

# EXCERPTS FROM: SLEEP NOW, REMEMBER LATER

*Researchers are exploring the mysterious and important links between memory and slumber.  
- Newsweek Magazine, April 27th, 2009, Robert Stickgold, Ph.D. and Peter Wehrwein*

“For many years, people believed that the brain, like the body, rested during sleep. After all, we are rendered unconscious by sleep. Perhaps, it was thought, the brain just needs to stop thinking for a few hours every day. Wrong. During sleep, our brain—the organ that directs us to sleep—is itself extraordinarily active. And much of that activity helps the brain to learn, to remember and to make connections.”

In the year 2000, a research team from Harvard University reported that people improve their performance on a memory test when the test is repeated after a sleep break of many hours.

## Sleep Improves Memory

There are several different types of memory, and scientists have designed ways to test each type. Whether the test involves figuring out how to do something, remembering facts, or recalling life events, performance improves when you learn the task and then “sleep on it”. “It’s as if our brains squeeze in some extra practice time while we’re asleep....This isn’t to say that we can’t form memories when we’re awake. If someone tells you his name, you don’t need to fall asleep to remember it. However, sleep makes it more likely that you do.”

## A Tired Brain Has Difficulty

Sleep-deprivation experiments have shown that a tired brain has a difficult time capturing memories of all sorts. In fact, when tired, we forget information associated with positive emotion more easily than information tied to negative emotion. This could explain, at least in part, why sleep deprivation can trigger depression in some people. Memories tainted with negative emotions seem to be the most sticky, in the sleep-deprived brain.

## Hippocampus talks to Neocortex

Sleep also seems to be the time when the brain’s two memory systems—the hippocampus and the neocortex— “talk” with one another. Experiences that become memories are laid down first in the hippocampus. To retain a memory, the brain has to ship it from the hippocampus to the neocortex—that wrinkled outer layer of the brain that processes higher thinking. Unlike the hippocampus, the neocortex is a master at weaving the new with the old. Sleep helps the hippocampus do its job by closing down external information for a while, so that the “undistracted” hippocampus can shuttle memories to the neocortex, and the neocortex can connect this memory to other related memories.

How sleep helps us consolidate memories is still a mystery. However, recent research suggests that in sleep, electrical waves of brain activity actually change the physical nature of the space (called a synapse) that connects one brain cell with another. This change greases the flow of information, so that brain cells deepen connections in a process that we know as learning.

## Sleep Improves Understanding too!

It's not just memory that is improved by sleep. Recent studies indicate that sleep also helps us develop new understanding. Scientific history is full of tales of scientists with nocturnal "aha!" experiences. The chemist, Dmitri Mendeleev, awakened from a dream with his periodic table of elements, the fundamental core to chemistry.

In a recent study in Germany, subjects were given a game to play that required mathematical calculations. There was a hidden rule. If players happened to discover the hidden rule, they would identify final answers quicker. Speed was a part of winning the game. Some of the players played the game, did other things for eight hours and played the game again. Another set of players played the game in the early evening, slept, then played the game again after awakening. The players who slept were almost three times more likely to have the insight that allowed them to spot the hidden rule, than those who did not sleep. Yet, none of the players were told there was a hidden rule to even spot! Sleeping allowed these players to make a discovery and connect the dots.

We spend about a third of our lives asleep, and we realize how little we understand about that third of our lives. So we continue experimenting, hoping to understand sleep better. And perhaps someday we will. After we've slept on it.

**WHY IS THIS INFORMATION SO IMPORTANT? SOME SLEEP RESEARCHERS BELIEVE THAT FOR EVERY TWO HOURS WE SPEND AWAKE, THE BRAIN NEEDS AN HOUR OF SLEEP TO FIGURE OUT WHAT ALL THESE AWAKE EXPERIENCES MEAN. SLEEP PLAYS A CRUCIAL ROLE IN CONSTRUCTING THE MEANING OF OUR LIVES. AND, BREAKDOWNS IN SLEEP PROCESSING MAY CONTRIBUTE TO THE DEVELOPMENT OF DEPRESSION.**