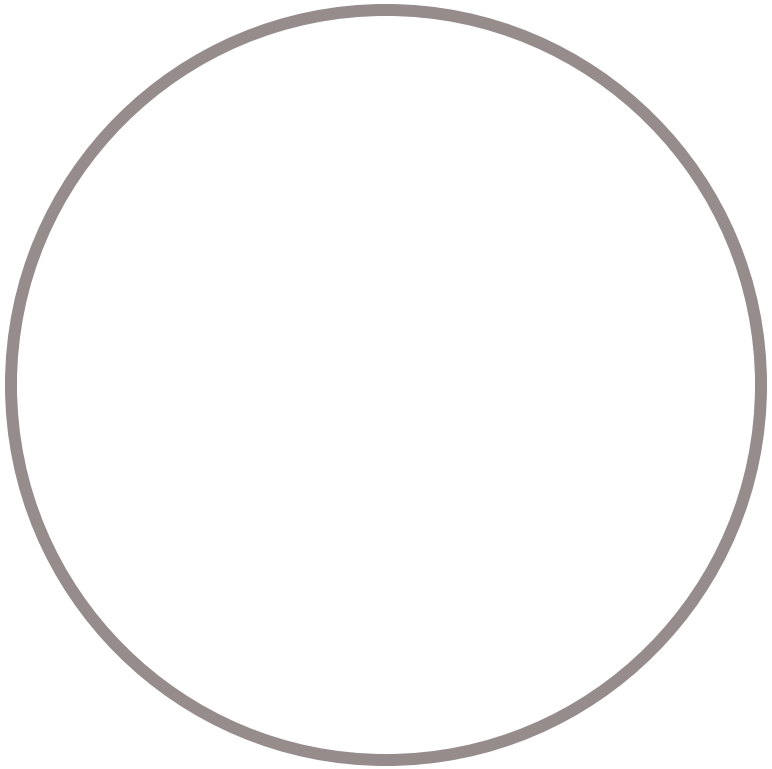
CREATIVITY AND SLEEP

Kognitívna veda 2012 – Session 3

Creativity

- Creativity is the result of the convergence of basic cognitive processes, core domain knowledge, and environmental, personal, and motivational factors which allow an individual to produce an object or behavior that is considered both **novel** and **appropriate** in a particular context.
  - Encyclopedia of cognitive science

Test ☺



Convergent and divergent thinking

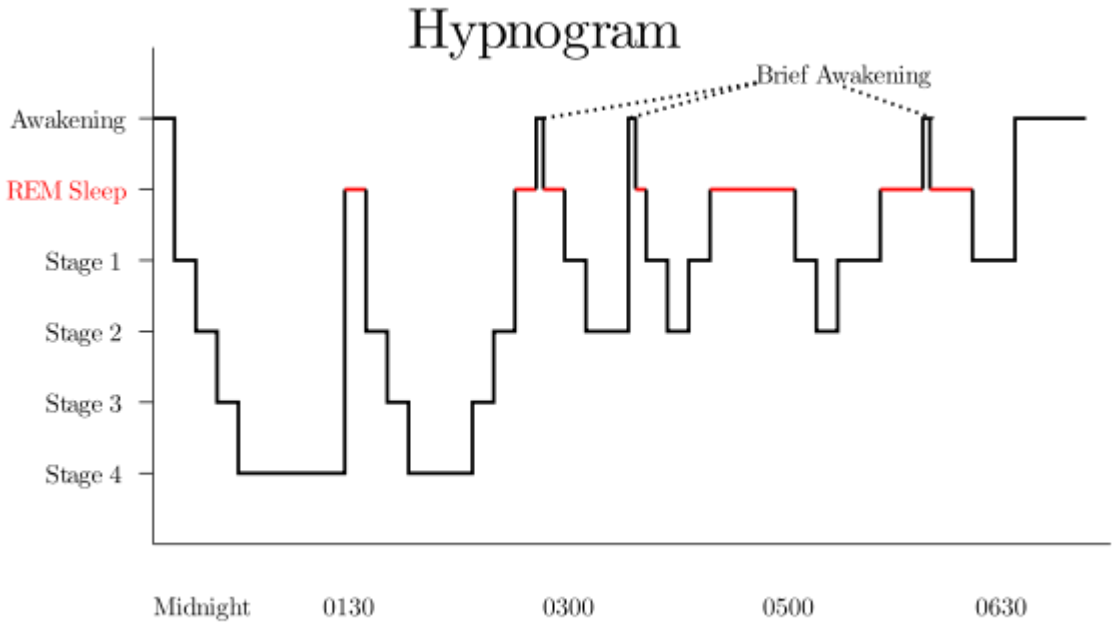
- Convergent thinking is oriented towards deriving the single best (or correct) answer to a clearly defined question.
- Divergent thinking is the creative generation of multiple answers to a set problem.

Sleep

- State of reduced or absent consciousness
  - Suspended sensory activity
  - Inactivity of voluntarily muscles

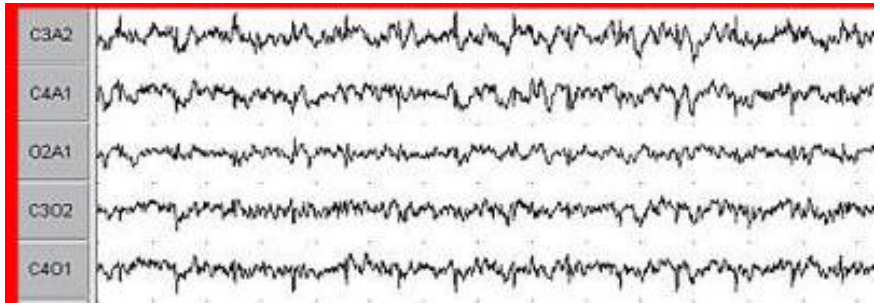
Sleep stages

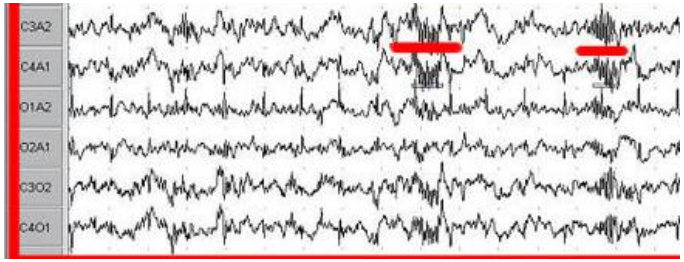
- REM sleep
- 3/4 stages of Non-REM sleep

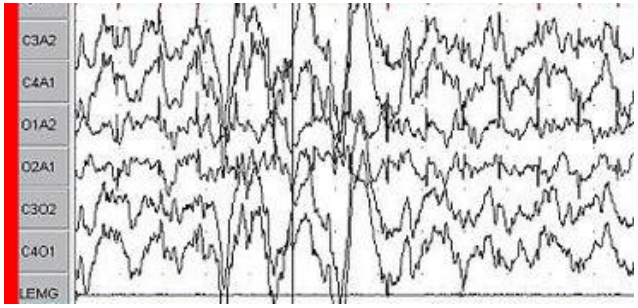


Non-REM sleep

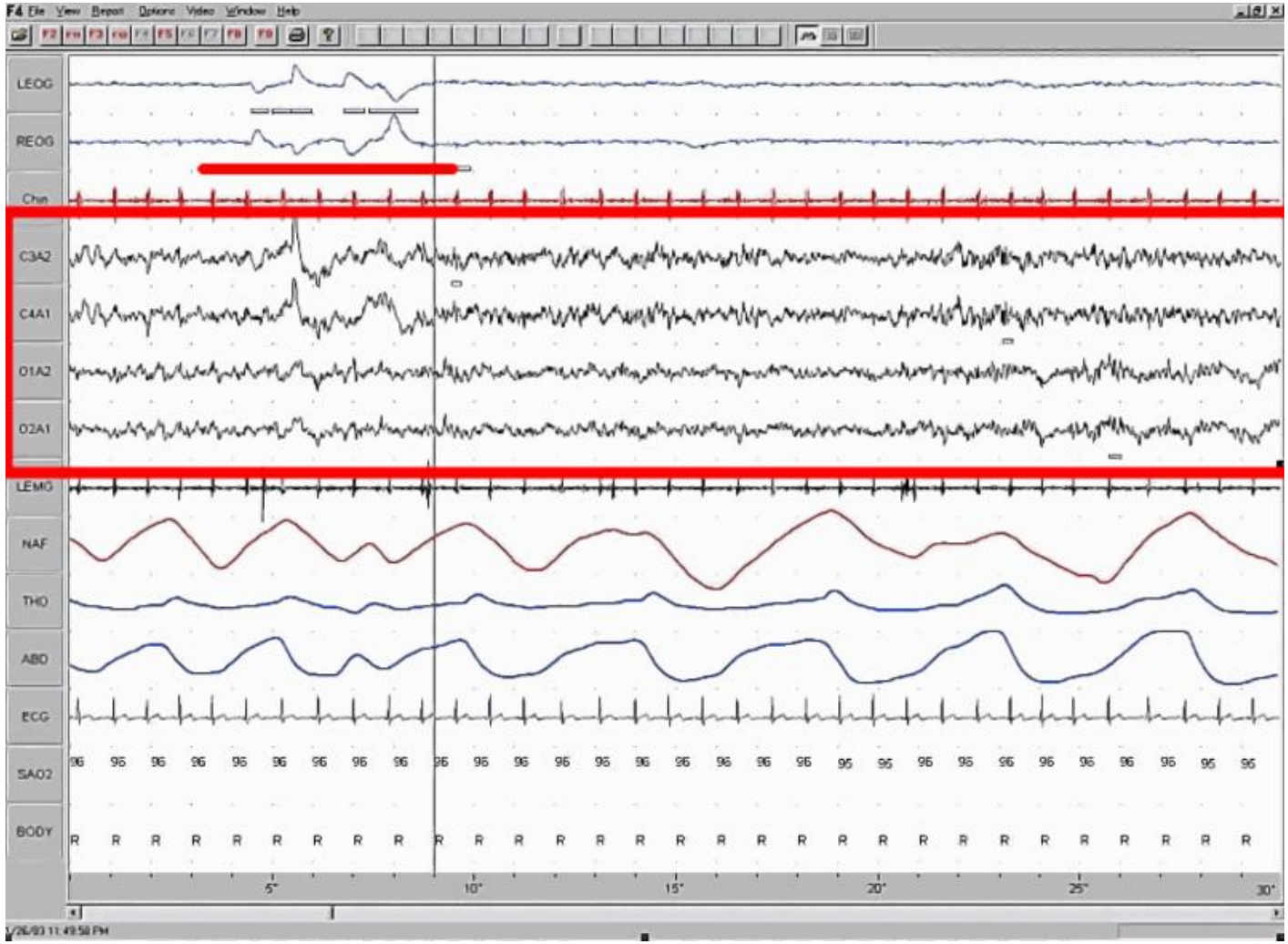
- **Stage 1**
  - beginning of sleep
  - slow eye movement
  - theta waves
  - Hypnic jerks
- **Stage 2**
  - no eye movement
  - dreaming very rare.
  - Sleep spindles and K-complexes.
- **Stage 3**
  - previously divided into stages 3 and 4 (deep sleep and slow-wave sleep)
  - dreaming may occur but is less vivid and often disconnected







REM sleep

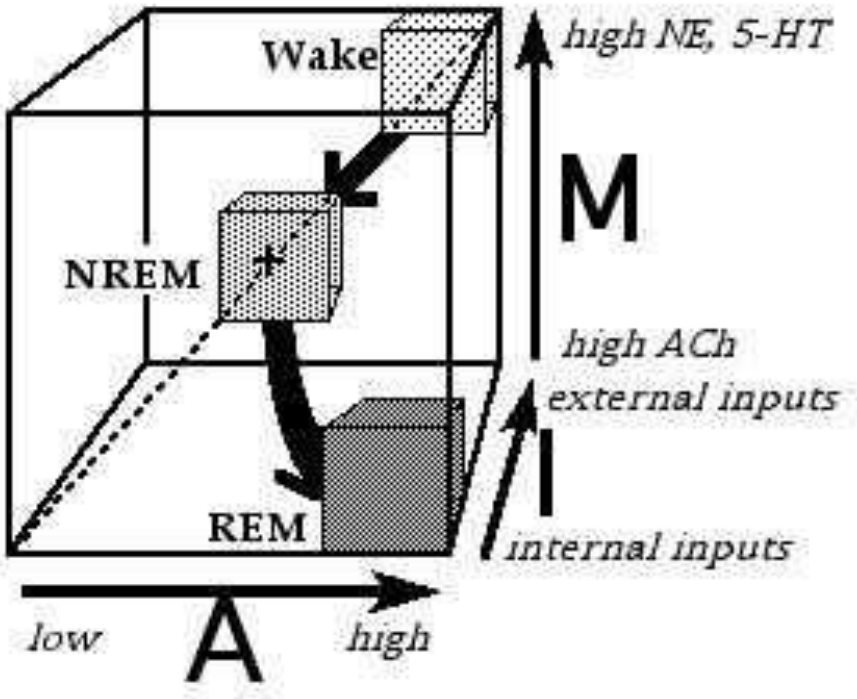

LEOG
REOG
Chin
C3A2
C4A1
O1A2
O2A1
LEMG
NAF
THO
ABD
ECG
SAO2
BODY
5'
10'
15'
20'
25'
30'

Non-REM/REM difference

- Deep sleep vs. REM
  - Rapid Eye Movements
  - Muscle paralysis
  - Dreaming
  - Bizzare thinking

AIM model of sleep/consciousness

- Alan Hobson



Normal sleeping cycle. As normal subjects progress through each sleep cycle, the successive points of AIM follow the trajectory shown. The shape of the trajectory changes from cycle to cycle during the night as subjects descend less and less deeply into NREM and more and more deeply into the REM domains. The rates of speed of transitions from domain to domain also vary: wake-NREM slow; NREM-REM rapid; REM-wake very rapid.

Functions

- Restoration
  - „folding of proteins“, imunity
- Hibernation (Web, 1982)
- Memory processing
  - Sleep plays an important role in consolidation of different types of memory and contributes to insightful, inferential thinking.
- Preservation (Meddis, 1975)
  - Organisms are safer sleeping than roaming around
  - They sleep at times when it is safe
  - Carnivores at the top of food chain sleep the longest

Sleep and robots

- Could robots benefit from sleep?
  - http://www.youtube.com/watch?v=ehno85yl-sA
  - „How would dream-inspired algorithms work in terra incognita? A robot would spend the day exploring part of the landscape, and perhaps be stymied by an obstacle. At night, the robot would replay its actions and infer a model of the environment. Armed with this model, it could think of—that is, synthesize— actions that would allow it to overcome the obstacle, perhaps trying out those in particular that would best allow it to understand the nature of the obstacle. Informally, then, the robot would dream up strategies for success and approach the morning with fresh ideas“
    - http://creativemachines.cornell.edu/papers/Science06_Adami.pdf

More sources

- http://thesciencenetwork.org/programs/waking-up-to-sleep