UNIVERSITEIT
GENT

WIJ EN ONZE HERSENEN PRIDE OR PREJUDICE ?

PROF.DR.P.SANTENS

NEUROLOGIE UZ GENT

VAKGROEP H&H, FAC GE

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Bakery
THE BALLAD OF
ME AND MY BRAIN
30
Zone
ENDS
ASKEW ROAD

me
and
my
BRAIN
Ellie's story
illustrated by
Antoniette Preston
written by
Antoniette Preston & Kerryn Lisa

THE BALLAD OF ME
AND MY BRAIN
E.R

INHOUD VAN DE LEZINGENCYCLUS

9/10 - De hersenen als dynamisch orgaan: van cel tot netwerk

16/10 - De kwetsbare hersenen: tussen verlies en hoop

23/10 - Zijn wij onze hersenen ? Durf denken, en twijfelen !

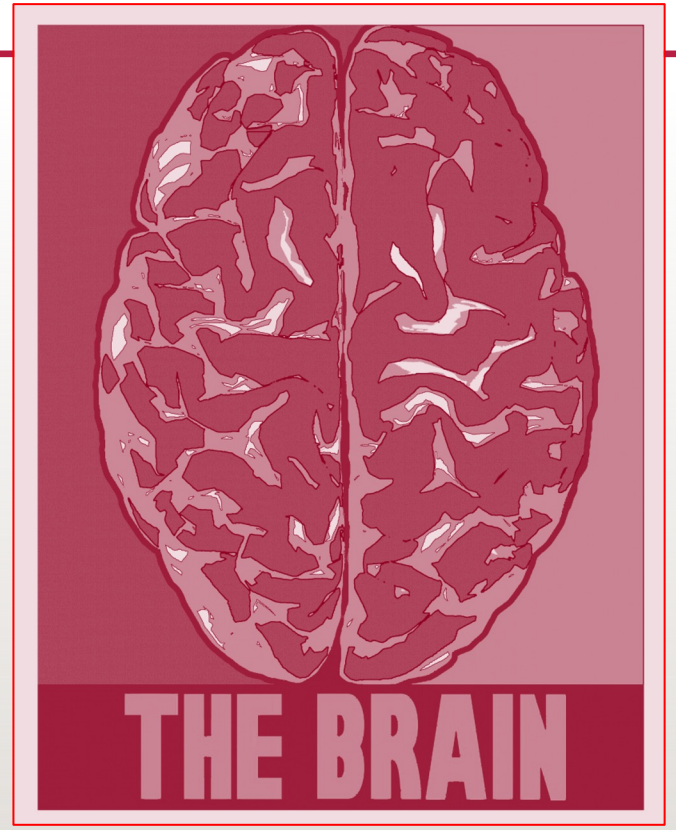
INHOUD VAN DE LEZINGENCYCLUS

4/10 - De hersenen als dynamisch orgaan: van cel tot netwerk

11/10 - De kwetsbare hersenen: tussen verlies en hoop

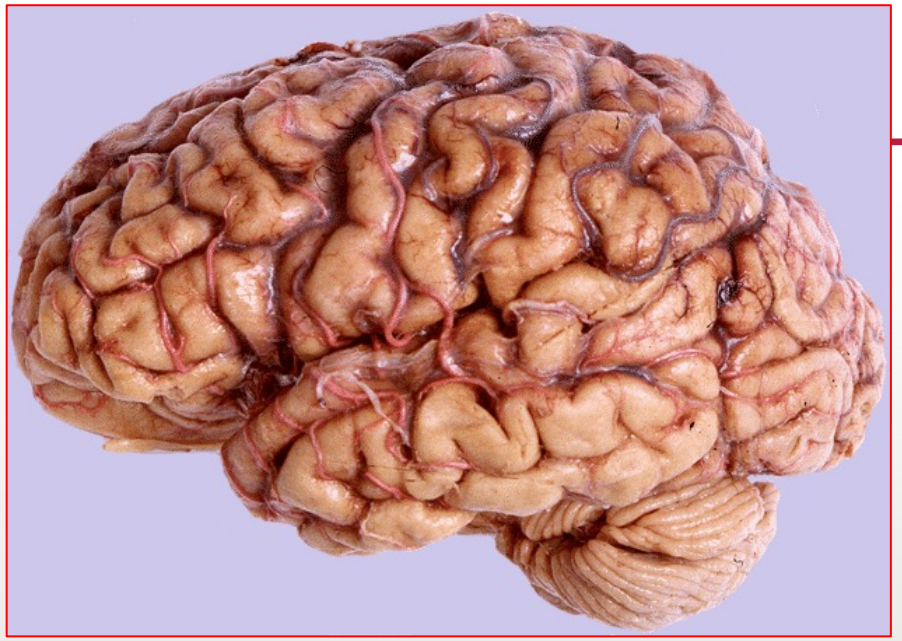
18/10 - Zijn wij onze hersenen ? Durf denken, en twijfelen !

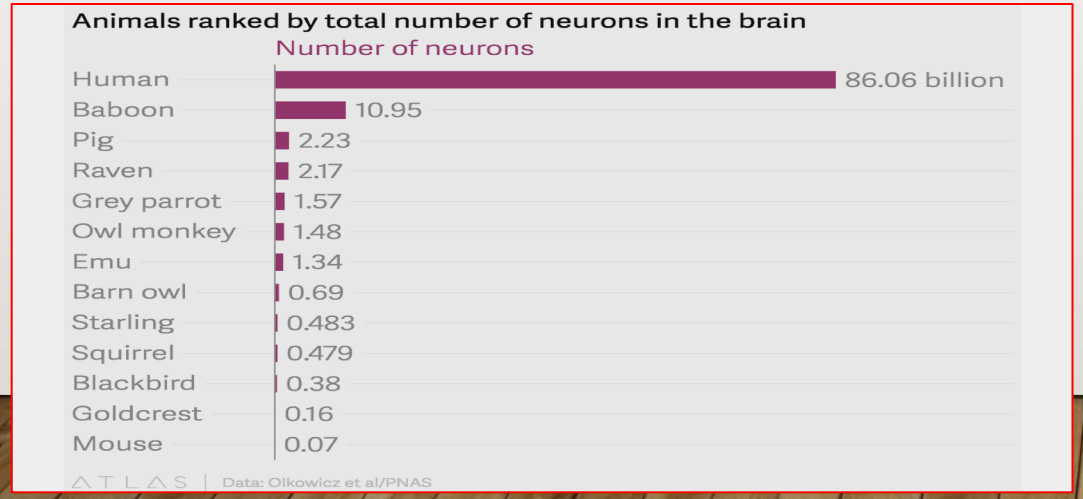
WAT WETEN WE OVER DE HERSENEN ?



- Structuur en bouw van de hersenen
- Ontwikkeling van de hersenen
- Structuur vs functie van de hersenen
- Hoe werken onze hersenen ?
- Hersenen en evolutie

DE HERSENEN IN CIJFERS





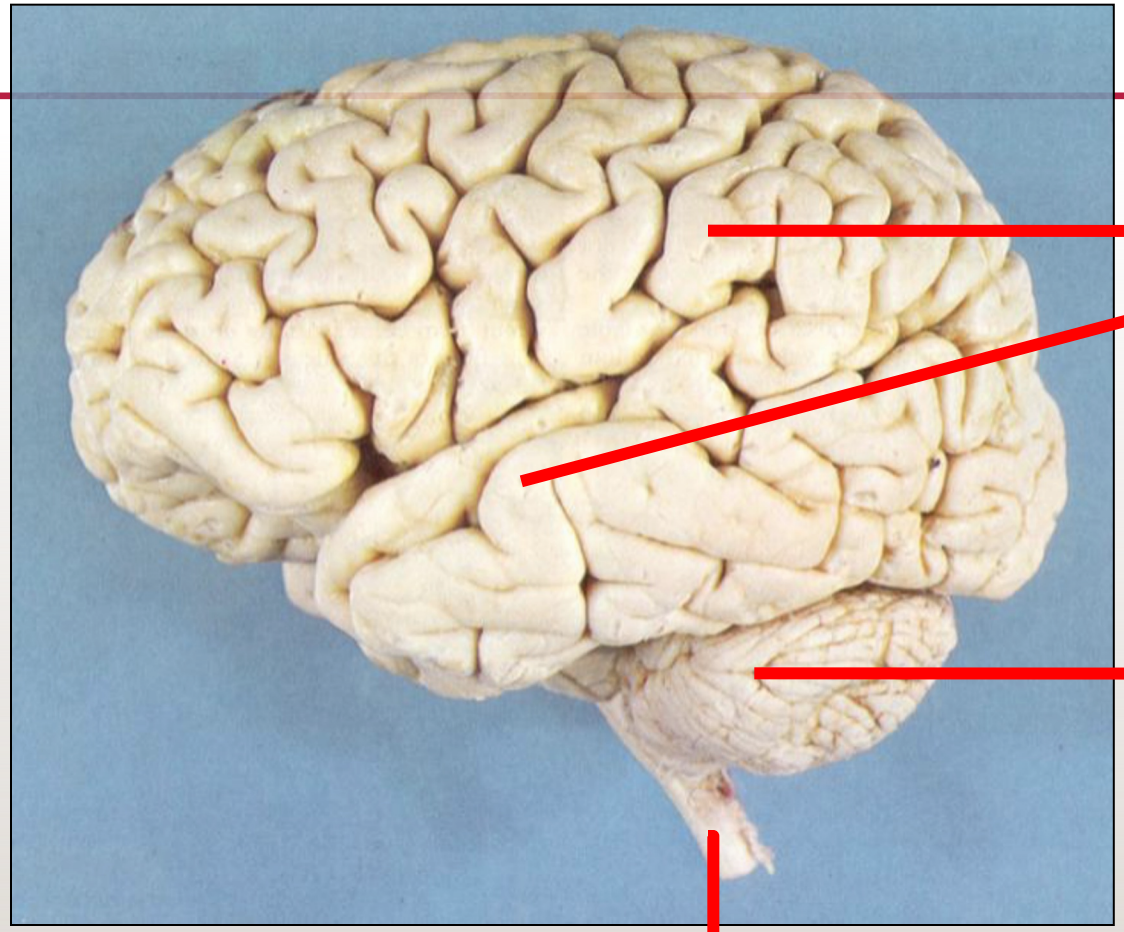
Gewicht gem 1200-1400g - Man>vrouw

Gewicht = ± 2% van het lichaamsgewicht
Energieverbruik tot 20% van het totaal

80-100 miljard zenuwcellen en 10x meer steuncellen

Elk neuron contact met gemiddeld 1000 anderen

STRUCTUUR : MACROSCOPISCH



Grote hersenen (cerebrum)

Kleine hersenen (cerebellum)

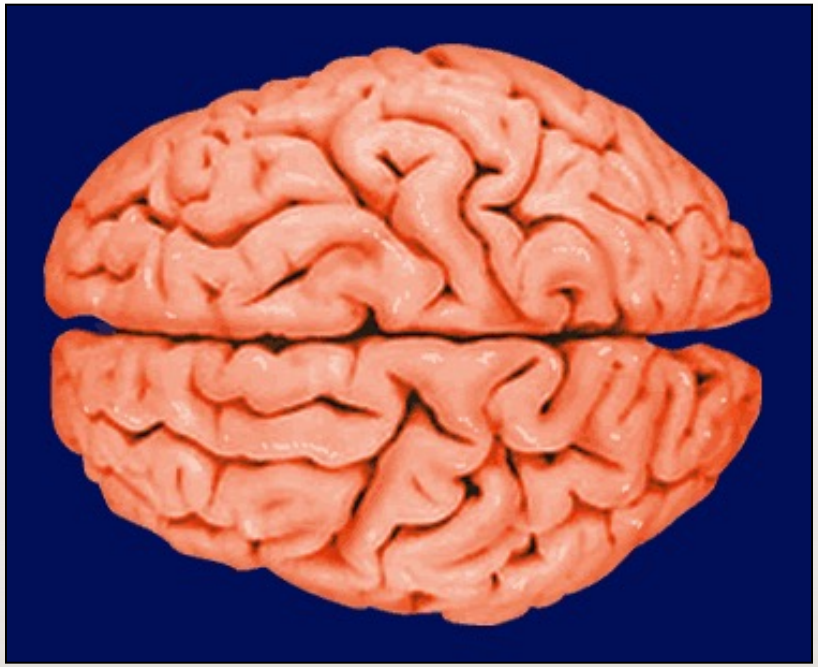
Hersenstam

STRUCTUUR : MACROSCOPISCH

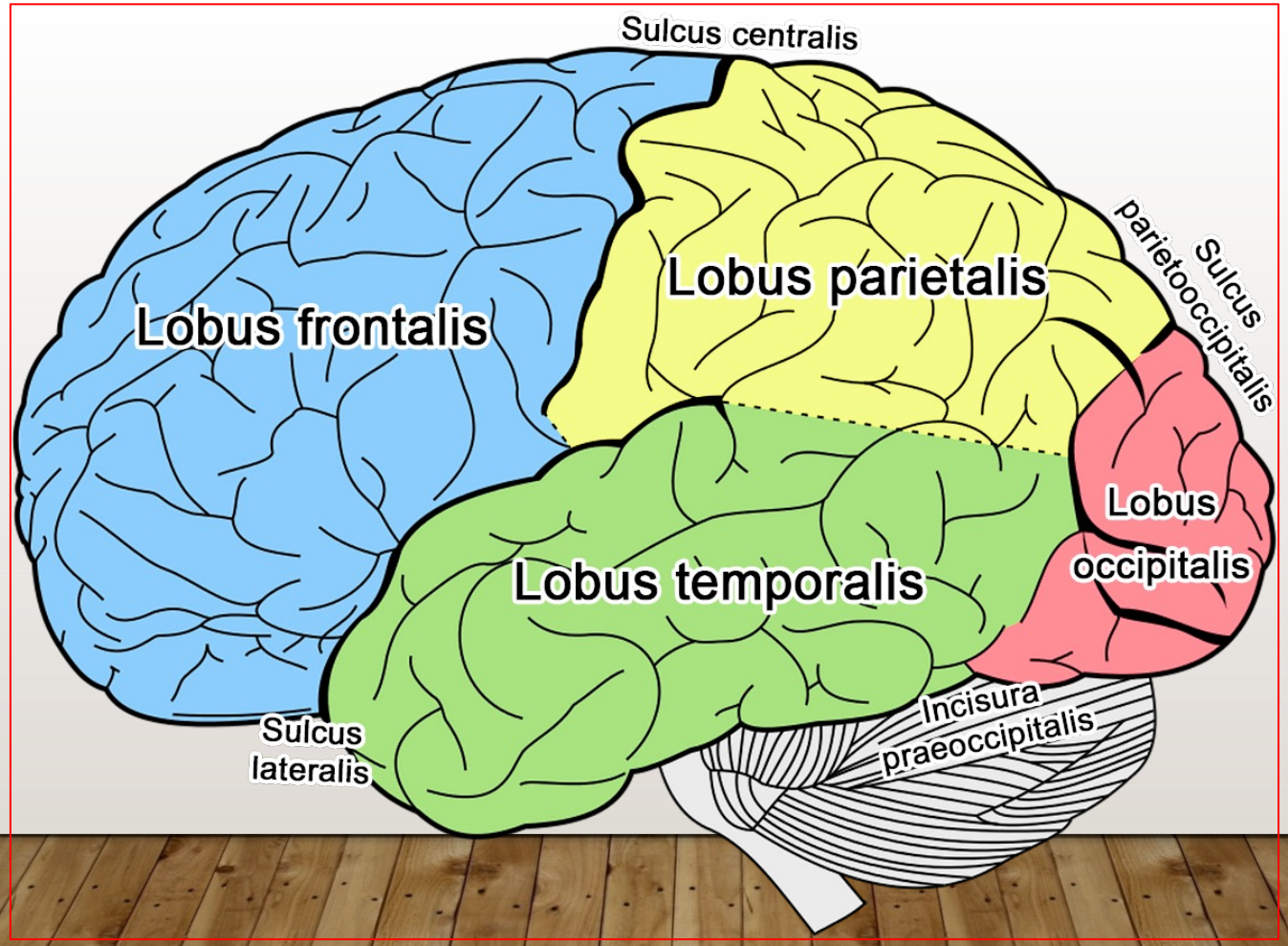
Twee hersenhelften (hemisferen)

Groeven (sulci)

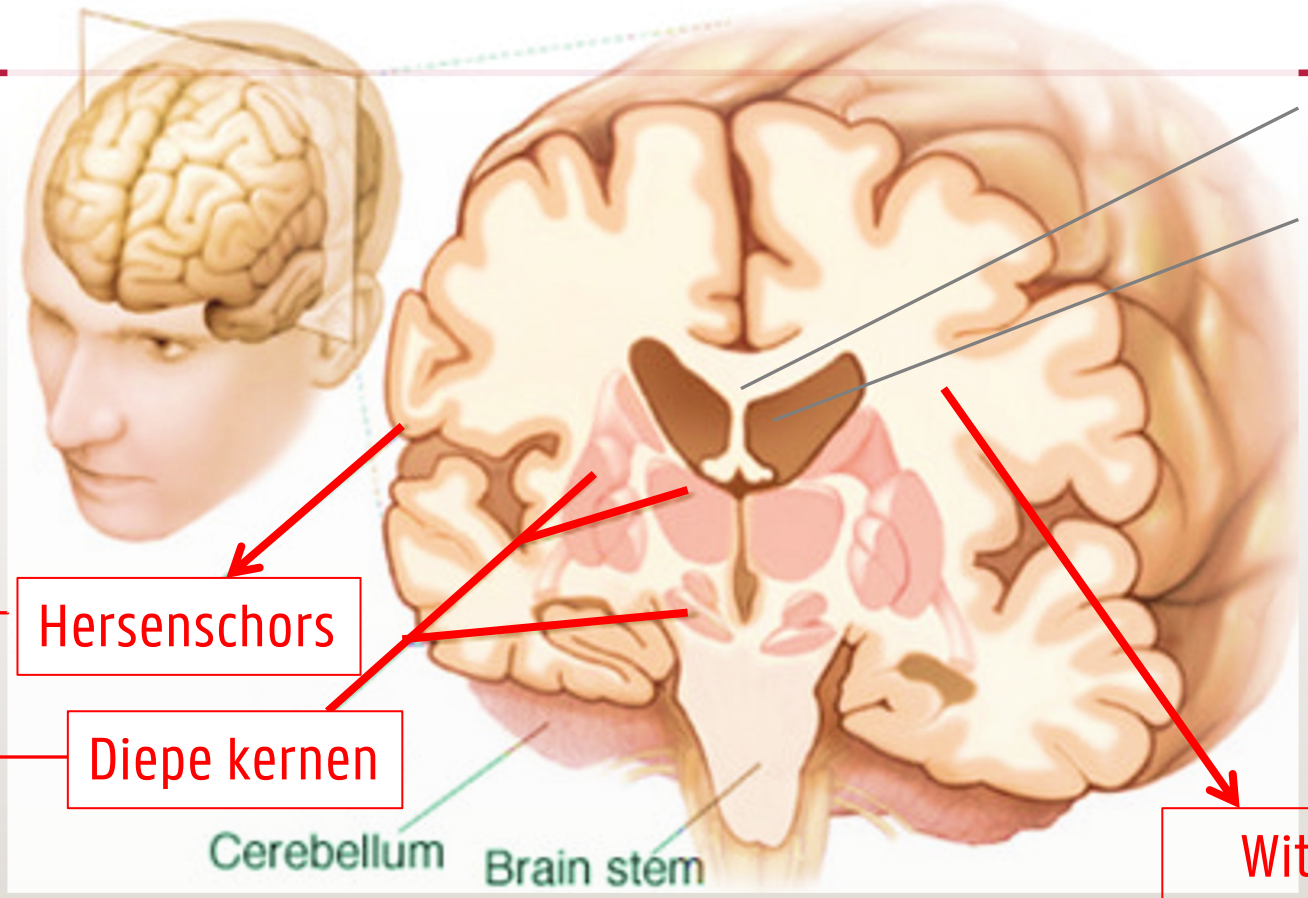
Windingen (gyri)



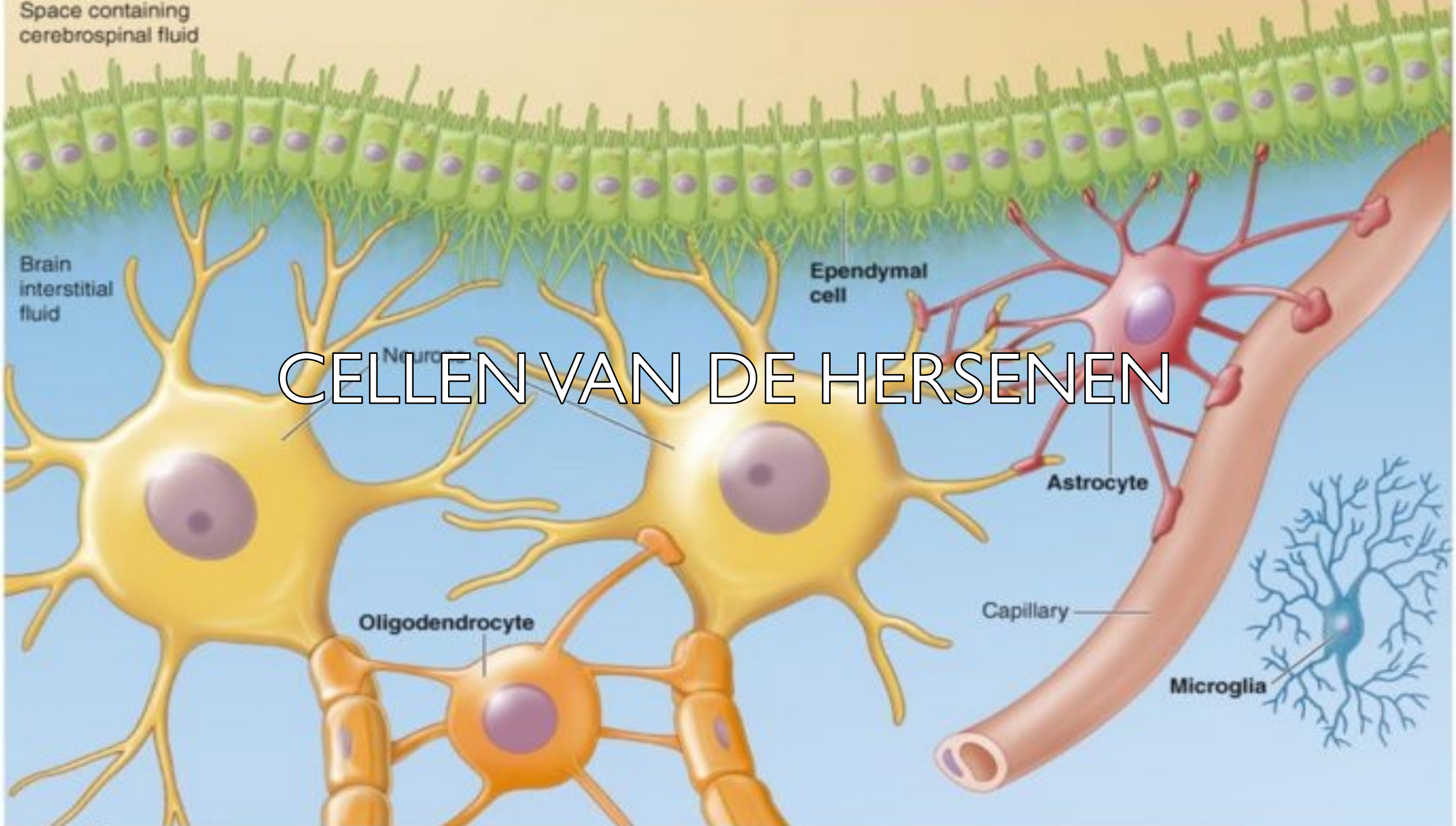
STRUCTUUR EN INDELING : MACROSCOPISCH



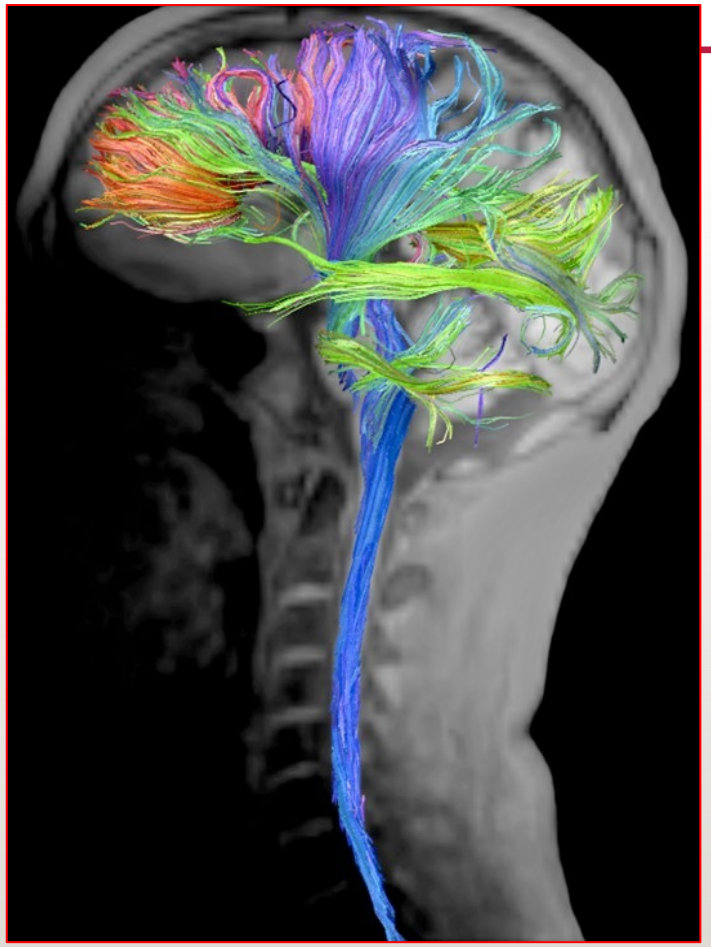
STRUCTUUR : MACROSCOPISCH

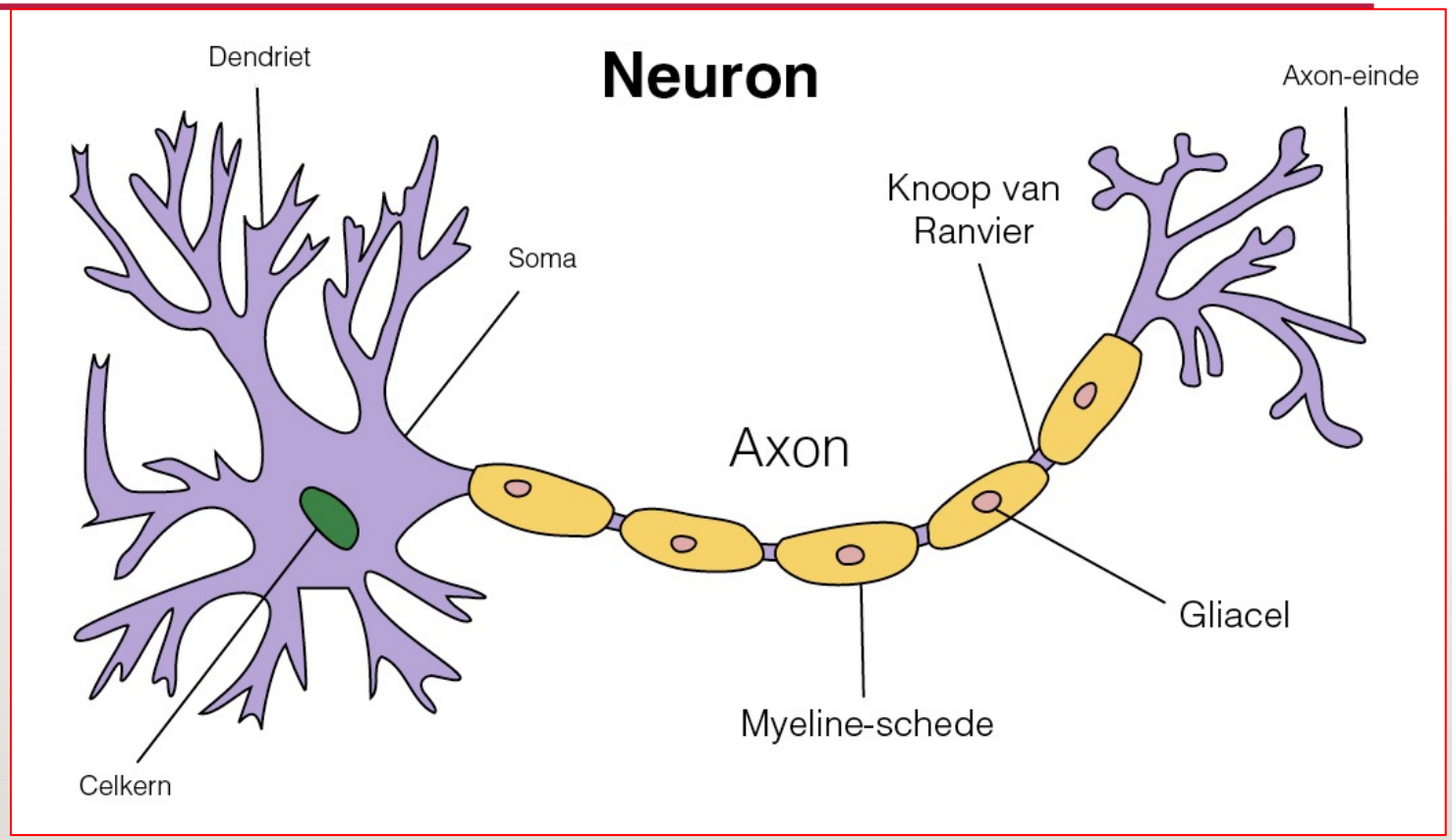


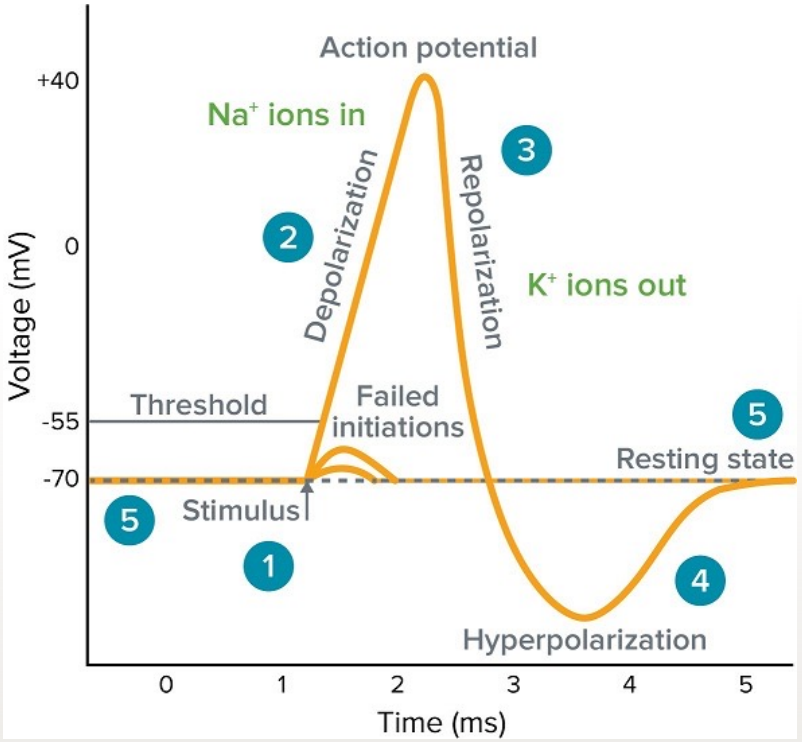
CELLEN VAN DE HERSENEN

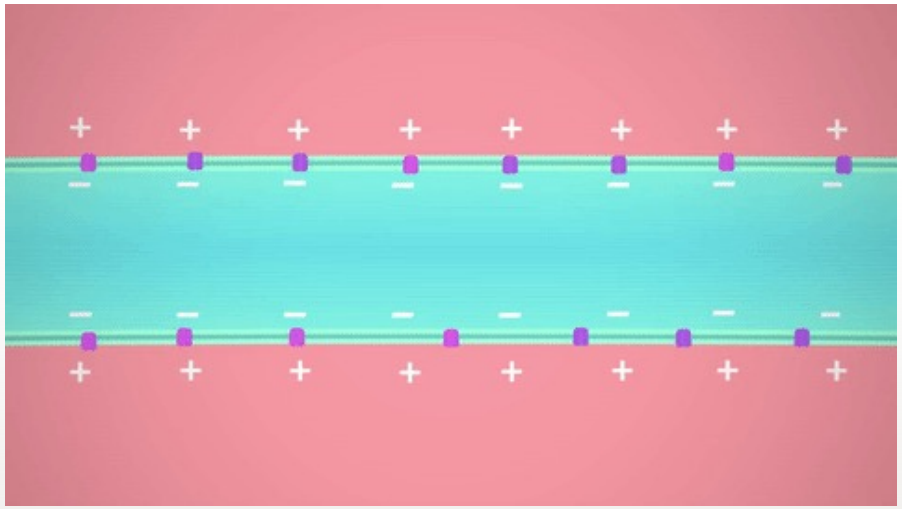


STRUCTUUR : ZENUWCELLEN EN VERBINDINGEN

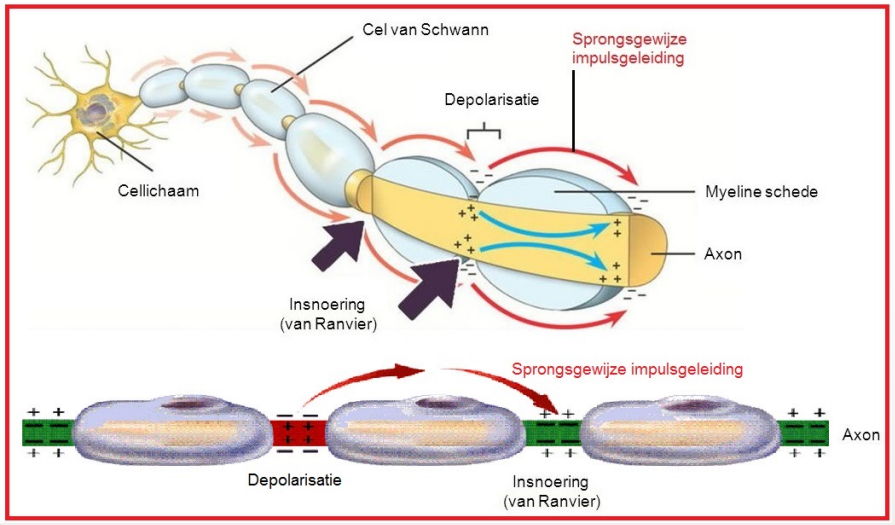


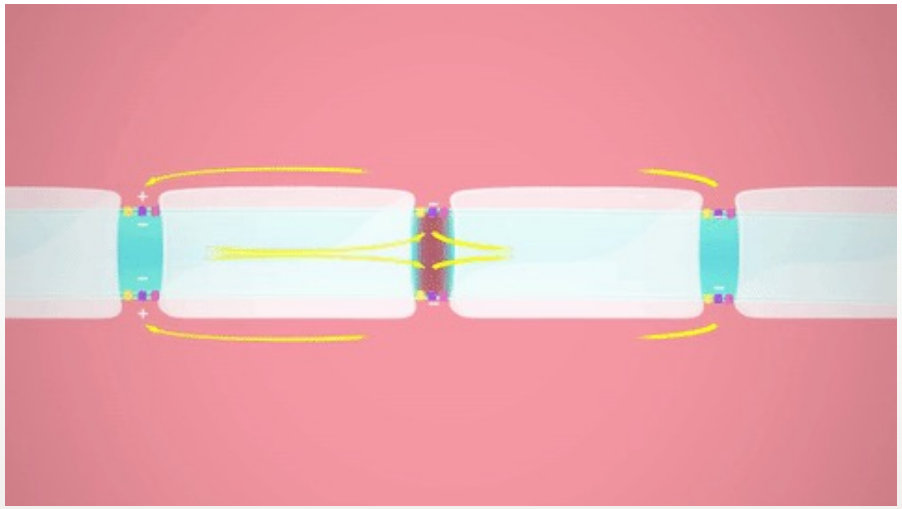




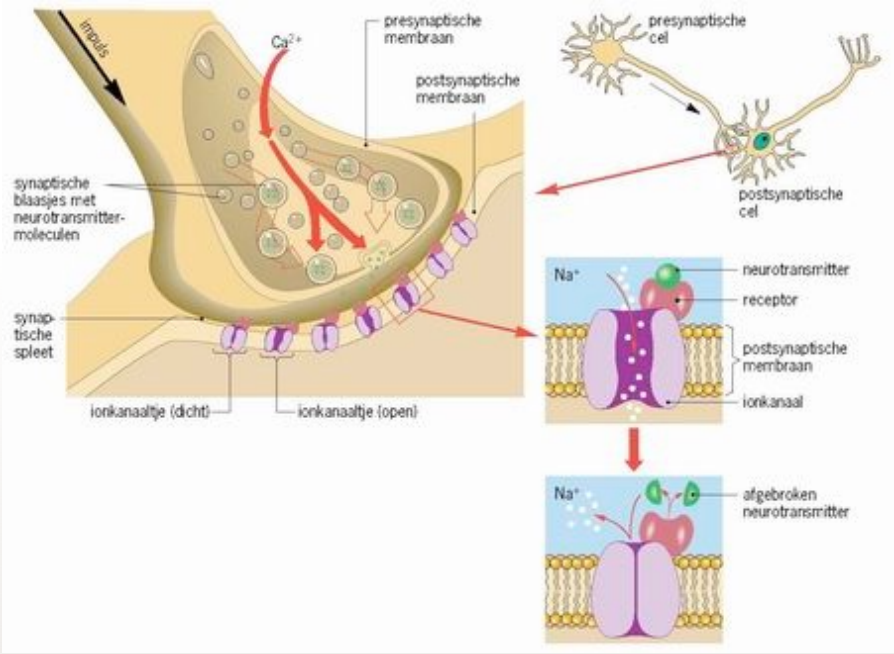


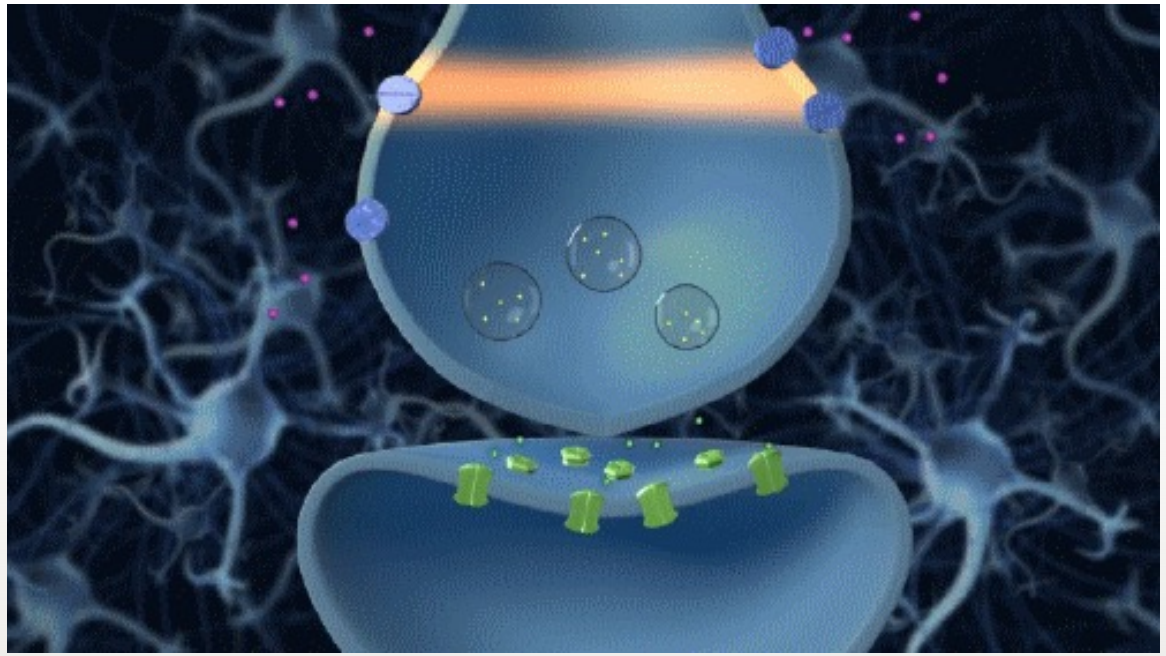
ELEKTRISCHE GELEIDING: DE ACTIEPOTENTIAAL





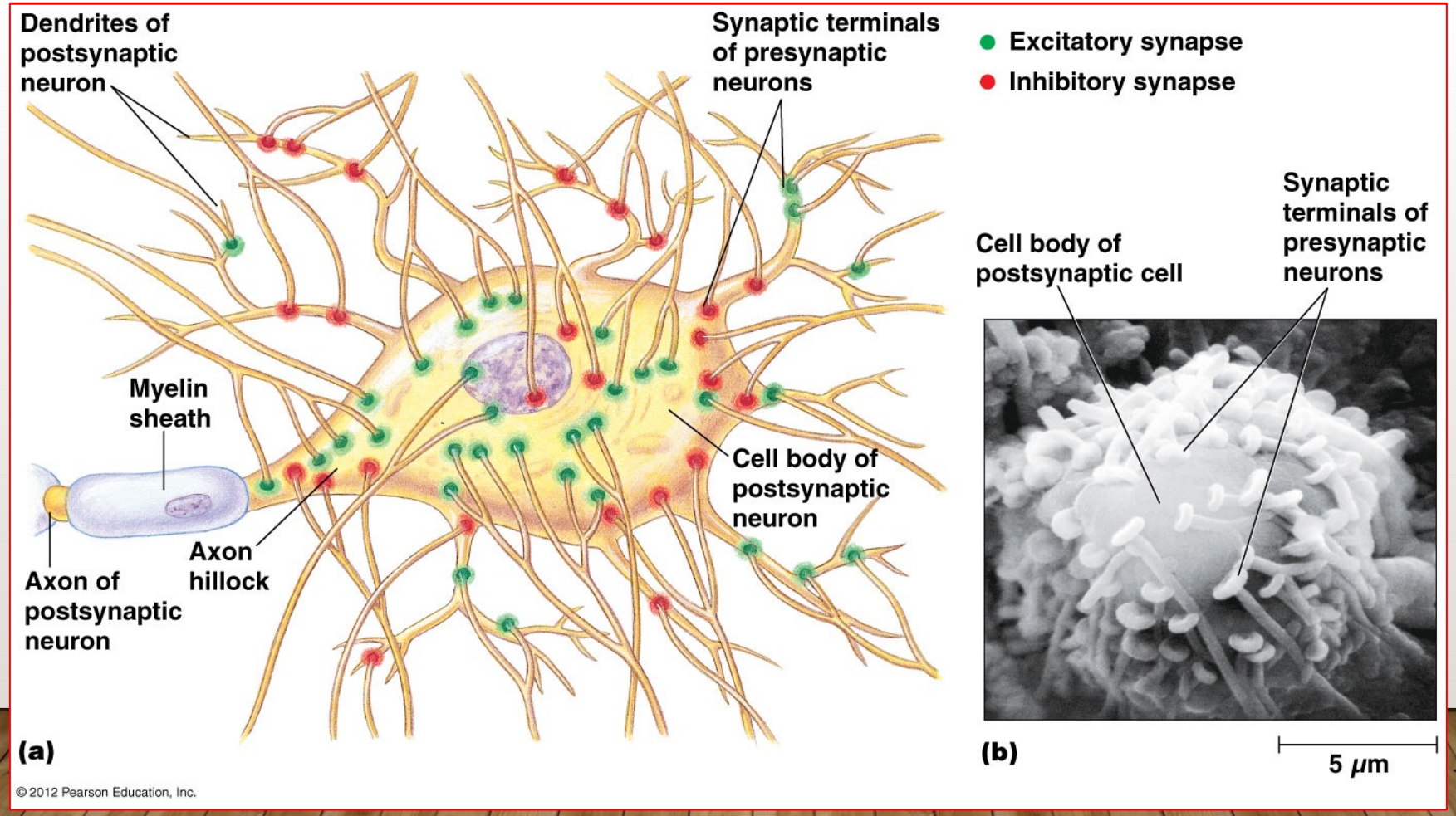
SALTATOIRE ELEKTRISCHE GELEIDING





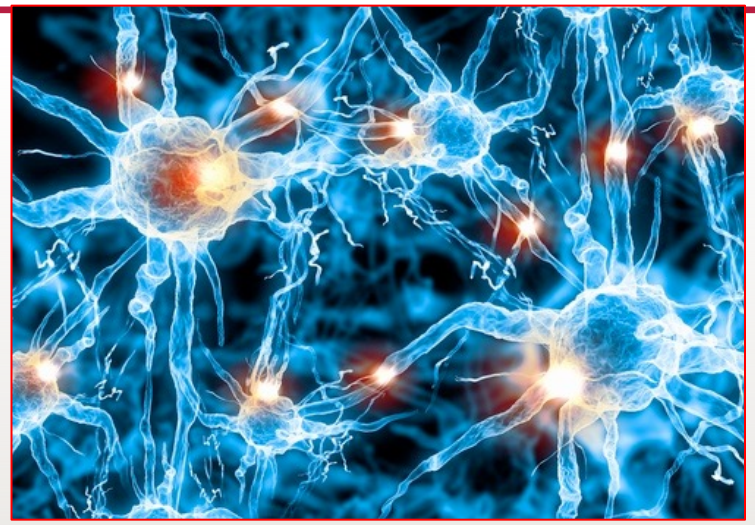
GELEIDING VAN SIGNALEN : CHEMISCH

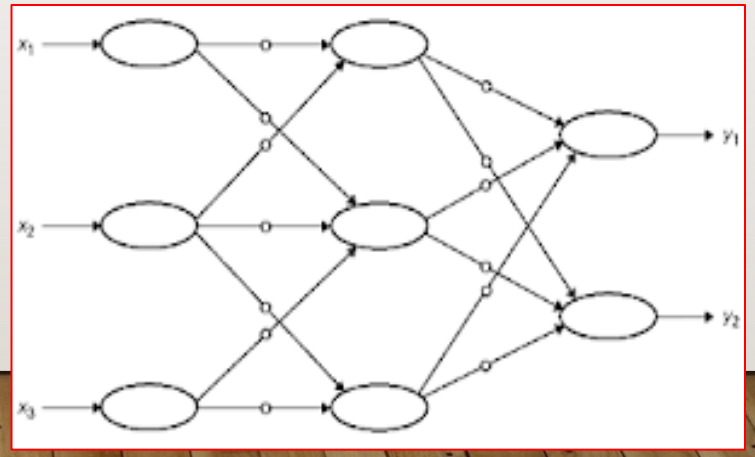
CONTACTEN TUSSEN ZENUWCELLEN : SYNAPSEN



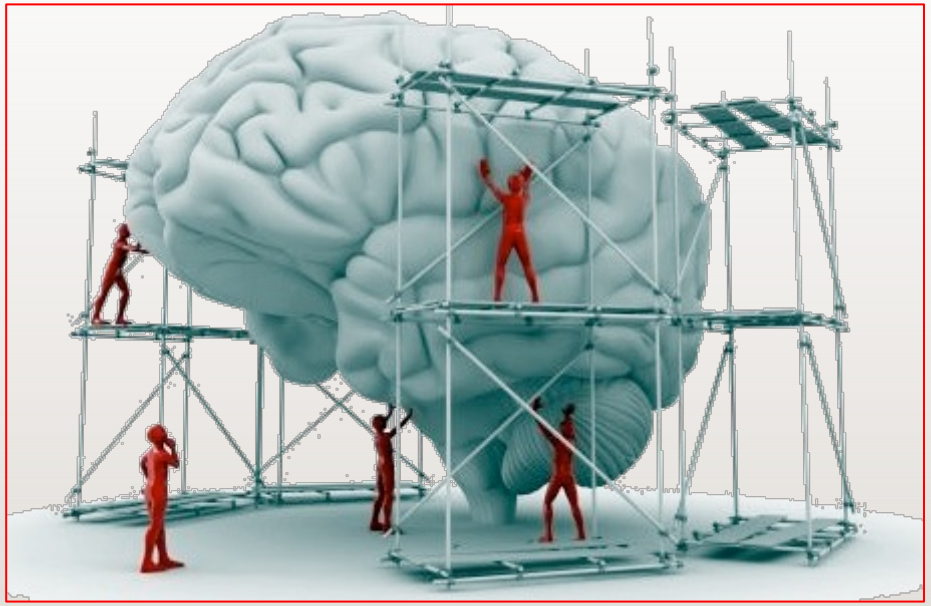
NETWERKEN IN DE HERSENEN

- Anatomische verbindingen
- Elektrische geleiding
- Chemische overdracht





DE HERSENEN ALS EEN DYNAMISCH GEHEEL

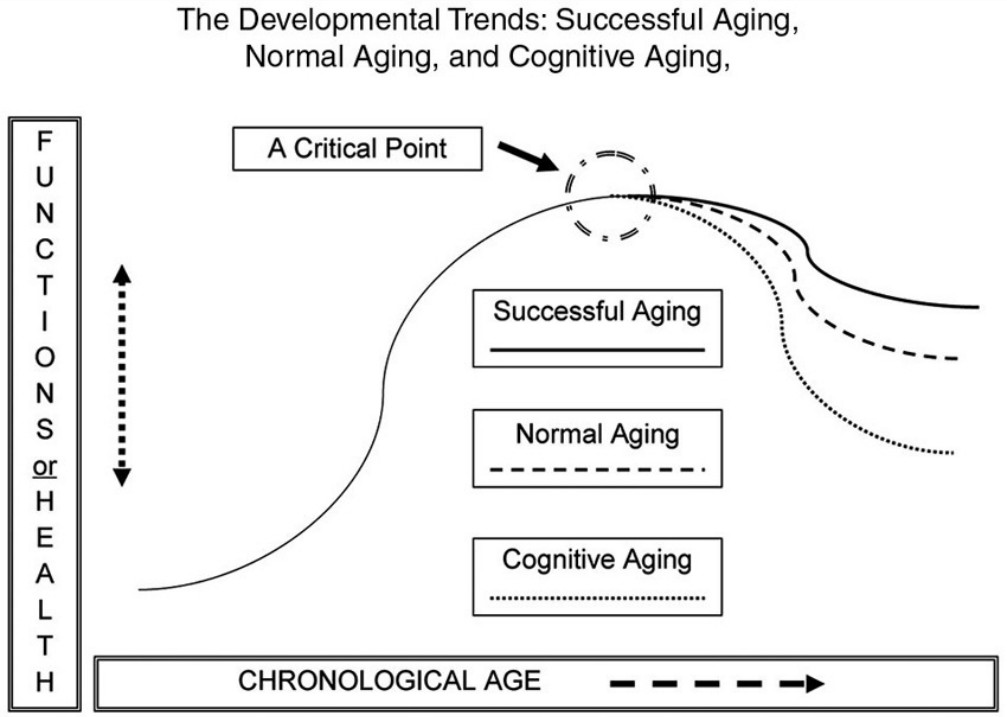


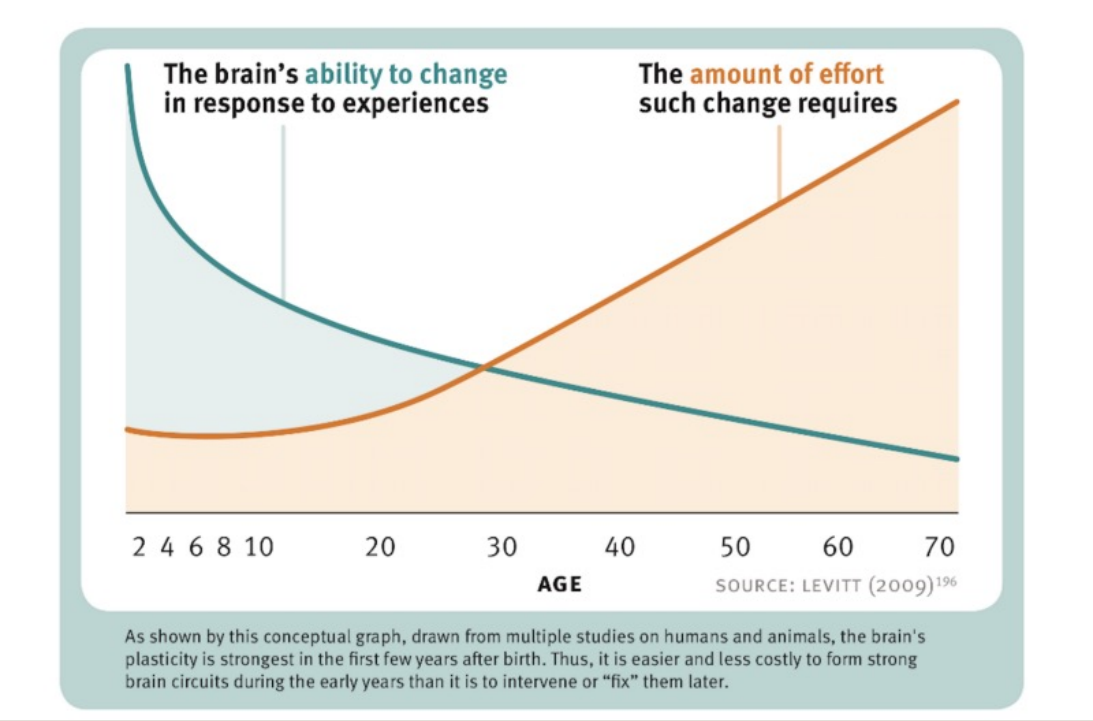
Ontstaan van nieuwe zenuwcellen : zeer beperkt

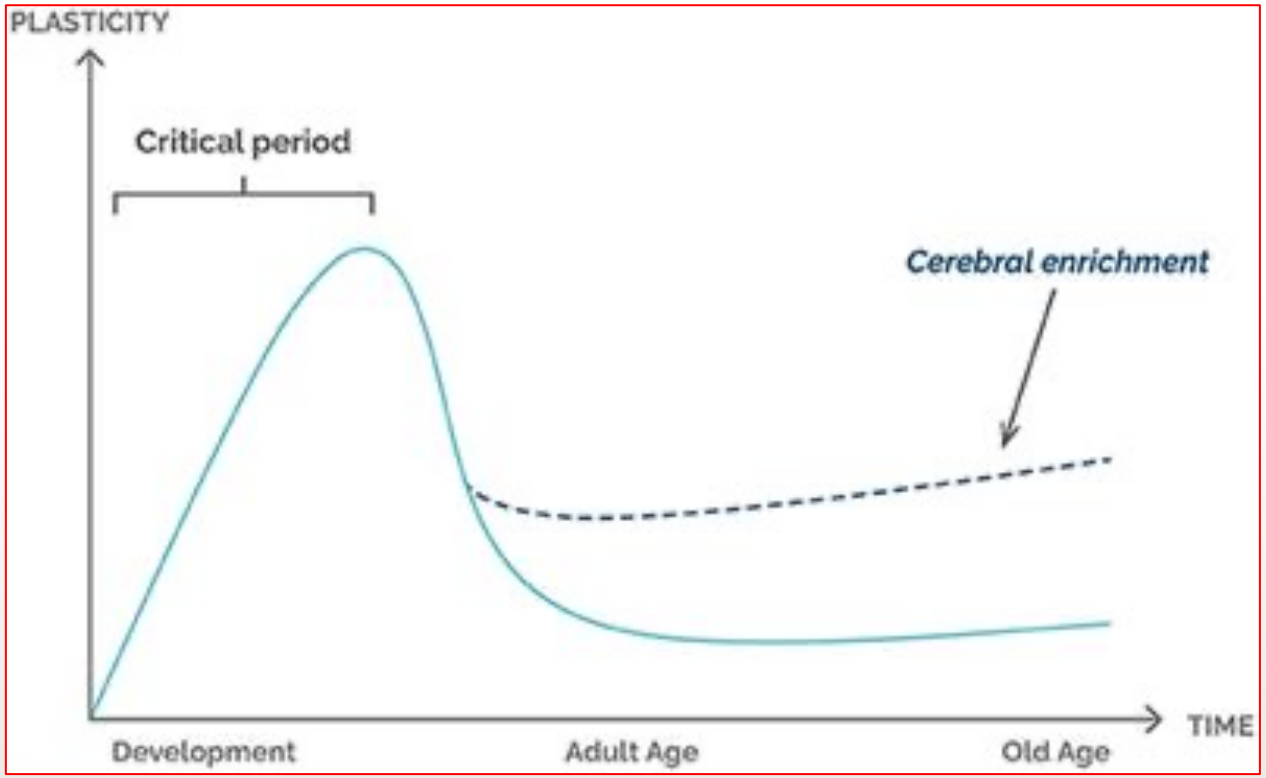
Myelinisatie tijdens ontwikkeling

Plasticiteit : leerprocessen leiden tot aanpassen van netwerken door versterking/verzwakking van synapsen en aanmaak van verbindingen of onderdrukken van bestaande

NEURALE (SYNAPTISCHE) PLASTICITEIT EN LEEFTIJD







POSITIEVE EFFECTEN OP PLASTICITEIT

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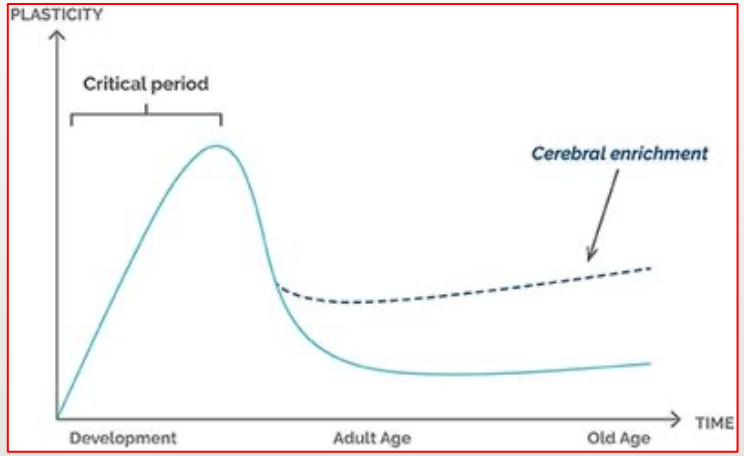


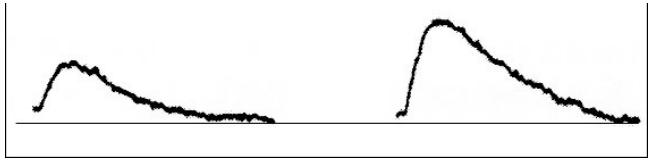
Omgevingsfactoren

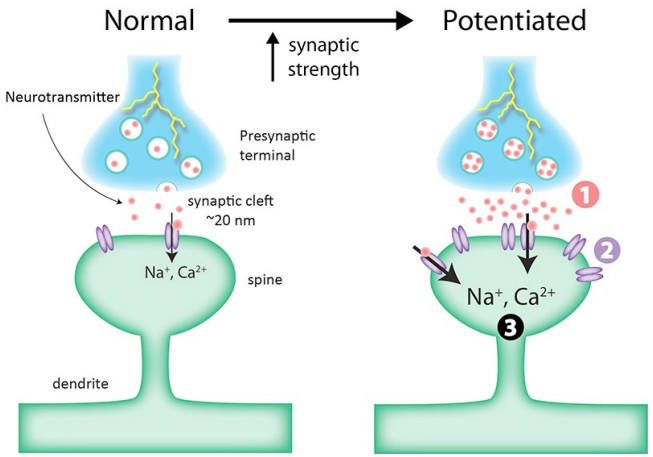
Beweging
Sociaal contact
Mentale activiteit

“Cognitieve reserve”

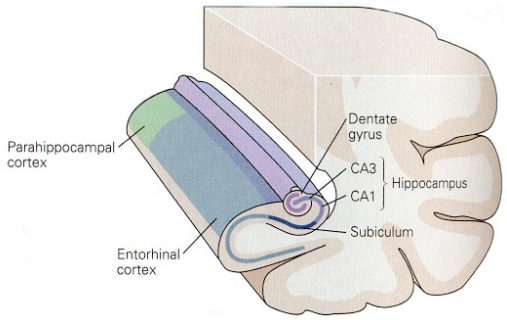
Opleidingsniveau
Meertaligheid
Genetica

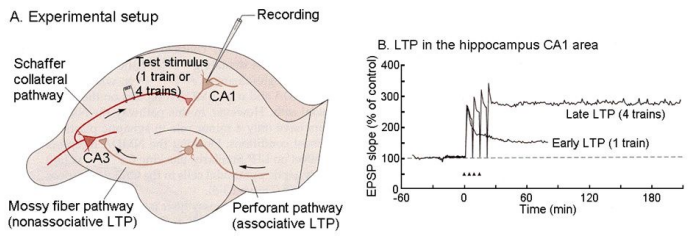
SYNAPTISCHE PLASTICITEIT

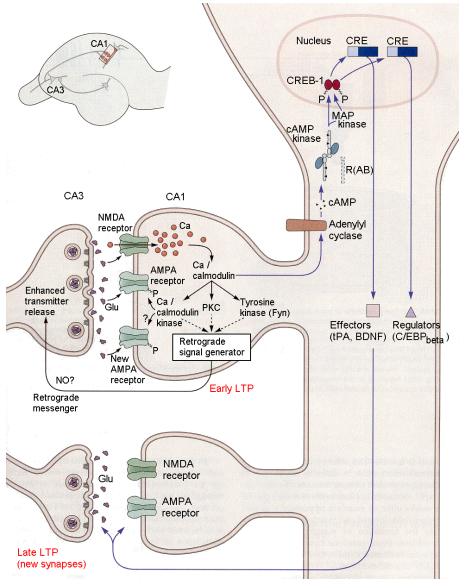


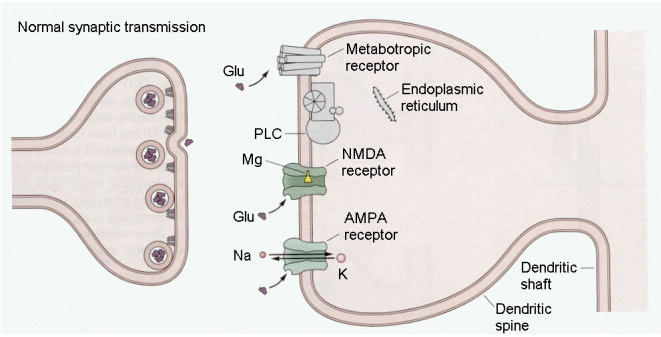


HERINNERINGEN EN DE HIPPOCAMPUS

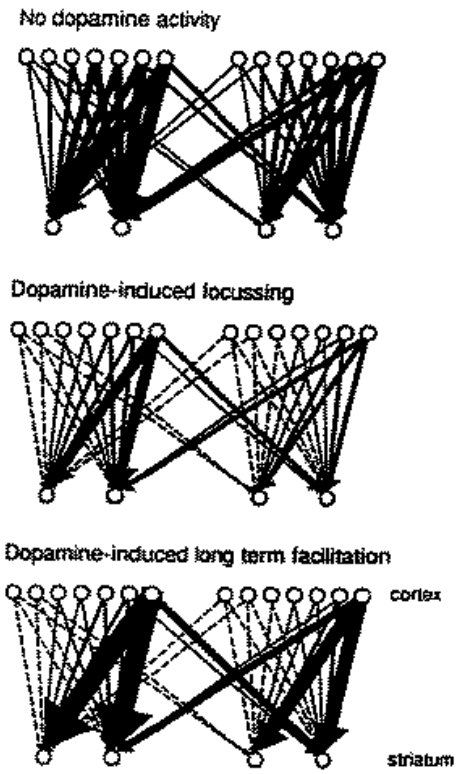




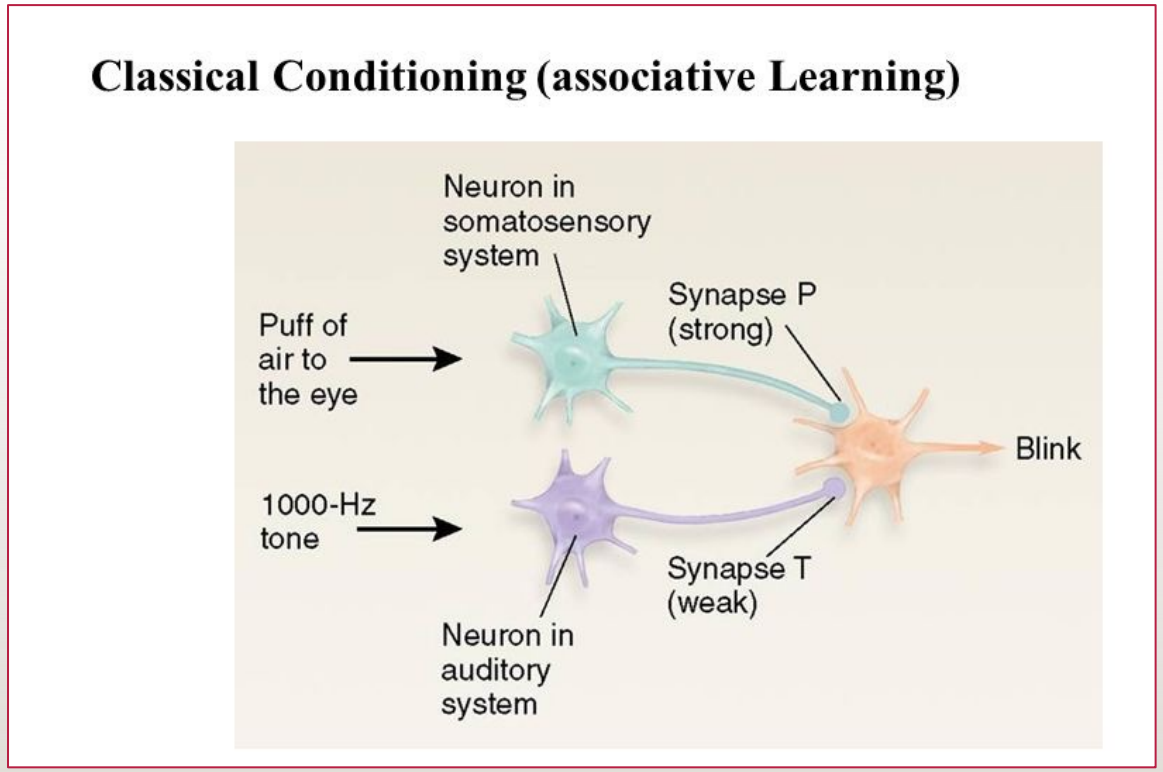


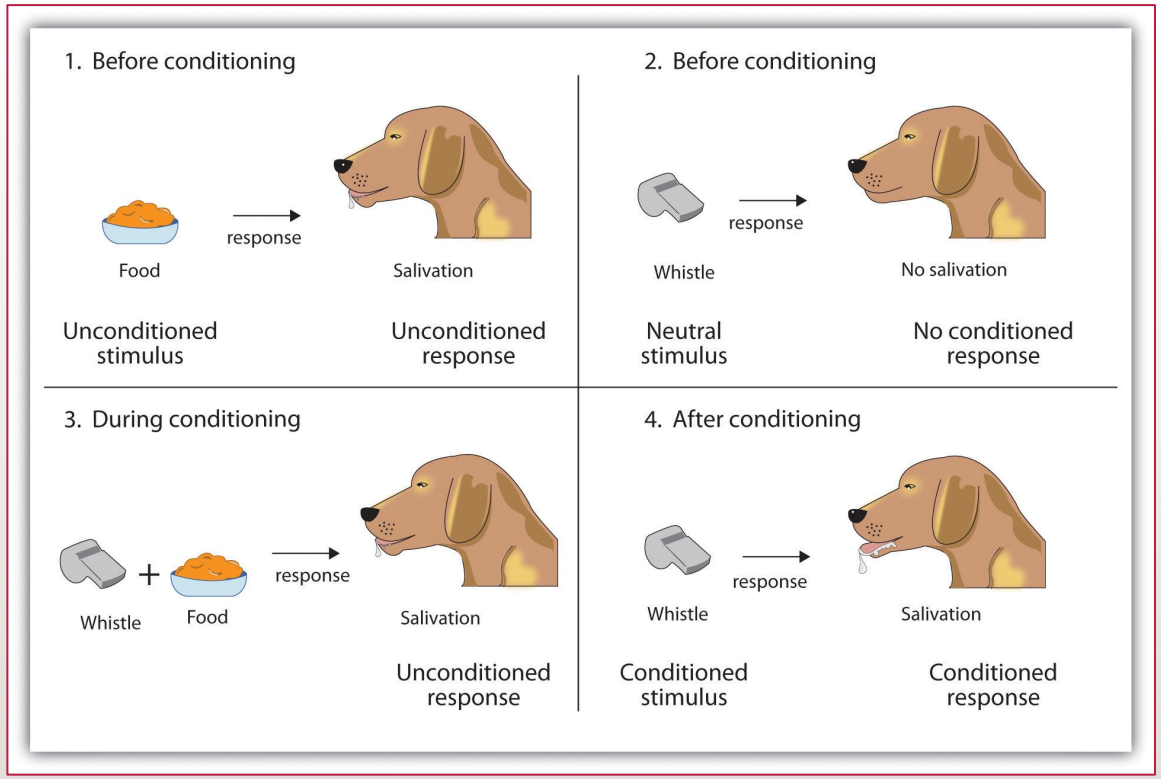


PLASTICITEIT EN MOTORISCH LEREN

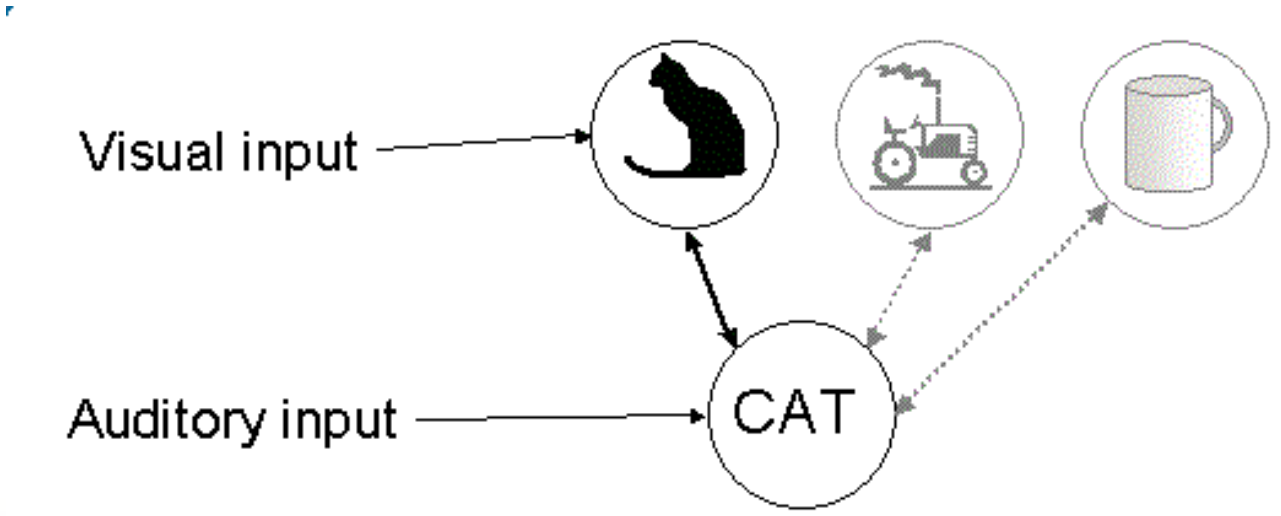


ASSOCIATIEF LEREN:
CELLS THAT FIRE TOGETHER, WIRE TOGETHER



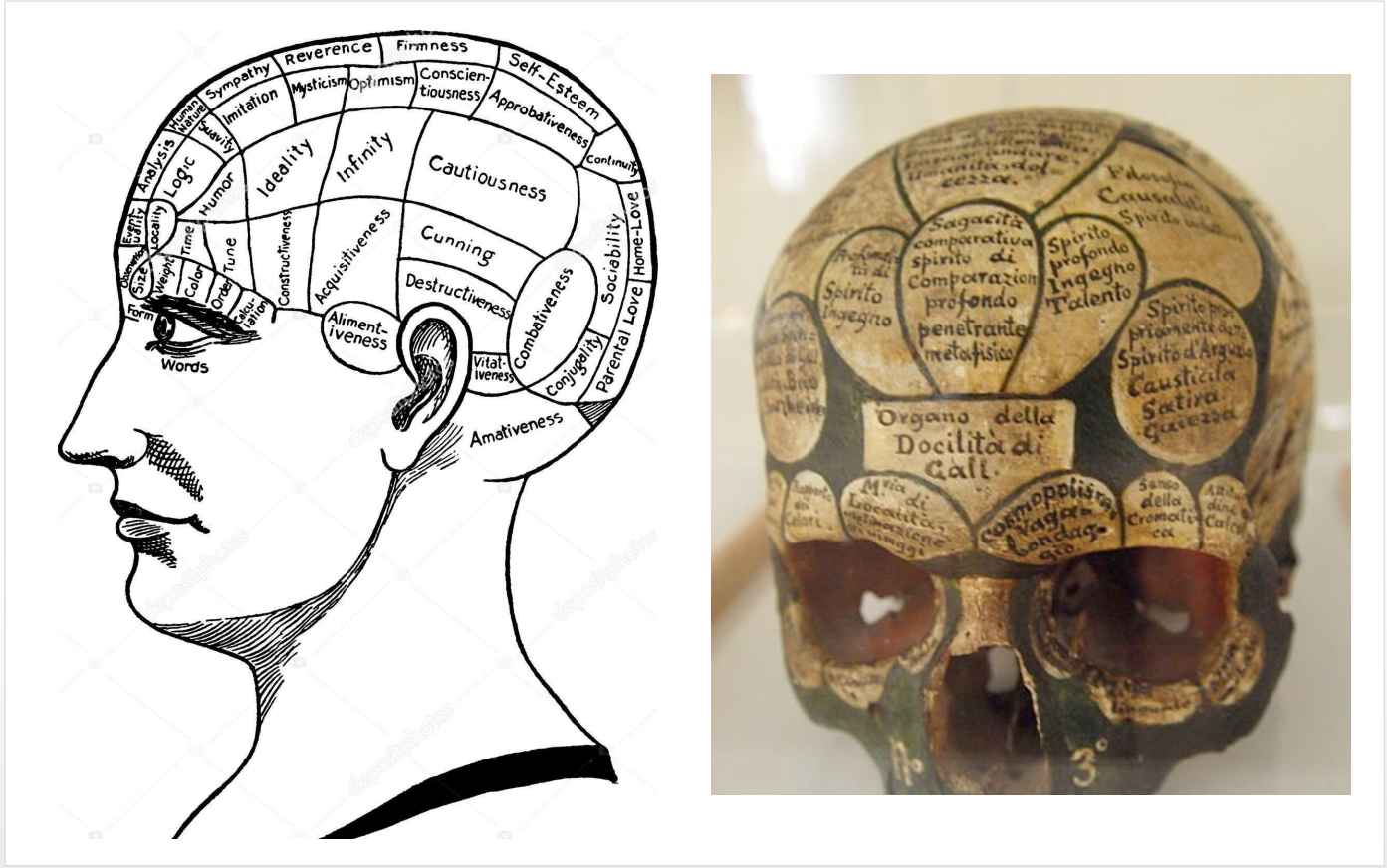


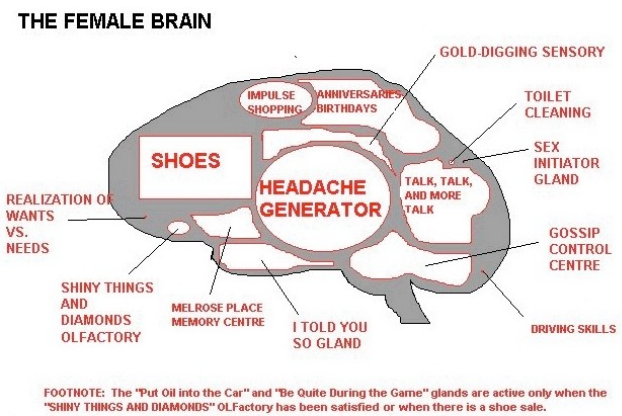
ASSOCIATIEF WOORDEN LEREN

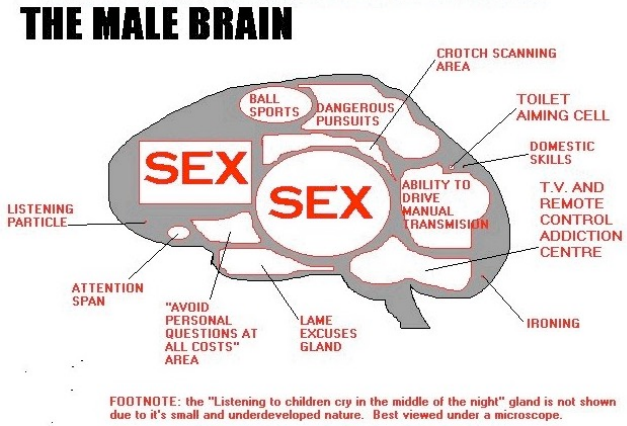


If 2 units are simultaneously activated, increase the strength of the connection between them

STRUCTUUR EN FUNCTIE IN DE HERSENEN: FRENOLOGIE (FJ GALL 1758-1828)



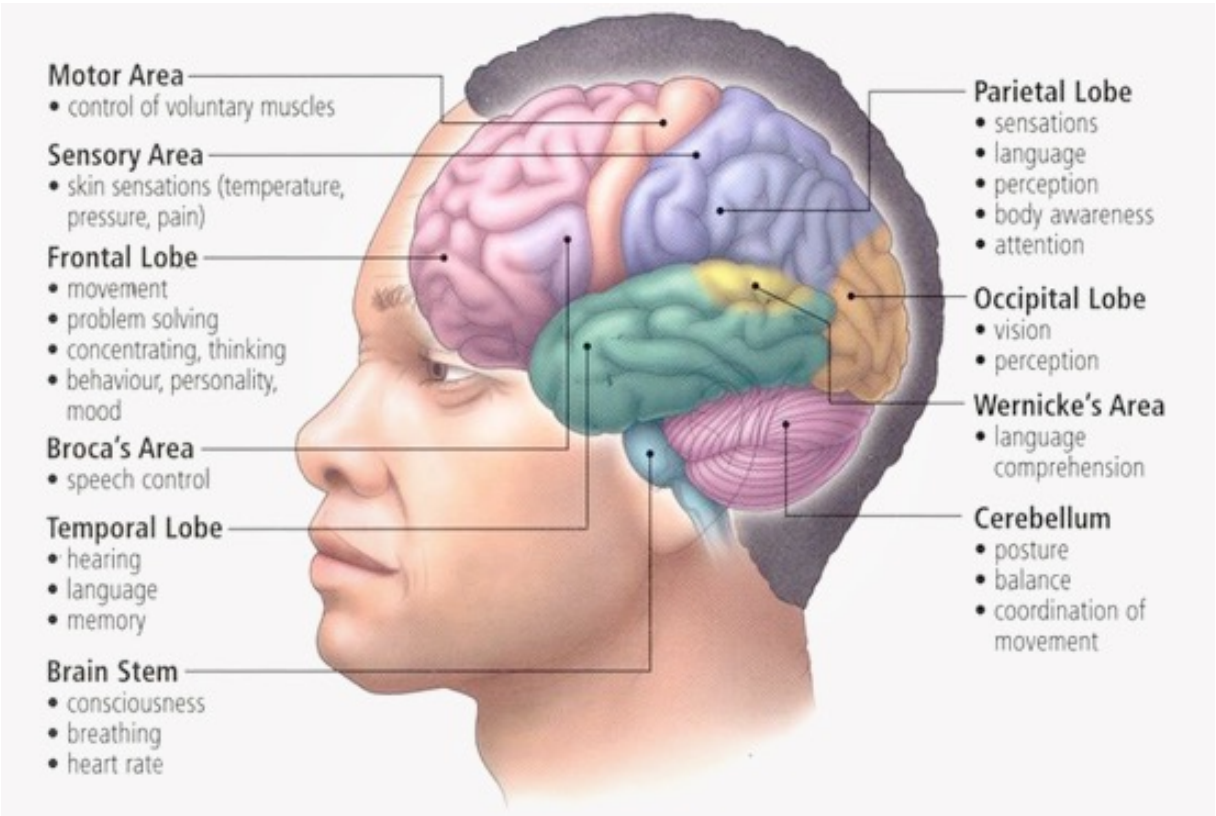




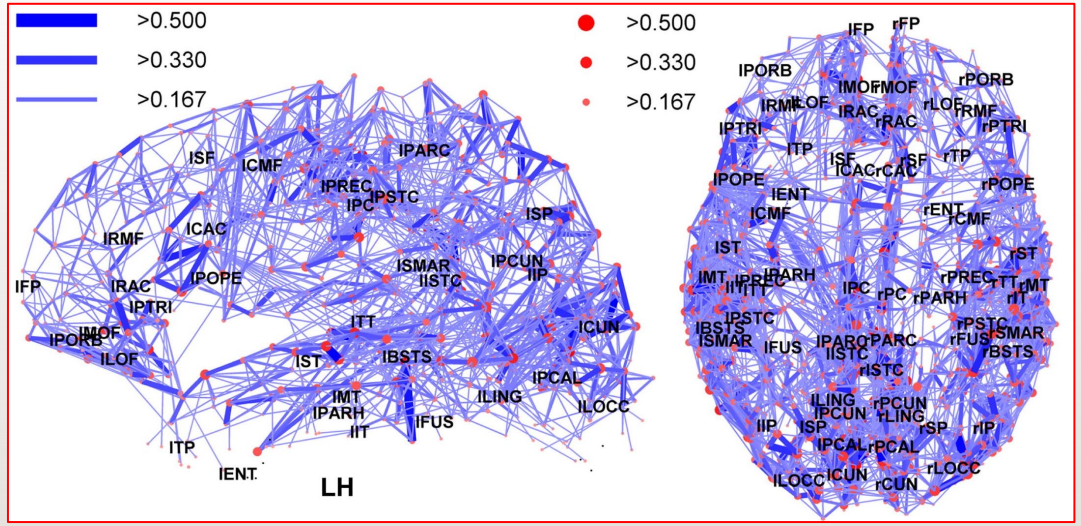
HEDENDAAGSE FRENOLOGIE ?

STRUCTUUR
EN FUNCTIE ?

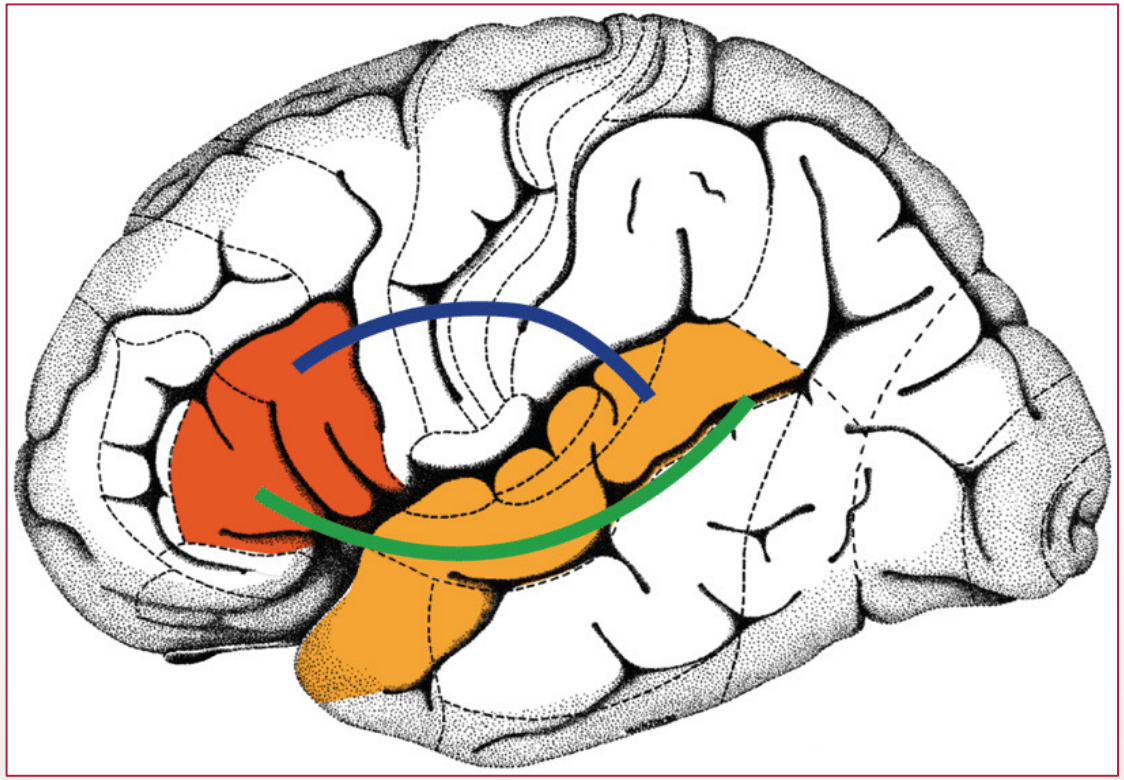
NETWERKEN !

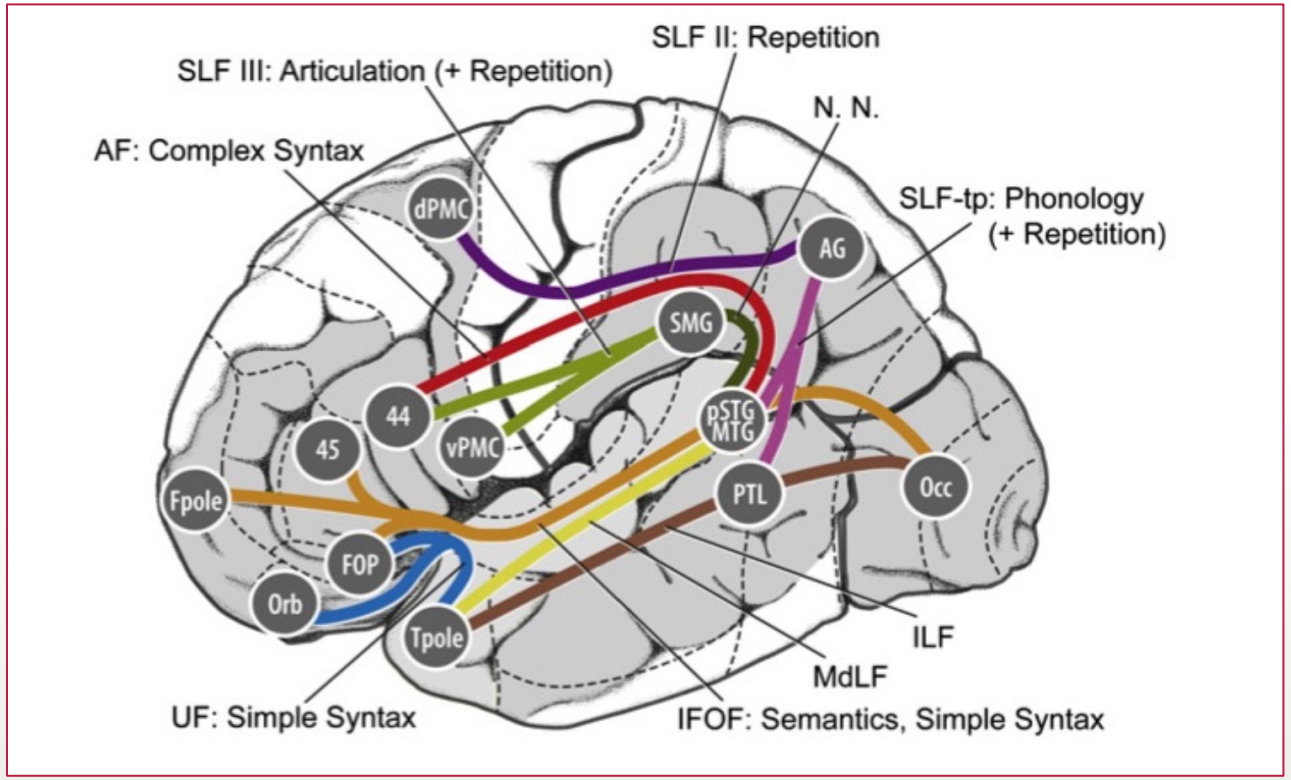


NEURALE NETWERKEN IN DE HERSENEN

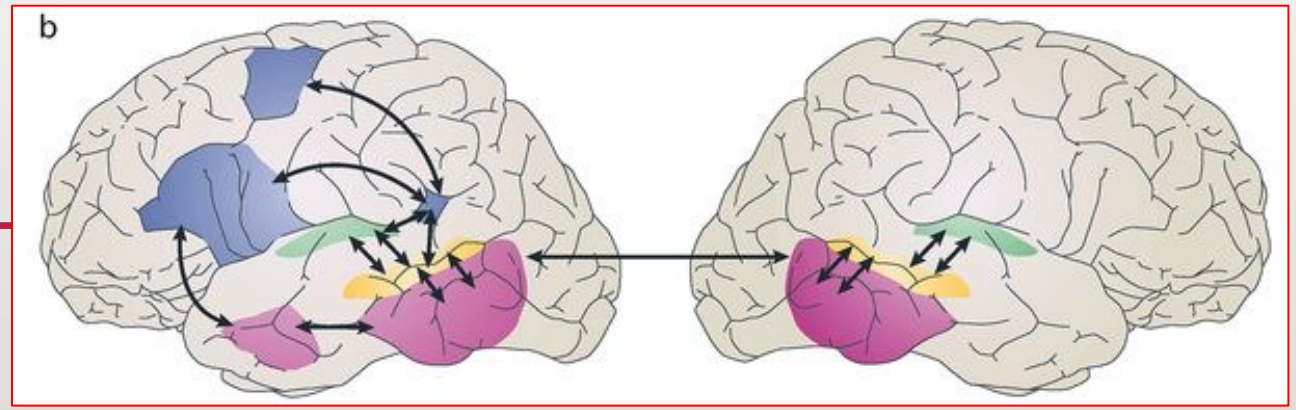


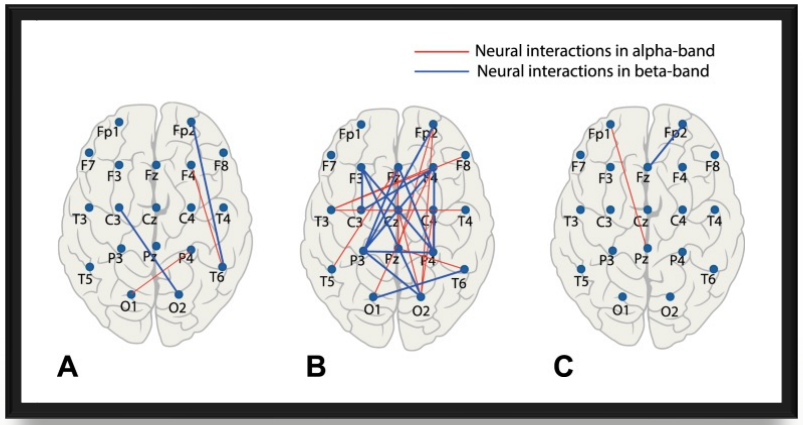
- Groepjes van neuronen die onderling met mekaar verbonden zijn door synapsen.
- “Knopen” (nodes) en hun verbindingen (edges)
- “Knopen” met heel veel verbindingen zijn “hubs”, die onderling verbonden kunnen zijn door ”spokes” (spaken)

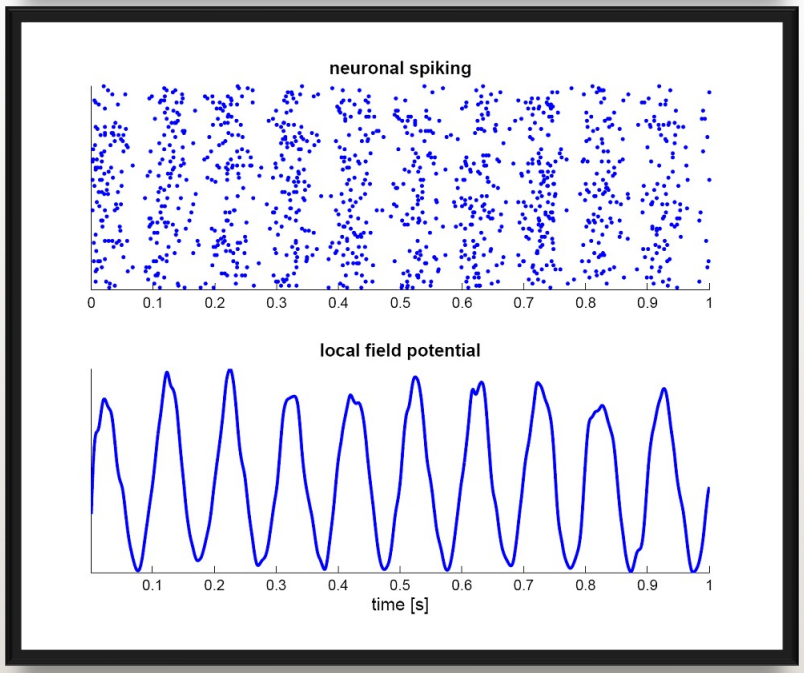


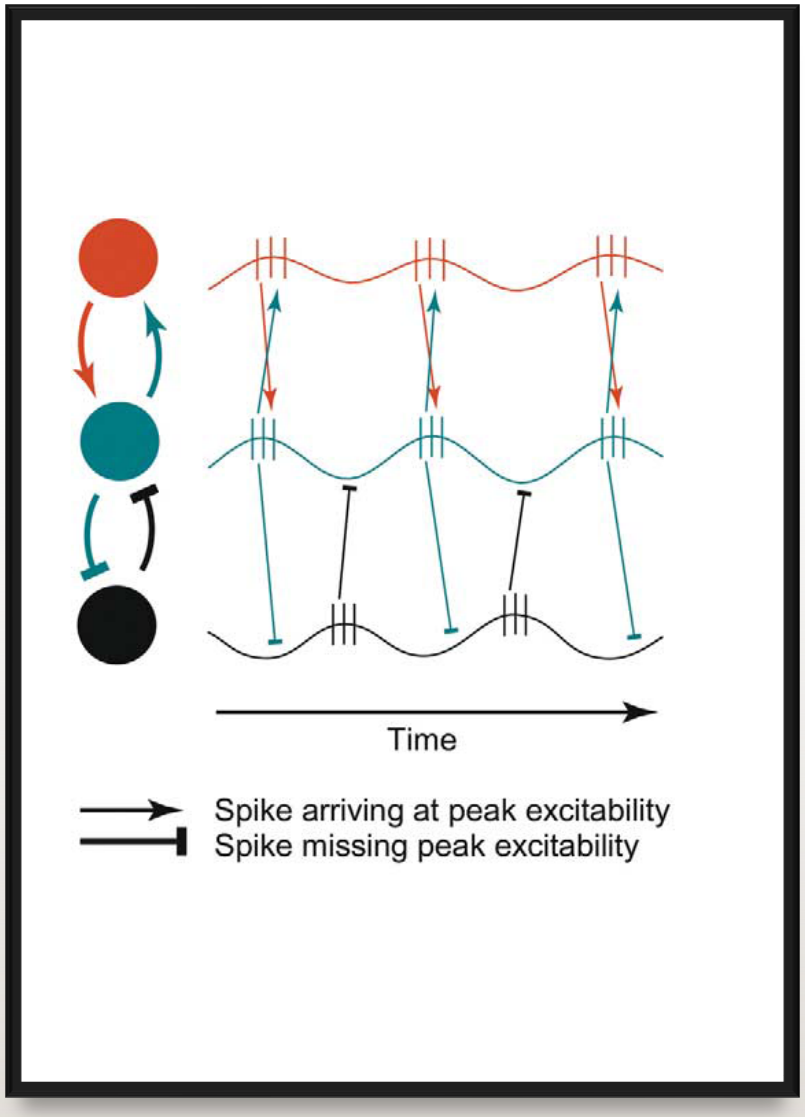


TAALNETWERKEN



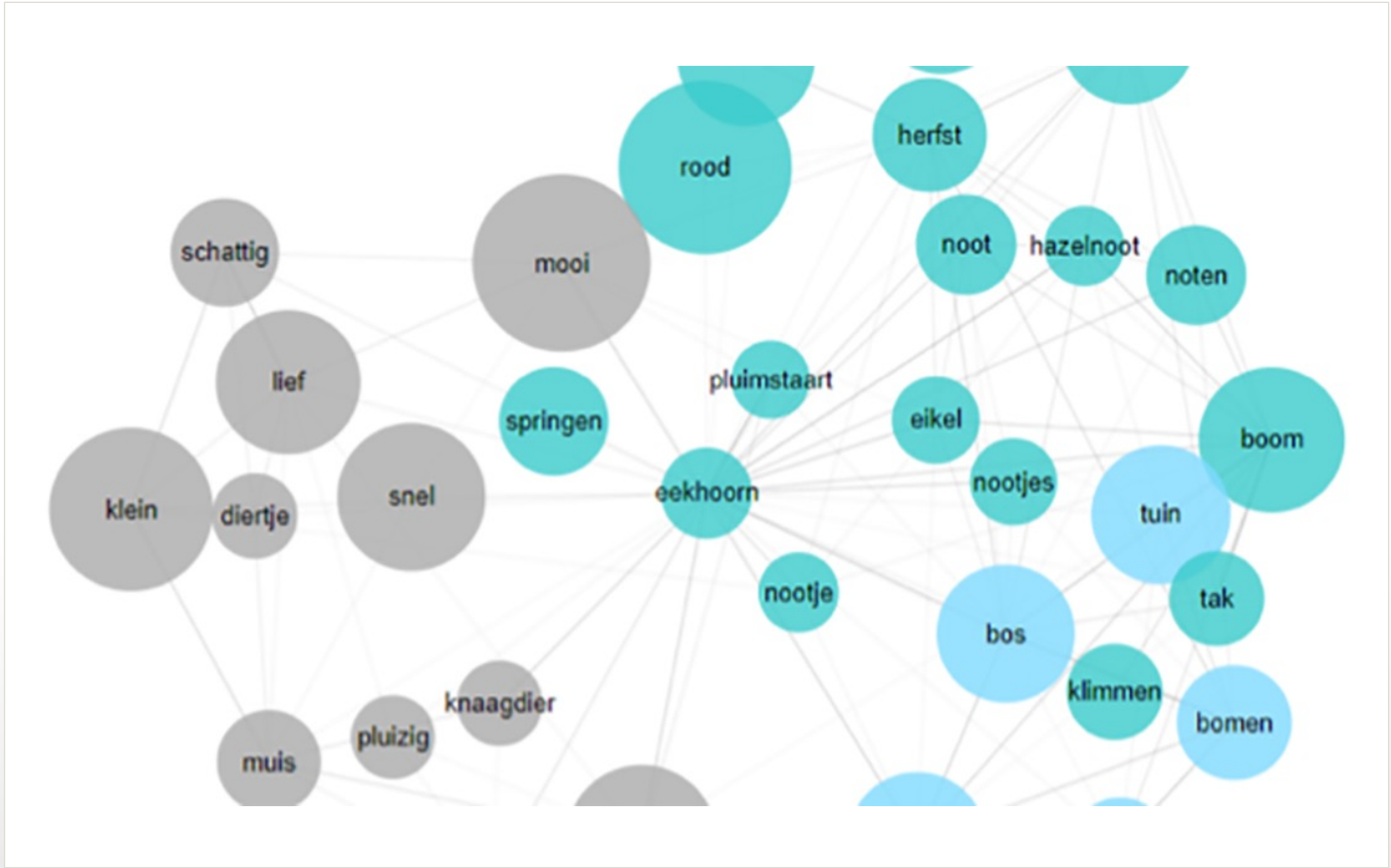




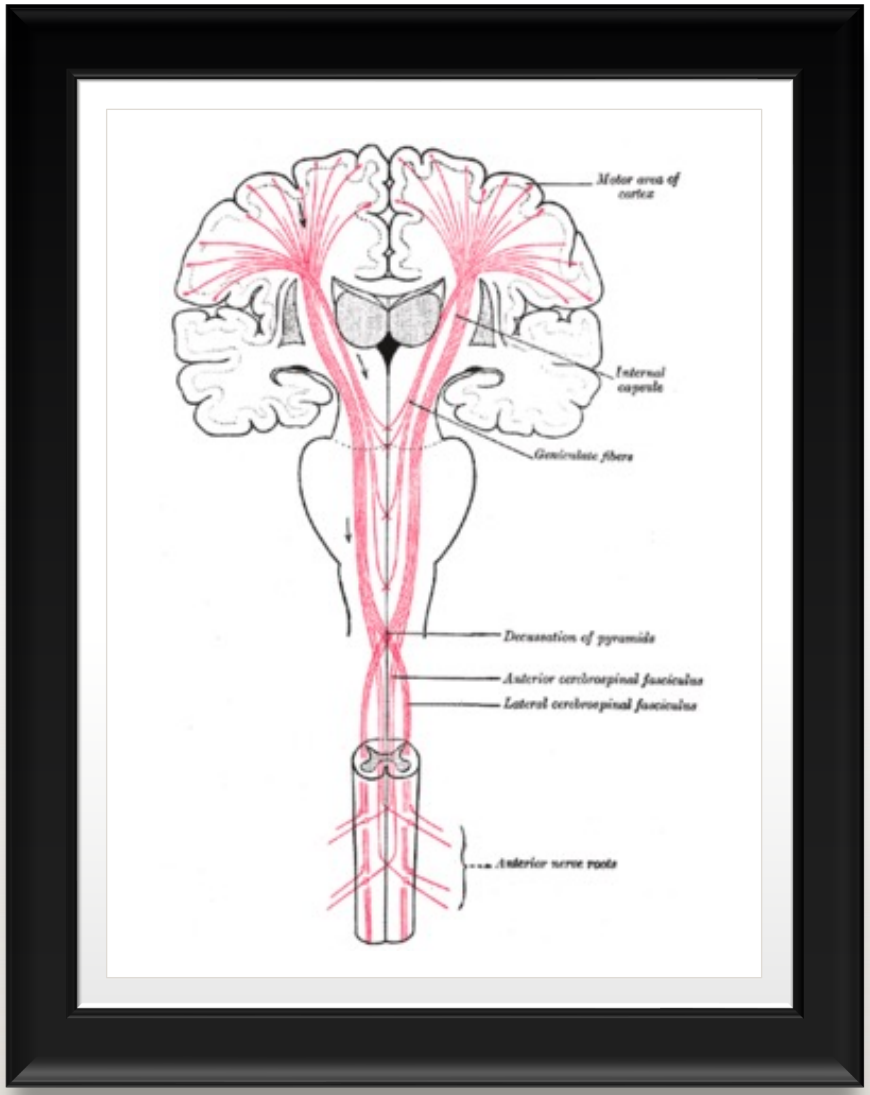


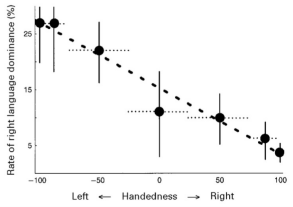
COMMUNICATIE IN NETWERKEN FREQUENTIE EN COHERENTIE

NETWERKEN EN VOORSPELLEN



DE GEKRUISTE BANEN





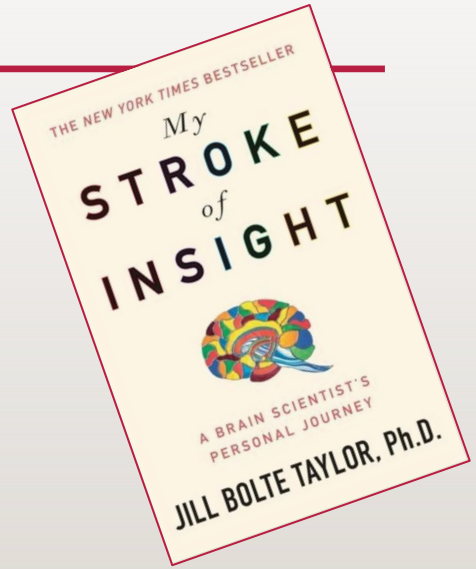
Handedness	−99 or less	more than −99; −75 or less	more than −75; −25 or less	more than −25; 25 or less	more than 25; 75 or less	more than 75; 99 or less	more than 99
n	37	26	50	18	40	48	107
Right dominance (%)	27	27	22	11	10	6	4

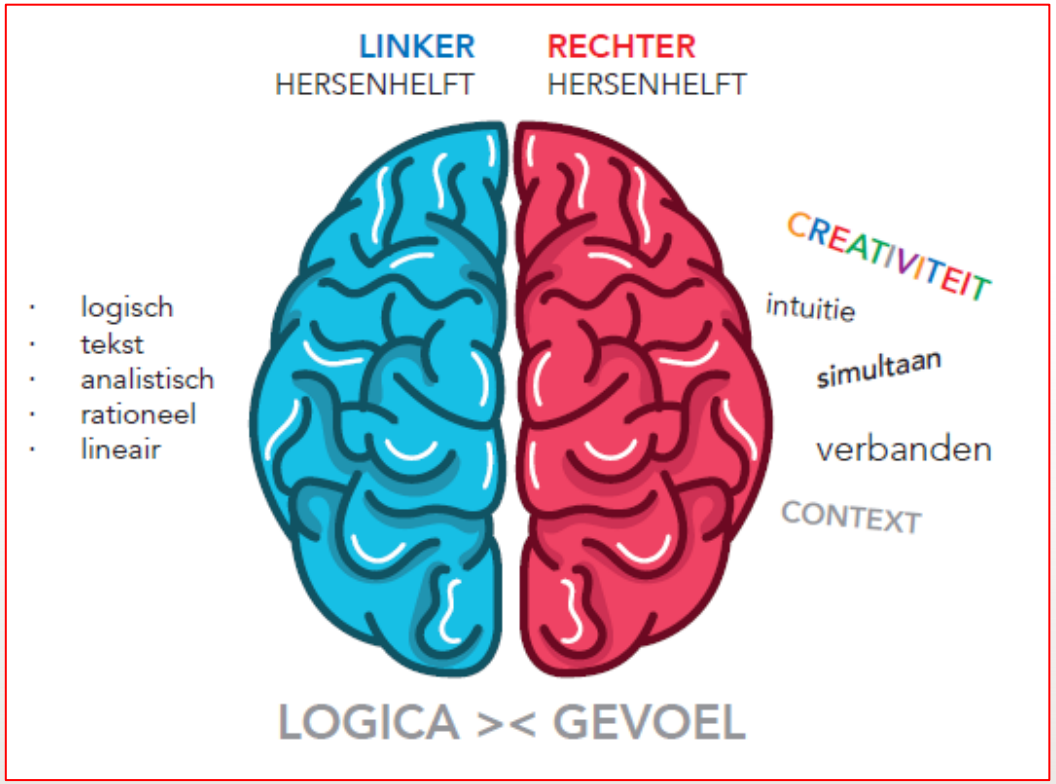
Fig. 3 Relationship between the degree of handedness by the Edinburgh Inventory (*x*-axis) and the incidence of right-hemisphere language dominance (*y*-axis). Bin width for each subgroup is represented by dotted horizontal lines. Error bars, represented by vertical lines, are based on the formula:

Handedness	Dominant Hemisphere %		
	Left	Right	Both
Right-handed	90	10	0
Left-handed	64	20	16
Ambidextrous	60	10	30

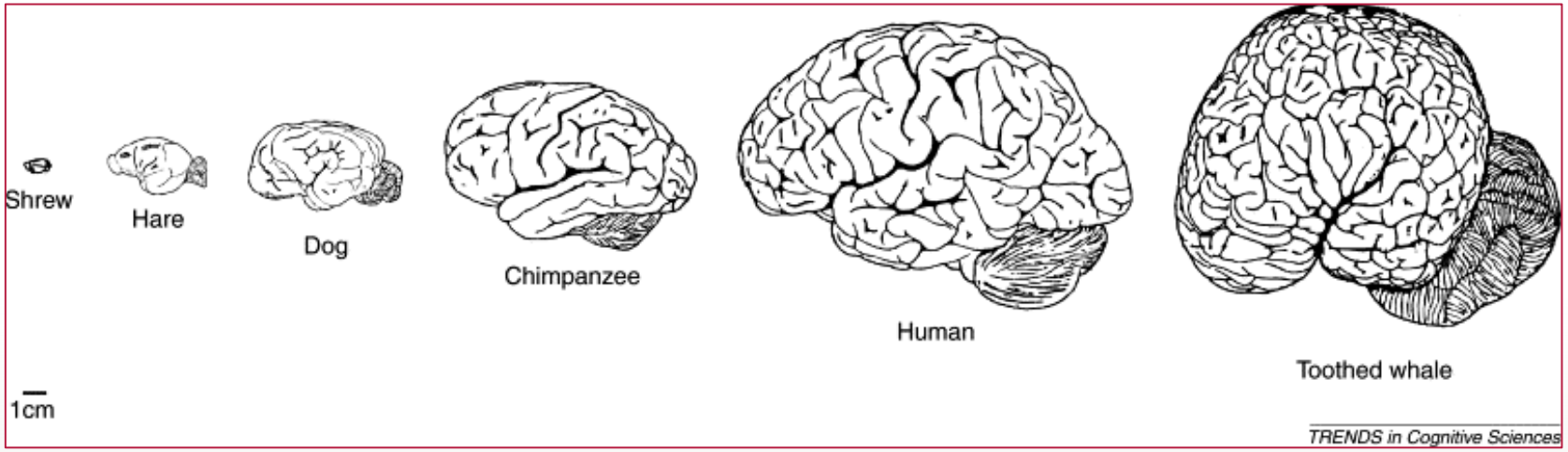
STRUCTUUR VS FUNCTIE IN DE HERSENEN: HEMISFERISCHE DOMINANTIE/SPECIALISATIE

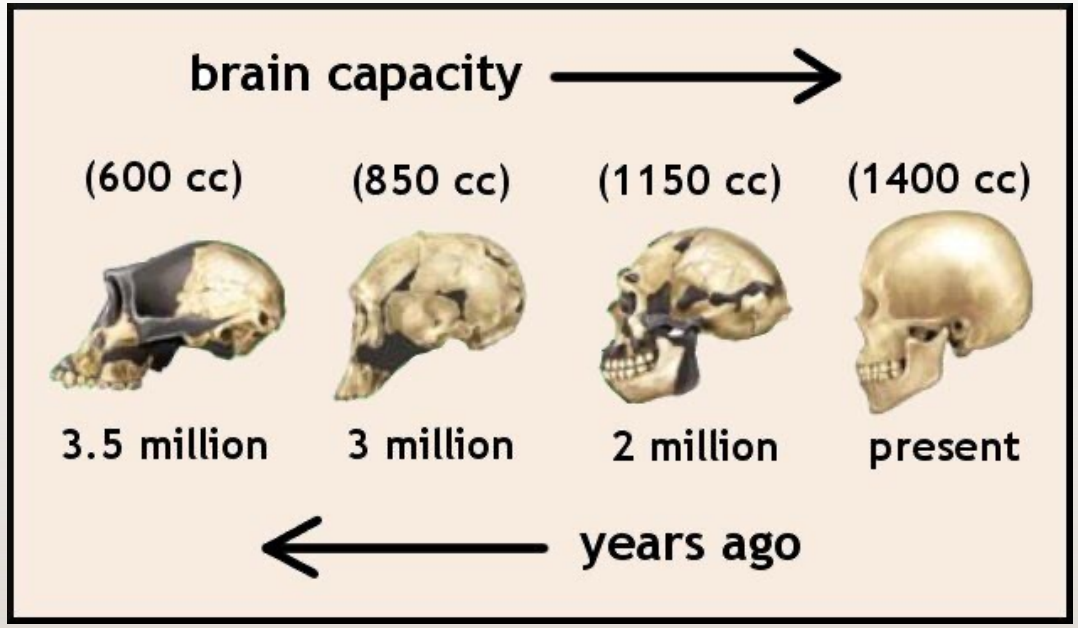
THE BATTLE OF THE HEMISPHERES ? RELATIVERING GEWENST



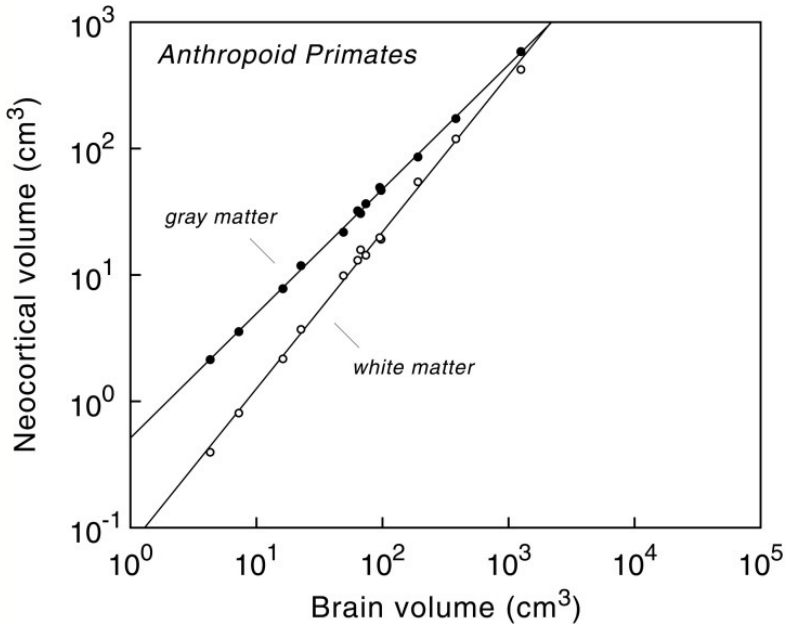


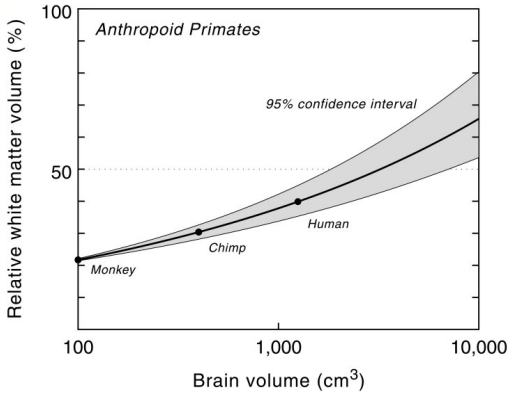
EVOLUTIE EN HET BREIN





EVOLUTIE VAN CONNECTIVITEIT





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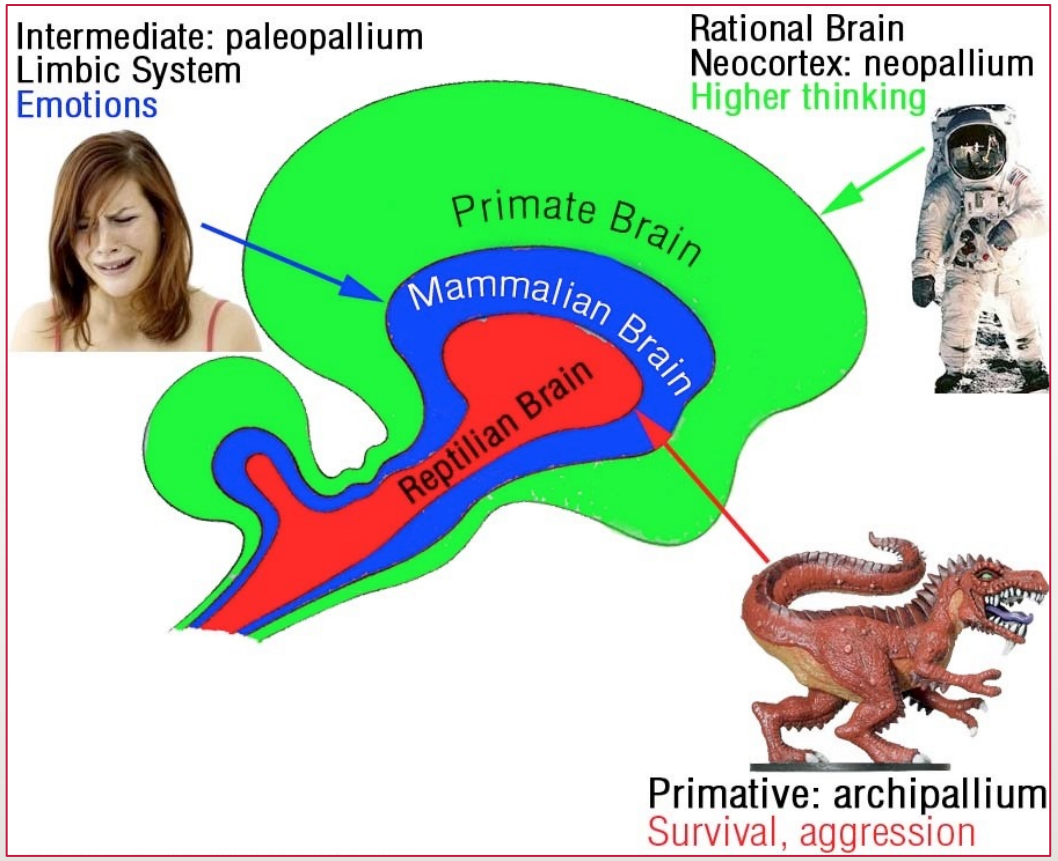
Evolution of the human brain: when bigger is better

Michel A. Hofman*

HERSENEN EN EVOLUTIE: ONTOGENESE EN FYLOGENESE ?



WAAROM HEBBEN WIJ HERSENEN ZOALS ZE ZIJN?

Flexibiliteit: aanpassen aan dynamische context

- Voorspellen van wat er gaat komen
- Verandering signaal-ruis verhouding

Leervermogen

- Leren in context bv herhaling, bekrachtiging
- Detecteren van anomalieën/fouten

Moraliteit, bewustzijn, taal….