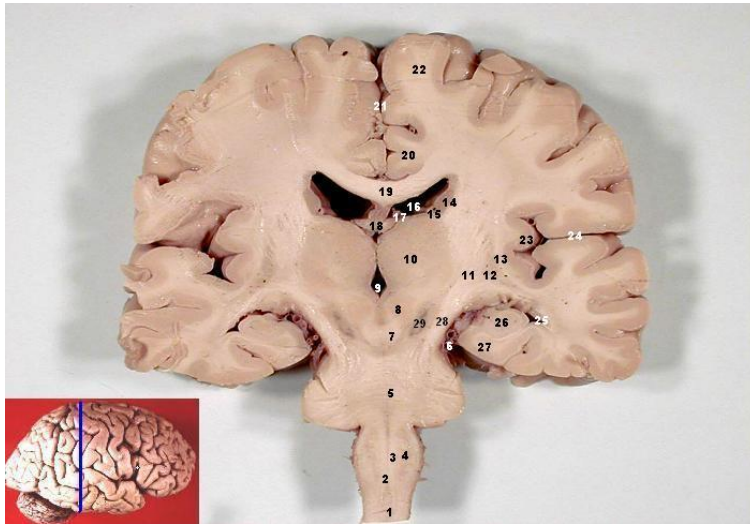


# Beethoven, Brains and Bloody Mary's



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WSU Vancouver Neuroscience

[nwnoggin.org](http://nwnoggin.org)

# nwnoggin.org

Neuroscience Outreach Group: Growing in Networks...



- **STEAM Education**

- STEM (Science, Technology, Engineering, Mathematics)
- Plus ART (🎨🎵🎸🎹🎻🎭🎨)

- Dedicated volunteers from PSU, WSUV, OHSU, PNCA



# Why art/music - and brains?

- Motivation and engagement
- Exploration, creativity, and discovery
- Personal relevance of STEAM material
- Internships, jobs and careers





Velo Cult





Skyview High School



McCoy Academy





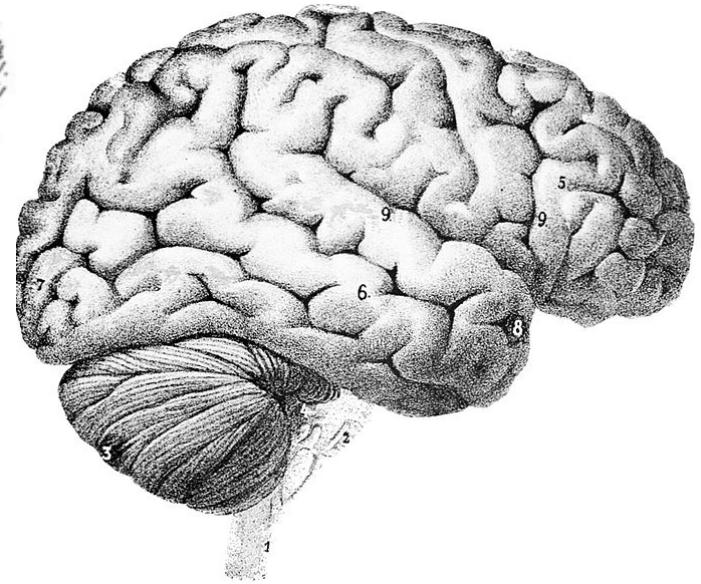
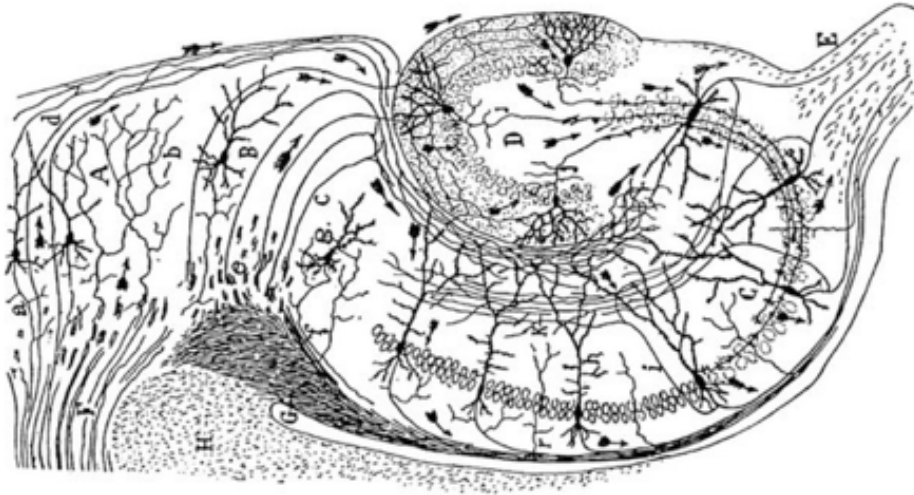
P:ear Homeless Youth Center



Jefferson High School



# What is memory?



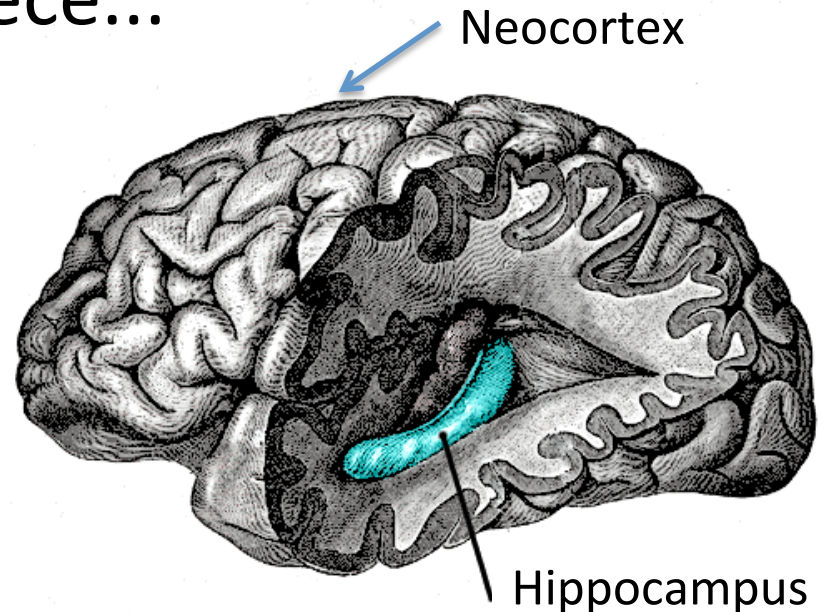
- Memory is physical
- Remembering an event is a creative act
- There are different forms of memory, each dependent on specific areas of the brain...
- Biological networks grow - and decay

# You remember events

- When you heard a song that has meaning...
- Details of episodes from own your life, like when you first picked up your instrument, or practiced a specific piece...



Depends on  
neural networks in the  
**hippocampus**, and other  
areas of **cortex**



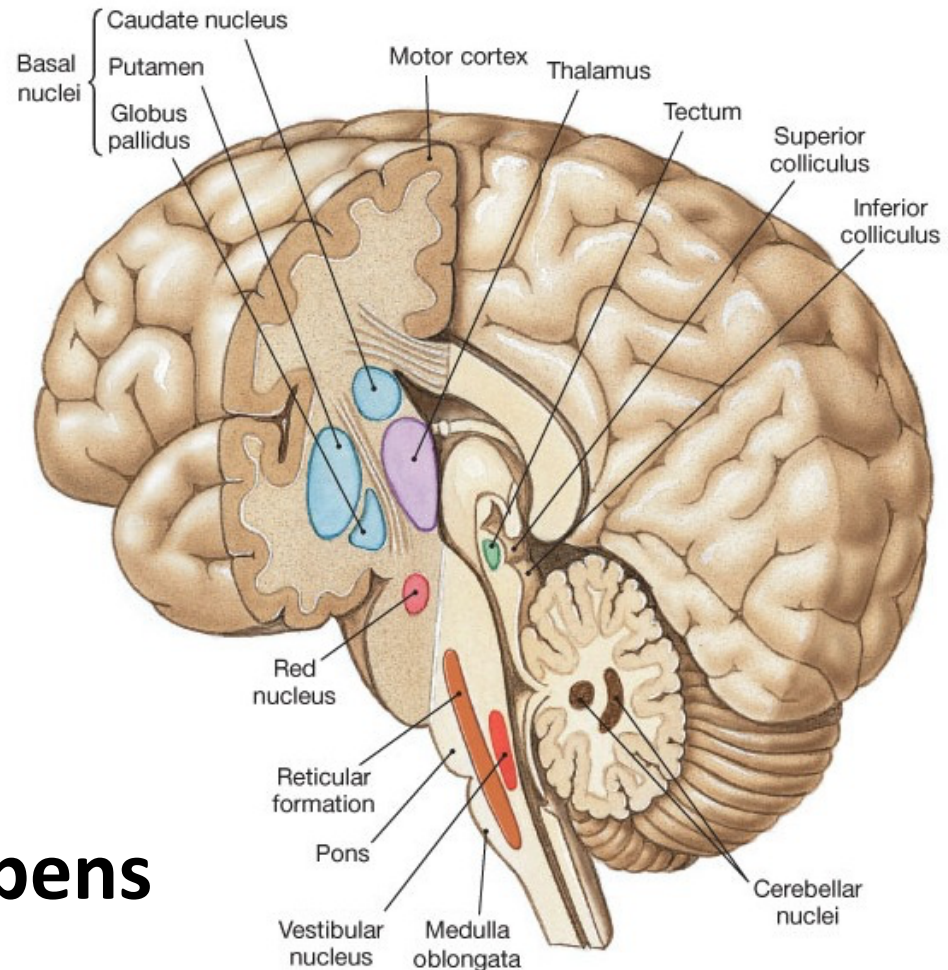


# You remember skills...

## And music also *moves* you...

*Literally...*

- **Basal ganglia**
  - Involuntary mvmt
  - Timing of mvmt
- **Cerebellum**
  - Balance
  - Coordination
  - Repetitive mvmts
- **Amygdala/Accumbens**
  - *Emotional* mvmts

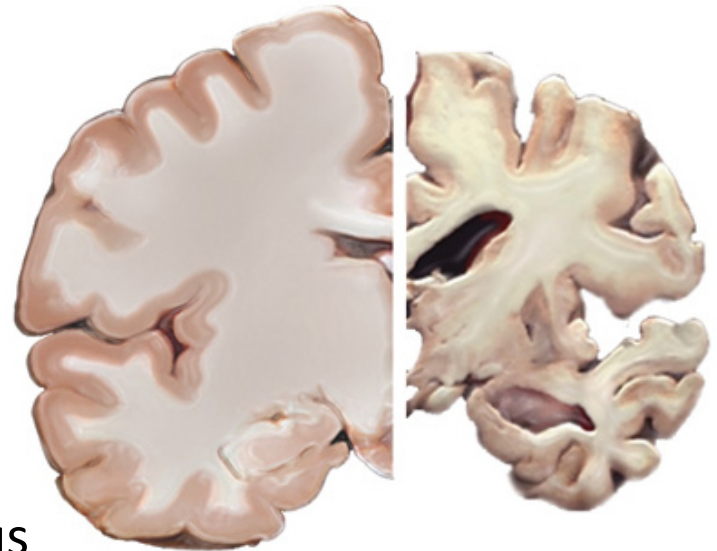


# Alzheimer's disease

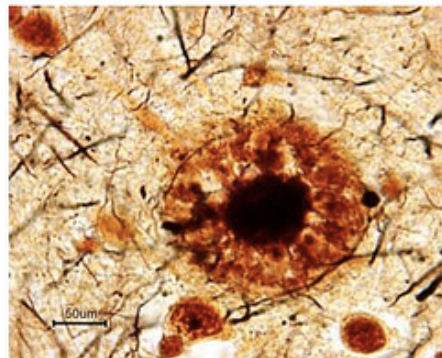
A “disconnection syndrome”

- Alois Alzheimer (1906)
- 6<sup>th</sup> leading cause of death (in US)
- Most common form of dementia
- Affects 5 million Americans
- Major damage in cortex, hippocampus
- Beta-amyloid plaques
- Tau protein tangles
- Aging, inflammation, genetics
- Late vs. early onset forms

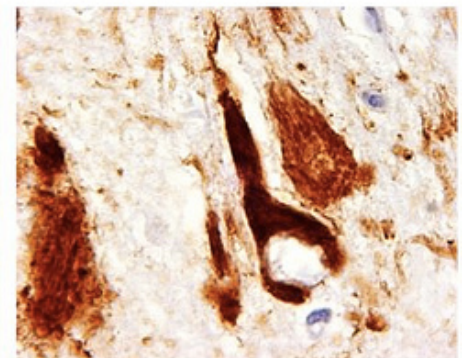
Healthy Brain      Severe Alzheimer's



Plaques



Neurofibrillary Tangles





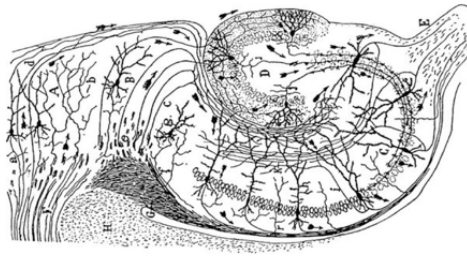
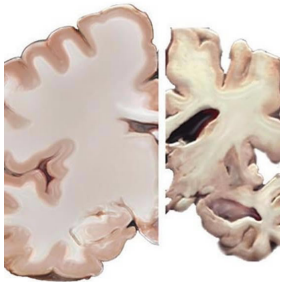
Have another Bloody Mary 🕶️ 🍹



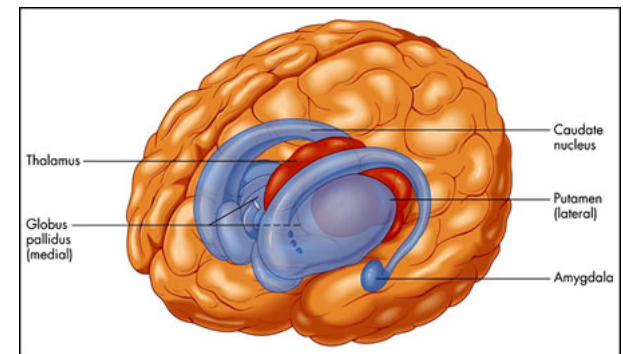
# Henry

Dementia involves damage to neocortex and hippocampus

Healthy Brain    Severe AD



*BUT: preservation of subcortical structures critical for involuntary movements, skills, emotions...*



# From the late great Oliver Sacks...

“There are undoubtedly particular areas of the cortex subserving musical intelligence and sensibility...but emotional response to music is widespread and probably not only cortical but subcortical, so that even in a diffuse cortical disease like Alzheimer’s, music can still be perceived, enjoyed, and responded to.”

“To those lost in dementia...music is no luxury...but a necessity, and can have a power beyond anything to restore them to themselves, and to others, at least for awhile...”