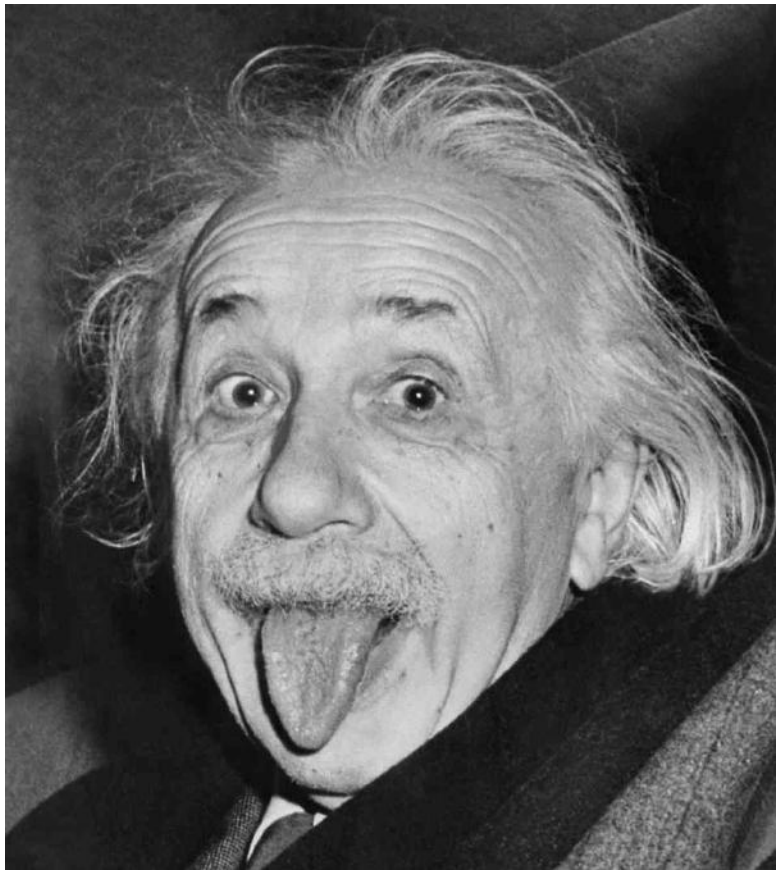
That Genius in the Brain

Maurizio De Pittà
Department of Neurobiology
University of Chicago

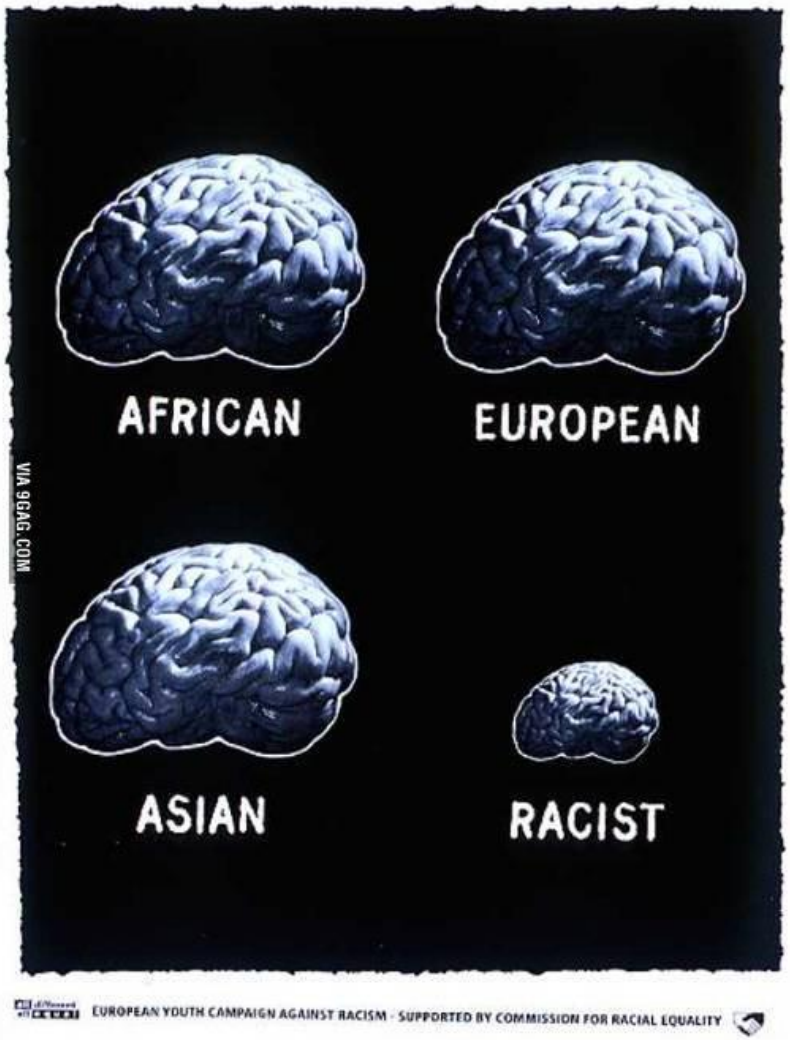
Chicago Cultural Center

Chicago, June 16, 2016

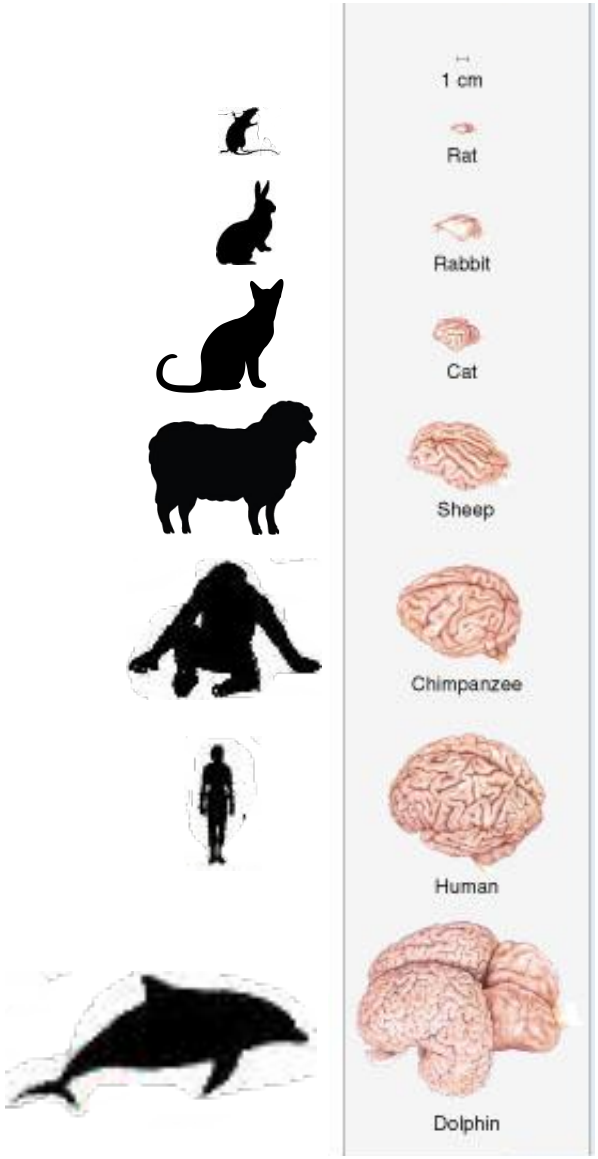
To be or not to be?



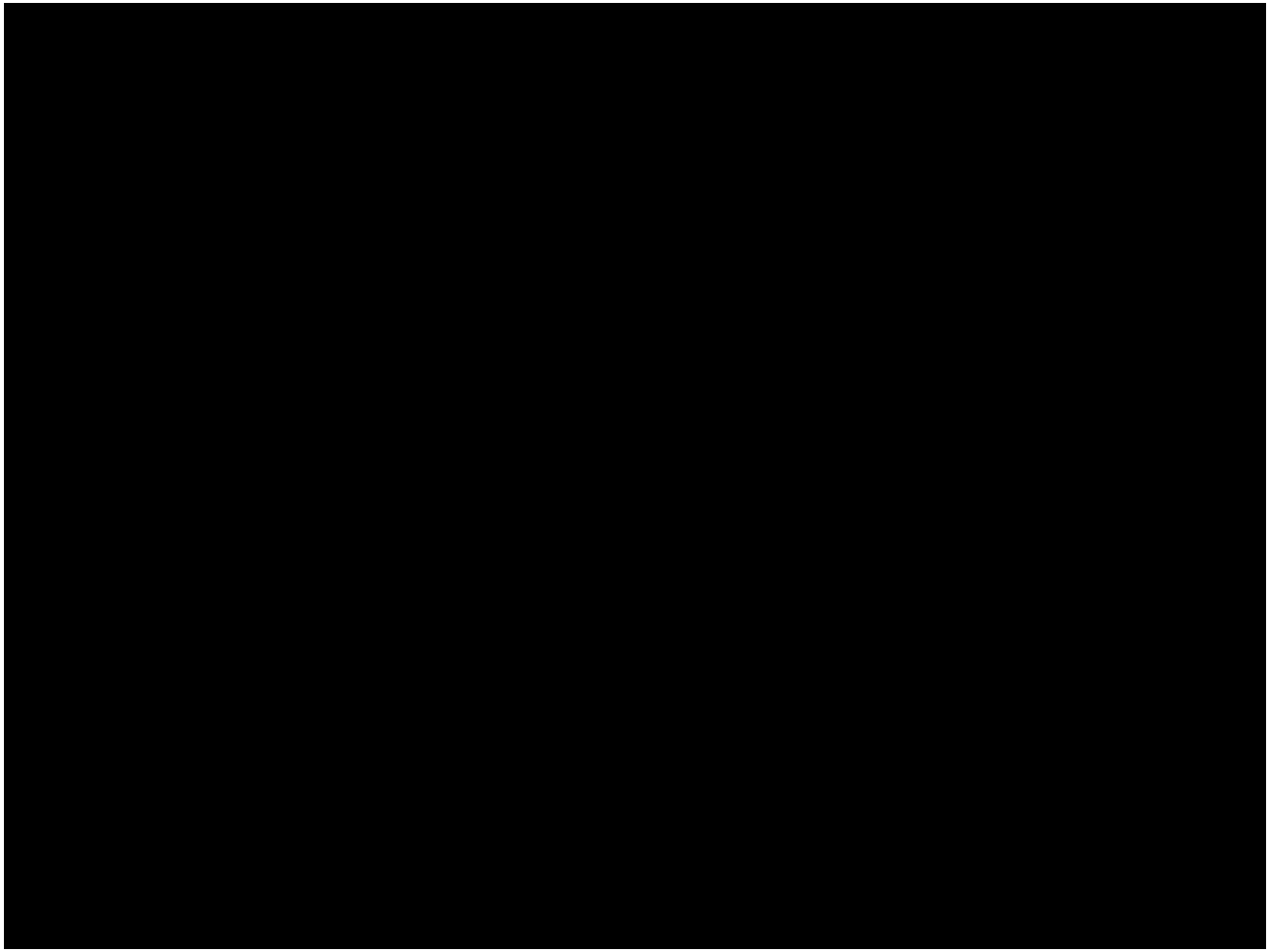
What to measure?

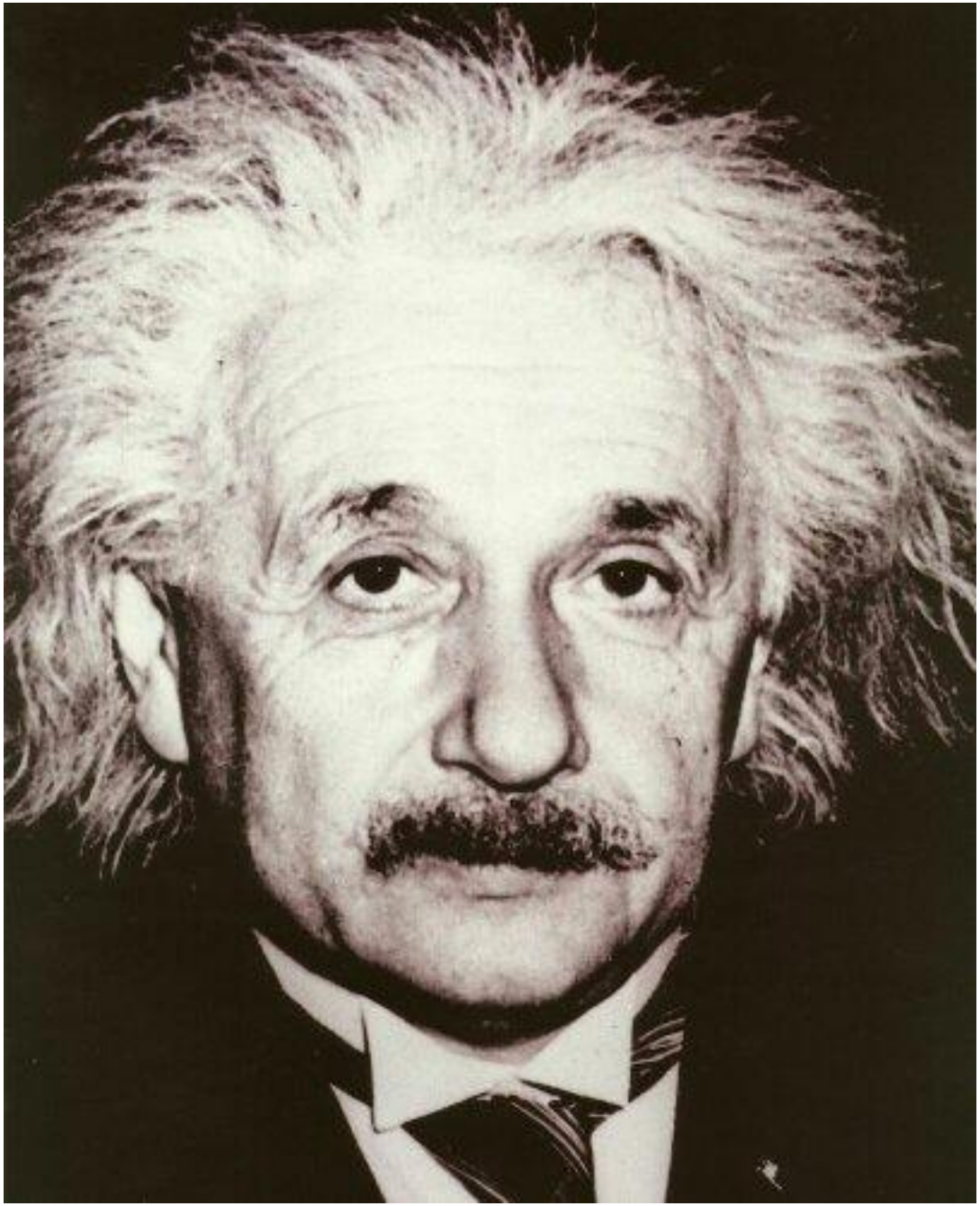


Is it a matter of size?

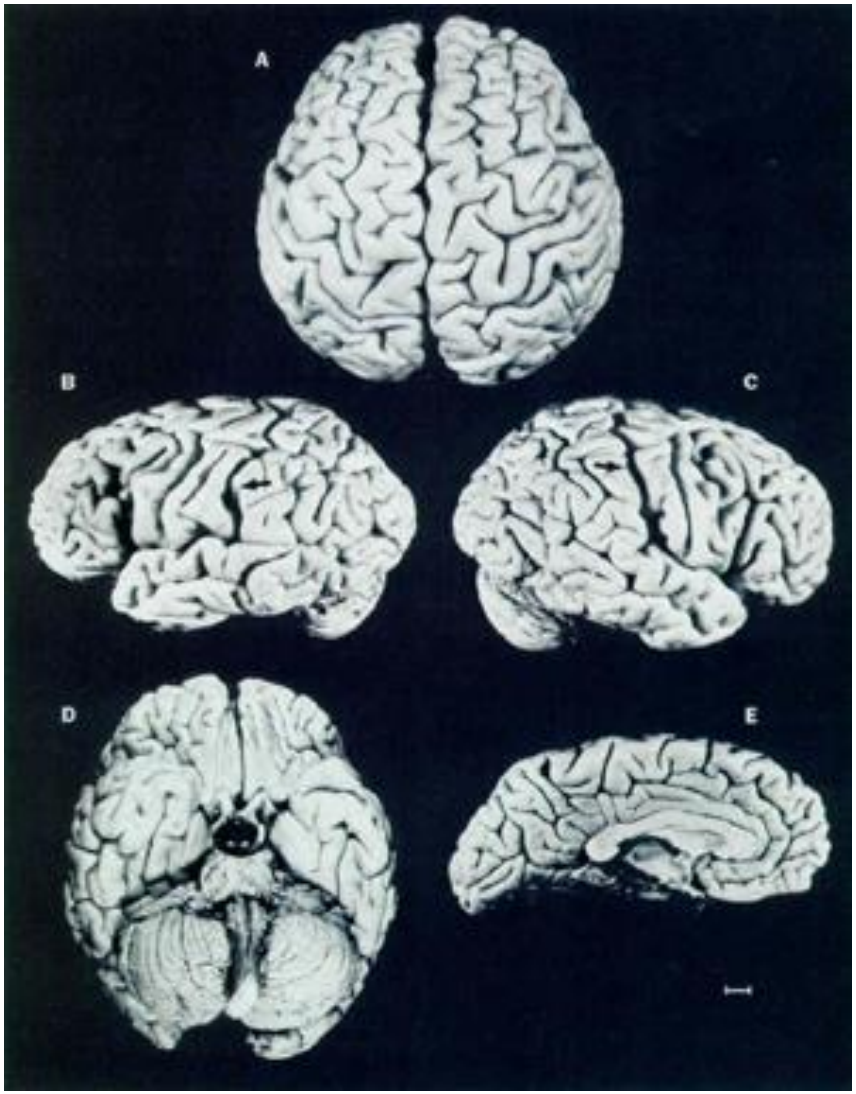


Our stonishing relative…

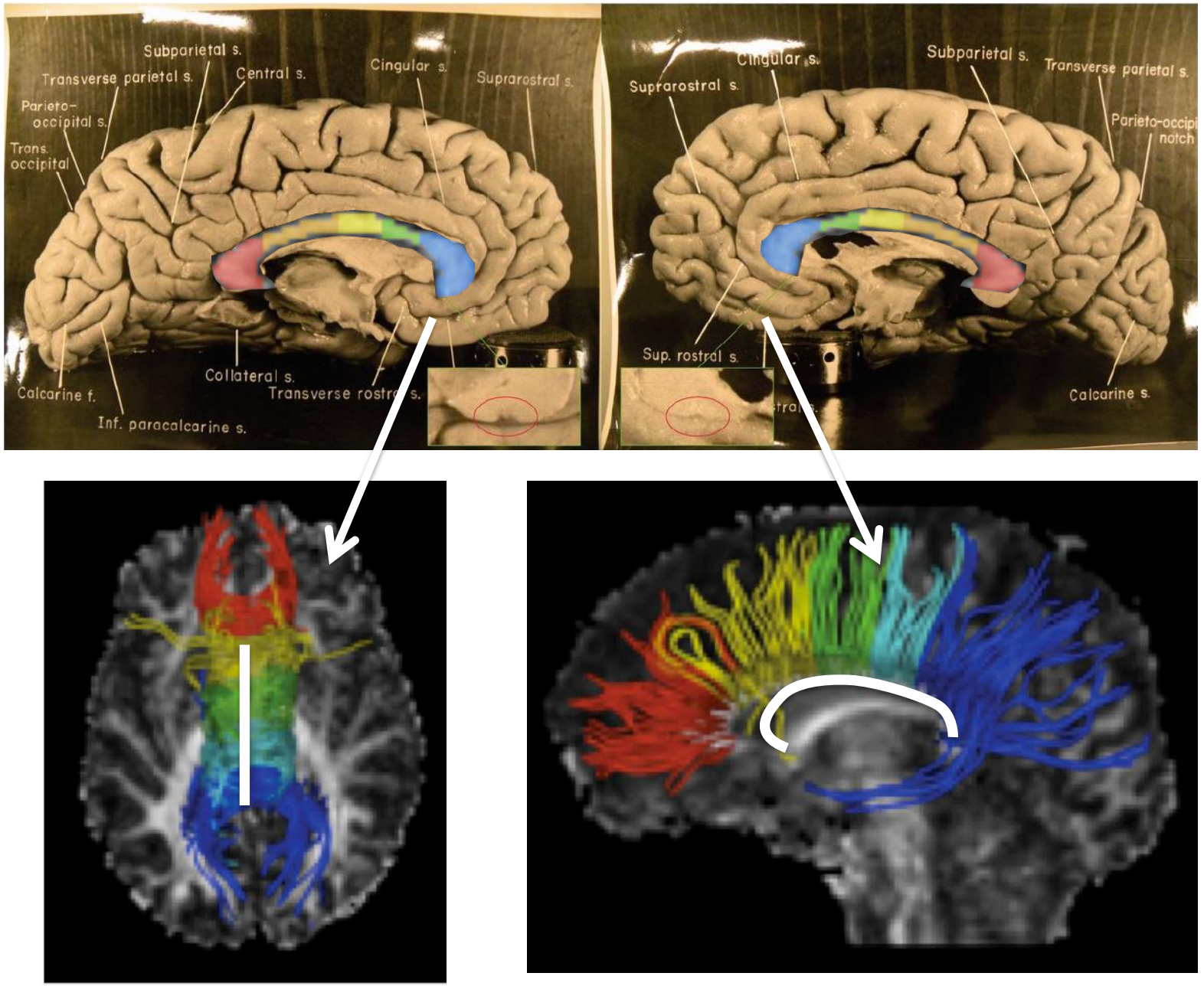




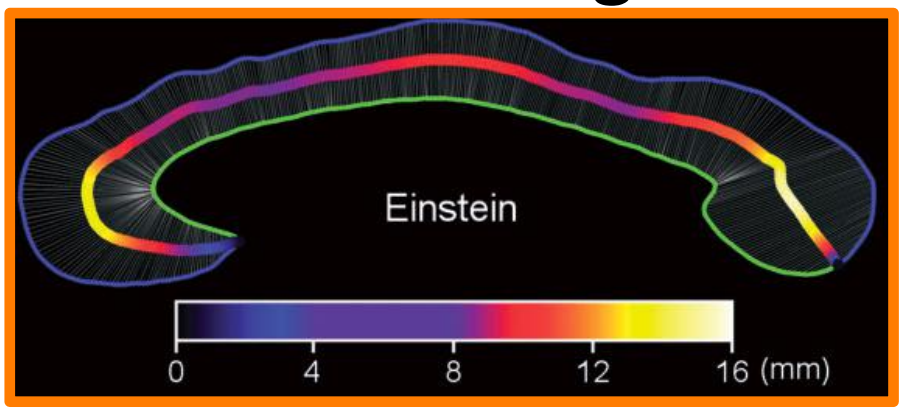
Einstein

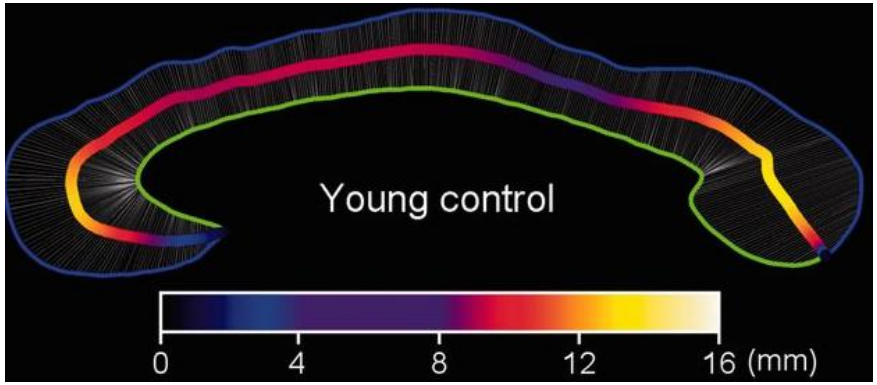


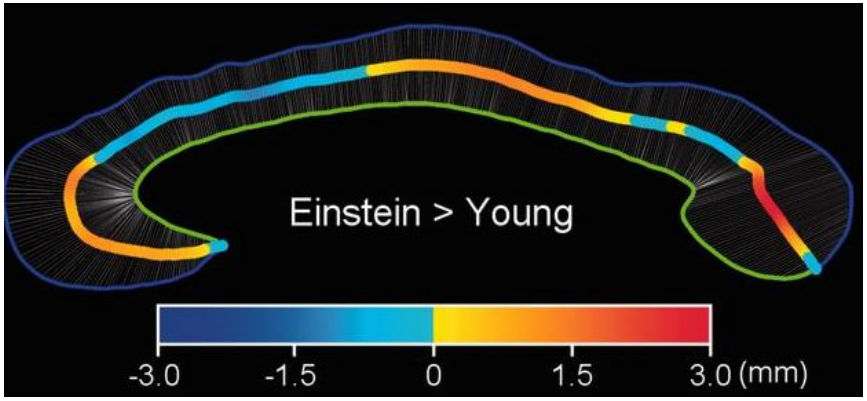
Corpus callosum

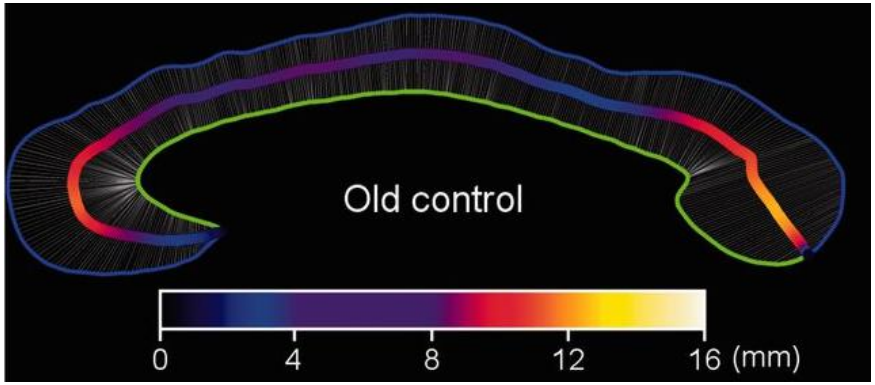


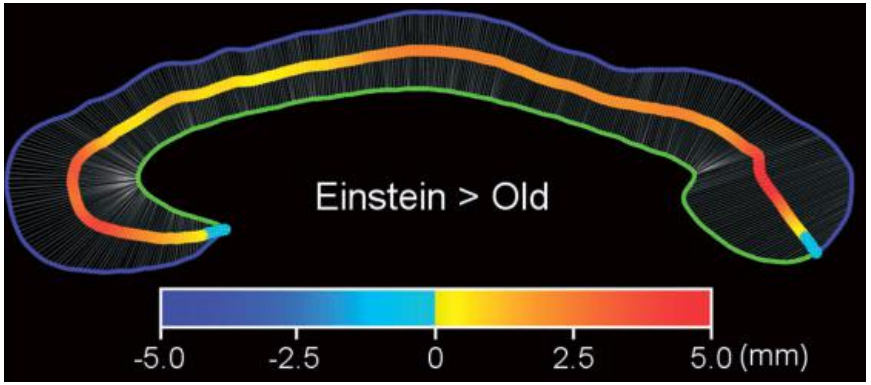
What age was Einstein's brain?





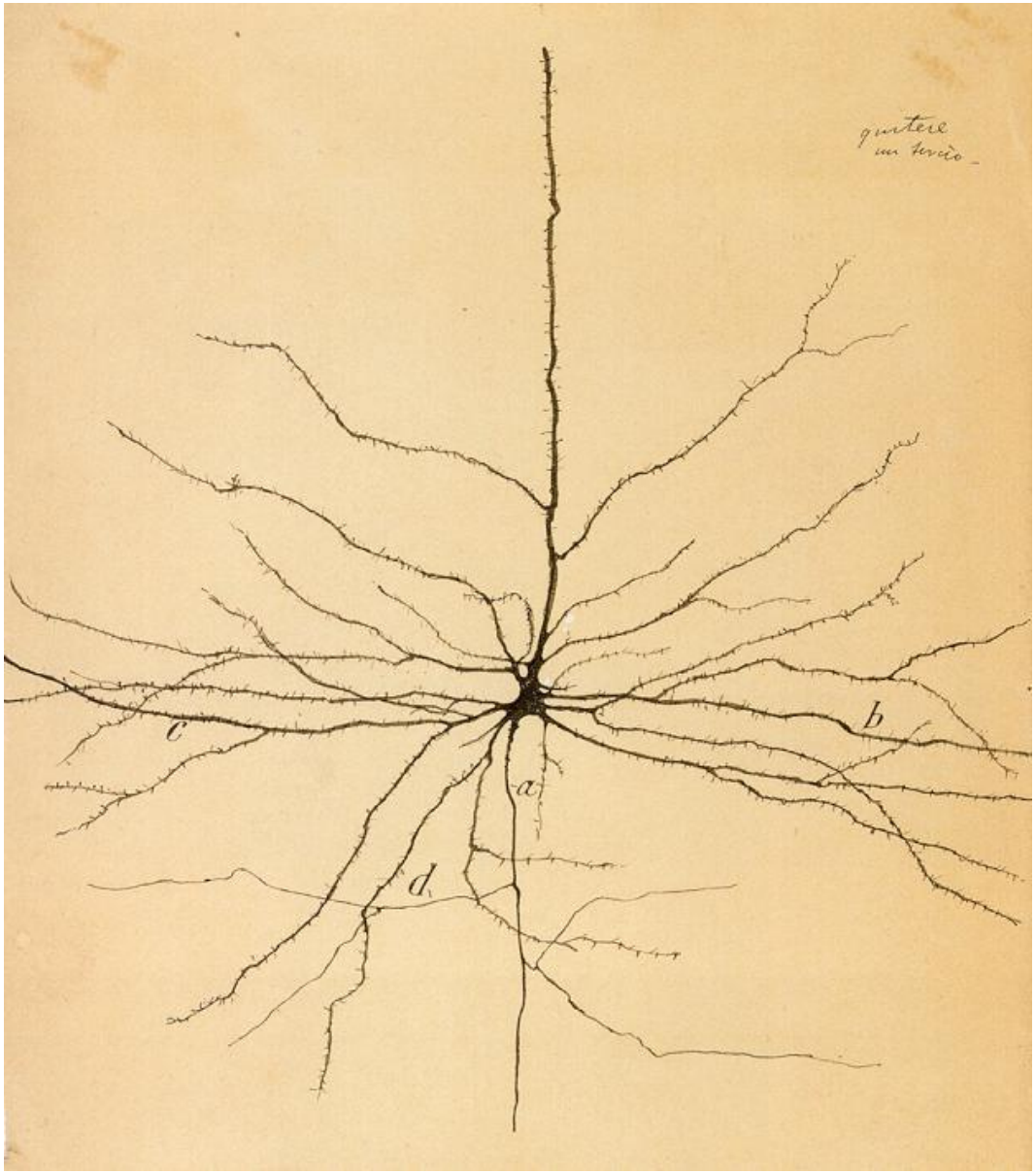




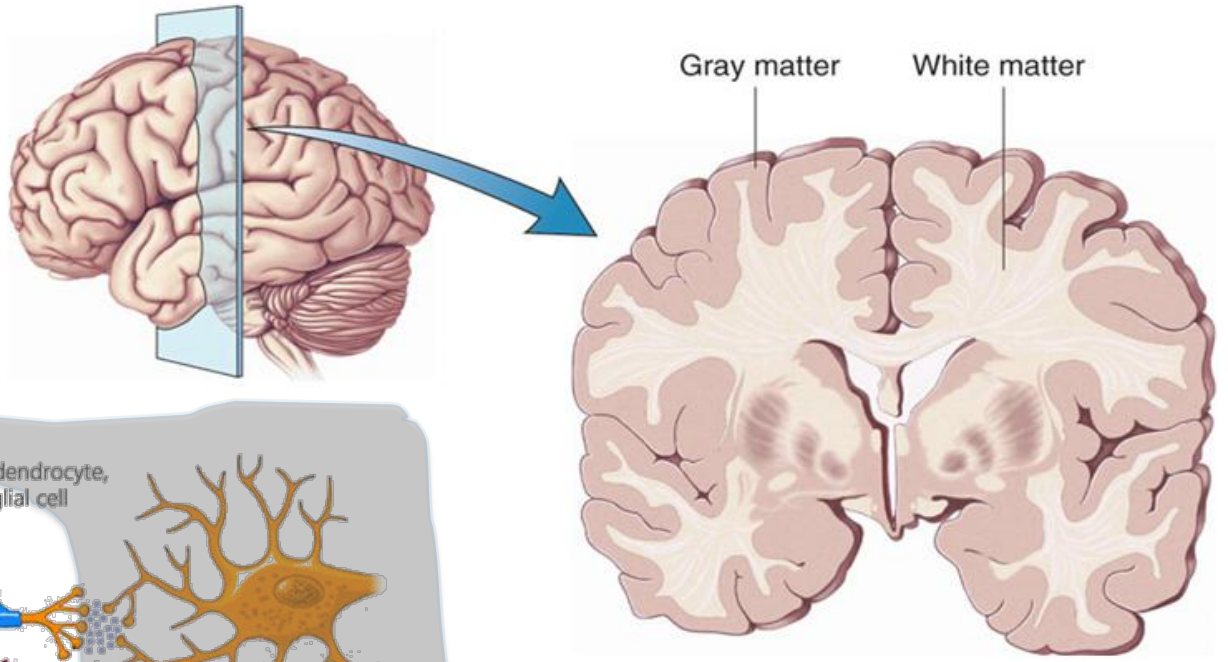


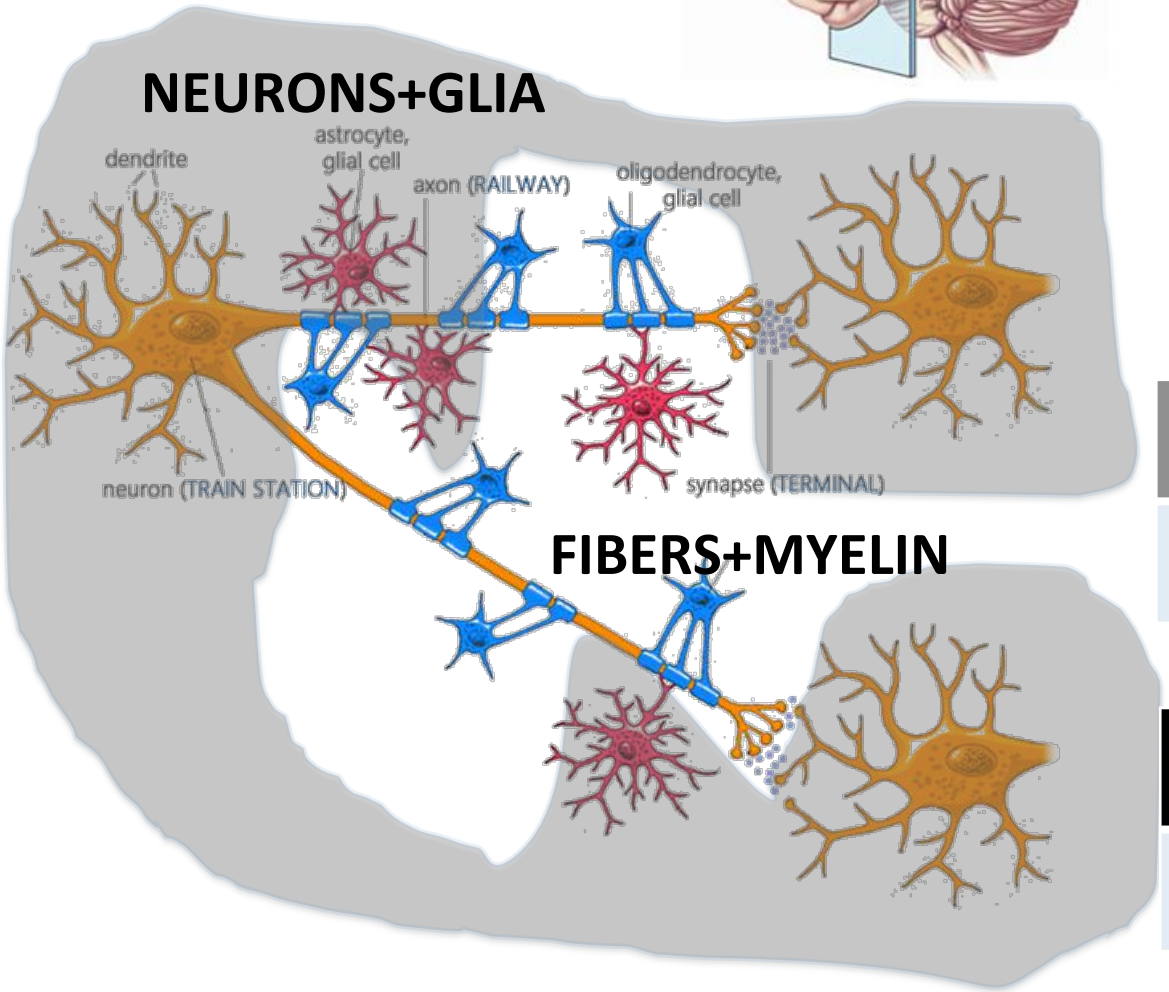
Men et al., Brain, 2013

The Neuron(s)



It is a matter of… colors





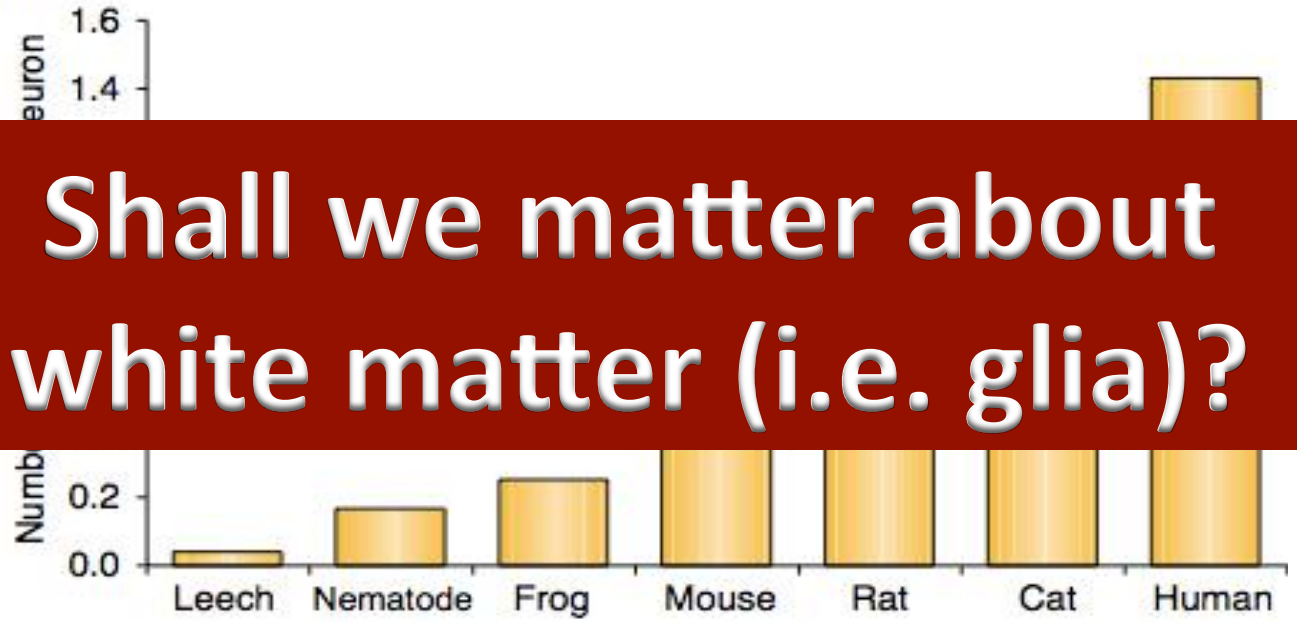
GRAY MATTER

NEURONS + GLIA

WHITE MATTER

FIBERS+MYELIN

Neuron-to-Glia Ratio



Shall we matter about white matter (i.e. glia)?

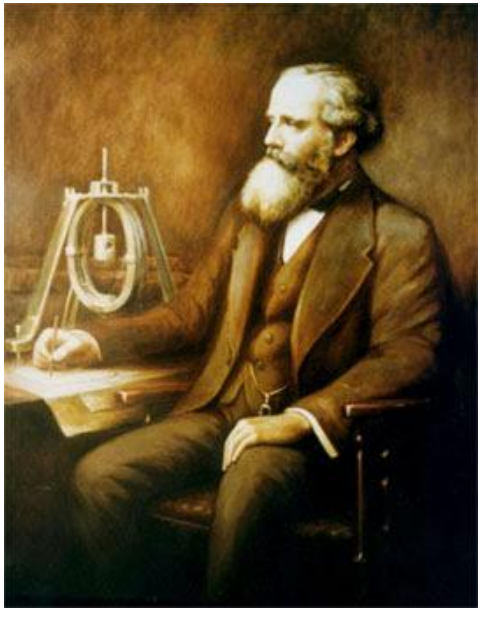
Nedergaard et al., TiNS, 2002

AVERAGE PERSON	EINSTEIN
1 : 1	**1 : 1.5 (2 : 3)**

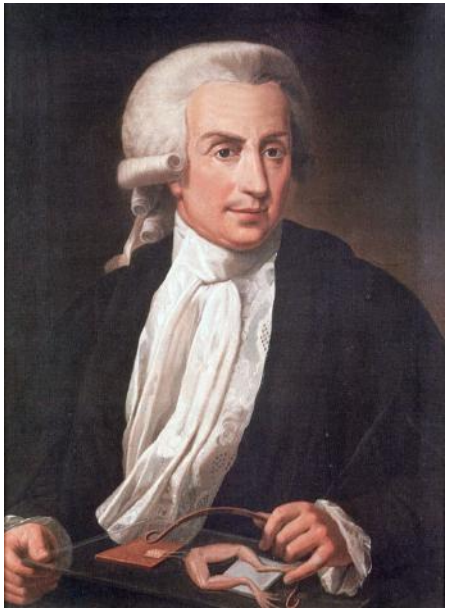
Diamond et al., Exp. Neurol. 1985

Electric excitability of Neurons

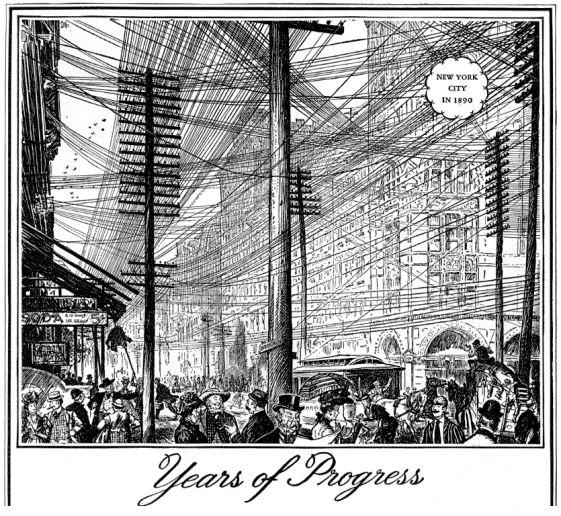
Karl Friederich Gauss
(1777-1855)

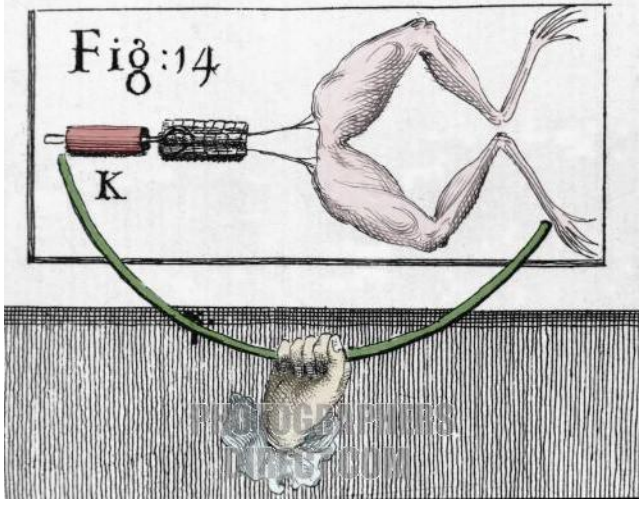


James Clerk Maxwell
(1831-1879)



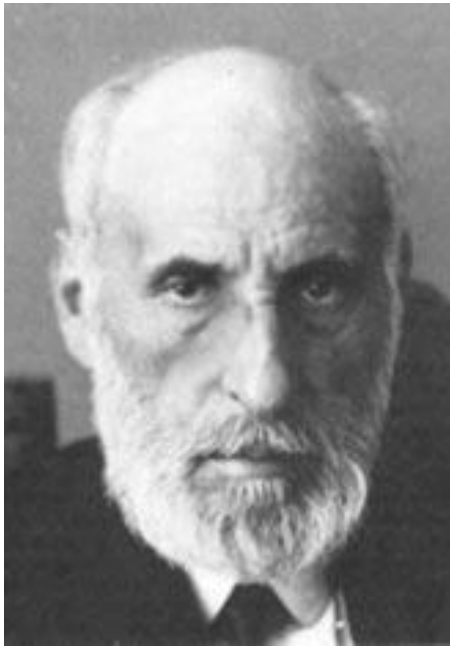
Luigi Galvani
(1737-1798)



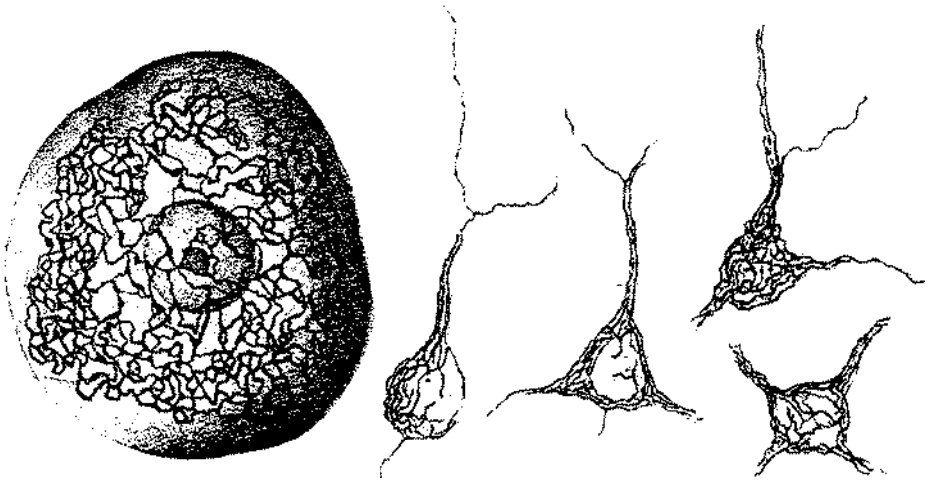


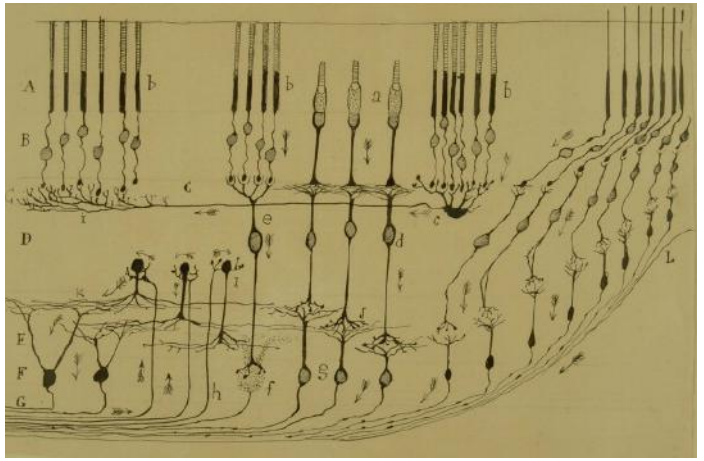
The Neuron Paradigm

Camillo Golgi
(1843-1926)

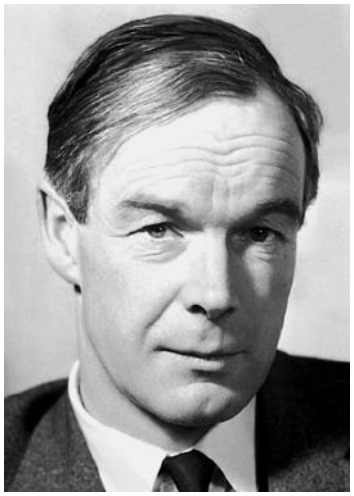


Santiago Ramon y Cajal
(1852-1934)

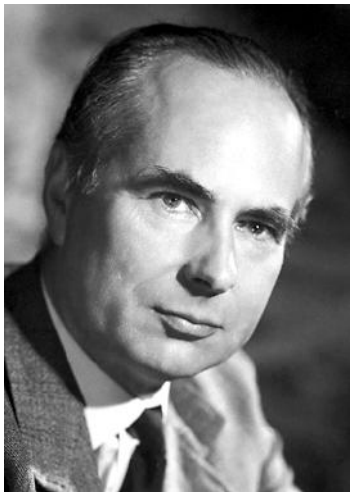




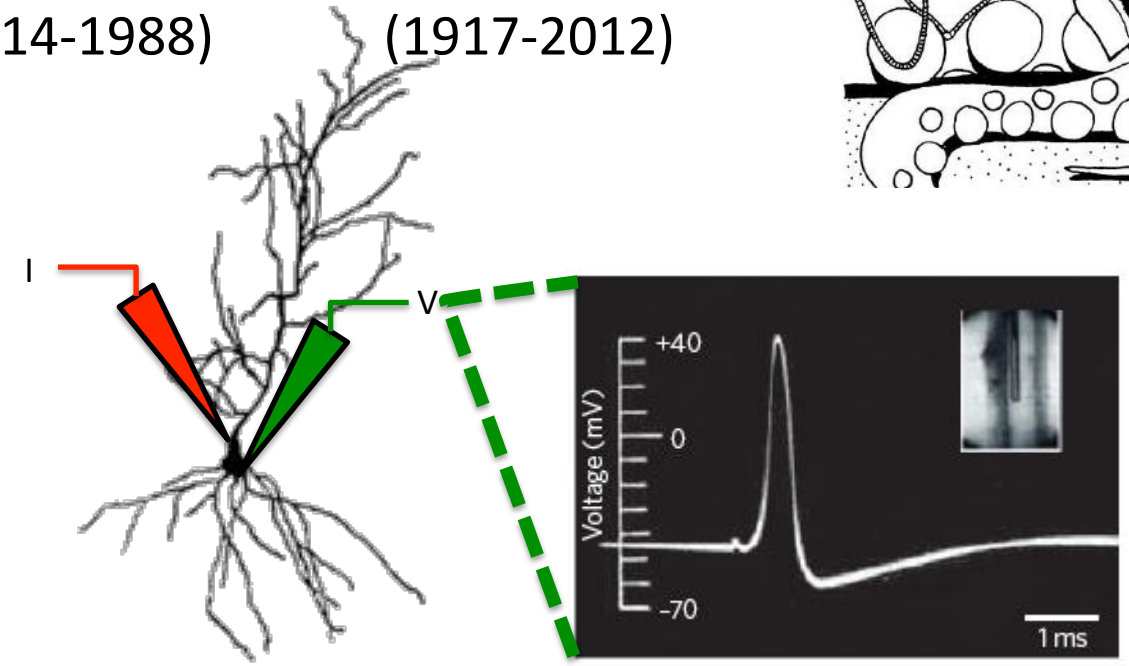
Neuronal Electrical Pulses



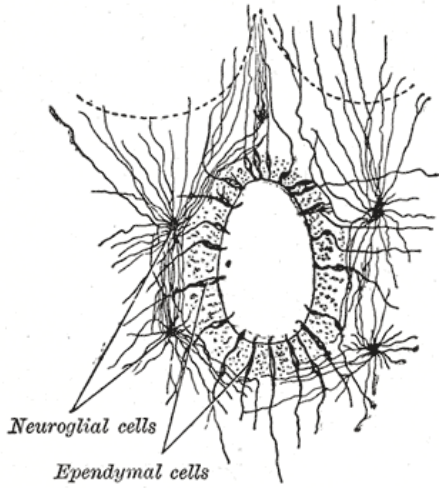
Alan Lloyd Hodgkin
(1914-1988)

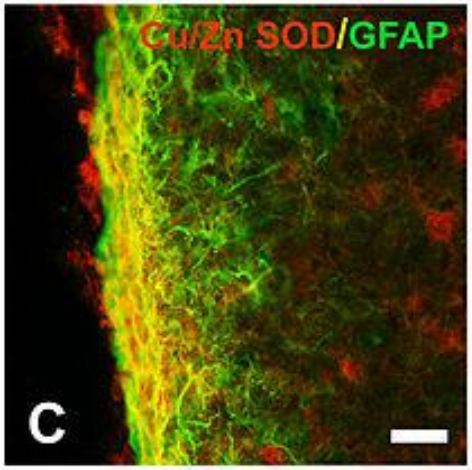


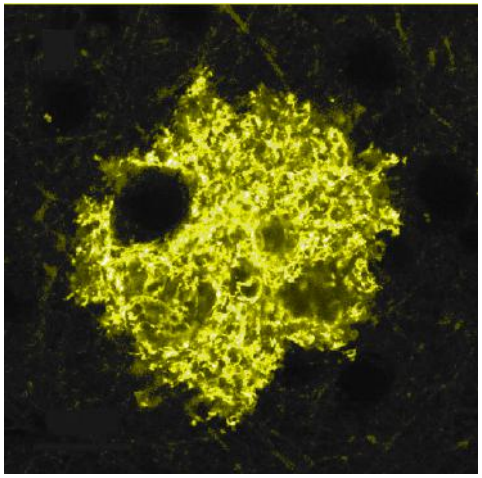
Andrew Huxley
(1917-2012)

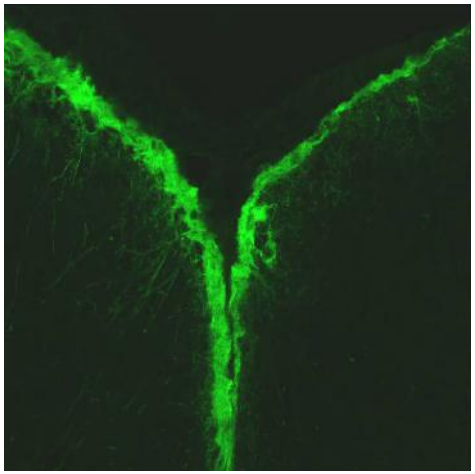


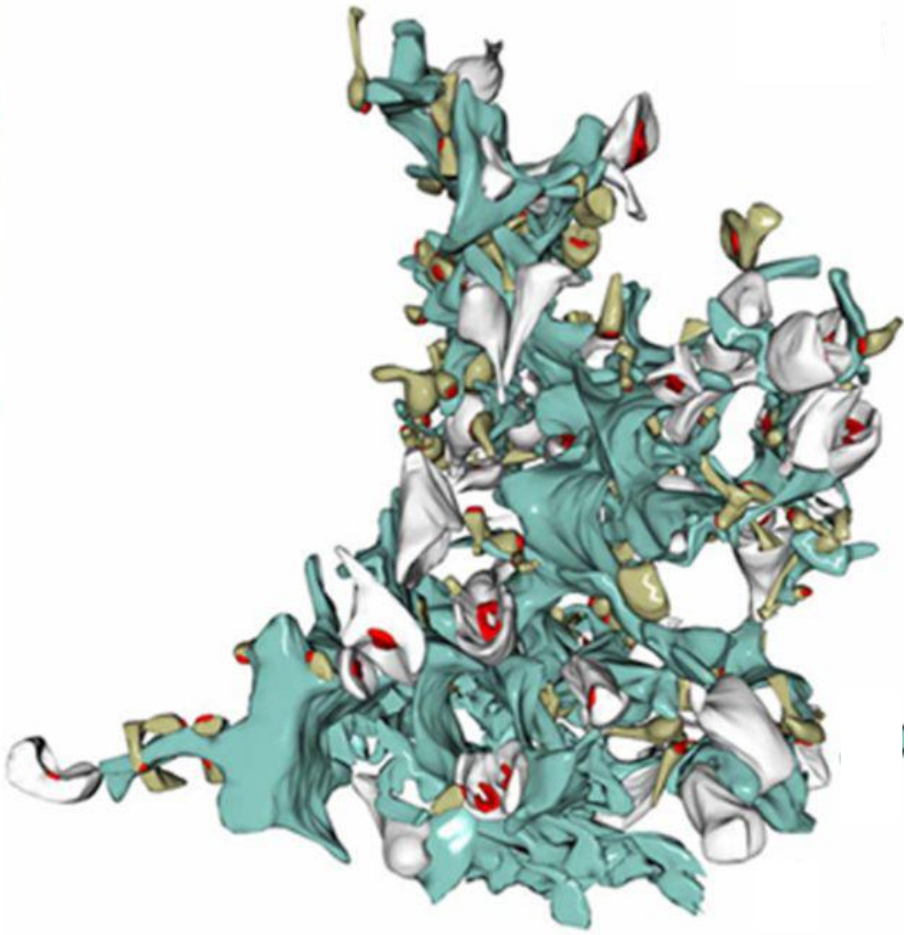
Glia: the brain's "glue"



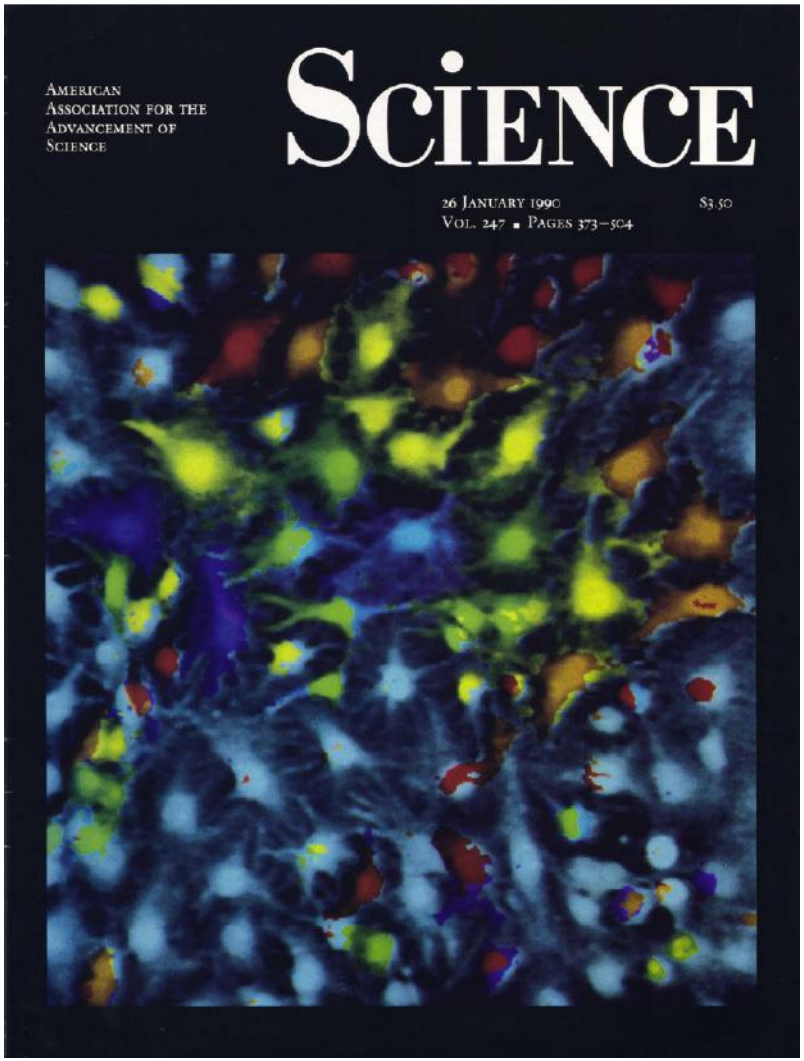






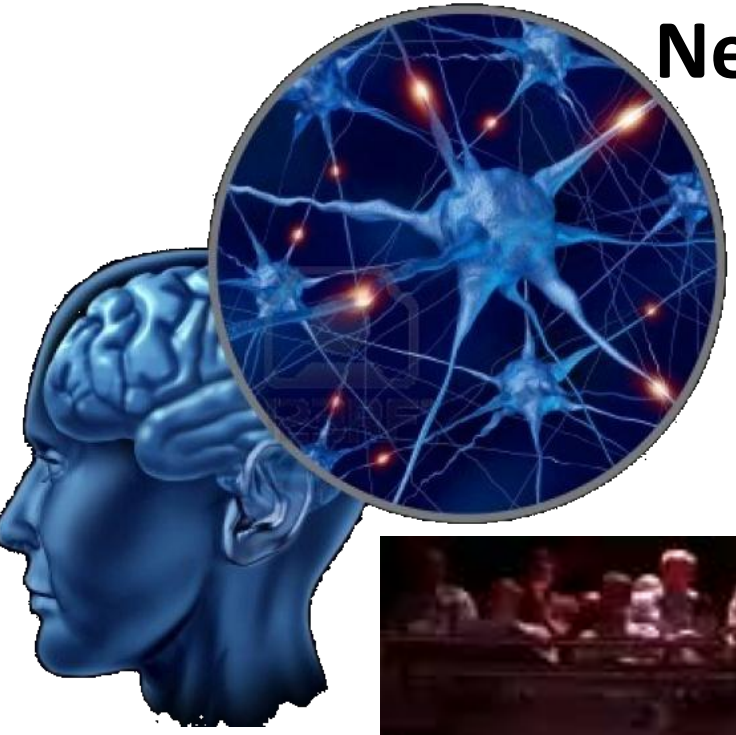


Astrocytes: Glia Rediscovered



"Calcium" Pulses

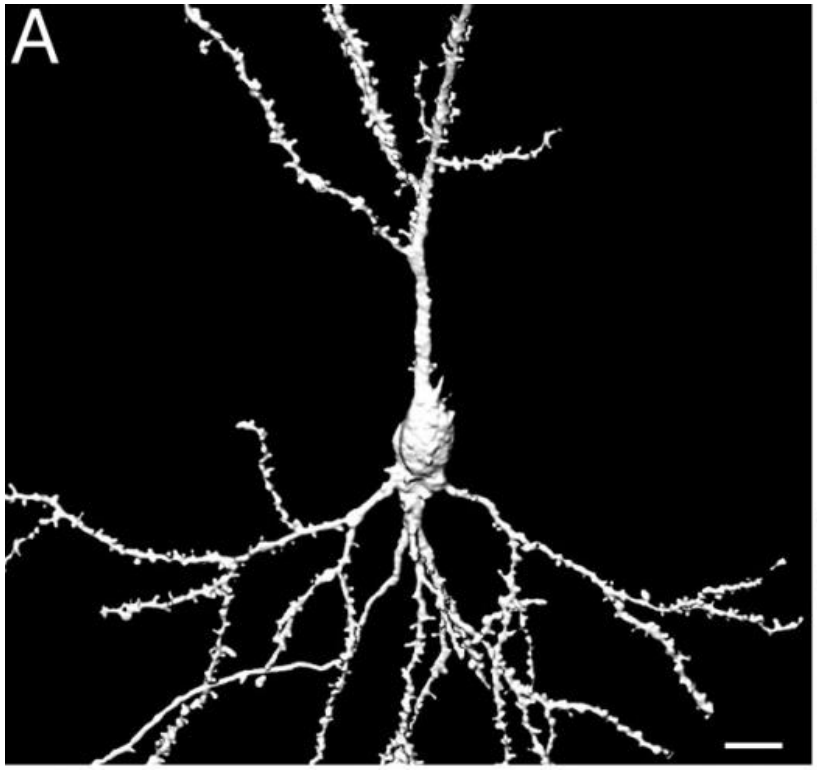
Neural Networks

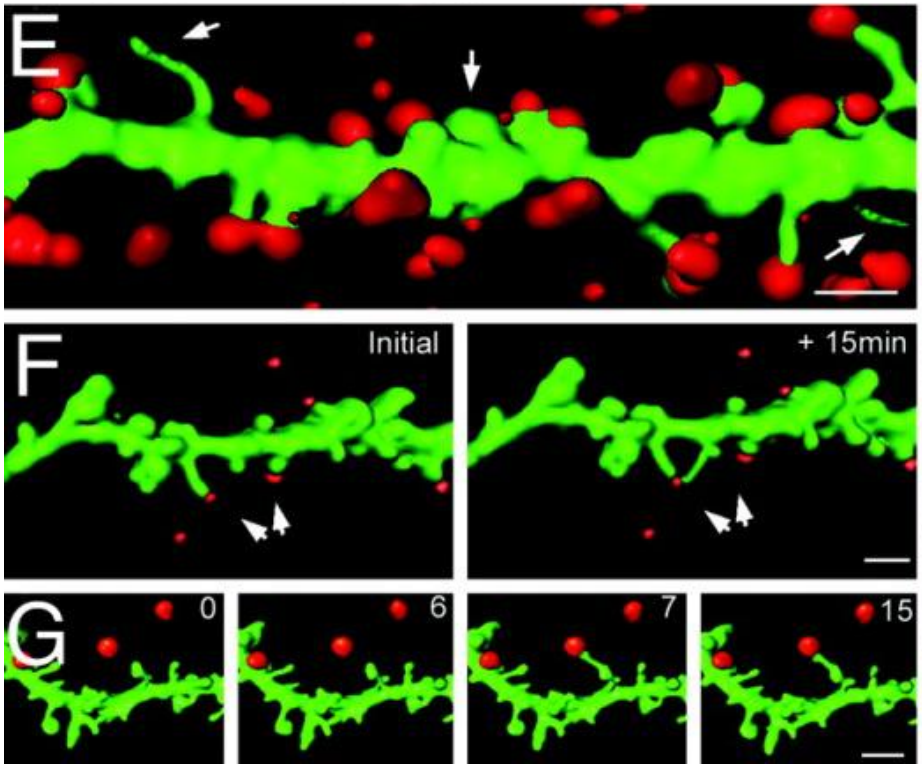


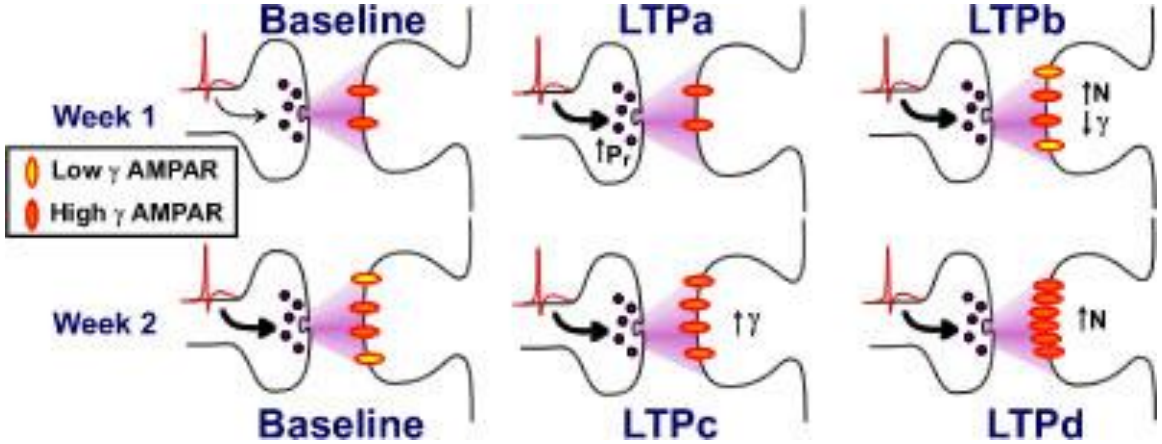
Stay connected!

The “classic” Synapse

Synaptic Plasticity







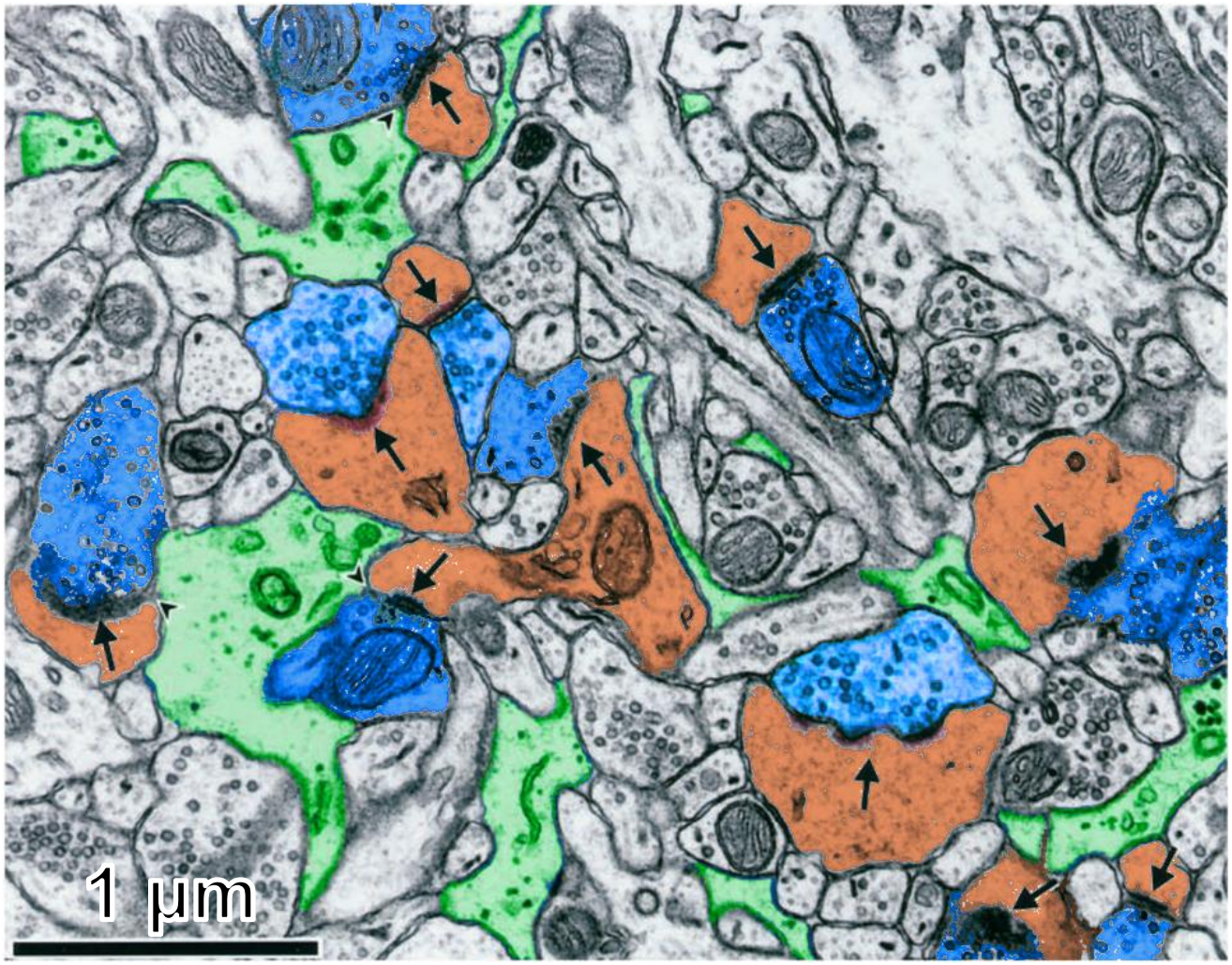
The Synaptic Self

100 000 000 000 **NEURONS**

1 000 000 000 000 000 **SYNAPSES**

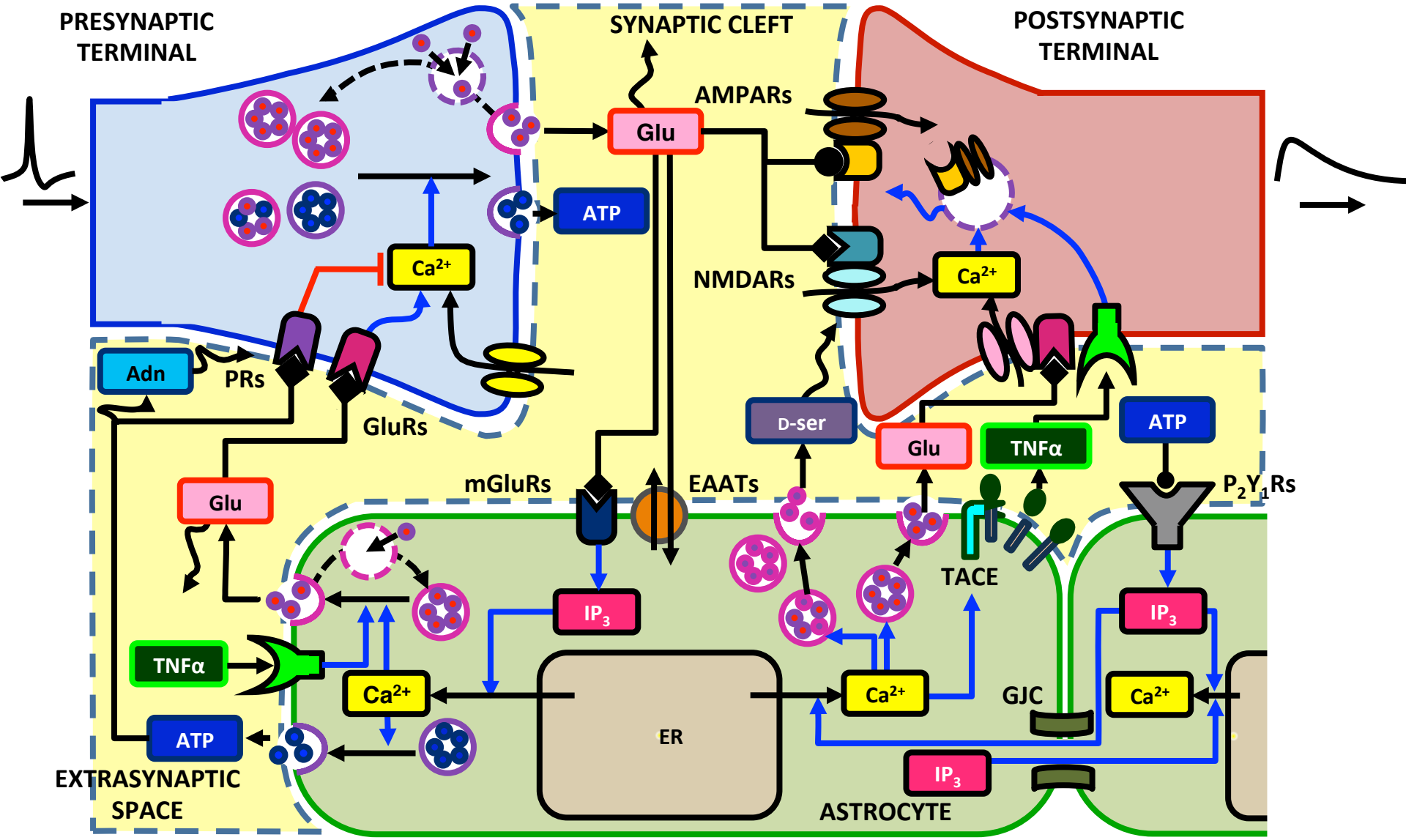
100 000 000 000 **GLIAL ASTROCYTES**

The “Tripartite” Synapse

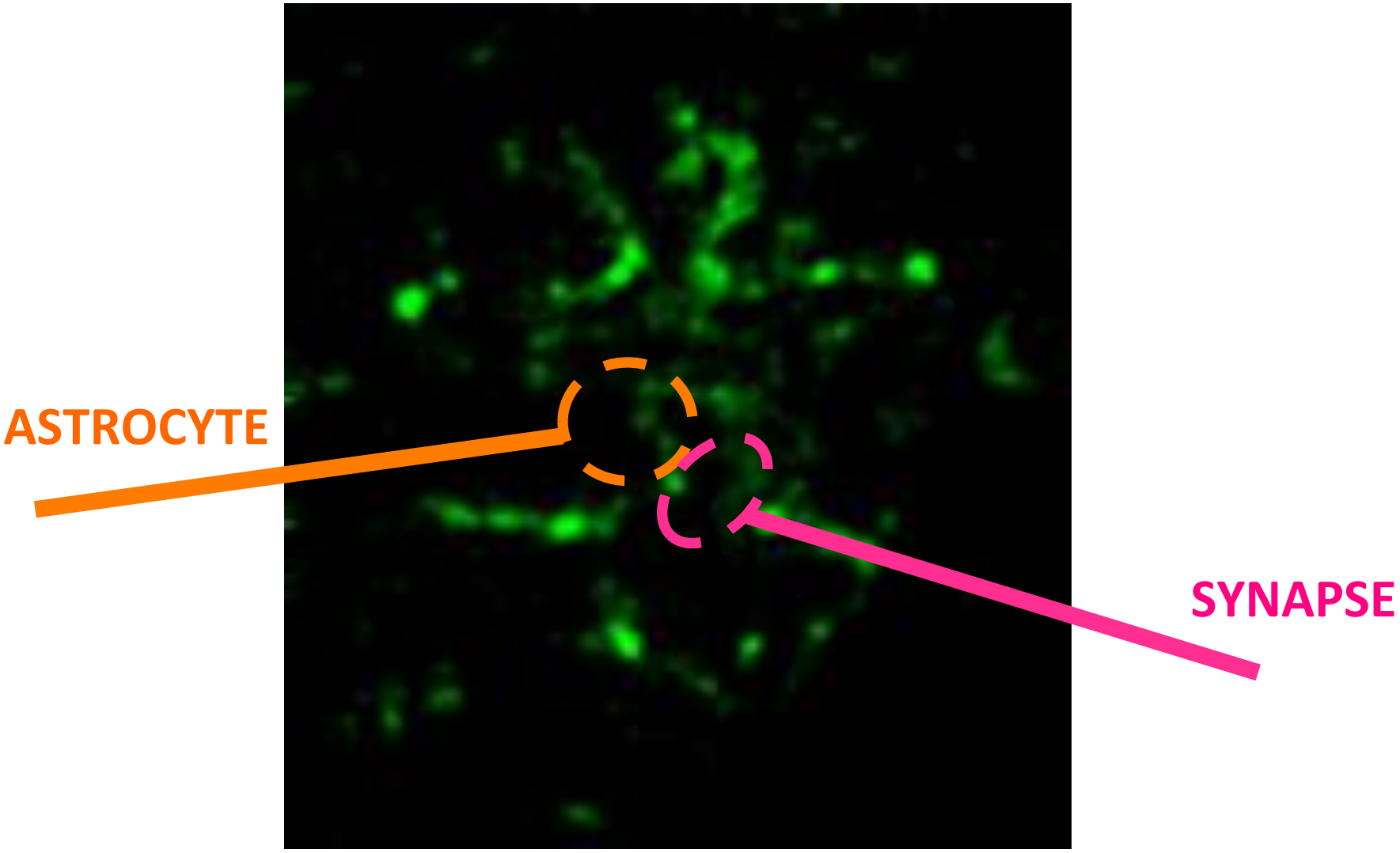


Ventura and Harris, *J. Neurosci*. 1999

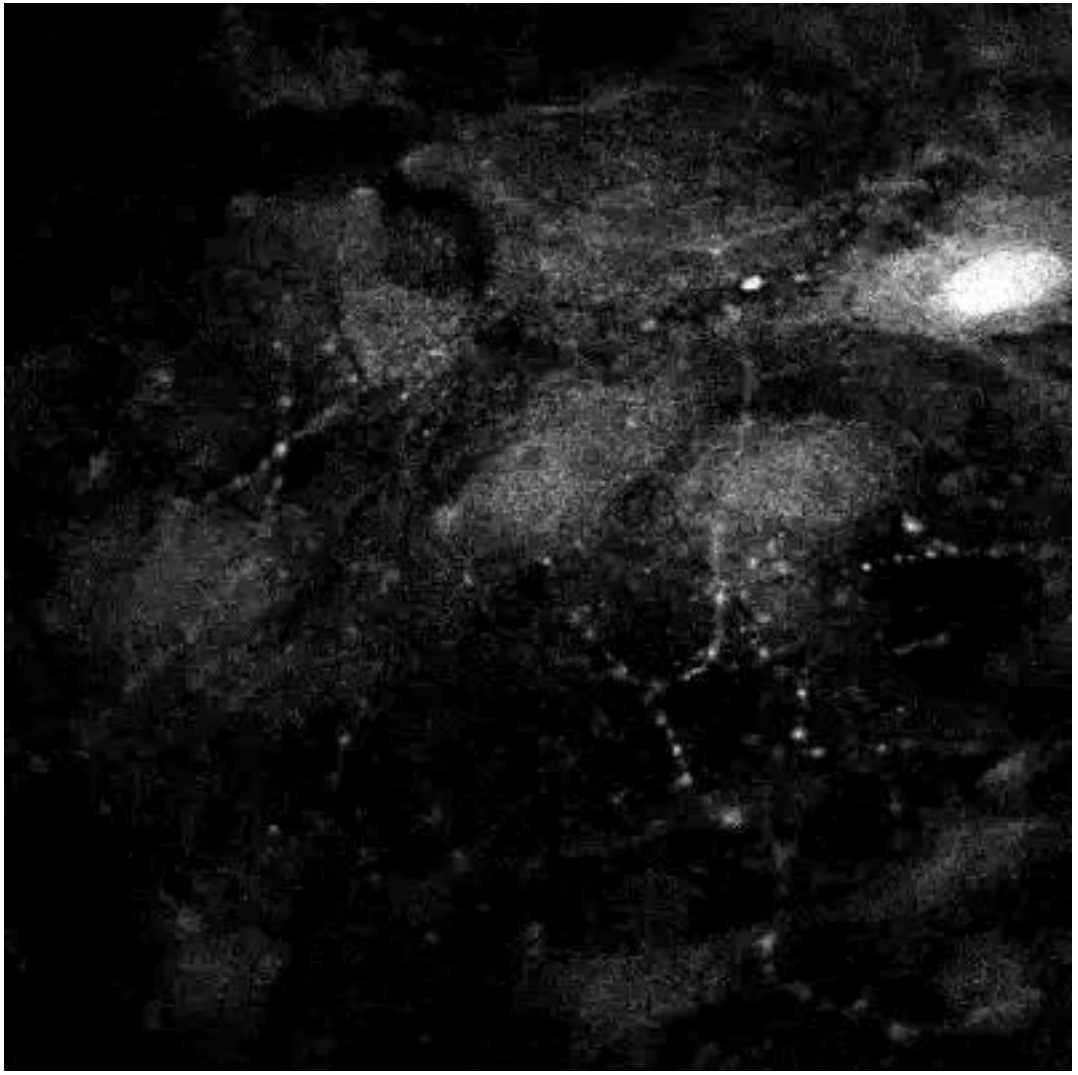
Synapses with Glia



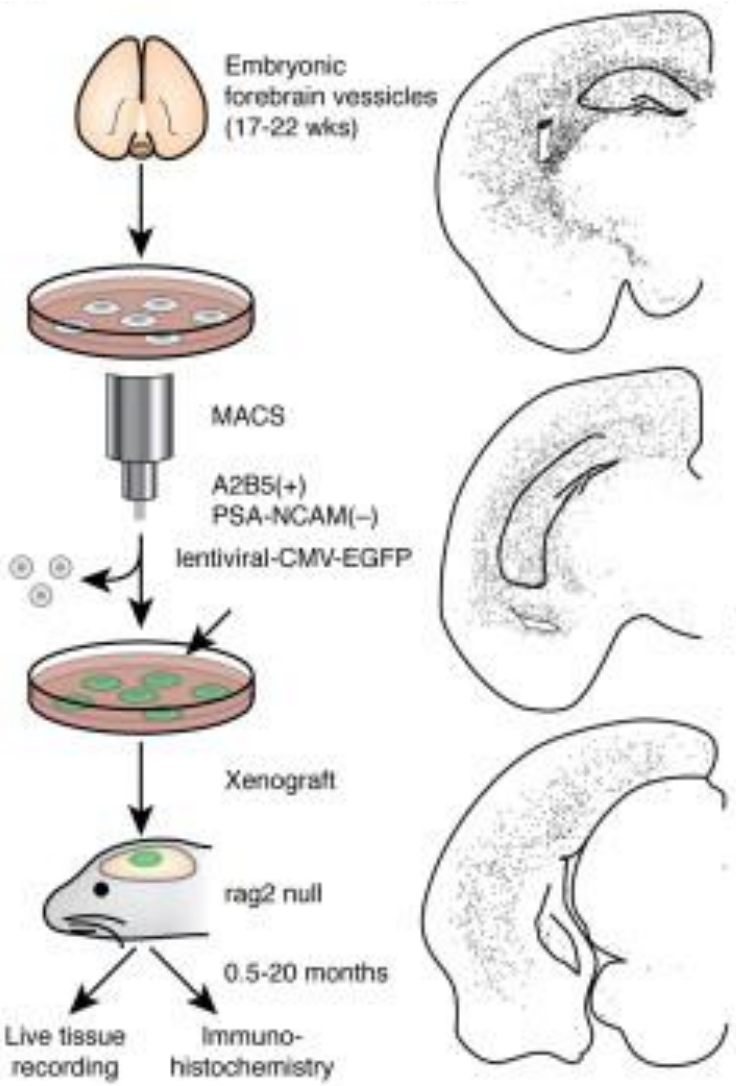
Gliotransmission

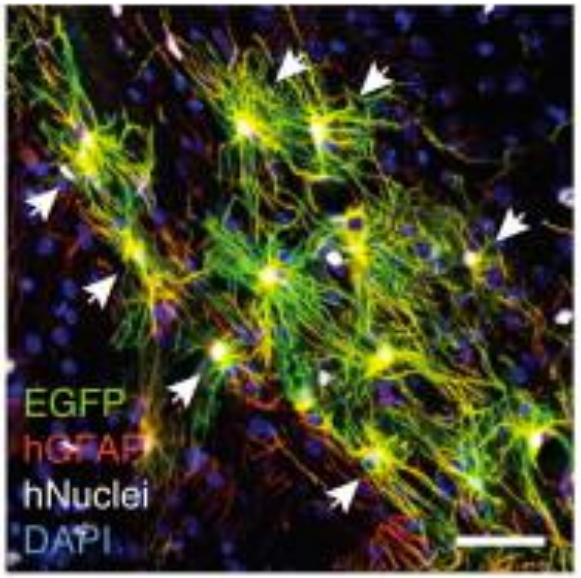


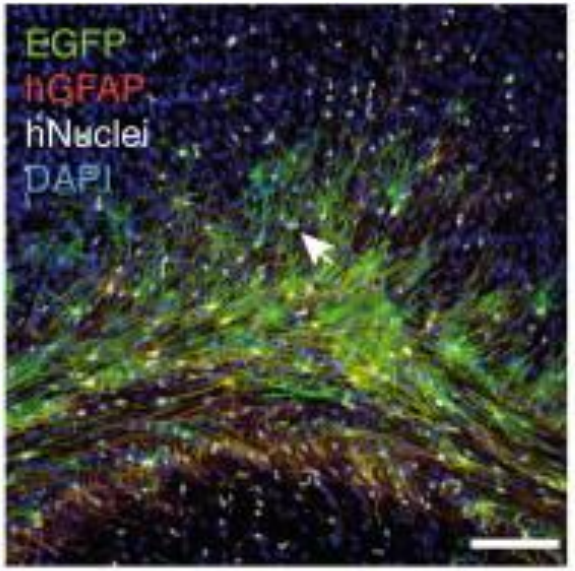
Cross-talk between astrocytes and neurons



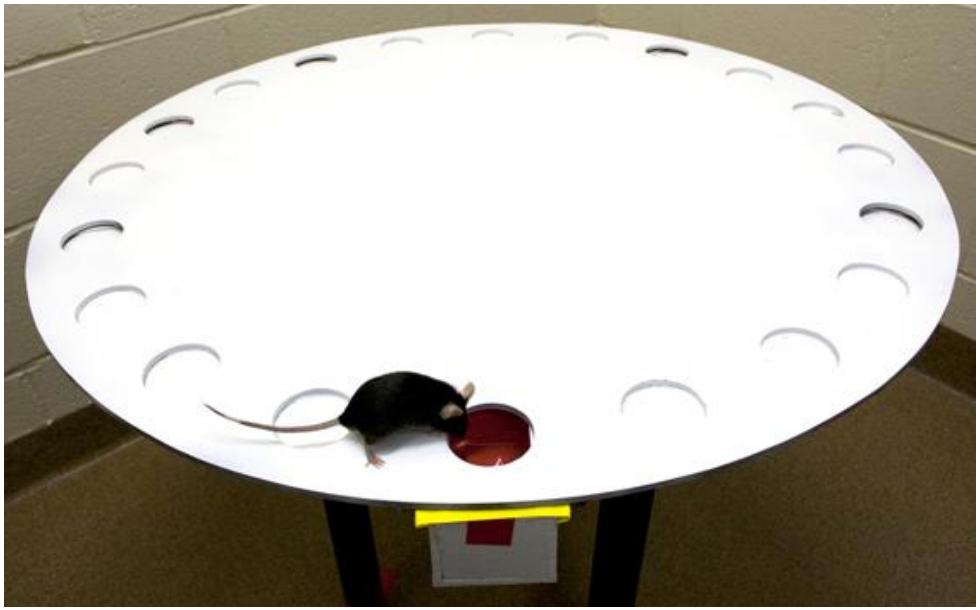
Frankenstein mouse

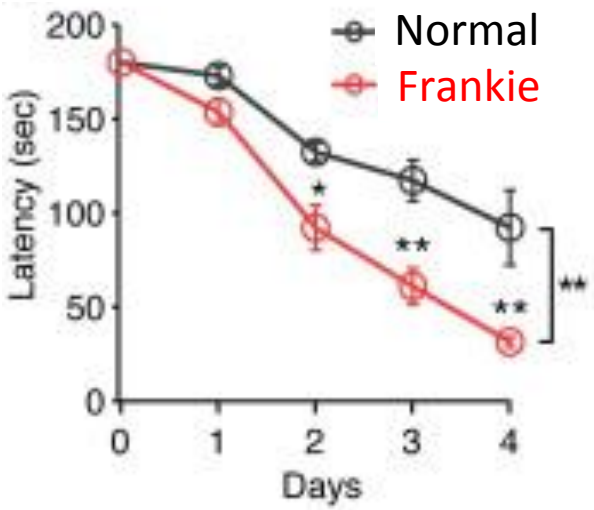


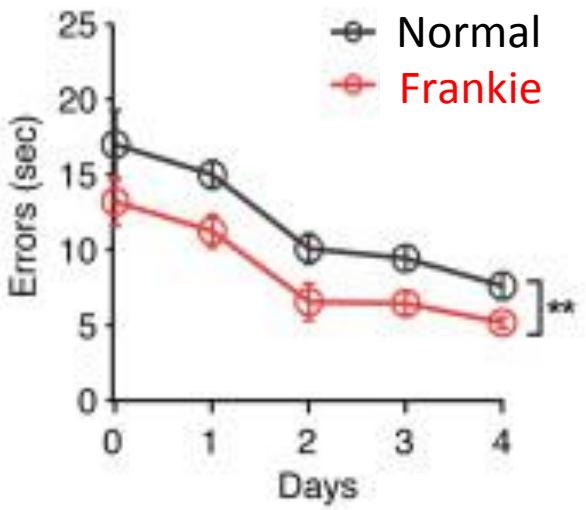




Barnes' labyrinth: A cognitive test



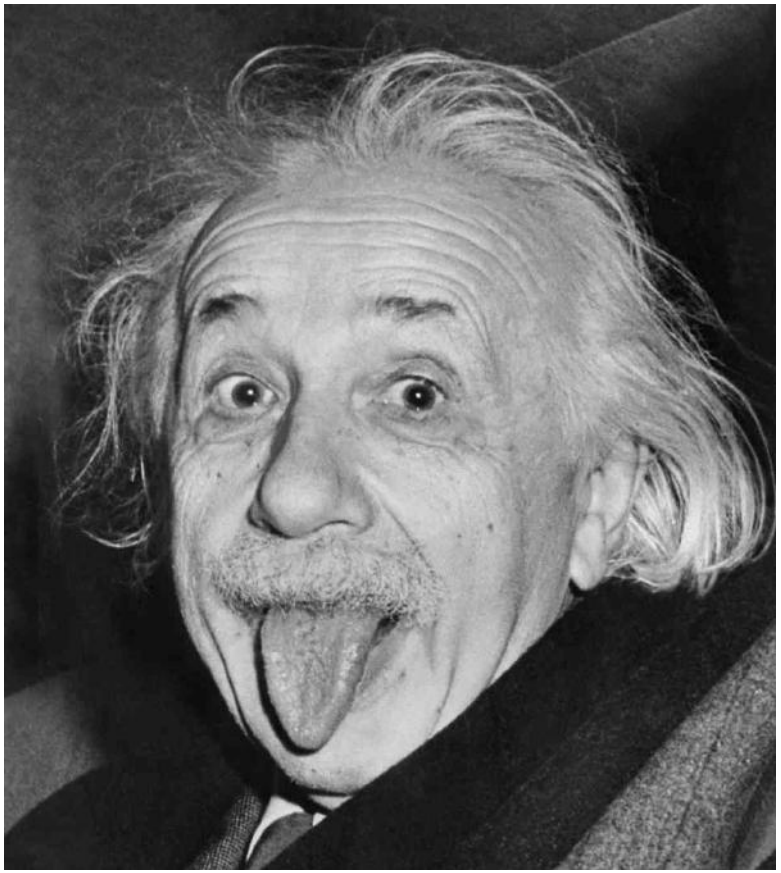




Is this the “final” answer?

NOPE! *Yet*…

Stick to it… Albert!



Thanks!