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, 10 Total

- Big Brown Bat
  Eptesicus fuscus
  3.9 REM, 19.7 Total

- European Hedgehog
  Erinaceus europaeus
  3.5 REM, 10.1 Total

- Guinea Pig
  Cavia porcellus
  1 REM, 9.5 Total

- Sheep
  Ovis aries
  0.6 REM, 5.9 Total

- Giraffe
  Giraffa camelopardalis
  0.5 REM, 4.5 Total

Low REM Sleep
≤ 1 hour of REM sleep/day

- Human
  Homo sapiens
  2 REM, 8 Total

- Ferret
  Mustela nigripes
  6 REM, 14.5 Total

- Guinea Baboon
  Papio papio
  1 REM, 9.5 Total

- Horse
  Equus caballus
  0.5 REM, 3 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
- 4-5%

Stage 2
- 45-55%
- Breathing pattern and heart rate slows. Slight decrease in body temperature.

Stage 3
- 4-6%
- Deep sleep begins. Brain begins to generate slow delta waves.

Stage 4
- 12-15%

Stage 5
- 20-25%
- 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 midday. 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.
Larks and Owls

Chronotype
Moring Larks
Evening Owls
Best time to nap

Larks
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 as 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.