

# The Science of Sleep: Dreaming, Depression, and How REM Sleep Regulates Negative Emotions

by Maria Popova

*“Memory is never a precise duplicate of the original... it is a continuing act of creation. Dream images are the product of that creation.”*

For the past half-century, sleep researcher **Rosalind D. Cartwright** has produced some of the most compelling and influential work in the field, enlisting modern science in revising and expanding the theories of **Jung** and **Freud** about the role of sleep and dreams in our lives. In *The Twenty-four Hour Mind: The Role of Sleep and Dreaming in Our Emotional Lives* (public library), Cartwright offers an absorbing history of sleep research, at once revealing how far we've come in understanding this vital third of our lives and how much still remains outside our grasp.

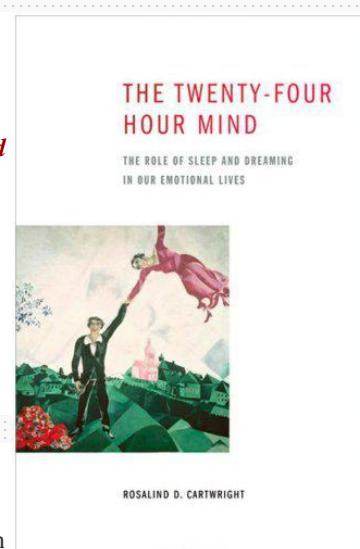
One particularly fascinating aspect of her research deals with dreaming as a mechanism for regulating negative emotion and the relationship between REM sleep and depression:

The more severe the depression, the earlier the first REM begins. Sometimes it starts as early as 45 minutes into sleep. That means these sleepers' first cycle of NREM sleep amounts to about half the usual length of time. This early REM displaces the initial deep sleep, which is not fully recovered later in the night. This displacement of the first deep sleep is accompanied by an absence of the usual large outflow of growth hormone. The timing of the greatest release of human growth hormone (HGH) is in the first deep sleep cycle. The depressed have very little SWS [slow-wave sleep, Stages 3 and 4 of the sleep cycle] and no big pulse of HGH; and in addition to growth, HGH is related to physical repair. If we do not get enough deep sleep, our bodies take longer to heal and grow. The absence of the large spurt of HGH during the first deep sleep continues in many depressed patients even when they are no longer depressed (in remission).

The first REM sleep period not only begins too early in the night in people who are clinically depressed, it is also often abnormally long. Instead of the usual 10 minutes or so, this REM may last twice that. The eye movements too are abnormal — either too sparse or too dense. In fact, they are sometimes so frequent that they are called *eye movement storms*.

But what has perplexed researchers is that when these depressed patients are awakened 5 minutes into the first REM sleep episode, they're unable to explain what they are experiencing. This complete lack of dream recall in depression has showed up in study after study, but it's been unclear whether it's due to patients' reluctance to talk with researchers or to truly not forming and experiencing any dreams. That's where recent technology has helped shed light:

Brain imaging technology has helped to shed light on this mystery. Scanning depressed patients while they sleep has shown that the emotion areas of the brain, the limbic and paralimbic systems, are activated at a higher level in REM than when these patients are awake. High activity in these areas is also common in REM sleep in nondepressed sleepers, but the depressed have even higher activity in these areas than do healthy control subjects. This might be expected — after all, while in REM these individuals also show higher activity in the executive cortex areas, those associated with rational thought and decision making. Nondepressed controls do not exhibit this activity in their REM brain imaging studies. This finding has been tentatively interpreted... as perhaps a response to the excessive activity in the areas responsible for emotions.





Cartwright spent nearly three decades investigating “how a mood disorder that affects cognition, motivation, and most of all the emotional state during waking shows itself in dreams.” What proved particularly difficult was understanding the basis for this poor dream recall during REM sleep, since anti-depressants suppress that stage of the sleep cycle, but early research suggested that this very suppression of REM might be the mechanism responsible for reinvigorating the depressed.

This brings us to the regulatory purpose of dreaming. Cartwright explains:

Despite differences in terminology, all the contemporary theories of dreaming have a common thread — they all emphasize that dreams are not about prosaic themes, not about reading, writing, and arithmetic, but about emotion, or what psychologists refer to as *affect*. What is carried forward from waking hours into sleep are recent experiences that have an emotional component, often those that were negative in tone but not noticed at the time or not fully resolved. One proposed purpose of dreaming, of what dreaming accomplishes (known as the mood regulatory function of dreams theory) is that dreaming modulates disturbances in emotion, regulating those that are troublesome. My research, as well as that of other investigators in this country and abroad, supports this theory. Studies show that negative mood is down-regulated overnight. How this is accomplished has had less attention.

I propose that when some disturbing waking experience is reactivated in sleep and carried forward into REM, where it is matched by similarity in feeling to earlier memories, a network of older associations is stimulated and is displayed as a sequence of compound images that we experience as

dreams. This melding of new and old memory fragments modifies the network of emotional self-defining memories, and thus updates the organizational picture we hold of ‘who I am and what is good for me and what is not.’ In this way, dreaming diffuses the emotional charge of the event and so prepares the sleeper to wake ready to see things in a more positive light, to make a fresh start. This does not always happen over a single night; sometimes a big reorganization of the emotional perspective of our self-concept must be made — from wife to widow or married to single, say, and this may take many nights. We must look for dream changes within the night and over time across nights to detect whether a productive change is under way. In very broad strokes, this is the definition of the mood-regulatory function of dreaming, one basic to the new model of the twenty-four hour mind I am proposing.



Towards the end of the book, Cartwright explores the role of sleep and dreaming in consolidating what we call “**the self**,” with another admonition against **memory’s self-editing capacity**:

[In] good sleepers, the mind is continuously active, reviewing experience from yesterday, sorting which new information is relevant and important to save due to its emotional saliency. Dreams are not without sense, nor are they best understood to be expressions of infantile wishes. They are the result of the interconnectedness of new experience with that already stored in memory networks. But memory is never a precise duplicate of the original; instead, it is a continuing act of creation. Dream images are the product of that creation. They are formed by pattern recognition between some current emotionally valued experience matching the condensed representation of similarly toned memories. Networks of these become our familiar style of thinking, which gives our behavior continuity and us a coherent sense of who we are. Thus, dream dimensions are elements of the schemas, and both represent accumulated experience and serve to filter and evaluate the new day’s input.

Sleep is a busy time, interweaving streams of thought with emotional values attached, as they fit or challenge the organizational structure that represents our identity. One function of all this action, I believe, is to regulate disturbing emotion in order to keep it from disrupting our sleep and subsequent waking functioning.

The rest of *The Twenty-four Hour Mind* goes on to explore, through specific research case studies and sweeping syntheses of decades worth of research, everything from disorders like sleepwalking and insomnia to the role of sleep in knowledge retention, ideation, and problem-solving.