

Why Do We Sleep?

Out of a 24-hour day, we humans spent an average of eight hours sleeping. In a culture where time is so precious, why do we “waste” a third of a day in bed?

PRACTICAL SCIENCE WITH PHIL FREDA

What is sleep?

All of us probably have a notion of what sleep is and agree that it is an enjoyable part of the day. On the other hand, I have heard some say they wish they could somehow bypass sleep to be more productive.

Sleep is something personal—it is a time to be totally disconnected from our lives and responsibilities. I myself have had dreams that have put me into an “alternate reality.”

But, what's strange is that, after waking from these [dreams](#), you immediately realize what has transpired in the dream is far from reality.

While in the dream, however, everything seemed so real, like you have always been there.

But what really is sleep, and why do we do it?

A sleeping person may seem inactive, but according to [Harvard University's Healthy Sleep Website](#), some parts of the brain are actually more active during sleep than when awake.

The simplest definition of sleep is a time where our body can rest and recuperate from the day's experiences.

According to an article on [Physorg.com](#), there are four leading hypotheses about why we sleep.

- Sleeping allows the body to repair cells that have been damaged by byproducts of metabolism called [free radicals](#). These are highly reactive substances that build up in the body during the day when we burn food. These chemicals are extremely dangerous because they can bind to essential molecules in the body causing mutation and cellular damage.
- Another hypothesis is that sleep helps replenish spent chemical energy that has been used up during the day. One of the most important fuel sources in the body is a molecule called [ATP](#) (Adenosine Tri-Phosphate). Think of ATP as little batteries that float around our cells. To do their jobs, our cells use the chemical bonds in ATP to help make reactions go forward. Research shows that when ATP levels are low, the body tells you to sleep more.
- Sleep may also be a time for your brain to “tidy up a bit.” As the day goes by, you are inundated with loads of information, new experiences and images. In response, your brain creates new [synaptic connections](#). This is how information is stored in the brain, through complex connections made by specialty cells called [neurons](#) (brain cells). Since your brain has a defined size, however, sleep may be a time where unneeded synaptic connections are cleaned out for newer, more relevant ones.
- The last hypothesis is that during sleep, your brain actually flows through all of the information in the day like a movie. This reinforces all of the memory and learning of the day. Research with rats have shown that after monitoring their brains' activity during a full day of maze running, the same brain

activity was seen when they were sleeping. This reinforces the thought that we replay experiences to better learn them. In addition, this is why we most likely experience dreams. While our brains flow through the day's events and clean out old memories, we experience a haphazard mix of sensory information that may manifest as a dream.

In reality, it is likely that the true reason of sleep is actually a combination of all four of these ideas. The reason we sleep is a multifaceted one.

What goes on when we sleep?

Psychologists and sleep scientists have noticed a pattern of brain activity that occurs in healthy sleeping individuals according to [Harvard University's Healthy Sleep Website](#).

Sleep is split into two parts, [REM](#) (rapid-eye movement) and NREM (non-rapid-eye-movement) sleep.

The [cycle](#) between REM and NREM sleeps happens every 90 to 120 minutes.

- **Light Sleep** – This stage is called N1 and serves as the entry into the sleep cycle. Waking someone from this stage of sleep is pretty easy since they have just fallen asleep. Body motions called sleep starts are common during this stage. Research shows that thoughts begin to lose logical sequence at this time. This is why people may be confused or startled if awoken during this time.
- **N2 Sleep** – This stage marks where the frequency of brain activity decreases (K complexes) and then increases again (Sleep Spindles). This marks the middle of the sleep schedule and also where brain waves start to become slower and more synchronized.
- **REM Sleep** – Most, if not all, of dreaming occurs during this time. The person's eyes move under the eyelids during this time, while the rest of the body appears to be paralyzed. The brain ensures that the synaptic connections to the muscles are shut off during this phase. During this time, the brain is very active and looks like brain activity of a person that is awake.
- **Deep Sleep** – This stage is called N3 and marks the point in which brain activity is the slowest. During N3 sleep, breathing patterns are very regular. There is a decrease in core temperature and a steady heart rate. A person may be woken out of this stage, but it may take up to an hour to regain full consciousness!
- **Awakenings** – After deep sleep, we actually hit a point of near awakening. These are infrequent and short in duration. If we actually do wake up during this time, we usually don't remember it. After this brief phase, the cycle starts over again.

Do other animals sleep?

They most certainly do!

[All animals need to sleep](#) for the same reasons we do, but “sleep” may seem strange with some creatures. Not all animals sleep like we do by closing their eyes and lying down.

Sharks have a problem—they need to keep a constant flow of water through their gills in order to breathe. So, sharks basically “sleep swim” by shutting off parts of their brain to rest while still moving.

According to [Wikipedia](#), the least complex organism that shows sleep-like tendencies is the nematode worm *[Caenorhabditis elegans](#)*.

Before going into a stage of molting, this organism enters a phase of inactivity similar to sleep.

Sleep cycles are also seen in insects like the fruit fly. If their sleep is disturbed, so is their ability to properly court and mate.

In the mammal world, the [brown bat](#) sleeps the most at almost 20 hours per day. On the other hand, [giraffes](#) only sleep about two hours a day.

Sleep is an extremely important and integral part of the day and our lives.

Infants and babies require more sleep because of increased developmental needs. For the same reasons, however, sleep is also important to adults.

The need to sleep may seem silly and non-productive at times, but the truth is, we need to do it.

Think about it.

Have you thought about it, yet? [Tell us in the comments.](#)