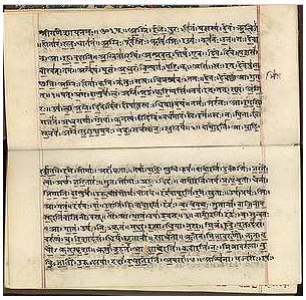
Somn, vise, veghe, stări de conştienţă, ritmuri, etc..

dr. Radu BRAGA, 2012

radu.braga@univermed-cdgm.ro

Vaishvânara
Taijasa
Prajnâ



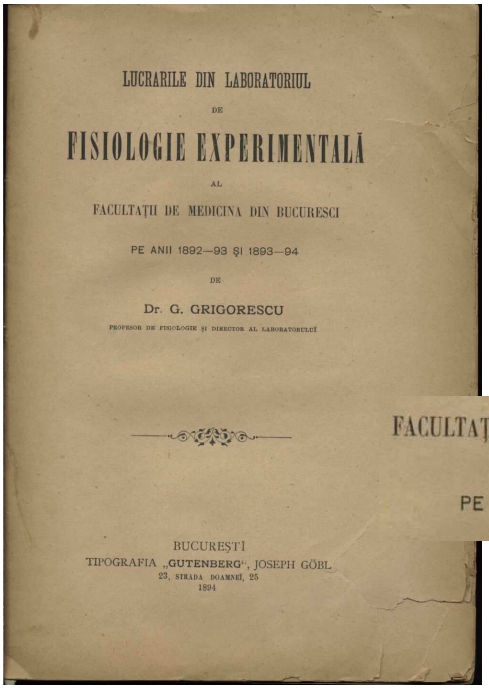
Vaishvânara, the Self as the universal person in his physical being, he is awake, and is conscious only of external objects. Corresponds to the first letter -- A. Whosoever knows Vaishvânara obtains what he desires, and becomes the first among men.

Thaijasa, the Self as the universal person in his mental being, corresponds to the second letter -- U. Thaijasa and the letter U both stand in dream, between waking and sleeping. Whosoever knows Thaijasa grows in wisdom, and is highly honored.

Prâjña, the Self as the universal person in dreamless sleep, corresponds to the third letter -- M. He is the origin and the end of all. Whosoever knows Prâjña knows all things.

This Self, beyond all words, is the syllable OM. This syllable, though indivisible, consists of three letters -- A-U-M

Mândûkya Upanishadh part of Atharva Vedha, 1500-1000 IChr



LUCRARILE DIN LABORATORIUL

DE

FISIOLOGIE EXPERIMENTALĂ

AL

FACULTAŢII DE MEDICINA DIN BUCURESCI

PE ANII 1892—93 ŞI 1893—94

DE

Dr. G. GRIGORESCU

PROFESOR DE FISIOLOGIE ŞI DIRECTOR AL LABORATORULUĬ

BUCUREŞTI

TIPOGRAFIA „GUTENBERG", JOSEPH GÖBL

23, STRADA DOAMNEI, 25

1894

FACULTAŢII DE MEDICINA DIN BUCURESCI

PE ANII 1892—93 ŞI 1893—94

Lecţiunea de la 30 Martie

Somnul.—Visele.

Ipnotismul: letargia, catalepsia, somnambulismul.—Mijlócĕle de a provoca ipnotismul.—Sugestiunea.—Explicaţia fisiologică a ipnotismuluĭ.—Causele luĭ.

Lecţiunea de la 1 Aprilie

Circulaţia encefaluluĭ.—Circulaţia corpuluĭ tiroid.—Pulsaţiile encefatuluĭ.

Fisiologia bulbuluĭ: Centriĭ bulbuluĭ, centrul respi-

Ce este somnul ?

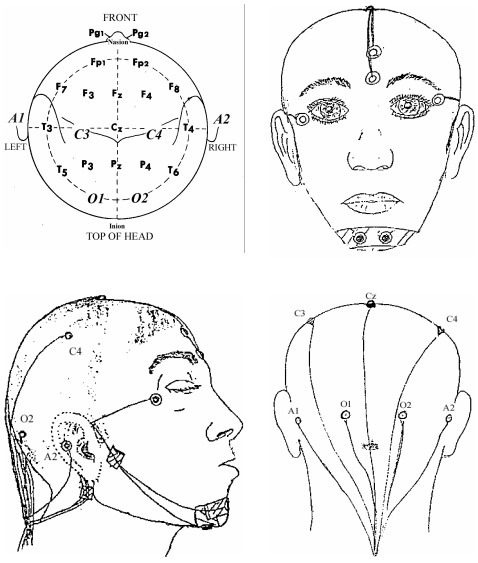
Criterii comportamentale:

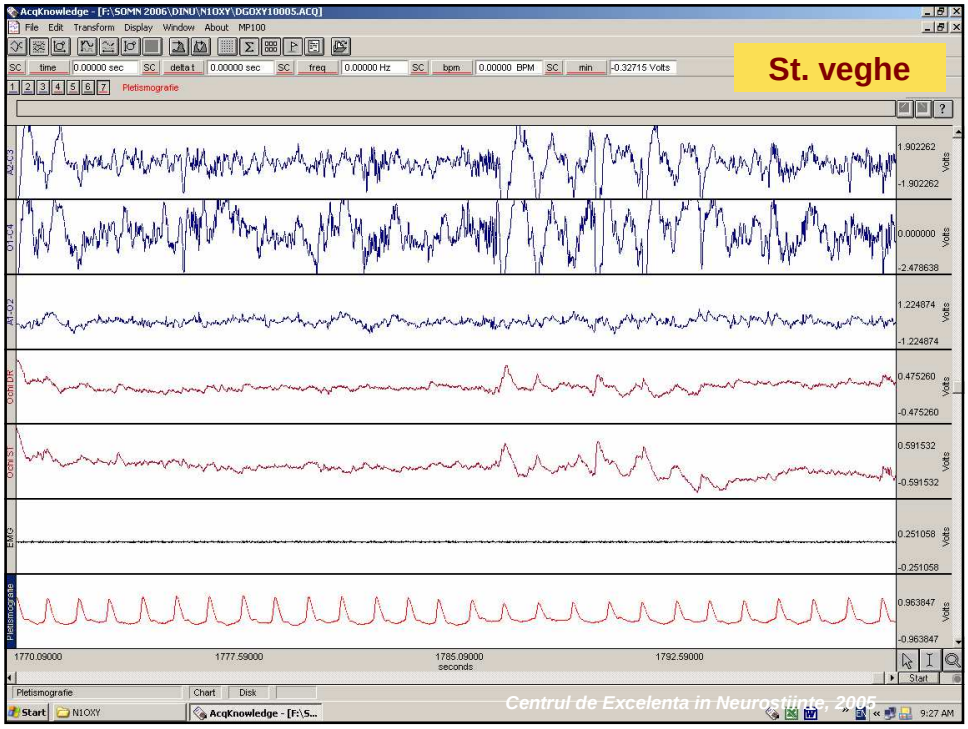
- diminuarea mobilităţii
- ochii închişi
- ↓ răspunsului la stimuli externi
- postura caracteristică
- stare de inconştienţă reversibilă

Criterii electrofiziologice:

- **EEG**
- **EMG**
- **EOG**

Montajul electrozilor

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-2.478638
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-1.224874
0.475260
-0.475260
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-0.591532
0.251058
-0.251058
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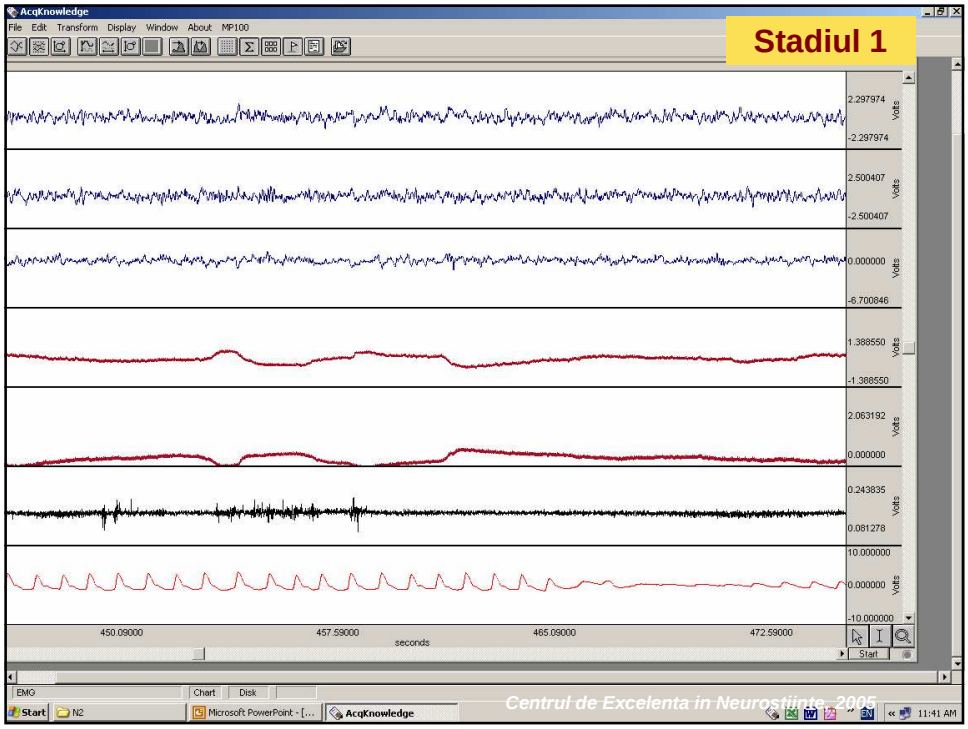
1777.59000
1785.09000
1792.59000
seconds
Centrul de Excelenta in Neurostiinte, 2005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Stadiul 1
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-2.500407
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-6.700846
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-1.388550
2.063192
0.000000
0.243835
0.081278
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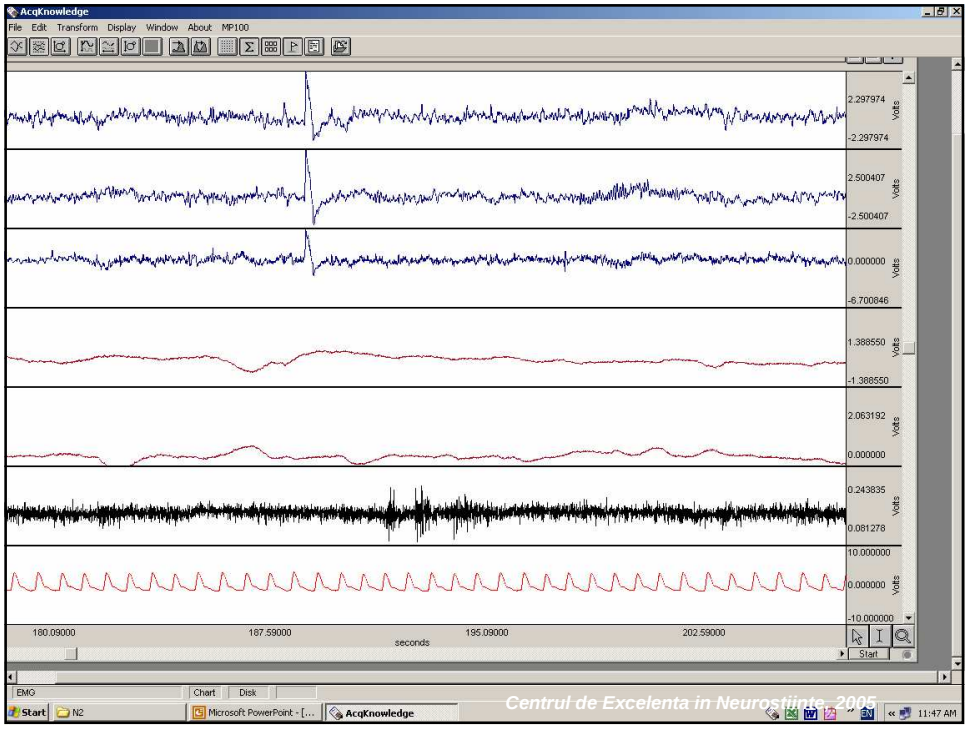
seconds
Centrul de Excelenta in Neurostiinte, 2005


AcqKnowledge
File Edit Transform Display Window About MP100
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Volts
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-1.388550
2.063192
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0.243835
0.081278
10.000000
0.000000
-10.000000
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187.59000
195.09000
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seconds
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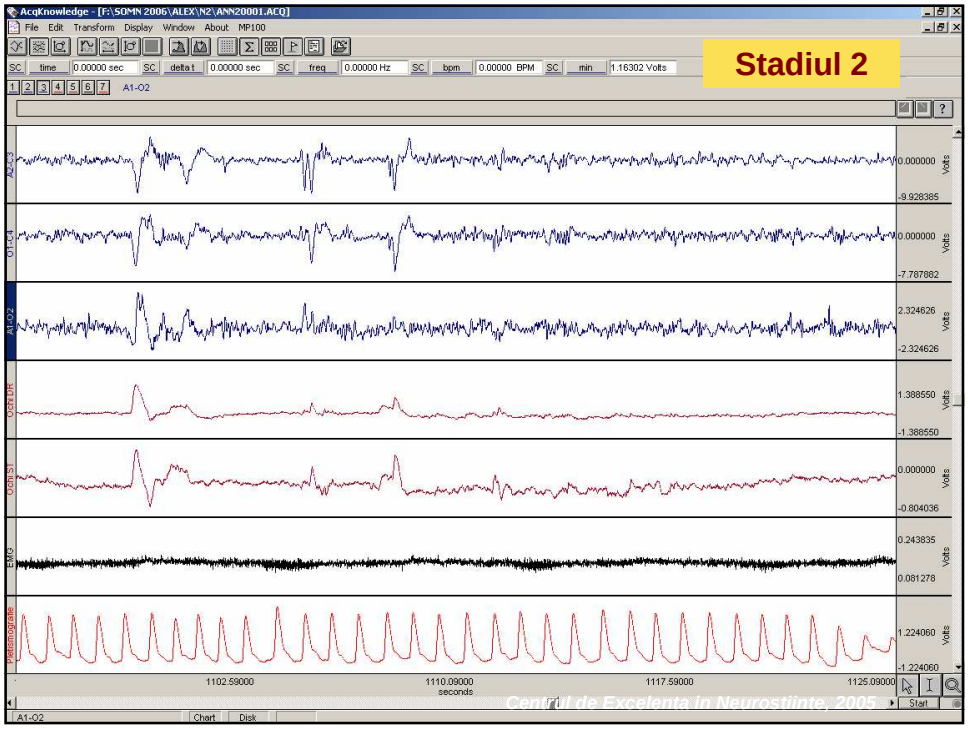
EMG
Chart
Disk
Start
N2
Microsoft PowerPoint - [...
AcqKnowledge
11:47 AM
Centrul de Excelenta in Neurostiinte, 2005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delta t 0.00000 sec
freq 0.00000 Hz
bpm 0.00000 BPM
min 1.16302 Volts
A1-O2
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-9.928385
-7.787882
2.324626
-2.324626
1.388550
-1.388550
0.000000
-0.804036
0.243835
0.081278
1.224060
-1.224060
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1117.59000
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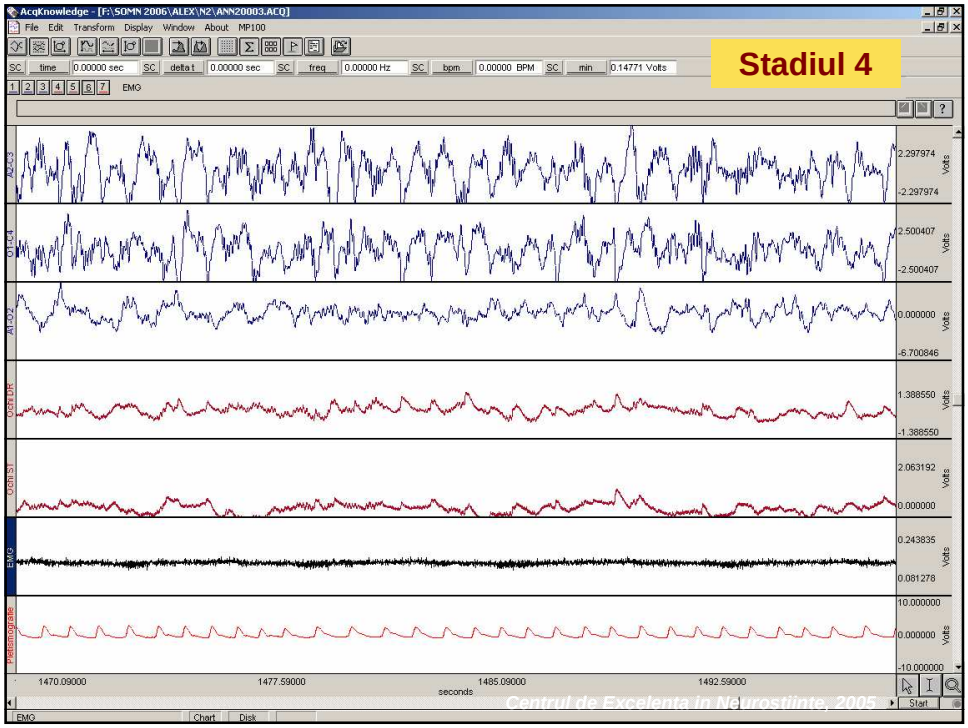
seconds
Start
A1-O2
Chart
Disk
Centrul de Excelenta in Neurostiinte, 2005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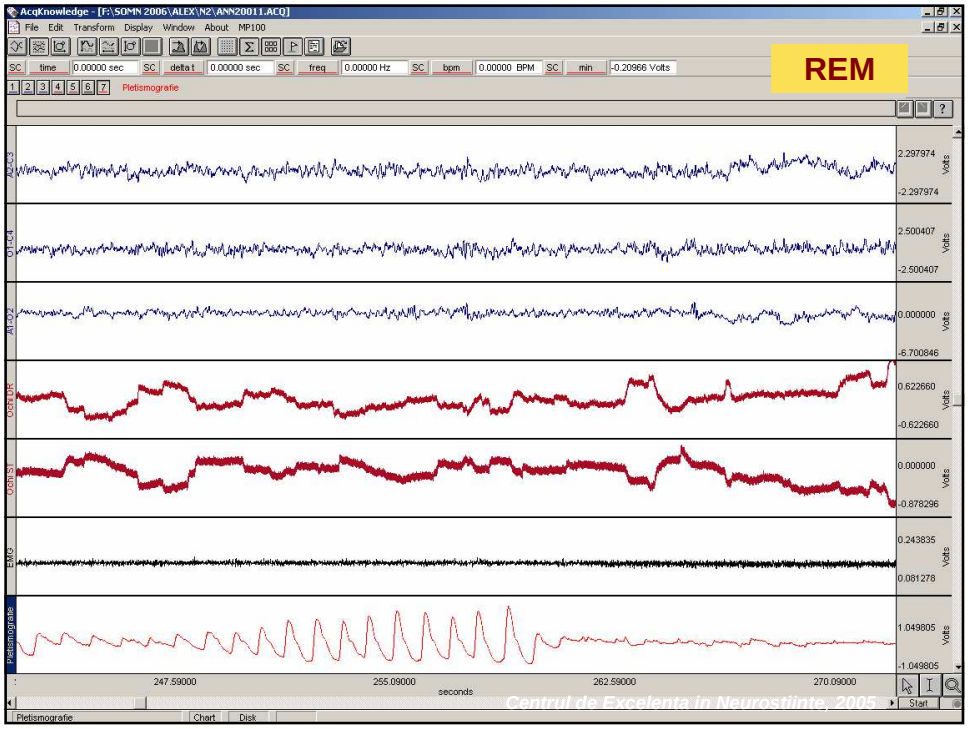
Centrul de Excelenta in Neurostiinte, 2005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REM
Pletismografie
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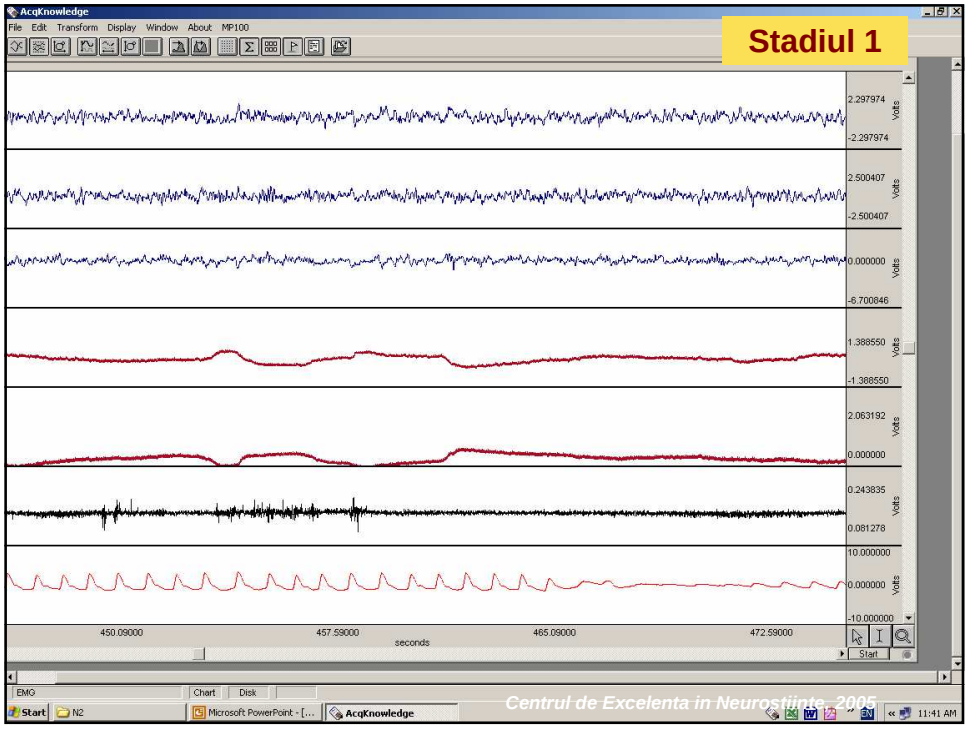
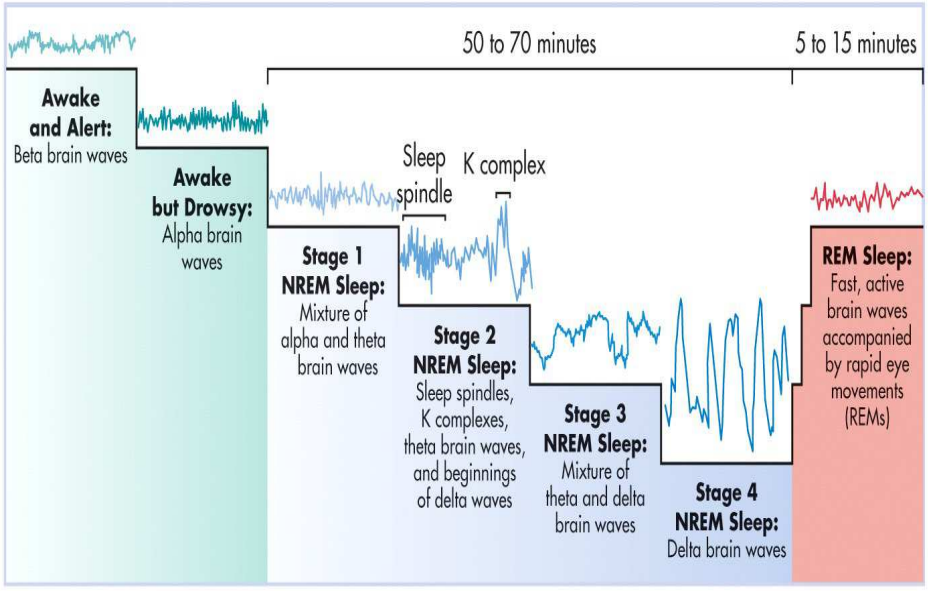
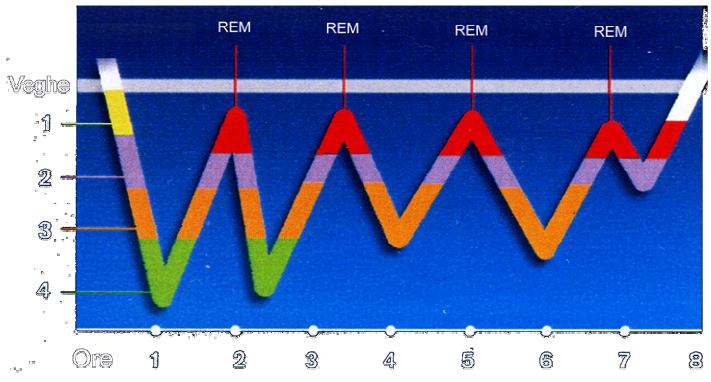
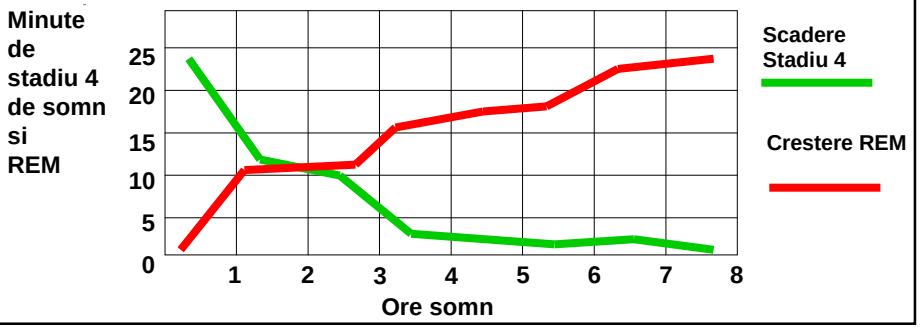
262.59000
270.09000
seconds
Centrul de Excelenta in Neurostiinte, 2005



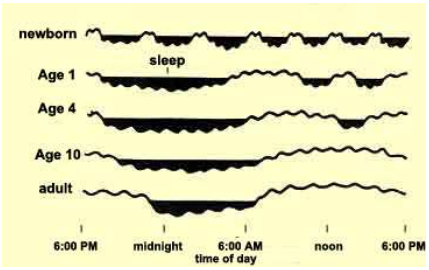
Ciclul de somn

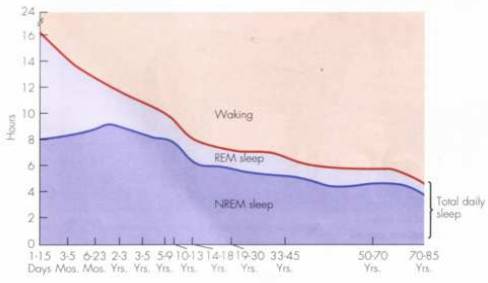


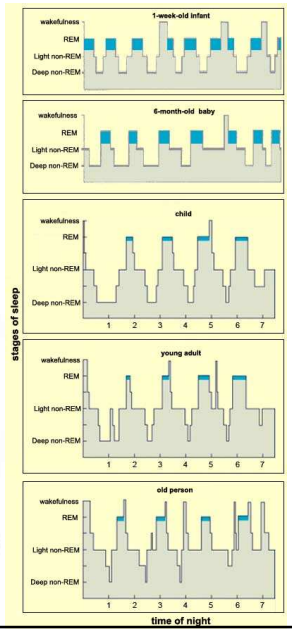


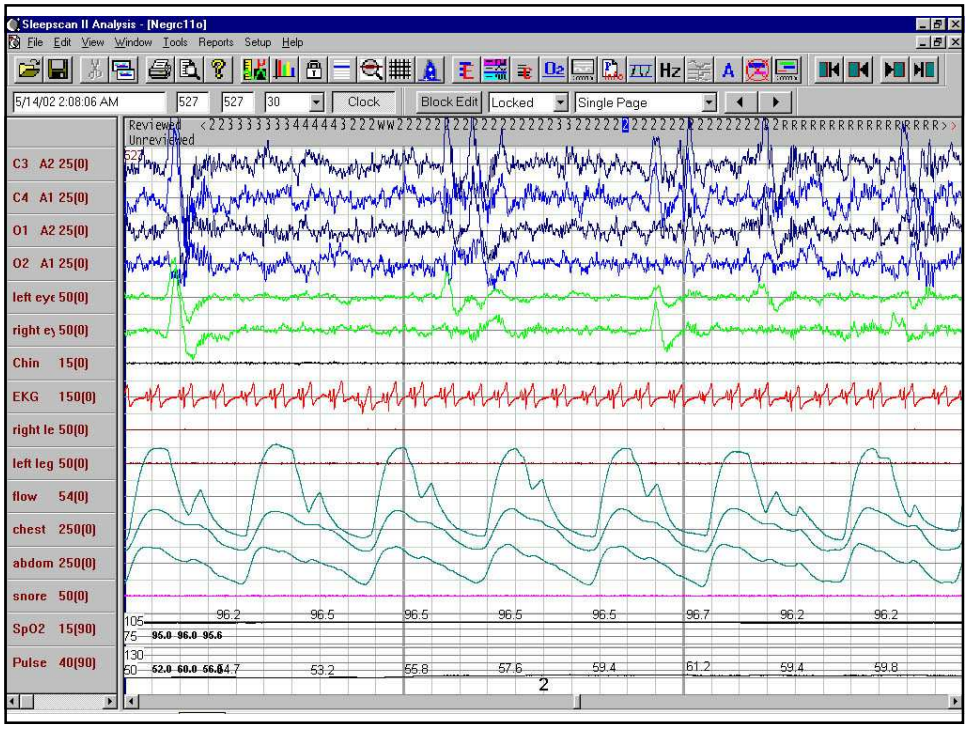


Arhitectura somnului in timp



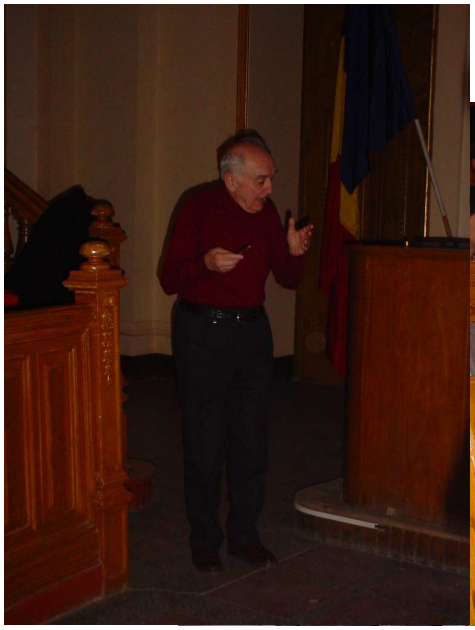


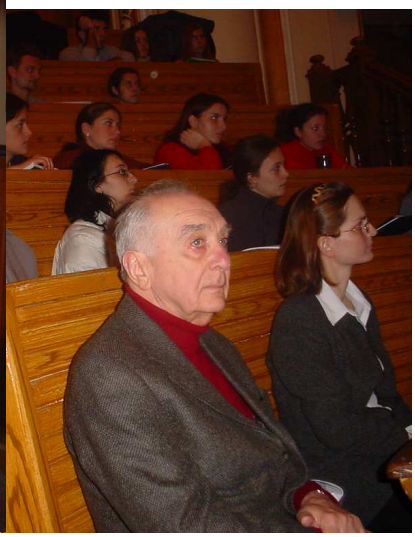




Mecanismele starilor de constienta

2003





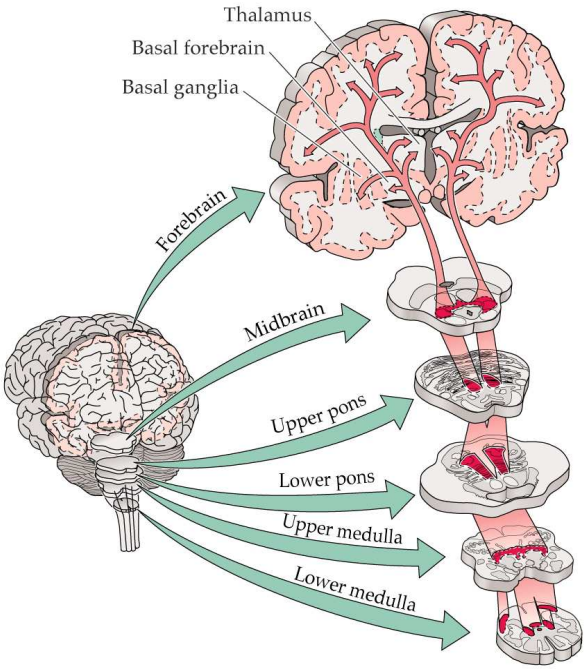
Mircea Steriade, 1924-2006

Starea de veghe

Somnul NonREM

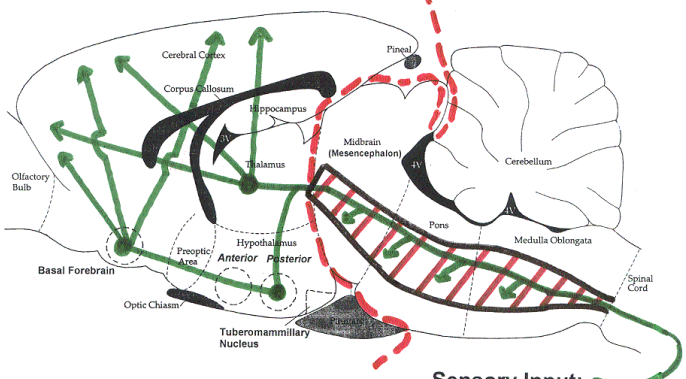
Somnul REM

SRAA



© 2001 Sinauer Associates, Inc.

Transection of Brainstem and Spinal Cord from Cerebrum



Sensory Input:
- Cutaneous
- Visual
- Auditory
- Visceral

Reticular Formation

VEGHEA - Mecanisme neurochimice

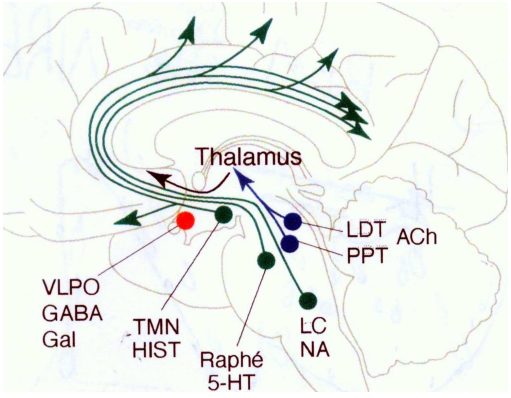
- **Noradrenalina – locus coeruleus (punte)**
  - Proiecţie difuză spre cortex şi formaţiuni subcorticale
  - Menţin şi cresc gr. de activare corticală
  - Interferenţe medicamentoase: cocaina, amfetaminele.
  - Ritm de descărcare:
    - VEGHE ++++
    - NonREM ++
    - REM +/0
  - NU este responsabil de activarea corticală din REM

VEGHEA - Mecanisme neurochimice

- **Acetilcolina (punte)**
  - Localizare
    - » Nc. Tegmental laterodorsal
    - » Nc. Tegmental pedunculopontin
    - » Diencefal
  - Ritm de descărcare:
    - VEGHE ++++
    - NonREM ++
    - REM ++++
  - Interferenţe medicamentoase
    - Nicotina (agonist colinergic) – stimulant, ↑activ. cortic.
    - Atropina (antagonist) – scade vigilenţa, ↓ activ. cortic.

VEGHEA - Mecanisme neurochimice

- **Serotonina**
  - Nn. Rafeului localizaţi în măduvă şi punte
  - Ritm de descărcare similar NA:
    - VEGHE ++++
    - NonREM ++
    - REM +/0
- **Histamina**
  - Nn. localizaţi în nc. Tuberomamilar
  - Proiecţie corticală şi dau activare corticală
  - Antihistaminicele dau o de-activare corticală



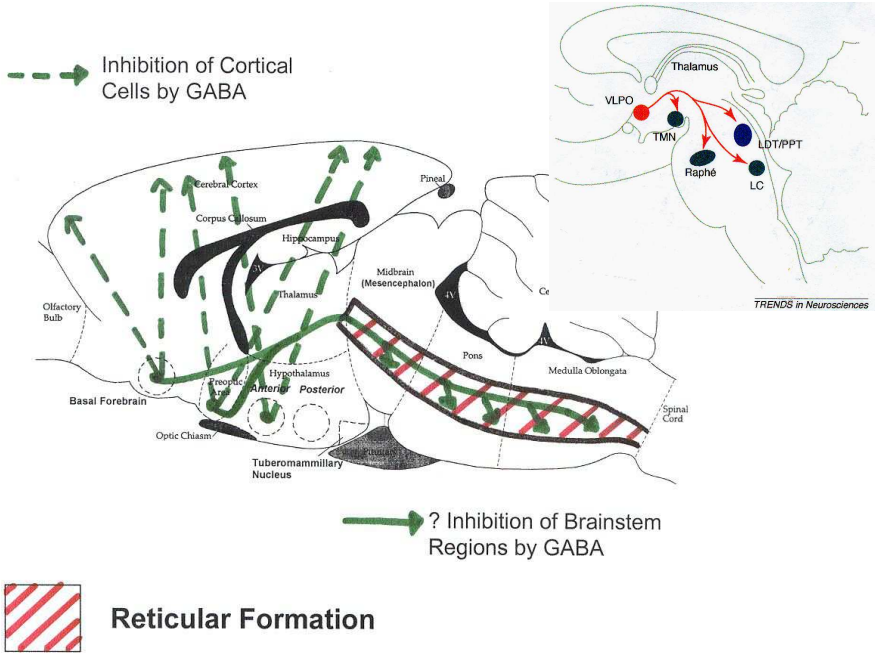
Starea de veghe

Somnul NonREM

Somnul REM

Somnul Non REM - mecanisme

- **Observaţii experimentale:**
  - Lez. hipotalamus anterior produce insomnie pe termen lung
  - Stimularea electrică sau chimică produce un pattern de somn nonREM pe EEG
  - Înregistrări intracelulare au arătat că există celule care descarcă maximal în somnul nonREM
  - Ritm de descărcare:
    - VEGHE +
    - NonREM ++++
    - REM +
  - **HIPOTALAMUSUL ANTERIOR ŞI ARIA PREOPTICĂ SUNT IMPLICATE ÎN SOMNUL NONREM**



NonREM - Mecanisme neurochimice

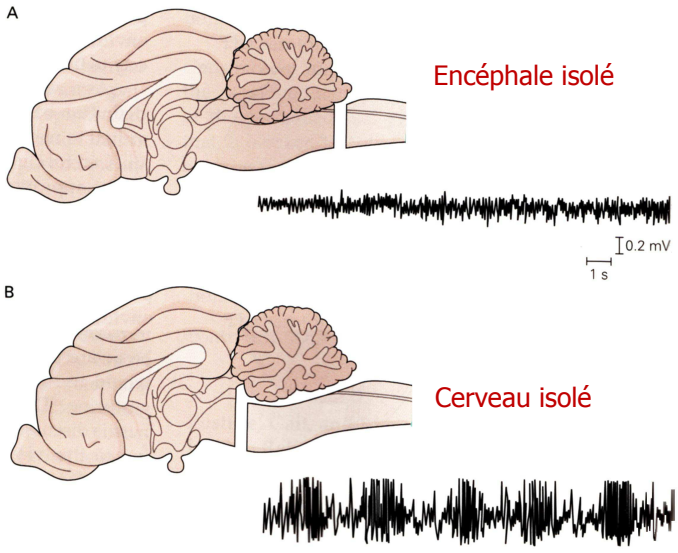
- **GABA**
  - Nn. GABA în trunchi, talamus, hipotalamus, diencefal, cortex
  - GABA e un neurotransmiţător inhibitor şi poate inhiba formaţiunea reticulată activatorie, staţiile de releu şi cortexul producand inhibiţia corticală şi de-activarea.
  - SOMNUL NU E UN FENOMEN PASIV
  - *Interacţiuni medicamentoase: benzodiazepinele cresc acţiunea postsinaptică a GABA având un efect sedativ.*

- **Adenozina**
  - Produs al metabolismului celular.
  - Poate fi un promotor al somnului.
  - Disponibilitatea pentru somn creşte funcţie de veghea prelungită anterioară şi hipertermie (↑activ. metabolice)
  - *Cofeina şi teofilina sunt antagonişti ai receptorilor adenozinici şi au efect stimulant.*

Starea de veghe

Somnul NonREM

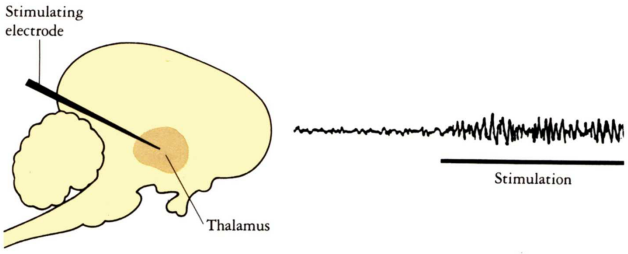
Somnul REM



Frédéric **Bremer**, Belgium, 1930
Sectiuni prin mezencefal

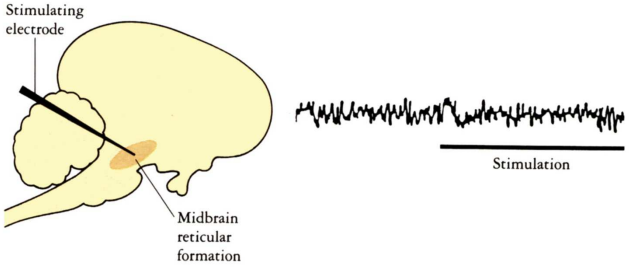
Walter Hess
Switzerland, 1950

Stimulation of the thalamus of waking cats produces sleep

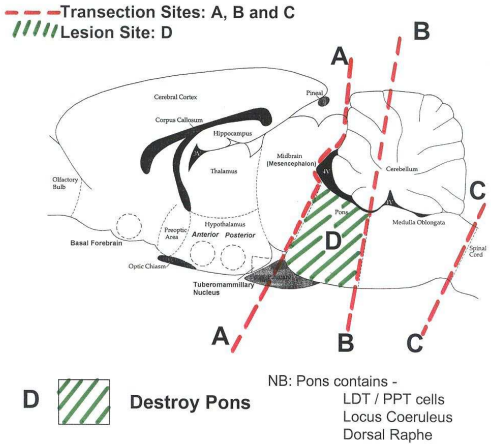


Magoun and Moruzzi
Northwestern Univ. 1949

Stimulation of the midbrain of sleeping cats produces wake

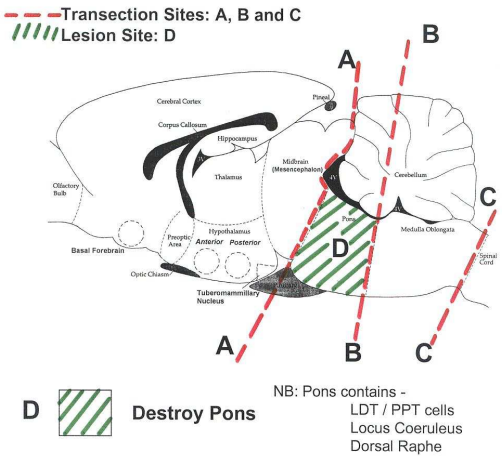


Secţiune pe linia A



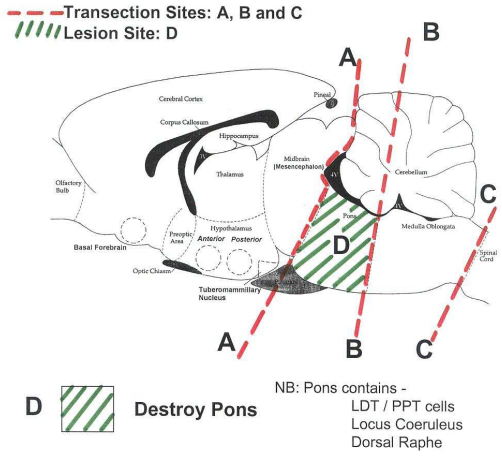
- **Joncţiune punte-mezencefal**
  - CAUDAL de leziune sunt prezente toate semnele de somn REM (ex. atonie, evenim. fazice)
  - ROSTRAL cortexul prezintă modificări spontane
    - EEG oscilează între sincronizat şi desincronizat
    - Mişcări rapide absente
    - Apar mişcări verticale ale globilor oculari ca răspuns la stimuli vizuali.

Secţiunea pe linia B



- **Joncţiune bulb-punte**
  - CAUDAL de leziune lipseşte orice fel de eveniment asociat somnului REM
  - ROSTRAL activitatea sugestivă de somn REM este prezentă.

Secţiunea pe linia C

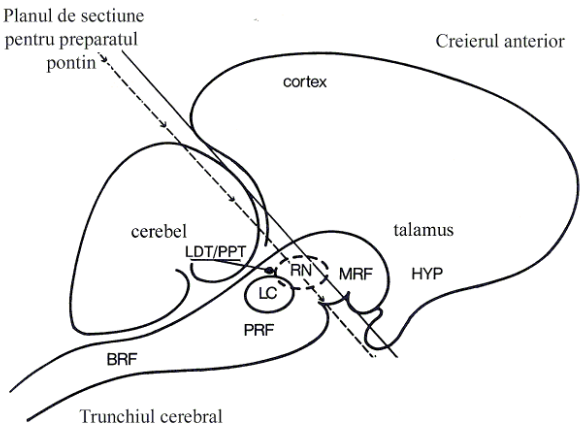


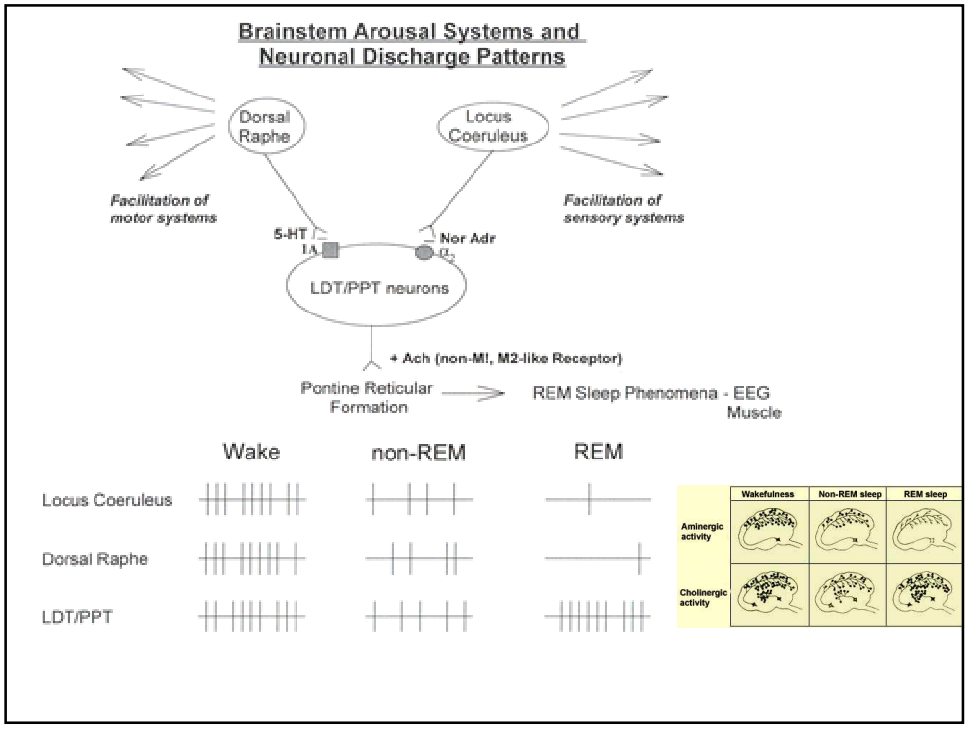
- **Joncţiune măduvă-bulb**
  - ROSTRAL toate semnele de REM prezente

Lezarea punţii

- Lipseşte orice semn de REM CAUDAL sau ROSTRAL faţă de punte
- **CONCLUZIA:**
  - PUNTEA ESTE NECESARĂ ŞI SUFICIENTĂ PENTRU GENERAREA SOMNULUI REM
- **ÎNTREBAREA:**
  - CARE NEURONI PONTINI ?

Pacemaker-ul pontin

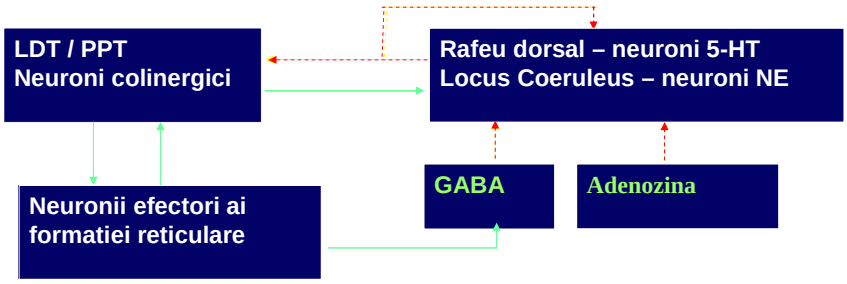




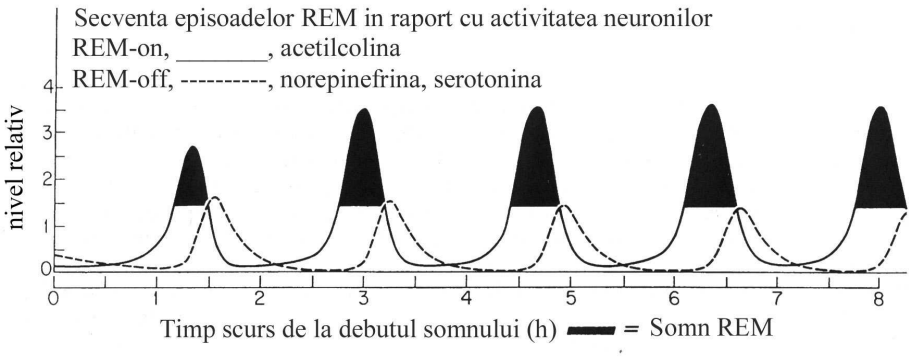
Modelul interacţiunii reciproce

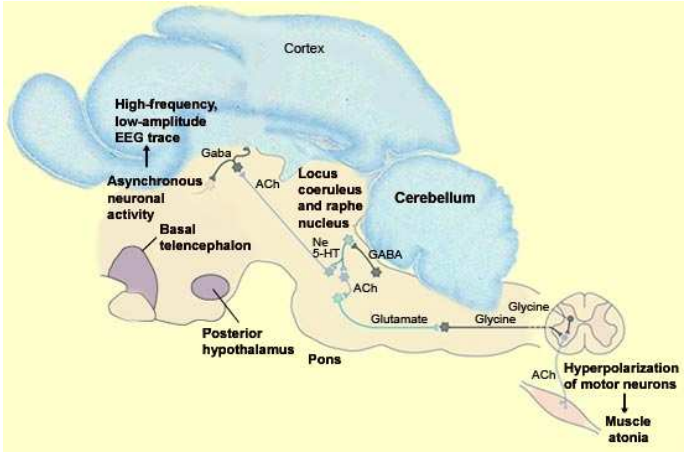
Neuronii REM-on = colinergici

Neuronii REM-off = serotoninergici
noradrenergici
histaminergici(?)



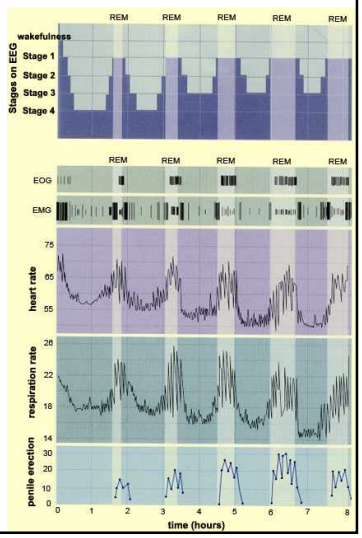
Modelul interacţiunii reciproce

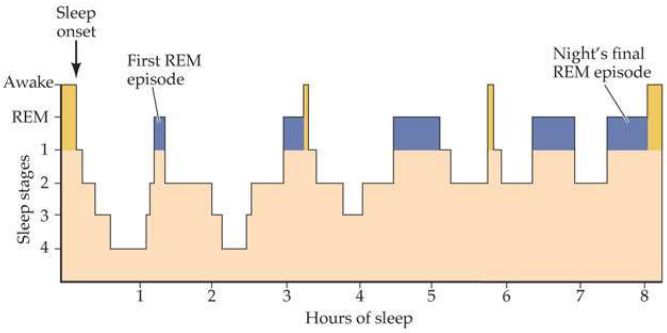




Modificări fiziologice în timpul somnului REM

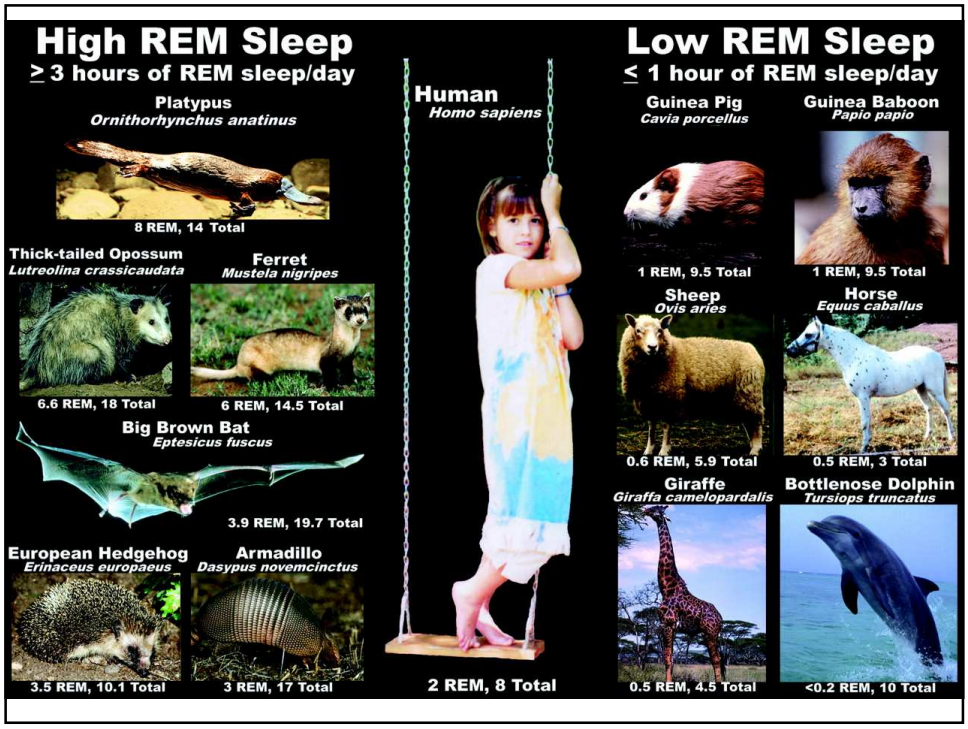
- Hipotonie musculară generalizată (cu excepţia sistemelor cardiovascular, respirator şi oculo-motor).
- Mişcări oculare rapide în special dreapta – stânga.
- Activarea în proporţie de 70 – 80% a masei neuronale cerebrale, creşte metabolismul, vascularizaţia, volumul cerebral, temperatura cu 1ºC
- Excitaţie a organelor sexuale.

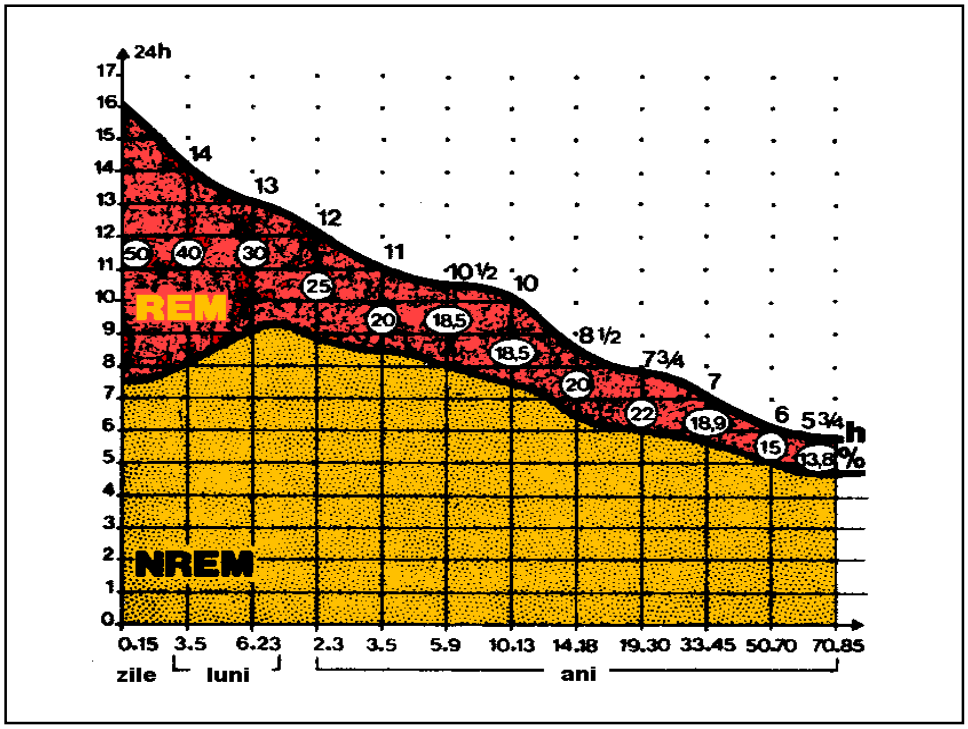




BIOLOGICAL PSYCHOLOGY, Fourth Edition, Figure 14.12 © 2004 Sinauer Associates, Inc.

- 4 / 5 episoade de cca. 20 min. la intervale de 90 min.


High REM Sleep
≥ 3 hours of REM sleep/day
Platypus
Ornithorhynchus anatinus
8 REM, 14 Total
Thick-tailed Opossum
Lutreolina crassicaudata
6.6 REM, 18 Total
Ferret
Mustela nigripes
6 REM, 14.5 Total
Big Brown Bat
Eptesicus fuscus
3.9 REM, 19.7 Total
European Hedgehog
Erinaceus europaeus
3.5 REM, 10.1 Total
Armadillo
Dasypus novemcinctus
3 REM, 17 Total
Human
Homo sapiens
2 REM, 8 Total
Low REM Sleep
≤ 1 hour of REM sleep/day
Guinea Pig
Cavia porcellus
1 REM, 9.5 Total
Guinea Baboon
Papio papio
1 REM, 9.5 Total
Sheep
Ovis aries
0.6 REM, 5.9 Total
Horse
Equus caballus
0.5 REM, 3 Total
Giraffe
Giraffa camelopardalis
0.5 REM, 4.5 Total
Bottlenose Dolphin
Tursiops truncatus
<0.2 REM, 10 Total


24h
REM
NREM
50
40
30
25
20
18,5
18,5
20
22
18,9
15
13,8%
14
13
12
11
10½
10
8½
7¾
7
6
5¾
h
0.15
3.5
6.23
2.3
3.5
5.9
10.13
14.18
19.30
33.45
50.70
70.85
zile
luni
ani

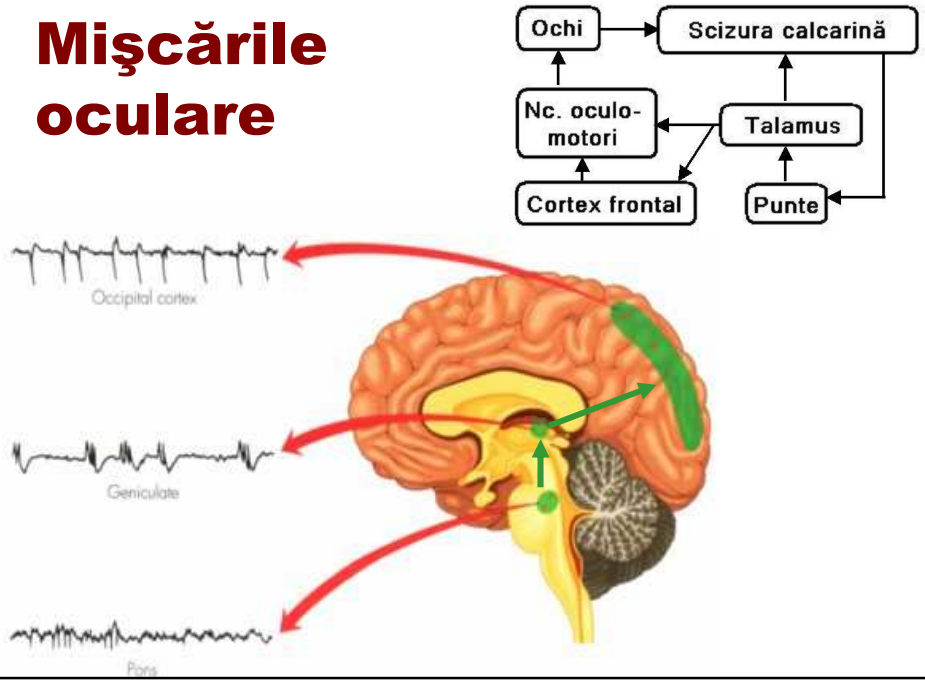
Variaţii fiziologice

- Când există un volum mare de informaţii de asimilat, începutul vieţii profesionale.
- Începutul vieţii de relaţie (curtare, cuplu, etc.).
- În sarcină.
- În stresul acut.
- În situaţii de izolare.

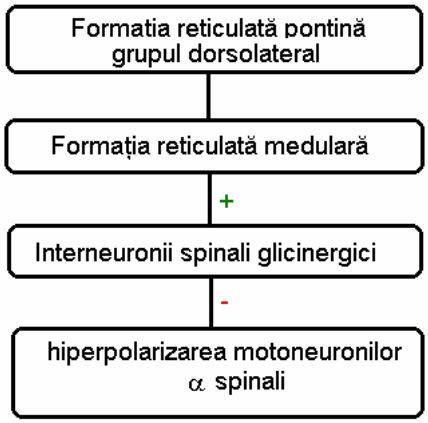
- 1950 – Michel Jouvet.
- 1953 – Aserinsky & Kleitman.

Mecanisme asociate somnului REM

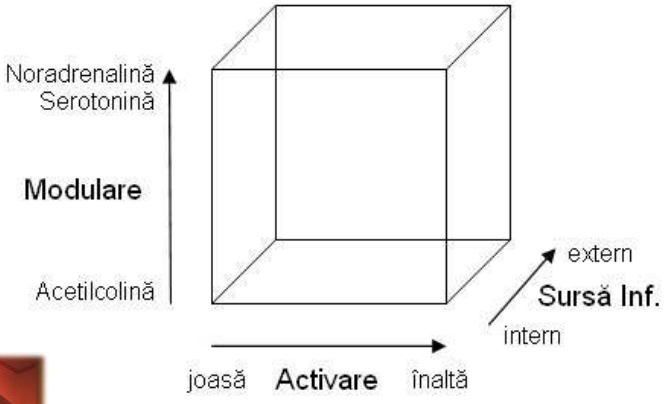
Mişcările oculare

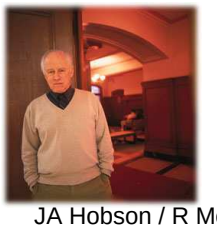


Inhibiţia motorie



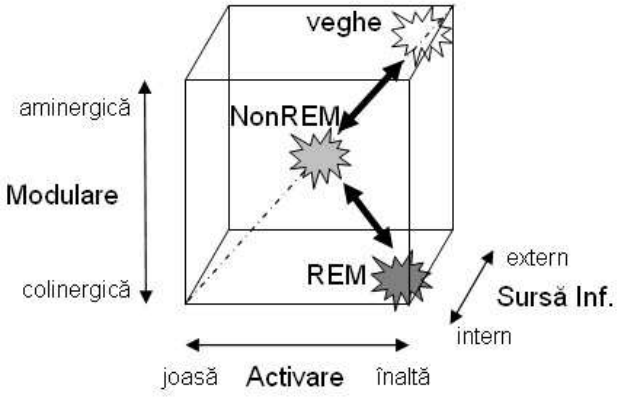
CE SUNT VISELE?





JA Hobson / R McCarley

Modelul AIM

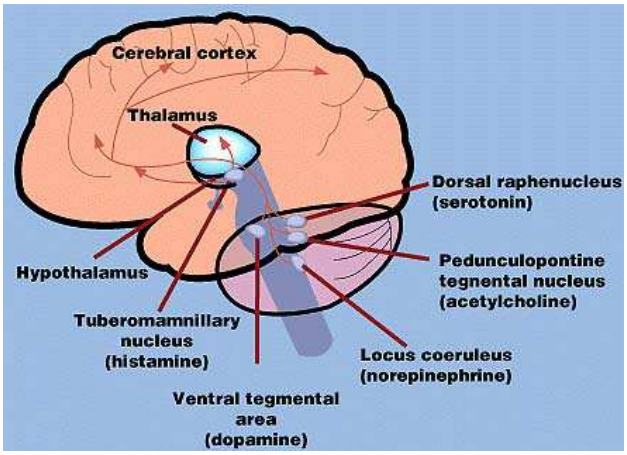


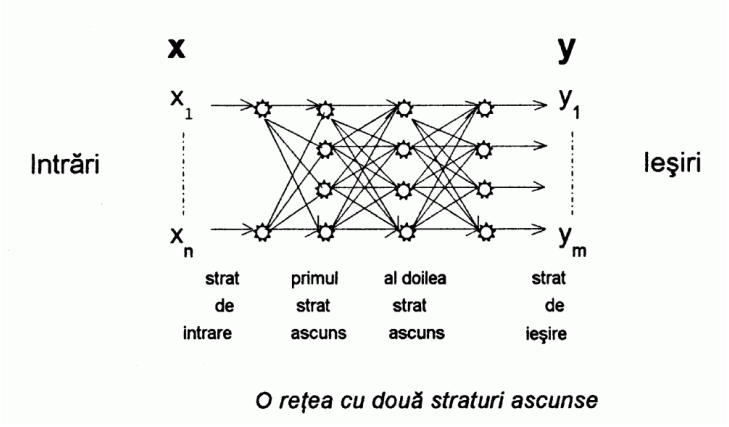
Visele sunt o stare de conştienţă

- Intrare date – procesor – ieşire date
- Procesorul este controlat de neuro-transmiţători
  - Sistem Aminergic: punte – amigdală
  - Sistem Colinergic: prozencefal – cortex
- Intrarea datelor poate avea o sursă externă sau internă
- Starea de activitate corticală

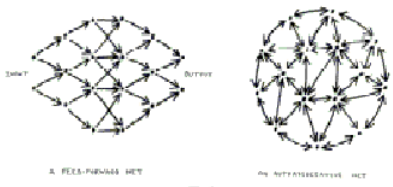
- **Veghe:** sursă externă, predominanţă aminergică, stare de activare corticală.
- **Vis:** sursă internă, predominanţă colinergică, stare de activare corticală.
- **Somn:** diminuarea aferenţelor, echilibru al neuro-transmiţătorilor, dezactivare corticală.

Producerea mentaţiei în somn





O rețea cu două straturi ascunse



Unde locuiam în 1990?

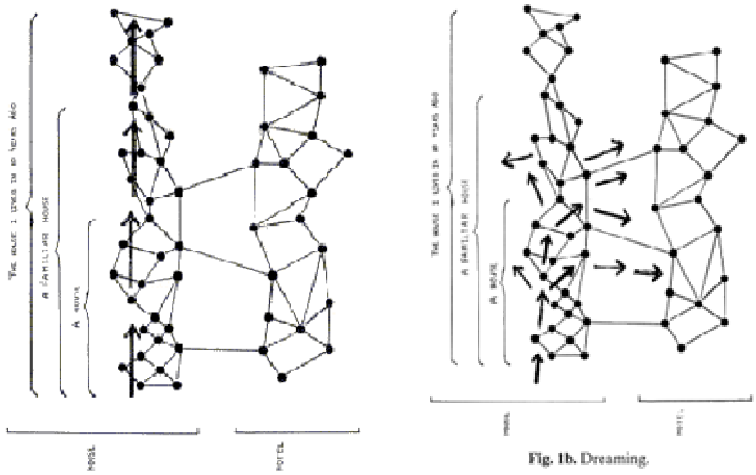


Fig. 1b. Dreaming.

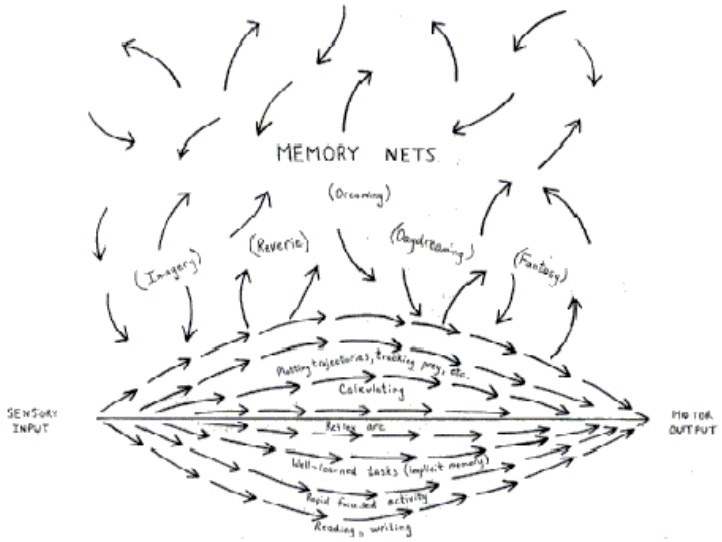
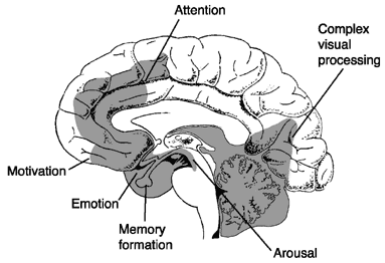


Fig. 2

Studii electrofiziologice şi imagistice evidenţiază:

- Activare în zona calcarină
- Activarea zonei extrastriate şi a căilor extrastriat – sistem limbic
- Rar în ariile auditive (expresivă şi receptivă)
- Activare locus coeruleus – centrii plăcerii



De ce visăm?

- 1983 F. Crick – “visăm ca să uităm”
- 1985 J. Winson – “în timpul visului se crează memoria de lungă durată”
- M. Jouvet – “testare şi practicarea programelor genetice”
- 1977 A. Hobson – “întăresc şi organizează memoria”

Interferenţe stare de veghe - vis

Influenţe directe

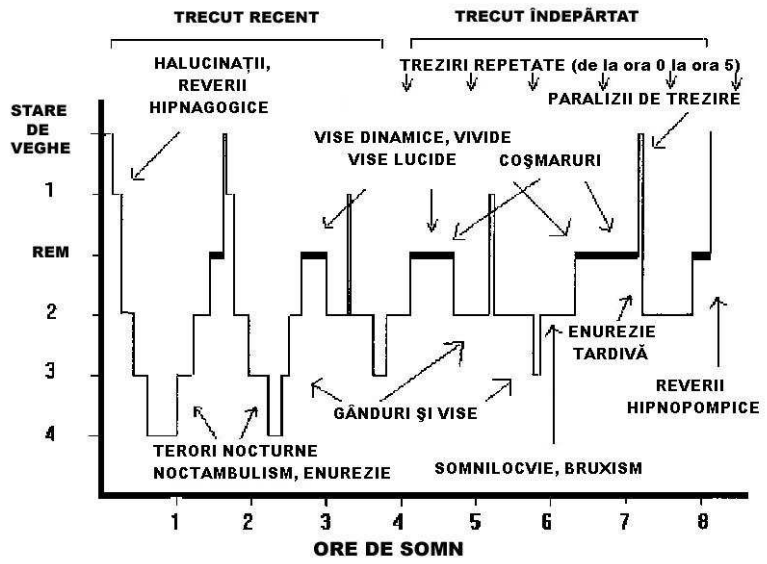
- ÎNCORPORARE
  - directă – rar
  - indirectă
    - asonanţă
    - asociere
    - reprezentare
- CONTINUITATE
- COMPENSARE

Influenţe dependente de subiect

- Vârstă
  - Copii – animale
  - Adulţii – personaje, relatii sociale
- Sex
  - Bărbaţii – personaje masculine, agresivitate
  - Femeile – relaţii interpersonale, prieteni, emoţii plăcute
- Personalitate
- Nivel de organizare cognitivă
- Motivaţie şi Control

Influenţe funcţie de moment

- 80% REM, 8% NREM
- În somnul NREM:
  - Adormire – reverii hipnagogice
  - Predomină evenimentele recente
  - SUL – terori nocturne
- În somnul REM:
  - Devin din ce în ce mai complexe pe măsură ce somnul avansează
  - Predomină visele intense, lucide şi coşmarurile



Interpretarea viselor

Tehnici de investigare clasice

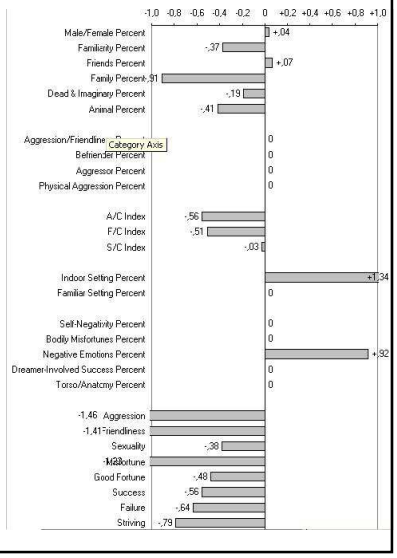
- Freud – “Calea regală spre subconştient.”
- Jung – “starea de veghe apare într-o manieră compensatorie şi complementară în vis. Visele sunt reprezentări creative subiective ale visătorilor.”
- Adler – “din vise se poate deduce stilul de viaţă şi soluţiile pentru problemele contemporane.”

Metode de interpretare

- Metoda liberei asociaţii (Freud)
  - Analiza metaforică
  - Analiza tematică

Tehnici de investigare moderne

- 1966 C. S. Hall & R. L. van de Castle
  - Personaje
  - Interacţiuni sociale (agresivitate, prietenie, sexualitate)
  - Activităţi
  - Scenarii
  - Noroc/ghinion, succes/ratări
  - Emoţii
  - Diverse



Visele & psihopatologia

- Schizofrenia – vise primitive, ↑sexualitate, ↑anxietate, ↑ostilitate
- Depresia – intense, ↑prietenie, ↑masochism, suicid
- Stres post-traumaic – vise recurente, coşmaruri, intruziuni, treziri, activitate motorie
- Tulburări alimentare – la bulimici ↑ostilitatea, la anorexici ↓ostilitatea
- Alcoolici – agresiune sexuali, coşmaruri
- Demenţa organică – ameninţări, ↓sexualitate
- Retard mental – simple, casă.

“ Dacă somnul nu are o funcţie absolut vitală, atunci este cea mai mare greşeală a procesului evoluţionist”

A. Rechtschaffen, 1970