

Lecture 19 - Sleep and Dreams

The Abstract: You spend about one third of your life asleep or, at least, you were built to do so. Why? And what happens if you abuse the system? This lecture will focus on four questions:

- 1) What does sleep behavior look like? How is it structured?
- 2) Why do we sleep? And what happens if we don't?
- 3) Why do we dream?
- 4) Can we extract any meaning from our dreams?

The answers, in a nutshell, are: We were designed by nature to sleep in a consolidated period of about 8 hours during the night. Within that 24 hour structure is another structure that sends us into dreaming sleep every 90 minutes or so. We dream as a by product of the biology. Freud didn't know the biology and had an elaborate theory of the role of dreams as a safe venting of repressed wishes. It is possible to reconcile Freud's core ideas with modern sleep research and we will try to do that by the end.

Lecture Notes

Why do you spend about 1/3 of your life in an altered state of consciousness?

PART ONE: What does the behavior look like?

The drive to sleep is driven by two (main) forces

Force #1: Circadian rhythms

Approx 24 hrs

Graph removed for copyright reasons.

How do we measure this? This picture shows running wheel activity in a mouse. Each line is a day (plotted twice). Black = activity. The horizontal arrow shows the day on which the light was turned on continuously.

Circadian rhythms can be
Entrained (to what?)

or

Free running (This mouse free runs with a cycle of about 23.5 hrs)

How do we measure this in humans?

Core body temp in humans

Circulating hormones (e.g. melatonin)

Force #2: Homeostatic sleep pressure

= time awake (more or less)

Bring these two together and you have a mechanism for producing 8 hrs sleep.

The behavior changes with age:

The national debt (sleep debt, that is)

Many bad things are associated with sleepiness

There is structure within sleep, too

	AWAKE	DEEP SLEEP	"REM"
EEG ElectroEncepholoGraphy			
EOG ElectroOculoGraphy			
EMG ElectroMyoGraphy (myo = muscle			

And....More structure: The interaction of circadian and 90 minute cycles

A larger scale structure to a night of sleep
more Slow wave early and more REM late.

It matters when you sleep, not just how much

PART TWO: Why do we sleep?

Some theories

1)

2)

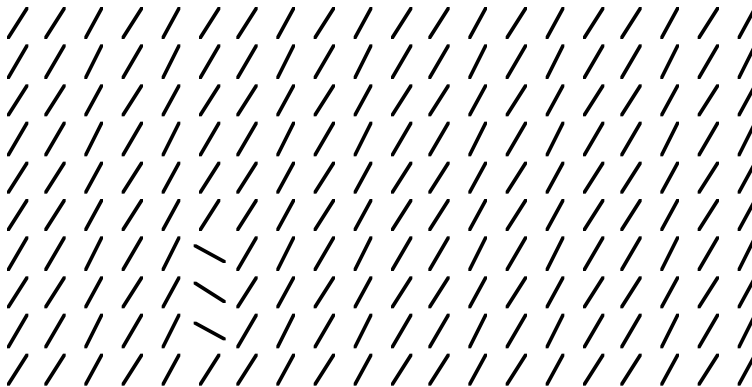
3)

...more

The role of sleep in learning

perceptual learning studies

What is the texture learning task?



Karni, A., & Sagi, D. (1993). The time course of learning a visual skill. *Nature*, 365(16 Sept), 250-252.

Stickgold, R., James, L., & Hobson, J. A. (2000). Visual discrimination learning requires sleep after training. *Nature Neuroscience*, 3(12), 1237-1238.

The power of napping!

Mednick S, Nakayama K, Stickgold R. 2003. Sleep-dependent learning: a nap is as good as a night. *Nat Neurosci* 6: 697-8

Can you do your problem set in your sleep?"

Wagner U, Gais S, Haider H, Verleger R, Born J. 2004. Sleep inspires insight. *Nature* 427: 352-5

Sleep deprivation makes you...

Slow (what is the evidence)

Careless

Not to mention stupid and sleepy

Will sleep deprivation kill you?

What about REM deprivation?

PART THREE: Why do we dream? (well, we have sort of talked about this by now, so...

PART FOUR: Can we extract any meaning from our dreams?

differences from waking consciousness.

Dreams seem to cry out for interpretation

In about 1900, Freud published "The Interpretation of Dreams"

A quick version of Freud's theory

Purpose: Part 1- to release unconscious steam

What is *Wish fulfillment*

What kind of wishes?

What is the *Day residue*

Is there any evidence that you dream about the prior day?

Stickgold R, Malia A, Maguire D, Roddenberry D, O'Connor M. 2000. Replaying the game: hypnagogic images in normals and amnesics. *Science* 290: 350-3

Purpose: Part 2 - protect the sleeper
From what?

another Freudian defense mechanism

What is the *latent content* of the dream?

What is the *manifest content*?

A standard complaint about the idea of disguise.

Cautions and comments about Freudian dream interpretation

Problems with Freudian theory

Problems from within psych.

The **BIG** problem of REM and the structure of sleep

Who has REM?

What is REM sleep for? (recap)

Can we reconcile Freud with the biology of dreams?

A hypothesis from
The New Psychology of Dreaming. by Richard M Jones. Pelican 1978