NEW TECHNOLOGY IS HELPING BRAIN SCIENTISTS UNRAVEL THE MYSTERIES OF THE NIGHT. THEIR WORK COULD SHOW US ALL HOW TO MAKE THE MOST OF OUR TIME IN BED

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In the middle of the night, we are all Fellini--the creator of a parade of fleeting images intended for an audience of one. At times, it's an action flick, with a chase scene that seems endless... until it dissolves and we’re falling, falling, falling into... is it a field of flowers? And who is the gardener waving at us over there? Could it be our old high-school English teacher? No, it's Jon Stewart. He wants us to sit on the couch right next to him. Are those TV cameras? And what happened to our clothes? In the morning, when the alarm rudely arouses us, we might remember none of this--or maybe only a fraction, perhaps the feeling of lying naked in a bed of daisies or an inexplicable urge to watch “The Daily Show.”

This, then, is the essence of dreaming--reality and unreality in a nonsensical, often mundane but sometimes bizarre mix. Dreams have captivated thinkers since ancient times, but their mystery is now closer than ever to resolution, thanks to new technology that allows scientists to watch the sleeping brain at work. Although there are still many more questions than answers, researchers are now able to see how different parts of the brain work at night, and they’re figuring out how that division of labor influences our dreams. In one sense, it's the closest we've come to recording the soul. "If you're going to understand human behavior," says Rosalind Cartwright, a chairman of psychology at Rush University Medical Center in Chicago, "here’s a big piece of it. Dreaming is our own storytelling time--to help us know who we are, where we're going and how we're going to get there."

The long-range goal of dream research is a comprehensive explanation of the connections between sleeping and waking, a multidimensional picture of consciousness and thought 24 hours a day. In the meantime, dream science is helping us understand and treat depression, posttraumatic stress, anxiety and a whole range of other problems. Neuroscientists are gleaning insights into how we learn by studying the physiology of dreaming in adults and children. Psychologists are also studying dreams to learn how both ordinary people and great artists resolve problems in their life and work by “sleeping on it.” For many of these researchers, accounts of ordinary dreams are a rich resource. Psychologist G. William Domhoff and his colleagues at the University of California, Santa Cruz, have meticulously cataloged and posted more than 17,000 dreams. That database (dreambank.net) is the source of the dreams printed here.

1. History Of Dream Research
I am with an older, "lecherous-looking" Freudian analyst who wants me to lie on the couch and recall the moment of my birth while he counts 1, 2, 3. I pretend and then tell him the truth. Then he gets undressed and wants to make love to me but just then Mother looks in by the door! And I lie very still; she closes the door. I awaken. (Then I remember wishing that I was still with my analyst.)

Thousands of years ago, dreams were seen as messages from the gods, and in many cultures, they are still considered prophetic. In ancient Greece, sick people slept at the temples of Asclepius, the god of medicine, in order to receive dreams that would heal them. Modern dream science really begins at the end of the 19th century with Sigmund Freud, who theorized that dreams were the expression of unconscious desires often stemming from childhood. He believed that exploring these hidden emotions through analysis could help cure mental illness. The Freudian model of psychoanalysis dominated until the 1970s, when new research into the chemistry of the brain showed that emotional problems could have biological or chemical roots, as well as environmental ones. In other words, we weren't sick just because of something our mothers did (or didn't do), but because of some imbalance that might be cured with medication.
After Freud, the most important event in dream science was the discovery in the early 1950s of a phase of sleep characterized by intense brain activity and rapid eye movement (REM). People awakened in the midst of REM sleep reported vivid dreams, which led researchers to conclude that most dreaming took place during REM. Using the electroencephalograph (EEG), researchers could see that brain activity during REM resembled that of the waking brain. That told them that a lot more was going on at night than anyone had suspected. But what, exactly?

Scientists still don’t know for sure, although they have lots of theories. On one side are scientists like Harvard’s Allan Hobson, who believes that dreams are essentially random. In the 1970s, Hobson and his colleague Robert McCarley proposed what they called the “activation-synthesis hypothesis,” which describes how dreams are formed by nerve signals sent out during REM sleep from a small area at the base of the brain called the pons. These signals, the researchers said, activate the images that we call dreams. That put a crimp in dream research; if dreams were meaningless nocturnal firings, what was the point of studying them? More recently, new theories have made some scientists take dreams more seriously. In 1997, Mark Solms of the University of Cape Town in South Africa published the results of his study of people with damage to different parts of the brain; he found that there was more than one mechanism in the brain for activating dreams. Since then, Solms has argued that technology like functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) might actually lend new weight to Freud’s ideas because the parts of the brain that are most active during dreaming control emotion, the core of Freud’s dream theory. Today, many therapists have a looser view of Freud, accepting that dreams may express unconscious thoughts, although not necessarily childhood conflicts.

Many others think the answer ultimately lies in a reconciliation of the different disciplines that study dreaming: neurobiology and psychology. “Both are useful, but they’re different,” says Glen Gabbard, professor of psychoanalysis and psychiatry at Baylor College of Medicine in Houston. “To have a truly comprehensive understanding of dreams, you have to be bilingual. You have to speak the language of the mind and the language of the brain.”

2. The Biology Of Dreaming

*Doctors are on the roof talking to people, saying they shouldn’t be up there because it’s dangerous. One doctor gives shots to immobilize the brain, rather than fixing ailments. I say if I fall to fix me up but leave my brain so I can dream.*

Adult humans spend about a quarter of their sleep time in REM, much of it dreaming. During that time, the body is essentially paralyzed but the brain is buzzing. Scientists using PET and fMRI technology to watch the dreaming brain have found that one of the most active areas during REM is the limbic system, which controls our emotions. Much less active is the prefrontal cortex, which is associated with logical thinking. That could explain why dreams in REM sleep often lack a coherent story line. (Some researchers have also found that people dream in non-REM sleep as well, although those dreams generally are less vivid.) Another active part of the brain in REM sleep is the anterior cingulate cortex, which detects discrepancies. Eric Nofzinger, director of the Sleep Neuroimaging Program at the University of Pittsburgh Medical Center, thinks that could be why people often figure out thorny problems in their dreams. "It's as if the brain surveys the internal milieu and tries to figure out what it should be doing, and whether our actions conflict with who we are," he says.

These may seem like vital mental functions, but no one has yet been able to say that REM sleep or dreaming is essential to life or even sanity. MAO inhibitors, an older class of antidepressants, essentially block REM sleep without any detectable effects, although people do get a “REM rebound”—extra REM—if they stop the medication. That's also true of selective serotonin reuptake inhibitors (SSRIs) like Prozac, which reduce dreaming by a third to a half. Even permanently losing the ability to dream doesn't have to be disabling. Israeli researcher Peretz Lavie has been observing a patient named Yuval Chamtzani, who was injured by a fragment of shrapnel that penetrated his brain when he was 19. As a result, he gets no REM sleep and doesn't remember any dreams. But Lavie says that Chamtzani, now 55, "is probably the most normal person I know and one of the most successful ones." (He's a lawyer, a painter and the editor of a puzzle column in a popular Israeli newspaper.)

The mystery of REM sleep is that even though it may not be essential, it is ubiquitous—-at least in mammals and birds. But that doesn't mean all mammals and birds dream (or if they do, they're certainly not --talking about it). Some researchers think REM may have evolved for physiological reasons. “One thing that's unique about mammals and birds is that they regulate body temperature,” says neuroscientist Jerry Siegel, director of UCLA’s Center for Sleep Research. “There’s no good evidence that any coldblooded animal has REM sleep.” REM sleep heats up the brain and non-REM cools it off, Siegel says, and that could mean that the changing sleep cycles allow the brain to repair itself. "It seems likely that REM sleep is filling a basic physiological function and that dreams are a kind of epiphenomenon," Siegel says--an extraneous byproduct, like foam on beer.
But dreaming may also fulfill many functions that we don't yet understand. Allan Rechtschaffen, a longtime sleep researcher and professor emeritus at the University of Chicago, compares dreaming to breathing. "We need to breathe to get oxygen," he says. "That's a physiological must. That's why the breathing apparatus evolved. But once it evolved, you can put it to other uses, like for speech or laughing or playing the saxophone." Perhaps dreaming, too, adapted to other uses. "There's no reason dreams have to be any one thing," he says. "Is our waking consciousness any one thing?"

3. Different Dreamers: Age And Gender

All night long, Jared is drunk and talking in his incoherent mumbly monotone. Finally, I have enough and tell him off. I call him a boring bastard. Then I notice a baby girl standing inside a flaming fireplace. I go up to her and say sympathetically, "You must be very hot and uncomfortable." She agrees. I pick her up and I hold her, taking her away from the fire.

We're born to be dreamers--although it apparently takes a while to get all the equipment working. While parents-to-be fantasize about their babies, fetuses probably aren't dreaming about Mom and Dad. "Almost the entire state of being before we're born is REM sleep," says Mark Mahowald, director of the Minnesota Regional Sleep Disorders Center in Minneapolis. "I can't imagine that there's a lot of conflict resolution going on in utero." Young children get a lot of REM sleep as well, which scientists think is probably stimulation for brain growth, not real dreaming. Researchers believe children have to reach a certain level of intellectual maturity, around the age of 8 or 9, before their dreams resemble adults'.

Inge Strauch, a psychology professor at the University of Zurich, has collected 550 dreams from a group of twenty-four 9- to 15-year-olds she studied in her lab over a period of two years. She found that children dreamed about animals more often than adults and were more likely to report being victims than aggressors. They were also more likely to have "fantastic" dreams, while adults' dreams tend to contain more elements of reality. A typical fantastic dream from a 10-year-old Strauch studied included a cat asking for directions to the "cat bathroom." Similarly, an 11-year-old boy dreamed that a snake wanted to go up a ski lift.

Gender differences in dream content show up in studies of adults as well. The biggest myth? That adult dreams are "full of sex," says Domhoff, author of "The Scientific Study of Dreams." When they do have dreams that include sex, they're often about someone they're not really attracted to or some conflict, he says. "They are not often joyful occasions." In fact, about two thirds of the characters in men's dreams are men; gender is more evenly divided in women's dreams. These differences appear to be true in many different cultures. Men's dreams also involve more physical aggression than women's dreams; they're more likely to be about chasing, punching, breaking, stealing or killing, Domhoff says. A more typical expression of aggression in women's dreams would be rejection or an insult ("That dress makes you look fat").

A favorite topic for women: weddings. But they're not always happily-ever-after dreams. "Something always goes wrong," Domhoff says. "It's the wrong dress, the wrong guy, the wrong church." In one recorded on dreambank.net, a woman is about to get married and doesn't have anything to wear. "I ended up wearing a genie outfit, genie pants, a gauze orange top, slippers, a belt with bells on it, lots of jewelry and my hair in a ponytail," she wrote. "I remember reassuring myself by thinking it was close to Halloween."

Not surprisingly, new mothers frequently dream about their babies, says Tore Nielsen, associate professor of psychiatry at the University of Montreal, who has analyzed the content of 20,000 dreams collected over the Web. In a separate study of 220 new mothers' dreams, he found that "a lot of bad things happen to their infants--the cat eating them, or they're suddenly lost, or they left them in the care of a relative who left them in a shopping center."

4. How We Use Dreams

There is a man talking calmly on a pay phone. He is a gunman. He talks casually as he blasts a machine gun up the stairs next to the pay phone, killing people. When he is out of bullets, he casually alters his weapon to use shotgun shells. He is poised, cold like steel, calm, and he kills.

People who don't remember their dreams can learn to recall them. In general, more introverted, psychologically oriented people naturally remember their dreams. Practical, concrete thinkers probably won't. It also helps to get enough sleep so you have time to dream. If you want to remember more, try to keep the REM state going by lying still and keeping your eyes closed while you repeat the dream scenario in your head to solidify it in your memory. Cartwright even suggests giving it a title, like "My Date With Brad Pitt." Keep a notebook by your bed and write down what's in your head as soon as you wake up.
Why should you care what happens in your head at night? Although there's lots of disagreement about the psychological function of dreams, researchers in recent years have come up with some tantalizing theories. One possibility is that dreaming helps the mind run tests of its Emergency Broadcast System, a way to prepare for potential disaster. So, for example, when new mothers dream about losing their babies, they may actually be rehearsing what they would do or how they would react if their worst fears were realized. There's also evidence that dreaming helps certain kinds of learning. Some researchers have found that dreaming about physical tasks, like a gymnast's floor routine, enhances performance. Dreaming can also help people find solutions to elusive problems. "Anything that is very visual may get extra help from dreams," says Deirdre Barrett, assistant professor at Harvard Medical School and editor of the journal Dreaming. In her book "The Committee of Sleep," she describes how artists like Jasper Johns and Salvador Dali found inspiration in their dreams. In her own research on problem solving through dreams, Barrett has found that even ordinary people can solve simple problems in their lives (like how to fit old furniture into a new apartment) if they focus on the dilemma before they fall asleep.

Whatever the function of dreams at night, they clearly can play a role in therapy during the day. The University of Maryland's Clara Hill, who has studied the use of dreams in therapy, says that dreams are a "back door" into a patient's thinking. "Dreams reveal stuff about you that you didn't know was there," she says. The therapists she trains to work with patients' dreams are, in essence, heirs to Freud, using dream imagery to uncover hidden emotions and feelings. Dreams provide clues to the nature of more serious mental illness. Schizophrenics, for example, have poor-quality dreams, usually about objects rather than people. Cartwright has been studying depression in divorced men and women, and she is finding that "good dreamers," people who have vivid dreams with strong story lines, are less likely to remain depressed. She thinks that dreaming helps diffuse strong emotions. "Dreaming is a mental-health activity," she says.

People often deal with traumatic events through dreams. Tufts University psychiatrist Ernest Hartmann, author of "Dreams and Nightmares," analyzed dreams from the same group of people before and after September 11 (none of them lived in New York). He found that the later dreams were not necessarily more negative, but they were more intense. "The intensity is a measure of emotional arousal," he says. For people suffering from posttraumatic stress disorder (PTSD), dream content can be a marker of the level of distress, says psychiatrist Thomas Mellman of the Howard University School of Medicine, who studies PTSD. Dreams that mimic the real-life trauma indicate that the patient may be "stuck" in the experience. He thinks one way to help people move past the memory is through an "injury rehearsal," where they imagine a more positive scenario.

All this has led to a rethinking of Freud's great insight, that dreams are a "royal road" to the unconscious. Mapping that royal road is a daunting task for scientists who are using sophisticated imaging techniques and psychological studies in an attempt to synthesize what we know about the inner workings of the mind and the brain. Dreaming, like thinking, is what makes us human--whether we're evoking old terrors or imaging new pleasures. "We dream about unfinished business," says Domhoff. And, if we're lucky, we wake up with a little more insight to carry the day.

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