

Cerebrum is de plaats van hogere hersenfuncties

- Corpus callosum verbindt de 2 hemisferen
- Grijze stof
 - Cerebrale cortex
 - Basal ganglia: controle van bewegingen
 - Limbisch systeem: link tussen cognitieve functies en emoties
 - Amygdala: emotie en geheugen
 - Hippocampus: leren en geheugen

Cerebrum is de plaats van hogere hersenfuncties

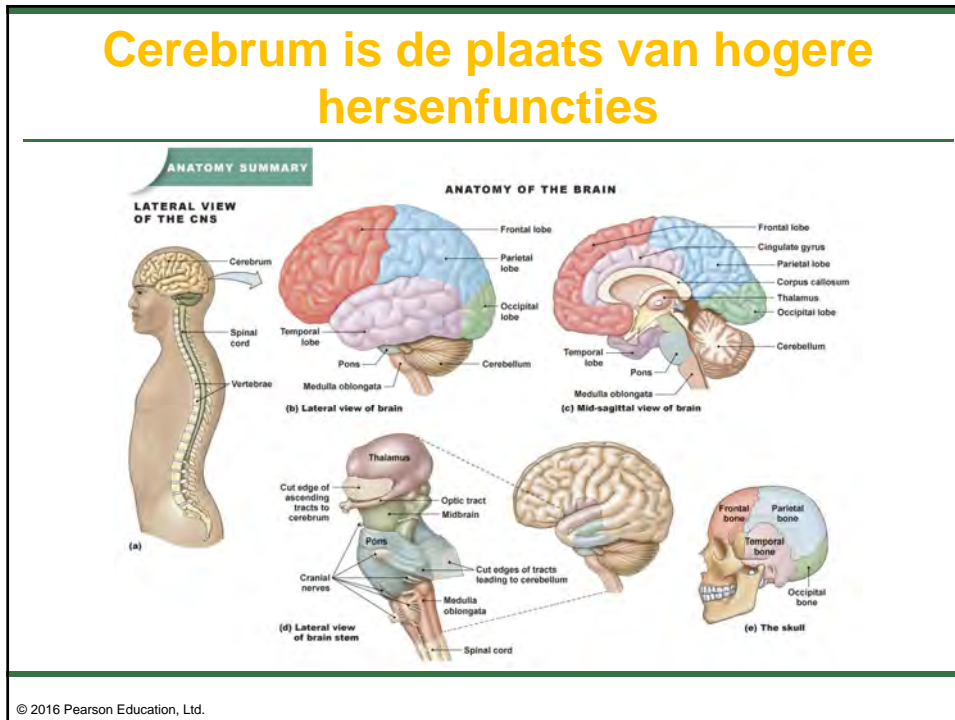
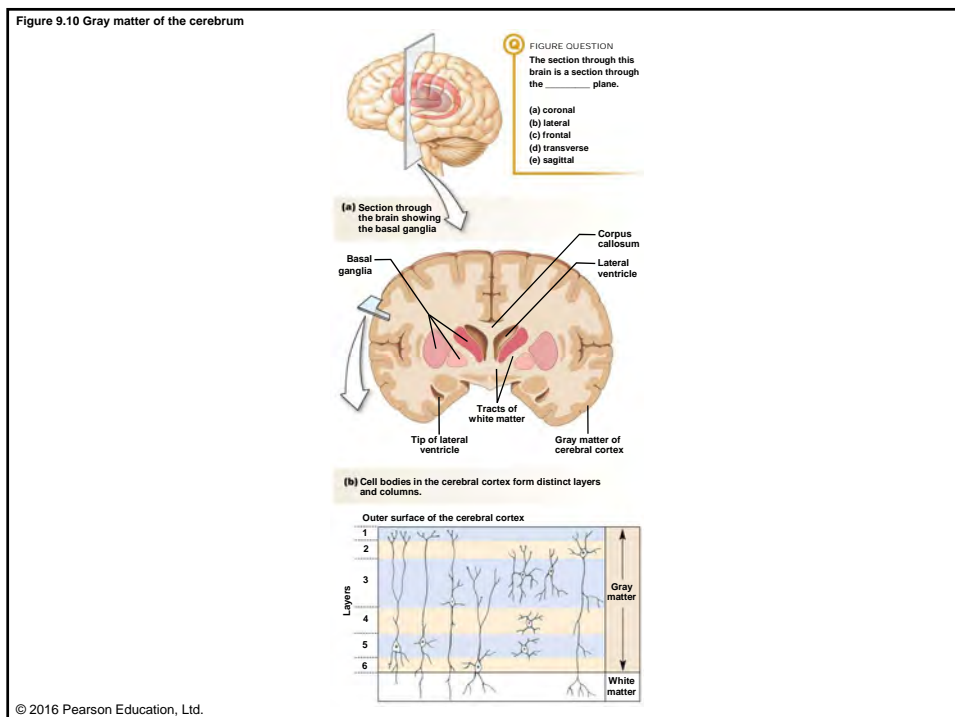
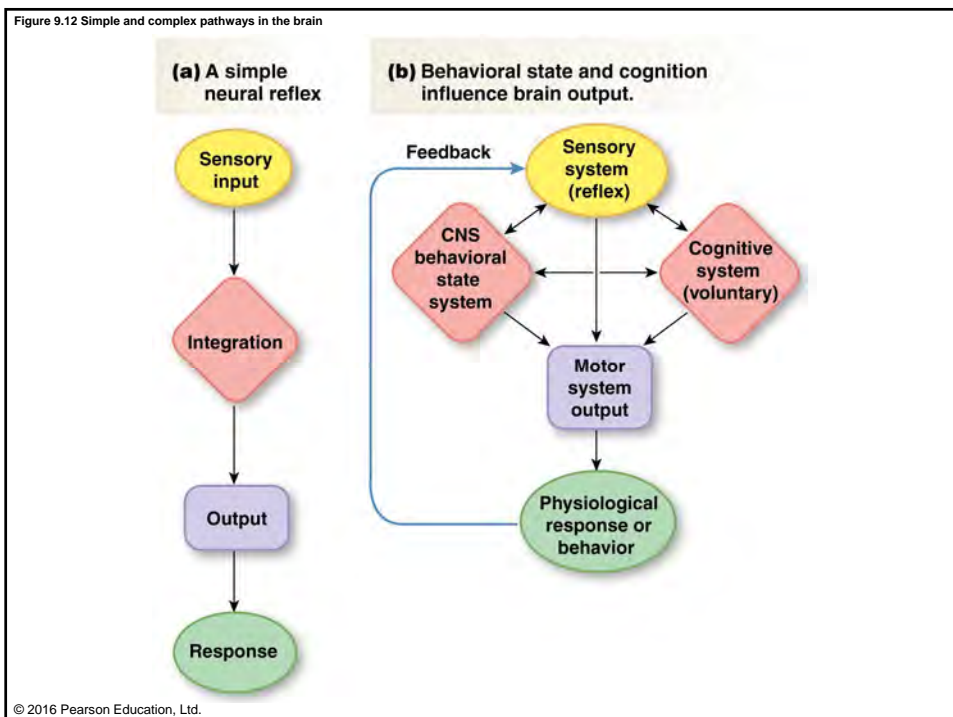
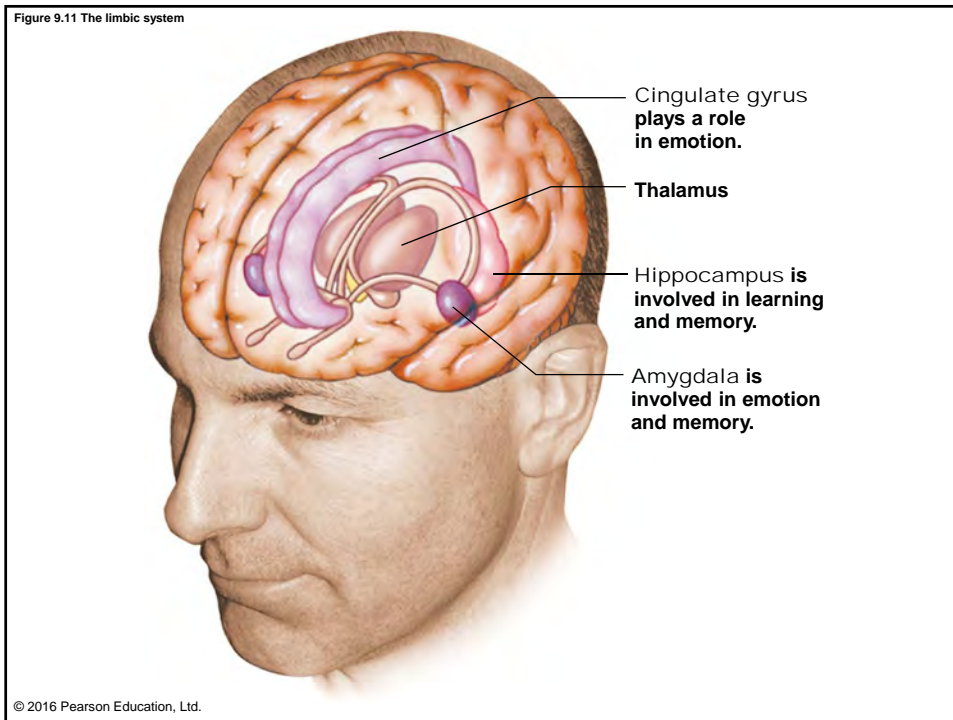


Figure 9.10 Gray matter of the cerebrum



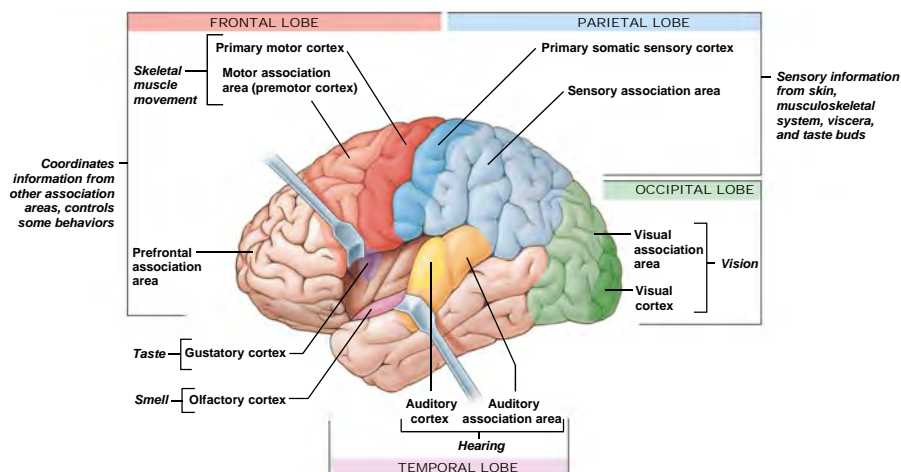


Hersenfuncties: Cerebrale cortex

- Vanuit functioneel oogpunt: kan verdeeld worden in 3 specialisaties
 - Sensorische gebieden
 - Sensorische input vertaald naar perceptie (bewustzijn)
 - Motorische gebieden
 - Skeletspier beweging
 - Associatie gebieden
 - Integreert informatie van sensorische en motorische gebieden
 - Stuurt vrijwillig gedrag aan
- Cerebrale lateralisatie

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Figure 9.13 Functional areas of the cerebral cortex

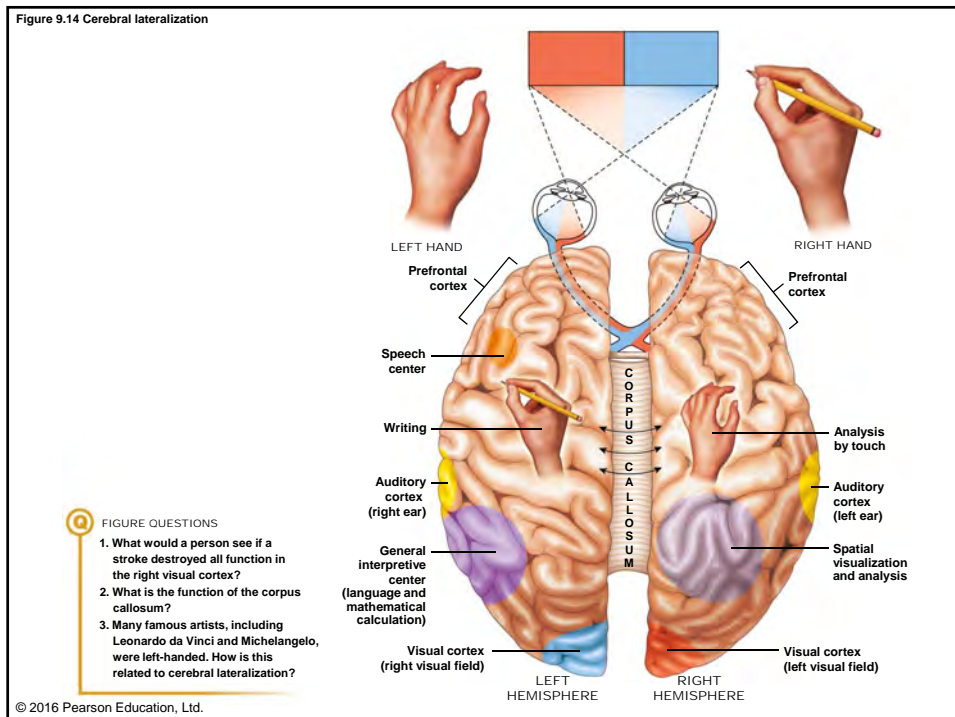


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TABLE 9.3 Selected Brain Imaging Techniques	
In Vitro Techniques	
Horseshradish peroxidase (HRP)	HRP enzyme is brought into axon terminals by endocytosis and transported by retrograde axonal transport to the cell body and dendrites. Completion of the enzyme-substrate reaction makes the entire neuron visible under a microscope.
Brainbow mice	Transgenic mice in which fluorescent proteins have been inserted into the neurons. Neurons light up in a rainbow of colors depending on which proteins they are expressing. (See chapter opener image.) http://jaxmice.jax.org/jaxnotes/510/510n.html
CLARITY: Clear, lipid-exchanged, anatomically rigid, imaging/immunostaining-compatible tissue hydrogel	Intact brain samples are made transparent by a technique that removes lipids and embeds the sample in a plastic matrix. Allows easier three-dimensional reconstructions of neural networks. www.nature.com/news/see-through-brains-clearly-connections-1.12768
In Vivo Imaging of Living Brain Activity	
Electroencephalography (EEG)	Brain electrical activity from many neurons is measured by electrodes placed on the scalp (see Fig. 9.17a).
Positive emission tomography (PET)	Glucose is tagged with a radioactive substance that emits positively charged particles. Metabolically active cells using glucose light up more (see Fig. 9.20). www.nature.com/cbfm/webfocus/mri/index.html
Functional magnetic resonance imaging (fMRI)	Active brain tissue has increased blood flow and uses more oxygen. Hydrogen nuclei in water create a magnetic signal that indicates more active regions. www.nature.com/news/brain-imaging-fmri-2-0-1.10365

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Figure 9.14 Cerebral lateralization



Hersenfunctie: Sensorische informatie

- Integratie van ruggemereflexen
- Primaire sensorische cortex
 - Eindpunt van pathways afkomstig van huid, spieren en viscera
 - Somatosensorische pathways
 - Aanraking
 - Temperatuur
 - Pijn
 - Jeuk

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Hersenfunctie: Sensorische informatie

- Lichaamspositie
- Speciale zintuigen hebben specifieke regio's
 - Visuele cortex
 - Auditorische cortex
 - Olfactorische cortex
 - Gustatorische cortex
- Neurale pathways breiden zich uit van sensorische gebieden naar associatie gebieden, waar stimuli geïntegreerd worden tot perceptie

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Hersenfunctie: Motorisch systeem

- Vrijwillige bewegingen
 - Primaire motor cortex
 - Motor associatie gebieden
- Neuroendocriene en viscerale responsen worden gecoördineerd in de hypothalamus en medulla.

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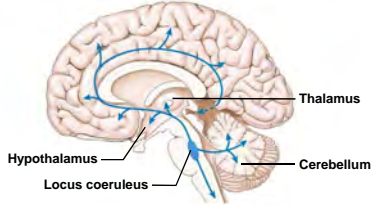
Hersenfuncties: Gedragstatus

- Modulator van sensorische en cognitieve processen
- Neuronen collectief gekend als diffuse modulatorisch systeem
 - Ontstaat in reticulaire formatie in de hersenstam
 - Projecteert axonen naar grotere gebieden in de hersenen
 - Controleert bewustzijn en slaap/waakcyclus
 - Experimenteel bewijs reticulair activatiesysteem erg betrokken in bewustzijn

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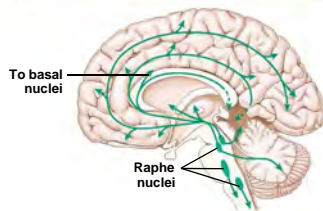
Figure 9.16a-b Diffuse modulatory systems

(a) Noradrenergic (Norepinephrine)



Functions:	Attention, arousal, sleep-wake cycles, learning, memory, anxiety, pain, and mood
Neurons Originate:	Locus coeruleus of the pons
Neurons Terminate:	Cerebral cortex, thalamus, hypothalamus, olfactory bulb, cerebellum, midbrain, spinal cord

(b) Serotonergic (Serotonin)

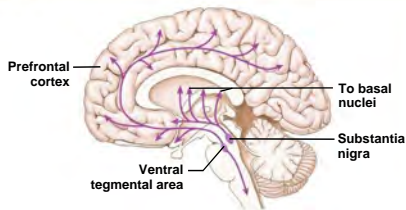


Functions:	1. Lower nuclei: Pain, locomotion 2. Upper nuclei: Sleep-wake cycle: mood and emotional behaviors, such as aggression and depression
Neurons Originate:	Raphe nuclei along brain stem midline
Neurons Terminate:	1. Lower nuclei project to spinal cord 2. Upper nuclei project to most of brain

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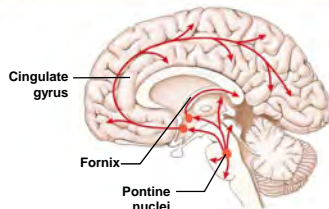
Figure 9.16c-d Diffuse modulatory systems

(c) Dopaminergic (Dopamine)



Functions:	1. Motor control 2. "Reward" centers linked to addictive behaviors
Neurons Originate:	1. Substantia nigra in midbrain 2. Ventral tegmentum in midbrain
Neurons Terminate:	1. Cortex 2. Cortex and parts of limbic system

(d) Cholinergic (Acetylcholine)



Functions:	Sleep-wake cycles, arousal, learning, memory, sensory information passing through thalamus
Neurons Originate:	Base of cerebrum: pons and midbrain
Neurons Terminate:	Cerebrum, hippocampus, thalamus

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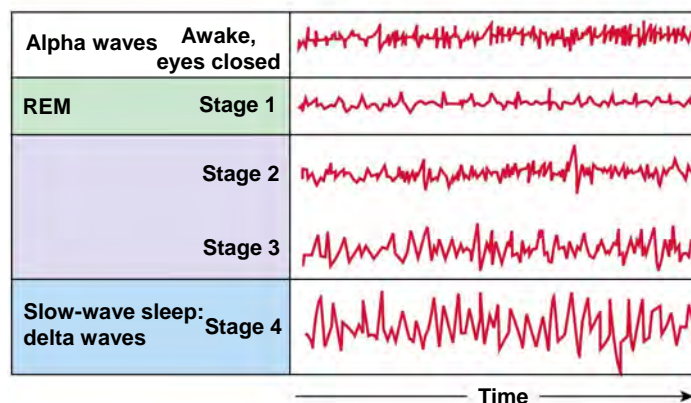
Hersenfunctie: Slaap

- Vier stadia met 2 belangrijke fasen
 - Slow-wave slaap
 - Corrigeert lichaam zonder bewuste commando's
 - Rapid eye movement (REM) slaap
 - Hersenactiviteit inhibeert motor neuronen naar skeletspieren die paralyseren
 - Dromen

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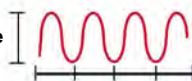
Figure 9.17a Electroencephalograms (EEGs) and the sleep cycle

(a) Recordings of electrical activity in the brain during awake-resting and sleep periods show characteristic patterns.



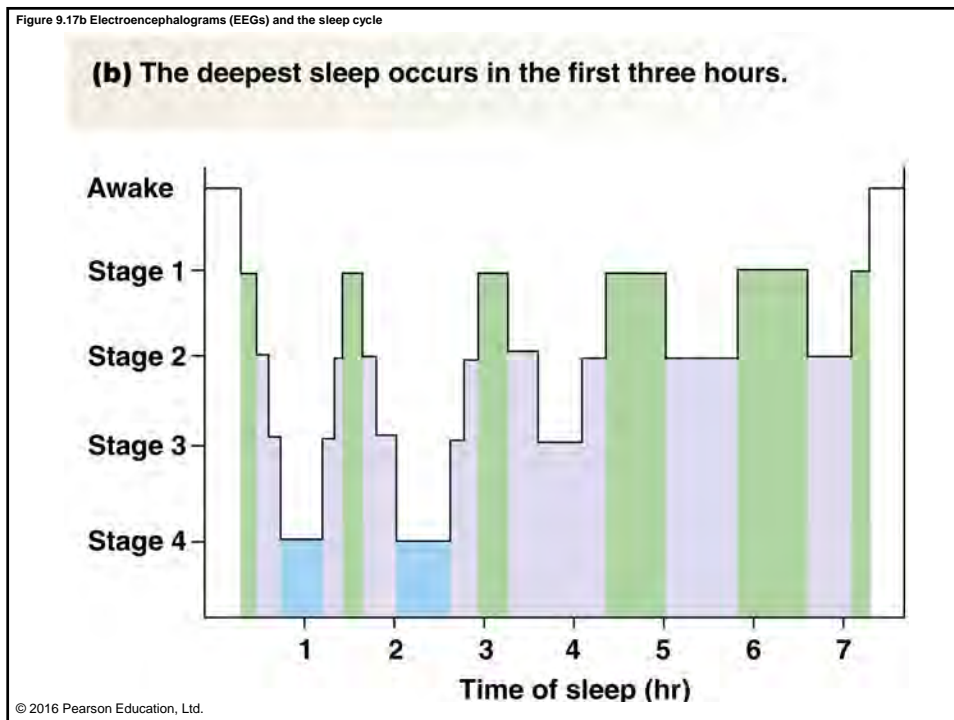
KEY

Amplitude



Frequency

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Hersenfunctie: Slaap

- Slaapstoornissen
 - Insomnia: onmogelijkheid om te slapen
 - Slaap apnea: normale ademhaling staakt gedurende de slaap
 - Somnambulisme: slaapwandelen
- Circadiaan ritme
 - Suprachiasmatische nucleus van de hypothalamus
 - Melatonine gelinkt aan circadian ritme verstoort bij ploegenarbeid en jet lag

Samenvatting

- ~~Emergente eigenschappen van neurale netwerken~~
- ~~Evolutie van het zenuwstelsel~~
- Anatomie van het centrale zenuwstelsel
- Het ruggemerg
- De hersenen
- Hersenfuncties