

# What Do Animals Dream About?

PEEK INSIDE THE MINDS OF SLEEPING ANIMALS.

**Y**our dog whimpers in his sleep. Your cat twitches. It definitely looks like your pet is dreaming. We can't ask them about it, but scientific evidence—based on similarities in our brains and behavior while sleeping—seems to indicate that animals do dream, just like us. But what are they dreaming about? Scientists are looking at sleeping cats, rats, and even bees to find out what really goes on when they snooze.

In people, the most vivid dreams happen when we experience rapid eye movement, or REM, sleep. During this time, our muscles are normally paralyzed so we don't act out our dreams, but our brains can be even more active than they are when we're awake.

All mammals and some birds also experience REM sleep. Other creatures, like reptiles and some insects, might go through

REM sleep—or something resembling it.

"They probably don't have the rich narrative dreams that we experience, but it seems reasonable to think that animals have images and some form of thinking during REM sleep," says Patrick McNamara, a neuroscientist at Boston University.

## 📌 Cat Naps and Sleeping Tweets

We first began to peer into the minds of sleeping animals in the 1960s. French scientists discovered that removing cells from the part of a cat's brainstem called the pons prevented the animal from becoming paralyzed during REM sleep. Instead of lying still, the cats got up and walked around, moved their heads as if following prey, and chased invisible mice—all while still fast asleep. These behaviors hinted that the cats were seeing images during REM sleep and acting out things they liked to do in their waking hours.









So if cats dream about stalking prey, what do birds dream about? Singing, of course!

Scientists recorded the activity of nerve cells in the brains of zebra finches as they sang. Particular brain cells activated, in a recognizable pattern, when the birds sang specific notes. Then the scientists looked at those same cells as the birds slept. In sleeping finches, the brain cells showed the same patterns of activity that researchers observed when the birds were singing.

The finches appear to replay melodies in their dreams, practicing their songs while they sleep.

#### 📌 Rat Slumber

For laboratory rats, dreams may take the form of replaying the fastest route through a maze to a tasty piece of food. Matthew Wilson, a neuroscientist at the Massachusetts Institute of Technology (MIT), and his colleagues compared the brain patterns of rats running through a maze with their brain activity during sleep afterward.

“It’s like going down the halls in your school or the different rooms of your house,” says Wilson. “The rats can follow different paths to get to a food reward, so there’s some incentive for them to explore.”

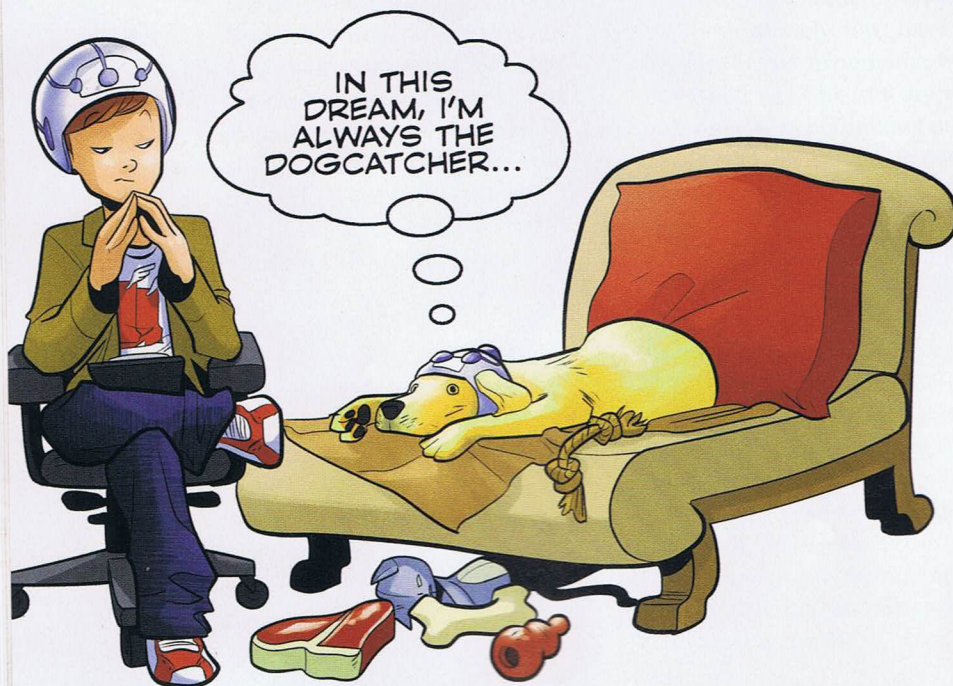
Wilson and his colleagues looked at an area of the brain called the hippocampus. Cells in this area activate in ways that correspond to a rat’s locations in space. The rats’ movements create new patterns of activity in the hippocampus. The researchers could tell where an awake rat was in the maze by the pattern of activity in its hippocampus.

When Wilson and his colleagues looked at the activity of the same nerve cells while the rats slept, they found nearly identical patterns of activity. It was as if the rats were running the maze in their minds while they slept. The brain patterns were so similar that the researchers could tell what part of the maze the rats were dreaming of.

“The rats seem to be traveling back in time, revisiting places they have been,” says Wilson. “Their dreams take the form of these short snippets of experience, like little movies.”

In another experiment, Wilson and his colleagues showed they can even influence what rats dream about.

The researchers trained rats to run a maze. This time, they played one sound to tell the rats to go left for food and another sound to tell them to go right. While the rats navigated the maze, the researchers recorded their brain activity. Later, as the rats slept, Wilson and colleagues again recorded their brain activity. When the researchers played the sounds from





the experiment near the slumbering rats, they saw an interesting thing: the rats appeared to dream about the section of the maze previously associated with the sound.

“When we played those sounds during sleep, we would see memories for the locations associated with the specific sounds reactivated,” says Wilson. In other words, they manipulated the content of the rats’ dreams.

### 📌 **Insects and Other Creatures**

Animals such as rats, cats, and finches have brains that are like our own and show similar behavior during sleep. But what about more distantly related animals? How can we tell if they are dreaming?

“Of the nearly one million described species of insect on the planet, only a handful have been studied with respect to sleep,” says Barrett Klein, a biologist at the University of Wisconsin–La Crosse.

Measuring sleep in insects is tricky. Scientists have generally focused on a group of behavioral signs of sleep, such as stillness, drooping, and muscle relaxation. Sleeping bugs also require intense stimulus to jar them into responding. Experiments show that some insects experience sleep rebound, which means that if deprived of sleep, they will subsequently need more of it.

Going without sleep has serious consequences for people. Insects can also suffer from lack of shut-eye. Klein investigated how sleep deprivation affects honeybee communication. Bees tell each other about the direction and distance to food sources with something called a waggle dance. Klein found that the dances of sleep-deprived bees are sloppier than those of bees that slept soundly.

In another experiment, scientists investigated whether sleep plays a role



in memory processing in bees, like it does in humans. The researchers trained bees on a task and presented them with an odor at the same time. When the bees slept, scientists exposed them to the same odor. The insects later demonstrated better memories of the task. The results suggest that bees might replay their daily experiences during sleep.

Klein says no one is sure if insects like bees dream, but there is great potential. “In my experience, there is no reason why an insect would not or could not do something comparable to human dreaming,” he says. “If they can process odors and replay information while they sleep, that’s what dreams are made of. If you watch a sleeping bee, there are titillating hints that she might be processing something. I’ve seen bees twitch their antennae and extend their tongue-like mouthparts during sleep. Are they dreaming about lapping up nectar from a flower?”

Recent research suggests dreaming may be more common in the animal kingdom than previously thought.



For instance, cuttlefish, relatives of the octopus, demonstrate a sleep-like state similar to REM sleep in which their eyes move rapidly, their arms twitch, and their bodies change color. And scientists observed something comparable to REM sleep in a lizard called a bearded dragon.

### 📌 **To Sleep, Perchance to . . . Understand You’re Dreaming?**

While the behavioral and biological evidence that other animals dream continues to grow, what that actually means remains elusive. We do not know what dreaming is like for animals or if they know that they are dreaming. People do not often realize they are dreaming while asleep, but it usually becomes clear as soon as we wake up. Do finches realize they sing in their sleep? Do rats wake up remembering the mazes they ran while they dozed? Do cats recognize their dreams of stalking prey as dreams and not reality?

We can say with reasonable certainty that other animals dream. But how animals experience those dreams is a mystery—for now.

**Mary Bates** is a freelance science writer based in Boston. She specializes in writing about the brains and behaviors of humans and other animals. She enjoys watching her cat twitch and snore in his sleep and imagining what he might be dreaming about.