Ne0nRa1n & Keith Biddulph present...

Hacking Sleep:
How to Build Your Very Own Sleep Lab

Human Sleep

Sleep is a normal state of rest that is characterized by unconsciousness, reduced activity, and limited sensory responsiveness

Sleep differs from other states of reduced consciousness such as drug intoxication or coma, because it is spontaneous, periodic, and readily reversible

Wakefulness is characterized by consciousness, sensory responsiveness, and purposeful activity

Sleep in Non-Humans

Some animals never exhibit a state that meets the behavioral definition of sleep

Some marine mammal species do not show evidence for REM sleep, and convincing evidence for this state in reptiles, fish and insects is lacking

The enormous variation in the nature of rest and sleep states across the animal kingdom and within the mammalian class has important implications for understanding the evolution and functions of sleep

High REM Sleep

≥ 3 hours of REM sleep/day

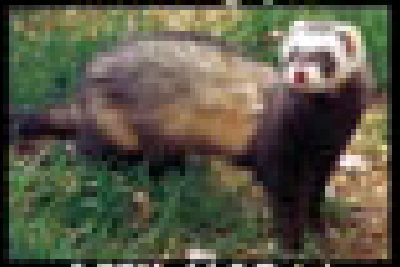
Platypus
Ornithorhynchus anatinus

8 REM, 14 Total

Thick-tailed Opossum
Lutreolina crassicaudata

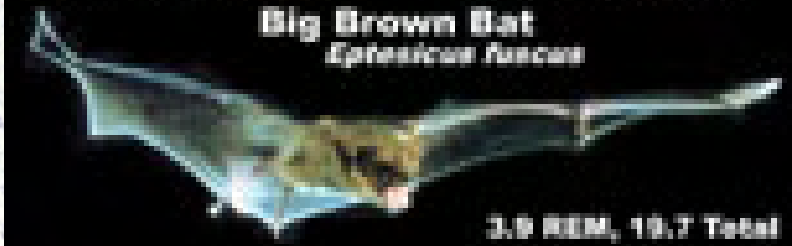
6.6 REM, 18 Total

Ferret
Mustela nigripes



6 REM, 14.5 Total

Big Brown Bat
Eptesicus fuscus

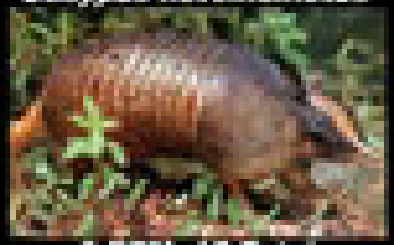


3.9 REM, 19.7 Total

European Hedgehog
Erinaceus europaeus

3.5 REM, 10.1 Total

Armadillo
Dasypus novemcinctus



3 REM, 17 Total

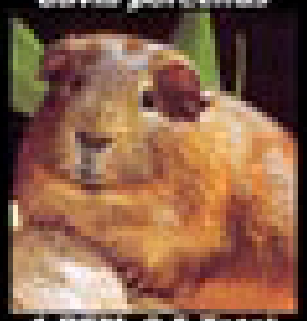
Human
Homo sapiens

2 REM, 8 Total

Low REM Sleep

≤ 1 hour of REM sleep/day

Guinea Pig
Cavia porcellus



1 REM, 9.5 Total

Guinea Baboon
Papio papio

1 REM, 9.5 Total

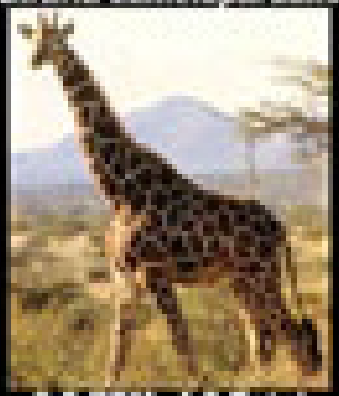
Sheep
Ovis aries

0.6 REM, 5.9 Total

Horse
Equus caballus

0.5 REM, 3 Total

Giraffe
Giraffa camelopardalis



0.5 REM, 4.5 Total

Bottlenose Dolphin
Tursiops truncatus

<0.2 REM, 10 Total

Discovery of REM

REM was discovered by accident in 1952

The discovery of REM sleep was the single event that hallmarked the onset of the modern era of sleep research

Researchers have yet to agree on the function of REM

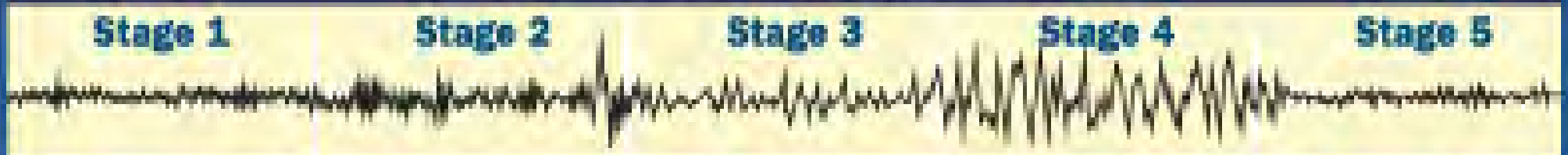
Stages of Sleep

Four Non-REM Stages of Sleep

REM Stage

Wakefulness

100% Sleep Cycle



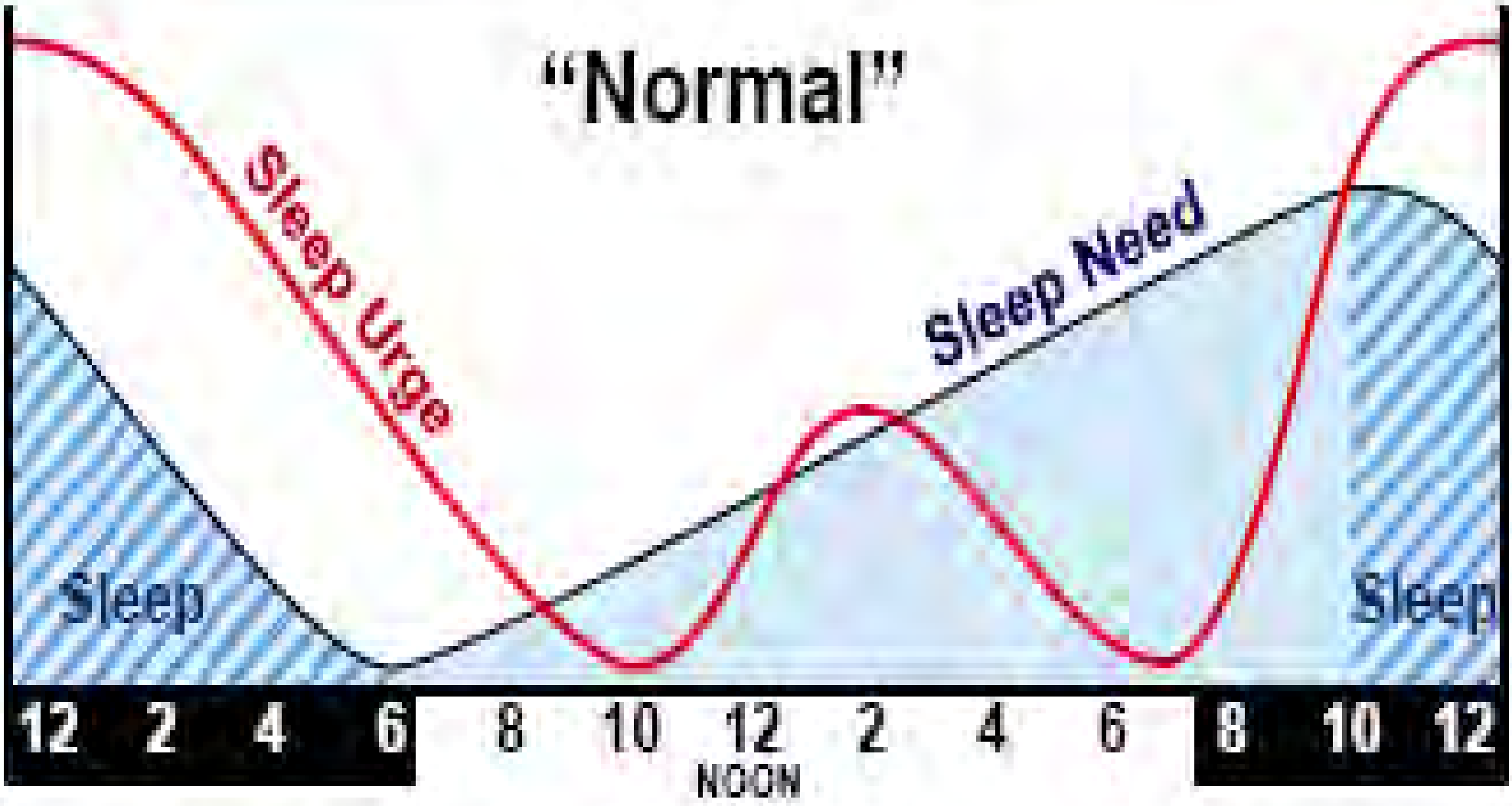
Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
4-5%	45-55%	4-6%	12-15%	20-25%
Light sleep. Muscle activity slows down. Occasional muscle twitching.	Breathing pattern and heart rate slows. Slight decrease in body temperature.	Deep sleep begins. Brain begins to generate slow delta waves.	Very deep sleep. Rhythmic breathing. Limited muscle activity. Brain produces delta waves.	Rapid eye movement. Brainwaves speed up and dreaming occurs. Muscles relax and heart rate increases. Breathing is rapid and shallow.

Sleeping and Waking

Biological Clock

Circadian Rhythm

Homeostatic Sleep Propensity



Normal circadian sleep rhythm. Sleep urge is greatest at night with a small increase at mid day. Sleep need increases throughout the waking hours and is replenished during sleep.

Incandescent Light

The first incandescent electric light was made in the 1800's

Electric light can affect circadian rhythm

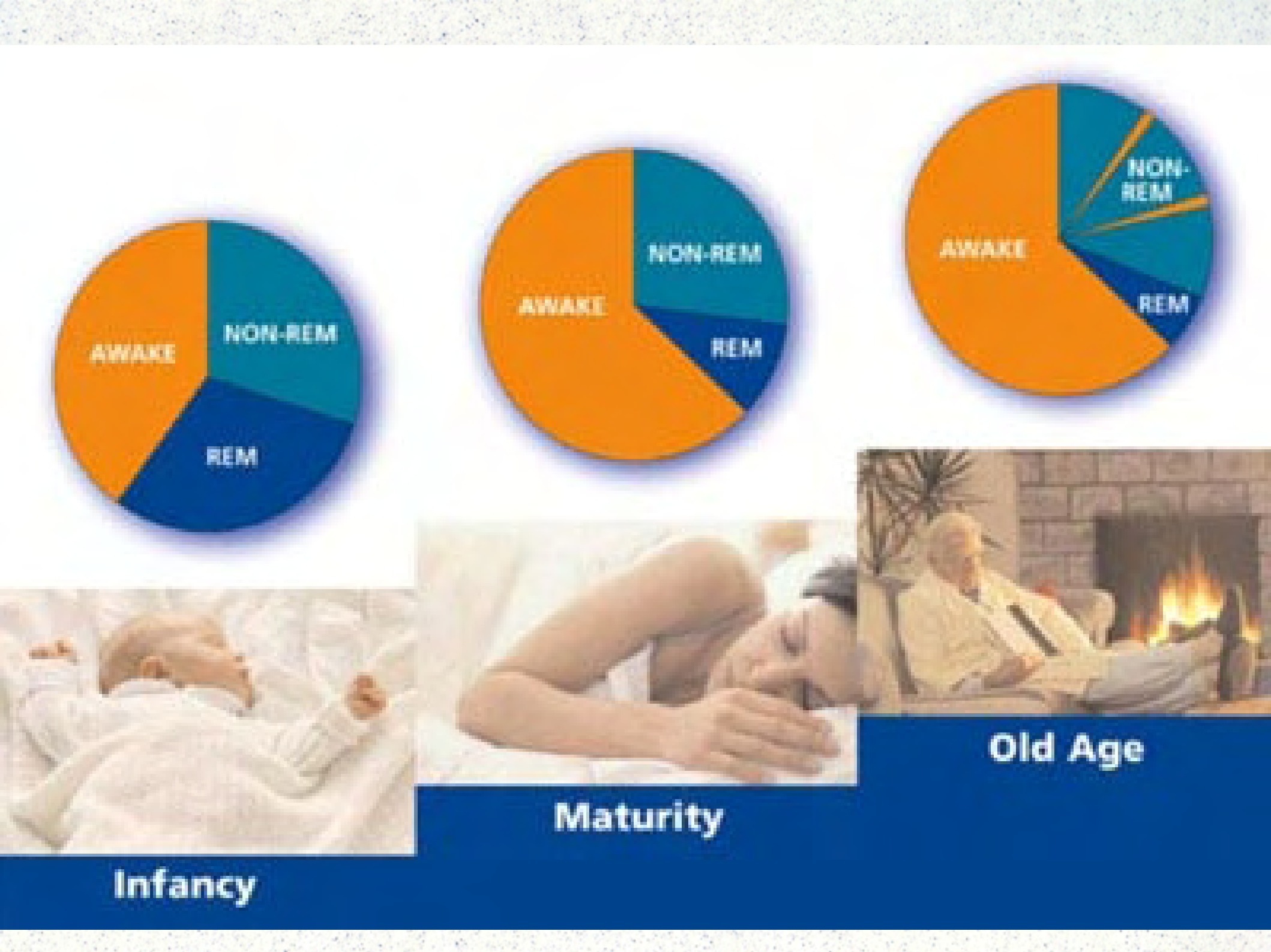
Circadian rhythm disruptions may be a cause of health problems

Aging and Sleep

The patterns of REM and NREM sleep show developmental changes as we age

As children grow, they sleep for longer periods at a time, with fewer sleep periods in a day, until achieving the adult pattern of a single sleep period each day

In most adults, the amount of nightly sleep remains fairly stable until old age

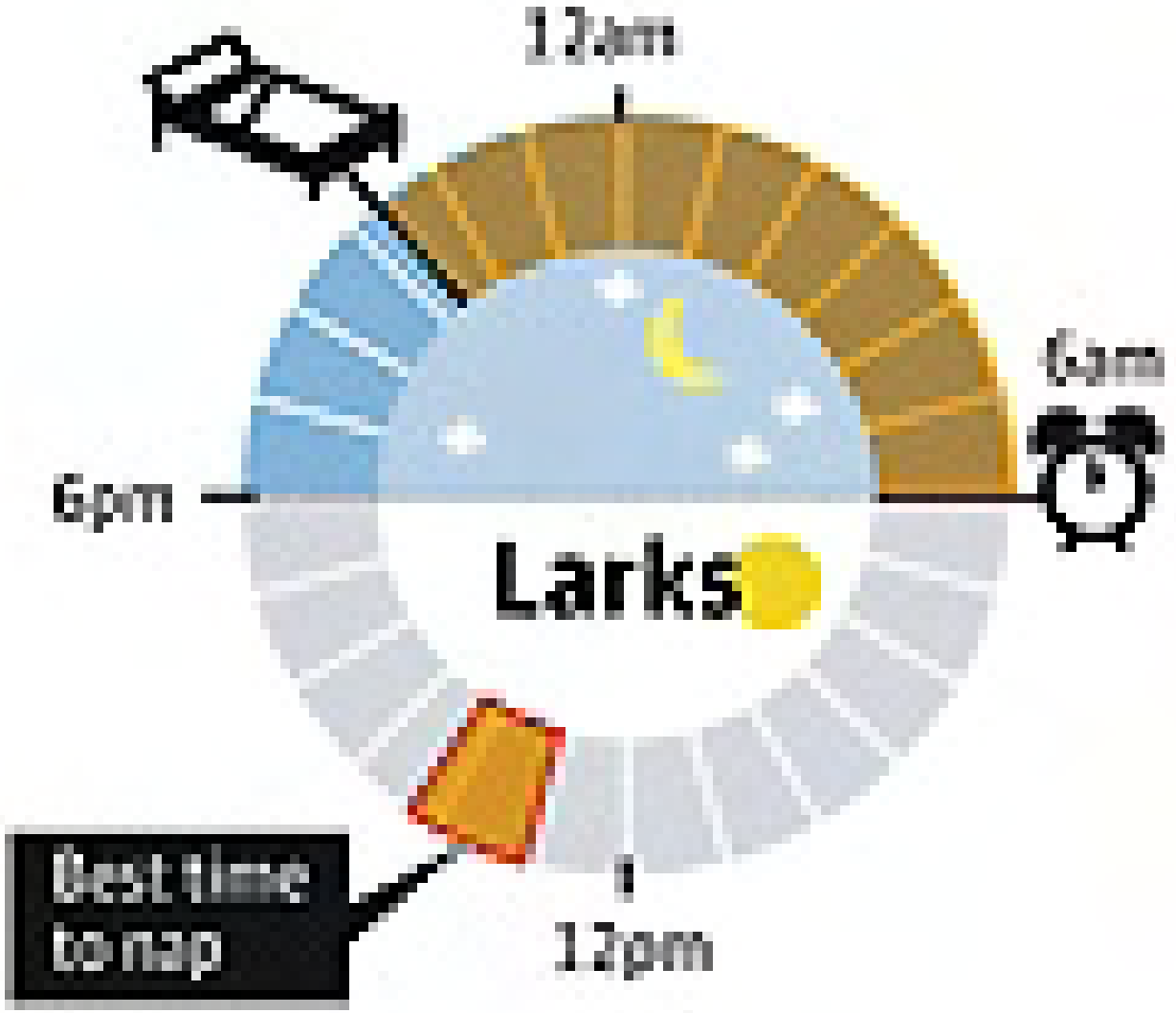

AWAKE
NON-REM
REM
AWAKE
NON-REM
REM
AWAKE
NON-REM
REM
Infancy
Maturity
Old Age

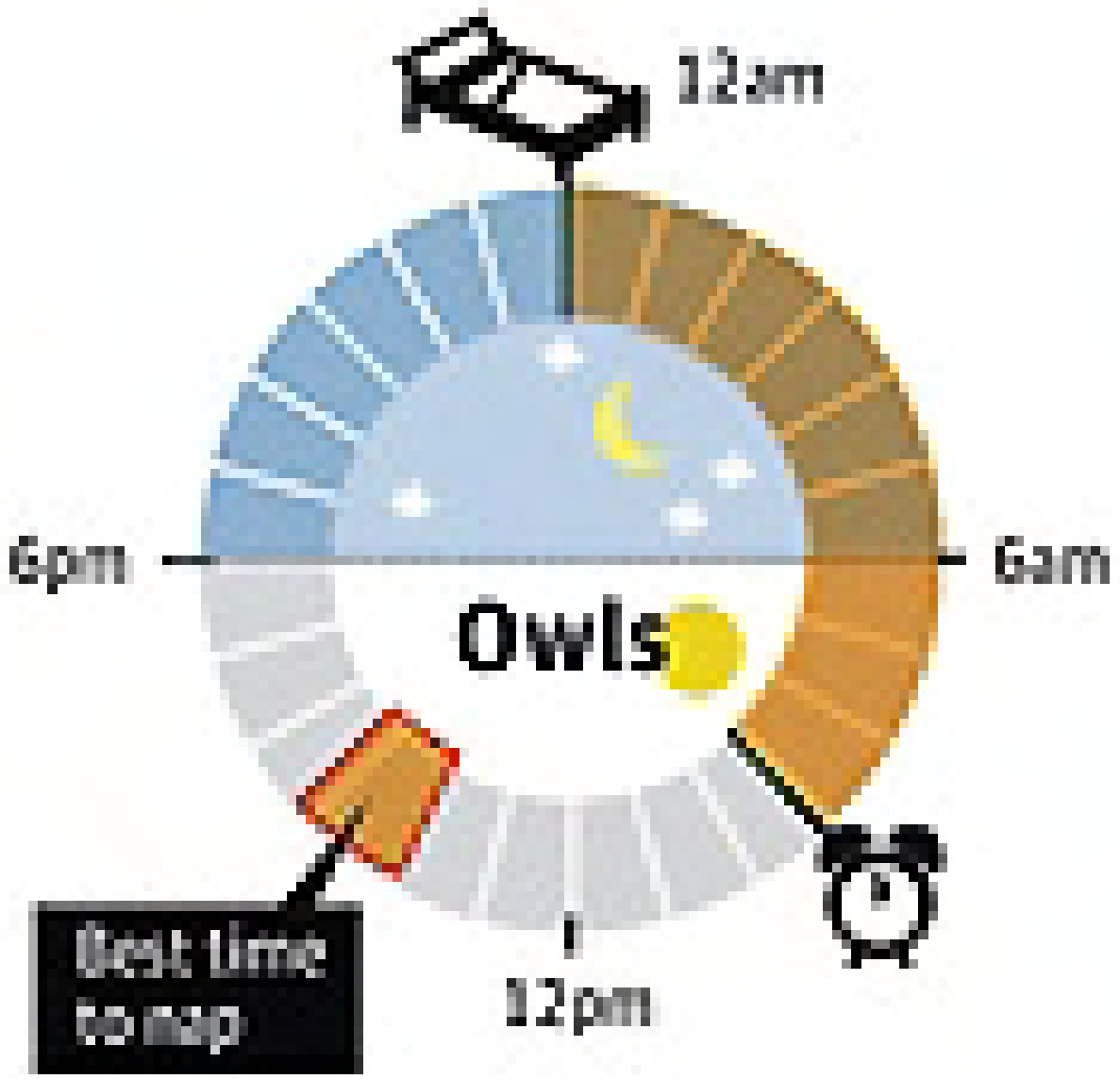
Larks and Owls

Chronotype

Moring Larks

Evening Owls


12am
6am
6pm
Larks
Best time to nap
12pm


12am
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Owls
12pm
Best time
to nap

Sleep Debt

Sleep debt is the cumulative effect of not getting enough sleep

There are two kinds of sleep debt caused by partial sleep deprivation or total sleep deprivation

There is debate in the scientific community over the specifics of sleep debt

Current Theories on Sleep

The physiological purpose of sleep continues to be something of a mystery

Theory of sleep as a restorative function

Theory of sleep an adaptive function

Sleep Disorders

The quality and quantity of sleep are important indicators of overall health

Sleep disorders can be classified into lack of sleep, disturbed sleep, and excessive sleep

Common sleep disorders

A Very Short History of Hypnotics

Chloral Hydrate

Bromide Salts

Barbiturates

Benzodiazepines

Non-Benzodiazepines

The Sleep Study

You go to sleep with electrodes attached to various points on your body

A computer records your brain waves, eye movement, muscle tension, and breathing patterns

A camera adjusted for low light and an audio-recorder are also used