Santiago Ramon y Cajal (1852-1934)
Morphological heterogeneity of neurons
Functional Polarity
Neurons can have more or less extensive Dendrites.

Principal cell of auditory nucleus in the brainstem.
It is mainly through the **Axon** that a neuron sends signals to its targets.

Cortical Chandelier Neuron
Neurons have one axon. It can be highly branched.
Some neurons have no axon

Granule cell of the olfactory bulb
Reyher et al. 1991

Amacrine cell of the retina
A neuron contacts its targets through **Synapses**
Target cell not necessarily a neuron.

Muscles and Glands
Boutons are axonal swellings or varicosities found typically at the sites where synapses occur.
Oligodendrocyte
Node of Ranvier
Astrocyte
Astrocyte
Astrocyte
Microglia
Schwann cell
Green Fluorescent Protein
Pacific jellyfish, *Aequoria victoria*
*Ex*: 395 nm  *Em*: 509 nm

Imaging of Living Neurons
GFP viral infection
GFP transgenic mice

Feng et al 2000
long term *in vivo* imaging of individual neurons

Oheim et al. 2001

Holtmaat Unpublished in Chklovskii 2004

Trachtenberg 2002