

Why do we sleep?



Lorenzo Daldini

Definition

Sleep is a natural periodic state of rest for the mind and body, in which the eyes usually close and consciousness is completely or partially lost, so that there is a decrease in bodily movement and responsiveness to external stimuli

(www.thefreedictionary.com)

History

Aristotle: *De sonno et vigilia*

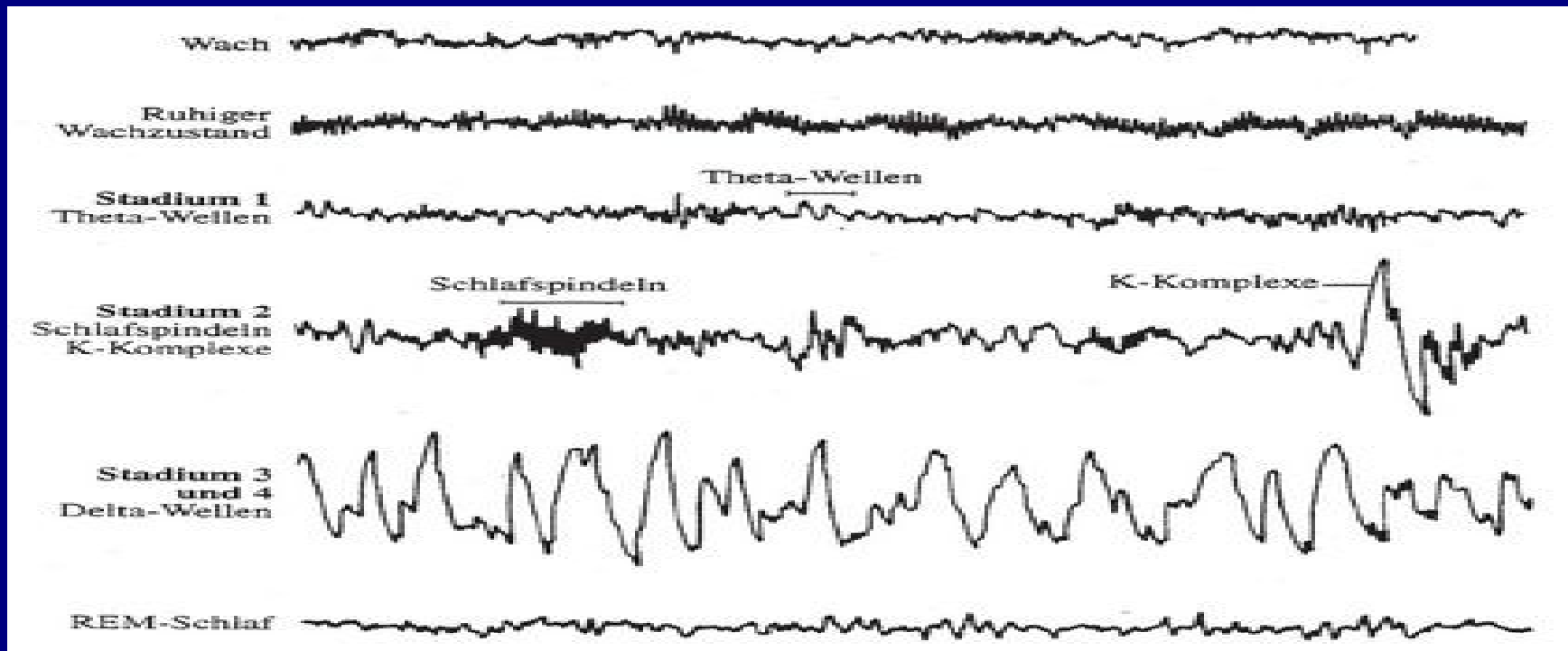
S. Freud: *Traumdeutung* (1900)

Hans Berger:

Über das Elektrenkephalogramm des Menschen (1929)

Electroencephalography (EEG)

Electroencephalography is the neurophysiologic measurement of the electrical activity of the brain by recording from electrodes placed on the scalp



History /2

N. Kleitman: *Sleep and Wakefulness* (1939)

discovery of REM sleep

Rechtschaffen & Kales:

*A Manual of Standardized Terminology, Techniques,
and Scoring System for Sleep Stages of Human Subjects*

(1968)

Stages of sleep

- 3 criteria

EEG: Electroencephalogram

EMG: Electromyogram

EOG: Electrooculogram

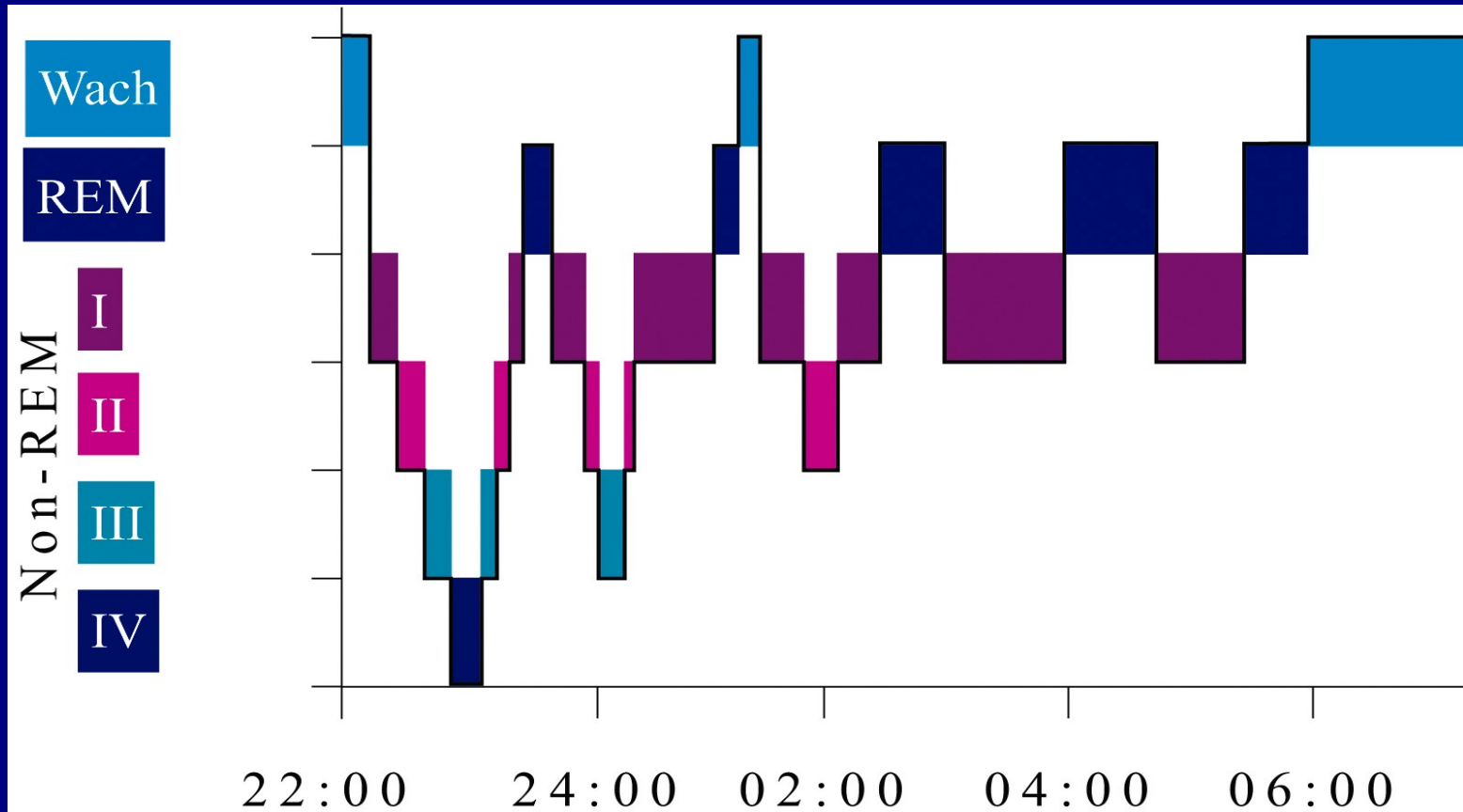
Stages of sleep /2

1) Wakefulness

2) SWS: Slow Wave Sleep

3) REM sleep: Rapid Eye Movements sleep

Stages of sleep /3



Slow Wave Sleep

75% of the total length of sleep: S1, S2, S3, S4

Diminution of cerebral activity

Wakefulness threshold became higher

Diminution of muscular tonus (but: Somnambulism)

Vital signs very low

Digestive system in action

REM Sleep

Great cerebral activity (dreams)
Vital signs augmented


Total paralysis of voluntary musculature


Rapid eye movements

25% of the total length of sleep

Wach 

Ruhiger Wachzustand 

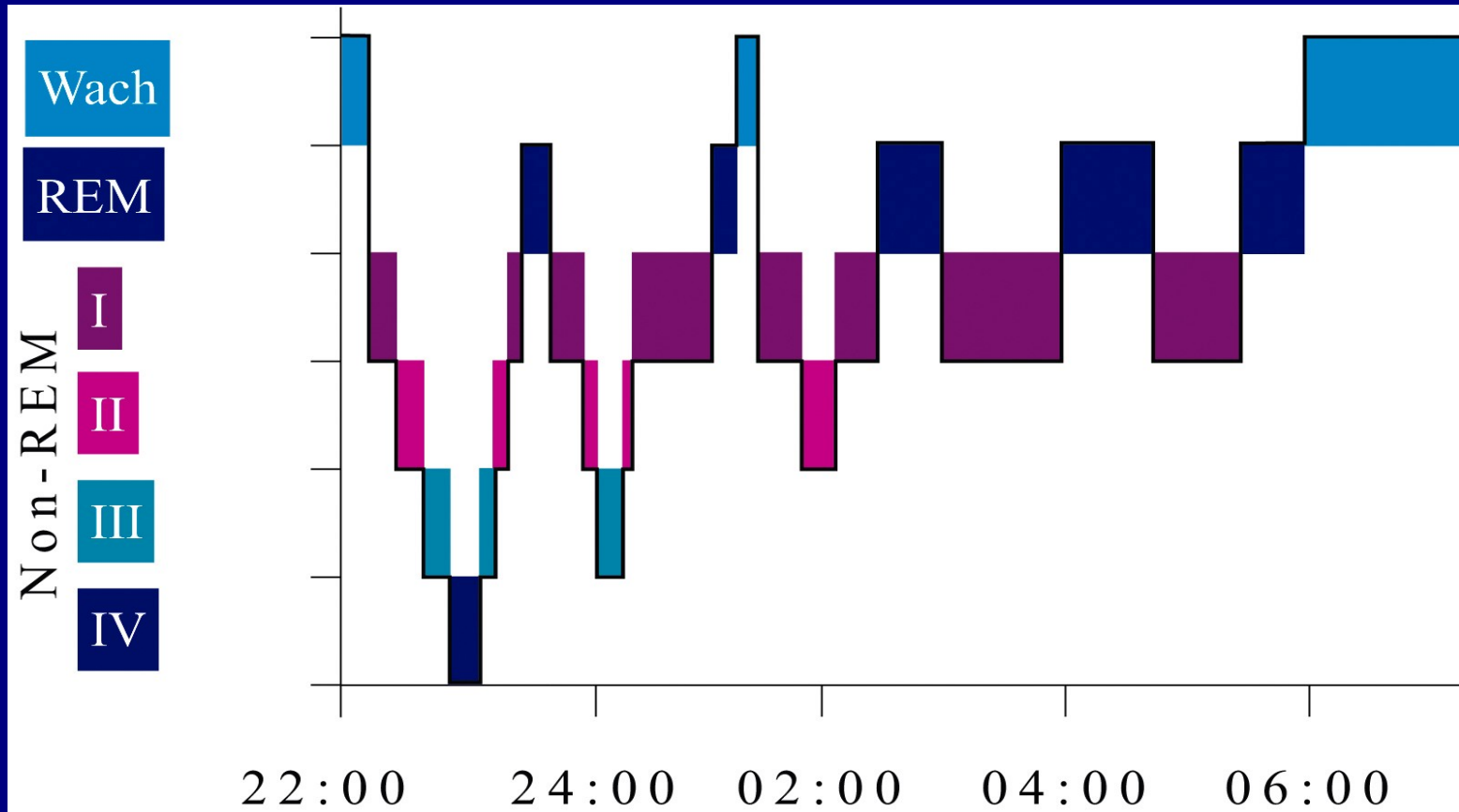
Stadium 1
Theta-Wellen 

Stadium 2
Schlafspindeln
K-Komplexe 

Stadium 3
und 4
Delta-Wellen 

REM-Schlaf 

Stages of sleep



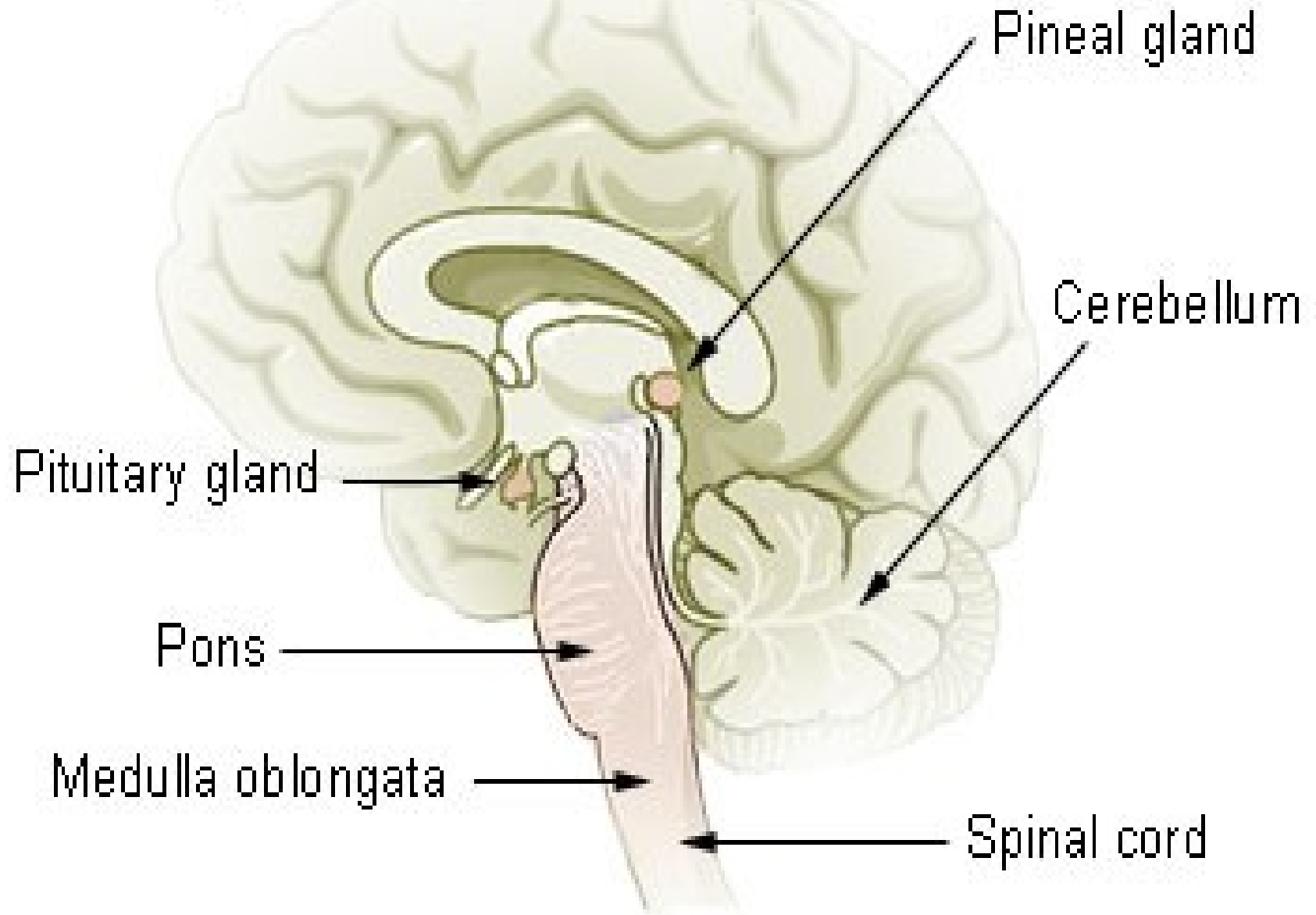
Circadian Rhythm

A circadian rhythm is a roughly-24-hour cycle in the physiological processes of living beings

The term «circadian» comes from the Latin *circa*=around, and *diem*=day, meaning literally «about a day»

- a) Endogen oscillators in the CNS
- b) Environmental factors
- c) Melatonin
- d) Adenosin

Pituitary and Pineal Glands



Circadian Rhythm /2

Melatonin

Melatonin: from the epiphysis secreted hormon having different effects on the hypothalamus (somnia!)



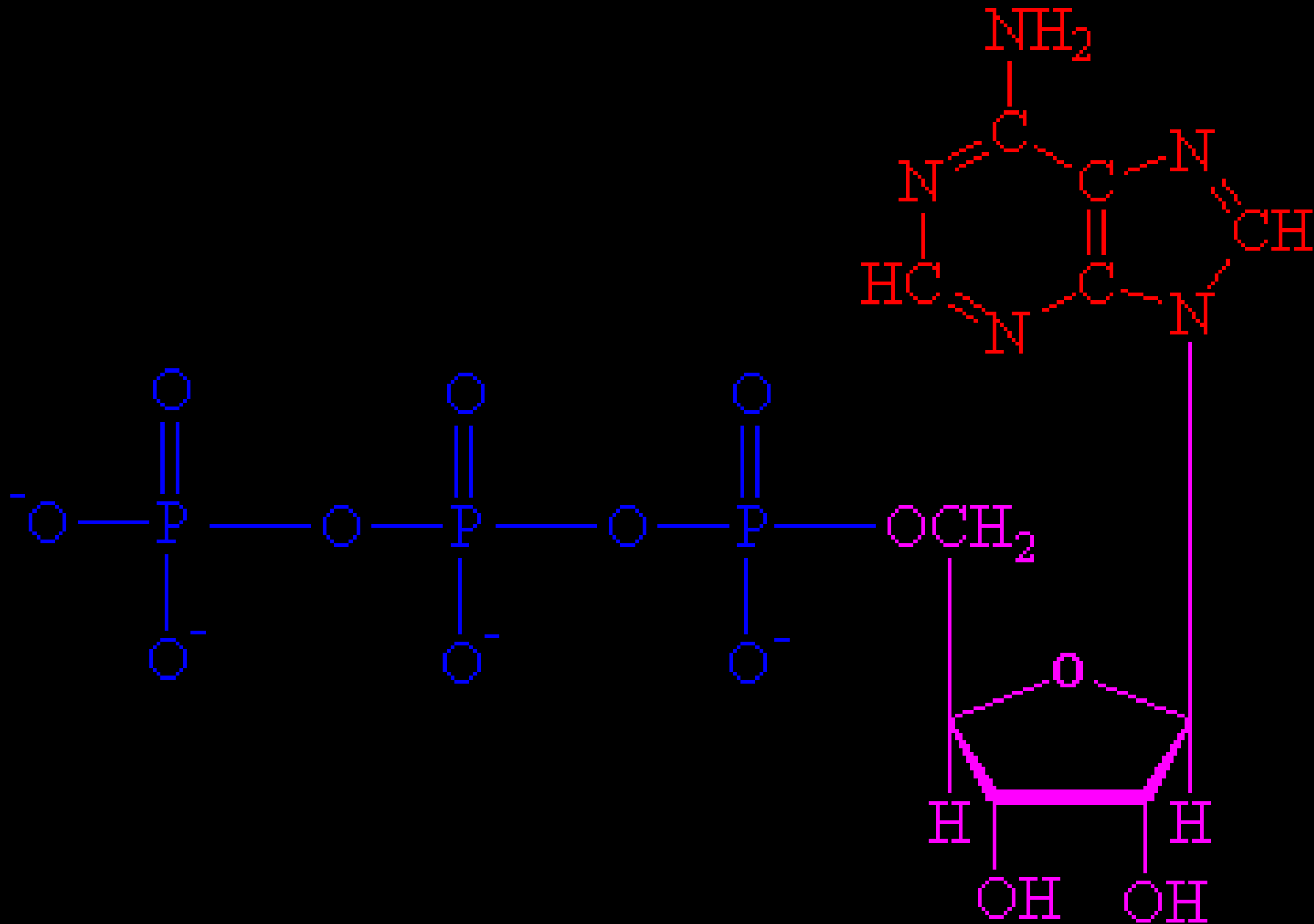
Circadian Rhythm /3

Adenosin

Adenosin: (among other things) inhibitory neurotransmitter

Consumption of energy \longrightarrow Break of ATP \longrightarrow
Augmentation of Adenosin in neurones \longrightarrow Somnolence

* Caffeine is an Adenosin-antagonist



Sleep functions

- SWS
 - Physical recovery
 - Growth Hormon secretion
 - inhibition of cortisol secretion
 - « synaptic homeostasis »
 - memory?

Sleep functions /2

Synaptic homeostasis

The role of sleep is to downscale synaptic strength to a baseline level that is energetically sustainable, makes efficient use of gray matter space, and is beneficial for learning and memory. Thus, sleep is the price we have to pay for plasticity, and its goal is the homeostatic regulation of the total synaptic weight impinging on neurons

G. Tononi, University of Wisconsin

Sleep functions /3

- REM Sleep
- Development? (Children: 8-10 h/day REM Sleep!!!!)
- involuntary movements of the eyes

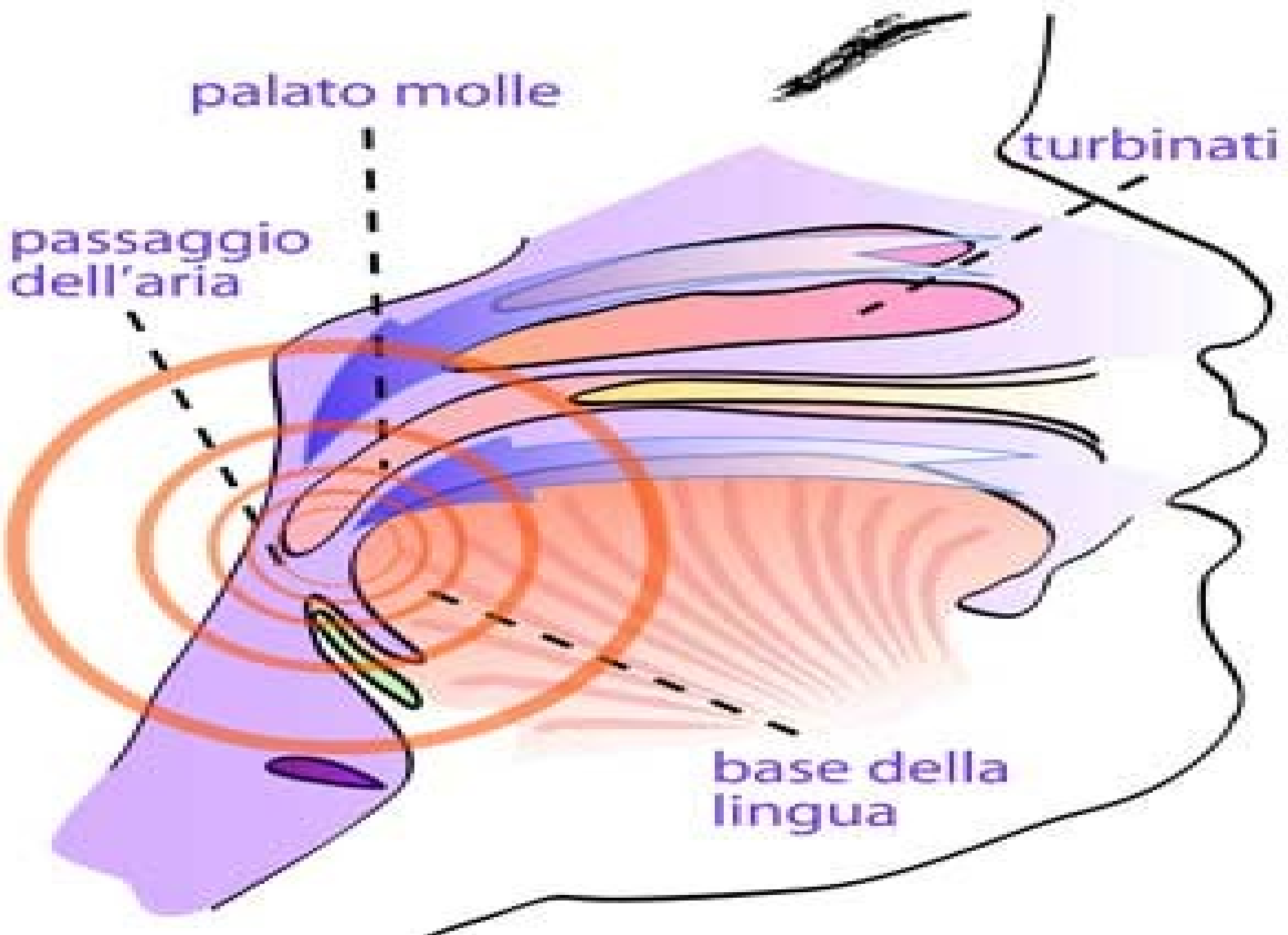
Snoring

Diminution of musculare tonus (max during REM Sleep)

Collapse and stenosis of the upper airway

Consequences:

- Vibration of the palate and the uvula **□ noise**
- Bad oxygenation



palato molle

turbiniti

passaggio dell'aria

base della lingua

Snoring /2

To avoid

-Alcohol

-Overweight

-Sleeping on the back

-(Sleeping pills)