Varieties of Lucid Dreaming Experience

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I. Introduction

Realization that one is dreaming brings a wonderful sense of freedom–freedom to try anything in the extended range of experience. … The nature of lucid dream experience may range up to the mystical, *whilst there seems to be an inherent resistance to anything erotic*. (McCreery, 1973: 114)

When lucid dreams endure beyond a certain point, at least for me, orgasm is almost inevitable… *in fully two-thirds of my lucid dreams, I feel the flow of sexual energy; this arousal culminates in an orgasmic burst on about half of these occasions*. (Garfield, 1979: 134-35)

What can we conclude from the above quotations? Certainly nothing regarding the nature of eroticism in the lucid dream state. Rather, they illustrate that the experience of lucid dreaming is subject to individual variation. This should not be surprising, since lucid dreaming, like all forms of conscious experience, is comprised of a flow of subjective events created by brain processes using input from sensory-perceptual modalities, internal algorithms or schemata and, perhaps, poorly understood neuronal activity associated with central nervous system homeostatic maintenance. Variability in individual experience is inherent at all levels: anatomical in the form of limitations imposed by breath and sensory system development, physiological as sleep and REM sleep needs, inborn activation and damping tendencies, and psychological variation caused by recent and long-term experiences, the development of habits of interaction with the environment, and assumptions about the way the world works.

The range of subjective experiences reported to occur during dreaming appears wider and more variable than those typical of waking. In this chapter we will focus on the nature of experience in lucid dreams. We begin by showing that lucidity in dreams is not a discrete phenomenon, but that reflective consciousness exists in all dreams and can be measured on a continuum with "lucidity" and "non-lucidity" representing two ends of the spectrum. The remainder of the chapter will explore the substantial individual variation in lucid dreams, illustrated with examples derived from the authors' experiences. The discussion will focus on two primary themes: the role played by belief systems and learning in shaping lucid dream experiences, and the role played by factors which appear to be independent of the dreamer's beliefs and learning.

II. The Meaning of "Lucid Dreaming"

The distinction between nonlucid and lucid dreams represents perhaps the broadest level of variation in dream experiences presently recognized. The contemporary notion of a lucid dream is a "dream in which one knows one is dreaming" (Green, 1968). This is in contrast to the nonlucid dream, in which dreamers are not aware of being in the dream state. Some dream theorists treat the lucid/nonlucid distinction in a way we consider too rigid, arguing these are two completely distinct types of phenomena (Hobson, 1988, 1994; Tart, 1984; Tholey, 1988). In our view, the distinction between lucid and nonlucid dreams is not as clear-cut as the definition suggests and fails to do justice to the subtlety of the actual

experience. We feel the contemporary distinction has misplaced focus away from what we consider the essential variations in dream cognition underlying dream lucidity.

We have recently developed a psychological model that we believe captures the *experiential essence* of the differences between lucid and nonlucid dreams (DeGracia and LaBerge, 1998). In brief, our model hinges on the relationship of the waking self and the identity of the dreamer, and addresses the question: at what psychological levels do changes in self-awareness in the dream state occur that correspond to the onset of dream lucidity? Or stated somewhat differently, what exactly *is* dream lucidity?

Our basis for answering this question involved a systematic comparison of waking, lucid and nonlucid dreaming within the framework of the Global Workspace (GW) model of consciousness developed by Bernard Baars (1988). Recognizing that dreams in general are an expression of consciousness during sleep, the critical feature of Baars's GW model we used was his formulation that conscious processes are molded and framed by unconscious processes. Baars formulates unconscious processes as *contexts*. Contexts are operationally defined as "a system (or set of systems) that constrains conscious contents without itself being conscious" (Baars, 1988: 372). Accordingly, we compared the unconscious contextual structures underlying waking, nonlucid and lucid dream consciousness.

A. Waking

Baars' GW model provides a model of waking consciousness. The GW model posits that waking consciousness is framed by a nested hierarchy of *unconscious* elements which Baars terms a *context hierarchy*. The context hierarchy is a relatively stable global construct that transforms through time as a function of learning and experience. The context hierarchy of the waking personality is composed of many relatively distinct contexts which correspond to, or are a computational way to model, the sensory, perceptual, attentional, mnemonic, cognitive, metacognitive, goal and effector operations carried out unconsciously by the nervous system, but which in turn condition conscious experience. Contexts can be relatively more innate (such as the topographic organization of conscious perceptions) or relatively more learned (such as language and culture).

A context strongly dependent on learning can involve *situation-dependent* forms of cognition, in which the context remains latent until external circumstances dictate its full expression. An example of a situation-dependent context would be the knowledge and skills associated with piano playing. The full expression of a "piano playing context" is situationally dependent on the presence of an actual piano. When confronted with a piano, the "piano playing context" expresses itself as a nested hierarchy of effectors: the desire (or goal) to play triggers the necessary declarative knowledge (of notes and music, etc) which in turn triggers the necessary motor effectors (eye motions for reading music, hand motions for striking keys) resulting in the act of playing the piano. According to Baars, context formation initially requires conscious participation. But, once established, contexts are unconscious factors framing conscious experience. Many such contexts accumulate within the waking personality as a function of learning and life experiences, and mold and frame the conscious aspects of waking.

B. Nonlucid Dreams

During nonlucid dreams, the consciousness of the dreamer is similarly constrained by unconscious contextual elements. These elements combine to form relatively *transient* global contexts that last only for a dream's duration, or possibly through a series of sequential dreams. The transience of global contextual structures in dreams contrasts to the relatively stable context hierarchy framing waking consciousness. One factor contributing to the transient quality of dream contexts involves the dreamer operating "in the moment" in response to the dream context with no conscious memory of precedents or antecedents to the events occurring in the dream. The unconscious global context framing nonlucid dream consciousness may or may not use elements from the waking context

hierarchy. Typically, dream contextual elements related to explicit memories do not necessarily correlate to elements of the waking personality, while contexts related to non-explicit memories do. For example, the dreamer's sense of identity (a declarative context) may be significantly different from the waking sense of identity (LaBerge, 1985). Likewise, the conceptual situation of the nonlucid dream (e.g. the "dream plot") may have little to do with the episodic experiences of the waking personality. This "incongruency of contexts" between waking and nonlucid dreaming perhaps contributes to the view of some theorists that the nonlucid dream state is akin to madness (Hobson, 1994). However, contexts defining non-explicit behaviors, when expressed in nonlucid dreams, are closely similar to waking. Such non-explicit behaviors include, for example, conscious perceptual representation (DeGracia and LaBerge, 1998), speech production (Salzarulo and Cipolli, 1974), or metacognitive monitoring (Kahan and LaBerge, 1994).

The carry over of waking habits of metacognitive monitoring has a particular significance in nonlucid dreams. We typically do not metacognitively monitor our state of consciousness when awake. The general set of expectancies guiding our ordinary waking experience also governs our ordinary dream state. Since we tacitly assume, in both cases, that we are awake, our cognition during dreaming is distorted to fit the assumption that we are awake. When bizarre dream events occur, as they frequently do during REM sleep, they are simply assimilated into the contextual structure of the dream in a consistent fashion (DeGracia and LaBerge, 1998). Again, some theorists have used this assimilation by the dreamer of unusual dream events as evidence that dreaming cognition is akin to madness. From our view, however, we are simply observing the adoption of the waking self's habitual form of metacognitive monitoring by the dreamer.

Importantly, the contextual structures and conscious experiences of nonlucid dreams tend not to contribute episodic memories to the waking personality; a condition recognized as dream amnesia (Hobson, 1988). Although it is common to recall fragments of dreams upon awakening, it is likely that the great majority of our nightly dreams are not remembered at all (Diamond, 1963). For most individuals there is only a piecemeal conscious recollection of dream experiences. However, as stated above, the nonlucid dreamer can access both explicit and non-explicit memories of waking experience. Nonlucid dreaming therefore tends to be a one-way street with respect to memory transfer between states: from waking to dreaming, but not the reverse. The result of this relatively one-sided transfer of memories between states means that elements of the waking personality can contribute to the identity of the dreamer as building blocks in the global (albeit temporary) contextual structure of the dream. But, dreams rarely contribute to the consciously accessible memories of the waking personality.

Because of the transient nature of the global contexts in nonlucid dreams, we suggest nonlucid dreams may function, among other things, to recombine unconscious elements within consciousness on a temporary basis. We call this process "mental recombination" (cf. Hunt, 1989) by analogy with genetic recombination. From the viewpoint of biocomputation, mental recombination likely contributes to maintaining an optimal information processing flexibility in brain neuronal networks. This notion is practically identical with Greenberg and Pearlman's (1974) conclusion that the evolutionary development of the dream state "has made possible the increasingly flexible use of information in the mammalian family". The notion of dreaming as mental recombination is also consistent with the role of REM sleep in learning and assimilation of new knowledge (reviewed in LaBerge, 1985).

C. Lucid Dreams

Lucid dream consciousness, like waking and nonlucid dreams, is also framed by unconscious contextual elements. To understand the contextual structure of lucid dreams, we must look at the role played by consciously accessible memory across lucid dreams and waking. Lucid dreamers are able to freely recall details of waking life, to a greater or lesser extent, while within a lucid dream (LaBerge, 1985). Just as important, lucid dreams are remembered after awakening with a much higher frequency than nonlucid dreams, probably due to the presence of a *mental set to remember* in lucid dreams. Although it would be difficult to

empirically ascertain, the anecdotal evidence suggests that at least some lucid dreamers remember their lucid dreams during waking at least as well as their waking experiences (LaBerge, 1985). In other words, lucid dreams contribute to the episodic memories of the waking personality. Therefore, in contrast to nonlucid dreams, there is a two-way transfer of consciously accessible memory between waking and lucid dream experiences. Thus, *there is a relative continuity of consciously accessible memory linking lucid dreams and waking experience.*

With repeated experiences of lucid dreaming, the associated memories of these experiences contribute to the formation of a stable and cumulative contextual structure in the mind of the waking self. This stable contextual structure we call the *lucid dream context*. The lucid dream context serves two complementary roles: (1) it serves as the global contextual structure framing lucid dream consciousness providing both precedent and antecedent structure to lucid dreams, and (2) it forms a situationally-dependent context within the waking personality. Regarding this latter point, lucid dreaming is a learnable skill (Moffitt, Hoffmann, *et al*, 1988; LaBerge, 1980, 1985; LaBerge & Rheingold, 1990). The full expression of this skill is dependent upon its occurrence during sleep, and is in this sense a form of situational cognition. The skill, however, belongs to the waking personality and shares features with other learned skills, particularly that it can be improved upon by learning and practice (LaBerge, 1980).

Thus, our distinction between lucid and nonlucid dreams is based on the contextual structure underlying dream consciousness: nonlucid dreams can be characterized by the formation of transient global contexts different from dream to dream, but lucid dreams are characterized by the presence of a distinct and persistent context, the lucid dream context. This lucid dream context belongs to both the waking personality and the lucid dreamer identity, serving as a bridge between them, and will continue to frame all future lucid dreams. The lucid dream context is susceptible to modification by learning and experience acquired in either the waking or lucid dream states.

There appear to be at least three essential components to the lucid dream context, each operating at a specific psychological level: (1) a "reference to state" operating as a metacognitive context, (2) a semantic contextual framework operating at the level of declarative knowledge, expectation and belief, and (3) a goal-option framework operating at the level of effector action.

1. The Reference to State

When a lucid dreamer thinks "I am dreaming" there are at least two levels of cognitive activity at work in this thought: a direct experiential realization of, and self-reflection on, ones condition ("I am..."), and an interpretation of the nature of that condition ("...dreaming"). The former is a metacognitive act, the latter a semantic interpretation. The notion of "reference to state" indicates the metacognitive component of the lucid dream context. The reference of subjects to their state of being is not merely declarative knowledge, it is a direct apprehension of their immediate experience. Metacognition is not unique to lucid dreams but also occurs in nonlucid dreams (Kahan and LaBerge, 1994). However, in nonlucid dreams, "reflection during dreaming involves an awareness of conditions within the dream" (ibid., p. 250). That is to say, reflection on events in nonlucid dreams is confined to the contextual scope of the nonlucid dream (typically limited by the absence of the habit of metacognitively checking one's state). Metacognition during lucid dreams is not confined to events occurring in the dream, but references, either explicitly or implicitly, waking experience as well (DeGracia and LaBerge, 1998). The reference to state in a lucid dream is framed by access to memories of waking experience, allowing a *contrast* between one's current situation and the knowledge of waking life. This contrast provides the contextual structure for the metacognitive recognition that the current experience is not a normal waking experience. Hence, lucidity in the context of dreaming, implies metacognition framed by consciously accessible memories of waking experience.

2. The Semantic Framework

Individuals who experience lucid dreaming develop a framework of knowledge by which to conceptualize and give meaning to their experiences. These semantic frameworks affect the consciousness of lucid dreamers in a contextual fashion by providing assumptions, expectations and beliefs upon which the lucid dreamers interpret their experiences and acts. Because there is a large diversity of perceptual experience in lucid dreams (to be outlined below), an equally wide variety of semantic frameworks have developed to give meaning to these experiences. The knowledge framework used by a given individual does *not* require that the experiences be conceptualized by that individual as "a lucid dream". The semantic framework itself does not even have to be true. How lucid dreamers conceptualize their "non-waking experience" is a function of their general knowledge. Alternative modes of conceptualizing the lucid dream experience include the notions that one is undergoing an "out of body experience" (OBE) or an "astral projection" (reviewed in DeGracia, 1997). The forms taken by one's reference to state depend on one's semantic framework. So, the semantic component of the statement "I am dreaming" reflects a knowledge structure conceptualizing the experience as a form of dreaming. A reference to state can just as easily take the forms "I am having an OBE" or "I am having an astral projection". As one of us stated previously: "…lucid dreams and OBEs [and we will add here, astral projections] are necessarily distinguished by only one essential feature: how the person interprets the experience at the time" (LaBerge, 1985, p. 234) In other words, these are not phenomenologically distinct categories of experience but are alternative conceptualizations of the intrinsic variety present in lucid dream experiences.

Because dream experience is not constrained by sensory input or other limits of waking experience (such as the law of gravity, for example) beliefs and expectations play a key role in determining the form of and behavior occurring within a lucid dream. As we stated in the Introduction, we are interested in ascertaining which features of lucid dream variability are belief-dependent and which are not. By "belief-dependent" we are referring precisely to the role played by a semantic framework in conditioning an individual's lucid dream experiences. The semantic framework, because it is a declarative framework of knowledge, is susceptible to modification by learning and experience, and therefore is a crucial dynamic element in an individual's lucid dream context.

3. The Goal-Options Context

Lucid dreaming includes a set of intentional actions that, taken as a whole, we call a goal-options context. As the semantic framework is the declarative component of the lucid dream context, the goal-options context includes the procedural aspects of lucid dreaming related to effector actions. A lucid dreamer's goal-option context includes both lucid dream initiation techniques and the range of behaviors expressed in an individual's lucid dreams. Examples of characteristic goal-option behaviors include making voluntary choices in lucid dreams, making a habit of metacognitively checking one's state of consciousness, and making a habit of remembering lucid dream experiences. The goal-option context is also a dynamic element of the lucid dream context which undergoes refinement concomitant with the accumulation of direct experience in the lucid dream state. The semantic framework has a direct effect on the goal-options available to the lucid dreamer by limiting what the dreamer believes is and is not possible to do in the lucid dream state.

D. The Relationship Between Nonlucid and Lucid Dreams

Let us summarize the discussion thus far. Dream lucidity involves specific unconscious contextual structures operating at metacognitive, semantic and effector levels that frame the consciousness of the lucid dreamer: together these form a lucid dream context. A lucid dream context develops from a two-way, consciously accessible memory transfer between the lucid dreamer and waking self, represents learned skills, and is a stable facet of the waking personality which grows with experience. In contrast, nonlucid dreams are characterized by the transient formation of dream contexts which draw, to a variable

extent, on elements of the waking personality, and do not contribute substantially to the consciously accessible memory structure of the waking personality.

Although this model appears to provide a clear-cut distinction between lucid and nonlucid dreams, it is not the main intention of this model to rigidly distinguish these experiences. We stated above our dissatisfaction with the current dichotomous notions of nonlucid and lucid dreams in this regard. This dissatisfaction derives from the inability of contemporary notions to adequately capture the lucid dreamer's experience, which can display subtle variations in cognition that are difficult to conceptualize. These variations seem to span the distinction between lucidity and non-lucidity as presented above so that our model is really intended to provide a basis for conceptualizing the subtle array of differences present in lucid dream experiences. Thus, the final step in our model is to develop how lucid and nonlucid forms of cognition can *interact* with one another.

To do so, we must turn again to notions introduced by Baars in the GW system. Baars defines the processes of *cooperation* and *competition*; these are mechanisms by which contexts interact. Cooperation refers to how contextual elements can form symbiotic linkages and mutually support each other in framing conscious processes. For example, the association of the metacognitive reference to state, semantic framework and goal-options context within the lucid dream context is an example of the cooperation of contextual elements. Competition is the opposite process whereby contextual elements displace one another in their effects on conscious processes. A waking example of competition can be found in the Stroop test, where one reads colored words of the names of colors flashed briefly on a monitor. People tend to mistakenly say the color of the word, instead of reading the word itself. Here, unconscious color recognition processes compete with unconscious word recognition for control of the contents of consciousness.

We showed that cooperation and competition of contextual elements can be observed in both nonlucid and lucid dreams (DeGracia and LaBerge, 1998). We also showed that *the tendency of nonlucid dreams to form transient global contexts is present during lucid dreams*. Characters and situations encountered unintentionally in lucid dreams can serve as factors around which may nucleate a nonlucid dream context. These factors can *compete* with the lucid dream context for access to the dreamer's intentions. If the lucid dreamer does not make a conscious effort to maintain the lucid dream context, it is possible for these distractions to absorb the attention of the lucid dreamer and draw the dreamer into a situation that unfolds independent of the dreamer's volition. At the extreme, a newly generated dream context can displace the lucid dream context resulting in a loss of lucidity and the transformation of the lucid dream into a nonlucid dream. In practice, however, subtler forms of competition will allow the lucid dream context to co-exist with competing dream elements that are not contained in the lucid dream context, resulting in modifications of the cognition of the lucid dreamer which affect memory access, thinking and behavior. In such situations, the dreamer appears to phase in and out of lucidity to various degrees. Thus, because of competitive processes, the degree of lucidity can itself vary within a single lucid dream. These notions will form part of our basis for discussing variations in lucid dream cognition in following sections.

III. Variations in Lucid Dream Experiences

Having presented a way of looking at the distinction between lucid and nonlucid dreams, we will now turn our attention to outlining the degree of variety that exists in lucid dream experiences. Because lucid dream experiences tend to be remembered nearly as well as waking experiences, and because lucid dreams are cumulative experiences, lucid dream reports can provide highly detailed and descriptive accounts of lucid dream phenomenology. We will draw on such reports below to illustrate the range of variation in lucid dreams. Our survey of lucid dream variations will parallel the general temporal course of lucid dreams, discussing in turn, lucidity initiation, variations in perception, emotion, cognition and action within lucid dreams, and finally, the termination of lucid dreams.

A. Variations in Lucid Dream Initiation

Since the lucid dream context bridges the waking and dream states, logic suggests that lucid dreams could be initiated either from the nonlucid dream state (a dream-initiated lucid dream, or DILD) or from the waking state (a wake-initiated lucid dream, or WILD) (LaBerge, 1980). Because transitions directly from the waking state to the REM sleep state are very rare, one would expect WILDs to occur with a lower frequency than DILDs–just what the data shows.

1. Dream-Initiated Lucid Dreams

More than 80% of lucid dreams are initiated when a nonlucid dream transforms into a lucid dream (LaBerge, Nagel, Taylor, Dement, & Zarcone, 1981). This process involves the lucid dream context displacing the current nonlucid dream context. The form of this displacement is dependent upon the individual's specific training in lucidity induction techniques and degree of lucid dreaming experience.

For inexperienced lucid dreamers, lucidity is perhaps most likely to arise from a nightmare or anxiety dream. LaBerge (1985) argues that there is an evolutionary-biological basis for anxiety stimulating reflective consciousness. Not all novice lucid dreamers experience anxiety-triggered lucidity; specifically, for example, DLD reports none, while SLB reports his percentage of anxiety-triggered lucid dreams recognized in years 1-3 respectively were 36%, 19%, and 5. The decrease in proportion (and frequency) of anxiety-initiated lucid dreams with time was probably due to the psychotherapeutic techniques SLB was practicing (LaBerge, 1985; see also Tholey, 1988) as the following example illustrates:

(SLB106) "I was in the middle of a riot in a classroom; a furious mob was raging about, throwing chairs and fighting with each other. A huge repulsive barbarian with a pock-marked face, the Goliath among them, had me hopelessly locked in an iron grip from which I was desperately trying to free myself. At this point, I recognized that I was dreaming, and remembering what I had learned from handling similar situations previously, I immediately gave up my struggle … and tried to feel loving as I stood face to face with my ogre

At first, I failed utterly, feeling only repulsion and disgust for the ogre. He was simple *too ugly* to love: thus spoke my visceral reactions. But I tried to ignore the image and seek love within my own heart. Finding it, I looked my ogre in the eyes, trusting my intuition to supply the right things to say. Beautiful words of acceptance flowed out of me, and as they did, he melted into me. As for the riot, it had vanished without a trace; the dream was over and I awoke, feeling wonderfully calm."

Other intense emotions such as embarrassment or delight can also initiate lucidity. Such lucid dreams are typically spontaneous and brief, and lucidity onset is quickly followed by awakening. Survey data suggest that most people have experienced a nominally lucid dream at least once in their lifetime (Snyder and Gackenbach, 1988). A spontaneously experienced lucid dream can serve as a nucleation event for the development of a lucid dream context, if there is follow-through on the part of the individual to cultivate these experiences.

A number of methods exist for the individual to intentionally cultivate the onset of lucidity from within nonlucid dreams (LaBerge, 1981, 1985; LaBerge and Rheingold, 1990; Rogo, 1983). The learning of these methods occurs during waking and adds to both the semantic and goal-option components of an individual's lucid dream context. The essence of methods to initiate lucidity during nonlucid dreams is to condition dreamers to recognize that they are dreaming through some form of *state testing* (also called "reality testing"). Some approaches to state testing are:

1. Anomaly recognition - Here dreamers condition themselves to use the recognition of bizarre dream events as a cue for lucidity onset. This approach is not limited to observing

events in the dream but can be based on self-observation as well, so that, if they perceive their behavior as unusual (not typical of waking) this may induce lucidity.

(SLB351) "I'm walking through a field that is fantastically animated with extravagant life: Magic Mushrooms (*Psilocybe cubensis*) popping up everywhere and growing to gigantic proportions. I realize the fantasy element of this scene: I must be dreaming. I do two all up eye movement signals, but this causes the dream to begin to fade. I try to press the micro-switch, and I seem to have succeeded, but it feels like I'm already awake..."

The anomalies that serve as lucidity cues, or "dreamsigns" (LaBerge & Rheingold, 1989) can be very subtle indeed as the following account from von Moers-Messmer (1938) illustrates:

From the top of a rather low and unfamiliar hill, I look out across a wide plain towards the horizon. It crosses my mind that I have no idea what time of year it is. I check the sun's position. It appears almost straight above me with its usual brightness. This is surprising, as it occurs to me that it is now autumn, and the sun was much lower only a short time ago. I think it over: the sun is now perpendicular to the equator, so here it has to appear at an angle of approximately 45 degrees. So if my shadow does not correspond to my own height, I must be dreaming. I examine it: it is about 30 centimeters long. It takes considerable effort for me to believe this almost blindingly bright landscape and all of its features to be only an illusion. [Translation from LaBerge, 1985, pp. 38-39.]

2. Programmed behaviors - Here dreamers condition themselves to perform an act that will tend to produce distinguishable results when performed during either waking or dreaming. For example, attempting to fly in a dream will tend to lead to the experience of flying; if the individual actually "lifts off" then this is a strong indication that the experience is a dream (as in the following example). Another behavior that can result in lucidity initiation is attempting to read and reread text; if the text changes, then this is used as a lucidity cue. This approach can be simplified to the point of simply looking at one's hands as a cue for lucidity onset.

(SLB1032) "At a movie theatre, I am running down a flight of stairs, skipping more and more steps, until I notice that I seem to be able to skip as many as I like! Wait a minute! That makes this a *dream*. But it doesn't seem at all like it. So I step into the air to convince myself. It is indeed! As I float upward close to the wall, the scene begins to fade. I decide to test rubbing hands together instead of spinning. I vividly feel the sensation and then also the wall at my back. I keep rubbing for perhaps 15 seconds, and then I feel a closet door, which I open. At first the closet contains only vague images, but they finally become vivid. I am now in a bedroom. L is on the bed, "talking in her sleep." She says something unintelligible. I ask her to repeat it: She says "Wisdom is being given out …mumble, mumble." While wondering what she means, the dream fades and I awaken."

3. Déjà rêvé - Lucidity can sometimes be initiated when lucid dreamers have an apparent or actual recognition that they have had a similar dream before as in the following example:

(SLB31) "I am walking with my friend, M, when I recognize that we are in a place I have dreamed of before–'The Museum of Uninvented Inventions'–and that *this* therefore, is a dream. I reflect how the real M. would like to have lucid dreams, knowing quite explicitly that this is 'M', a dream figure. Nevertheless, I suggest to him that even though he is only a dream character, perhaps he could realize that he is dreaming. Maybe he does, for *I* wake up."

With increasing experience, DILD techniques become habitual. After a certain degree of experience, the individuals may simply recognize that they are dreaming without any apparent state testing or lucidity onset cue. Frequently dreamers question their state and decide they are awake and not dreaming. A dream in which the dreamer has at one point raised this question without arriving at the correct conclusion is commonly termed "pre-

lucid" (Green, 1968). Pre-lucid dreams can be interpreted as a failed attempt by the lucid dream context to gain full access to framing dream consciousness.

2. Wake-Initiated Lucid Dreams

It is possible to maintain continuous reflective consciousness while falling asleep and hence to enter a lucid dream directly from the waking state. As with DILDs, this form of lucid dream initiation is a skill that improves with motivation and practice. Its cultivation has been described by Tibetan yogis, and several modern sources (LaBerge 1985; LaBerge and Rheingold 1990; Ouspensky, 1960; Rogo 1983). WILDs are most likely to occur after awakening in the morning or during afternoon naps (LaBerge, 1980). While falling asleep, the subject's mind is kept focused and lucid through the transition from waking to dreaming. Experiences of visual and auditory hypnagogic imagery are common during this transition. Unusual somesthetic imagery may also occur; subjects may feel themselves "float" or "sink out of their body". There may (e.g. SLB561) or may not (e.g. SLB37) be a momentary break in subjects' consciousness. Then the subjects will find themselves fully in a dream scene and lucid. Once in the dream-state, the lucid dream continues exactly like those initiated directly from the dream state. Some examples from the authors' personal experiences illustrate the fascination of this transition:

(DJD55) "I went back and laid on my bed hoping to project some more. I laid there and hypnagogic images came and went: city scenes, people sitting at a bar, a friend sitting on a stool behind an open door with a beautiful girl standing next to him. I could feel myself sinking deeper and deeper. Finally, I felt myself sink very deep and simultaneously my visual field locked into a stable scene and I felt a strong wind blowing over me. I could hear loud "whooshing" and wind sounds. Next I knew, the "wind" grabbed me and was pulling me along. It seemed to be pulling me forward but what I saw was me passing through fuzzy but identifiable frames of my bedroom."

(DJD48) "I woke from sleep. Had fleeting glimpses of my dream memories, then they were gone. I shut my eyes and could see hypnagogic images. A few scenes formed and faded but I don't recall what they were. The scene of a street formed vividly in front of my closed eyes. There was a river off to my left, 50-100 yards from the road. On the left seemed to be a construction site. There were buildings on my right. I was trying to observe details and I felt my foot step forward! This surprised me! Next thing I knew, I was walking along the street."

(SLB561) "I have just awakened from a dream in the sleep lab and am worrying about how the night is almost over and I *still* haven't succeeded in having a lucid dream. Suddenly, I find myself flying hundreds of feet above a field of wildflowers: I realize at once, with great excitement, that *this* is a dream and carry out the pre-planned protocol, making an eye-movement signal and singing 'Row, row, row your boat/ Gently down the stream/ Merrily, merrily, merrily/ Life is but a dream!' Then I make another signal and estimate 10 seconds by counting 'One thousand-one, ... one thousand-ten' and signal again. When I finish this sequence, I am overjoyed and do a virtual cartwheel in the air. After a few seconds, the dream begins to fade...."

(SLB37) "I was lying awake in bed late in the morning listening to the sound of running water in the adjoining bathroom. Presently, an image of the ocean appeared, dim at first like my usual waking imagery. But its vividness rapidly increased while, at the same time, the sound level of the running water decreased; the intensity of the internal image and external sound seemed to alter inversely (as if one changed a stereo balance control from one channel to the other). In a few seconds, I found myself at the seashore standing between my mother and a girl who seemed somehow familiar. I could no longer hear the sound of the bath water, but only the roar of the dream sea...."

Differences in styles of lucid dreaming give rise to individual differences in DILD and WILD frequency. Although quantification of such differences has not been attempted in a large

sample of lucid dreamers, to illustrate such stylistic differences, a comparison of lucid dream initiation frequencies of the authors is here presented. DJD has 114 recorded lucid dreams of which 43% were WILDs and 56% were DILDs. In contrast, only 8% of SLB's dissertation sample of 388 recorded lucid dreams were WILDs, a significantly lower proportion.

3. Ambiguities in Lucidity Induction

With increasing experience, some facets of lucid dreaming become habitual, making the classification of dream lucidity more ambiguous. Consider the following example:

(DJD74) "My (nonlucid) dream involved me, X and a bunch of other people. We were all roommates in a big house. I was unaware that I was dreaming. There was a party going on or something. We were down in the basement hanging out. However, at some point in the dream I looked at X and told him I'd be back in a little bit because I was going to go up to my room and try to project! I went up to my bedroom in this dream house. Again, at this point I thought everything was normal and had no idea I was dreaming. I laid down on my bed and started concentrating to leave just exactly like I always do on the physical plane….[text omitted of a 1400 word lucid dream report]

…I decided I was done for the time being, so I got up out of bed. I was still in the dream house and still unaware that I was dreaming. I went looking for some paper to record my experience. I ended up going back into the basement where everyone was still hanging out. X was there and the others and I told them all about the projection I had just had. Meanwhile, I'm getting very concerned that I can't find any paper. Then I woke up for real. For a moment I was totally disoriented."

In this example, DJD, in the midst of a nonlucid dream, performs his habitual techniques for achieving a WILD. He then experienced what was, for all practical purposes, a typical lucid dream. Following this, he "awakes" in the exact same nonlucid dream setting and seeks paper to record his lucid dream, which is also a habitual behavior. Shortly thereafter, DJD truly wakes up in a momentarily disoriented state.

How is one to classify such an experience? What we see here is a lucid dream nested perfectly inside of a nonlucid dream. One could argue that DJD merely *dreamt* that he was lucid dreaming, but this clarifies nothing. The characteristics of the lucid dream (the omitted text) were identical in general features to all of his other lucid dreams. What we believe this particular sequence represents is the *cooperation* between the global nonlucid dream context and DJD's lucid dream context. In this particular instance, the global nonlucid dream context provided perfectly for the full expression of the lucid dream context because the subject dreamt all of the requisite details needed for activation of his lucid dream context. After completion of the lucid dream, the lucid dream context returned control of access to the dreamer's consciousness to the previous nonlucid dream context. This kind of situation could only result because the subject possessed a well-defined lucid dream context that could clearly demarcate itself from the global nonlucid dream context.

This is an extreme example of the mixing of nonlucid and lucid dream elements. However, it is not uncharacteristic of the kind of subtleties and ambiguities encountered when attempting to characterize dream consciousness and what does and does not constitute dream lucidity. A related issue is the characterization of intentionality in lucidity induction. It is not always easy to draw a clear distinction between a lucid dream that is "spontaneous" and one that is "deliberately" induced. In fact, the characterization of such factors is critically dependent upon the subject's degree of experience, and the relative maturity of the lucid dream context. As the lucid dream context matures, and hence, becomes more habitual, the likelihood of unintended lucid dreams increases and the ambiguity of what constitutes dream lucidity also increases. WILDs are typically intentional by nature. However, it is possible, for example, for an experienced lucid dreamer to lie down and nap

with the intention to merely rest, and have an unintended WILD. In the case of DILDs, the issue of intention becomes even more ambiguous because the experienced subject may simply come to learn to recognize that he or she is dreaming, with no cause other than sheer familiarity with the state; in such a case, there may be no explicit onset of lucidity (e.g. no reality testing, no statement "I am dreaming").

Alternatively, experienced lucid dreamers may have a nonlucid dream in which they access elements of their lucid dream context incompletely and never achieve full lucidity. These types of considerations are important because they indicate that the subject's degree of experience can profoundly affect how dream lucidity manifests itself, and clearly indicate that lucidity induction is not homogeneous across subjects. What constitutes dream lucidity may be more subtle and ambiguous to identify for experienced subjects who have programmed aspects of lucidity induction and manifestation to be habitual.

B. Perceptual Variations in Lucid Dreams

The examples listed above begin to illustrate the diversity of perceptions that can occur in lucid dreams. By "perception" we are referring to the *hallucinated* sensory modalities characteristic of dream consciousness. Because afferent input from peripheral senses is attenuated during dreaming (LaBerge, 1985), it should be understood that the use of the term "perception" in the following discussion refers to the hallucinated analogs of the sensory modalities. Dreams are, in general, highly perceptual experiences expressing all the dream analogs of waking sensory modalities. Dream perceptions are typically characterized as "bizarre" (Hobson, 1988). Examples of perceptual bizarreness in dreams may include dream characters or environments transforming abruptly (discontinuities), or the perception of physically impossible scenes and events. Perceptual bizarreness occurs in lucid dreams just as it occurs in nonlucid dreams (Gackenbach, 1988). However, bizarreness in perception is often recognized as such by lucid dreamers, and can be described by them in vivid detail, providing us with a clear window into the perceptual qualities of lucid dreams.

To understand the perceptual diversity of lucid dreams we need to introduce the notion of *perceptual environment*. This is the complete hallucinated sensorium of the dreamer including all the sensory modalities: vision, audition, somatosensation, gustation, olfaction and the submodalities therein. These hallucinated sensory perceptions combine to form the dreamer's body image (if present), and the allocentric space perceived by the dreamer. The dreamer can be either immersed within the dream environment or observing it from without. For both authors, our lucid dreams are associated with immersion in the perceptual environment, which seems to hold true in general; reports of lucid dreamers as pure observers are rare (LaBerge, 1985). The vividness and richness of the perceptual environment ranges from the "minimal" in which most or all sensory qualities are absent or greatly attenuated, through the "typical" much like everyday experience, to the "surreal" in which the environment is vibrantly, psychedelically alive with fantastic, extravagant detail.

1. Typical Perceptual Environments

A "typical" perceptual environment is experienced as immersion within or observation of a rich sensory environment containing all sensory modalities. Typical perceptual environments are characteristic of both nonlucid and lucid dreams. These environments generally contain the same elements that waking environments do such as landscapes, city streets, trees, buildings, driving in cars, etc., and are readily comprehensible by the dreamer, although bizarreness is frequent.

Within lucid dreams, typical perceptual environments display a large variety of perceptual qualities. In some the scene is dimly lit or vaguely delineated; others overwhelm the lucid dreamer with their intense beauty and extravagant detail. Some seem, indeed, "more real than real". In general, the average lucid dream is more perceptually vivid than the average

nonlucid dream. This conclusion is supported by relatively intense brain activation during lucid dreaming which may correlate with increased perceptual vividness (LaBerge, 1981).

2. Surreal Perceptual Environments

A surreal perceptual environment is characterized by the presence of at least some sensory modalities displaying rich perceptual content. However, surreal environments have no counterpart in normal waking experience; they are often abstract spaces of color, shape, and motion within which the dreamer is immersed. These environments are abstract, and typically are not comprehendible by the dreamer. Surreal perceptual environments occur very rarely in nonlucid dreams (Hall and Van de Castle, 1966), although Hunt (1989) has discussed them in the context of activated dreams. A clear distinction should be drawn between surreal environments and bizarreness perceived in typical environments. Some forms of hypnagogic imagery and psychedelic drug-induced hallucinations (e.g. described in Mavromatis, 1987, and Aaronson and Osmond, 1970, respectively) resemble surreal perceptual environments, but in lucid dreams, there is a definite sense of somatic immersion in the environment. The following are examples of surreal perceptual environments; the lucid dreamer's lack of comprehension of his perceptions are apparent:

(DJD75) "But I managed to turn around and what I saw was unbelievable and utterly amazing. I don't even really know how to describe it! When, after great effort, I turned myself around, I was no longer seeing the forest. Instead I was looking onto this unbelievable colored field and there were three spheres ahead of me and they had something that looked like butterflies dancing in each of them. But they were not butterflies, though they looked a little like them. Whatever they were, there was one each inside of the three spheres and these "butterflies" were spinning and rotating within the sphere and constantly changing color. The way they changed color was strange, it was as if colors were welling into them from somewhere I could not see, like a liquid, and flowing around inside of these butterfly creatures. I was both awed and confused; confused that the forest was gone, and confused at what I was looking at, awed because whatever I was looking at was very, very beautiful."

(DJD70) "I got the idea to shut my eyes, spin around rapidly, and pretend that I was shrinking. When I did this and opened my eyes up I was quite surprised to see that I was actually somewhere else! And what I saw when I opened my eyes was amazing. I was in the midst of a spectacular panorama of swirling activity and spiraling colors. The scene was staggering in its complexity. I was floating amongst the images, floating surrounded by these moving color patterns. I remember that I was amazed, but baffled, and didn't understand in the least what I was looking at, other than that it was very beautiful and moving around too much to make out any definite structure."

What these surreal perceptions represent is currently unknown. It is intriguing, however, to speculate that lucid dreamers perceiving such imagery may be in fact perceiving the lower level neurological processes that underlie normal conscious sensory perceptions, as has been suggested for LSD-induced hallucinations (Mavromatis, 1983).

3. Minimal Perceptual Environments

Minimal perceptual environments are characterized by immersion in an environment containing a minimum of sensory perception. Again, these appear to occur frequently in lucid dreams, but rarely in nonlucid dreams. This is a relatively neglected area in the literature with the exception of Gillespie (1988), who has experimented extensively with deliberately eliminating sensory content from his lucid dreams.

It is not uncommon for lucid dreamers to involuntarily "fade" from a lucid dream to the waking state with no break in consciousness (LaBerge, DeGracia, et al., 1998). Prior to and during the fading process, lucid dreamers perceive their sensorium as "unstable". In general, lucid dreamers learn to perceive their sensorium as more or less stable; this is a

perception with no counterpart during waking. When a lucid dream is "stable", all perceptions of the dream environment appear normal. When a lucid dream is "unstable", there may be a "blinking on and off" of the visual field, as if one is phasing in and out of blindness. The visual field may also become cartoon-like or pale in color. Somatic sensations may feel as if they are fading in and out. Although the basis of this fading process is not currently understood, techniques exist to stabilize one's sensorium in the event that it is perceived to be fading (LaBerge, DeGracia, *et al.*, 1998). The degree to which lucid dreamers experience instability events seems to be quite variable both between and within subjects. We know of no waking counterparts for the perception and sensations associated with fading and stability. These are wholly experienced and learned in the lucid dream state. Even in nonlucid dreams the experience of fading appears confined to the transition to waking. However, in lucid dreams, variations in one's "stability" can occur at any time during a lucid dream, for a greater or lesser duration.

Minimal perceptual environments are related to perceptions of fading and stability. Some individual lucid dreamers do not awaken when they experience a complete loss of stability and fade from their lucid dreams. Instead they find themselves in minimal perceptual environments. Minimal perceptual environments are characterized by a loss of the rich sensory modalities typical of dreaming; such experiences may be perceived by the lucid dreamer as being in a "void" or in "darkness". However, lucidity is preserved; internal speech, affect and cognitive function remain intact within this minimal environment. Some sensory modalities are also preserved; kinesthetic sensations may be present (so that the subject seems to be "moving") although somesthetic sensations (sense of body image) typically are absent. There are perceptions of visual depth (e.g. the "darkness" has a sense of depth and size to it), but typically not visual perceptions of color or form. The "darkness" can sometimes appear to have visual motion; it may "swirl" or "bellow".

Because some lucid dreamers can undergo a loss of stability and appear in a minimal perceptual environment instead of awakening, it is possible for a lucid dream experience to consist of a string of lucid dreams occurring in typical or surreal environments punctuated by minimal environments (a multi-part lucid dream). That is, the lucid dreamer will be in a typical lucid dream, lose stability and fade from the dream into a minimal environment. Techniques similar to those used to prevent lucid dream fading, such as spinning in place or inducing somatic sensations, can also be used to cause a sensorium to re-form around the lucid dreamer, giving rise to the second lucid dream. The second lucid dream environment may or may not be the same as the first. The cycle can then repeat. It is possible for a single lucid dream session to consist of perhaps six or more lucid dreams in typical or surreal environments punctuated by fadings or minimal experiences.

The following are accounts of minimal sensory environments from the authors' records.

(DJD16) "Found myself in the void. My mind was wandering in all kinds of thoughts. Then I noticed that I could 'leave' my body. I flew off through the void. Everything was dark, kind of somber, and I didn't have a body. I had the desire to be somewhere. Soon a large, what appeared to be wooden fort appeared in the mist. It was still quite dark but I could 'see' now."

(DJD31b) "Though I was in the void, I was still being pulled along by this mysterious wind force. As I was being pulled along, a very beautiful rainbow colored sphere came rolling past me and it was very clear and well defined in appearance. I was very surprised because this is the first time I had ever actually seen an object in the void and I began to wonder what was going on. I quickly noticed that I was surrounded by subtle arrays of colored patterns. It was very subtle because the darkness of the void seemed to be covering over these color patterns, the patterns seemed to be behind the darkness. The colors and patterns were very intricate and I have no words to describe what I was seeing."

(DJD61) "In my imagination, I imagined flying off, but got pulled back again. This happened twice. Then, I dove off my bed straight downwards. I was moving straight downwards in the

void. Far below me in the darkness I saw a square floating. In the square I could see colors, like a scene was inside the square. I stretched to grab this square and my arms stretched far below me like Plastic Man, and I grabbed the floating square. I pulled it up over me like putting on a pair of pants, and was thinking to myself, 'I'm not gonna let this one go!' I stepped into this square and was all of a sudden somewhere! I was very surprised. I was in what looked like a high school hallway standing in line with people going into a room."

(SLB56) "...I am looking at the image of an instruction book for a vacuum cleaner or some such appliance, knowing that I am asleep. As I focus on the writing the image stabilizes (and I have a sensation of opening my eyes) and I am able to read some but it is not interesting to me. Then my hands appear and I am looking at this piece of paper in bed. I think I ought to do the eye movements and so I follow my finger up, then down (I am very aware of the muscle strain in my arm and wrist, and feel the need to urinate). Then the dream fades."

It is of interest to note that the lucid dreamer can "fade out" from both typical and surreal environments into minimal environments, and conversely, can "materialize" out of a minimal environment into typical or surreal environments (as DJD61). As (DJD31b) indicates, the dreamer perceived "the darkness of the void seemed to be covering over these color patterns, the patterns seemed to be behind the darkness". It is almost as if the lucid dreamer's sensorium is tuning in and out of stable patterns of perceptions, akin to tuning a radio to a radio station. The following journal entry illustrates clearly how surreal and minimal environments can fuse, and fade into typical environments. This example suggests that clues to understanding sensory consciousness may be found in the phenomenology of lucid dream perceptions:

(DJD64) "I seemed to now be floating in the void. However, there were what seemed to be colored triangles moving around, crossing and spinning over one another making distinctly geometric patterns in front of me. The colors were mainly a yellowish green with red, orange and pink hues and they had the texture of clear and smoky, but smooth glass. 'This is a weird view of the void,' I thought to myself. I stared at these patterns wondering what the hell I was looking at. I began to focus harder and harder on these patterns, trying to discern some detail in them. Then, as I was focusing, the most incredible thing happened. I watched these patterns 'solidify' and transform into the scene on the dance floor of the club I had just faded from. The spinning triangles were actually the dancing people in the club! I was amazed. I relaxed my focus and the scene faded back to the spinning triangles. I was thinking, 'Wow! This is amazing!' I tightened my focus again and the triangles again transformed into the dancers on the dance floor. This time I tightened my focus so much that the entire bar scene faded in around me! I was back in the bar again!"

What minimal lucid dream environments correspond to in physiological terms is unknown. It is tempting to speculate that minimal, surreal and typical perceptual environments correspond with lesser to greater degrees of brain activation, respectively, during REM sleep. Minimal environments superficially resemble the "thought-like" character of non-REM subjective experience (Hobson, 1988). However, given the fact that it is more or less easy to re-establish a typical or surreal environment from a minimal environment, the minimal environment may correlate with tonic REM. The time after REM onset may also be an important variable affecting perceptual qualities of lucid dreams. The interrelated phenomena of stability, fading, and minimal perceptual environments during lucid dreams has interesting implications for our understanding of conscious processes. Clearly, in these experiences, higher level cognitive functions of consciousness continue to operate in the relative absence of conscious sensory modalities. We are observing in these phenomena some type of dissociation, or perhaps lack of binding, of the contents of consciousness. Psychophysiological characterization of this phenomena would be of great interest.

No previous studies have presented data regarding the frequency with which lucid dreamers as a population or individual lucid dreamers experience the three perceptual environments we have identified here. Published dream reports indicate that typical environments predominate lucid dreamers' perceptions, although we have encountered cases where this

is not true for single individuals, and it seems likely that individuals will have characteristic distributions of environment type. For example, 52%, 96%, and 17% of DJD's lucid dreams had at least one scene with minimal, normal, and surreal environments, respectively; the figures for SLB are 16%, 92%, and 5%. Although the great majority of both authors' lucid dreams take place in normal environments, DJD's were significantly more likely to have minimal and surreal environments as well. The differences in frequency are even more striking if we consider the extreme case of minimal environments, the void, without any content at all; DJD, 32% vs. SLB, 3%.

4. Perceptual Variation in Specific Sensory Modalities

Within the context of one of the three varieties of perceptual environment just reviewed, the specific contents of consciousness in different sensory modalities can vary from the normal to the bizarre. Thus, for example, a particular lucid dream may take place in an environment that is almost entirely normal, with the exception of a single element of the sensory array. Or everything may appear perfectly normal if considered individually, but quite anomalous when considered in context. For example, van Eeden (1913) describes experimenting with breaking a claret-glass in a lucid dream: "It broke all right, but a little too late, like an actor who misses his cue. This gave me a very curious impression of being in a fake-world, cleverly imitated, but with small failures."

The factors affecting the variations in lucid dream perceptual bizarreness and their frequency of occurrence have yet to be investigated. Here we will very briefly review some of the variations in perceptual experience and bizarreness in several sensory modalities.

a. Vision

Although the visual contents of most lucid dreams seem quite normal, there are some aspects of the visual experience that do not operate in the same way as in waking perception. For example, the Marquis de Saint-Denys observed that he was often unable to alter the level of illumination in his lucid dreams (see LaBerge, 1985), an effect termed the "Light-Switch" phenomenon by Hearne (1987).

(SLB1029) "...[in a lucid dream] I remember the light task and look around for a switch. I find a table lamp and flick it's switch on: it dimly illuminates. I switch it off and it goes off. I try willing it to light, focussing my willpower on the bulb, but no luck. Then I try another lamp, a halogen desk lamp. I turn the on knob and it dimly lights (about as bright as in waking imagination). Twist off and off it goes. Magical will power has no effect, again.."

Visual bizarreness in the geometry of the dream environment (allocentric space) is described clearly by lucid dreamers, as the following two examples illustrate:

(DJD20) "It didn't strike me at the time, but what was weird was how the ghoul was positioned in my backyard and the angle I was viewing him from out my window. He was standing at the corner of my room on the outside, with its side facing in my direction and its front facing towards the street and its back facing into the backyard. What I didn't realize until I woke up and wrote this is that there is no way I could see someone if they were standing in this position physically. After waking, I tried to look out my window from where I was standing in my room in the lucid dream, and you simply can't see that corner of the house. I had to put my face right up to the window and turn my head to see that position from my window. But in the lucid dream I could see that position perfectly standing back a few feet from the window."

(DJD43) "I looked up at the ceiling and got a nice visual surprise. The hallway seemed to repeat itself upward and curving out of sight, like the effect of two mirrors up against each other, except there were no mirrors."

The visual texture of objects is highly variable in lucid dreams. Scenes can take on appearances ranging from highly realistic to "cartoon-like". Lucid dreamers frequently report that dream objects appear to be "glowing" as if self-illuminated. The visual texture of whole dream environments can take on drastically different appearances in lucid dreams, usually accompanied by distinctive affect, as the following examples indicate:

(DJD76) "Standing on the lawn I saw a white picket fence running up the walk to the front door. Across the street was a lake and beyond the lake an amazing horizon of sun and colors. Everything seemed to have a pinkish red tint to it. The colors were like soft delicate pastels. A warm breeze was blowing. My movements were like slow motion as I walked through the front yard (not the slow motion kind of movement that makes it difficult to move, but a slow motion in the sense of being very dream like). My thoughts seemed very removed from my situation. The whole thing seemed to be beautifully unreal…."

(SLB355) "…I find myself on a street (not at first aware that I'm dreaming). Then after a few seconds I realize that I am dreaming again. I fly up into the warm air towards the sun. But it always seems out of reach. I fly over mountains and then the sea and, as I continue to try for the sun, weird volcanic-organic forms sprout up from the ocean. Gradually this bizarre fractal-coral creature's transformations dominates the scene and the sun is above my field of vision. I find myself sinking into the water. I no longer seem to be able to fly and feel continuously more constrained by the dream…."

As in nonlucid dreams, visual aspects of dream characters, objects and environments in lucid dreams can transform visual appearance. In some cases, the effect of such transformations is similar to the familiar morphing process popular in computer graphics (DJD61), in other cases, the transformation is more abrupt, a discontinuity (DJD18). Often, discontinuities of perceptual environments involve a change in the visual setting of the dream contrary to the dreamer's expectation (DJD18):

(DJD61) "...I was glad to have gotten her attention. But then I noticed as I was staring at her face, that her features kept shifting from that of an old lady to that of a beautiful young woman."

(DJD18) "Through the window I saw that it was raining outside. I desired to experience this astral rain. I tried to pass through the wall to get outside but I couldn't. The window was open, but there was a screen blocking my way. I tried to open the screen but couldn't, so I decided to tear the window out. I smashed through it but the hole was too small to crawl through, so I tore away the wall around the window. But the hole was still too small to pass through! So I tore down the whole kitchen wall! Now the hole was big enough to climb through and I jumped through it. But I wasn't outside! Instead, I was in a strange and unfamiliar hallway. I turned around and the kitchen with the hole in the wall was gone! I was in some kind of hallway that looked like an apartment building."

Lucid dreamers report that reading, and especially re-reading, of text in lucid dreams can present challenges. Here is Oliver Fox's description: "…reading [in lucid dreams] is a very difficult matter. The print seems clear enough until one tries to read it: then the letters become blurred or run together, or fade away, or change to others" (1962, pg.46). If comprehended initially, the text, upon rereading, can change in either form, lexical structure, semantic structure, or based on rhyme and alliteration (LaBerge, 1996). Here are some examples:

(DJD53) "I saw a bulletin board and went and tried to read it. I managed to read, with great difficulty, one line of what looked like a flyer announcing a party. I tried to reread the line so as to memorize it, but it now read something completely different. Familiar with this kind of thing, I gave up trying to read."

(DJD13) "I noticed a sign in front of a building and got the idea to go try to read it... The sign was on some steps leading into a building and I got the sense that it was some kind of

official sign. I tried to read it but had a very difficult time. I could not get it into focus that easily. All I could make out were the letters 'OR', which for some reason I interpreted to mean Oregon, and, with difficulty I read the statement 'Cheyan Country'. At that moment I thought to myself 'This sign is senseless.' I gave up my attempt to read the sign and walked back down the steps somewhat shaken up."

There are other occasions in which lucid dreamers read dream material that is coherent and even especially meaningful as in the following example:

(SLB592) "Exploring around a grand old hotel that for some reason I take to be 'Freud's Hotel'. Fully lucid, I find a piece of paper that appears at first to be a prescription, but upon closer inspection now seems the will or legacy of Anna Freud. On the paper I read the words:

TO DUST, WE MUST;
TO LIGHT, WE MIGHT."

Variations in dream reading presumably occur because the brain creates dreamed text without any external source of visual information, resulting in unstable perceptions of dream text. The relative roles of individual differences versus expectation in the variations of dream reading has yet to be determined.

b. Audition

Sound may be experienced during WILDs, in the transition from waking to sleep, in the form of cracking, hissing, twinkling, or similar sounds, sometimes reported as "haunted house" sounds. These are auditory forms of hypnagogia. Lucid dreamers have reported hearing songs during lucid dreams, as if a radio was playing, when in fact, there was no other source of the perception of music using other modalities. Subjects experiencing sleep paralysis have reported hearing voices, sometimes of a threatening or terrifying nature, reminiscent of the auditory hallucinations of schizophrenics. Lucid dreamers also frequently experience playing music:

(SLB270) "In a 'high-school dream' that has become lucid, I walk up to the teacher who is demonstrating something on the piano as if I am an expected guest artist and sit down to play. I think of playing something from a book, but find that my vision is too weak. So I improvise a Fantasy in F#m, starting out prosaically enough, but building up gradually to a terrific climax. The dream fades with the last chord…."

There are infrequent reports reminiscent of fluent aphasia by lucid dreamers.

(DJD76) "He said something about getting into a fight with his Dad. I asked him where he was from and he said 'the Land-O-Lakes, from Idaho.' I asked for his address but he mumbled nonsense. He told me his name but I can't remember it now."

However, reports containing aphasic qualities are rare, and even in (DJD76) word comprehension was mixed with incomprehension. Generally, auditory conversation with dream characters is marked by lexical, syntactical and pragmatic accuracy (Meier, 1993).

c. Somatosensation

There is strong variability in somatosensation during lucid dreams. Variations in somatosensation are prevalent during initiation of WILDs where, during the transition from waking to lucid dreaming, the person may experience any of the following somatic sensations: vibrations, tingles, waves of warmth, a sense of melting, floating, peeling, flipping over, flopping, slipping, and sinking. Once in a lucid dream, there may be variations in perceptions of a body image, ranging from being a disembodied point or freely

moving center of awareness (but still immersed in the perceptual environment), to perceiving in full detail that one is in a body and fully immersed in one of the varieties of perceptual environments. Autoscopy is reported in which the lucid dreamer may see his or her body as if looking at it from the outside. All of these variations in somatosensation have been proposed, at one time or another, as criteria to distinguish out-of-body experiences from lucid dreams (e.g. Gabbard and Twemlow, 1984; Irwin, 1988). There is little justification for this distinction (Levitan and LaBerge, 1991) and it seems most reasonable to simply recognize that there is a wide variability of somatic sensations associated with lucid dreaming. Some of these embodiments can seem very strange indeed as in the following two cases:

(SLB308) "I have been telling an improvised version of the story of *Fatima the Spinner and the Tent*. Through a forgotten transition, my awareness has come to rest within a collection of porcelain plates and china. Queen Fatima is walking through the gallery and I begin to communicate with her by rattling my plates. All the while I am fully aware that I'm dreaming. The courtiers try to stop the rattling, believing an earthquake to be taking place…Then I believe I have awakened during-an earthquake! I find the apparent incorporation of the earthquake in my dream interesting until I actually awaken a few moments later."

(SLB880) "After lying on my back for a long while, still seemingly awake, I suddenly feel as if I've turned into a bluish gas: actually a cloud of coarse blue spheres in the general form of my body that floats above the bed…"

Tholey (1988) describes a very interesting phenomenon in which the lucid dreamer's "ego" leaves his dream body and "enters into another dreamer figure". The result can be a more complete degree of interpersonal understanding than usually results from such techniques as dialoguing with dream figures. Tholey reports that it is also possible to "slip into different dream figures, one after the other, during lucid dreaming, *and* to conduct a dialogue with a dream figure that one has left with the ego consciousness" (p. 284).

A particular kinesthetic sensation is reported by lucid dreamers but not nonlucid dreamers: this is a sensation of being uncontrollably dragged or whisked along by a "force", sometimes described as a "strong wind", which carries the lucid dreamer through the dream environment:

(DJD31a) "I floated up through the roof to the outside. Suddenly, I lost my ability to fly, and I began to be pulled along by a strong force, that was like a strong wind gust. This force pulled me violently towards the house next door and I shut my eyes in fright, fearing that I was going to smash into the wall. But then, I just passed smoothly through the wall as the wind force continued to pull me along. I had a momentary glimpse of the inside of the house before I was pulled up through the roof of this house."

Hobson and coworkers have suggested a motor-control theory of dreams in which PGO-initiated stimulation of vestibular and motor pathways generates dreamed motion in a random fashion (Hobson, 1988). Such phasic REM events are a potential explanation of the uncontrolled kinesthesia experienced in lucid dreams described here. However, lucid dreamers, to our knowledge, do *not* report autonomic sensations associated with vestibular activation in lucid dreams. For example, spinning is quite common for lucid dreamers (used as a technique to stabilize the dream sensorium) but this does not typically produce sensations of vertigo. Thus, it may be that vestibular pathways do not directly affect dream consciousness, and somatic sensations are generated at the level of sensorimotor cortex.

Sleep paralysis is commonly reported both by nonlucid and lucid dreamers. Sleep paralysis involves the intrusion of peripheral somatosensory input associated with REM atonia into the dreamer's consciousness. Closely related to sleep paralysis is the commonly reported feature of the difficulty of moving or talking in dreams, often when the dreamer is subject

to a threat. This feature is also reported by lucid dreamers, and again suggests intrusion of peripheral somatosensory afferent information into dream consciousness.

d. Other senses

Lucid dreams can contain content in every sensory modality, including temperature, pain, olfaction, and gustation. Most of these modalities are somewhat rare in lucid dreams, just as they are rare in waking life; but all are possible. Here is an example from van Eeden (1913):

On Sept. 9, 1904, I dreamt that I stood at a table before a window. On the table were different objects. I was perfectly well aware that I was dreaming and I considered what sorts of experiments I could make. … Then I saw a decanter with claret and tasted it, and noted with perfect clearness of mind: "Well, we can also have voluntary impressions of taste in this dream-world; this has quite the taste of wine."

According to folk-lore, a dream pinch is supposed to be painless. LaBerge and Levitan (1998) tested this idea by asking lucid dreamers to induce several somatosensory experiences (pain, pressure and light touch) through dream actions and then awaken and rate the results on a seven-point scale for intensity, discomfort, and pleasure. The same procedure was also followed in waking and in imagination. The results showed a notable deficiency in the reproducibility of the conscious experience of pain on demand in lucid dreams (mean discomfort 1.5 in dreams vs. 3.9 in waking; $p<.05$). The subjects had much better success at eliciting lucid dream sensations of pressure (means of 2.9 in dreams, 3.7 in waking) and light touch (mean=3.2 in dreams, 3.0 in waking). These findings suggest that, while some sensory experiences are well modeled by the brain in the absence of primary sensory input, pain may be a special case. To experience convincing realistic pain in dreams, the brain may require some peripheral somatosensory input that may be interpreted as pain. Lest this study be misunderstood to suggest that one cannot experience pain in dreams, here is the testimony of one of the subjects to the contrary:

(C. S.) However, as soon as I knew I was dreaming, I remembered the experiment... so I stopped and pinched my left forearm with my right hand. At first, I didn't feel anything but the touch. So, I pinched myself as hard as possible. The pain was so extreme that I yelled out "Oh my God!" … the sensation of pain [was] so severe … that I woke up.

On the other hand, the finding that it is easier to experience pleasure than pain in dreams is an intriguing result demanding explanation, and in any case, good news for lucid dreamers.

C. Emotions

Emotion in lucid dreams, while generally positive or relatively neutral, can vary over the entire range of human emotions from agony (mitigated by the realization that "it is only a dream") to the unmitigated ecstasy of sexual or religious bliss. The realization that one is dreaming is frequently accompanied by an unmistakable sense of excitement and delight. For Rapport (1948), the emergence of lucidity "instantly" transformed his dream into "an incommunicably beautiful vision." Fox (1962), described the onset of his first experience of lucidity: "instantly, the vividness of life increased a hundredfold...never had I felt so absolutely well, so clear brained, so divinely powerful, so inexpressibly *free*!" Not surprisingly, the emotions felt in lucid dreams often carry over into the waking state as in the following example:

(SLB1027) I had somehow gotten myself out on a limb as it were: at the end of a girder high above the street below. I was trying to choose between walking or crawling. Both seemed too risky and I looked around for other alternatives. I observe that behind me is another way I can escape. I climb off the end of the girder onto another ledge and start to work my way through cobwebs in another passageway. I believe I was partially lucid during this

because I have a false awakening in which I am telling someone about the preceding dream. I describe letting go of my mental set of going back on the beam the way I came. At the words "letting go" I realize that I'm dreaming again and that the real solution is to trust and *let go*. As I do so, leaping into the beautiful sunrise sky, I am overwhelmed with feeling and awaken with tears of joy.

Emotional arousal, whether associated with the excitement of lucidity onset or for any other reason, presents lucid dreamers with a problem: Experience of strong emotion within a lucid dream may increase sensations of instability and lead to fading from the lucid dream. Thus, prolonging the lucid dream state requires a degree of emotional control. According to Celia Green (1968: 99), "Habitual lucid dreamers almost unanimously stress the importance of emotional detachment in prolonging the experience and retaining a high degree of lucidity."

A second problem of emotional involvement is that the lucid dreamer's consciousness may be reabsorbed by the dream, and as the lucid dreamer becomes emotionally absorbed, re-identify with the dream role. This amounts to a displacement of the lucid dream context by a nonlucid dream context. This is a problem more often encountered by beginners than experienced lucid dreamers, and through practice and experience, one can learn to maintain lucidity in spite of intense and emotional involvement with the dream.

D. Cognitive Functions

Characterizing variations in cognition during lucid dreaming is both subtle and complex. Not only can variations in cognition occur amongst lucid dreamers, cognition can also vary for a single individual from lucid dream to lucid dream, or within the same lucid dream. Because lucid dreaming is a cumulative skill modified by experience and practice, this means there will always be at least some degree of continuous variation underlying the cognition of lucid dreamers, reflecting changes in the psychological development of that individual both with respect to lucid dreaming, and in general. Nonetheless, variations in cognition within lucid dreaming can be due to other factors including the subject's semantic framework and contextual competition, affecting in particular memory access and thinking.

1. Variations in Memory

Access to memories of waking experience can vary, in spite of the lucid dreamer's intention to access those memories. For example, a lucid dreamer may be unable to recall one's phone number, or the date, or even one's name, in a given lucid dream, although such memories may have been accessed in other lucid dreams. On the other hand, sleep laboratory subjects can remember to perform complex tasks during lucid dreams, tasks which had been previously planned and/or rehearsed during waking. Thus, variations in voluntary access to waking memory may be partly due to intrinsic factors, such as the degree of cortical activation in a given lucid dream or the degree of competition from elements outside the lucid dream context, and partly due to prior preparation and priming of memory.

Levitan and LaBerge (1993) tested memory for four different tasks in a group of 20 lucid dreamers. The tasks and percent of successful recall were: where one is sleeping (95%), the current date (94%), and arbitrary word learned before bed (100%), and a fact that one could not remember previously while awake despite multiple efforts (19%).

2. Variations in Thinking

The thoughts, conceptions, metacognitive reflections and expectations of lucid dreamers are strongly conditioned by the dreamers' semantic framework. Within a given semantic framework, the quality of lucid dreamers' thinking tends to be consistent. However, the use of different semantic frameworks results in more or less accurate conceptions of the lucid dream experience. For example, lucid dreamers who conceptualize their lucid dreams

as out-of-body experiences (OBEs) may tend to confuse physical and dream objects, and may operate under the assumption that what they perceive in their lucid dreams corresponds to physical reality (LaBerge, 1985). People who conceive of their lucid dreams as astral projections may come to similarly flawed conclusions. Within the astral projection lore, it is commonly taught that characters encountered during astral projections are the souls of the deceased (Leadbeater, 1895, Fox, 1962, Monroe, 1985). Thus, the astral projector may act as if dream characters are "real" and not mental representations. These examples illustrate that what could be mistakenly taken for a flaw in thinking during a lucid dream is not necessarily a defect in thought per se, but a consequence of the lucid dreamer operating in a specific semantic framework. In such cases, it is the semantic framework that is flawed, not the dreamer's ability to think or reason. Because of the tremendous perceptual diversity of lucid dreams, the variations on this theme are boundless. Considerations of an individual's semantic framework also apply to near-death experiences (NDEs), which have phenomenological overlap with lucid dreams. NDEs are characterized by autoscopy, lucidity, and surreal perceptual environments such as the experiences of perceiving white light, or moving through a tunnel (Greyson, 1993). NDEs are often interpreted in a religious context as proof of life after death (Reader, 1995). Again, the emphasis here is that individuals' semantic frameworks will affect their interpretation of events and behavior in lucid dreams and phenomenologically similar states.

The semantic frameworks used by individuals is not confined to their lucid dream experiences but also has consequences for their waking life. Because lucid dreams are not widely understood in our society, and because of the variety of semantic frameworks available, some peoples' responses to their lucid dream experiences may alter the course of their waking lives. Furthermore, these individuals can influence the beliefs of others and thereby replicate their semantic framework within the wider culture. The elaboration of these notions involves the study of biographies of individuals who have undergone lucid dreaming but interpreted these as something else. This topic is beyond the scope of this chapter, but the interested reader can find sources illustrating these points (e.g. Lutyens, 1975; Monroe, 1985; Tillett, 1982).

On the other hand, lucid dreamers can display alterations in thinking that are not in any obvious way the direct result of operating under a specific semantic framework (Barrett, 1992; Levitan, 1994). These alterations in thinking resemble minor lapses in rationality, unclear thinking, and drawing absurd conclusions. Several factors can account for these belief-independent variations in thinking: (1) the lucid dreamer's degree of experience is such that the lucid dreamer has not yet learned what is and is not appropriate behavior in a given dreamed circumstance, (2) competition from nonlucid dream contexts provided distractions that absorb the dreamer into a dream narrative, and influence the dreamer's thought processes toward this narrative, and (3) variations in brain activity during the course of the lucid dream could alter the performance of higher level cognitive tasks such as comprehending situations and formulating responses.

There is sometimes no obvious difference between belief-dependent and belief-independent variations in thinking when viewing isolated dream reports. Ascertaining these requires knowing a lucid dreamer's semantic framework and taking this into account when judging the quality of the thinking reported during lucid dreams.

E. Volition and Action

There is more voluntary choice available to lucid dreamers than to nonlucid dreamers. The experienced lucid dreamer seems capable of exercising at least as much free choice while dreaming as waking. However, waking volition is constrained by general knowledge and past experience. Likewise, volition during lucid dreams is constrained by the dreamer's semantic framework and past lucid dream experience. These factors together define to the lucid dreamer what is and is not possible, and therefore, what voluntary choices are available. The set of these possible choices are contained in the lucid dreamer's goal-options context.

The actions of lucid dreamers vary from simple to complex. A lucid dreamer's actions may be *reflexive*, as when walking in a lucid dream without losing balance. Others are *instinctive*, such as attempting to avoid threatening situations. Still others are *habitual*, such as speaking or driving a car or performing other procedural tasks in a dream. Finally, some of the actions are *deliberate* and based on volitional choice. Volitional actions are initiated by the lucid dreamer for any number of reasons: curiosity, desire, etc.

The actions of lucid dreamers are not constrained by the real world either physically or socially. Hence, lucid dreamers routinely fly, pass through walls or perform other actions impossible in the physical world as the following passage indicates:

(DJD54) "I stared up at the big window before me and there was nothing on it indicating that I could open it. So then I did a very interesting trick to get out through the window. I stared at the window and "bent" my perspective on the window so that there was now a gap between the window and the wall that was large enough for me to climb through. I hovered up out of the chair, ignoring the nurse, and pulled myself through the opening I had just created. I was wiggling through the hole wondering what the nurse and other people in the room were thinking."

Lucid dreamers can also freely violate social mores, and behave in highly uninhibited fashions. This can provide a form of therapy to lucid dreamers in terms of overcoming anxiety, recognizing habitual patterns of social interaction, and developing self-knowledge, as well as simply providing a form of pleasure and entertainment (LaBerge and Rheingold, 1990).

The characterization of the actions of lucid dreamers is subsumed under the notion of "dream control". A distinction can be drawn between two kinds of dream control (LaBerge, 1985). One type involves magical manipulation of the dream environment or of dream characters other than the dream actor. The manipulation of the window in (DJD54) is an example of magical manipulation of the dream environment. The other kind of control open to lucid dreamers is *self*-control, exercised over one's own actions and reactions to events occurring in the lucid dream.

Contrary to some descriptions of lucid dreaming, lucid dreamers typically do not have complete volitional control over their lucid dreams. The most important factor in this regard is that lucid dreamers do not necessarily have control over the perceptual environment in which they find themselves. Like nonlucid dreams, lucid dreamers often find themselves in novel and completely unfamiliar environments which they had no intentional control over creating. This is particularly true of surreal lucid dream environments; here lucid dreamers often cannot even comprehend what they are experiencing (as in DJD75 and DJD70 above). Likewise, lucid dreamers do not intentionally desire to appear in minimal sensory environments, and often have no control over this happening. Thus, lucid dreaming is less like a fantasy experience and more like an exploratory experience.

There are also limits to the actions of lucid dreamers, particularly with respect to magical manipulations. For example, the attempt to fly during any given lucid dream may be met with varying degrees of success. The lucid dreamer may fly readily, merely hover, or not be able to fly at all. Likewise, a lucid dreamer may not always be able to pass through walls (as illustrated in DJD61). Thus, because the lucid dreamer may have performed such acts in previous lucid dreams, the inability to perform such an act will often be met with confusion. This variability in performance of actions from lucid dream to lucid dream appears to be belief-independent because, for example, a lucid dreamer may remember that he has flown before, and will expect to fly, but then cannot fly in the current lucid dream. It is reasonable to hypothesize that variations in performance of actions during lucid dreams reflects underlying variations in REM brain activity.

There are also situations where the dream environment itself imposes actions on the lucid dreamer completely outside the dreamer's intentions or expectations. We have presented examples of this in preceding sections: the need to maintain stability is perhaps the most general non-volitional action with which lucid dreamers are faced. Here, lucid dreamers must control their emotions, and often take steps to stabilize themselves (through spinning or other techniques) in order to prolong their lucid dreams. The kinesthesia experienced as being carried by a strong wind (DJD55 and DJD31a,b above) also occurs outside the will and intention of the lucid dreamer. Often, perceptual discontinuities, such as illustrated in (DJD61) will occur in spite of the lucid dreamer's intention and are often met with surprise by the lucid dreamer.

To suggest that the lucid dreamer "unconsciously" desires or wills experiences that are outside the dreamer's conscious intentions does not offer a credible explanation of these forms of lucid dream variability. It would appear that events and actions occurring in lucid dreams are a combination of: (1) those intentionally generated by the lucid dreamer, limited by the dreamer's experience and knowledge and (2) those generated by the dream environment outside of the conscious knowledge and intention of the lucid dreamer.

With respect to unintended actions generated by the dream environment, these events and actions must in some way be related to the occurrence of physiological phenomena in the sleeping brain. This is clearly the case with sleep paralysis in which peripheral atonia intrudes into the dreamer's consciousness unintentionally. A second example, the sensation of being uncontrollably whisked along by a "wind force" may be a subjective correlate of localized miniature seizure activity in somatosensory cortex, which itself may be grounded in the random brainstem neurotransmission so actively advocated by Hobson and his followers as a basis for dream generation. Another example highly suggestive of the involvement of neurophysiological processes is when a lucid dreamer "fades" from a lucid dream: there is a relatively stereotyped loss of conscious sensory modalities (LaBerge, DeGracia, et al 1998). These fade in the order of vision followed by somatosensation and audition. This suggests a pattern of cortical deactivation from occipital cortex followed by a medial to lateral and caudal to rostral deactivation in the temporal and parietal cortices, respectively. Together, these examples indicate that unconscious brain physiology can intrude into the consciousness of lucid dreamers, forcing unintended actions on the lucid dreamer.

There are Tibetan traditions of lucid dreaming dating from the Ninth Century which claim that a person can achieve complete control of the dream environment (LaBerge, 1985); similar claims are commonplace in Western occult lore (e.g. Leadbeater, 1895). However, no one in the modern era has demonstrated this capability. It is perhaps reasonable, given the evidence at our disposal, to recognize that actions and events occurring in lucid dreams are due to a complex combination of psychological and neurological factors. This, of course, does not preclude testing the limits of possibility in lucid dreams. Indeed, teasing apart the relative roles of neurology and psychology in lucid dream experiences could provide significant insight into the workings of the mind and brain and further our understanding of the relationship between subjective experience and neurological events.

F. Termination of Lucid Dreams

Sooner or later, all things end, and lucid dreams are no exception. There are two general possibilities for terminating lucid dreams: lucidity is lost while the dream continues, or the lucid dream ends with an awakening. The first mode we have discussed above and involves displacement of the lucid dream context by a nonlucid dream context. Novice lucid dreamers are particularly susceptible to loss of lucidity and may need to explicitly remind themselves that they are dreaming (LaBerge & Rheingold, 1989). With experience, some lucid dreamers learn to maintain lucidity without any special effort (e.g., SLB; The percentage of lucid dreams in which lucidity was lost in years 1-3 respectively were 18%, 1%, and 0.4% for SLB, and 17%, 21%, and 40% for DGD, and, a significantly different pattern).

For more experienced lucid dreamers, lucid dreams are more likely to terminate by awakening than by loss of lucidity. Termination by awakening typically involves the "fading out" sensations discussed above. Ordinarily there is a high degree of continuity of consciousness during this transition. In contrast, there is usually a moment of confusion when dreamers wake from a nonlucid dream, as they make the transition from the nonlucid dreamer to the waking self.

There are two other possible ways in which lucid dreams can come to an end. In one case, the lucid dreamer enters non-REM sleep and ceases dreaming. Typically, if awakened at this point, the dreamer would recall nothing. In the other case, lucidity is lost, and REM sleep continues, with the person *dreaming* that he or she has awakened. These dreams are usually called "false awakenings" (Green, 1968) and are very commonly reported concomitants of lucid dreams. Sometimes, false awakenings occur repeatedly with the lucid dreamer seeming to awake again and again only to discover each time that he or she is still dreaming. In some cases, lucid dreamers have reported enduring literally *dozens* of false awakenings before they finally wake up "for real". False awakenings tend to increase in frequency with experience in lucid dreaming. For example, here are the percentage of lucid dreams with false awakenings in years 1-3 respectively were 9%, 13%, and 24% for DGD, and 16%, 31%, and 39% for SLB. The reason for the increase frequency of false awakenings is probably that more experience with lucid dreams leads to the greater expectation that as a lucid dream is about to end that one is about to wake up. Thus the expectation of awakening leads to the dream content of the false awakening. Increased familiarity leads to increased likelihood of recognizing that one is dreaming during a false awakening. The percentage of false awakenings recognized in years 1-3 respectively were 4%, 8%, and 20% for DGD, and 0%, 3%, and 26% for SLB.

IV. Conclusions

Dream experience is innately complex and the waking personality can choose to explore this complexity with a greater or lesser degree of involvement. When there is more involvement of the waking self with one's dream life, one's dreams partake more of lucidity. When lucid dreams are explored, significant variation is discovered, and individual factors underlie a great deal of this variation. Much of the phenomenology we have described above is not understood in either psychological or neurological terms, but it offers intriguing glimpses into the processes underlying conscious experience, and the relationship between subjective experience and neurological processes. A deeper understanding of the variety of lucid dream perceptual environments may shed light on sensory representations in waking. An understanding of the effects of semantic structures on lucid dream experience underscores the role of belief in subjective perception and behavior. Finally, study of the unintentional aspects of lucid dream action may bring us closer to understanding the generation of dreams, and the relationship between subjective experience and neurological events. We hope this chapter will inspire more comprehensive research on the phenomenology of lucid dreaming experience.

Acknowledgements

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