

# **The brain and how to study it**

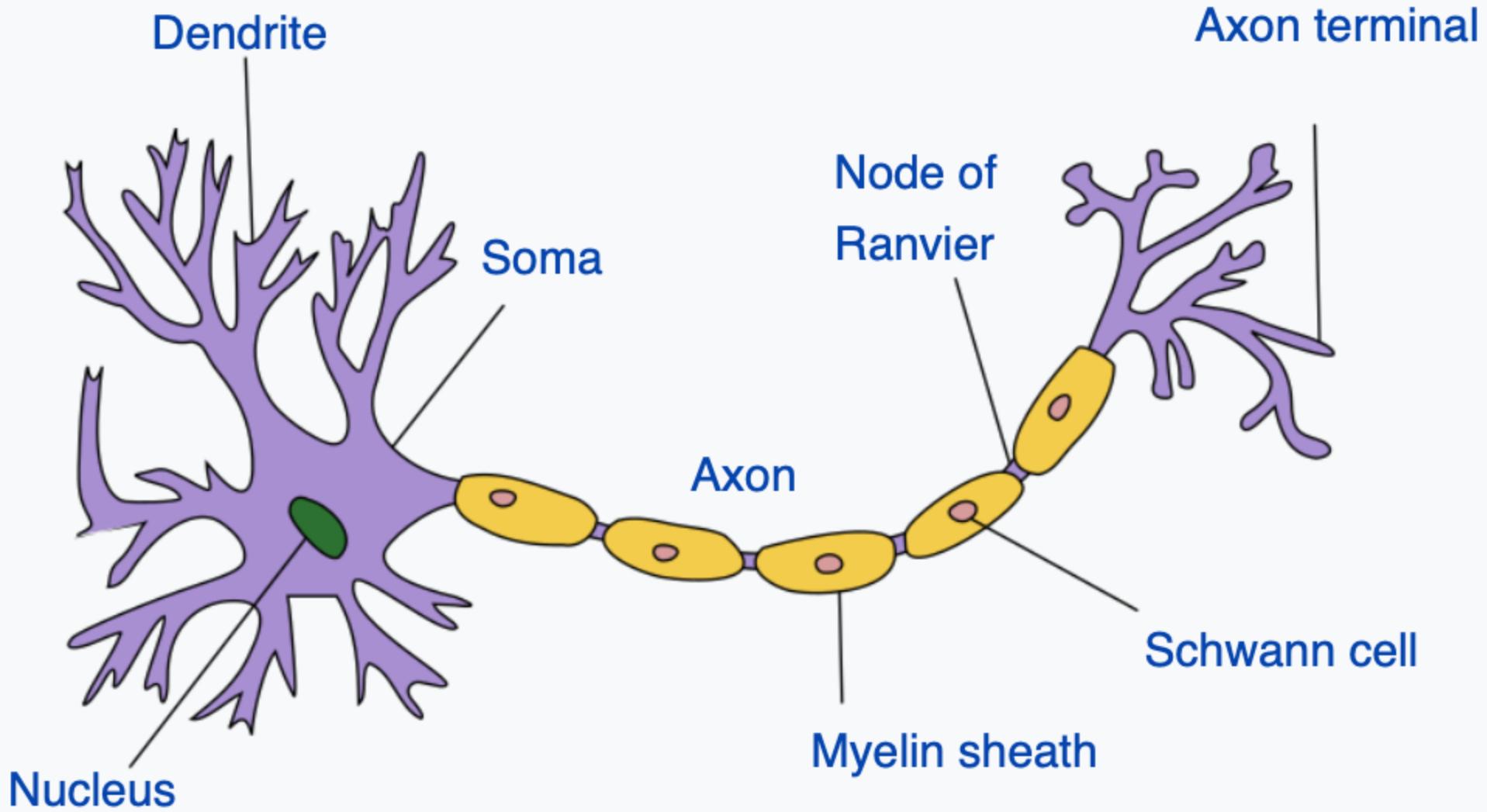


# **Brain facts**

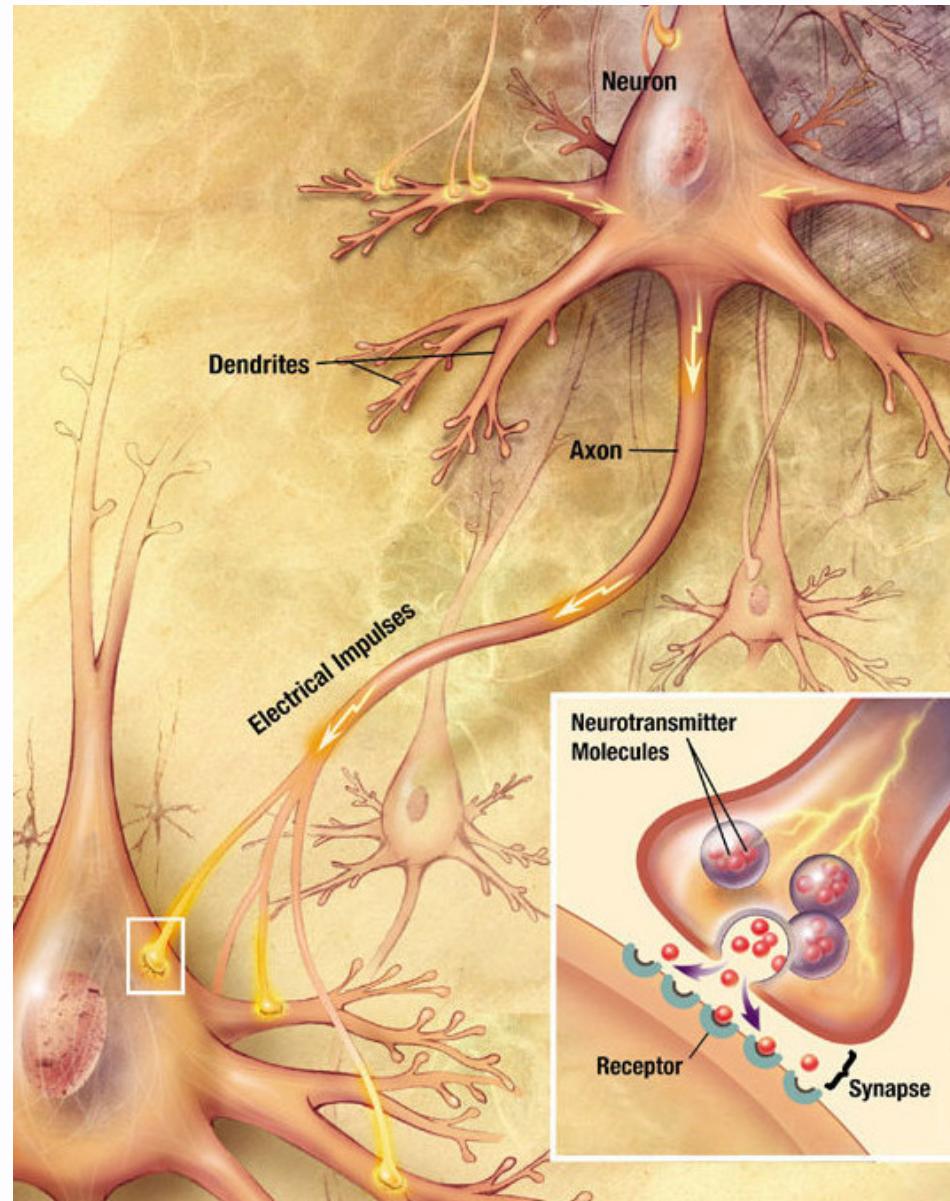
- By far the most complex organ
- Cerebral cortex has about 15 billion neurons
- Cerebellum has 55-70 billion
- Each neuron connects to up to several thousands other neurons

# Neurons

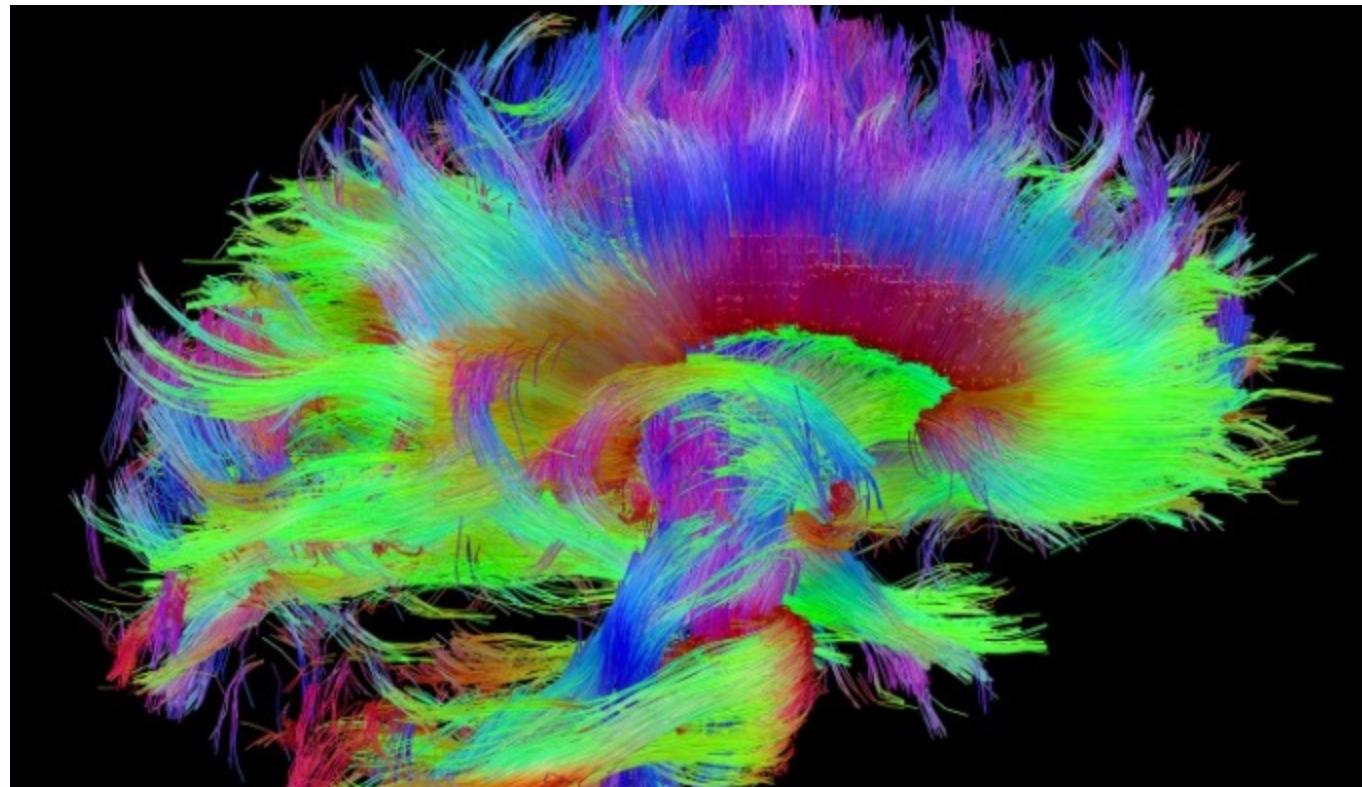
## Neuron (peripheral nervous system)



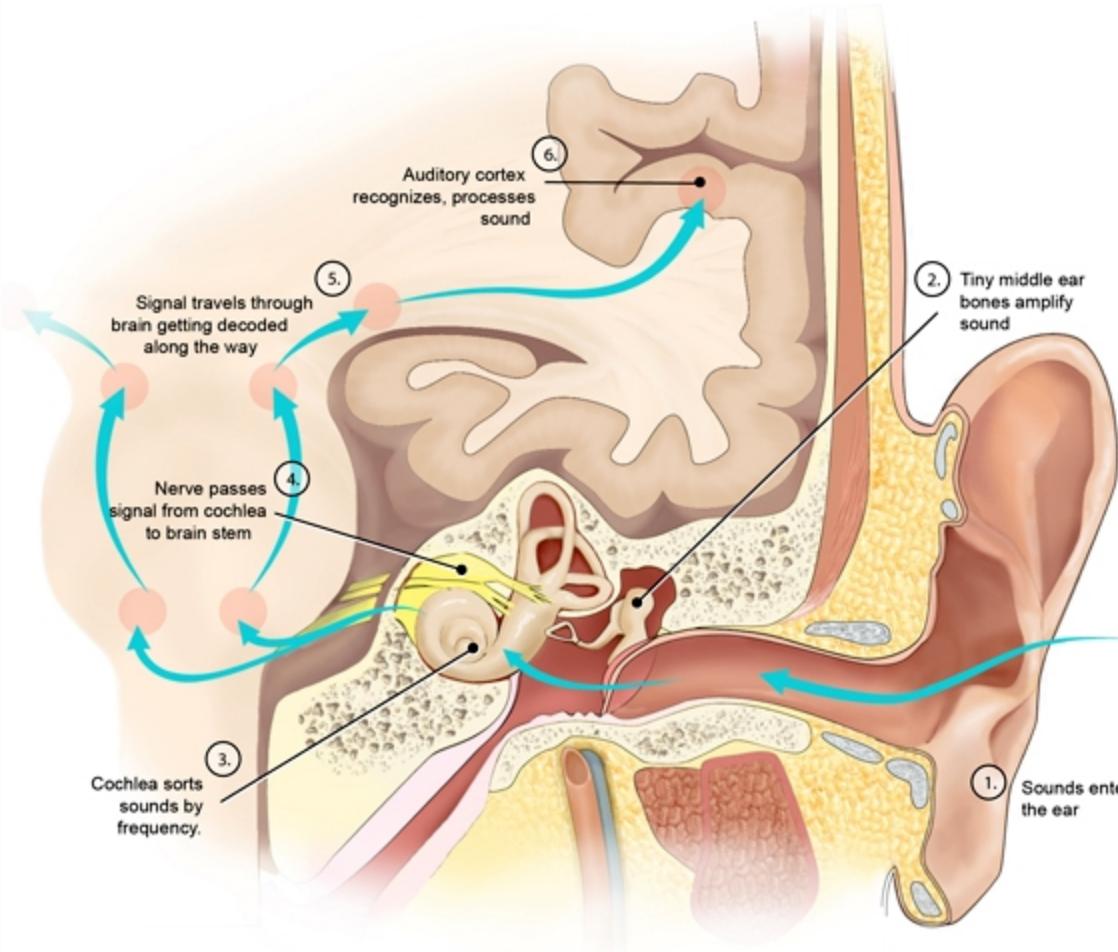
# Neurons synapse with each other



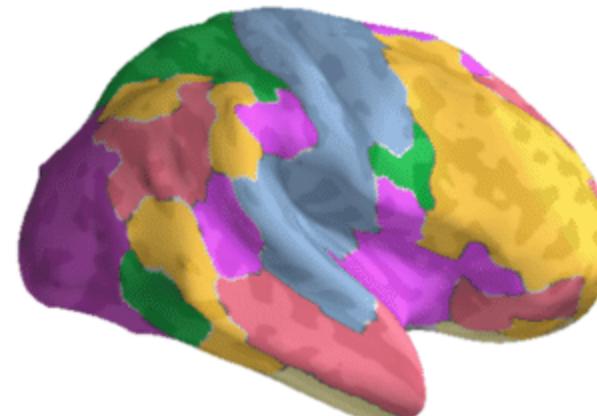
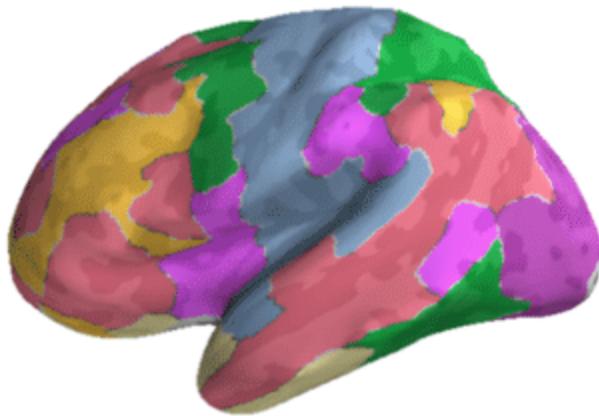
# Whole brain is connected



# Example - auditory pathway



# Neurons form functional networks



■ Visual

■ Somatomotor

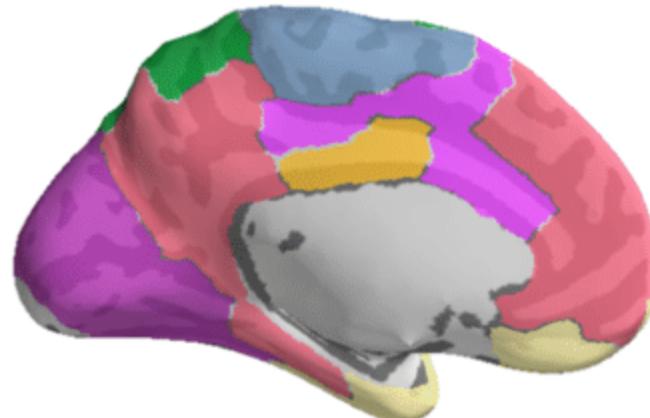
■ Dorsal Attention

■ Ventral Attention

■ Limbic

■ Frontalparietal

■ Default Mode



# **Networks and function**

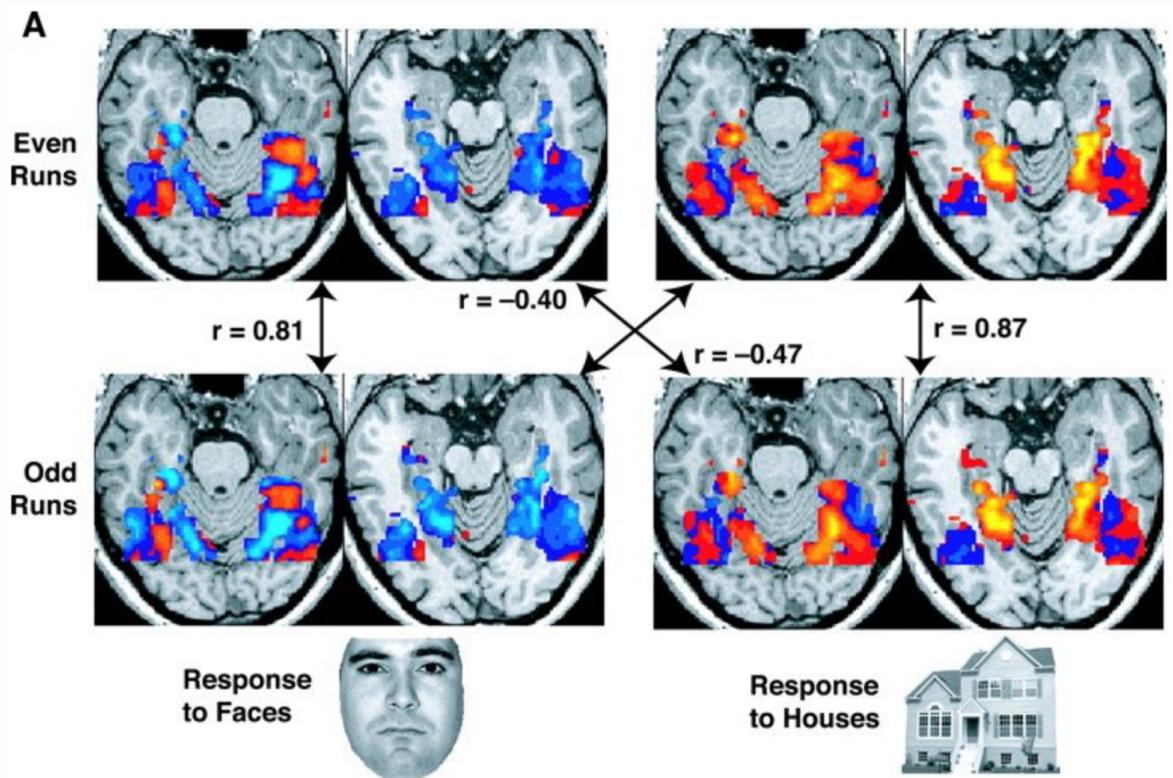
- Many networks perform a given function
- Many functions are performed by a given network

**How do we know all this?**

# Functional Magnetic Resonanse Imaging (fMRI)



# fMRI



# fMRI

- Blood-oxygen-level dependent signal (BOLD)
- You can see the function *in vivo* (kinda)
- Good spatial resolution
- Poor temporal resolution

# Electroencephalography (EEG)



# EEG results



# Other methods

- MEG (magnetoencephalography)
- PET (positron emission tomography)
- NIRS (near-infrared spectroscopy)
- Pupillometry
- Electrodermal response