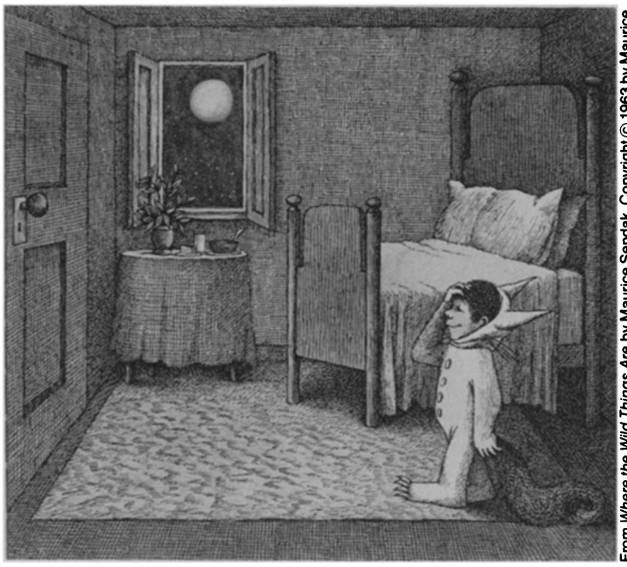
FORGOTTEN DREAMS



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A Nobel laureate says that remembering dreams may be unhealthy

By WRAY HERBERT

Dream theorists have always argued over the meaning of dreams. Indeed, for Sigmund Freud and his protégé Carl G. Jung, differences over dream interpretation were enough to cause a bitter falling out and a lasting intellectual rift. But throughout the history of dream theory one basic assumption has gone unchallenged: the vivid imagery and mysterious symbolism we experience nightly must have significant psychological meaning.

In the past few years, even this assumption has been challenged. As biologists have explored the physiology of dream sleep (or what is now known as rapid-eye-movement, or REM, sleep), they have found evidence that argues against theories of unconscious wish-fulfillment and collective unconscious. The latest theory, offered by Nobel prize-winning biologist Francis Crick, suggests that dreams may be little more than the result of the brain's random firing to debug its overloaded cortex. According to the co-discoverer of DNA—the code to real life—dream life has no code, and what takes place in the mind during sleep is probably best forgotten.

Writing in a recent NATURE, Crick, of the Salk Institute in La Jolla, Calif., and Graeme Mitchison, a colleague at the Medical Research Council in Cambridge, England, theorize that dream sleep functions as a mechanism for "reverse learning." As a result of normal brain development and experience, they suggest, there occur accidental and meaningless connections in the brain—connections that must be eliminated if the cortex is to remain a well-behaved thinking system. Everything about REM sleep, they say, indicates that it functions to dampen such "parasitic" connections.

According to Crick and Mitchison, their theory grew out of observations about the anatomy of the brain's cortex. Specifically, they note, the cortex (unlike other parts of the brain) is made up of richly interconnected neuronal networks — local assemblies of cells each with the capacity to excite its neighbors. These neuronal "nets" could store associations, which would be retrievable through excitation of any of the interconnected cells.

The problem with such a storage system, the authors say, is that it can become overloaded, resulting in three possible cortical behaviors: it might produce bizarre associations (or fantasies); it might repeat the same pattern whatever the input (obsession); or it might respond improperly to insignificant signals from outside (hallucinations). A system is needed to defuse some brain connections — to "unlearn" things that are unimportant — so that the entire thinking and memory system can function more efficiently.

Any such debugging system, Crick and Mitchison say, would have to be isolated from the outside world and it would have to have a way of randomly zapping the cortex — in order to fire off parasitic connections and thereby dampen them. The system that has evolved specifically for this purpose, they say, is REM sleep, and the hallucinatory character of dreams is nothing more than the random firing needed for the daily cleaning of the cortex. Crick and Mitchison note that they are building upon much recent work, most notably that of Harvard University's Robert McCarley and J. Allan Hobson, who have postulated the existence of a "dream state generator" in the brain stem that repeatedly stimulates the cortex during REM sleep.

Although Crick and Mitchison concede that their theory is not readily testable, they say that it is the only theory that is compatible with everything that is known about REM sleep. Most dreams, they note, never reach consciousness, so that a sound theory of REM sleep would have to explain the hours of unconscious dreaming (which they call "remination") rather than the few dreams that are recalled. A dream theory would also have to explain why most animals, newborn humans and even fetuses experience REM sleep. A strictly developmental theory might explain dreaming in the womb and during infancy, but it wouldn't explain adult dreams; conversely, psychological theories (such as Freud's) cannot explain the large amounts of REM sleep in the womb.

On the face of it, the theory seems to contradict data from animal studies that link REM sleep with strengthened memory traces; based on such data, it has been theorized that REM sleep has to do with memory storage and integration — not with "unlearning." But according to Crick and Mitchison, their theory is not inconsistent with the memory enhancement theory of REM; they point to a computer simulation experiment by John J. Hopfield of the California Institute of Technology, which indicates that in an idealized memory net, systematic unlearning does indeed eliminate spurious "memories" and enhance the efficiency of the whole memory system.

What all this suggests, the authors conclude, is that REM sleep evolved specifically to tune the cortex, and in fact that the cortex could not perform well without such a clean-up mechanism. The failure of such a system, they note, would probably cause grave disturbances (perpetual hallucinations, for example) that would be quite maladaptive. A partial failure, they add, might also cause hallucinations and obsessions; and in fact, Crick and Mitchison say, schizophrenia might be linked to a defect in reverse learning. The implication for normal, healthy people, finally, is that trying to remember one's dreams — the cornerstone of psychoanalysis — should be discouraged. Unconscious dreams are, in essence, parasitic synapses that should, for the health of the organism, be damped down, or unlearned. "We dream," Crick and Mitchison conclude, "in order to forget." □