chapter 13

Dreaming III: Dream Recall and Lucid Dreaming

Everything that we know about dreaming depends upon people's abilities to accurately recall and report their dreams when they awaken. Unfortunately, the usual problems of introspective reporting are magnified in research on dreaming. In many cases dreams are recalled only vaguely, or not at all. Theories of dreaming are only as good as the dream report data on which they are based. In this chapter I will discuss the problem of dream recall and forgetting in some detail, because it is central to all research on dreaming.

Perhaps you have had the experience of knowing that you are dreaming, while you are asleep and dreaming. This experience is called *lucid dreaming*. Lucid dreaming is the newest topic of systematic dream research. Most theories of dreaming have said nothing about lucid dreaming, in fact, lucid dreaming is contrary to most dreaming theories. But as we will see, not only can people learn to increase their frequency of lucid dreaming, but some people can learn to control the dream events, and some lucid dreamers have been able to make overt signals to researchers when certain dream events occur. Finally, at the end of the chapter I will make some general concluding comments on dreaming and its implications for consciousness.

DREAM RECALL AND FORGETTING

The question of how to define *dream recall failure* is a problem for research on dream recall (Goodenough 1978). When research subjects say that they do

not recall any dream, does it mean that they did not have a dream, or does it mean that they had a dream but forgot it? In practice, the usual assumption is that the mind is continuously active during sleep. Failure to report some sort of sleep mentation—dream or thought—is assumed to represent a failure of recall rather than a failure of occurrence. This practical assumption is made so we can get on with research on dream recall failure. Nonetheless, it is an unproven—and unprovable—assumption.

The major questions about dream recall are: Why are dreams harder to recall than waking experiences? Why are some dreams easier to recall than others? Why do some people recall dreams more frequently than other people do?

On the assumption that some sort of mental activity occurs almost continuously during sleep, four hypotheses have been suggested to explain forgetting of dreams and other sleep mentation: (1) interference with memory encoding; (2) low salience; (3) repression; and (4) physiological state change.

The Interference Hypothesis

David Cohen (1979a, 1979b) argued that the concept of interference can explain most instances of dream-recall failure. Interference occurs when two mental processes or events cannot occur at the same time, either because they are fundamentally incompatible with each other, or because together they would exceed the mind/brain system's limited information processing capacity. The effect of interference on waking memory has been thoroughly documented (see Ashcraft 1989; Klatzky 1980). Interference with dream storage and recall might occur at any of several stages (Cohen 1979a): (1) during dreaming, when incompatible processes can interfere with storing dreams in memory; (2) immediately after awakening, when events can interfere with maintaining dreams in short-term memory; (3) shortly after awakening, when events can interfere with mnemonic processes in STM for storing dreams in long-term memory; (4) at the time of attempted recall from LTM (due to absent or inappropriate retrieval cues); and (5) at the time of dream reporting, when language limitations or social factors might interfere with dream reporting, even though dream recall is adequate.

Foulkes (1985) supported the interference hypothesis of dream forgetting in his cognitive psychological theory of dreaming. He put the emphasis on interference with mnemonic processing during dreaming itself. Dream production is a process of activation and synthesis of memories, and it is incompatible with mnemonic process for storing new memories. Storing dreams in LTM requires a shift in information-processing mode, from synthesis to mnemonic processing, which occurs only after awakening.

The importance of interfering events after awakening was emphasized by Koulack and Goodenough (1976), who argued that the STM trace of a dream is very brief, and most dream recall involves retrieval from LTM. In order for a dream to be retrievable from LTM, it must be subjected to elaborative mnemonic processing (rehearsal, organization, chunking, recoding, association) in STM. Mnemonic processing is poor during sleep. Dream recall is best when people awaken during or immediately after a dream, while the dream is still in STM. The increased arousal level upon awakening en-

ables improved mnemonic processing in STM, thus improving subsequent retrieval of the dream from LTM. However, mnemonic processing of the dream upon awakening is not automatic—it requires thinking. And mnemonic processing is very sensitive to interference by distracting external or internal stimuli.[1]

Experimental test of the interference hypothesis. The interference hypothesis predicts that dream recall will be reduced when external stimuli or activities occur immediately after awakening and interfere with recall of the dream in STM and mnemonic processing in STM for storage in LTM. Cohen and Wolfe (1973) tested the hypothesis by asking college students to fill out a dream report form the next morning upon awakening. Half of the subjects (distraction group) were instructed that, immediately upon awakening, they should dial the weather-report telephone number and find out the temperature and write it at the top of the page, *before* completing the dream report. The control group was instructed to lie quietly in bed for about ninety seconds (the average amount of time taken by the distraction group to get the temperature) before completing the dream report. Thus, control subjects had an opportunity to think about their dreams for awhile before reporting them. The result was that dream or sleep mentation contents were reported by 63 percent of the control group subjects, compared to only 33 percent of the distraction group subjects.

The implication is that if you want to recall your dreams, it is critically important that you avoid distracting stimuli, thoughts, or activities upon awakening. Dream recall is facilitated by lying still in a quiet room and concentrating on recalling your dreams for a few minutes before starting to write in your dream diary. Individual differences in dream recall frequency could be explained at least partly in terms of differences in interference at the time of awakening.

Interference with dream reporting. Dream reports are a type of introspective verbal report, and they have the same limitations as other introspective reports (see Chapter 3). One limitation is the possibility of censorship by the subject.

Dream reporting is an interpersonal process, and it can be affected by the social relationships of the dreamer and the audience. This point was demonstrated in a study involving two subjects who were participating in a laboratory dream experiment during the same weeks in which they were undergoing psychotherapy (Whitman, Kramer, & Baldridge 1963). Sometimes the dreams reported to the laboratory technician at night were different from those reported to the therapist in the morning. The male subject reported dreams to the technician but withheld them from the therapist when the dreams reflected the patient's homosexual fears (for example, dreams of closeness to a man or being examined and penetrated by a man). But dreams reflecting the patient's heterosexual adequacy (such as helping a woman or dating women other than his wife) were reported to the therapist. The female subject reported to the technician, but not to the therapist, dreams reflecting her sexual concerns and doubts about the therapist's adequacy. Dreams criticizing the technician were reported to the therapist but not to

the technician. It appears that the subjects edited or suppressed their dream reports, depending upon the nature of the social relationship between themselves and the dream audience. In view of the potentially profound effects of social interactions on the accuracy of dream reports, this factor should receive more attention from experimenters than it has in the past.

The Salience Hypothesis

Salience refers to the degree to which objects or events "stand out" perceptually. Highly salient events attract and hold our attention, so we are more likely to remember them. Cohen (1979a) argued that salience also affects the recall of dreams:

> The salience hypothesis suggests that more intense, emotionally exciting, consciously vivid dreams will tend to be more readily recalled, that individuals with good waking imagery will tend to be better dream recallers, and that conditions that increase dream intensity (e.g. presleep distress, REM as opposed to NREM physiology) will more likely be associated with dream recall (p. 256).

The salience hypothesis is not incompatible with the interference hypothesis. Rather, salience explains why some dreams are recalled better than others. In a sense, more salient dreams are more resistant to interference, because they are more likely to attract and hold our attention, so we are more likely to think about them and give them the mnemonic processing that is necessary for LTM storage and retrieval.

Several laboratory experiments have tested the salience hypothesis, at least indirectly, by asking subjects in the morning to *re-recall* all of the dreams that they had reported during the night after REM awakenings. Although reporting dreams after REM awakenings undoubtedly tended to increase their subsequent recallability, subjects did not recall all of their night dream reports in the morning. The dreams that were best re-recalled were those that were highest in salience factors (such as vividness, emotionality, bizarreness, length) in the original reports (review by Goodenough 1978).

The salience hypothesis is also supported by experiments that influenced dream salience by manipulating presleep experiences or instructions. Cohen and Cox (1975) assigned subjects to either a negative (stressful) or a control presleep condition. The negative presleep condition, which was expected to enhance the salience of dreams, included ego-threatening events such as "failure" on a difficult IQ test, social isolation, and perfunctory, impersonal treatment by the experimenters. As predicted by the salience hypothesis, the frequency of morning dream recall (or re-recall) was greater in the negative treatment group (61 percent) than in the control group (38 percent). Both groups re-recalled a higher percentage of REM dreams than NREM dreams, a result that fits with the fact that REM dreams are usually more salient than NREM dreams.

Cohen (1979a) suggested that individual differences in dream-recall frequency may be related factors such as personality, psychopathology, and current life stresses that affect dream salience. Alternatively, these factors might affect the frequency of nighttime awakenings, thus affecting the number of awakenings directly from REM sleep when dream recall is best.

The Repression Hypothesis

Freud developed the repression concept as part of his psychoanalytic theory of personality and psychotherapy. *Repression* is a process that actively interferes with retrieval of objectionable material from long-term memory as a defense against the anxiety that would result if the material were to be retrieved into consciousness. Repressed material includes unacceptable unconscious wishes (sexual, aggressive) and traumatic memories. Freud (1900/1965) extended the repression concept to explain dream-recall failure. In his view, dream memories are normally repressed in order to prevent the anxiety that would occur if we were to recall them and see through their symbolism to comprehend their true meaning. Thus, dream-recall failure is normal, and successful dream recall represents a failure of the repression process, in Freud's view.

Psychoanalysts have claimed support for the repression hypothesis from their clinical case studies, which suggest that "dreams are often recalled at the moment when resistance to the dream content is lifted during the course of analysis" (Goodenough 1978). However, acceptance of this type of evidence depends upon prior acceptance psychoanalytic theory.

The repression hypothesis implies that dreams with the most anxiety-evoking content should be most repressed, and hence least recalled. Thus, the repression hypothesis makes a prediction directly opposed to that of the salience hypothesis. The evidence appears to be strongly against the repression hypothesis, insofar as highly salient dreams (such as highly emotional and bizarre dreams) are re-recalled better than more mundane dreams. Of course, we have no way of knowing the anxiety potential of never-recalled dreams. Furthermore, psychoanalysts argue that the anxiety potential of a dream's latent (hidden) content is more important than that of its manifest (surface) content. Thus, the controversial repression hypothesis is entangled with the controversial dream symbolism hypothesis, making an objective direct test of the repression hypothesis impossible.

Most attempts to test the repression hypothesis have been derived from the idea that repression is an ego defense mechanism that is used more by some people ("repressors") than others ("nonrepressors"). The prediction is that repressors will recall dreams less often than nonrepressors. The greatest difficulty in testing this prediction is in measuring the repressor personality trait. There is some evidence to support the prediction, but other evidence is inconsistent or has alternative interpretations (reviews by Cohen 1979a, 1979b; Goodenough 1978).

Another prediction derived from the repression hypothesis is more susceptible to experimental testing: that following a stressful presleep experience—one that might tend to produce unpleasant dreams—dream recall will be reduced compared to a nonstressful control treatment. Several studies have tested this prediction, with inconsistent, largely negative results. The contents of stressful films viewed before sleep are more likely than those of nonstressful films to be incorporated into dreams, a result that supports the salience hypothesis but not the repression hypothesis.

All in all, there is little experimental evidence for the repression hypothesis. Most of the results can be more parsimoniously explained in terms

of the salience or interference hypotheses. The main contribution of the repression hypothesis is to have pointed out a personality dimension (repressor vs. nonrepressor) that may be related to individual differences in dream recall.

The Physiological-State Hypothesis

The physiological state hypothesis is concerned with the question of why dreams are harder to recall than waking experiences. Of course, we should not exaggerate our ability to recall waking experiences. We forget most of our waking experiences, especially those that are relatively trivial, including most of our daydreams. Nonetheless, it is a common experience to awaken with the feeling that you have been dreaming, though you cannot recall what the dream was about, or you recall less of it than you would expect to recall of a waking experience that had occurred only a minute or so earlier.

There are two types of physiological-state hypotheses, in regard to dream-recall failures: (1) The *state dependent memory hypothesis* emphasizes the fact that neurophysiological brain states are different in sleep, when dreaming occurs, than in waking, when recall is attempted. (2) The *encoding-deficiency hypothesis* says that memory-storage processes are inherently deficient during sleep.

State-dependent memory is said to occur when information learned in one physiological state cannot subsequently be retrieved when the organism is in a different physiological state, though the information can be retrieved again when the organism returns to the original physiological state (Overton 1973). State-dependent memory was originally discovered in animal research on transfer of learning between drugged states and normal states. One interpretation of the state-dependency effect is that memory organization is different in different neurophysiological brain states, such that retrieval cues that are effective in the original state are not available or are not as effective in a different state. The state-dependency hypothesis easily explains the fact that REM dreams are better recalled than NREM mentation, since REM is physiologically more similar than NREM to the waking state.

The state-dependent memory hypothesis says that poor dream recall is a case of retrieval failure, not storage failure. Dreams may be stored in LTM during sleep, though they cannot be retrieved (or can be only partially retrieved) in the waking state. An implication of the state-dependency hypothesis is that prior REM dreams will be better recalled during subsequent REM sleep than in the waking state. Repetitive dreams sometimes occur, and one explanation is that repetitive dreams are recollections of earlier dreams. But repetitive dreams can be explained alternatively in terms of continuing personal concerns and waking experiences that affect dream contents.[2]

The *encoding-deficiency hypothesis* says that memory-storage processes are inherently deficient during sleep, so that dreams that are not recalled upon awakening are unlikely to ever be recalled because they have not been stored in LTM. The encoding deficiency hypothesis is consistent with repeated failures of attempted verbal learning during EEG-confirmed sleep to transfer to the waking state (Aarons 1976; Overton 1973). Hobson (1988) supported

the encoding deficiency hypothesis of dream forgetting, as part of the activation-synthesis theory of dreaming. He suggested that during REM sleep the brain's information-processing centers concentrate on dream synthesis and do not initiate memory storage processes. He cited evidence that activity in the brain's aminergic neurotransmitter circuits decreases in REM sleep, resulting in a reduction in memory-encoding processes during REM sleep. (In Hobson's view, poor dream recall from NREM stages reflects a lack of NREM dreaming rather than a NREM dream recall problem.) Like Hobson, Foulkes (1985) suggested that mnemonic encoding is deficient during sleep, but Foulkes emphasized the incompatibility of different information-processing modes, rather than changes in neurophysiological states.

Conclusion

I have gone into some detail on the problem of dream recall because the accuracy of dream recall is the limiting factor in the accuracy of all dream research and theory. None of the four hypotheses explains all of the facts about dream forgetting and recall. Memory encoding deficiency during sleep is probably the major reason why recall of dreams is poorer than recall of waking events. The salience and interference hypotheses can explain why we recall some dreams better than others.

LUCID DREAMING

Up to this point I have been discussing research and theory on ordinary dreams, that is, hallucinatory dreams where the dream world seems to be real and you are unaware that you are dreaming. But perhaps you have had the experience of realizing that you were dreaming while you were asleep. Dreams where people know that they are dreaming are called *lucid dreams*. Lucid dreaming is the newest topic for scientific dream research, although lucid dreaming has been known at least since Aristotle and discussed by many writers since then (LaBerge 1988a). Frederik Van Eeden coined the term "lucid dream" in 1913 and described several of his own lucid dreams. The following example from Van Eeden illustrates an important feature of lucid dreams, in which the dreamer can sometimes control the dream action:

> 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. I began by trying to break glass, by beating it with a stone. I put a small tablet of glass on two stones and struck it with another stone. Yet it would not break. Then I took a fine claret-glass from the table and struck it with my fist, with all my might, at the same time reflecting how dangerous it would be to do this in waking life; yet the glass remained whole. But lo! when I looked at it again after some time, it was broken.
>
> 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. I took the broken glass and threw it out of the window, in order to observe whether I could hear the *tinkling*. I heard the noise all right

> and I even saw two dogs run away from it quite naturally. I thought what a good imitation this comedy-world was. 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" (Van Eeden 1913, reprinted in Tart 1972a, p. 154).

Lucid dreaming involves reflective self-consciousness during sleep. In contrast, ordinary nonlucid dreaming mainly involves primary consciousness. Rechtschaffen (1978) characterized ordinary dreaming as "single-minded," in that there is typically a single stream of thought and action going on at one time, without the alternation of primary and reflective consciousness that often characterizes waking thought. Snyder (1970) showed that people sometimes think reflectively during ordinary dreams, in the sense of having thoughts about their dream experiences (such as "Why did she say that?"), but ordinary dreaming does not involve full reflective self-consciousness with awareness that one's current experience is a dream.

Although lucid dreaming, with its possibility of self-control during dreaming, is inherently fascinating, it has been neglected by scientific dream researchers until recently. There are two reasons for this neglect. First, lucid dreaming is contrary to preconceived notions about what the human mind can do during sleep. For example, it is contrary to the Freudian theory that dreaming is a product of a nonrational, instinct-driven unconscious mind, and to Hobson and McCarley's idea that dreaming is just a byproduct of physiological processes during REM sleep. Second, lucid dreams are relatively rare, and they hardly ever occur in the sleep laboratory. (Only one of 104 REM dream reports collected by McCarley and Hoffman [1981] and none among over 600 dream reports collected by Snyder [1970] were classified as lucid dreams.) In the past, when lucid dreams were reported in the laboratory, they were usually discounted as an artifact of brief awakenings during sleep. However, in recent years scientists have started to take lucid dreaming more seriously, thanks to pioneering research by Stephen LaBerge (1985) and others (Gackenbach & LaBerge 1988) who have demonstrated that lucid dreams occur in a physiologically-verified sleep state, and that it is possible to use special training techniques to increase the frequency of lucid dreams.

Becoming Aware That You Are Dreaming

Lucid dreaming involves a concordance of two events: dreaming and reflective awareness. Thus, lucid dreaming might develop in two ways, according to LaBerge (1981, 1985): (1) people might develop reflective awareness—specifically, awareness of dreaming—after they have already fallen asleep and started to dream, or (2) people might maintain reflective awareness while they are falling asleep, and maintain it until they start dreaming. The first method is the most natural and most common, while the second method requires deliberate effort and practice.

When, while asleep, you ask yourself whether you are dreaming, then you are in a *prelucid* stage of dreaming. Sometimes you reach the wrong conclusion and decide that you are really awake. Then you continue in nonlucid

(or prelucid) dreaming. (For example, if, while dreaming, you were to test your state by pinching your dream body, and you felt the pinch, then you might conclude that you are really awake! In such a case, your reality testing was insufficient.) At other times the prelucid question "Am I dreaming?" leads to a "yes" answer, and you are then—by definition—having a lucid dream.

People's spontaneous awareness that they are dreaming usually occurs as a result of some incongruous, bizarre, or anxiety-evoking event that prompts them to ask themselves, "Is this real?" (LaBerge 1985; Price & Cohen 1988). For example, if you notice that you are flying, or breathing under water, you might realize that you are dreaming. If you suspect that you might be dreaming, you can do a "reality test" by trying to control the dream events or trying to do something that you could not do in reality. One of the most commonly used reality tests is attempting to fly. These points are illustrated by a dream that I had some years ago, before I was aware of the research literature on lucid dreaming:

> One summer day I backpacked into a wilderness campsite deep in the Maine woods. On the trail on the way in I met two other backpackers, who were headed out. They said that they had seen a big black bear near the campsite the previous night. That night at the campsite the bear was on my mind. To make matters worse, I was alone, and I had to sleep in a lean-to, without even a tent wall to shield me from the bear if it should come around while I was asleep. I had a hard time falling asleep, due to my anxiety about the bear. Every sound in the woods grabbed my attention. Finally I fell asleep. At some point during the night I heard a scratching noise and the sound of heavy breathing. I sat up and looked, and I saw a huge bear silhouetted in the moonlight. The bear was sniffing around at the open side of the lean-to, a few feet away from me. I quickly crawled out of my sleeping bag and stepped out of the lean-to. Then the bear turned and looked at me. I could see its teeth gleaming in the moonlight. At that point I asked myself, "Is this really happening, or am I dreaming?" I thought that if it was a dream, then I should be able to fly away. So I spread my arms out and flapped them like wings. Then I flew up into the air, and only at that point did I know for sure that I was dreaming. From fifty feet above the ground I looked down on the bear. I could see the bear and the campsite and the surrounding area in vivid detail. I flew out over the nearby pond, and saw the moonlight dancing on the water (August, 1976).

LaBerge's (1985) favorite reality test involves trying to read something. He usually has difficulty reading during dreams because the print keeps changing. Even when he manages to read a few words, if he looks away from the page and then looks back, the words have changed. He concluded that the difference between dreams and waking perceptions is more a matter of stability than vividness. But specific tests of dreaming are not always necessary. Often the mere recognition of bizarreness or anomaly is enough to produce lucidity. Furthermore, if anything prompts you to ask whether you are dreaming, then you probably are. After all, you never have to ask whether you are dreaming when you are awake!

Methods of Increasing Lucid-Dream Frequency

Oneironauts (explorers of the inner world of dreams—a term coined from Greek roots by LaBerge [1985]) have developed several methods of deliberately increasing the likelihood of having a lucid dream. The methods can be classified into two broad categories: intention and suggestion techniques, and external cue techniques (Price & Cohen 1988).

Intention and suggestion techniques. Intention and suggestion techniques involve thought processes that occur in the waking state. The distinction between intention and suggestion is somewhat arbitrary here, but in general intention techniques involve a willful resolve to achieve lucidity, whereas suggestion techniques rely on a more passive, permissive, hypnotic-like attitude (Tholey 1983). The success of these techniques depends on a high level of motivation, so that you will be willing to continue practicing even if initial attempts fail. Also, it helps if you have a high frequency of dream recall. Dream recall—lucid or nonlucid—can be improved by paying attention to your dreams and keeping a dream diary.

Garfield (1974) used autosuggestions (self-suggestions) to increase lucid dreaming. She simply repeated to herself, while falling asleep, "I will have a lucid dream. I will have a lucid dream."

LaBerge (1985) developed the *MILD (Mnemonic Induction of Lucid Dreams) technique.* The underlying principle is to establish cues to remind you to notice—or test—whether you are dreaming the next time you dream. The MILD technique involves three steps: (1) When you wake up from a dream, during the night or early morning, recall the dream in as much detail as possible and replay it several times in your mind to familiarize yourself with it. (2) Then, while you are lying in bed, give yourself the autosuggestion, "The next time I dream I will recognize that I am dreaming." (3) Replay your most recent dream, this time visualizing yourself recognizing that you are dreaming, while you are in that dream. Recycle steps 2 and 3 several times while you are drifting back into sleep. With practice, you will sometimes have a lucid dream after you fall back asleep, though the next dream will not necessarily resemble the one that you rehearsed previously.

A helpful autosuggestion technique is to suggest to yourself before sleep that a particular event, when it occurs during a dream, will trigger lucidity or prompt you to ask whether it is a dream. Additionally, you can use an *action-specific intention,* where you suggest to yourself that you will perform a particular action and that that action, such as flying, will trigger lucidity (Garfield 1974; Price & Cohen 1988; Tholey 1983). Carlos Casteneda's sorcerer, Don Juan, triggered lucidity by finding his hands and lifting them to the level of his eyes in his dreams (Casteneda 1974).

Purcell et al. (1986) compared several different training methods for lucid dreaming—including posthypnotic suggestion, enhanced awareness of dreaming, and a mnemonic technique—against a control group. Dream reports were scored on a nine-point scale of self-reflectiveness. The mnemonic technique produced the highest self-reflectiveness scores. In the mnemonic condition the subjects wore a leather bracelet that reminded them several times each day to intend to dream lucidly and to rehearse a set of possible

dream events that would prompt lucidity, including personal dream themes, oddities, and distorted perceptions.

Tholey (1983) described techniques based on the idea of maintaining reflective consciousness while falling asleep. His methods incorporated the idea of enhancing reflective consciousness during the waking state by asking frequently "Am I dreaming?" and attending to relevant cues. He recommended a combination of procedures, including methods of enhancing dream recall, enhancing reflective self-awareness, autosuggestion for self-awareness during dreaming, and resolving to carry out a particular action while dreaming.

If you want to try self-training techniques for lucid dreaming, bear in mind these two points. First, it is common for lucid dreaming beginners to awaken spontaneously when they become aware that they are dreaming. These spontaneous awakenings decrease with practice. Second, false awakenings are fairly common in lucid dreaming, where people believe that they have awakened, but in fact are still asleep (LaBerge 1985; Price & Cohen 1988).

External cueing techniques. External cueing techniques are limited to the sleep laboratory. It is suggested to the subject that when he or she perceives a particular stimulus it will prompt lucidity. Then the experimenter presents the stimulus while the subject is in REM sleep. Several stimuli have been tried with some success, including a spray of water on the face, a bright light, and a tape-recorded message ("this is a dream") in the subject's own voice (review in Price & Cohen 1978).

Laboratory Studies of Lucid Dreaming

Signaling during sleep. Does lucid dreaming occur during sleep or during brief periods of wakefulness? LaBerge et al. (1981) set out to answer this question, using five oneironauts trained with the MILD technique. In addition, they sought to find out whether lucid dreamers could perform an overt voluntary act to signal when they became aware that they were dreaming. The voluntary signals included extreme eye movements, fist clinches (detected by wrist EMG), or a combination of both. The subjects spent a total of thirty-four nights in the sleep laboratory, with the usual electrophysiological (polygraph) measures (EEG, EOG, chin EMG) being taken. On thirty-five occasions subjects spontaneously awakened themselves from sleep and reported a lucid dream.

The overwhelming majority (thirty-two; 91 percent) of lucid dreams occurred during REM sleep, and there was no evidence that they were an artifact of brief awakenings during sleep. In thirty cases the subjects reported having signaled during the dream, and in twenty-four (80 percent) of these cases an independent blind judge verified this by matching the dream report with the correct temporal segment of the polygraph record.[3]

The most reliable signal was a series of extreme horizontal eye movements (left, right, left, right). However, the most dramatic record involved a combination of eye movements and fist clinches, shown in Figure 13.1. Similar results were obtained in a subsequent study (LaBerge 1988b; LaBerge,

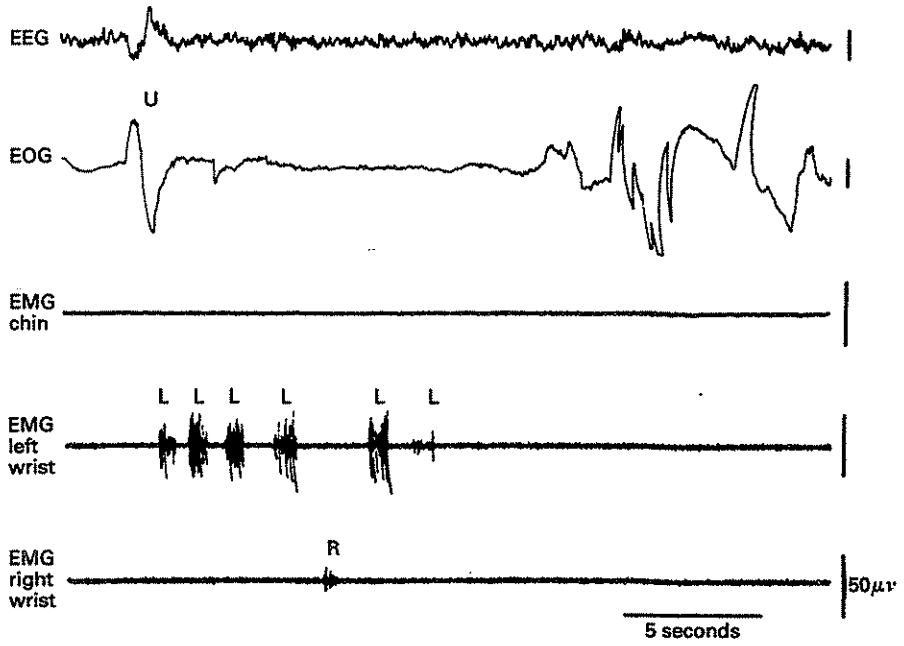

FIGURE 13.1. Polygraph record of a sleeping subject's signal that he knows he is dreaming. The signal was made as planned before sleep: an extreme upward eye movement (marked "u" in the EOG tracing), followed by a sequence of fist clinches shown in the EMG records (LLL LRLL, which signals the dreamer's initials, "S. L.," in Morse code). The sleeper awoke about twenty seconds later and reported that he had been dreaming and had made the prearranged signal. (The upward blip in the EEG record [above the "u"] is an EEG artifact caused by the extreme eye movement.) [Reproduced with permission of the authors and publisher from LaBerge, S., Nagel, L. E., Dement, W. C., & Zarcone, V. P., Jr. (1981). Lucid dreaming verified by volitional communication during REM sleep. *Perceptual and Motor Skills*, *52*, 727–32.]

Levitan, & Dement 1986), in which it was shown that lucid dreaming becomes increasingly likely across successive REM periods of the same night. One implication of this research is the development of a methodology for learning more about the correlation between dream events and physiological events, by having subjects signal during sleep when particular dream events occur (LaBerge 1988b; Schatzman, Worsley, & Fenwick 1988).

Physiological correlates. Are there any differences in physiological responses for lucid versus nonlucid dream periods during REM sleep? LaBerge et al. (1986) did a detailed analysis of polygraph records of some seventy-six lucid dreams (from thirteen subjects) in which the dreamer had used extreme eye movements to signal the onset of lucid dreaming. The records showed increases in eye-movement frequency, respiration rate, heart rate, and skin electrical potential starting thirty seconds before the lucidity signal and continuing for one to five minutes after the signal. These physiological responses indicate that lucidity is associated with increased central nervous system and autonomic arousal. LaBerge (1988b) speculated that lu-

cidity might require increased brain arousal, which would increase the dreamer's thinking capacity.

Sexual activity in lucid dreams. Patricia Garfield, in *Pathway to Ecstasy* (1979), reported that she could voluntarily initiate sexual activity in her lucid dreams, and that such experiences led to orgasms of "profound" intensity. Having heard similar reports from some of his female oneironauts, LaBerge (1985) attempted to catch such a dream in the sleep laboratory. A female volunteer, Miranda, was fitted with the usual EEG, EOG, and chin-EMG measuring devices, plus others to measure respiration, heart rate, vaginal EMG, and vaginal pulse amplitude. In her fifth REM period of the night, Miranda signaled—using eye movements—that she was having a lucid dream. Two minutes later she signaled that she was beginning dream sexual activity, and about fifteen seconds later she signaled that she was having a dream orgasm. Shortly thereafter she allowed herself to wake up, whereupon she described her dream, and reported that she had felt a mild, but real, orgasm while dreaming. The polygraph recordings showed that between Miranda's second and third signals—during sexual activity leading up to orgasm—her respiration and vaginal blood flow and vaginal muscle activity reached their highest levels of the night, while her heart rate showed a moderate increase. Comparable results were obtained with a male subject.

Characteristics of Lucid Dreams and Lucid Dreamers

Jayne Gackenbach (1988) reviewed evidence on differences between lucid and nonlucid dreams. The main difference, by definition, is that only lucid dreams involve reflective self-consciousness with awareness of dreaming. Compared to nonlucid dreams, lucid dreams tend to have more auditory imagery, more cognitive activity, more obstacles, and fewer characters. Subjects with frequent lucid dreams report kinesthetic (limb movement) sensations and the ability to control dream events in lucid dreams. About 15 percent of lucid dreams are initiated during nightmares. But for a wide variety of characteristics and specific contents, the main conclusion is that lucid and nonlucid dreams are more similar than different.

How often does lucid dreaming occur? Snyder and Gackenbach (1988) found that about 60 percent of adults reported having had at least one lucid dream in their life, with about one third of them claiming to have lucid dreams as often as one or more per month. In a group of people sufficiently interested in dreams to keep a dream diary, about 13 percent of the dreams reported in diaries appeared to be lucid dreams.

Snyder and Gackenbach (1988) reviewed studies on the characteristics of people who frequently have lucid dreams and concluded that they "tend to rely primarily on the self in psychological functioning rather than on external referents" (p. 254). They are more self-oriented than socially oriented; they are open to internal risks but not to external risks; and they have a relatively high arousal level. Also, they are especially sensitive to tactile/kinesthetic and vestibular cues and are "field independent" in that they can maintain body balance and distinguish the vertical orientation without reference to visual cues. Gackenbach et al. (1986) found that compared to nonlucid

dreamers, frequent lucid dreamers (untrained subjects) had greater sensitivity in the vestibular system—the structure, located in the inner ear, that is responsible for the sense of balance and body acceleration. Vestibular sensitivity was shown by visual nystagmus (elicited eye movements) and vertigo (dizzy or spinning sensations) in response to irrigation of an ear canal with warm water. These results are noteworthy, in that lucid dreaming often is associated with dreams of flying or spinning, and suggest that natural lucid dreamers have either greater-than-normal vestibular system activation during REM sleep or greater-than-normal sensitivity to such stimulation. The implications of this finding for lucidity training have not yet been investigated.

Applications and Conclusions

LaBerge (1985) suggested several potential practical uses of lucid dreaming. (1) Scientific research on the nature of dreaming: for example, hypotheses about psychophysiological parallelism (mind/brain isomorphism) during dreaming could be tested with the help of voluntary signals. Foulkes (1985) pointed out, however, that lucid dreaming is not the same state as ordinary, hallucinoid dreaming; thus, it is uncertain whether conclusions derived from lucid dreaming will be generalizable to ordinary dreaming. (2) Creative problem solving, rehearsal, and decision making while dreaming. (3) Wish fulfillment and recreation: for example, sexual activity for people without opportunities for real sexual activity. (4) Healing and personal growth: for example, learning to face one's fears and develop competence. Attempts to use lucid dreaming for practical purposes are not new, but progress is likely to accelerate with the development of new methods for training lucid dreaming and identifying it in the laboratory. (See Gackenbach & LaBerge 1988 for more on clinical applications of lucid dreaming.)

Lucid dreaming shows that volition and rational thought and reflective self-consciousness can occur during sleep. However, many examples and speculations about lucid dreaming are still based on home dream reports, where the person's sleep state was not verified. Systematic laboratory research on lucid dreaming is very new. So far, the tentative conclusions about lucid dreaming are based on a relatively small number of subjects, and a relatively small number of dream reports, compared to the large volume of research on ordinary REM dreaming. Many questions remain. How does lucid dreaming occur, and why doesn't it occur more commonly? Can everyone learn to dream lucidly with the right training? How much self-awareness and recall of one's waking intentions and experiences can occur during lucid dreaming? Is lucid dreaming a variety of REM dreaming, or is it a unique state of consciousness, separate from ordinary hallucinatory REM dreaming? Hunt and Ogilvie (1988) discussed lucid dreaming in relation to other altered-consciousness experiences and related it closely to out-of-body experiences (OBE) and meditative states. Lucid dreaming has been largely ignored in most theories of dreaming, but theoretical explanations of lucid dreaming are likely to develop in the wake of increased knowledge from sys-

tematic research. The topic of lucid dreaming promises exciting research and theoretical and practical developments in the future.

CONCLUDING COMMENT ON DREAMING

Although people have long been interested in dreams because of their differences from waking thought and perception, researchers are increasingly realizing the importance of the *similarities* between dreaming and waking consciousness (Foulkes 1985, 1990). The study of dreaming reveals that fundamental characteristics of consciousness—the interpretation of experience and the construction of a world model—continue during sleep.

To a degree, dreaming can be compared with waking perception. Perception has been characterized as an interpretive, constructive process, guided by sensory data but influenced by our prior knowledge, needs, and expectancies (Best 1989; Neisser 1976). But it is more accurate to compare dreaming with daydreaming, particularly, daydreaming with visuospatial imagery. In both cases, we use stored knowledge about people, objects, events, spatial relationships, narrative structures, and cause and effect to construct a relatively stable, coherent model of the world and to imagine ourselves undertaking action in that world. In both cases, our thoughts and images are influenced by our current concerns and recent waking experiences—though perhaps more so in daydreaming than in sleep dreaming.

Many writers have discussed the interpretive, constructive nature of waking consciousness (Johnson-Laird 1983; Ornstein 1977). For example, recall Gazzaniga's (1985) ideas about the left-hemisphere interpreter, following from his research on split-brain patients (Chapter 5), and the discussion of interpretive processes that occur when we attempt to introspect the causes of our own behavior (Chapter 7). Research on dreaming indicates that the interpretive, constructive role of consciousness continues while we sleep. As Foulkes's (1985) theory suggests, in dreaming we construct a world model and create narrative stories from images and knowledge stored in memory. Of course dream stories are fictional and sometimes odd or bizarre. There are several reasons for dream oddities: (1) we have no perceptual data from the external world to guide and limit our creations; (2) processes of association and narrative construction operate somewhat differently during sleep; (3) phasic physiological events may disrupt or redirect the construction process; and (4) reflective self-conscious thought is reduced or absent during dreaming, such that dreaming is not consistently checked against and guided by our remembered waking reality, life history, and self concept.

The drastic reduction or absence of reflective self-conscious thinking and volitional control during dreaming is a particularly important difference between sleeping and waking thought. Typical daydreaming involves a great deal of reflective thought—we comment on our experiences, and we think about our own thoughts, feelings, and actions, in order to interpret or evaluate them. Further, there is a strong self-awareness, where we relate our thoughts and experiences to our continuing self- concept and place them in

the stories of our lives. In contrast, reflective thought is absent, or minimal, during typical hallucinoid dreaming. There may be some commentary on events—for example, a dream where I walked into a bar and saw adults sitting in oversized baby highchairs, and commented to myself that it seemed odd—but higher levels of reflective thought are absent in ordinary dreaming. There is no relating of events to our self-concept and continuing life story. The process of interpreting events is severely flawed, so that we do not realize that our vivid visual experience is imaginary—hence the delusional quality of dreams. And despite the fact that our dreams are our own creations, we have no feeling of control over them. Thus, typical dreaming and daydreaming are similar in that they both involve construction of world models and imagining our own actions, but they differ in that insight into what is really going on is absent in dreaming, where reflective thought and the feeling of control are absent. (This explains why you are more likely to tell people your dreams than to tell them your daydream fantasies, since you feel that you have less control over your dreams, and hence less personal responsibility for them.)[4]

Of course, there are atypical daydreams and sleep dreams. Reflective thought and the feeling of control are largely absent in the relaxed, vivid reverie type of daydreaming. And lucid dreaming involves a higher than ordinary degree of reflective thought, to the point that we realize that we are dreaming, and we may be able to control the dream action to a degree. Thus, waking reverie is similar to typical hallucinoid dreaming, whereas lucid dreaming is similar to typical daydreaming, as far as reflective thought and feeling of control are concerned. On the other hand, it is noteworthy that waking actions sometimes occur automatically, without reflective self-consciousness or a feeling of voluntary control—as in hallucinoid dreaming. (Further research on lucid dreaming may help us to understand the relationship between primary and reflective consciousness.)

Like waking conscious perception and daydreaming, dreaming is an active process of interpreting and constructing experience. The similarities between waking consciousness and sleeping consciousness are as important as their differences for helping us understand the nature of consciousness. Contrary to Freud's claim that dreams are "the royal road to the unconscious," it now seems that "dreaming reveals not the unconscious, but consciousness" (Foulkes, 1990).

SUMMARY

Our knowledge of dreams is limited by problems of accurate dream recall and reporting. Four factors have been proposed to explain dream recall failures: (1) interference with dream memory-encoding processes, either during dreaming or shortly after awakening; (2) low salience, which reduces attention and memory encoding of dreams (conversely, highly salient dreams are more likely to be recalled); (3) repression, Freud's idea of an emotional block against retrieval from LTM; and (4) physiological state change, where memory-encoding processes for dreams are deficient during sleep and/or

dreams are encoded differently than normal so they cannot be retrieved during the waking state.

In lucid dreaming, people are aware that they are dreaming, while they are asleep and dreaming. Spontaneous awareness of dreaming usually occurs as a result of incongruous, bizarre, or anxiety-evoking incidents, which prompt the dreamer to ask "Am I dreaming?" Lucid dreaming occurs during REM sleep. Some lucid dreamers can voluntarily control the dream action, and some can signal lucidity during sleep by means of extreme eye movements and fist clinches. Several methods have been developed to increase lucid dream frequency, enabling it to be studied in the laboratory, and promising practical applications in dream research, psychotherapy, and personal growth.

In conclusion, it was suggested that dreaming has important similarities to waking consciousness, particularly to daydreaming. In both cases, we construct a world model and imagine ourselves acting in that world. Both dreaming and waking consciousness are active constructive processes. Dreaming is different in that it typically occurs with no volitional control or reflective self-consiousness, though this sometimes happens in waking consciousness, too.

ENDNOTES

[1]Laboratory research indicates that dreams are recalled better after rapid arousal from sleep than after gradual arousal (Goodenough et al. 1965). Apparently, rapid arousal allows dreams to be recalled from STM and thought about before they are forgotten.

[2]Consistent with the state-dependency hypothesis is the idea that some *déjà vu* experiences occur when a waking experience seems familiar because it is similar to a prior dream experience, but we do not realize that the prior experience was a dream because we cannot recall the dream. I am not suggesting that dreams predict the future. Rather, I am suggesting that since we spend about 550 to 700 hours per year in REM-state dreaming, and dreams are fictions based on our personal knowledge and episodic memories, some of our dream experiences will by coincidence be similar to our subsequent waking experiences. This is my pet hypothesis about *déjà vu* experiences, but it would be difficult or impossible to test it.

[3]Tyson, Ogilvie, and Hunt (1984) found that lucid dreaming was associated with the occurrence of alpha EEG during REM sleep. This finding is controversial. Some alpha EEG normally occurs during REM sleep, and LaBerge (1988b) found no more alpha waves during lucid dreaming than during nonlucid dreaming.

[4]Foulkes (1990) pointed out a paradox, that the development of adult-style narrative dreaming in children is correlated with the development of reflective self-awareness and controlled daydreaming, yet adult-style dreams typically occur without volitional control and with little or no reflective thought.