

Paradoxical Sleep

During REM Sleep Your Up Brain Appears to Wake Up

Now all the cloudy shapes that float and lie. Within this magic globe we call the brain fold quite away, condense, withdraw, refrain, and show it tenantless—an empty sky.

THOMAS WENTWORTH HIGGINSON

Rapid eye movement sleep is referred to as paradoxical sleep because it is one of the deepest stages of dream sleep. Yet brain waves during REM are firing at the same rate as in a person who is wide awake.

The Roman poet Lucretius was one of the first to observe REM when he wrote in the first century B.C. of watching a hunting dog twitch as it lay sleeping by the fire. Watching its eye dart, he said that “the animal was chasing some kind of phantom prey in its mind.” Modern scientists didn’t realize the significance of REM sleep until 1951, when the modern era of sleep research began.

Since a researcher in another room reading an EEG in a sleep lab would think that the subject had woken up when the REM phase began, researchers need to measure other feedback to ensure the subject has, in fact, not awakened. Luckily there are other measurable changes in the body that occur during REM. A person usually shifts body position—rolls over, adjusts the pillow—just before going into REM and upon exiting it.

To test REM, sleep researchers place electrodes around the eyes to detect the rapid eye movements, but they also put a detector over muscles in the chin and neck in order to measure the loss of tonus in these muscles during REM. For reasons that are not understood, the muscles of the throat and tongue relax profoundly during REM sleep. As the eyes move back and forth, tonus in the throat is lost. One reason may be so that people don’t scream out their dreams or talk in their sleep.

Another interesting inherent condition of REM sleep is called atonia, which is the paralysis of voluntary muscle movement. Your body is paralyzed for REM sleep so that your cerebellum can go offline. Whenever you enter or exit REM sleep, it is marked by a significant readjustment of body position, because your body is paralyzed during REM.

During REM, the cerebellum is signing off on its duties so that it can focus on sending information elsewhere in your brain to be processed. Since the cerebellum controls proprioception, it doesn’t have to keep tabs on your

body's position in space if you are paralyzed. The cerebellum is also in charge of tongue, throat, eye, and body movements. Another interesting thing about REM is that the VOR reflex (vestibulo-ocular reflex) shuts off, too, so that your eyes *are* able to dart around. You can reverse VOR in the daytime by fixing on an object in front of you (like a red "power on" switch when you're running on the treadmill). Poke your tongue out a little bit and move your head back and forth and you can pull the same thing off, in reverse.

All animals sleep. Fish, which need to keep swimming in order to breathe, shut down half their brain at a time. They sleep with half their brain, while the other half keeps them moving, and then flip it. Neuroscientists think that the different stages of human sleep may be doing a similar thing in terms of giving parts of the human brain a period offline to regroup and consolidate during the five stages of the human sleep cycle.

REM is most likely about bottom-up processing. Researchers at MIT have shown that our primitive brain (the cerebellum) actually teaches our thinking brain (the cerebrum). At night, it is a tutoring session, a chance for the cerebellum to go over the lessons of the day with the cerebrum in the form of dreams and to catalogue and store them for our intellect.

Beyond Counting Sheep:

Real Methods for Beating Insomnia

*Wrench'd and sweaty—calm and cool then my body becomes,
I sleep—I sleep long.*

WALT WHITMAN

Hrayr P. Attarian, M.D., reviews ways to diagnose and treat insomnia, a symptom of several sleep disorders. "Insomnia is a prevalent and serious condition that is often missed or dismissed. Most of the time, it is treated with ineffectual means, frustrating both patient and physician," says Attarian, an assistant professor of neurology at Washington University School of Medicine in St. Louis and a member of the school's Sleep Disorders Center. In "Helping Patients Who Say They Cannot Sleep—Practical Ways to Evaluate and Treat Insomnia," published in the *Postgraduate Medicine* journal, Attarian lists the following rules for a good night's sleep:

- *Restrict the time you spend in bed so you're tired when you try to fall asleep.*