PHYLOGENY OF THE CORTEX
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NEURO-COG
http://www.neuro-cog.com

Factores genéticos

- Mutación en un gen de transcripción FOXP2: familaia con trastorno del desarrollo: afecta al lenguaje, espec. fonología y sintaxis (Hurts et al 1990)
- Síndrome de Williams: Factor IIi (GTF2I) hiperrexpresado en la evolución humana. Vía dorsal: modificación filogenética reciente (Bellugi et al 1999, Alberto y Jurado 2003)
- Gen de α-calcio/calmodulin proteinkinasa-II (α-CaMKII$^{+/-}$). Relacionado con LTP y plasticidad cerebral. Hiperexpresado

Diferencias en la estructura y función cerebral de humanos, monos superiosres y otros animales: correlatos genéticos

Complejidad

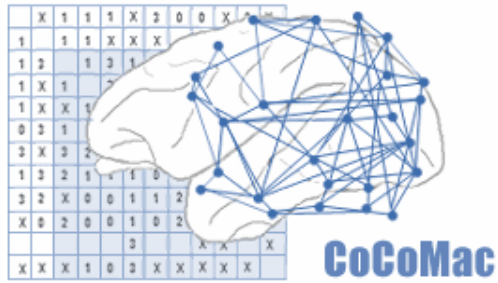
- Progresiva complejidad biológica, genómica y proteómica (Tema de debate: Adami et al 2000).
- Darwin (1871): dirección evolutiva hacia la complejidad
- Enfoque actual
  - Conplejidad en función de los flujos de información en los sistemas (Gould 1994, Adami et al, 2000, Carroll 2001).
  - Redes neuronales: sistemas complejos con una conectividad interregional.
  - Dos principios básicos: Segregación e integración
  - Theoretical neuroanatomy (Seth y Edelman 2004).

http://134.95.56.239 - home - Microsoft Internet Explorer

Fitxer Edita Visualització Preferits Eines Ajuda

CoCoMac | DATABASES | ORT | EXAMPLES | DOCUMENTS | REFERENCES | CONTACTS

login | password | go! | get a password here



Untangling the Brain

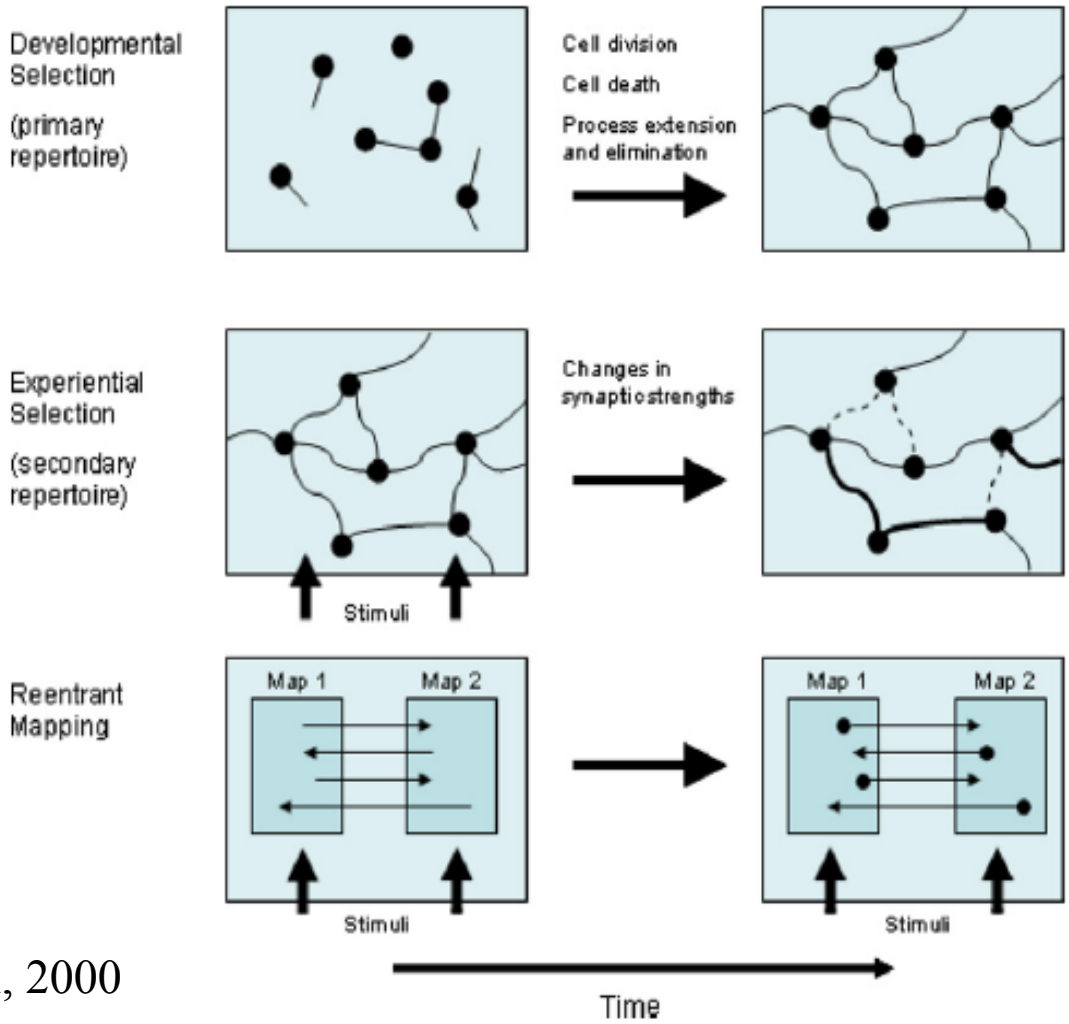
Current database version uploaded on 23.12.2005:

410	literature reports
7959	brain sites
8274	mapping details
2764	tracer injections

CoCoMac (Collations of Connectivity data on the Macaque brain) is our approach to produce a systematic record of the known wiring of the primate brain. The main database contains details of hundreds of

CoCoMac (Collations of Connectivity data on the Macaque brain) is our approach to produce a systematic record of the known wiring of the primate brain. The main database contains details of hundreds of tracing studies in their original descriptions. Further data are continuously added. To overcome the problem of divergent brain maps we developed **ORT** (Objective Relational Transformation), an algorithmic method to convert data in a coordinate- independent way based on logical relations between areas in different brain maps.

Complexity: Neural Darwinism



Edelman & Tononi, 2000

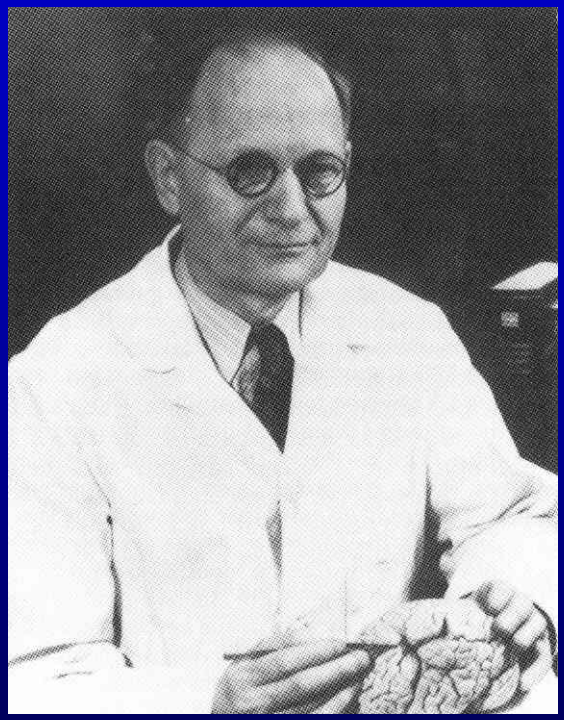
THE TRIUNE BRAIN
(una especie de metáfora)

Paul MacLean

Paul I Yakovlev

From Papez… to MacLean

Papez: Limbic System (1937)



James Papez (1883-1958)

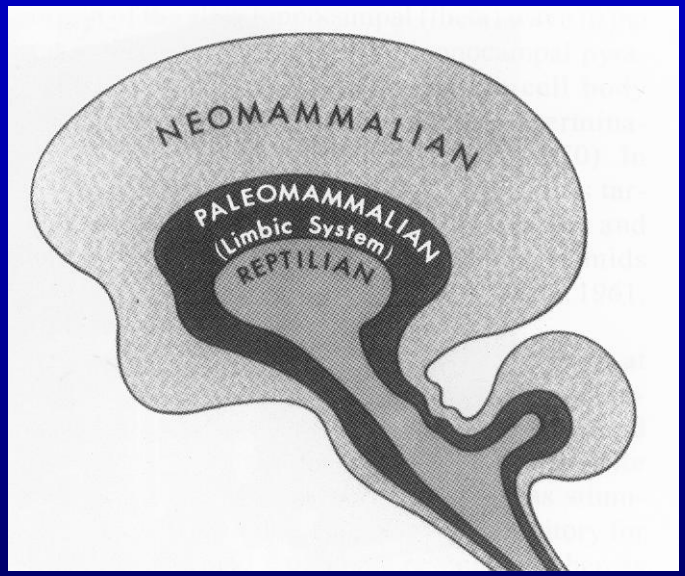
"A proposed mechanism of emotion"

MacLean: Visceral brain (1949)

- Emotional behavior & basic drives of eating, drinking and reproduction
- The triune brain (levels as HH. Jackson)

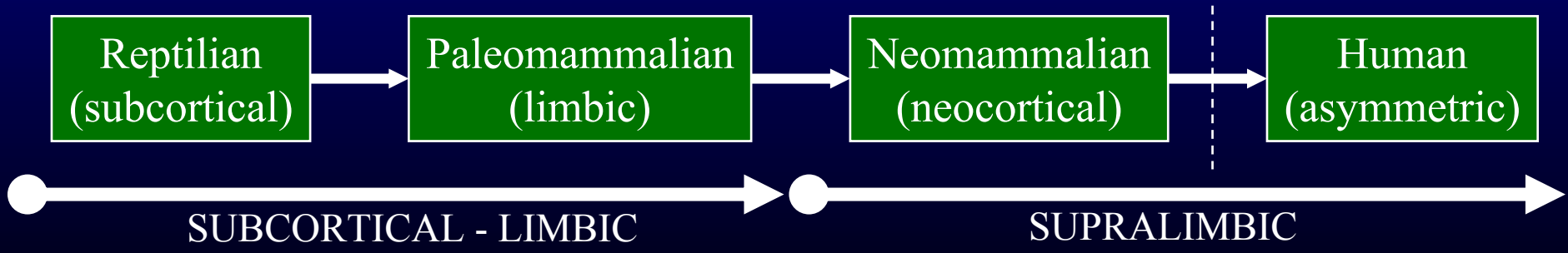
- Papez J. A proposed mechanism of emotion. Arch Neurol Psych, 38:725-743, 1937
- Papez JW. Visceral brain, its component parts and the connections. J. Nerv Medt Dis. 126:40-55
- MacLean PD. Psychosomatic disease and the "visceral brain". Recent developments bearing on the Papez theory of emotion Psychosomatic Medicine, 11: 338-353, 1949 (& 1952, 1954, 1978)

MacLean: evolutinary layering

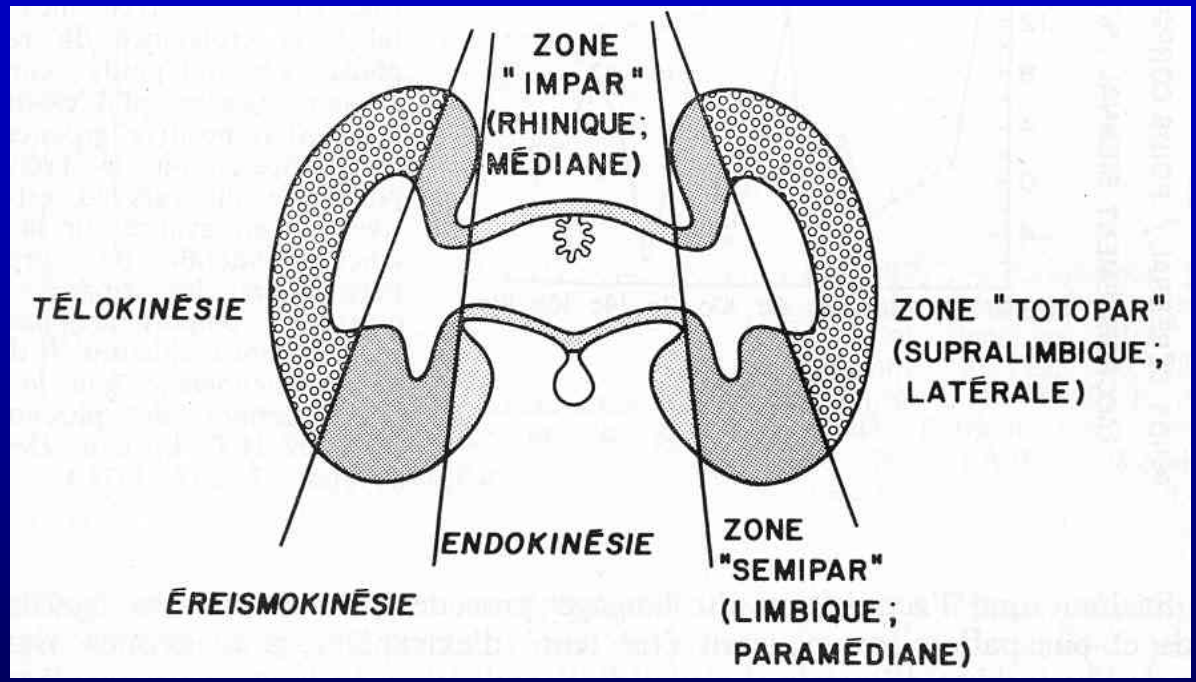


- Succesive overlay of neural tissue with new functions during evolutionary time
- The "triune brain"

1. Reptilian
2. Paleomamalian (limbic)
3. Neomammalian



Phylogenetic development: Telencephalon



Yakovlev (1948, 1963, 1968, 1970)

1. Impar: Median (rhinal): endokinesis

2. Semipar: Paramedian (limbic): ereismokinesis (exmotion)

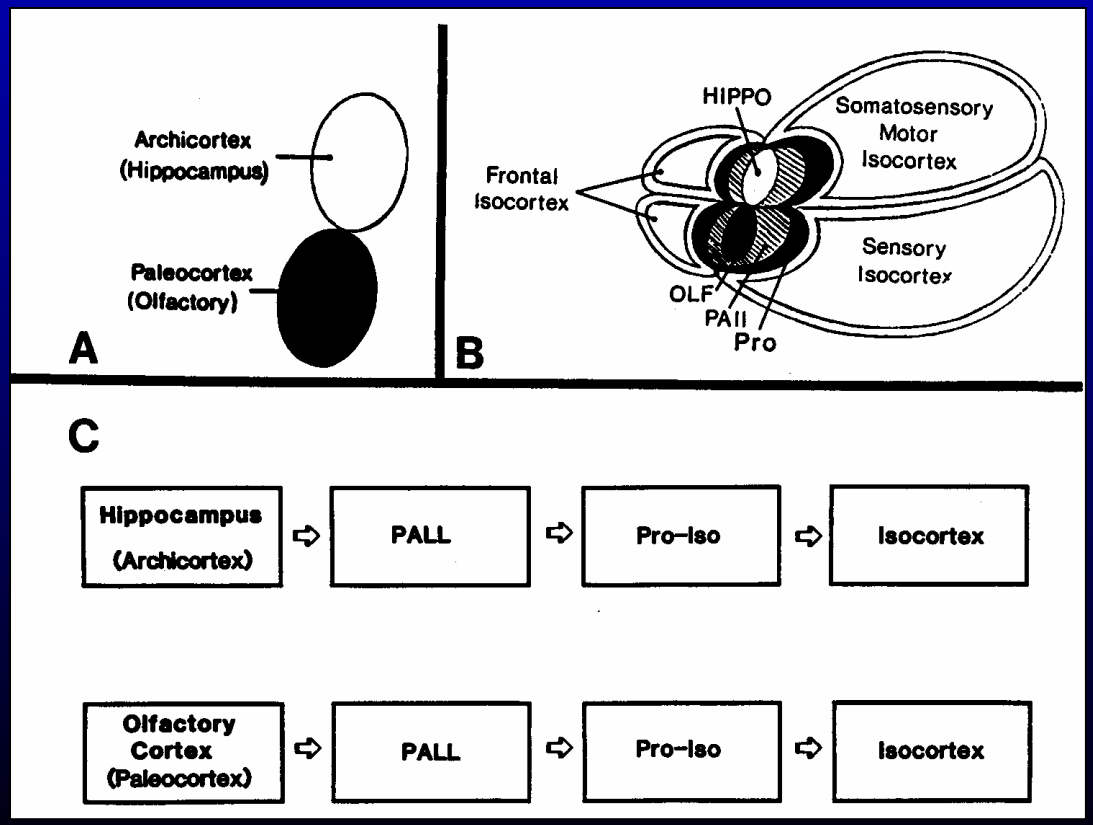
3. Totopar: Supralimbic (lateral): telokinesis

Yakovlev's Model:
Layers, structure and functions

	Inner	Intermediate	Outer
Neurons	Short, unmyelinated	Long, partially myelinated	Long, well myelinated
Organization	Diffuse	Ganglia, allocortex	Isocortex
Evolution	Invertebrate to reptile	Reptile to early mammal	Mammal to primate
Structure	Reticular core Granial nerves Periaqueductal gray Hypothalamus	Basal ganglia Limbic thalamus Olfactory paleocortex Hippocampal archicort.	Primary sensory cs. Primary motor cs. Corpus callosum Association cortex
Function	Arousal /autonomic Metabolism Respiration Circulation	Motor synergistic, motivation, communal activities Emotion	Motor precision Praxis, gnosis Language, .../... Abstract cognition

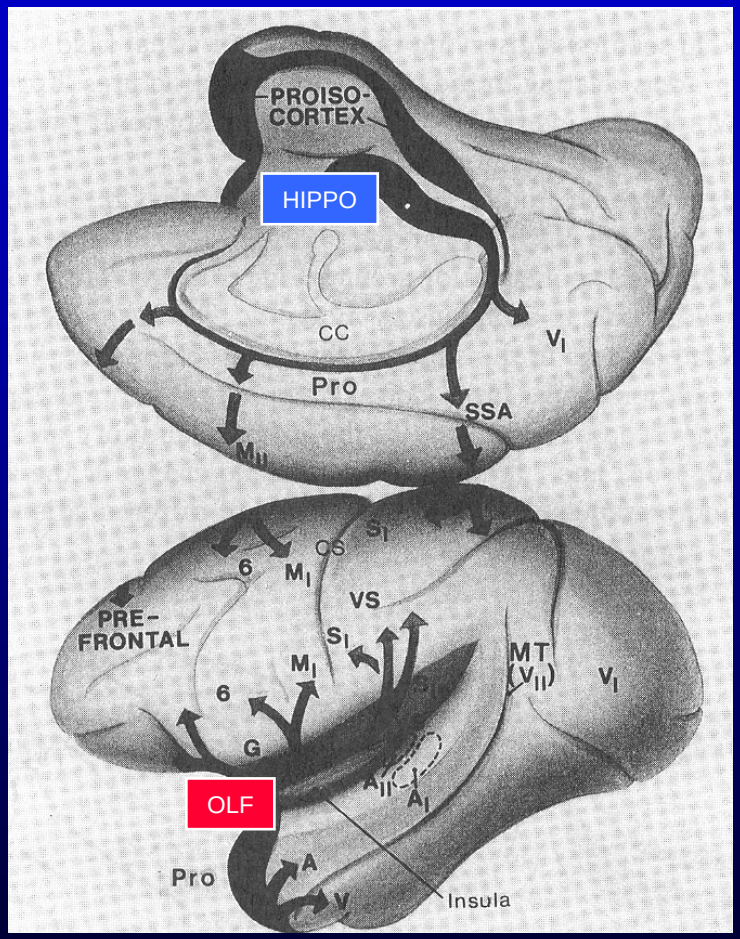
El origen dual de la corteza

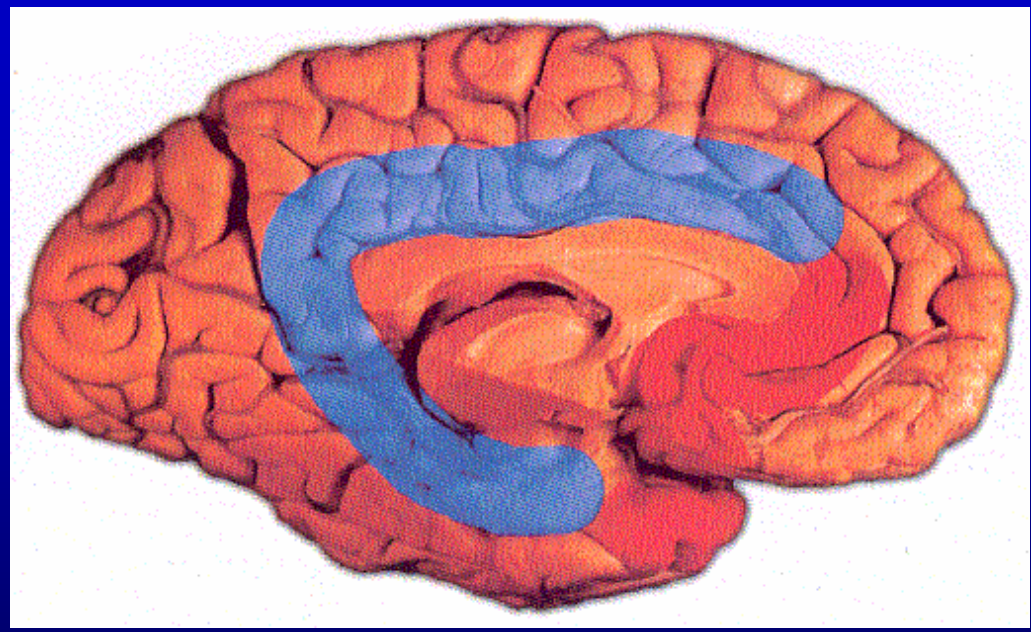
- Evolución desde las cortezas más primitivas (allocortezas) hacia la isocorteza (6 capas).
  - Dart (1934), Abbie (1940), Sanides (1969)



- Dos orígenes
  - Paleocorteza
    - » (olfatoria)
  - Archicorteza
    - » (hipocámpica)

Cortical & paralimbic trends





Paralimbinc trends
Orbito-frontal. Paleocortical. (red)
Hippocampal trend. Archicortical (blue)

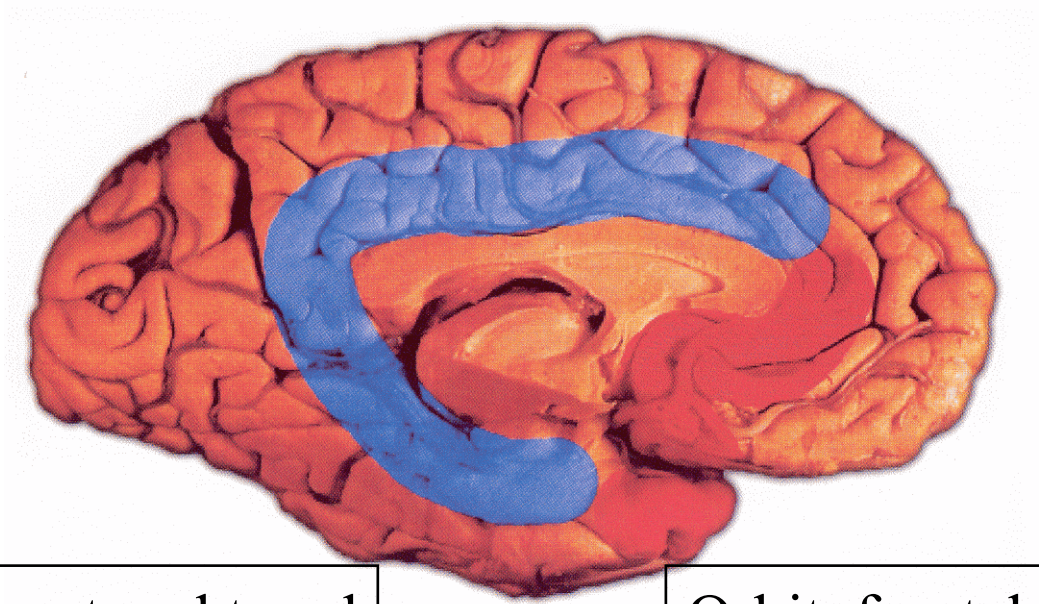
Pandya and Yeterian, 1990

Cummings and Mega, 2003

Desarrollo de las tendencias corticales

- TENDENCIA PALEOCORTICAL (corteza olfativa)
  - Proisocortex temporo-polar e insular
  - Areas auditivas: región temporal superior
  - Areas de campos visuales centrales
  - Areas somatosensoriales y motoras: cabeza, cara, cuello
  - Areas vestibulares, gustativas
  - Areas prefrontales ventrales
- TENDENCIA ARCHICORTICAL (hipocampo)
  - Area ventromedial temporal
  - Areas de campos visuales perifericos
  - Areas somatosensoriales y motoras: tronco y extremidades
  - Areas frontales y prefrontales dorsolaterales

Paralimbic trends of evolutionary cortical development



Hippocampal-centered trend

- Posterior Parahippocampal
- Retrosplenium
- Posterior cingulate
- Supracallosal cingulate
- Anterior cingulate

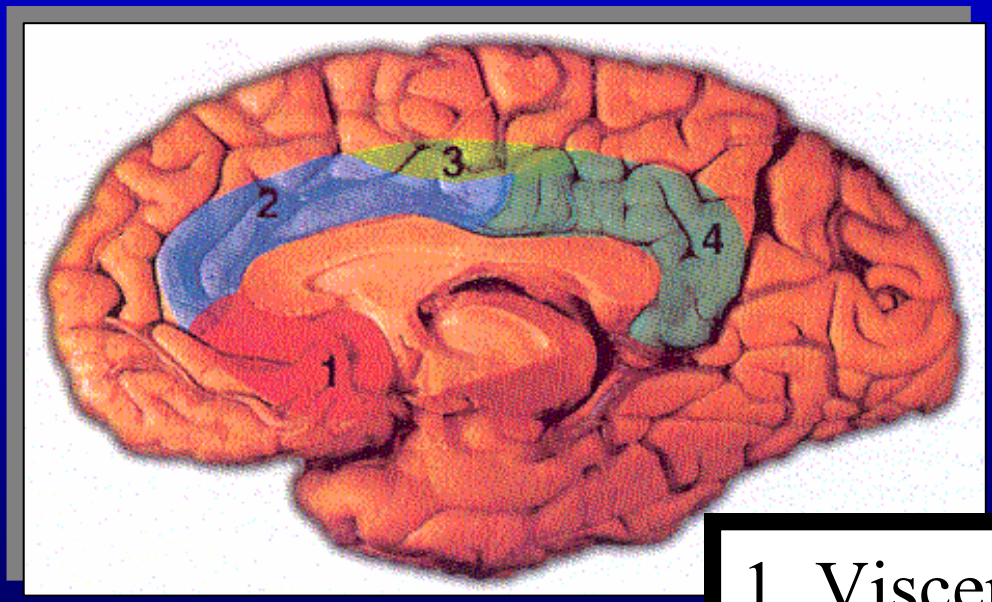
Orbitofrontal-centered trend

- Subcallosal cingulate
- Temporo-polar
- Anterior insula

Mega et al, 1997 1996 [Cummings & Mega 2003]

	Divisones paralímbicas	
	División Orbitofrontal	**División Hipocámpica**
Tendencias	Paleocortical (olfativo)	Archicortical
Tipo celular	Granular	Piramidal
Estructuras	Amígdala Parahipocampo anterior Insula Polo temporal Cíngulo infracalloso	Hipocampo Parahipocampo posterior Retroesplenio Cíngulo posterior Cíngulo supracalloso
Función	Procesamiento implícito Integración visceral Análisis de rasgos visuales Impulsos apetitivos Conciencia social Humor	Procesamiento explícito Codificación mnésica Análisis visual-espacial Efector nusculoesquelético Sistemas atencionales Motivación

Cingulate cortex: functional divisions



1. Visceral effector
2. Cognitive effector
3. Skeletomotor effector
4. Sensory-processing region

Cummings and Mega, 2003