipulation, and bodily movement, given that human bodies share several quite specific sensorimotor capacities."⁴³

Research has shown that when motor actions are imagined, some of the same brain regions that are involved in actually performing those actions are activated.⁴⁴ Other research has demonstrated that when a visual scene is imagined, the same brain regions that are involved in actually perceiving such a scene are activated.⁴⁵ These studies suggest that many of the same neural networks that are activated during sensorimotor interactions with the world are reactivated when mental imagery of those engagements is remembered or imagined. This evidence supports the view that image schemas could be the fundamental structuring mechanisms that provide the form and dynamic

properties of both the sensorimotor cortex-mediated experiences of the external world and the sensorimotor cortex-generated simulation of the inner world's spontaneous imagery experiences during dreaming, spontaneous thought, and ayahuasca experiences.

To examine how an image schema might structure ayahuasca imagery, I relate a quote from one of our research participants, a Western-educated male in his fifties, whose experience relates to the first substage, enhanced conflicting energy, and the second substage, tolerating overwhelming experiences:

Without warning a menacing face appeared. . . . I was frightened and opened my eyes to get away from it . . . when I closed my eyes again the face was still there and I tried to calm myself so I could look at it . . . it reminded me of the kinds of faces I had seen in Buddhist paintings depicting wrathful deities . . . but I was still uneasy because it seemed too powerful and cold and otherworldly . . . I didn't trust it . . . the face was at the center of a matrix of lines of energy that was related to the face . . . at the center of the face there was some kind of heightened energetic movements and if I kept my attention there it grew stronger and if I looked away it diminished . . . as I focused at this central place it opened as a round portal and I could see inside into another realm that was a luminous blue with white star-like objects shining . . . after a long time of inner debating I grew more calm and somehow knew how to let go enough to pass through the portal. . . .⁴⁶

Although each ayahuasca report is unique, this one clearly reflects elements of the previously summarized themes: a monstrous mask, a geometric grid with a central focus, entity encounters, and the shamanic journey. Johnson suggests that because of the nature of our bodies, "we project right and left, front and back, near and far, throughout the horizon of our perceptual interactions."⁴⁷ Our perceptual fields encompass an area of attention focus and periphery. Johnson identifies a center-periphery image schema, based on this horizontal character of our perception. The face and matrix described above appear to reflect the features of the center-periphery image schema. Johnson suggests that because of the ongoing forces we experience upon our bodies, we experience *compulsion*, *attraction*, and *blockage of movement* image schemas.⁴⁸ As previously discussed, dream imagery and related brain pro-

cesses—and, by extension, spontaneous ayahuasca imagery—are portrayals of those aspects of experience that have an emotional charge requiring meaning-making and eventual integration into a larger narrative process of self-understanding. In the experience quoted, both the *attraction* and *blockage of movement* image schemas appear to be involved. As we face unresolved emotional memories, there is often the feeling of being drawn both to approach and to avoid. The ayahuasca experience quoted above suggests that this impasse is resolved when fear can be tolerated, when attention can be calmly kept on the central concern, and when the process itself is trusted enough so that it can unfold spontaneously. This is a simple example of how several image schemas might be related to our bodily experience of our inner world. While image schemas initially develop through our engagement with the world and with our many ways of communicating with our environment, we simultaneously use them also in our inner dream life and spontaneous thoughts, as we consolidate the meaning of our body-based experiences into a revised life narrative. So image schemas structure the ways we communicate both with the world and with ourselves.

Form Creation and Form Expression Processes

The model suggests that in the initial major stage, *form dismantling and healing processes*, outmoded forms are eliminated so that in the second major stage new forms will spontaneously unfold in which spontaneous imagery narratives display these processes in consciousness. This allows awareness to crucially engage with the imagistic displays that reflect these processes. Some aspects of these processes can be seen in the above-quoted account by the Chilean woman having a very difficult dismantling experience followed by seeing her mother no longer looking sick, at which point she felt a sense of being released by this interaction and perhaps healed by new qualities of her mother's presence.

All the material presented above regarding the initial major stage, *form dismantling and healing processes*, shares considerable detail and correspondence with psychotherapy process research, mythology, and possible neuroscience mechanisms. However, this is not the case for either of the next two major stages of the model: *form creation processes* and *form expression processes*.

Everyone has formed attachments to people or things, and therefore must go through the first major stage of this process in minor or major ways. I suggest that as we experience losses throughout life, we are taken through this form-dismantling stage in order to accommodate to our new life situations. I think it is for this reason that much more is known about this first major stage. And while everyone also must go through form creation processes and form expression processes, what may be different there is the extent to which these later stages are experienced consciously, and how they might be used in the overall process of fuller human development. Artists and creative individuals of all kinds clearly traverse the second major stage in ways that involve enhanced creativity, complexity, and coherence of mind and expression. And perhaps individuals with a more refined spiritual sensibility traverse the third major stage in similarly enhanced ways.

One way to discuss this model that accommodates individual differences would be to look at figure 5.1 and imagine changes in the shape and height of the sine wave as representing the paths of different individuals through these three major stages of the change process. Perhaps the degree to which individual people descend into full dismantling of self-schemas might determine whether they find themselves more consciously exploring the second and third more creative and spiritually oriented processes. Artists often feel there is a link between their neuroses and their creativity, and perhaps in a sense they are right. We might also imagine that individuals who traverse this path and have relatively little unresolved memory need not move downward for dismantling at all, but might instead enter immediately into the second major stage, *form creation processes*. Similarly, someone who feels quite centered in the moment, and who has explored the creative domain—for example, an advanced spiritual teacher—might immediately enter into the third major stage, *form expression processes*. Used in this way, the model allows for an infinite variety of individual paths while still retaining some uniform structure within each region of the model, which does not determine the *specific* content of the experiences, but does suggest that imagery with specific dynamic properties will unfold in each of the substages and be displayed within the spontaneous transformative imagery narrative.

Form Creation Processes

There is less evidence for the second and third major stages of the model, which thus are more speculative, but enough evidence exists to describe them and their functions. Evidence for the model's suggestion of a clear sequential relationship between intense form-dismantling processes leading to highly valuable and creative form creation and expression processes can be seen in Jung's personal experiences: "The years when I was pursuing my inner images were the most important in my life—in them everything essential was decided. It all began then; the later details are only supplements and clarifications of the material that burst forth from the unconscious, and at first swamped me. It was the *prima materia* for a lifetime's work."⁴⁹

In the model, the three substages of the form creation processes are *enhanced inner attunement*, *enhanced form fluidity*, and *enhanced compressed complexity*. It is suggested not that these three processes are most primary to creativity in general—only that they were observed to be most prominent in the reports of our ayahuasca research participants, and have been used to develop this stage of the preliminary model. The first substage, *enhanced inner attunement*, identifies an experience that has been widely reported to be crucial at moments when the dismantling process is most intense. It could occur at the unbearable experiential moment when an individual, who has long ago lost faith in asking for help, cries out. Von Franz suggested that Jung equated the Annunciation in Christian tradition with the alchemical process *rubedo*, both of which he thought signified the beginning of new life coming from a stage of darkness. She quoted Jung: "Analysis should release an experience that grips or falls upon us as from above, an experience that has substance and body such as those things that occurred to the ancients. If I were to symbolize it I would choose the Annunciation."⁵⁰

During most portrayals of the Annunciation, Gabriel, who is the angel of revelation, appears to Mary in a vision with the good news that she will be the mother of the world savior. From my perspective, that would certainly qualify as a waking spontaneous transformative imagery narrative. The Flemish fifteenth-century painter Rogier van der Weyden (1399–1464) depicts the Annunciation (figure 5.3a). Looking at it as an imagery narrative and not as sacred dogma, one sees some of the major elements of transformative narra-

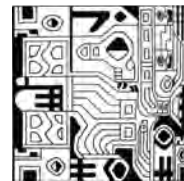


FIGURE 5.3. Top: (a) Rogier van der Weyden, *The Annunciation*, c. 1435. Photograph © Verlagsgesellschaft. Center row, left to right: (b) the angel Gabriel's gestures; (c) the Virgin Mary's gestures. Bottom row, left to right: (d) *Gateway of the Sun*, Tiahuanaco tapestry; (e) attendant deity in version 1; (f) attendant deity in version 2; (g) attendant deity in version 3.

tive. An angel of revelation exists to assist human beings; this particular angel specializes in revelations; in this case the revelation has to do with news that the divine is to be made flesh; and Mary, a human being, has the role of the mother who uses her body to give birth to that process.

I have included two additional images (figures 5.3b–c) to emphasize the artist's suggestion that Gabriel and Mary communicate through nonverbal gestural attunement. I would suggest that while this painting displays an abundance of visual detail, it also communicates something about a kinesthetic experience of gestural attunement. Although neither Von Franz nor Jung wrote about this dimension of the communication between Gabriel and Mary, the importance of such attunement has been widely examined in the context of infant attachment research, which indicates that when infants are securely attached to their mothers, there is a quite rapid and energetic nonverbal dance of gesture and vocalization between the two that allows the infant to learn that energetic dyadic exchanges can be quite pleasurable and reliable, thus enabling the infant to become familiar with and unafraid of the high-energy states associated with pleasure, creativity, and uninhibited self-expression commonly observed in securely attached infants.

As the infant's immature nervous system slowly develops, so do its own capacities for self-regulation, assisted by a process of "attuned communication involving the resonance of energy and information"⁵¹ between mother and infant. This process also occurs between therapist and client, and I suggest that it happens as well between spiritual teachers and their students, shamans singing as part of the process of healing their patients, between lovers, and in all loving relationships. Many reports from our ayahuasca participants mentioned that at moments that were most difficult for them, they experienced a tender presence, or they themselves prayed for help and care. In many cases it was at the most difficult moments—when the individual was in anguish and no longer felt able to struggle—that the care came to them. Research examining ayahuasca encounters with disincarnate entities also uncovered a specific class of entities that seemed to serve the function of providing tender care.⁵² Reports of enhanced inner attunement coupled with some kind of guiding, tender, and soothing entity, presence, or force seem to arise spontaneously after the most difficult parts of ayahuasca journey experiences.

After the *enhanced inner attunement* substage has occurred, the individual

typically feels a much greater expansiveness and freedom to explore the inner world. This is reminiscent of how the mother serves as a solid base for the securely attached infant who thus feels empowered to move away from her to explore the new and exciting physical environment, and to return when feeling threatened. It is the cooperative and attuned experiencing of heightened energies while retaining a coherence of mind at this substage of *enhanced inner attunement* that provides a much more secure foundation to consciously explore the dazzling displays of novel forms that ayahuasca famously helps to facilitate during the next two substages, *enhanced form fluidity* and *enhanced compressed complexity*.

While it is very hard to communicate in words what kinds of visual and kinesthetic imagery can be experienced during the use of ayahuasca, there are suggestive images created by the Huari pre-Colombian Peruvian culture (750–1000 CE), which used as a sacrament not ayahuasca but a hallucinogenic snuff made from the seeds of the plant *Anadenanthera colubrina*, which contain bufotenin, a compound with a chemical structure similar to that of DMT.⁵³ Huari tunics are widely prized by collectors and museums for their unprecedented material qualities and abstract textile designs. In modern Bolivia, a monument called the Gate of the Sun incorporates the depiction of a fierce deity; I believe its function is similar to that of the Face of Glory, which is discussed above. On both sides of the main deity are found two vertical rows of attendant deities, one of which appears in figure 5.3d. Figures 5.3e, f, and g are drawings of the different abstract depictions of this attendant deity in the fabric designs on various Huari tunics. I have adapted these drawings from Alan R. Sawyer, who has examined the iconography in great detail.⁵⁴ I offer them to demonstrate visually an example of the *enhanced form fluidity* that is so very common during this substage of the *form creation processes*.

By the phrase “form fluidity,” I refer to a dynamic process whereby a basic form, such as the one in figure 5.3d, undergoes a series of transformational changes that ayahuasca research participants have described as *playful, dynamic, morphing, extremely novel, experimenting with possibilities, improvisation around a theme, intricate, and intelligent*. I believe that form fluidity, and in fact all of the processes described herein, are multimodal. This fluidity is also reported to occur in spontaneous gestures and is similarly described, but with the additional descriptors of *embodied, channeled movements, attuned tac-*

tile communications with some kind of kinesthetic force or presence, delicate, tender, and exquisitely nuanced. Spontaneous vocalizations have also been reported to have the same properties.

Neuroscience Correlates of Ayahuasca

As a clinical and research psychologist, my focus has been to extend psychotherapy and psychology of religion research using phenomenological methods to examine the spontaneous imagery narratives elicited by ayahuasca while simultaneously recording brain waves or electroencephalograms (EEG) to identify the neural network activity associated with these imagery experiences. Before presenting our findings, I will briefly review the research on the brain correlates of ayahuasca experience other than EEG correlates.

A study⁵⁵ using single photon emission tomography (SPECT) has shown that ayahuasca activates specific frontal and paralimbic brain regions that are known to be involved in the processing of somatic awareness, emotional arousal, and emotional processing, and that significant activation has occurred in the right anterior insula, a region proposed as supporting interoceptive subjective feeling states and self-awareness.⁵⁶ Interoception is redefined from its narrow sense to

denote this generalized homeostatic sensory capacity . . . The sensory afferents that represent the condition of the body subserve *homeostasis*, which is the ongoing, heirarchically organized neurobiological process that maintains an optimal balance in the physiological condition of the body . . . Homeostasis in mammals comprises many integrated functions and includes autonomic, neuroendocrine and behavioral mechanisms. Thermoregulation is a good example of a homeostatic function . . . The primordial means of thermoregulation in vertebrates is motivated behavior, similar to hunger and thirst. In humans, such affective motivations are accompanied by distinct homeostatic (interoceptive) “feelings,” and these modalities include not only temperature, pain, itch, hunger and thirst, but all feelings from the body, such as muscle ache, visceral urgency . . . I regard these feelings as *homeostatic emotions* that drive behavior . . . The neuroanatomy of the forebrain pathways . . . compel this concept.⁵⁷

In a magnetic resonance imaging (MRI) study of long-term meditators, the right anterior insula was also linked to increased awareness of the interoceptive stimuli of breathing sensations. This suggests that enhanced interoception can result from meditation and use of ayahuasca.⁵⁸

Research studies have also examined the neurotransmitter mechanisms that are presumed to be related to ayahuasca experiences. Research has shown that DMT, the most potent psychoactive ingredient in ayahuasca, binds to serotonin (5-hydroxytryptamine [5-HT]) neurotransmitter systems with high affinity to the 5-HT_{2A} receptor.⁵⁹ Serotonin neurotransmitter systems are considered to be involved in the pathophysiology of depression, and drugs that increase serotonergic activity usually exert antidepressant effects on patients.⁶⁰ Endogenous DMT has been found in human urine, blood, and cerebrospinal fluid, and recent biochemical, physiological, and behavioral experiments have indicated that DMT is an endogenous agonist for the sigma-1 receptor.⁶¹ New drugs have been developed that target the sigma-1 receptor and have demonstrated relatively rapid antidepressant-like actions in preclinical studies, and clinical trials of these drugs have now commenced.⁶² Psychostimulant drugs such as cocaine and methamphetamine also bind with sigma receptors, and new drugs to treat addiction targeting the sigma-1 receptor are now being considered.⁶³

Neuroscience Correlates of Ayahuasca and Form Dismantling and Healing

As the above review suggests, ayahuasca appears to exert its beneficial effects by targeting the same neurotransmitter systems as are involved in the latest drugs for depression and addiction. Indigenous people of the Amazon probably discovered ayahuasca more than a thousand years ago and have been refining its use since that time, thus suggesting that a closer examination of its use by Amazonian indigenous communities is warranted. Just such an effort was begun in 1992 when Jacques Mabit, a French physician, founded the Takiwasi Center in Peru, where patients with addiction problems live in a therapeutic residential community for an average of nine months. The center's screening criteria excludes individuals from the ayahuasca treatment program with serious metabolic disorders such as diabetes, functional de-

ficiencies such as cardiac insufficiency, and digestive lesions such as stomach ulcers or dilated veins of the esophagus that could degenerate into hemorrhages during the force of the vomiting. Also excluded are individuals taking antidepressants, because of the risk of serotonergic shock; individuals with dissociative disorders; and women who are pregnant. The center integrates views and methods from Western psychotherapy and the indigenous use of ayahuasca, and it offers individual psychotherapy, daily group therapeutic activities, and once-a-week evening ayahuasca sessions totaling an average of twenty-five for the entire process. An unpublished study of 380 addiction patients treated from 1992 to 1998 showed that 67 percent improved after two years.⁶⁴ Mabit has drawn upon the indigenous practices of the Amazonian basin to create a spiritual therapeutic context for his treatment, using ayahuasca to heal the body and transform the despair, damaged self-esteem, and meaninglessness associated with addiction. His “program is designed to create an initiatory experience, similar to a rite of passage that reveals and integrates the authentic self,” and he suggests that “an initiatory death” experience often occurs in those patients with positive treatment outcomes.⁶⁵ In the model I have presented, the initiatory death experience can be seen as being comprised of the first four substages. The first substage is *enhanced conflicting energy*, and ayahuasca seems to naturally facilitate the shift from it to the next substage, *tolerating overwhelming experiences*, which is what individuals normally cannot do but ayahuasca and depth psychotherapy can often facilitate. If an individual feels confident to move deeper to the third substage, *dismantling of self-schemas*, then it is possible that the fourth substage, *enhanced inner attunement* can also occur. This, in my view, completes the initiatory death-and-rebirth experience that is so often reported in ayahuasca accounts.

In addition to using SPECT to examine the impact of ayahuasca upon the central nervous system, the EEG has also been used. A review of the findings of early EEG and psychedelic research, which was conducted before the development of quantitative EEG analysis, reported that the impact of psychedelics on the EEG was to decrease the global absolute amplitude of the slower theta and alpha frequencies and to increase the global relative amplitude of the higher beta frequencies. This was interpreted as a generalized and pronounced increase in cortical activation.⁶⁶ The effect of ayahuasca on the EEG as viewed using quantitative analysis found a global reduction in

the amplitude of all EEG frequencies and a relative shift toward higher EEG frequencies that is congruent with older reports on the effects of classical psychedelics on the EEG. A detailed analysis of frequency changes revealed a profile also shown by pro-serotonergic drugs, supporting the view that the psychoactive DMT in ayahuasca binds with the serotonergic 5-HT₂ receptor, thus causing its effects in the central nervous system.⁶⁷

Neuroscience Correlates of Ayahuasca and Enhanced Form Fluidity

In collaboration with the Colombian anthropologist Luis Eduardo Luna, I traveled with my dissertation student David Stuckey⁶⁸ to a retreat center in the Amazonian jungle near Manaus, Brazil, in 2000. After setting up a portable field laboratory we were able to examine the effects of ayahuasca on the EEG of two experienced research participants. As expected, it was immediately apparent that ayahuasca decreased the amplitude of the EEG across frequencies, as had been widely reported in previous research. During one of the recording sessions, while watching the EEG in real time on the computer screen I clearly saw that most of the nineteen EEG tracings were rising and falling precisely together, thus suggesting that many cortical regions were generating highly correlated electrical patterns at specific frequencies—an EEG measure called coherence. Although it entailed much additional effort and time, Stuckey agreed to also include EEG coherence in his analysis, which revealed ayahuasca-enhanced EEG coherence at the beta and gamma frequencies from many cortical regions, with the highest global coherence increases in the gamma frequencies.⁶⁹ This was the first time that an EEG study had shown any psychedelic-altered EEG coherence, and it could potentially be an important finding; but because the study had only two participants with little artifact-free data, it needed replication.

This replication had to wait for our second field research project, which took place in Brazil in 2005; we obtained EEG recordings and subjective reports from twelve research participants before, during, and after ayahuasca sessions. The participants typically reported that they noticed the initial effects of ayahuasca about fifteen to forty minutes after ingestion. On the basis of the experience of hundreds of ayahuasca sessions, it is fairly certain that most individuals encounter the *form dismantling* and *healing processes* stage

about twenty to forty minutes after feeling the initial ayahuasca effects. On average, the *form creation processes* stage lasts for the next forty to sixty minutes, with the *form expression* stage lasting for the next forty to sixty minutes after that. The total range of time from ingestion until cessation of effects ranges from approximately 2 to 3.5 hours for most individuals. Because the process of recording EEG requires that individuals remain quite still in order to reduce muscle artifacts, it is possible to acquire reliable data before effects are felt and before the *form dismantling* and *healing processes* begin, but usually not during this main stage, because its intensity makes it all but impossible for participants to maintain muscle relaxation. Since the first substage of the form creation process is also quite prone to artifacts, our most reliable EEG research data has been collected from 80 to 110 minutes after ingestion. On the basis of the phenomenology of ayahuasca reports and of my model, our EEG recordings were acquired from our participants during the substage of *enhanced form fluidity*, and do not reflect the many other kinds of experiences that can occur during an ayahuasca session. The following is a report of a fifty-five-year-old male made during the *enhanced form fluidity* substage, ninety-five minutes after ingestion.

There is a shield-like quickly morphing form composed of illuminated rectilinear lines of energy and solid shifting planes that retains a certain similar kind of geometry but also seems to be constantly experimenting with novel versions of itself . . . that is right at the center of my visual field with my eyes open or closed . . . when I look directly at it, it seems to energize it, and it becomes more intensely illuminated . . . the colors are earth tones of gold and dark red and dark green . . . lines also radiate out from this form and it seems to generate an entire field around itself . . . once when I look right at it, it opened in some way and what it looked like inside was like a dark night sky with points of light slowly rotating . . . it was very beautiful and the entire experience lasted for about 5 minutes.⁷⁰

We recorded EEG from our twelve participants during an eyes-closed baseline condition just prior to the ingestion of ayahuasca, using discrete gold sensors attached to the scalp. Nineteen EEG tracings were obtained in this way, using the standard international 10-20 system to establish the pre-

cise scalp locations. After 80 to 110 minutes, we recorded the EEG again from the same participants, who, still with eyes closed, were by this time fully experiencing the effects of ayahuasca. Although EEG can be analyzed in many ways, the finding that discriminated most robustly between the two conditions was EEG coherence, which is equivalent to the correlation of EEG activity at a particular frequency in one location on the scalp compared to another. The measure is presumed to reflect the relative strength of neural network connectivity between specific EEG locations; it indicates the level at which information is processed with higher coherence, and thus signifies enhanced cooperative activity between the regions.⁷¹

Coherence is often averaged over a specific range of frequencies, because evidence suggests that different frequency ranges, or EEG “bands,” are related to different neural processes. We found that ayahuasca has significant effects upon EEG frequencies from one to fifty cycles per second; and the EEG band that we found to best discriminate the baseline from the ayahuasca condition in our participants was a frequency range from twenty-five to thirty cycles per second, which is known as the high beta EEG frequency band. Figure 5.4a shows the standard nineteen locations where we recorded EEG activity.

Figure 5.4b shows EEG high beta frequency coherence differences between eyes-closed ayahuasca compared to eyes-closed baseline conditions, averaged for the group of twelve research participants. The solid lines in-

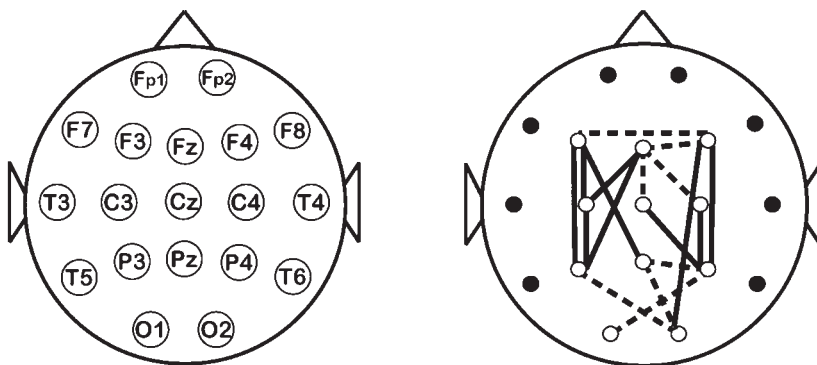


FIGURE 5.4. Left: (a) standard EEG locations for scalp recording. Right: (b) ayahuasca and baseline EEG beta (25–30 cps) coherence differences.

dicating significant increases ($p \leq .01$) in EEG coherence between cortical regions, suggesting enhanced information processing between these regions during ayahuasca as compared to the baseline condition. The dashed lines indicate significant decreases ($p \leq .01$) in EEG coherence between cortical regions, suggesting decreased information processing between these regions during ayahuasca as compared to the baseline condition.

Our findings are congruent with Francisco Varela's research and theoretical writing; he speculates that "a unified cognitive moment relies on the coordination of scattered mosaics of functionally specialized brain regions . . . [and that] . . . although the mechanisms involved in large-scale integration are still largely unknown . . . the most plausible candidate is the formation of dynamic links mediated by synchrony over multiple frequency bands."⁷² Our participants' heightened, complex, and creative ayahuasca experiences during the substage of *enhanced form fluidity* could be related to the fact that their EEGs showed very significant changes in EEG coherence over many frequency bands. These coherence changes may be related to the neural network dynamics required to sustain the *enhanced form fluidity* our participants reported. The kinds of future research needed to replicate and clarify the significance of these findings will be discussed in the concluding section of this chapter.

Enhanced Compressed Complexity

After the substage of *enhanced inner attunement*, the unfolding narrative may seamlessly progress through the *enhanced form fluidity* substage. During the *enhanced compressed complexity* substage, more complex narrative experiences start to occur; these are reported to be more vivid, realistic, dramatic, and lengthy narratives that sometimes include encounters with entities and the classic shamanic journey to other worlds. Often in these other worlds, strange symbolic objects are a part of the encounter, as the following excerpt from one of our participants illustrates:

There is an object in front of me. All kinds of equipment. They were showing me something. Something that was curled, about this long.
[The participant holds both hands out about 30 inches apart.] Some-

thing that was curled like this, like a rod. It was like art, it was like an object that was made by some being, but it was like a staff, like a psychic staff. They [the staffs] were just laying on something [an ornate desk or table], ten or twelve staffs laying together in parallel.⁷³

Another example of a spontaneous imagery narrative showing *enhanced compressed complexity* and involving a vivid encounter with a disincarnate entity can be found in Janet Gyatso's translation of the secret spiritual autobiography of the revered Tibetan master, Jigme Lingpa (1730–1798), which includes many descriptions of spontaneous visionary experiences that he later used to create tantric visualization meditation practices that are still widely practiced by both Tibetan and Western meditators. The passage below is drawn from Jigme Lingpa's *Dakki's Secret Talk*, written from 1767 to 1769.

I mounted an attractive white lioness and was carried to an unrecognizable (place) . . . I encountered . . . the face of the dakini . . . She committed to me a flattened casket made of wood, in the shape of an amulet box . . . she said, “. . . This is the Treasure of Samantabhadra's heart-mind, the symbol of the great expanse of Awareness-Holder Padma, the great secret repository of the dakinis. Symbol's dissolved!” As she said that, she vanished . . . filled with great delight, I opened up the box. From inside came rattling out five rolls of yellow paper. . . . At once I carefully opened up the large roll of paper. There was an immeasurable effusion of the aromatic fragrance of camphor . . . I opened [the roll] . . . slowly . . . which was filled with scrambled secret dakini sign-letters, which the mind could not make sense of. Since I could not read it, I began to roll it up, when just in that instant, like an optical illusion . . . all of the symbolic characters inside turned at once into Tibetan.⁷⁴

Tibetan Buddhism has a mind terma tradition that is very relevant to the central topic of this paper. The mind terma is a spiritual teaching that consists of an imagery narrative which arises spontaneously in the minds of only very advanced meditators, and then on very rare occasions—but it does allow new teachings to come into the Tibetan tradition through visionary experiences. A part of this tradition is that during a spontaneous kinesthetic and visual transformative imagery narrative, the meditator engages with a celestial en-

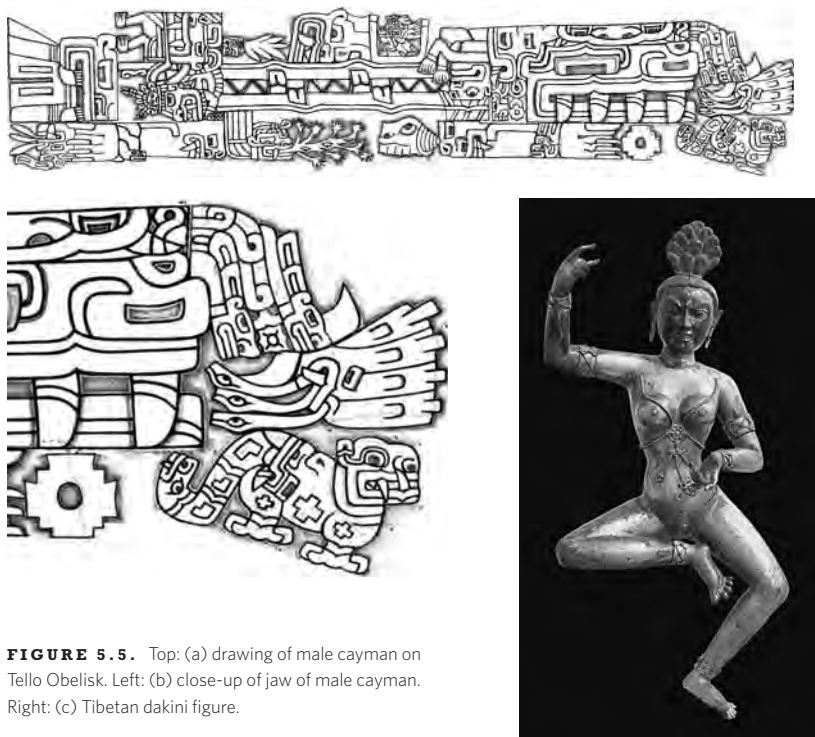


FIGURE 5.5. Top: (a) drawing of male cayman on Tello Obelisk. Left: (b) close-up of jaw of male cayman. Right: (c) Tibetan dakini figure.

tity, a sky dancer or dakini (figure 5.5c) known to destroy conventional forms and to teach by nonverbal means that which is beyond conception. When I was first introduced by Barbara Stafford⁷⁵ to her notion of the “cognitive work” being done by compressed compositions of the sixteenth-century European emblem tradition, I was immediately struck by the similarities between these European compositions and the special kinds of imagery I had been investigating from reports of ayahuasca experiences and spiritual visionary experiences of dakini script.

A final example of an image demonstrating *enhanced compressed complexity* comes from one monumental sculpture of the a pre-Colombian Chavin culture (800–200 BCE): the Tello Obelisk, found in Peru at Chavin de Huantar, which is carved with what are probably a male and female cayman facing each other. Their bodies are covered with kenning, or visual metaphors. Figure 5.5a shows the male cayman. Peter Roe suggests that the images on the Tello Obelisk depict the two caymans, plants, the jaguar, and the harpy eagle, all of

which are of Amazonian origin.⁷⁶ In figure 5.5b the compressed composition of embedded animal images comprising the jaw region of the male cayman can be more easily seen in an enlargement of that section of the image.

At lower left in figure 5.5b a cross-sectional slice of the San Pedro cactus can be observed; many more of these are included throughout the relief. Research suggests that the San Pedro cactus, which contains mescaline and hallucinogenic snuffs that include DMT-like compounds, was probably used in Chavin religious practices,⁷⁷ and the resulting visions must have exerted a powerful impact upon methods of rendering imagery in pottery, in stone, on shells, and in textiles. In all of this creative work, the form creation processes I have called *enhanced form fluidity* and *enhanced compressed complexity* can be seen.

Because spontaneous imagery is so central to the ayahuasca experience and to spontaneous thought, the closing section of a recent neuroscience review article concludes that spontaneous thought may play a very significant role in human creativity, similar to that of dreaming. This may also provide important clues about the ayahuasca experiences as well.

Spontaneous thought facilitates memory consolidation—or the integration of isolated episodic experiences into a coherent, meaningful autobiographical structure that gives us a sense of self. Similarly to sleep, the function of spontaneous thought may be to help us make sense of our experiences by building a coherent and meaningful structure out of the isolated, and at first unrelated, events that constitute our everyday lives. When we let our mind wander, we shift our mode of thinking to a more spontaneous, less controlled kind of thinking, which can help us reach more creative, less predictable conclusions. This could broaden the amount of information and the number of factors we could take into account while thinking. In contrast to sleep, however, wakefulness may allow this integration to occur at a more conscious level—by allowing spontaneous thought to interact with deliberate, goal-directed thought. . . . when it produces a cognitive benefit, spontaneous thought either proceeds or follows a period of more goal-directed, deliberate thought. This temporal alternation between the two different modes of thought may be what leads to some of the most beneficial outcomes, such as new insights, deeper levels of understanding, and novel, creative ideas.⁷⁸

During ayahuasca experiences, individuals are immersed in the flow of spontaneous imagery much more deeply than during spontaneous thought. With experience, however, the imagery during ayahuasca sessions can also be very lucid. In this sense, there is no temporal alteration between spontaneous and reflective modes of consciousness; in fact, the two modes can be simultaneous. Perhaps this is one reason why so many individuals report that ayahuasca experiences are profoundly creative.

Form Expression Processes

The final major stage of the model involves the *form expression processes*, with the substages of *enhanced field complexity*, *enhanced vertical attunement*, and *enhanced horizontal attunement*.

Only two of our twelve subjects reported ayahuasca experiences that were clearly of this type, so this part of the model is the most speculative and most related to spiritual experiences. One way of looking at the model is to conceptualize the major stage of form creation as being preparatory to the form expression stage. If form creation processes function to explore the possibilities of form fluidity and compressed complexity as they can be appreciated, form expression processes allow for expression of the richness of these forms and their accompanying meaning. Our two research participants who reported these form expression experiences had many years of prior training in one or more forms of spiritual practice.

The first substage is *enhanced field complexity*; an image representing this is the Tibetan Buddhist Kalachakra mandala, shown in figure 5.6a. Since it is well beyond the scope of this chapter to explain this mandala in any but the most summary manner, the intent here is to suggest only a few of its obvious features which directly correspond to experiences of our participants and to the model. In summary, the mandala, along with the sacred mountain,⁷⁹ temple, shrine, or tree, is the sacred environment that supports the transformative process of awakening at the symbolic sacred axis of the world, or axis mundi.⁸⁰ Rudolph Arnheim observes, “When we speak of the center we shall mean mostly the center of a field of forces, a focus from which forces issue and toward which forces converge.”⁸¹ Tibetan Buddhism suggests that there is actually no real self at the center of things, and while we experience ourselves

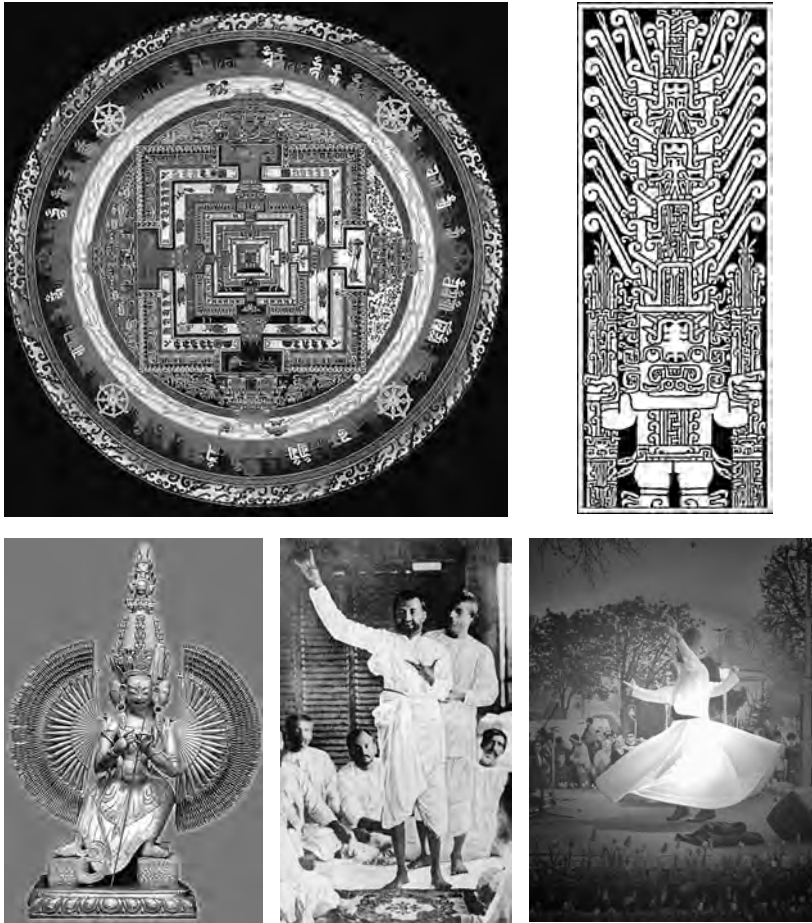


FIGURE 5.6. Top left: (a) Tibetan Kalachakra mandala: enhanced field complexity. Top right: (b) Rai-mondi Stela, Chavin: enhanced vertical attunement. Bottom left: (c) Tibetan Bodhisattva Tara (*Sitapatra*): enhanced horizontal attunement. Bottom center: (d) Ramakrishna in trance. Bottom right: (e) Mevlevi dervish dancing.

as the center of everything, in reality we *construct* a self. Through meditation practice, the reality of no-self can be directly realized. So the journey to the center of the mandala is a discovery that there exists no separate self. Often a mandala is visualized as a part of Tibetan Buddhist visualization practice: it is round, surrounded by protective fire, and it contains sacred symbolic objects. It has a square central portion that is the palace of the deity, and four gates facing the four directions; the deity sits upon a throne at the center of the

palace. Surrounding and supporting the mandala are many attendant beings and an area outside of the palace that is beautifully ornamented.

Although the mandala is often represented in only two dimensions, when visualized it also has the vertical dimension of the palace walls; the palace building itself rises many stories and has a central high axis. This general plan of a palace in which the deity resides at the central axis is a very widespread narrative that Eliade referred to as the symbolism of the center.⁸² For the meditator, the culminating processes related to awakening take place at the central axis. For the Shapibo shaman, the central wooden axis of the *maloka*, or sacred building where only ayahuasca ceremonies are held, is the where Shapibo sacred narrative processes unfold. Two of our participants reported that they found their way into situations where they were at the center, and that the center possessed certain unique properties. One participant had experiences reflecting the *enhanced vertical attunement* substage:

I was feeling energy in the area of my neck and the top of my head when suddenly there a blinding flash of white light and what felt a waterfall of downflowing energy coming down through the top of my head and washing through my body . . . my body was shaking and trembling but the feeling was ecstatic and beyond words . . . it also felt electrical and powerful . . . it lasted for perhaps 20 seconds and for quite a while I had no thoughts and my mind was still and spacious.⁸³

Many spiritual traditions employ esoteric systems that explain the vertical movement of some kind of spiritual energy in the area of the spine, and which consider such movement to be related to spiritual development. In my view, such experiences are spontaneous and primarily kinesthetic waking transformative imagery narratives.

My hypothesis is that in the major stage of *form expression processes*, the experiences shift from being visual to more kinesthetic, because to be expressive the motor system must be operative and attuned. One way of characterizing these processes is to see them as a shift from inner experiencing to outer expression of subtle, highly complex states of mind, as would be required by a master artist or spiritual teacher who not only experiences what is profound and meaningful, but also develops the capacity to express it to others. My

intuition is that sacred art forms communicate information related to inner developmental processes, such as *enhanced vertical attunement*, that were first directly experienced and later rendered into a form. Figure 5.6b illustrates the Raimondi Stela, another Chavin major deity from Chavin de Huantar, the imagery of which was probably inspired by the psychedelic San Pedro cactus. Again, keening is used throughout this image, with snakes and animal heads incorporated throughout the deity's body and the extreme vertical movement of the image suggesting intense "peaking" to most individuals who have had strong psychedelic experiences. Multiple heads or energy lines radiating from the head, such as halos, are ways of graphically portraying profound inner experience that are used both in the sacred art of cultures that employ psychedelics as a sacrament and in Buddhist, Islamic, and Christian sacred art depicting religious figures. The last substage of the *form expression processes* is *enhanced horizontal attunement*. Unlike the *enhanced vertical attunement*, which receives the vertical flow of spiritual energies, the *enhanced horizontal attunement* continues to receive down- and possibly up-flowing spiritual energies, but also simultaneously projects energies horizontally and outwardly to other beings as transmissions of healing, as can be seen in figure 5.6c, which depicts the Tibetan Bodhisattva Tara. Figure 5.6d is a photograph of the Indian twentieth-century saint, Ramakrishna, surrounded by his disciples at a time when he is reported to have remained in deep ecstatic trace in standing postures, embodying the image of verticality for long periods of time. His unusual arm and hand postures, I suggest, are ways in which spontaneous transformative experiences can be embodied and expressed in a kinesthetic form. One of the challenges for a spiritual teacher is to communicate the ineffable.

The model suggests that the function during this main stage of *form expression processes* is to communicate, which means to embody highly complex inner experiences so that they can be outwardly shown. Figure 5.6e is a photograph of a Mevlevi dervish performing his ecstatic sacred dance. Here again, expressive and elegant body posture in rapid spinning motion around the vertical axis shows something of the verticality and energetics of the inner experience that words, or even a static image, cannot convey. From the standpoint of this stage model's emphasis on creation and expression, once old forms are allowed to die, a parallel process can be seen in the origin of this ecstatic dance. The Persian poet Rumi had been deeply in love, and when he

lost his lover, out of the maddening despair that drove him deep into himself, what emerged were ecstatic movements that brought him back to life and deepened his capacities to communicate not only in spiritual poetry but also spontaneously through his body. In this manner he was able to express something that otherwise would have remained hidden. Gyatso suggests that the ground from which these kinds of nondual states arise “is understood to be intrinsically expressive”; perhaps it is for this reason that when human beings can allow this ground to flow through them unimpeded, the expressive display strikes us as being inspired.⁸⁴

Both of these expressive forms, *enhanced vertical attunement* and *enhanced horizontal attunement*, have as their necessary foundation the resources of the *enhanced field complexity* depicted by the mandala; these expressive processes work in tandem with these field dynamics. In Figure 5.6c the Tibetan Bodhisattva Tara, from the Tibeto-Chinese sixteenth century, exemplifies the capacity to provide abundance to others in the imagery of her thousand arms, hands, heads, and legs.⁸⁵

Conclusion

Two primary questions guided this inquiry. The first was how ayahuasca might facilitate the reported benefits in healing, creativity, and spiritual development. The second question was what neural image processing mechanisms might be activated during ayahuasca spontaneous imagery narratives, and how these mechanisms might contribute to the benefits reported for ayahuasca. This section will summarize the model used to explain the nature and function of ayahuasca imagery narratives, and discuss its limitations. While the model is new and speculative, it generates potentially productive hypotheses and suggestions for future research.

The model is a stage model, and evidence for the characteristics of each stage comes primarily from research that I have so far gathered on change processes during ayahuasca, psychotherapy, and spiritual experiences. The research evidence includes verbal descriptions of change processes, interpretations of those processes, and sacred art representing them. Future research clearly is needed to see whether additional relevant evidence supports the model. Additional research is also needed to examine spontaneous imag-

ery narratives in dreams where change processes are apparent. The changes should conform to the model's assumptions regarding the sequence of specific kinds of imagery. Additional work is also required to better define the image-schematic characteristics of each of the model's stages. The model suggests that in consciousness, the image-schematic display of these normally unconscious neural mechanisms allows for the emergence of more complex experiences that are reported as healing, enhanced creativity, and spiritual unfolding. It is suggested that the model may apply to Tibetan Buddhist visionary experiences that sometimes arise spontaneously during daytime meditation practices and during dreaming, and further research could test some of the model's assumptions. The fifth Dalai Lama's secret autobiography contains many shamanic-like themes, and is certainly worth examining in detail.⁸⁶ In some Tibetan Buddhist religious writing, dreams are said to be unreal, deceptive, and of no value, while in other writing from that tradition it is presented as a magical art to be mastered by the yogi, with the meaning of dreams being of supreme value.⁸⁷ This apparent contradiction may in fact highlight the importance of being mindful that there may be different kinds of spontaneous narratives, some of great worth and some without value. A more comprehensive examination of the Tibetan Buddhist literature may offer insight into this question.

Because image schemas are defined as reflecting the dynamic experiences of human beings interacting both mentally and physically in a physical environment governed by universal laws, many of them are considered to reflect universal human experiences; the model should thus apply across cultures. Research has suggested that image schemas serve to structure both ordinary thought and dreaming, and a systematic analysis of the image schematic aspects of dream imagery has shown that it is possible to discern how dream images are connected to the expressed desires, fears, and other important concerns of the dreamer.⁸⁸ Future image schema research could develop more precise methods of analyzing the kinds of spontaneous visual and kinesthetic imagery that arise in ayahuasca experiences and determine whether future findings are similar across cultures. In addition, such research could attempt to examine each of the model's different stages in terms of sequences and combinations of image schemas.

Our EEG research examined ayahuasca experiences 80 to 110 minutes from

the time of ingestion, because we found that was a time when our research participants were still actively involved in imagery narratives, but past the “peaking” phase of the session; at 100 minutes after ingestion they could more easily speak and relax their muscles, and this allowed the recording of EEG data uncontaminated by muscle artifacts. Our reported EEG findings are therefore limited to the *enhanced form fluidity* stage of the model. In figure 5.4b, the eight EEG locations indicated by a black circle are susceptible to muscle artifacts, and EEG changes from these locations were not reported. Future EEG coherence and ayahuasca research is needed to show the full extent of neural network changes from all cortical regions. Given these limitations, it still can be observed that the solid lines in figure 5.4b, showing significant increases in the EEG high beta 25 to 30 cycles per second (cps) frequency band coherence caused by ayahuasca, mainly connecting brain regions within both hemispheres, which may suggest increased cortical processing within each hemisphere. It can also be seen that the dashed lines which indicate significant decreases in the high beta 25 to 30 cps frequency band coherence mainly connect brain regions across the two hemispheres, which may suggest either decreased cortical processing across them or some kind of alteration in the way they function together. Future research is needed to address these possibilities, but this new direction in research may be important because it may also be linked to the findings, reported earlier in this chapter, that reflective thought and spontaneous thought appear to function in a more unified manner during ayahuasca, with spontaneous thought being mediated more by the right hemisphere and reflective thought more by the left. Based on our EEG coherence findings of decreased EEG 25 to 30 cps beta coherence across the hemispheres, it could be hypothesized that these changes are part of the neural network activity necessary for both reflective thought and spontaneous thought to arise together in consciousness during the *enhanced form fluidity* stage of ayahuasca experience. This may actually be true for ayahuasca experiences in general, and these findings may also apply to other related states in which reports of reflective thought and spontaneous thought exist together, such as lucid dreaming and certain meditation states.

Because significant amounts of muscle activity and body movement occur during the most intense ayahuasca experiences, there is currently no reliable method to record artifact-free EEG of those experiences. Future research is

needed to develop better ways of examining and correlating brain changes and experiential changes across the entire ayahuasca session. As previously mentioned, current research supports the notion that human neural networks can be viewed as complex systems exhibiting emergent properties, and the model suggests that some of the model's stages, such as *enhanced form fluidity*, may be associated with emergent and more complex neural network processes that underlie creative image processing. Our research did find widespread ayahuasca-related changes in EEG coherence across many brain regions and frequencies, but we have not yet calculated or reported that EEG neural network complexity is correlated with the changes in cognitive image content and complexity across the model's stages. Future research using more refined measures of cognitive and neural complexity are needed to provide more than suggestive evidence that complexity theory persuasively explains the mechanisms relating neural network changes to psychological change processes.

While a selection of relevant neuroscience evidence has been provided in this chapter, a much more extensive review of that evidence is needed to determine how well the model can accommodate it. Future research recording ayahuasca brain and experiential correlates with very experienced participants is clearly the most direct test of the model's assumptions. All stage models must contend with problems caused by human individual differences. There are significant metabolic differences that alter the intensity of ayahuasca experience but not the overall profile of intensity effects.⁸⁹ Once an individual's metabolic response to ayahuasca is established, it is theoretically possible to adjust the ayahuasca dosage to provide an ayahuasca experience that is equally intense across individuals. However, our research indicates that even with this adjustment individuals report significantly different kinds of experiences, and at this stage in our research it is unclear which specific factors contribute to these individual differences. We believe that relative psychological maturity and prior experience with ayahuasca are probably two important individual factors, but future research is needed to examine the individual differences more fully. Individuals who are both psychologically mature and very experienced with ayahuasca have also been among those who are capable of speaking and reflecting upon their experiences during the ayahuasca experience without diminishing its intensity. Shamans prob-

ably have developed similar complex skills. This capacity is crucial in our research because we need rich experiential descriptions given during the ayahuasca experience. Future research could more closely examine which neural network activation patterns, and possibly personality or temperament measures, are associated with different capacities for self-reflection and precise verbal articulation during ayahuaca experiences. The model would suggest that these capacities are emergent, and it would require that spontaneous and deliberative thought processes would be available either within one mental state with a correspondingly more widespread neural network joining these usually segregated processes, or as an enhanced and fluid alternation between these two processing modes and their respective neural network activity patterns.

The model's three main sequential stages are *dismantling and healing processes*, *form creation processes*, and *form expression processes*. The first stage of the model involves *dismantling and healing processes*. Clearly not everyone is interested in a form of psychotherapy or change process that requires one to willingly endure enhanced conflicting energy, tolerate overwhelming experiences, and allow one's sense of self to be dismantled, but this is just what many spiritual traditions suggest is required for an authentic understanding of oneself. Future neuroscience research that explores these kinds of change processes may provide a more nuanced understanding of why such methods are effective, and may help to refine these methods so that they appeal to a wider range of psychotherapy clients in modern cultural contexts. In some sense this process may be analogous to how modern drugs have been developed from traditional medicines. With close collaboration between traditional and modern understandings of healing, like that which exists in the clinical addiction treatment and research program directed by Jacques Mabit in Peru,⁹⁰ enhanced psychotherapy methods may be developed.

The second main stage of the model is that of *form creation processes*. The model suggests that ayahuasca facilitates spontaneous thought, but that unlike normal spontaneous thought, this includes reflective thought that may account for the insights, deeper understanding, and fresh and creative ideas reported for ayahuasca. The model further suggests that the level of this creativity should be correlated with the greatest intensity of spontaneous thought processes while the lucidity of reflective thought is maintained. Fu-

ture multidisciplinary research examining ayahuasca, spontaneous thought, reflective thought, and creativity using neuroscience and phenomenological methods could examine these hypotheses.

The model also suggests that the third main stage of ayahuasca spontaneous imagery narratives is that of *form expression processes*, in which spiritual and/or creative processes are experienced and expressive capacities develop to communicate these experiences. Multidisciplinary research designed to bridge the neuroscience/humanities divide may face special challenges when the inquiry concerns spiritual experience. Members of a multidisciplinary research team may differ on how to view the value of spiritual experiences embedded within the spontaneous imagery narratives reported by research participants. We have some preliminary evidence regarding the impact of prior belief in spiritual experience on subsequent ayahuasca experiences. We found that our research participants took one of two primary epistemological stances when they first experienced a spontaneous imagery narrative that included an entity encounter. Six of our twelve participants reported such experiences. Of these six, three reported that during the experience they reflected that the entity was probably a projection of their own mind's unconscious processing. They also reported that the effect of this reflective stance was to diminish the intensity and complexity of the experience. In fact, they reported often using this line of reasoning to maintain control when frightened. The other three participants reporting these encounters reflected that they were possibly encountering an actual intelligent entity, and that the result of this stance was to greatly intensify the experience—in most cases causing the entity to come towards them, leading in turn to a deepening involvement in the unfolding narratives involving the entity, which in some cases triggered the full-blown classical shamanic journey experience.

The neuroscience/humanities divide was bridged by the members of our research team representing the disciplines of psychology, anthropology, cognitive neuroscience, religion and psychopharmacology. Each member of our research team had a significant amount of personal experience with ayahuasca, and each held somewhat different views regarding the meaning of their own entity-encounter experiences. But all of our team members agreed that one of the most fascinating aspects of ayahuasca is that it can reliably facilitate profoundly meaningful religious experiences, including revelatory

experiences involving entity encounters, in appropriately prepared individuals even in our neuroscience field laboratory conditions. Jigme Lingpa's eventual stance towards his experiences with entities is worth noting; he suggests that such experiences are, at their core, indeterminate. The effect of this stance seems to be to intensify and greatly enhance the complexity of subsequent experiences while also minimizing naïve idealization and fantasy. So it seems that neither rejection nor belief in the validity of such experiences is optimal in terms of enhancing ayahuasca experience; the indeterminate stance seems congruent with the standards of scientific objectivity, and it was the perspective that our research team found was optimal for our work.

The model's value can be determined by seeing how well it provides greater coherence in integrating the relevant multidisciplinary research evidence on the nature and function of spontaneous imagery narratives and related change processes in psychotherapy, sacred art, and spiritual development. Future multidisciplinary ayahuasca research that effectively bridges the neuroscience/humanities divide may be of significant value, because ayahuasca makes available to scientific investigation many usually hidden dimensions of cognition that are central to the neuroscience of image processing, the psychophysical change processes in psychotherapy and spiritual development, and the psychophysiology of creativity.

Notes

1. Frank G. Echenhofer, Katee O. Wynia, David Joffe, Luis Eduardo Luna, Gregory A. Benitz, John Burton, Sidney Sudberg, and Dennis J. McKenna, "EEG Correlates of Spontaneous Mental Imagery after Ingestion of the Shamanic Brew Ayahuasca" (working paper, 2009).
2. Benny Shanon, *The Antipodes of the Mind: Charting the Phenomenology of the Ayahuasca Experience* (New York: Oxford University Press, 2002).
3. John Heuser, "Ayahuasca Entity Visitations: A Thematic Analysis of Internet-Reported Encounters," PhD dissertation, California Institute of Integral Studies, 2006. *Dissertation Abstracts International*, publ. nr. AAT3218522, DAI-B 67/05.
4. Dennis J. McKenna, "Ayahuasca: An Enthopharmacologic History," in R. Metzner, ed., *Ayahuasca: Hallucinating, Consciousness, and the Spirit of Nature* (New York: Thunder's Mouth Press, 1999), 187–213.
5. Jace C. Callaway, "Phytochemistry and Neuropharmacology of Ayahuasca," in

R. Metzner, ed., *Ayahuasca: Hallucinogens, Consciousness, and the Spirit of Nature* (New York: Thunder's Mouth Press, 1999), 250–75.

6. Michael J. Harner, "Common Themes in South American Indian Yagé Experiences," in M. J. Harner, ed., *Hallucinogens and Shamanism* (Oxford: Oxford University Press, 1973), 155–75. Quotations at 172–73.

7. Milciades Chaves, "Mitica de los Siona del alto Putumayo," *XXXI Congreso Internacional de Americanistas, Miscelanea Paul Rivet Octogenario Dictata 2* (Mexico: Universidad Nacional Autonoma Mexico, 1958), 121–51. Quotation at 131.

8. Claudio Naranjo, "Psychological Aspects of the Yaje Experience in an Experimental Setting," in Michael J. Harner, ed., *Hallucinogens and Shamanism* (Oxford: Oxford University Press, 1973), 176–90. Quotations at 177–90.

9. *Ibid.*, 184.

10. *Ibid.*, 184–85.

11. Benny Shanon, *The Antipodes of the Mind: Charting the Phenomenology of the Ayahuasca Experience* (Oxford: Oxford University Press, 2002). Quotations at 113–40.

12. *Ibid.*, 141–59.

13. *Ibid.*, 86–98.

14. Benny Shanon, "Ayahuasca Visualization: A Structural Typology," *Journal of Consciousness Studies* 9, no. 2 (2002): 5.

15. *Ibid.*, 24.

16. *Ibid.*, 25.

17. *Ibid.*, 28.

18. The specific research examined in psychotherapy is that of experiential psychological change processes. In the psychology of religion, it is the research that examines experiential spiritual change processes. In the anthropology of religion and religious studies, it is the research examining the transformation themes that are depicted in sacred texts and art.

19. Research evidence from psychotherapy, psychology, developmental neuropsychology, and neuroscience will be presented to show that the functions and mechanisms of dreaming and REM (rapid eye movement sleep), mind wandering, and spontaneous waking thought processes all are states of consciousness that share the processes of spontaneous imagery narratives, and that these processes may be crucial for emotional self-regulation, long-term memory consolidation, coherent self-narratives, and creative activities generally. Research will also be presented regarding the presumed underlying bodily mechanisms that are involved in these processes.

20. Francisco Varela, Jean-Philippe Lachaux, Eugenio Rodriguez, and Jacques Martinerie, "The Brainweb: Phase Synchronization and Large Scale Integration," *Neuroscience* 2 (2001): 229.

21. Harry H. Hunt, *The Multiplicity of Dreams: Memory, Imagination, and Consciousness* (New Haven: Yale University Press, 1989), 3.

22. John Heuser, "Ayahuasca Entity Visitations: A Thematic Analysis of Internet-Reported Encounters," PhD dissertation, California Institute of Integral Studies, 2006. *Dissertation Abstracts International*, publ. nr. AAT3218522, DAI-B 67/05, 70.
23. Carl G. Jung, *Memories, Dreams, Reflections* (New York: Vintage Books, 1989), 170.
24. *Ibid.*, 172.
25. *Ibid.*, 173.
26. *Ibid.*, 177.
27. *Ibid.*, 178.
28. *Ibid.*, 179.
29. Marie-Louise von Franz, *Alchemy: An Introduction to the Symbolism and the Psychology* (Toronto: Inner City Books, 1980), 223.
30. Carl G. Jung, *Psychology and Alchemy* (Princeton, NJ: Princeton University Press, 1953), 335.
31. Eugene Gendlin, *Experiencing and the Creation of Meaning: A Philosophical and Psychological Approach to the Subjective* (Evanston, IL: Northwestern University Press, 1997).
32. Leslie S. Greenberg and Jeremy D. Safran, *Emotion in Psychotherapy* (New York: Guilford Press, 1987).
33. *Ibid.*, 252–54.
34. Joseph Campbell, *The Mythic Image* (Princeton, NJ: Princeton University Press, 1974), 118.
35. Matthew P. Walker and Els van der Helm, "Overnight Therapy? The Role of Sleep in Emotional Brain Processing," *Psychological Bulletin* 135, no. 5 (2009): 741.
36. *Ibid.*, 743.
37. Daniel J. Siegel, *The Developing Mind: How Relationships and the Brain Interact to Shape Who We Are* (New York: Guilford Press, 1999), 65.
38. K. Christoff, A. Gordon, and R. Smith, "The Role of Spontaneous Thought in Human Cognition," in O. Vartanian and D. R. Mandel, eds., *Neuroscience of Decision Making* (Psychology Press, forthcoming).
39. Siegel, *Developing Mind*, 214.
40. *Ibid.*, 217.
41. *Ibid.*, 219.
42. *Ibid.*, 222.
43. Mark Johnson, *The Meaning of the Body: Aesthetics of Human Understanding* (Chicago: University of Chicago Press, 2007), 136.
44. M. Jeannerod, "The Representing Brain: Neural Correlates of Motor Intention and Imagery," *Behavioral and Brain Sciences* 17 (1994): 187–245.
45. K. M. Kosslyn, *Image and Brain: The Resolution of the Imagery Debate* (Cambridge, MA: MIT Press, 1994).

46. Echenhofer et al., "EEG Correlates of Spontaneous Mental Imagery."
47. Johnson, *Meaning of the Body*, 137.
48. Ibid.
49. Jung, *Memories*, 199.
50. Von Franz, *Alchemy*, 269.
51. Siegel, *Developing Mind*, 71.
52. Heuser, *Ayahuasca Entity Visitations*.
53. For a description of the archaeological iconographic evidence from Huari textiles, snuff paraphernalia, ceramics, and stone sculpture depicting the hallucinogenic plant *Anadenanthera colubrina* and its possible role in Huari shamanic religious practices, see Patricia J. Knobloch, "Wari Ritual Power at Conchopata: An Interpretation of *Anadenanthera Colubrina* Iconography," *Latin American Antiquity* 11, no. 4 (2000): 387–402.
54. Alan R. Sawyer, "Tiahuanaco Tapestry Design," *The Textile Museum Journal* 1, no. 2 (1963): 27–38.
55. Jordi Riba, Sergio Romero, Eva Grasa, Esther Mena, Ignasi Carrió, and Manel J. Barbanoj, "Increased Frontal and Paralimbic Activation Following *Ayahuasca*, the Pan-Amazonian Inebriant," *Psychopharmacology* 186 (2006): 93–98.
56. A. D. Craig, "How Do You Feel? Interoception: The Sense of the Physiological Condition of the Body," *Nature Reviews Neuroscience* 3 (2002): 655–66.
57. Ibid., 658.
58. S. W. Lazar, C. E. Kerr, R. H. Wasserman, J. R. Gray, D. N. Greve, M. T. Treadway, M. McGarvey, B. T. Quinn, J. A. Dusek, H. Benson, S. L. Rauch, C. I. Moore, and B. Fischl, "Meditation Experience Is Associated with Increased Cortical Thickness," *Neuroreport* 16 (2005): 1893–97.
59. D. J. McKenna, D. B. Repke, L. Lo, and S. J. Peroutka, "Differential Interactions of Indolealkylamines with 5-Hydroxytryptamine Receptor Subtypes," *Neuropharmacology* 29 (1990): 193–98.
60. Madhu Kalia, "Neurobiological Basis of Depression: An Update," *Metabolism Clinical and Experimental* 54 (suppl. 1, 2005): 24–27.
61. Dominique Fontanilla, Molly Johannessen, Abdol R. Hajipour, Nicholas V. Cozzi, Meyer B. Jackson, and Arnold E. Ruoho, "The Hallucinogen N,N-Dimethyltryptamine (DMT) is an Endogenous Sigma-1 Receptor Regulator," *Science*, 323 (February 13, 2009): 934–37.
62. T. Hayashi and S. M. Stahl, "The Sigma-1 (Delta-1) Receptor and its Role in the Treatment of Mood Disorders," *Drugs of the Future* 34, no. 2 (2009): 137.
63. Rae R. Matsumoto, "Targeting Sigma Receptors: Novel Medication Development for Drug Abuse and Addiction," *Expert Review of Clinical Pharmacology* 2, no. 4 (2009): 351–58.
64. Jacques Mabit, "Ayahuasca in the Treatment of Addictions," in Michael

Winkelman and Thomas B. Roberts, eds., *Psychedelic Medicine (Vol. 2): New Evidence for Hallucinogenic Substances as Treatments* (Westport, CT: Praeger/Greenwood Publishers, 2007), 87–103.

65. *Ibid.*, 97.

66. J. Riba, P. Anderer, A. Morte, G. Urbano, F. Jané, B. Saletu, et al., “Topographic Pharmacoo-EEG Mapping of the Effects of the South American Psychoactive Beverage Ayahuasca in Healthy Volunteers,” *British Journal of Clinical Pharmacology* 53, no. 6 (2002): 613–28.

67. *Ibid.*, 621–26.

68. David E. Stuckey, “EEG Gamma Coherence and Other Correlates of Subjective Reports during Ayahuasca Experiences,” PsyD dissertation, California Institute of Integral Studies, 2004. *Dissertation Abstracts International*, publ. nr. AAT3162121, DAI-B66/01.

69. *Ibid.*, iv.

70. Echenhofer et al., “EEG Correlates of Spontaneous Mental Imagery.”

71. Robert W. Thatcher, Carl J. Biver, and Duane M. North, “EEG and Brain Connectivity: A Tutorial—6: What is Coherence,” July 28, 2004 to June 13, 2008, <http://www.brainfitness.com/researchEEG.html>, 17.

72. Francisco Varela, Jean-Philippe Lachaux, Eugenio Rodriguez, and Jacques Martinerie, “The Brainweb: Phase Synchronization and Large Scale Integration,” *Neuroscience* 2 (2001): 229.

73. Echenhofer et al., “EEG Correlates of Spontaneous Mental Imagery.”

74. Janet Gyatso, *Apparitions of the Self: The Secret Autobiographies of a Tibetan Visionary* (Princeton, NJ: Princeton University Press, 1998), 56.

75. Barbara Stafford, *Echo Objects: The Cognitive Work of Images* (Chicago: University of Chicago Press, 2007), 43–73.

76. Figure 5.5b is an adaptation of a drawing made by Peter G. Roe, professor of anthropology at the University of Delaware. The original drawing is of the male cayman on the Tello Obelisk found at Chavín de Huántar in Peru. This image was downloaded and adapted, with Dr. Roe’s permission, from his website at <http://copland.udel.edu/~roe/chavin.html#tello>.

77. The examination of a series of stone head sculptures at the Old Temple at Chavin de Huantar shows the stages of a priest transforming from human to a jaguar-like being that could serve as an intermediary between the human and supernatural realms. Mucus can be seen flowing from the nose of some of these stone heads, and this has been interpreted as evidence for the use of hallucinogenic snuffs, since these potent substances irritate the mucous membranes of the nose, causing discharges and visionary altered states of consciousness. The San Pedro Cactus is also prominently depicted in the iconography at Chavin, suggesting that hallucinogenic snuffs containing compounds similar to DMT and mescaline from San Pedro probably

facilitated the spontaneous visionary experiences at Chavin and contributed to the development of religious beliefs and practices and styles of sacred art. See Richard L. Burger, *Chavin and the Origins of Andean Civilization* (London: Thames and Hudson Ltd., 1995), 157.

78. K. Christoff, A. Gordon, and R. Smith, "The Role of Spontaneous Thought in Human Cognition," in O. Vartanian and D. R. Mandel, eds., *Neuroscience of Decision Making* (Psychology Press, forthcoming).

79. John G. Neihardt, *Black Elk Speaks* (Lincoln: University of Nebraska, 1998), 46.

80. Mircea Eliade, *Images and Symbols: Studies in Religious Symbolism* (New York: Sheed & Ward / Rowan & Littlefield, 1969), 27.

81. Rudolf Arnheim, *The Power of the Center: A Study of Composition in the Visual Arts* (Berkeley: University of California Press, 1982), 2.

82. Eliade, *Images and Symbols*, 27–56.

83. Echenhofer et al., "EEG Correlates of Spontaneous Mental Imagery."

84. Gyatso, *Apparitions of the Self*, 200.

85. Marylin M. Rhie and Robert A. F. Thurman, *Wisdom and Compassion: The Sacred Art of Tibet* (New York: Abrams, 1991), 321.

86. Angela Sumegi, *Dreamworlds of Shamanism and Tibetan Buddhism: The Third Place* (Albany: State University of New York, 2008), 4.

87. Ibid., 184–85.

88. George Lakoff, "How Metaphor Structures Dreams: The Theory of Conceptual Metaphor Applied to Dream Analysis," *Dreaming: Journal of the Association for the Study of Dreams* 3, no. 2 (1993): 77.

89. J. C. Callaway, "Fast and Slow Metabolizers of Hoasca," *Journal of Psychoactive Drugs* 37, no. 2 (2005): 157–61.

90. Mabit, *Ayahuasca in the Treatment of Addictions*.