UNROMANCING THE DREAM ...

The work of Aserinsky and Dement explored the apparent need for dreaming sleep in humans. Other research has examined the reasons why you dream and some of the functions dreaming might serve. The history of research on dreaming has been dominated by the belief that dreams reveal something about yourself: they are products of your inner psychological experience of the world. This view can be traced back to Sigmund Freud's psychoanalytic theories of human nature.

You'll recall that Freud believed that dreams are the expression of unconscious wishes for things we are unable to have while awake. Therefore, dreams offer insights into the unconscious that are unavailable in waking thought. However, the psychoanalytic approach also contends that many of these wishes are unacceptable to the conscious mind and, if expressed openly in dreams, would disrupt sleep and create anxiety. Thus, to protect the individual, the true desires contained in the dream are disguised in the dream's images by a hypothetical censor. Consequently, the theory asserts the true meaning of most dreams lies hidden beneath the dream's outward appearance. Freud called this surface meaning of a dream the manifest content and the deeper, true meaning the latent content. In order to reveal the meaningful information of a dream, the manifest content must be interpreted, analyzed, and penetrated.

While the validity of a great portion of Freud's work has been drawn into serious question by behavioral scientists over the past 50 years, his conceptualization of dreams remains widely accepted by psychologists and Western culture in general. (See the reading on Anna Freud for a discussion of other enduring aspects of Freud's theories.) Almost everyone has had the experience of remembering an unusual dream and thinking, "I wonder what it really means!" We believe that our dreams have deep meaning about conflicts that are hidden in the unconscious parts of our psyches.

In the late 1970s, Allan Hobson and Robert McCarley, both psychiatrists and neurophysiologists at Harvard's medical school, published a new theory of dreaming that shook the scientific community so deeply that the tremors are still being felt today. What they said, in essence, was that dreams are nothing more than your attempt to interpret random electrical impulses produced automatically in your brain during REM sleep.

They proposed that while you are asleep there is a part of your brain, located in the brain stem, that is periodically activated and produces electrical impulses. This part of your brain is related to physical movement and the processing of input from your senses while you are awake. When you are asleep, your sensory and motor abilities are shut down, but this part of your brain is not. It continues to generate what Hobson and McCarley regarded as meaningless bursts of neural static. Some of these impulses reach other parts of your brain, responsible for higher functions such as thinking and reasoning. When this happens, your brain tries to synthesize and make some sort of sense out of the impulses. To do this, you sometimes create images, ideas, and even stories with plots. If we awaken and remember this cognitive activity, we call it a dream and invest it with all kinds of significance, which, according to Hobson and McCarley, was never there to begin with.

Hobson and McCarley's original article, upon which this discussion is based, is a highly technical account of the neurophysiology of sleep and dreaming. While their work can be found in nearly all textbooks that include information about dreaming, very little of the detail is offered there, due to the complex nature of the researchers' reporting. We explore their article in significantly greater detail, although for clarity and understanding, considerable distillation and simplification are unavoidable.

THEORETICAL PROPOSITIONS

Hobson and McCarley believed that modern neurophysiological evidence "permits and necessitates important revisions in psychoanalytic dream theory. The activation-synthesis hypothesis ... asserts that many formal aspects of the dream experience may be the obligatory and relatively undistorted psychological concomitant of the regularly recurring and physiologically determined brain state called 'dreaming sleep'" (p. 1355). What they meant by this was simply that dreams are triggered automatically by basic physiological processes, and there is no censor distorting the true meaning to protect you from your unconscious wishes. Moreover, they contend that the strangeness and distortions often associated with dreams are not disguises, but the results of the physiology of how the brain and mind work during sleep.

The most important part of their theory was that the brain becomes activated during REM sleep and generates its own original information. This activation is then compared with stored memories in order to synthesize the activation into some form of dream content. In other words, Hobson and McCarley claim that
what is referred to as REM sleep actually causes dreaming, instead of the opposing popular view that dreams produce REM sleep.

METHOD

In their article, Hobson and McCarley incorporated two methods of research. One method was to study and review previous work by many researchers in the area of sleep and dreaming. In this single article, the authors cite 37 references that pertain to their hypothesis, including several earlier studies of their own. The second method they used was research on the sleep and dreaming patterns of animals. They did not try to claim that nonhuman animals dream, since this is something no one can know for sure. (You may believe your pet dreams, but has your dog or cat ever told you what the dream was about?) However, all mammals experience stages of sleep similar to those in humans. Hobson and McCarley went one step further and claimed that there is no significant difference between humans and other animals in the physiology of dreaming sleep. So they chose cats for their experimental subjects. Using various laboratory techniques, they were able to stimulate or inhibit certain parts of the animals' brains and record the effect on dreaming sleep.

RESULTS AND DISCUSSION

The various findings detailed by Hobson and McCarley were used to demonstrate different aspects of their theory. Therefore, their results will be combined with their discussion of the findings here. The evidence generated by the researchers in support of their theory can be summarized in the following points:

1. The part of the brain in the brain stem that controls physical movement and incoming information from the senses is at least as active during dreaming sleep (which they called the D state) as it is when you are awake. However, while you are asleep, sensory input (information coming into your brain from the environment around you) and motor output (voluntary movement of your body) are blocked. Hobson and McCarley suggest that these physiological processes, rather than a psychological censor, may be responsible for protecting sleep. You will remember from the previous article that you are paralyzed during dreaming, presumably to protect you from the potential danger of acting out your dreams. Hobson and McCarley reported that this immobilization actually occurs at the spinal cord and not in the brain itself. Therefore, the brain is quite capable of sending motor signals, but the body is not able to express them. The authors suggested that this may account for the strange patterns of movement in dreams, such as your inability to run from danger or the perception that you are moving in slow motion.

2. The main exception to this blocking of motor responses is in the muscles and nerves controlling the eyes. In part, this explains why rapid eye movement occurs during D state, and may also explain how visual images are triggered during dreaming.

3. Hobson and McCarley pointed out another aspect of dreaming that emerged from a physiological analysis of the D state and that could not be explained by a psychoanalytic interpretation. This was that the brain enters REM sleep at regular and predictable intervals during each night’s sleep and remains in that state for specific lengths of time. There is nothing random about this sleep cycle. The authors interpreted this to mean that dreaming cannot be a response to waking events or unconscious wishes, because this would produce dreaming at any moment during sleep, according to the whims and needs of the person’s psyche. Instead, the D state appeared to Hobson and McCarley to be a preprogrammed event in the brain that functions almost like a neurobiological clock.

4. The researchers pointed to findings by others that demonstrated that all mammals cycle through REM and NREM sleep. This sleep cycle varies according to the body size of the animal. A rat, for example, will shift between REM and NREM every six minutes, while for an elephant a single cycle takes two-and-a-half hours! One explanation for this difference may be that the more vulnerable an animal is to predators, the shorter are its periods of sound sleep during which it is less alert and thus in greater danger of attack. Whatever the reason, Hobson and McCarley took these findings as additional evidence that dreaming sleep is purely physiological.

5. Hobson and McCarley claimed to have found the trigger, the power supply, and the clock of the "dream state generator" in the brain. They reported this to be the pontine brain stem, located in the back and near the base of the brain. Measurements of neural activity (the frequency of firing of neurons) in this part of the brain in cats found significant peaks in activity corresponding to periods of REM sleep. When this part of the brain was artificially inhibited, the animals went for weeks without any REM sleep.
sleep. Furthermore, reducing the activity of the pontine caused the length of time between periods of D state sleep to increase. Conversely, stimulation of the brain stem caused REM sleep to occur earlier and increase the length of REM periods. Such increases in REM have been attempted through conscious behavioral techniques, but these have been mostly unsuccessful. The authors' interpretation of these findings was that since a part of the brain completely separate from the pontine brain stem is involved in consciousness, dreaming cannot be driven by psychological forces.

6. The first five points summarized from Hobson and McCarley's research focused on the activation portion of their theory. They maintained that the synthesis of this activation is what produces your experience of dreaming. The psychological implications of their theory were detailed by the authors in four basic tenets:

a. "The primary motivating force for dreaming is not psychological but physiological, since the time of occurrence and duration of dreaming sleep are quite constant, suggesting a preprogrammed, neurally determined genesis" (p. 1346). They did allow that dreams may have psychological meaning, but suggested that this meaning is much more basic than the psychoanalytic view imagines it to be. They further contended that dreaming should no longer be considered to have purely psychological significance.

b. During dreaming, the brain stem is not responding to sensory input or producing motor output based on the world around you; instead it is activating itself internally. Since this activation originates in a relatively primitive part of the brain, it does not contain any ideas, emotions, stories, fears, or wishes. It is simple electrical energy. As the activation reaches the more advanced, cognitive structures of the brain, you try to make sense out of it. "In other words, the forebrain may be making the best of a bad job in producing even partially coherent dream imagery from the relatively noisy signals sent up to it from the brain stem" (p. 1347).

c. Therefore, this elaboration of random signals into dreams is interpreted to be a constructive process, a synthesis, instead of a distortion process by which unacceptable wishes are hidden from your consciousness. Images are called up from your memory in an attempt to match the data generated by the brain stem's activation. It is precisely because of the randomness of the impulses, and the difficult task of the brain to try to inject them with some meaning, that dreams are often bizarre, disjointed, and seemingly mysterious.

d. Freud's explanation for our forgetting dreams was repression. He believed that when the content of a dream is too disturbing for some reason, you are motivated to forget it. Hobson and McCarley, acknowledging that dream recall is poor (at least 95% of all dreams are not remembered), offered a pure physiological explanation that was concordant with the rest of their activation-synthesis hypothesis. They claimed that when we awaken, there is an immediate change in the chemistry of the brain. Certain brain chemicals necessary for converting short-term memories into long-term ones are suppressed during REM sleep. So unless a dream is particularly vivid (meaning that it is produced by a large amount of activation) and you awaken during or immediately after it, the content of the dream will not be remembered.

Figure 1 illustrates Hobson and McCarley's comparison between the psychoanalytic view of the dream process and their activation-synthesis model.

![Figure 1](image)

**FIGURE 1** Psychoanalytic theory and activation-synthesis hypothesis compared.

(Adapted from p. 1346.)
IMPLICATIONS AND RECENT APPLICATIONS

Hobson and McCarley have continued to conduct research in support of their revolutionary hypothesis of dreaming. Their new conceptualization has not been universally accepted, but no psychological discussion of dreaming would be considered complete without its inclusion.

Twelve years after the appearance of Hobson and McCarley’s original article on the activation-synthesis model, Allan Hobson published his book called, simply, Sleep. In this work, he explains his theory of dreaming in expanded and greatly simplified terms. He also elaborates on his view about what impact the theory may have on the interpretation of dream content. And, he allows, dreams are not devoid of meaning, but should be interpreted in more straightforward ways. Hobson states his view as follows:

For all their nonsense, dreams have a clear import and a deeply personal one. Their meaning would stem, I assert, from the necessity in REM sleep for the brain-mind to act upon its own information and according to its own lights. Thus, I would like to retain the emphasis of psychoanalysis upon the power of dreams to reveal deep aspects about ourselves, but without recourse to the concept of disguise and censorship or to the now famous Freudian symbols. My tendency, then, is to ascribe the nonsense to brain-mind dysfunction and the sense to its compensatory effort to create order out of chaos. That order is a function of our own personal view of the world, our current preoccupations, our remote memories, our feelings, and our beliefs. That’s all. (Hobson, 1989, p. 166)

Another dream researcher— took Hobson’s sentiments a step further. Foulkes (1985), a leading researcher on daydreaming, also subscribes to the notion that night dreams are generated by spontaneous brain activity during sleep. He has suggested that while dreams do not contain hidden unconscious messages, they may provide us with a great deal of psychological information. Foulkes maintains that the way your cognitive system places form and sense onto the random impulses in your brain reveals information about the importance of certain of your memories and provides insight into your thinking processes. He also believes that dreams serve several useful purposes. One of these arises from dreams you have about experiences that have not actually happened to you. These dreams may assist in preparing you to encounter new or unexpected events-something like a cognitive rehearsal, or "What would I do if ... ?"

And the research continues. Many studies seek to challenge Hobson and McCarley's conceptualization of the origin and function of dreams. One such study demonstrated how the controversy among sleep and dream theorists lives on. The Freudian-based, psychoanalytic community continues to express their annoyance that Hobson and McCarley's theories leave little room for the Freudian view that dreams are messages from the unconscious. In a journal devoted to Freudian psychoanalysis, Mancia (1999) demonstrates the differences between the psychoanalytic notion of dreaming and the theory proposed by Hobson and McCarley, often referred to as the "neuroscientific" approach. Mancia describes the clash between these two fundamental views with great clarity:

Whereas the neuroscientists are interested in the structures involved in dream production and in dream organization and narratability; psychoanalysis concentrates on the meaning of dreams and on placing them in the context of the analytic relationship [with the analyst] in accordance with the affective [emotional] history of the dreamer .... The brain structures and functions of interest to the neurosciences ... are irrelevant to their psychoanalytic understanding. (Mancia, 1999, p. 1205)

Of course, Hobson and McCarley very likely would reply that there is no psychoanalytic understanding possible, because there is no such thing as an unconscious in the Freudian conceptualization of it. That debate, while well worth having, must be saved for another time and place.

Finally, a fascinating study questioning Hobson and McCarley's theory took a new look at the specific regions of the brain that are active during REM (Solms, 2000). Until recently, most researchers, led by Hobson and McCarley, assumed that REM and dreaming are physiologically equivalent activities controlled by a single, connected brain process. However, Solms has suggested that dreaming may be generated through direct stimulation of the forebrain during non-REM sleep, independently of any brain stem involvement. Conversely, REM sleep, along with the usual brain stem activation, may occur without any dreaming taking place. Therefore, Solms suggests that brain stem activity is “just one of the many arousal triggers that can activate this forebrain mechanism. The ‘REM-on’ mechanism therefore stands outside the dream process itself, which is mediated by an independent, forebrain ‘dream-on’ mechanism” (p. 845).
CONCLUSION

Whether you are willing to accept the rather less romantic view of dreaming developed by Hobson and McCarley's research, this is an excellent example of how psychologists or scientists in any field need to remain open to new possibilities even when the established order has existed for decades. There is no doubt that the activation-synthesis model of dreams has changed psychology. This does not mean that we have solved all the mysteries of sleep and dreaming, and perhaps we never will. But it's bound to be a fascinating journey.