

Chapter 2

Lecture I: Psychology

J. Allan Hobson

Proof That Dreams Are Real

First, take a brain and steep it in a world.
Then, lay it by a while to set. Next, go
Reduce the voltage till the waves unfurled
Are quicker paced and nothing's felt below.
Now, activate some cells, unlocking stored
Emotions and events as they'd appeared,
And watch the nonsense loosed excite a score
Of pathways making these stray bits cohere.
Yet, this state dreamt was but a new event;
It "happened" like those "real" ones we'd espied—
Remembered, from the world—yes, underwent
As if it too were input from outside.
Thus, the perceived and dreamed, seen close enough,
Reveal that they're both made of that same stuff!

—David Borodin

Despite the difficulties with recall, most of us can remember at least a few dreams vividly. Our dreams always have certain features in common, as I will try to illustrate with an example from my own dream consciousness experience. I hope this exercise will be both enlightening and inspiring. The Holy Grail of dream science may be in your own bedroom.

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2.1 London Tree Trimming Dream-Verbatim Report

I am in London. I am riding a bicycle in traffic, toward an uncertain location at which I am going to trim a tree. To that end I am carrying across the handlebar of my bicycle a tree trimmer tool, about six feet long, that has, at one end, a hardware device for culling an out-of-reach branch and, by pulling a rope connected to a moveable blade, cutting it off without a ladder or pruning shears.

I assume that I am in the right part of the town when I notice that the architecture is typical town house style of Georgian England (as seen on Wimpole Street or on Beacon Hill in Boston). It is in such urban neighborhoods that people may still have trees, small gardens, and shrubs like the one I suppose I will trim.

The house I stop at has a very small tree in front of it but is hardly worth trimming. There is certainly no need for the long-handled apparatus that I have brought to the job. A young girl in 18th century dress comes out of the house, making me feel that I am at the right place after all.

I therefore ask her to call her father so that we can discuss the goals and terms of the tree trimming job. An elegantly frock-coated man appeared and smiled at me as if he were my employer.

There are two ways to approach this account. The interpretative approach seeks to understand the dream in terms of its autobiographical psychodynamic significance. What does the tree-trimmer symbolize? Why do I take on such foolish assignments? Why am I always so over prepared for my work routines? Why do I persist when all the evidence is against my success? (Fig. 2.1)

These are perfectly reasonable and relevant questions which would lead to a reasonable and relevant hypothesis about why I am the way I am. I could, for example, record my associations to the dream material such as the tree pruner and show that they lead to explicit and tense interactions with my father who was obsessed with gardening and landscape.

2.2 The Formal Analysis of Dreams

Whatever one's reaction to the interpretative approach, it can safely be asserted that no attention is paid by most dream interpreters to the alternative and complimentary approach of formal analysis. In order to understand the difference between dream content analysis (by what I call the interpretative approach) and dream form analysis (by what I call the mental status approach) we need only consider the difference in clinical psychology and psychiatry between taking an autobiographical history and performing a formal mental status exam.

In a case like that of my 80 year old mother, the history concerned her getting lost in familiar environments; her not knowing the names of people familiar to her; and her intermittent confusional states such as not knowing what she was doing or why she was doing it. The mental status exam revealed disorientation (especially for time and place but also for persons), memory loss (especially for recent events), and confabulation (making up stories to cover the holes in her memory).


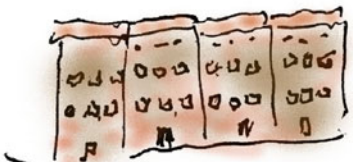



<p><u>DREAM REPORT</u></p> <p>I drew and recorded these dream recollections in Vol. 51 of my personal journals on 10/2/1990. Each of the five subsequent squares contains a drawing and the relevant part of the report.</p>	<p>(1) I am riding my bicycle in London. Across the handlebars is a 6 ft. tree trimmer. I assume I have an appointment to trim a tree.</p> 
<p>(2) But I am not sure of my destination. Then I realize that my destination is 18th century London. e.g. Wimpole Street, Row houses etc.</p> 	<p>(3) I arrive at a house in 18th century London. There is a girl wearing an 18th century dress. I assume that the neighborhood is having a period dress festival.</p> 
<p>(4) I see a small tree in the yard and assume I am to trim it but it is only 4 feet high and very scrawny.</p> 	<p>(5) A man with mutton chop sideburns and 18th century frock coat appears. He is jovial and smiles broadly at me. I assume he is the one who hired me. ...I wake up</p> 

Fig. 2.1 London tree trimming dream report

The fact that my mother had Alzheimer's disease had little to do with her biographical history. It was, rather, biology that determined the symptoms. Her brain cells had degenerated to the extent that she had state-dependent psychological problems. The essence of the mental status concept is that whatever its content, the mental state of a person reflects that person's brain-state. By means of the formal

analysis of dreams, we may thus be able to use the mind to study the brain more or less directly. I am already jumping to a startling conclusion: what we call mind is in fact a brain function. There is no deeply dualistic assumption lurking here. As discussed in greater detail in Lecture III, dual-aspect monism holds that REM sleep and dreaming are two sides of the same coin. One side is subjective; the other side is objective. Thus, I use the hybrid term *REM sleep dreaming* to refer to a unified state of the brain-mind.

My tree trimming dream has formal features which are every bit as telling as my mother's response to certain aspects of her mental status exam. Her symptoms were perhaps more easily understood because they were so flagrant. But let us reflect for a moment. Her symptoms occurred in the context of waking consciousness. Suppose that my dream perceptions, feelings, and thoughts had occurred in waking. What I would have made of them then is quite a different story, you must agree. Let us walk through the mental status exam and see what it shows about my dream.

1. *General Appearance and Behavior*

In the dream, I am me. I don't see myself as a third person, hence I do not know what I looked like nor do I hardly ever see myself in my dreams whereas the monitoring of my appearance is an important aspect of my waking consciousness. Self-reflective awareness is therefore as markedly deficient in my tree trimming dream, as it is in almost all of my dreams.

In my recent dreams, the fact that I am often riding a bicycle (or skiing or swimming) is surprising since I have not been able to ride a bicycle in the 7 years since a brain stem stroke made any balanced motor activity impossible. So, already, in my personal attributes, there is a marked discrepancy between the waking me and the dreaming me. At no point in any of my dreams does it seem peculiar that I am riding a bicycle. In my tree trimming dream, that impossible behavior goes off without a hitch.

2. *Stream of Talk*

Compared to a face-to-face interview in waking, very little is said when I am dreaming. I do talk to myself a bit as I reassure myself about my dream goal and destination. And when I get there I do ask the girl to go and get her father. I have had dreams with more discourse than this but I often find that my communications (and even my hearing of music) are soundless, as if the perception and emotion were stimulus independent, which of course they are. Dreamers often report that they "just knew" what was said or heard.

Very recently I have begun to talk in my sleep. I often give lecture-like speeches heard only by my wife and others within earshot of my bedroom. Just the other night I addressed a group of students about writing instruments. According to my stepson, Luca, I said: "I never use pencil. Fountain pens are too messy and ballpoint pens are too crude. The best pen is architect's fine point soft tip." Somewhere around "ball point pens" my own voice woke me up. I was surprised to hear myself talking so clearly while asleep and listened, with interest, to the rest of the speech, which felt just as automatic as are my over-learned lectures. As far as I know, this was the first and last time that I

addressed the subject of writing instruments in a dream or any other state of consciousness. But the opinions that I expressed are sincere and deeply held by me.

Since writing this chapter, I have been diagnosed with classic sleep apnea. My treatment consists of using a continuous positive airway pressure machine (CPAP). With CPAP operating, I have stopped lecturing in my sleep!

I wasn't dreaming when I gave that sleep talk and I am not saying that dreaming can't be loquacious. I assert only that dream talk is rare but that, when it is heard, it can be quite clear. Speech delivery, when it is permitted, is just as likely to be lucid (as in my felt-tipped pen discourse) as it is to be garbled (as is more typical of the sleep talking that occurs earlier in the night). Verbal receptivity is, if anything, enhanced in dreams so that communication sometimes takes place without any speech whatsoever. This process is similar to thought broadcasting and the delusional idea that people are talking about a schizophrenic patient. Dream speech is in need of much more careful study.

3. *Clarity versus Clouding of Consciousness*

I now feel that my dreaming consciousness is just as clouded as was my mother's in her confused states. The sharpness of perception and the sense of realistic clarity are at the same time enhanced. Dreaming is truly surreal as Leonardo da Vinci's rhetorical question suggests: "Why does the eye see a thing more clearly in dreams than it does when awake?" One answer, of course, is that the eye doesn't see at all in either state. The brain sees whatever image the eye, or some other part of the brain, sends it.

In waking, the eye and its brain (that is to say the retina) are essential to the perception of external stimuli. But when I am asleep, my eyes are closed and it is dark. When I dream so convincingly of riding my bike through London, you could say that my vision of London is less detailed than it would be if I was really seeing those distinctive red phone booths, the unique double decker buses and the quaint black hackney cabs, but my consciousness of London is nonetheless just as keen in my dream as is Shakespeare's awareness of his lover in his dream sonnet 43. So keen is my sense that I am in London that I do not notice the absence of local place markers. I don't need them because my perceptual consciousness is enhanced. This belief in false private perception is exactly what happens when people go crazy (see the subsequent discussion of hallucinations and delusions).

4. *Intellectual Functions*

Knowing how to read and calculate are important cognitive skills which I, for one, practice a lot in my waking consciousness. But I hardly ever do so in my dreams. My London tree trimming dream is typically devoid of either reading or calculations. I do not really know where I am going, but I do not seek any street signs. And I do not succeed (or fail) to read them as I would were I awake. And I do not wonder how much I will charge or be paid for my tree trimming services as I would most certainly do if I was awake. When I see the too small tree, I don't say to myself: "I will charge this guy an hourly rate of X just for showing up." There is no X and I don't notice this very unprofessional lapse.

If I had been awakened from this dream I would have been able to read and find my way around on a map of London. I could easily subtract 7 from 100 and get 93 and subtract 7 again and get 86, then 79 and so on (as long as I was not sleep deprived, which would make even simple math difficult). I would know that George Bush was at that time still the president of the U.S. and that Barack Obama and Hillary Clinton were then battling for the democratic presidential nomination. But current events play no more part in most of my dreams than do math or reading. I may often puzzle over some problem in my own private life, like why I am in London when I suppose I am in Boston. In brief, when I dream my mind doesn't function very well as an analytic engine.

5. *Orientation to Time, Place and Person*

I know who I am even if the me I take myself to be has (or lacks) attributes that are not current (like dream consciousness bike riding when I am incapable of wake consciousness bike riding), I could be in London (because I am anticipating going there) but I am in fact asleep in my bed in Boston. My confidence about my location is not as bad in this particular dream as it sometimes is. Many times when dreaming, I may feel as confused as my poor Alzheimer's diseased mother when she had no idea where she was. She may still think she is the very sane Anne Hobson, and be able to tell you so even though she has no idea who you are or where it is that you are conversing with her. By clever feigning and confabulation she may fool you into thinking she is really ok. Just as you and I fool our critical selves into thinking everything is ok in dreams when we are riding a bike with a tree trimmer across its handlebars through what we take to be downtown London. The date, as usual, is unspecified in my London tree trimming dream and I do not look at my dream watch to see how I am doing in biking to a job interview. Time is rarely specified by dream consciousness. We seem only to know that the time is now, whatever time that may be. This formal dream feature has not yet been scientifically studied.

In other words mental functions so essential and prominent in anchoring waking consciousness to the here and now are markedly deficient in dreaming. Strangely enough this gross cognitive defect, so strongly suggestive of organic brain dysfunction, had escaped the notice of dream interpreters until very recently. This is surprising since artists, like the surrealist painter, Salvador Dalí, have long recognized formal dream features and represented them in their work. Table 2.1 lists the formal dream features which have, so far, been scientifically studied.

I am reminded of my patient, Irvin Monroe, whose flagrant paranoia seduced my psychodynamically-tuned mind so strongly that I forgot to ask him if he knew what day it was. As his long-suffering sister pointed out to me, he *didn't* know what day it was. He was also disoriented because his brain was soaked in alcohol, but it was the sub-arachnoid hemorrhage that killed him. I missed that diagnosis because I was too interested in Irvin's history and in psychoanalytic theory to perform a simple, routine, mental status exam. Perhaps it is embarrassing mistakes like that which impel me not to miss the neurological

Table 2.1 Some formal properties of dream consciousness of relevance to neurobiology. These studies, which are summarized, were all performed in the Laboratory of Neurophysiology, Harvard Medical School, Boston, MA

<i>Phase I (1980–1994): Laboratory and unmonitored home reports</i>	
Perception	Vision and sense of movement predominate; pain and taste are rare
Bizarre cognition	Times, places, and persons change without notice; (bizarreness is measured as plot discontinuity and incongruity)
Fantasy	Chimeric characters are common in dreaming but absent in fantasy
Children	Adult type dreaming begins ~ age 5
Emotion	Anxiety (fear), elation, and anger predominate; sadness, guilt, and depressed affect are rare
Plot sequence	Gradual loss of orientation within scenes; radical loss of orientation across scenes
Splicing	Judges cannot recognize continuity across scenes (Hobson et al. 1987; McCarley 1982; Merritt et al. 1994; Resnick et al. 1994; Stickgold et al. 1994a, b; Sutton et al. 1994a, b; Williams et al. 1992)
<i>Phase II (1995–2004): Home dreams with physiological monitoring</i>	
Report length	REM reports 7× longer than NREM reports
Sensation of movement	More common in REM than NREM reports
Character recognition	Unreliable in REM but dreamer does not notice errors
Thinking	Highest in waking, lowest in REM; reciprocal with hallucinating across states
Memory source	Identified in only 20 % of dream incidents (80 % of dream events synthesized de novo) (Fosse et al. 2001, 2002, 2003; Hobson et al. 2000; Kahn et al. 2000, 2002; Pace-Schott and Hobson 2002; Porte et al. 1996; Stickgold et al. 2000; Walker et al. 2002, 2003)
<i>Phase III (2005–present): Home dreams with physiological monitoring – focus on secondary consciousness (metacognition)</i>	
Theory of mind	Dreamer recognizes mental process of other dream characters
Logic	Some dream thinking is rational; most dream thinking is non – rational
Authorship	Dream reports incorrectly grouped by judges
Schizophrenia	Patients and controls have equally bizarre dreams; patients, but not controls, have bizarre TAT responses (TAT = Thematic Apperception Test) (Hobson et al. 2011; Kahn and Hobson 2005)

diagnosis of dreaming. We probably could not have done much for Irvin Monroe but if we do a mental status exam of dreaming we can very possibly save a whole field of human inquiry from missing the brain basis of consciousness.

6. Mental Content

This part of the mental status exam interests us psychiatrists most because it asks the subject about internal perceptions (hallucinations) and false beliefs (delusions). What this part of the mental status exam does is to assess psychosis, the degree to which the subject is out of contact with reality. When I dream of riding my bicycle in London traffic on my way to a tree trimming job, I am disoriented to a psychotic degree because I can actually see and feel myself to

be in London when I am in fact in bed in Boston. My movement through the dream space is smooth, my vision of the traffic and buildings is continuous and convincing (or even surreal as I have already pointed out). There is thus no room for doubt. The hallucinated perception of bicycling through London dominates my mind. There is no room for doubt, and anyway, no one at home to do the doubting.

Allan Rechtschaffen has astutely characterized this aspect of dream consciousness as “single-mindedness” (Rechtschaffen 1978). Not only am I in the grips of both hallucination and delusion but I have no alter ego to help me out of this mental mess. Self-reflective awareness, background-foreground monitoring, insight and judgment, all dissolve with this loss of my second self, my observing ego. This cognitive failure has led me to suspect that my dreams have me as much as I have the dreams!

Protoconsciousness theory holds that the dreaming brain, activated in sleep, produces a self, an I, who is doing something (riding a bicycle), somewhere (London), toward some end (trimming a tree). All this is fabricated but it is a scenario. My brain, when activated as it is in REM, is therefore a scenario generator. The same system might well support the scenario structure of my waking consciousness when the external reality of the world supplies the details of time, place, other persons, and a goal for my behavior. In other words, I am suggesting that the brain, whenever and however it is activated, generates a scenario structure for consciousness. This is quite useful, especially if we can reliably suppress the tendency to dream when we are awake. Unfortunately, not everyone can do this. Some of us become “mentally ill” instead!

Silvio Scarone and his fellow psychiatrists at the Ospedale San Paolo in Milano have shown that psychotic patients have the same amount of bizarreness in their dreams as do normal people (Scarone et al. 2008). Both patients and normals are thus equally “crazy” when they dream. But while normal people control and contain bizarreness during their waking consciousness, psychotic patients do not. Their waking consciousness is just as bizarre as their dreams. They also lack the self-reflective awareness, the insight and judgment, and what we call perspective in social awareness. This is a severe handicap, as are the other cognitive defects summarized in Table 2.1.

7. *Dream Memory*

Waking consciousness has access to a vast domain of accurate details of past knowledge and past experience. Memories can be explicit and semantic (when they convey facts and knowledge) or implicit and procedural (when they underlie skills and know-how). It can be argued that memory is our most important mental power. By means of calling up facts and skills from memory, our cognitive and behavioral repertoires are enhanced immeasurably. Of course, most of the information that is stored in our memory is non-conscious until it is called or kicked up into consciousness by an association or by our command.

We should not assume that our occasional failure to access information stored in the brain is due to active interference with retrieval. We don't yet know enough to be sure that recall problems, or for that matter slips of the tongue (or pen), can be accurately identified as "Freudian slips." There are many cognitive imperfections of which very few may be psychologically motivated in the way that Freud supposed.

As shown in Table 2.1, dream consciousness has very different rules for memory access and storage from waking consciousness. It is rare, in dreaming, to seek a memory, as in the increasingly common waking experience that I have (due to aging) of trying to remember the name of a place or a person. This failure to recollect voluntarily could be due to the loss of self-reflective awareness that I will discuss in the next section. And it is certainly related to the occurrence of dream plot discontinuity and incongruity as well as to my failure to recognize these gross peculiarities when I dream. This has long been recognized by dream interpreters who make of it an active process – a psychologically motivated need to forget—but their emphasis is upon poor dream recall following awakening and not on the striking amnesia that occurs *within* the dream itself – like my inability to realize that I can not possibly be riding a bike in my recent dreams because I lost that ability 7 years ago!

My colleague, Ursula Voss, a psychologist who works in Bonn, Germany, has been studying the dreams of persons who are blind, deaf, mute, and paraplegic from birth (Voss et al. 2011). Such subjects do not dream of themselves as handicapped nor do they experience handicap in their dreams. It is as if their protoconscious brain saw, spoke, heard, and moved in their dreams.

In another recent dream, I embraced my lifelong friend, the pianist Rial Ogden, who was playing very sweetly for me. Suddenly I realized sadly that Rial had died about a year ago. I said "Rial, you can't leave me," as I hugged him tightly. In this case I became partially lucid but I still didn't know I had been dreaming until I woke up.

Why, then, are certain dream plots formed and not others? My Rial Ogden-pianist dream, is not hard to understand. It was triggered by a longing for Rial. But what about tree trimming in London? That one is not so easy. In fact, Magdalena Fosse and others in our group found that dreamers were not able to identify *any* specific memory source for about 20 % of their dream plot items (Fosse et al. 2003). So, contrary to the popular idea that dreams replay memories, we need to consider the possibility that there is often no discernible memory order in dream plot selection and construction.

This idea is repugnant because it suggests that chance plays a larger part in the shaping of our dream lives than we would like to admit. But the idea becomes more attractive when we recognize that a random process guarantees a more thorough check on the contents of memory than an overly determined mechanism would allow. In other words, in exchange for the comfort of interpretive constraint we gain considerable cognitive freedom (and even creativity). The problem is that we have to abandon our interpretive conceits to recognize it!

Many people prefer the security of just-so stories to the anxiety of open-field uncertainty. Like Freud, they are Newtonian mechanists rather than Einsteinian relativists or, God forbid, those quantum physicists like Niels Bohr (1934), who posits that two contrary states can simultaneously co-exist!

Speaking of security, my London tree trimming dream makes it clear that my upper brain still knows how to ride a bike. That skill could be reinforced during sleep even if it is no longer useful to me in waking. As for the tree trimmer, that too I still know how to use. In fact, when awake I even know exactly where in my Vermont barn it is stored even though I will probably never use it again (in waking, that is!).

There is more abundant evidence to support the idea that at least procedural memory benefits from sleep (see Fig. 4.4). This fits with the finding of formal analysis regarding the ubiquitous movement in dream plots, a robust formal feature never previously noticed by interpreters of dreaming. McCarley and Hoffman pointed out that every sentence of every REM sleep dream report contained an action verb (McCarley and Hoffman 1981). Dream consciousness is much more concerned with doing than it is with reflecting. We will further emphasize this point when we discuss dream thinking.

The idea that is lurking here is that the apparent down-time of sleep is an illusion. Even if there are no outward signs of movement in REM sleep, motor programs in the upper brain are churning away. Internal networks can be checked while we sleep peacefully and have only slight recollections of this iterative process when we wake up. Developmental theories are very compatible with this sort of insight. Not only are we able to practice our skills while we sleep, but we might be able to produce and improve those skills in a safe behavioral vacuum.

This is indirect but strong evidence for the protoconsciousness hypothesis. Not only is the dreaming brain prepared to act in waking but it is prepared to act in an effective way. This is more than scenario framing, it is action enhancing! I don't need to be conscious of how to ride a bike. My brain just knows how to do so because it has run my bike riding programs while I was asleep!

8. *Dream Emotion*

My London tree trimming dream is not highly emotional. In that dream, I did have some anxiety related to my orientational uncertainty but my wake state is mild compared to that of many of my dreams. I am not particularly elated by my dream obligations nor am I as miffed as might be expected by having pedaled halfway across London to trim that puny tree. I was a bit surprised to find my prospective employer and his daughter dressed in eighteenth century garb but surprise, that cousin of emotion, was quickly squashed by the congruity of the costumes with the eighteenth century architecture that I had noted. This typical *ad hoc* rationalization shows that my dream thinking is motivated but uncritical.

Even when dreaming is much more emotional than my London gardening adventure was, dream reports do not include many descriptions of feelings unless subjects are asked to give them. Dreamers are so busy describing the curious details like riding the bike in traffic with a 6 ft. long tree trimmer across

the handlebars, the Georgian neighborhood and its denizens, and the puny little tree in the garden, that they forget to mention the usual dream feelings of anxiety, elation or anger unless specifically instructed to do so.

Insofar as I had any emotion in my tree trimming dream, that emotion was entirely consonant with the bizarre plot. Compared to waking, I would have felt much more anxious about cycling in London traffic with an unwieldy tool across my handlebars than I did in my dreams. And I really should have been much more put out to be summoned to trim a shrub that was so scrawny that I myself would have cut it down. As mentioned before, I would certainly have fretted over how I was to be compensated for this absurd inconvenience.

Come to think of it, my emotional state in the tree trimming dream was surprisingly flat. I have something like the '*belle indifférence*' of Jean-Martin Charcot and Pierre Janet's hysterical patients at the Salpêtrière Hospital in Paris. Normally emotion, especially if elicited with affirmative probes, is quite prominent in reports of dream consciousness. As suggested above, the most common dream emotions are anxiety, fear, elation, and anger. Strikingly under-expressed are what we might call such social emotions as shame, guilt, and sadness. I had none of these emotions as I cycled across London.

As a rule dream emotion (as in waking) is entirely consonant with dream plot details. In other words, emotion is tightly associated with what is going on in the dream. If I were thoroughly lost, as I so often am in my dreams, I should be extremely anxious. If I were headed for a more exciting dream interlude, like a romantic encounter, I might well be giddily elated. A hostile encounter with my prospective employer would have enraged me. This consonance between dream emotion and dream content is what I call emotional salience. In that sense, dreaming and waking consciousness are quite similar even though the emotional range of dreaming is constricted.

Although not yet tested by systematic experiment, it is my impression that dream consciousness is more fraught with emotion than is waking consciousness. When I consider the long hours that I spend awake alone, reading, writing, and thinking, I would estimate my conscious, waking emotional experience to be very near zero. If the telephone rings, I may have a violent but very brief startle response which causes me to shift my attention from the private world of my work to the public world around me. There may also be a faintly perceived level of what I call existential anxiety but it is nothing like my intensely anxious dreams. Of course, you might say, a waking control for dream emotion must be social, not private. The content of dreaming is social rather than individual.

Leaving aside the important formal contextual difference between wake and dream consciousness, it is tempting to argue that I was mostly alone in my London bicycle dream and therefore had little social occasion for emotion. But I am often alone in my dreams and often very anxious in association especially with extreme disorientation. So it is not as simple as the social context argument would suggest. There is no substitute for an empirical test. However challenging an assessment of wake-state emotion may be, experimental investigation must be undertaken.

As already emphasized, dream consciousness is commonly emotional with anxiety, elation, and anger leading the parade. But the emotional element is qualitatively and quantitatively variable in ways that we don't yet fully understand. While many dream emotions make sense from a contextual point of view, there are notable exceptions suggesting that even in this cardinal area there are discontinuities as well as tight links. The emotional-cognitive system usually, but not always, plays by a set of strict associative rules.

These and other cognitive features of dreaming are so distinctively different from those of waking as to suggest a major reorganization of underlying brain activity. The details of that reorganization will be the subject of Lecture II. As early as 1953, it was recognized that brain physiology did change dramatically in sleep (Aserinsky and Kleitman 1953). The superficial signs of these profound changes are summarized in Fig. 2.2.

9. *Dream Thinking*

Compared to my own waking life, I pay far less attentional energy to thinking when I am dreaming. Even though I am an academic professional and therefore paid to think in waking, I cannot use that fact to explain the extreme paucity of thinking during my dreams. As I cycled through London with a tree trimmer across the handlebars of my bike, I never once questioned my activity or my goal. I was in the thrall of Allan Rechtschaffen's single mindedness. I was dream-bicycling, but I was not thinking.

I did not have the usual background concerns that characterize my waking consciousness. When I am going out to a teaching assignment or making a house call for medical reasons, I am always asking myself: Am I on the right route? What street is this? Where is my map? Whom do I expect to meet? What is our contract? What will I say? These background cognitive elements are typical of what is called waking fantasy. Sometimes fantasy is magically positive (I will succeed certainly). But more often than not, it is banal, commonplace or even negative in tone (defeat is inevitable). This feature has led me to conclude that much so-called fantasy is in fact fictitious behavioral rehearsal and predictive preparation for social interaction. This gives waking consciousness one of its greatest powers: autocriticism, an important part of self-reflective awareness. This is a feature of what we call secondary consciousness. It is not present in dreams so it must be specific to waking.

Autocriticism is related to theory of mind insofar as it is an awareness of one's social impact upon another person. As we speed on bikes or in cars to a social rendezvous, our foreground consciousness guides the vehicle to its destination while we play out social scenarios in our mind. Being able to imagine a variety of scenarios is to help us prepare our response to them. Of course real life scenarios may defy prediction. Then we are surprised and have to fly by the seat of our pants and react instinctively.

In dream consciousness we have no background awareness, hence no alter ego, no self-reflective awareness, no monitor, and no working memory. I don't

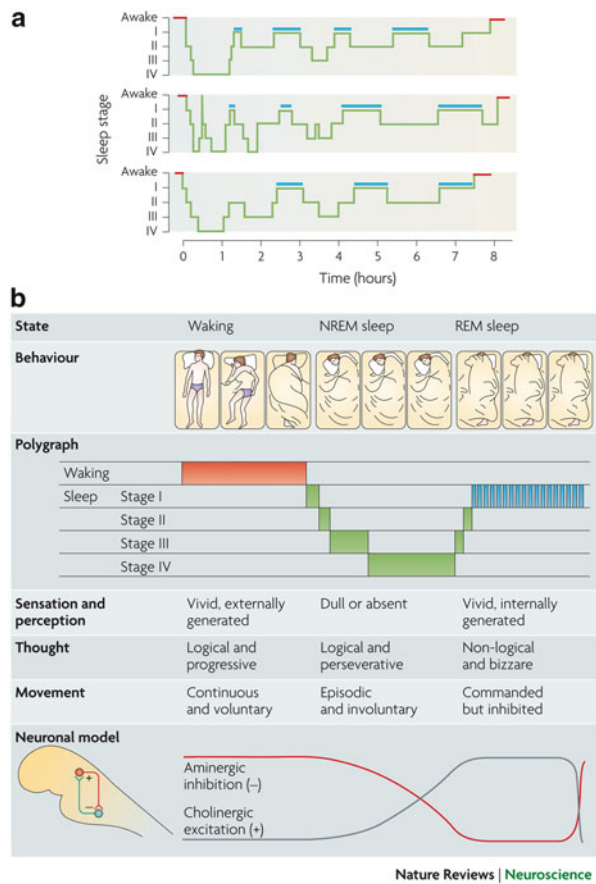


Fig. 2.2 Sleep science fundamentals

Standard sleep laboratory measurements reveal 90–100 min cycles of rapid eye movement (*REM*) and non-rapid eye movement (*NREM*) sleep (see the figure, part **a**, which shows cycles for three subjects; the *blue lines* indicate periods of REM sleep). Reports of dreaming are most common from sleep onset stage I (when dreams tend to be fragmentary and unsustained), late-night stage II (when dreams tend to be thought-like) and stage I REM (when they tend to be long, vividly hallucinatory and bizarre). All of the deep phases of sleep (III and IV) occur in the first half of the night, whereas lighter stages of sleep (stages I and II) predominate in the second half of the night. Regardless of time of night, reports of dreaming are longest and most bizarre following awakenings from stage I REM.

The states of waking and sleep have behavioral, polygraphic and psychological manifestations (see the figure, part **b**), which seem to be orchestrated by a control system in the pontine brainstem. In the figure, the neuronal model of the clock that programs these states is depicted as the reciprocal interconnection between aminergic inhibitory neurons and cholinergic excitatory neurons. The activity levels of these two groups of neurons are also reciprocal: the activity of aminergic cells is highest during waking, declines during NREM sleep and is lowest during REM sleep, whereas the activity of cholinergic cells shows the reverse pattern. Changes in state and phase take place whenever the two activity curves cross; these are also the times when major postural shifts occur. The motor immobility during sleep depends on two different mechanisms: disfacilitation during stages I–IV of NREM sleep and inhibition of motor systems during REM sleep. The motor inhibition during REM sleep prevents motor commands from being carried out, so that we do not act out our dreams. (Part **a** is unpublished data of Snyder and Hobson) (Part **b** of the figure is reproduced, with permission, © (1983) J. Allan Hobson. Parts **a** and **b** reproduced in Hobson 2009) (Color figure online)

ask myself if it is wise to ride by my bike in London traffic. I don't ask why I should be carrying a tree trimmer. It is not so much that my thinking is illogical as it is that I am nearly literally thoughtless when I dream. My waking behavior would suffer enormously if it were guided by dream consciousness.

Roar Fosse quantified this dream thoughtlessness when he measured explicit references to thinking in the 3,000 reports he obtained from our 'grand mentation' study of 16 people as they woke, worked, made love and slept, over a 2 week period (Fosse et al. 2001). In contrast to quiet or more active waking those subjects showed a twofold drop in explicit reference to thinking while they were dreaming (in REM sleep compared to quiet or active waking). These results are illustrated in Fig. 2.3.

Recently David Kahn and I (Kahn and Hobson 2005) have returned to this problem. We asked two questions:

- (1) Was Roar Fosse correct in his observation that thinking declined markedly in REM sleep?
- (2) Was such thinking as was present logically sound, or was it logically flawed? (a question that Roar Fosse didn't ask).

To answer these two questions we began by studying 40 dreams recorded by me over 2 years ago (like the London tree trimming dream).

Compared to waking, the dream reports showed the predicted decrease in the initiation of thinking. While some dream logic was as inferentially sound as it is in waking, some was inferentially unsound. One example of each follows:

- (1) Sound Reasoning:

I infer from seeing the eighteenth century houses that I must be in the right part of the town. (Given the premise of my imagined destination, this inference is logical).

- (2) Unsound Reasoning:

I infer from the dress of my employer that this must be a pageant day for the neighborhood. (This inference is superficially logical but is a far-fetched *ad hoc* explanation of an unexpected dream observation).

Most striking of all was the absence of any inferential operation by my mind on even outlandishly bizarre dream plot items. For example there was never any reasonable question about why the tree trimmer was being carried. The danger of the traffic and the ultimate redundancy of the tool simply did not register in my dream consciousness.

At this point you might well ask: 'Why all this fuss about logical thinking in dreams? We have always known that dreams were not logical.' But, as shown above, some dream thinking is present and, when it is present, the thinking may be logically sound. Research psychologists have therefore questioned the faulty logic hypothesis as part of their tendency to equate waking and dreaming consciousness. As silly as that may seem to us, it is important to take peer opinions seriously and to determine that the observed distinctions are due to methodological, not substantial differences between

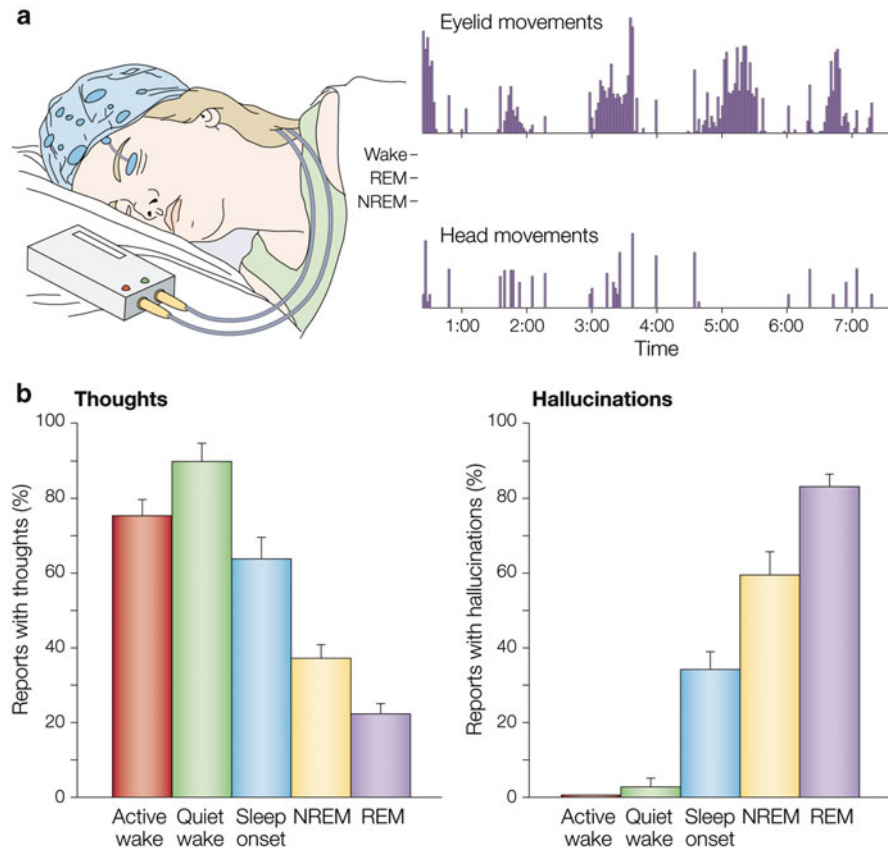


Fig. 2.3 Reciprocal state-related changes in thoughts and hallucinations measured using the Nightcap system. **(a)** Central arousal accompanying the activated states of rapid eye movement (REM) sleep and waking can be measured using the “Nightcap”—a simple ambulatory monitor. The Nightcap is a two-channel recording device that distinguishes waking, REM sleep and non-REM (NREM) sleep. One channel of the Nightcap monitors eye movement and the other monitors body movements. The Nightcap eyelid-movement readout is thought to reflect activity in portions of the brainstem oculomotor nucleus that innervate the eyelid and are adjacent to portions of the medial brainstem ascending reticular system, the activity of which, in turn, generates forebrain activation. **(b)** Decline in directed thought and reciprocal increase in hallucinations during progression from active waking through sleep onset and NREM sleep to REM sleep. The values of thoughts and hallucinations are reciprocal for the five states represented on the abscissas of the two graphs. Thoughts and hallucinatory imagery would appear to be mutually antagonistic and, in the extreme, incompatible with each other (Reproduced with permission from Hobson and Pace-Schott 2002. Original modified from Fosse et al. 2001)

studies. Because thinking is so rare, our dream consciousness is very different from our consciousness in waking. We need to establish that fact beyond the shadow of a doubt before we ask why.

10. *Insight and Judgment*

At no time during my London bicycle dream did I entertain any doubt that I was awake. And yet I was asleep. My insight regarding my true state was therefore entirely non-existent. I was completely fooled. I should have asked myself, even if I was fooled, about my true state. "Why should I be riding a bike in heavy London traffic, and with a tree trimmer across the bike's handle bars?" I am a physician by trade, not a tree trimmer and while I do sometimes visit London, I never ride a bike there. Not even before I had my stroke did I ever ride a bike in London. The knowledge base necessary to achieving this insight is simply unavailable to me when I am dreaming. It is walled off from conscious access, like certain aspects of mental activity that are made unavailable to waking consciousness by a hypnotist.

Without insight, my judgment is also poor. I fail to recognize the danger to which I exposed myself by riding a bike in London traffic. I admit that I used to pedal dangerously around Boston, but that was 50 years ago and I knew at the time that my judgment was poor. No such awareness characterized my dream consciousness. In my right senses, I would never expose myself to the ridicule that might be heaped upon an itinerant tree trimmer. And had I beheld a girl and her father dressed up as eighteenth century gentry, I would have laughed and gone straight home. The scrawny tree in their yard would have helped me to turn away and to chuckle at my own foolishness.

11. *Abstraction versus Concreteness*

One of the most powerful and delightful attributes of waking consciousness is our capacity to think abstractly. Abstraction is the essence of art and science. When we see and experience an object, a person, an event, we are not only able to classify and characterize that particular stimulus but also to generalize from it. We thus recognize that our perception is only superficial and that a deeper meaning lies beneath the surface of each observation.

We say that a sign is also a symbol so that one thing can stand for another. Dream interpreters would not accept my bicycle as only a bicycle, but perhaps, a social vehicle from the wrong to the right part of town; my tree trimming tool might also be seen as a practical ticket for this social voyage. Even though I don't need it, and didn't use it, it is there defending me against the charge of decadence. For the died-in-the-wool psychoanalyst, a tree trimmer is a more provocative instrument because it culls and cuts branches up to an inch thick. It would be wise to keep fingers and other long thin body parts out of its reach!

I have none of these ideas when I dream. It is only when I wake up and consider my dream that my waking consciousness makes these suggestions. So it could be that dreaming is phenomenologically concrete but that dreams are inevitably abstract. Hence, they invite interpretation. But how can we have more than literary satisfaction from any such interpretation? I look forward to hearing your answers to this question.

By contrast, the rigidification of the mind by whatever changes occur in sleep may be specifiable. At this point we could say: 'O.K., Dreams are interpretable in the same way that any product of human consciousness is interpretable.' But we should certainly not assume that such abstraction as is inspired by even concrete mental products was put there to deceive us.

On that reading I am not supposed to know I am a social climber or a man who is determined to be respected as much for his manual skills as for his intellect. The 18th century has always had an allure for me, so why not stay and enjoy the party. Stash the bike and chuck the tree trimmer. If you are in a time warp, go with it. Put on some frilly clothes and join the party. I might even hear the following poem, written in 1724, read for my pleasure by its frock-coated author disguised as Jonathan Swift (1823):

*Those Dreams that on the silent night intrude,
And with false flitting shades our minds delude,
Jove never sends us downward from the skies,
Nor can they from infernal mansions rise,
But are all mere productions of the brain,
And fools consult interpreters in vain.*



Sleep and Dreaming.

Jay Vogel song has created this image in the manner of Giorgio de Chirico to create a sense of dream disorientation.

2.3 Lucid Dreaming: Curing the Psychosis of Dreaming by Autosuggestion

Just as psychotic patients can be trained, through psychotherapy, to recognize their hallucinations and delusions as fabrications, so can normal people learn to recognize their dream hallucinations and delusions for the cognitive miscreants that they are. This rare and evanescent state is called lucid dreaming. In the sleep lab, a pre-arranged sequence of voluntary eye movements indicates a subject's awareness that he is dreaming, while he is dreaming. This dream double-mindedness occurs spontaneously and is quite common in children of 9–10 years of age after which it declines in spontaneous incidence. But it can be inculcated at least until the age of 40, by simple pre-sleep autosuggestion. After age 40, lucidity declines with many other delights of life.

With a notebook and pen on the bedside table as a task reminder and recorder, you can tell yourself just before going to sleep that you are going to look for and recognize bizarreness as a sign that you are dreaming. As soon as you notice discontinuity and incongruity in your mental content you will know that you are dreaming. That will allow enough of you to wake up enough to watch the dream evolve. You may even want to intervene, change the plot, and enact pleasurable behaviors like flying and love-making.

Ursula Voss and her colleagues have recently demonstrated that young subjects, who are trained to signal their dream lucidity via voluntary eye movements, have a significant increase in the 40 Hz EEG activity of their frontal lobes. They also show an increase in the EEG coherence of their frontal and occipital lobes. These findings suggest that lucid dreaming is more like waking than non-lucid dreaming. Consciousness clearly changes its qualitative as well as its quantitative character when underlying brain activation is globally or regionally altered (Voss et al. 2009). These results are illustrated in Fig. 4.3.

Lucid dreaming is as evanescent as it is rare. Subjects note that they may lose their power to observe as they are pulled back down into the dream. Or they may wake up altogether. In that case they are no longer dreaming but can have recall. And having assured recall by awakening it may be possible to return, directly, to the same dream plot that the dreamer has temporarily exited! As if we didn't know it already, this proves beyond the shadow of a doubt that dreaming is as much a psychodynamic process as it is an organic one. The argument is thus in favor of an and/or rather than an either/or approach to the brain mind. The brain-mind, it would seem, can change itself.

I will say more about brain physiology in the next lecture. My main point here is to emphasize the importance and the richness of relatively simple approaches to the psychology of dream consciousness. A key to success with this approach is to address formal rather than content analytic aspects of the dreams. Despite some similarities, dream consciousness is radically different from waking consciousness. How are we to explain the similarities and differences and what functional sense can we make of them? The answer to the last question could be quite different from

that suggested by content analysts like Sigmund Freud. My answer is that REM sleep dreams are evidence for a protoconsciousness process that indicates the brain-mind preparation for its most glorious achievement, waking consciousness.

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Dream Consciousness

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