



**Universitair Medisch Centrum Groningen**



# Tinnitus

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# Introductie

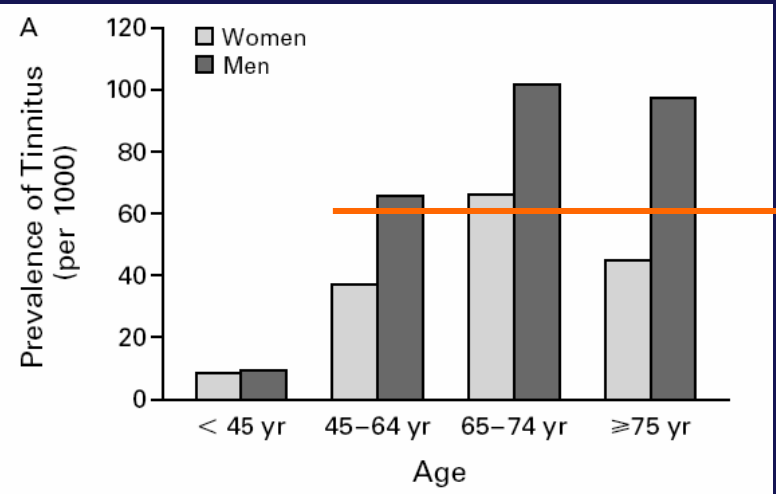
## Tinnitus:

- een (betekenisloos) geluid
  - zonder akoestische bron buiten het lichaam
- 
- Objectieve tinnitus  $\Rightarrow$  objectiveerbare akoestische bron
  - Subjectieve tinnitus  $\Rightarrow$  fantoomgeluid



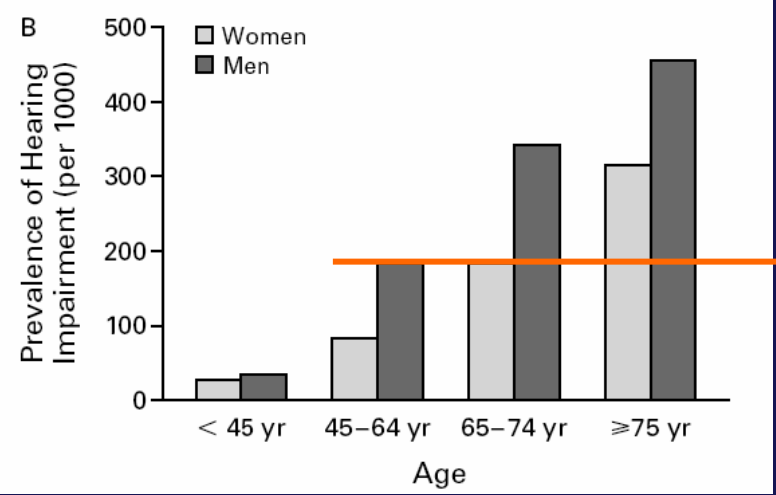
# Tinnitus en gehoorverlies: prevalentie

Tinnitus



6 per 100

Gehoorverlies



20 per 100

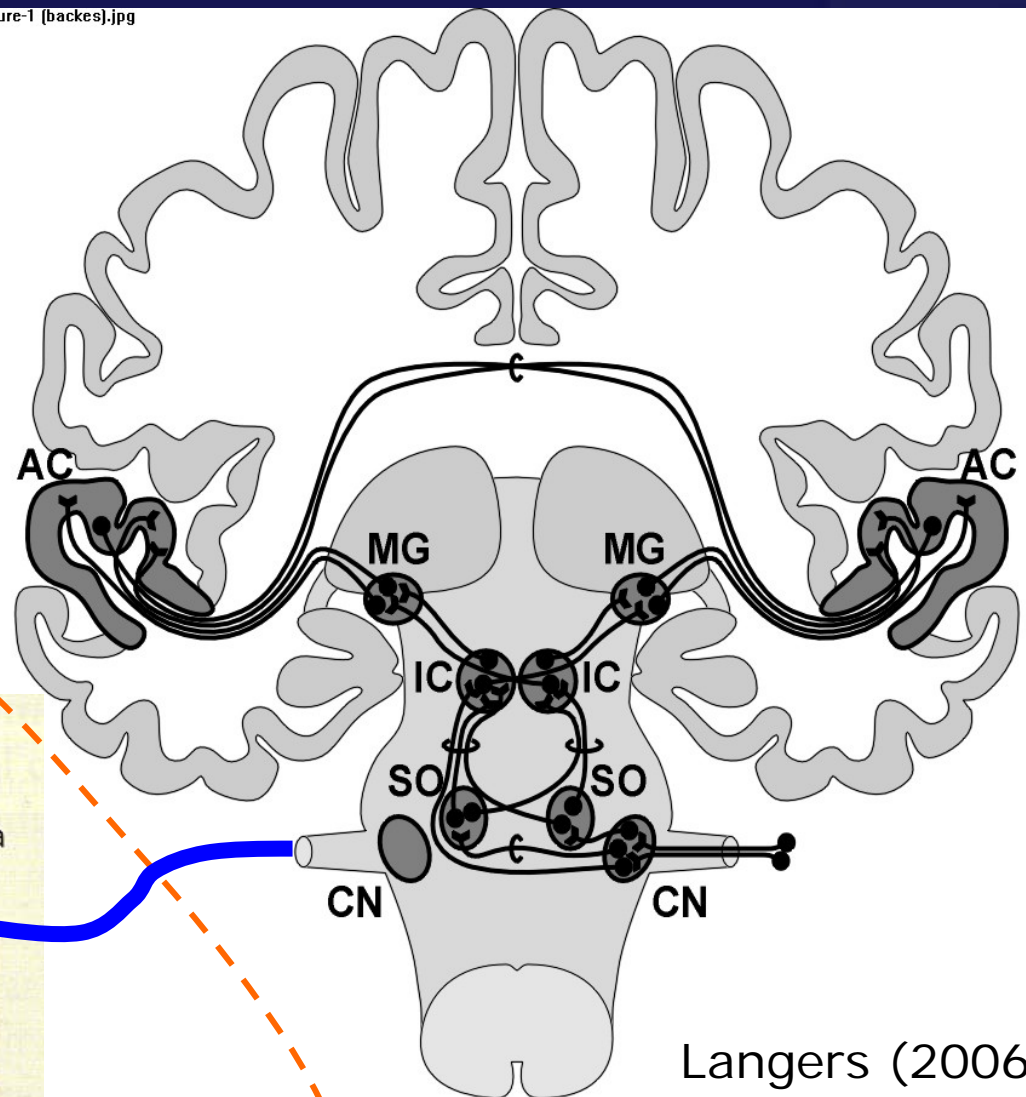
Lockwood *et al.*, 2002



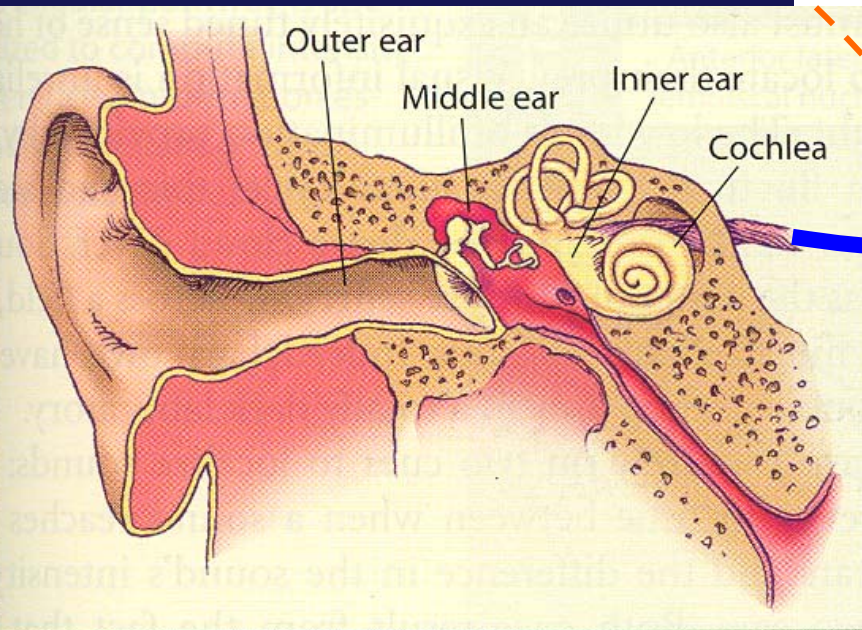
# Centrale auditieve systeem

# Perifeer gehoor

Figure-1 (backes).jpg



Langers (2006)





# Tinnitus als aandoening van het centraal auditieve systeem

- In 35-85% geeft sectie van de gehoorzenuw geen verlichting van tinnitus (House & Brackman, 1981; Dandy, 1941; Silverstein, 1976; Gardner, 1984)
- In 50% ontstaat tinnitus na sectie van de gehoorzenuw (Berliner *et al.* 1992)



# Tinnitus $\Leftrightarrow$ spontane neurale activiteit

## Neurale activiteit:

- Response op een stimulus
- Spontane activiteit  $\Rightarrow$  tinnitus

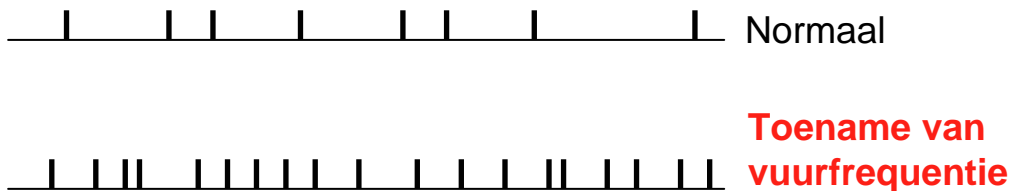
are needed to see this picture.  
TIFF (LZW) decompressor  
QuickTime™ and a

Tijd  $\rightarrow$



# Tinnitus en spontane activiteit

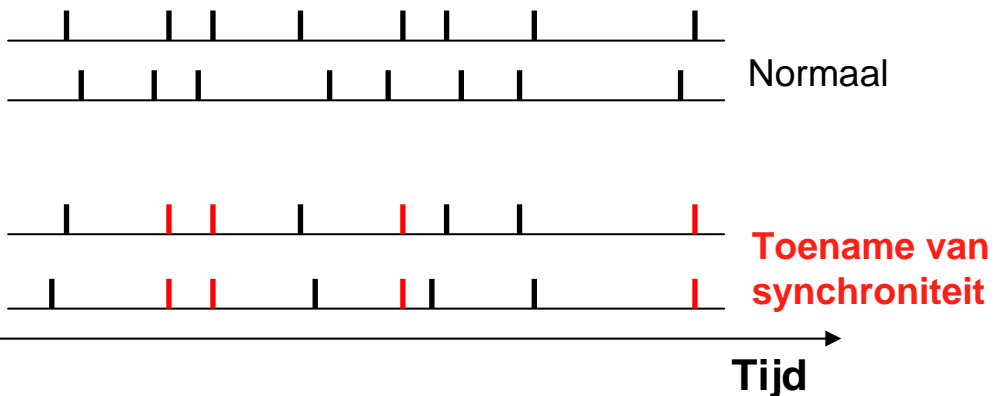
- Toename in vuurfrequentie?



- Toename van bursts?



- Toename van synchroniteit?





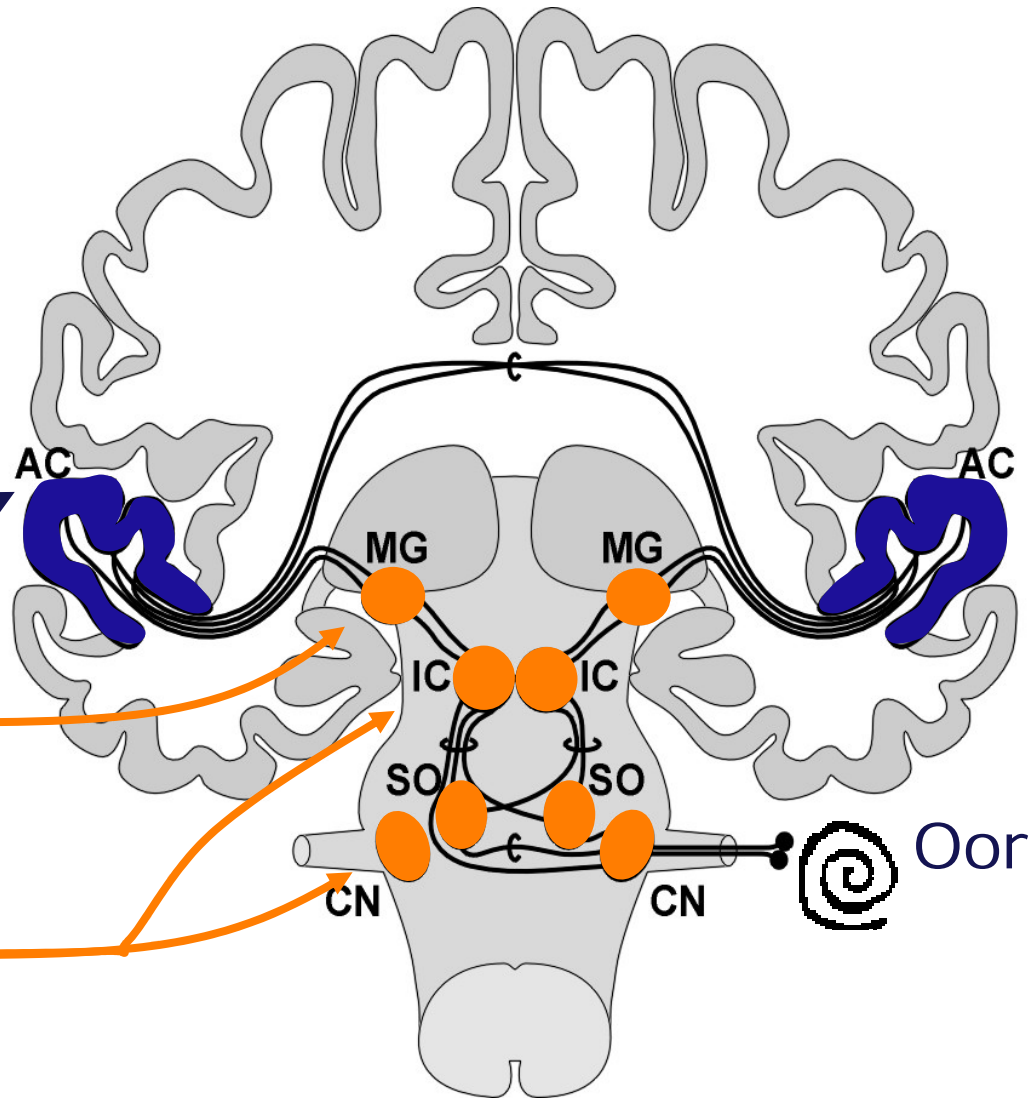


QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

Cortex

Thalamus

Hersenstam



Oor



# Number of neurons of the afferent auditory system

Auditory cortex  
10,200,000

Medial geniculate body  
422,000

Inferior colliculus  
392,000

Nuclei of the lateral lemniscus  
38,100

Superior olivary complex  
34,300

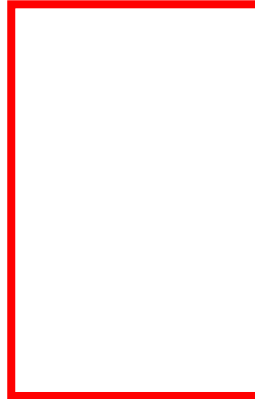
Cochlear nuclei  
88,000

Auditory nerve (NVIII) unilateral  
30,000



# Spontane activiteit en geïnduceerd gehoorverlies

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.



Eggermont and Roberts (2004)

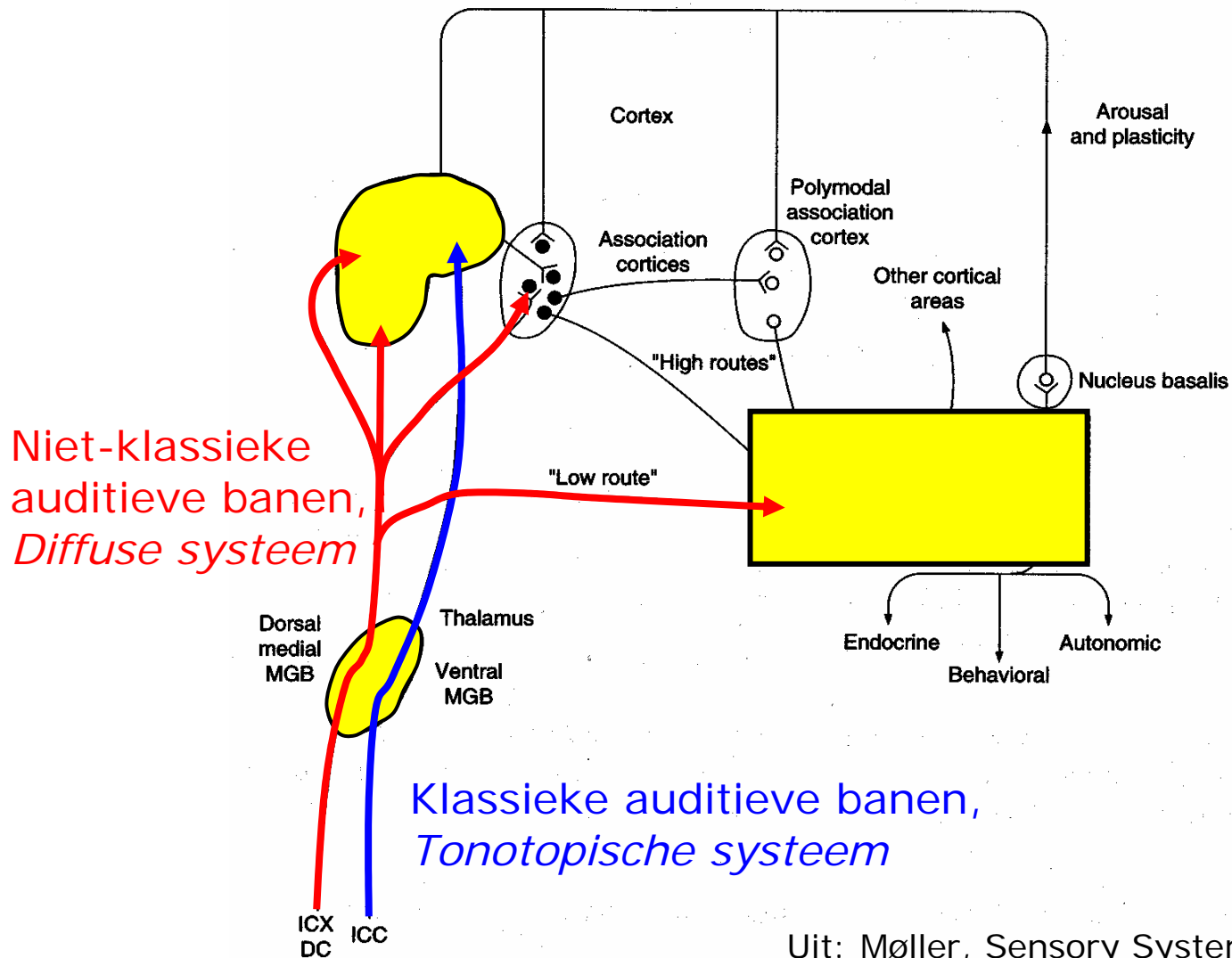
## Perifeer gehoorverlies

⇒ verminderde afferente prikkeling

⇒ veranderde spontane activiteit



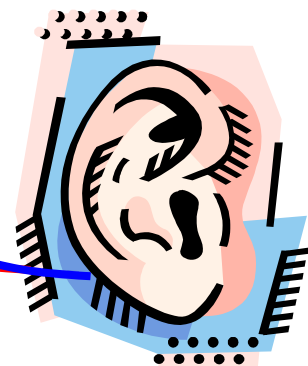
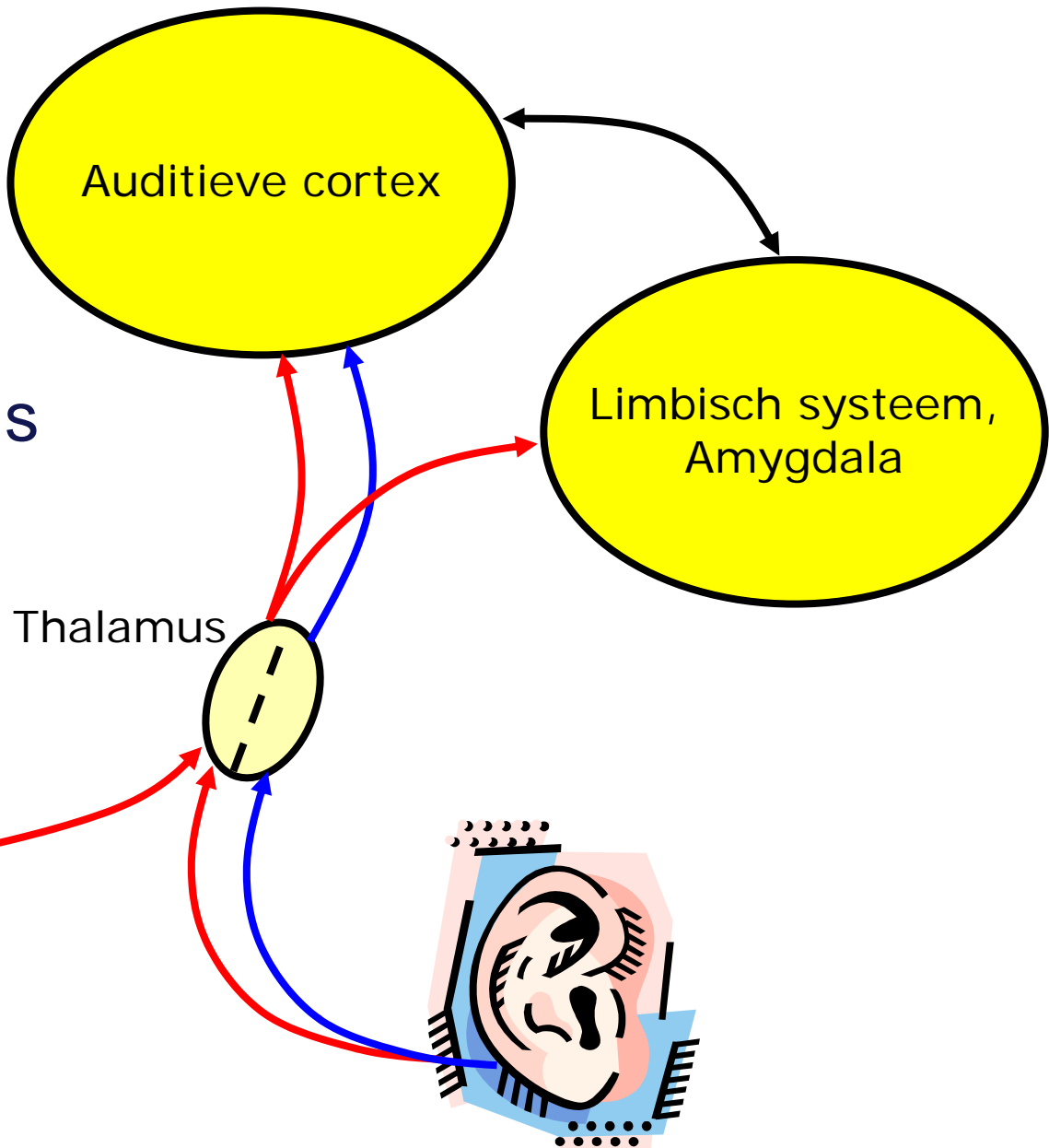
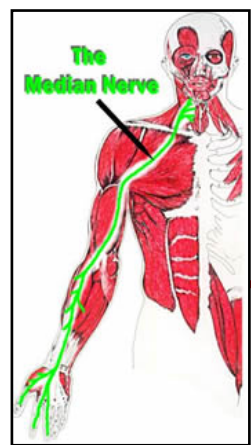
# Emotie en tinnitus: thalamus-cortex-amygdala



Uit: Møller, Sensory Systems

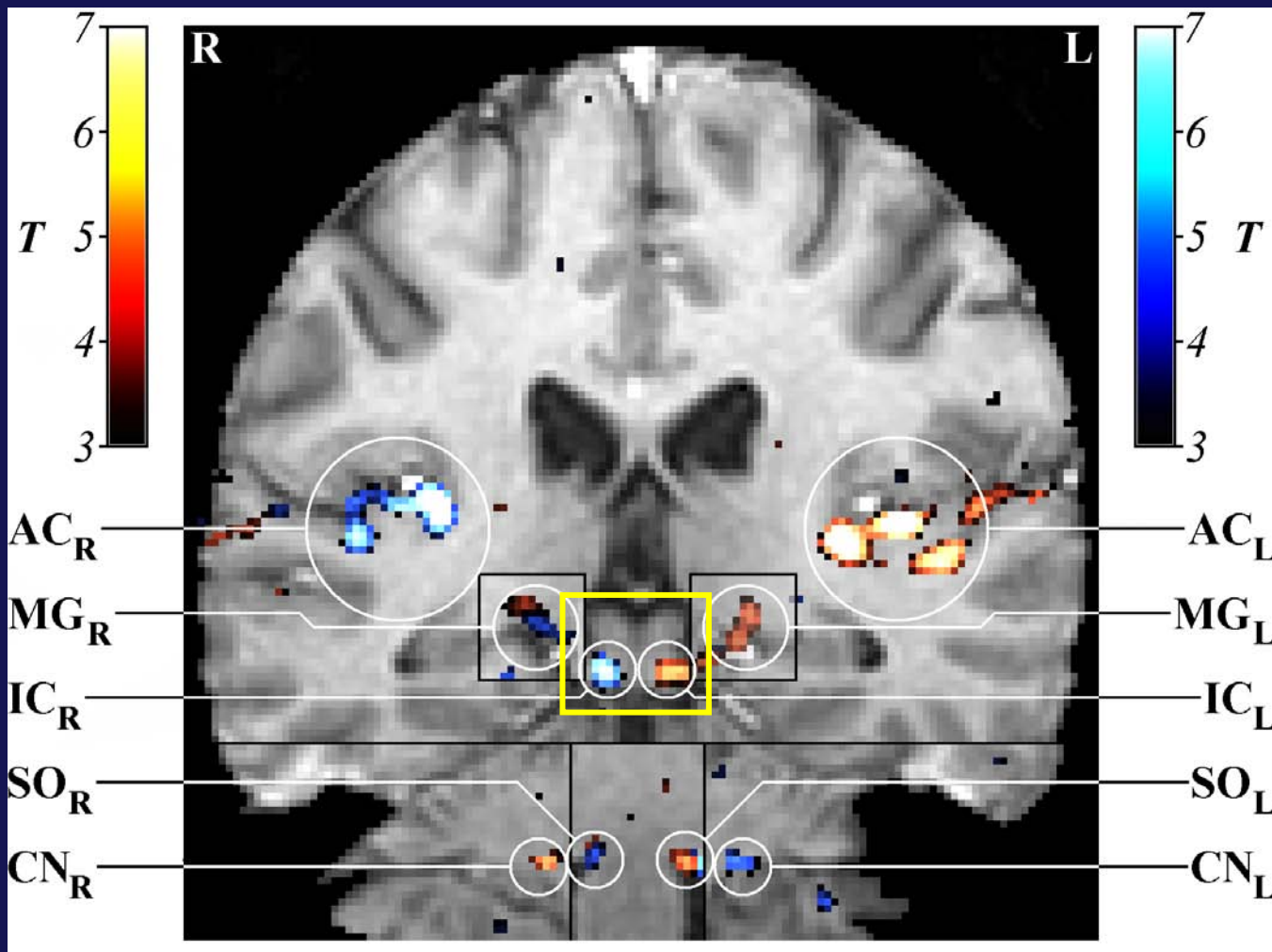


# Somatosensorische modulatie van tinnitus





# fMRI van het centrale auditieve systeem



Langers *et al.*, 2005



# Excitatie en inhibitie

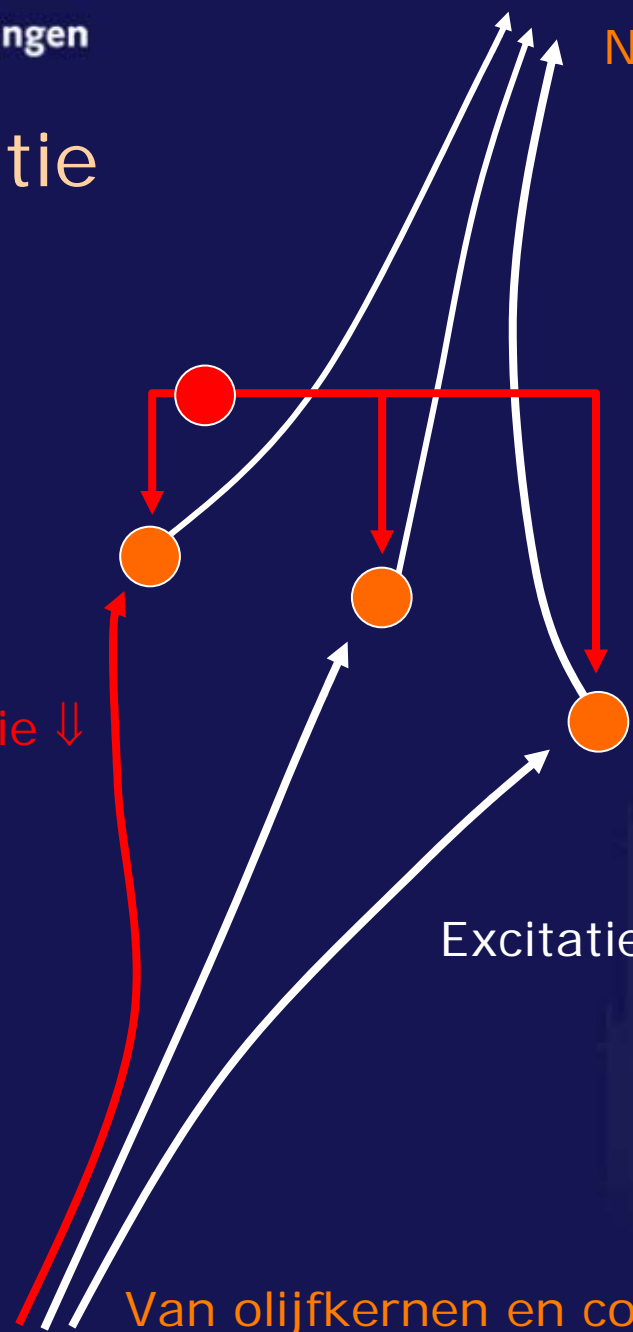
Inferior colliculus

Inhibitie ↓

Excitatie ↑

Naar thalamus

Van olijkernen en cochleaire nuclei





## Discussie fMRI-experiment

- Meer neurale response bij tinnitus
- Meer excitatie en/of minder inhibitie
- $\Rightarrow$  Meer spontane activiteit  $\Rightarrow$  Tinnitus