

These Slides Accompany the YouTube Video Tutorial:  
<https://www.youtube.com/watch?v=pzO6dPMJBLw>

## CONSCIOUSNESS

*Sensations & perceptions of external events*

+

*Self-awareness of mental events*

Waking  
Consciousness

Altered  
Consciousness

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## *Causes of Altered State of Consciousness*

- Sensory Overload
- Monotonous Stimulation
- Unusual Physical Conditions
- Restricted Sensory Input

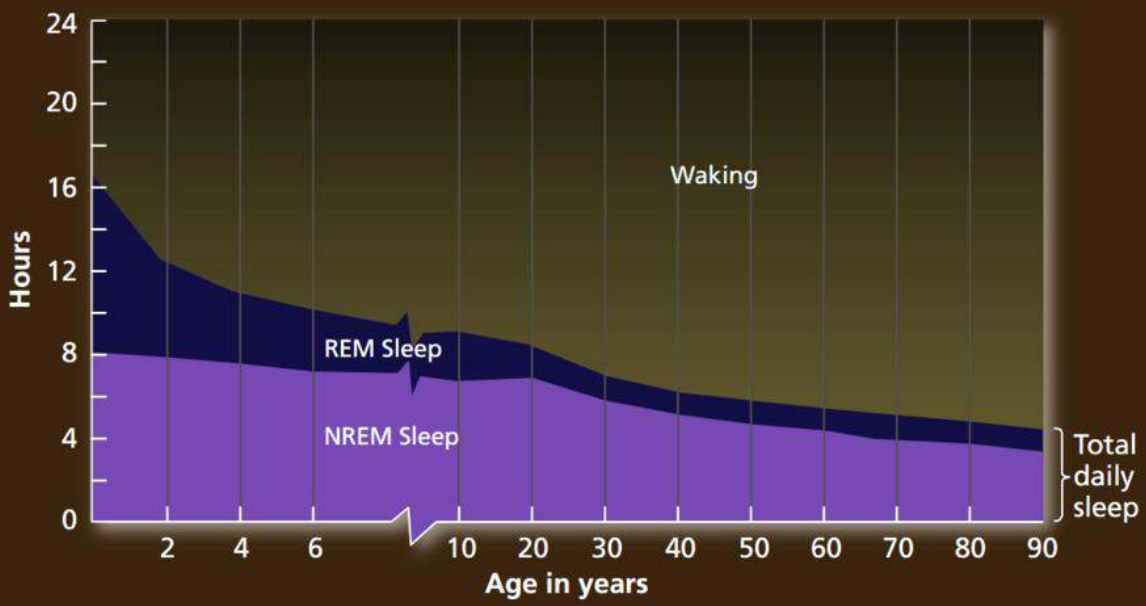
## SLEEP

*Micro-sleep to Macro-accidents*

*It is necessity not luxury*

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# Biological Basis of Sleep



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## Night Roller-Coaster



## EEG & EMG Patterns

- $\beta$  (beta)  $> 13$  Hz
- $13$  Hz  $\geq \alpha$  (alpha)  $\geq 8$  Hz
- $8$  Hz  $> \theta$  (theta)  $\geq 4$  Hz
- $4$  Hz  $> \delta$  (delta)
  
- EMG  $> 0.5$  sec  $\rightarrow$  NREM Sleep

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## Stage W

- Waking Stage
- EMG – High tonic
- EEG – low voltage (alpha and beta waves)

Awake – low voltage – random, fast



Drowsy – 8 to 12 cps – alpha waves



Stage 1 – 3 to 7 cps – theta waves



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## STAGE 1

- *Light Sleep*
- *Irregular Breathing*
- *Muscles relax*
- *Reflex muscle twitch (hypnic jerk) / Positive Myoclonus*
- *Alpha waves (8-13 Hz) to Theta Waves (4-7Hz)*
- *No K-Complex or Sleep Spindles*
- *EEG – Low voltage (amplitude) implies high frequency*
- *EMG – Lower than Stage W*

Stage 2 – 12 to 14 cps – sleep spindles and K complexes



Delta Sleep – 1/2 to 2 cps – delta waves  $>75 \mu\text{V}$



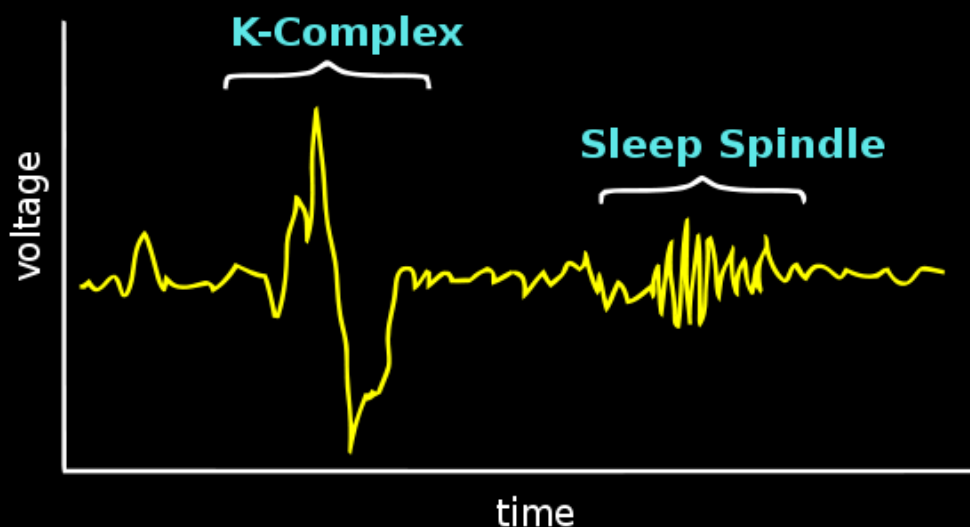
REM Sleep – low voltage – random, fast with sawtooth waves



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## STAGE 2

- Sleep Spindles (within 4 minutes – person sleeps) – 12- 14 Hz
- K-Complex (<3 minute low voltage)
- EMG – Muscle activity decrease
- 45-55% of total sleep



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## Stage 3

- *Delta Waves appear (large and slow) – 0.5-2 Hz*
- *Parasomnia, Night terror, Sleepwalking occur*
- *No eye movements*
- *EOG - High voltage slow wave activity*
- *EMG – Active but with very low levels*

## Stage 4

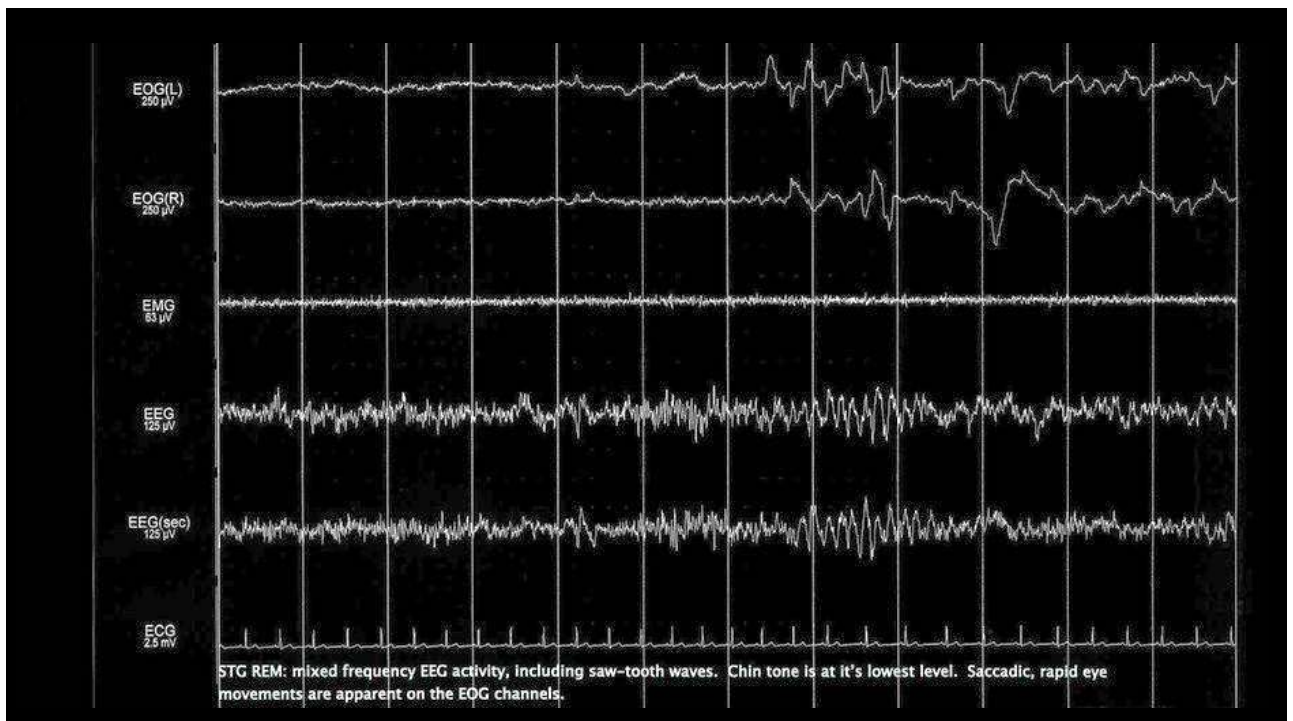
- *Slow Wave Sleep (SWS)*
- *Delta waves*
- *Deepest level of normal sleep*
- *EOG - High voltage slow wave activity*
- *EMG – Active but with very low levels*
- *Growth hormones are released at peak*



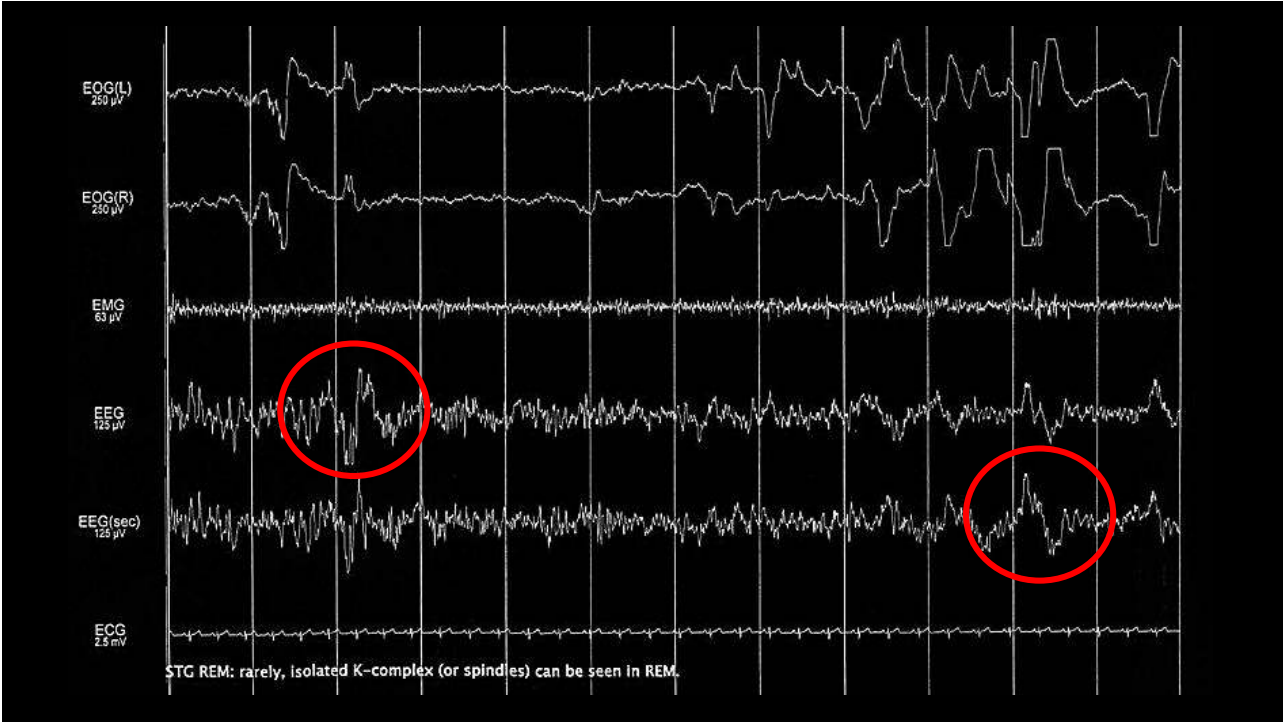
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## REM

- 20-25% of total sleep & Most memorable dreams
- EEG – rapid low voltage, mixed frequency
- Descending muscle atonia
- Sawtooth waves – Notched Waves – Theta Range
- EMG – Lowest Level, Phasic Twitches (<0.10sec)
- EOG – burst of eye movement, increase as sleep progress
- Rare Delta waves, Alpha waves more prominent than Stage 1
- Excessive beta waves (not confuse with sleep spindle)
- Few K complex (if >3 minutes)



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*Recommendations - American Academy of Sleep Medicine  
(AASM)*

- REM → R
- NREM → N
- Wakefulness → W
- Stage 3 & 4 → N<sub>3</sub>
- Now, W, R, N<sub>1</sub>, N<sub>2</sub>, and N<sub>3</sub>