

Sleep may be nature's time management tool

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If there is a society of expert sleepers out there, a cult of smug snoozers satisfied that they're getting just the right number of restful hours a night, it must be a secretive one. Most people seem insecure about their sleep and willing to say so: they would like to get a little more; maybe they wish they could get by on less; they wonder if it's deep enough.

And they are pretty sure that being up at 2 a.m., pacing the TV room like a caged animal, cannot be good. Can it?

In fact, no one really knows. Scientists aren't sure why sleep exists at all, which has made it hard to explain the great diversity of sleeping habits and quirks in birds, fish and mammals of all kinds, including humans.

Why should lions get 15 hours a night and giraffes just 5 — when it is the giraffes who will be running for their lives come hunting time? How on earth do migrating birds, in flight for days on end, sleep? Why is it that some people are early birds as young adults and night owls when they're older?

The answer may boil down to time management, according to a new paper in the August issue of the journal *Nature Reviews Neuroscience*. In the paper, Jerome Siegel, a professor of psychiatry at the University of California, Los Angeles, argues that sleep evolved to optimize animals' use of time, keeping them safe and hidden when the hunting, fishing or scavenging was scarce and perhaps risky. In that view, differences in sleep quality, up to and including periods of insomnia, need not be seen as problems but as adaptations to the demands of the environment.

"We spend a third of our life sleeping, and it seems so maladaptive — 'the biggest mistake nature has made,' scientists often call it," said Dr. Siegel, who is also chief of neurobiology at the V.A. Greater Los Angeles Healthcare system. "But another way of looking at it is this: unnecessary wakefulness is a bigger mistake."

As a field of study, sleep research is anything but sleepy — experts disagree strongly on almost every theory offered, and this one is no exception. Among other objections, critics point out that sleeping animals are less alert to predators than they are while awake, and that sleep appears to serve other essential functions. Some studies suggest that the brain consolidates the day's memories during slumber; others suggest that it needs sleep to repair neural damage.

"My own theory, which is more consistent with the mainstream, is that neurons require sleep as part of the long-term process" of modification to support learning, wrote Dr. Clifford Saper, a neuroscientist at Harvard, in an e-mail message. But, he added, his theory and Dr. Siegel's may not be mutually exclusive.

For one thing, sleep is not nearly as vulnerable a state as it appears. Sleepers are highly sensitive to some sounds, like a baby's whine or an unusual thump or voice. And as Dr. Siegel put it, sleepers are less vulnerable to harm than they would be if they were out on the street late at night.

For another thing, the new paper argues, evidence from other animals strongly suggests that the need for sleep drops sharply during the most important waking hours. Migrating killer whales are alert and swimming for weeks on end, and seemingly just as alert as when well rested, studies find. Recent research suggests that the same goes for white-crowned sparrows : they get far less sleep than usual when migrating.

Consider the big brown bat, perhaps the longest-sleeping mammal of them all. It snoozes 20 hours a day, and spends the other 4 hunting mosquitoes and moths in the dusk and early evening. "Increased waking time would seem to be highly maladaptive for this animal, since it would expend energy and be exposed to predatory birds with better vision and better flight abilities," Dr. Siegel writes.

In humans, it is well known that sleep quality changes with age, from the long, deep plunges of early childhood to the much lighter, more frequently interrupted five or six hours that many elderly people call a night's sleep. Doctors have long debated whether elderly people are sleep-deprived as a result, or simply need less restful slumber. In Dr. Siegel's view, it's a matter of tradeoffs: older people no longer have a child's need to grow, which requires deep, long sleep and may have more need and more ability to do things for themselves instead.

In short, when there is hay to be made, animals tend to make it, whether the sun is shining or not. Depending on the animal, a long period of waking may or may not be followed by a long recovery sleep.

The theory also supports what people already suspect about early birds and night owls: they are most alert when they are naturally most productive. And they can feel strung out if their work schedule doesn't match.

None of which is to say that good sleep is unnecessary or that serious sleep problems do not exist. It is and they do. But the theory does suggest that a stretch of insomnia may not be evidence of a disorder. If sleep has evolved as the ultimate time manager, then being wired at 2 a.m. may mean there is valuable work to be done. Time to turn off the "South Park" reruns and start doing it.

New York Times, New York, Aug. 31st 2009, Health, online.