

# StayingAlive

## The birds are REMing, singing in their sleep

**MATTHEW EDLUND M.D.**  
Contributing Columnist  
health@lbknews.com

*Birds sing. Fruit flies sleep.  
Zebra finches REM.  
Birds do it. People do it. Which may help explain  
why we sleep.*

Zebra finches are popular pets, partly because of their lovely, complex songs. Their sociability, tight adherence to their mates and quick ability to breed have caused many to spend their lives not in Australia but in worldwide laboratories, where they frequently participate in genetic studies. Researchers study them to learn about learning, as zebra finches must learn how to sing.

Only the males sing. With puberty they begin to copy the songs of their fathers. In time, rather like jazz musicians, they take elements of the many sounds around them and add them to their song. Unlike jazz musicians, once a zebra finch learns its song, its form remains fixed. They will sing that song for the rest of their lives. But how do they learn it in the first place?

To know about learning, you must understand sleep. Scientific excitement about zebra finches has risen as research at the Salk Institute now demonstrates zebra finch sleep is similar to that of people. Even their REM sleep is similar.

That's a surprise. For a long time it was thought that birds did not REM. How can you reach REM sleep when you don't even have a neocortex? It's one reason "bird brains" get a bad name.

The trick is knowing where to look. The group at Salk used a new microminiaturized array, studying very small parts of the zebra finches' brains. When the data were suitably mathematically massaged, REM sleep popped out in all the zebra finches.

### Sleep and information processing

The human state of consciousness called REM sleep is rather confusing. During REM sleep, the brain proportionately uses more energy than when we're awake. Yet while some parts of the brain are highly active in REM, others are turned down or off.

Position sense, in particular, becomes inactive. Ever fly in your dreams? Ninety-nine percent of people do. If you ever dreamt you're in one place and immediately discover yourself in another with no idea or concern for how the transition took place, you're probably in position sense-less REM.

Though your mind may imagine enormous physical activity during your REM dreams, your body does not move. In REM, circulation and breathing are normal, but your skeletal muscles are turned off. Fortunately they are not paralyzed, merely flaccid, providing some relief for sufferers of arthritis and chronic pain. Also in REM, internal temperature controls disappear. We become like infants, our bodies cooling or heating depending on the temperature of where we lie asleep. What possible usefulness to us is this weird REM state?

REM appears necessary to make accurate, complicated decisions, demonstrated in a recent German experiment studying a practical question — what was the best deal on a car? Other recent data argues REM is needed for some types of creativity, like generating entirely new ideas. Yet it's hard to figure out how to generate all the physiological weirdness of REM when you lack a neocortex.

### The evolution of dreams

Birds are estimated to have evolved over 150 million



years. If birds started REMing early, REM sleep may have been around more than 100 million years. Birds, however, diverged from most mammals a very long time ago, so some researchers think they may have developed REM sleep independently.

Why develop a state that leaves your muscles lax, your internal temperature out of control, prey to bizarre, complicated brain fabrications while your body lies open to predator attacks?

The answer may lie in the nature of dreams. We can dream in all states of sleep, but it is in REM where our most complicated and colorful narratives occur. It appears that REM dreams mirror much of what is going on in the brain, which is then creating a vast in-gathering and dissemination of information.

We do more than learn in dreams. We assemble things in unknown ways, much as the immune system does when facing new foreign invaders. During REM our cortex runs riot, as information is passed, sifted, refined, resurrected and rebuilt into forms so strange they often make no sense when we wake up and review them.

One reason they may be hard to understand is because in REM we're building new memories, literally rewiring ourselves. Sleep is highly active and no more so in REM, where all the information of the day is redirected and recombined. Some material is so summarized as to make it "lost," which may possess the advantage of leaving us plenty of space to add new information.

Shakespeare wrote "to sleep, perchance to dream." Perhaps we sleep perchance to learn, to remember, to renew and create anew.

And to sing. The birds know that, too.

*Dr. Matthew Edlund practices sleep medicine and psychiatry in Sarasota. His new book, "Designed To Last," is available online. He can be reached at 365-4308 and via his Web site at doctoredlund.com.*

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