



**His suffering can lead to suicide.
And he's good at hiding it.**



Dreams: Night School

A hundred years after Freud, one man may have figured out why we dream. You'll never think the same way about nightmares again.

By Jay Dixit, published on November 01, 2007 - last reviewed on July 19, 2013

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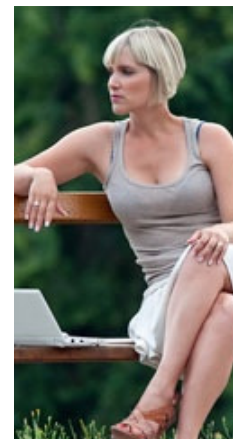
The Dream Robbers



What happens when a rat stops dreaming? In 2004, researchers at the University of Wisconsin at Madison decided to find out. Their method was simple, if a bit devilish. Step 1: Strand a rat in a tub of water. In the center of this tiny sea, allot the creature its own little desert island in the form of an inverted flowerpot. The rat can swim around as much as it pleases, but come nightfall, if it wants any sleep, it has to clamber up and stretch itself across the flowerpot, its belly sagging over the drainage hole.

In this uncomfortable position, the rat is able to rest and eventually fall asleep. But as soon as the animal hits REM sleep, the muscular paralysis that accompanies this stage of vivid dreaming causes its body to slacken. The rat slips through the hole and gets dunked in the water. The surprised rat is then free to crawl back onto the pot, lick the drops off its paws, and go back to sleep—but it won't get any REM sleep.

Step 2: After several mostly dreamless nights, the creature is subjected to a virtual decathlon of physical ordeals designed to test its survival behaviors. Every rat is born with a set of instinctive reactions to threatening situations. These behaviors don't have to be learned; they're natural defenses



—useful responses accrued over millennia of rat society.

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The dream-deprived rats flubbed each of the tasks. When plopped down in a wide-open field, they did not scurry to the safety of a more sheltered area; instead, they recklessly wandered around exposed areas. When shocked, they paused briefly and then went about their business, rather than freezing in their tracks the way normal rats do. When confronted with a foreign object in their burrow, they did not bury it; instead, they groomed themselves. Had the animals been out in the wild, they would have made easy prey.

The surprise came during Step 3. Each rat was given amphetamines and tested again; nothing changed. If failure to be an effective rat were due to mere sleep deprivation, amphetamines would have reversed the effect. But that didn't happen. These rats weren't floundering because they were sleepy. Something else was going on—but what?

What Dreams Are Made Of

Dreaming is so basic to human existence, it's astonishing we don't understand it better. It consumes years of our lives, and no other single activity exerts such a powerful pull on our imaginations. Yet central as dreaming is, we still have no idea why we dream. Freud saw dreams as convoluted pathways toward fulfilling forbidden aggressive and sexual wishes; frightening dreams were wishes in disguise—wishes so scary, he believed, they had to transmute themselves into fear and masquerade as nightmares.

Later came the idea that dreams are the cognitive echoes of our efforts to work out conflicting emotions. More recently, dreams have been viewed as mere "epiphenomena"—excrescences of the brain with no function at all, the mind's attempt to make sense of random neural firing while the body restores itself during sleep. As Harvard sleep researcher Allan Hobson puts it, dreams are "the noise the brain makes while it's doing its homework."

"There's nothing closer to a consensus on the purpose and function of dreaming than there's ever been," says Deirdre Barrett, a Harvard psychologist and editor of the forthcoming *The New Science of Dreaming*. Indeed, no theory has been able to reconcile the findings of various subdisciplines of dream science. Until now.

Finnish psychologist Antti Revonsuo believes the marooned rats lost their ability to defend themselves not because they were exhausted but because they were robbed of their dreams. Dreams, he contends, are a training ground in which animals and people alike go over the behaviors that are key to their survival. Prevented from dreaming, the rats were unable to rehearse their survival behaviors. In other words, they were defenseless because they were out of practice.

A Theater of Threats

Say you're in a fight and somebody wraps his arms around you from the front, pinning your arms to your sides—a bear hug. Most people reflexively stiffen their body. But this is actually the worst thing to do; making your

body rigid makes you easier to lift—and lets your assailant pick you up and drop you on your head, or worse, haul you off somewhere.

Better to bend your knees and lower your center of gravity so you're harder to lift. You're then free to punch your aggressor's testicles, claw the skin on his back, kick out his knee, stomp his foot, even bite his neck—unappetizing options, but effective against even the biggest thug.

The difference between the typical and optimal response could save your life. But making such a reaction swift and automatic takes practice. It's the reason martial arts students drill their movements over and over. Frequent rehearsal prepares them for that one decisive moment, ensuring that their response in an actual life-or-death situation is the one they practiced.

Dreams may do the same thing. A dream researcher at the University of Turku, in Finland, Revonsuo believes that dreams are a sort of nighttime theater in which our brains screen realistic scenarios. This virtual reality simulates emergency situations and provides an arena for safe training. As Revonsuo puts it, "The primary function of negative dreams is rehearsal for similar real events, so that threat recognition and avoidance happens faster and more automatically in comparable real situations."

Faced with actual life-or-death situations—traffic accidents, terrorist attacks, street assaults—some people report entering a mode of calm, rapid response, reacting automatically, almost without thinking. Afterward, they often say the episode felt unreal, as if it were all a dream. Threat simulation, Revonsuo believes, is why.

A Season in Hell

As a grad student in psychology in the early 1990s, Revonsuo often had bad dreams. What struck him the most was how lifelike they were. "I would say to myself, in my dream, 'Oh shit! I've dreamt of this before, but now this is really happening!'" he recalls.

"Credible world analogs" are what cognitive psychologist David Foulkes calls dreams. Although we tend to dwell on the bizarreness of dreams, most dreams are quite mundane, Foulkes notes. You move around, talk, run, interact with others, experience emotions, and feel the passage of time, just as in everyday life.

When Revonsuo began studying dreams, he asked his students to start keeping logs of their own nocturnal escapades. He noticed something striking. The dreams were filled with dangerous events, negative emotions, monsters, chases, escapes, fights, and near-death experiences. The dream world was a hellscape of danger, teeming with threatening events far more sinister than in waking life.

These weren't the misfirings of diseased brains. Threat dreams were the norm, accounting for a staggering two-thirds of all dreams. Revonsuo discovered that we grossly underestimate the number of nightmares we have. As it turns out, we have 300 to 1,000 threat dreams per year—one to four per night. Just under half are aggressive encounters: physical aggression such as fistfights, and nonphysical aggression such as verbal arguments. The rest are about car crashes, falling and drowning, missing a

meeting or a test, being lost or trapped, and being naked in public. The whole dream world seemed to have a negative bias: more negative emotions than positive ones, more misfortune than good fortune, more nightmares than fantasy.

A Theory Is Born

In the ancestral environment, Revonsuo reasoned, our dreams served to protect us, teaching us how to respond when a wild animal was chasing us or when we got lost in the forest. That was why the dream world was so filled with peril: to simulate the potential threats and prepare us to react quickly. But how could dreams help us select the optimal response, given that dream recall is so fragile? After all, we remember only a few of our dreams, and even those fade fast in the tumult of the day.

Revonsuo believes that by providing rehearsal, dreaming helps us recognize dangers more quickly and respond more efficiently. We don't need to be aware of this rehearsal, just as you don't have to recall exactly where you practiced your tennis serve in order to reap the rewards.

The idea that dreams are a dojo for perfecting waking activities fits well with what is already known about practice. Mental rehearsal through visualization improves skills, enhances learning, and changes the brain, polishing performance in almost any domain, from sports to piano playing.

The single most pervasive theme in dreaming is that of being chased or attacked. Just as athletes in training repeat parts of their performance, we may, in our nightmares, be attacked and chased over and over again, not to solve a particular problem but to actually practice efficient escape behavior.

Saber-toothed tigers no longer stalk our villages, but Stone Age themes still rule our dreams. "Nowadays, the evolutionary footprint is clearest in the dreams of children, who often dream about being chased by monsters, much the same way we were once chased by predators," says Revonsuo. As life has evolved, so have the threats we rehearse. "You insert a modern danger into that ancestral key and get a bizarre combination," says Revonsuo. "We dream of being chased, shot, or robbed, getting into traffic accidents, a burglar in our house, or perhaps smaller mishaps such as losing our wallets—and that prepares us for our waking life."

The dreaming brain, explains Revonsuo, scans emotional memories. When it detects a memory trace with a strong negative emotion, it constructs a nightmare around that theme. The more traumatic the event, the more intense the nightmare. The brain's system for detecting threats is sensitive and flexible: Anything the brain tags with a strong negative charge gets thrown into the threat bin and dredged up at night.

Sometimes this system works well: Dreaming about a boy running in front of our car better prepares us should that danger crop up in real life. But sometimes the modern world throws the threat-detection mechanism out of whack: Watching horror movies can trigger nightmares about vampires, ghosts, aliens, or zombies. Such "nonsense nightmares" don't rehearse any useful threats; they're like an allergic reaction, says Revonsuo. Just as our immune system can mistake pollen for a pathogen and mount a

defensive campaign, the threat-detection system misperceives horror movies and deploys its defenses by generating a nightmare.

Heroes of Our Own Dreams

In the jungles of the Amazon lives a tribe called the Mehinaku. The Mehinaku lead the traditional life of hunter-gatherers. They spend their days fishing and gathering roots. Since they believe that dreams predict the future, they are scrupulous about remembering them and sharing them with others. That makes them perfect for an ethnographic study of dreams. In 1981, anthropologist Thomas Gregor surveyed their dreams and analyzed the content.

As it turns out, the Mehinaku dream profusely about the dangers in their everyday lives: being attacked by wild pigs; chased by jaguars; bitten by snakes; stung by wasps, ants, or bees—all potentially lethal. "Their dreams simulate over and over again what to do and how to do it quickly when they spot these animals in the wild," reports Revonsuo. Across a tribesman's lifespan, a single failure to react efficiently could be fatal. If threat simulation even marginally increases the likelihood that such fatal failures won't occur, it would prove adaptive.

If the threat-simulation theory is correct, dreams should focus on the self, and when confronted with a threat, the dream self should react realistically to ensure its own survival and that of its loved ones. And so it is. We are the heroes of our own dreams. We don't dream about other people's adventures or about fictional superheroes battling monsters. We dream about ourselves.

If dreams evolved to simulate the threats in our environment, then being exposed to more dangers in real life should activate the nightmare function, overstuffing our dreams with threats. This is precisely what happens. Even a single exposure to a life-threatening situation can plunge a person into an inferno of post-traumatic nightmares, dreams in which the threatening event—the attack, the rape, the war—is repeated over and over in every possible variation.

Studies of traumatized Iraqi and Palestinian children who grew up in extremely violent environments, some of whom witnessed their parents' deaths, show that their dreams are phantasmagoric carnivals of threatening events. People who watched more television on September 11, 2001, and saw threatening images were more likely to dream about the events of that day; people who merely talked about it with others were less likely to dream about it.

Traumatic dreams do seem to rehearse relevant threats. Just four weeks into the first Gulf War, as Scud missiles were raining down on Tel Aviv and Haifa, the war was already encroaching on the dreams of Israeli college students, according to a study. The most prominent topic: gas masks.

But not all our dreams contain threats. That's not surprising, says Revonuso. There's no reason a biological system has to express its function at all times. Many bodily systems spring into action only in critical situations. Take sperm cells. The average man ejaculates over 100 million sperm at a time, yet over the course of his life, only a few will ever

accomplish their biological mission of fertilizing an egg. Every day, millions of sperm are wasted—and while this may, as Monty Python sings, make God quite irate, it doesn't mean that sperm cells have some function other than fertilizing eggs and competing with other sperm.

The Nighttime Edge

Intriguing as Revonsuo's theory is, not everyone is sold on the idea that dreams are primarily a theater of threat rehearsal. Dream researchers have known for centuries that dreaming helps problem solving, for example—but they still do not know why.

Some researchers argue that dreams are designed specifically to help us come up with creative solutions. But if that's the case, it's infuriatingly inconsistent—and complicated by the fact that we rarely remember our dreams.

Those who awake with brilliant solutions to scientific or artistic problems are the exception. German chemist Friedrich August Kekule struggled to find the molecular structure of benzene until he dreamed about a snake devouring its own tail and realized benzene was a closed circle—a ring. The self-taught Indian mathematician Srinivasa Ramanujan came up with every one of his proofs in dreams. Paul McCartney dreamed "Yesterday," woke up, and wrote it down.

Problem solving may be a side effect of the simulation system. The mere fact of running scenarios over and over may inevitably generate new solutions. That's why when we have an important decision to make, we like to "sleep on it" first, why, according to a study by University of Maryland psychologist Clara Hill, couples who dream about their relationship are more likely to resolve their conflicts than couples who don't.

It's also known that we get better at tasks just by dreaming about them. Robert Stickgold, a sleep researcher at Harvard Medical School, found that if you time people as they tap out the sequence 4-1-3-2-4 with their fingers, then ask them to do it again later that day, they are no better.

But let them sleep in between and their performance improves—literally overnight. The implication seems obvious: Sleep provides practice. People given brainteasers before bed dream about the answers. Math students are all too familiar with dreams about algebra problems. Anyone who's ever played too much Tetris knows you can start having Tetris dreams.

Stickgold holds that dreaming is much more complex than rehearsal. He points, for example, to the ability of sleep to allow us to integrate and consolidate knowledge. During sleep, our brains are making sense of the world, discovering new associations among existing memories, looking for patterns, formulating rules. "That's how we create meaning," says Stickgold. "Our brain puts things together."

Dreams do have a certain edge over conscious thought. Neuroimaging work has shown a distinct pattern of activation and inhibition in the dreaming brain. Visual and emotional centers are abnormally activated, while censoring mechanisms are deactivated. When we try to visualize during the day, imagery is thin and insubstantial, less real than the real

world. But studies suggest that vivid hallucinations during dreaming rival the clarity and detail of vision itself.

"Dreaming is a sensitive system that tries to pay much attention to the threatening cues in our environment," Revonsuo concludes. "Their function is to protect and prepare us."

"Yes," says Harvard's Barrett, "dreams are worrying about disasters. But they're also planning for nice things and they're fantasizing and they're problem solving."

She contends that the purpose of dreaming is "as broad as all waking thought. That's why I say dreams are really just thinking in a different biochemical state."

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