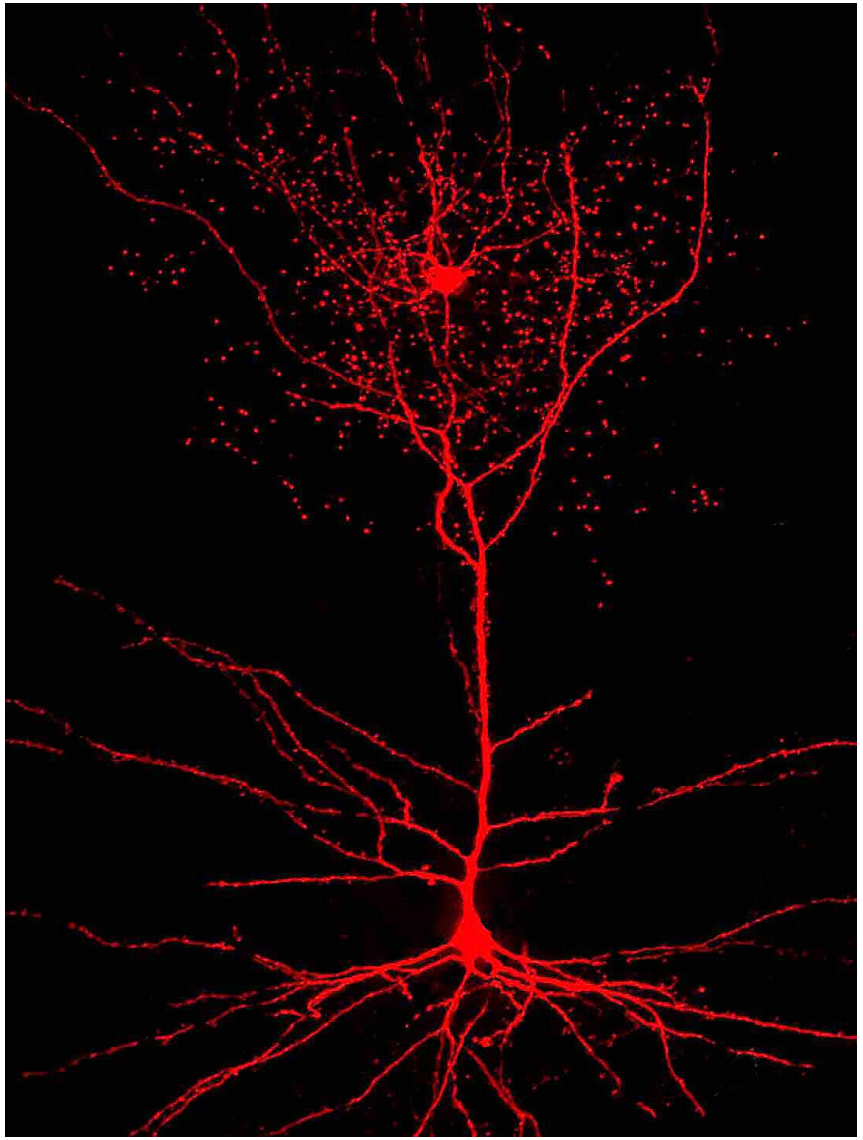
NEUR 265

Thursday, February 5th, 2026

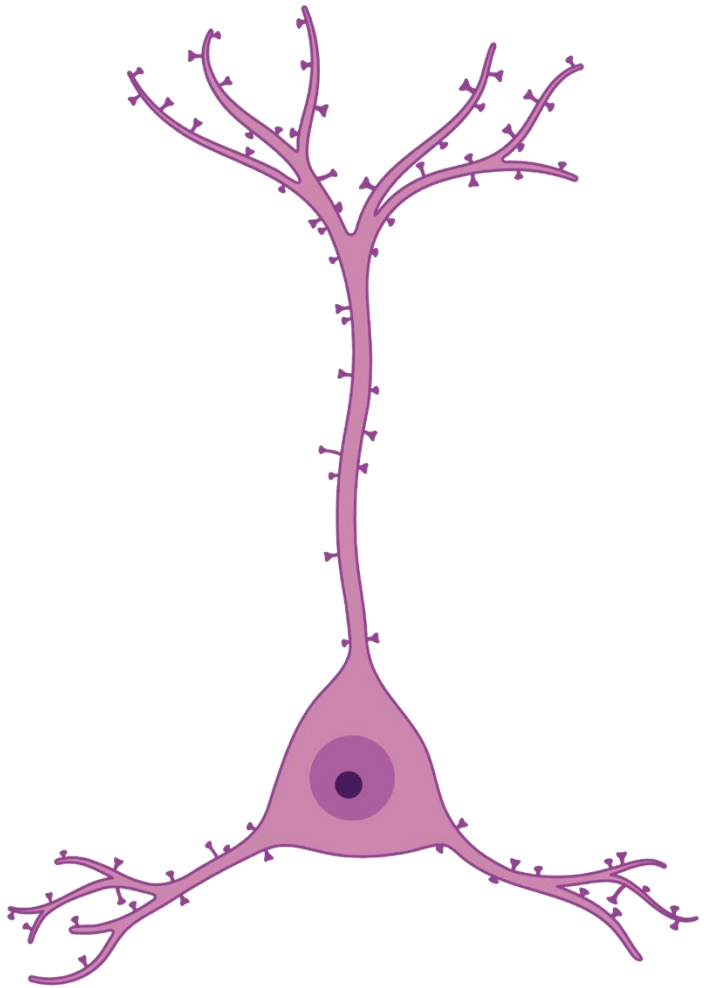


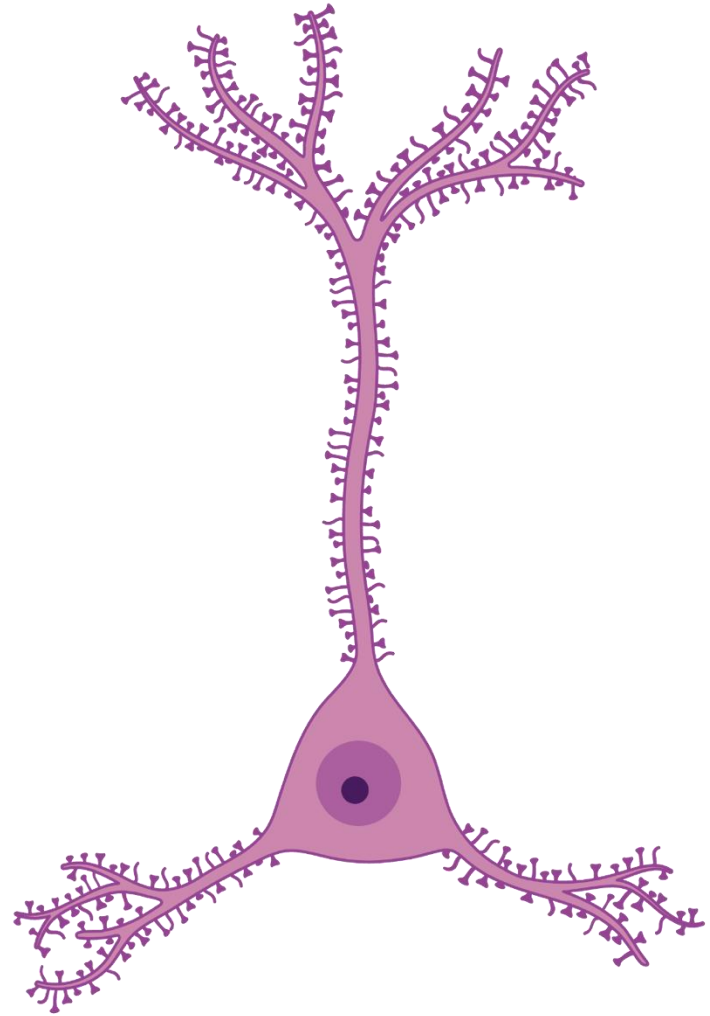
The brain is made up of many cells

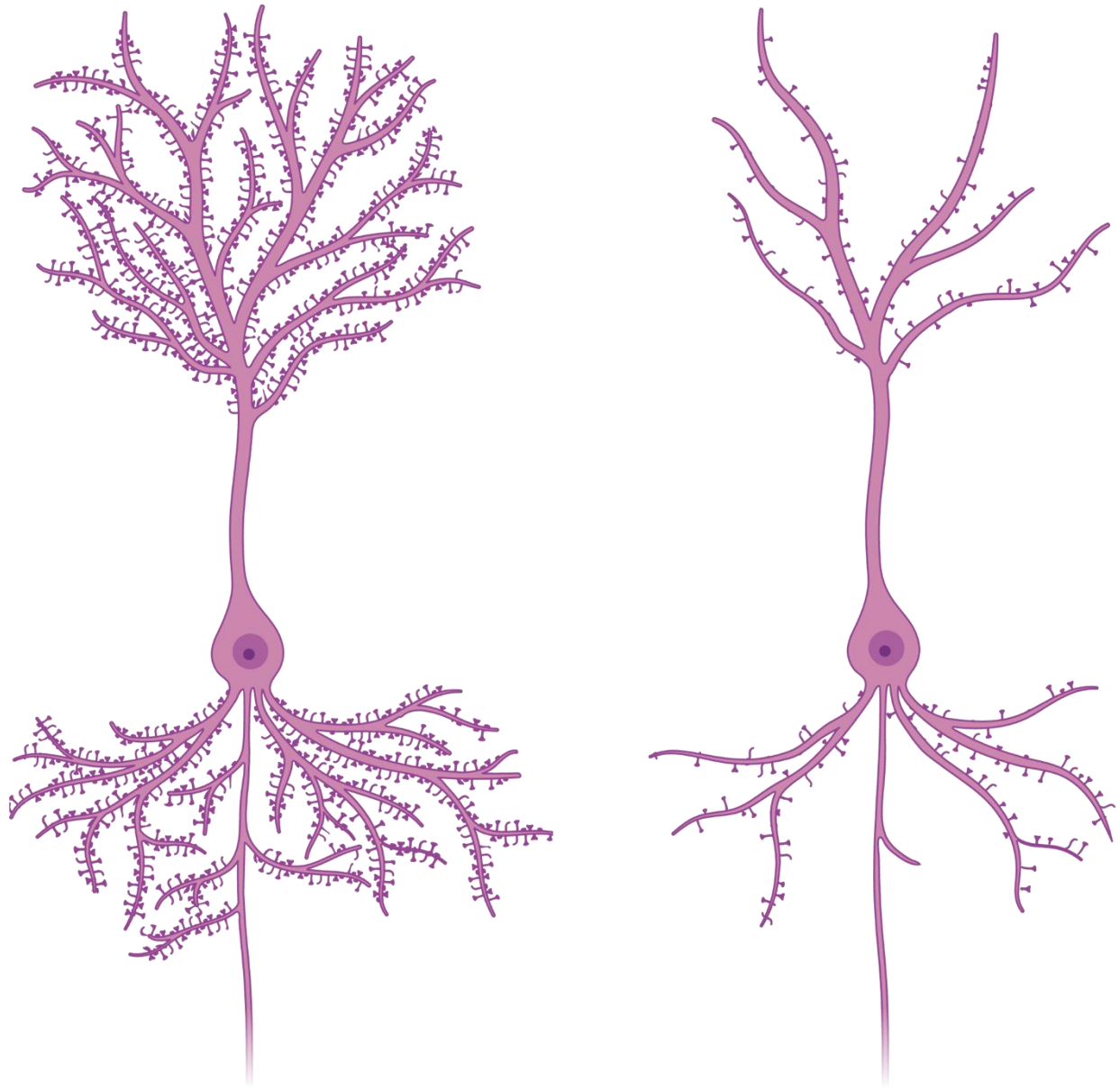
These cells are called **neurons**

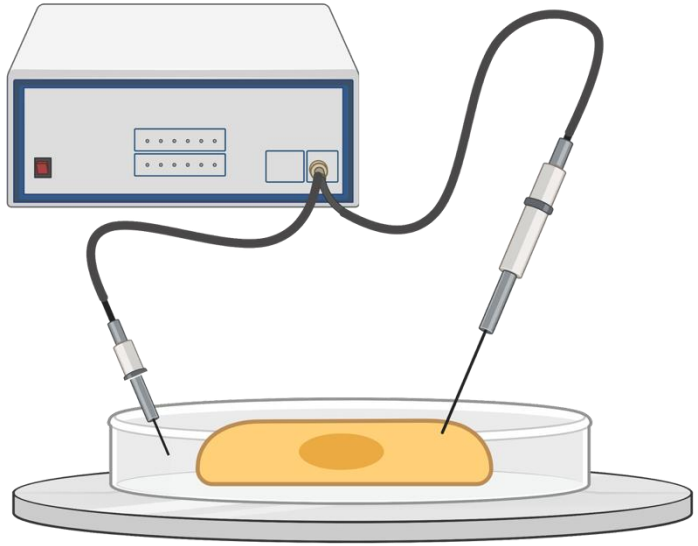
Are all neurons the same?

What are some attributes that neurons have?







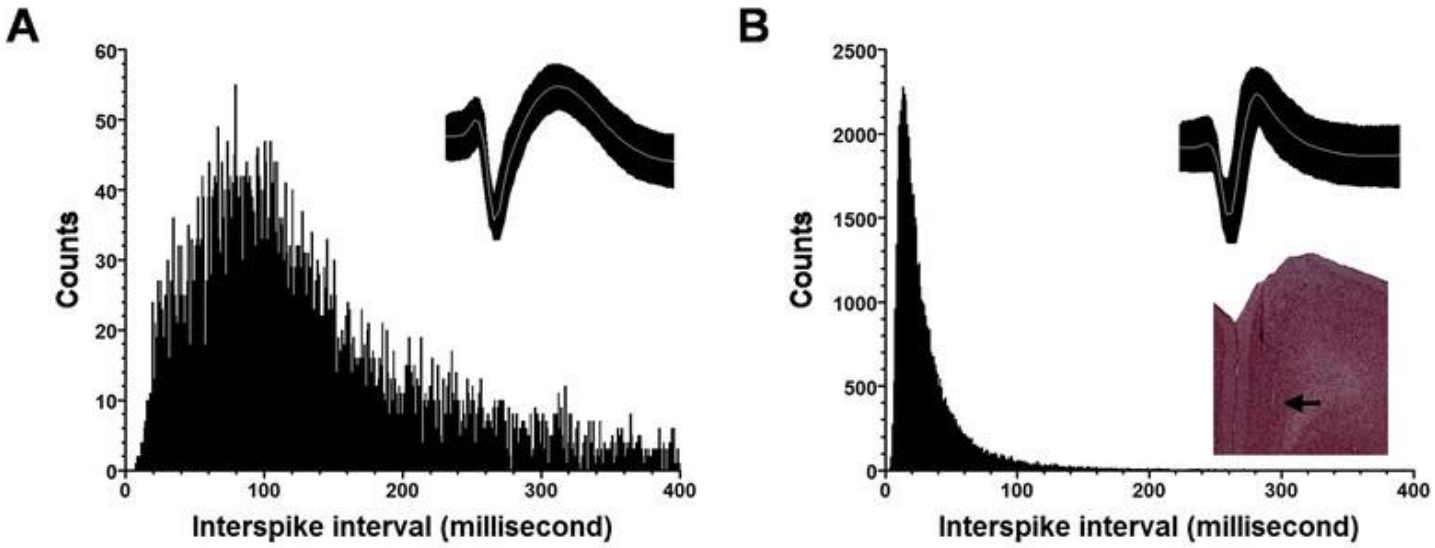


Physiological properties:

Action potentials

Post-synaptic potentials

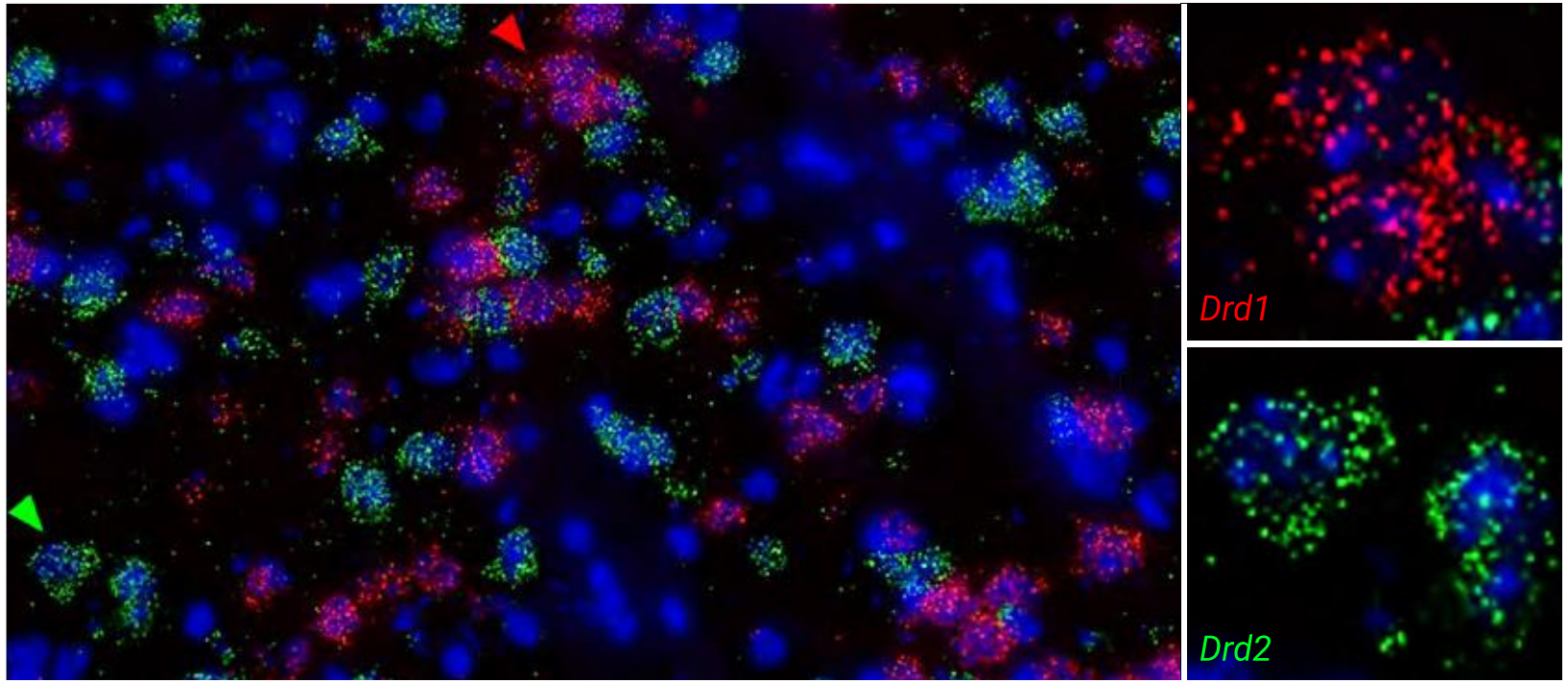
Resting potential



How to find these cells?

Cells also have unique patterns of gene expression

Many cells have **marker genes** – genes that are uniquely expressed in that “type” of cell



Drd1 = D1 receptor-expressing cells in the striatum

Drd2 = D2 receptor-expressing cells in the striatum

You can use marker genes to look at cell morphology and physiology

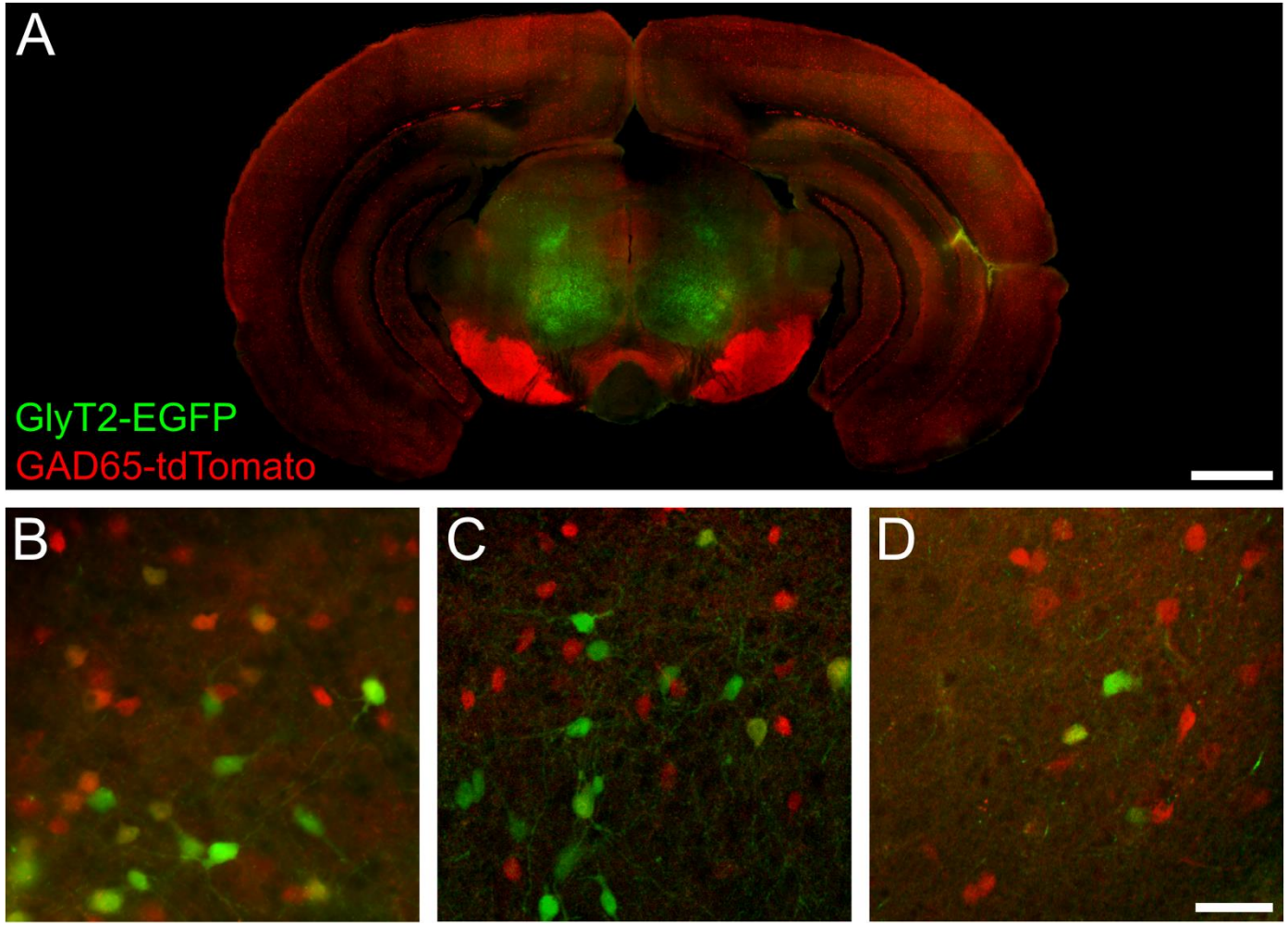
Cre-lox recombination

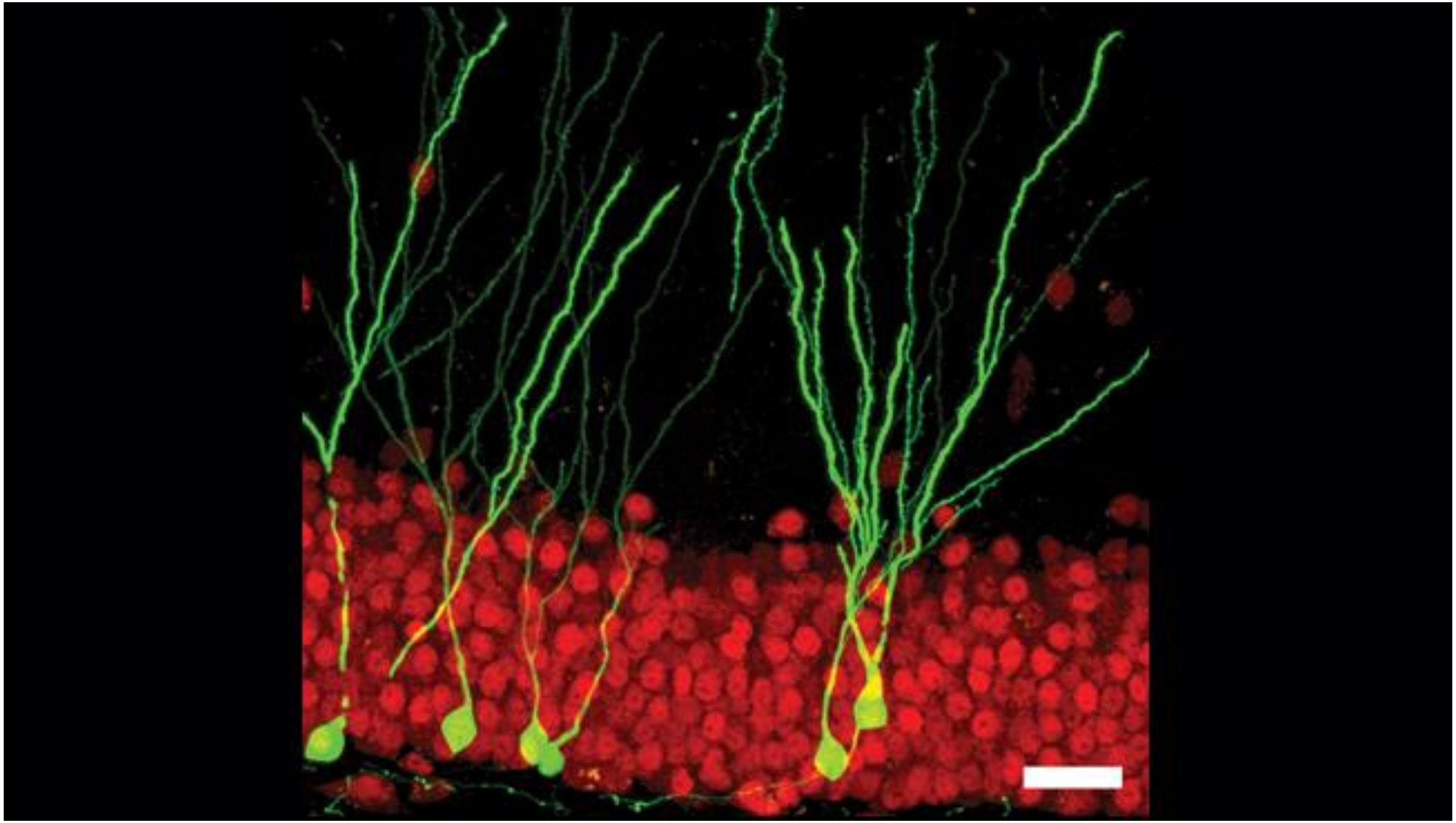
Make a mutant mouse that expresses Cre whenever a marker gene is also expressed

Inject a virus that codes for a fluorescent protein – like GFP or tdTomato

The gene that codes for this protein is flanked by sites that keep it from being transcribed

Cre is like a pair of scissors that cuts these sites off – so in cells that express Cre, the fluorescent protein is also expressed





Questions:

I inject a virus that codes for GFP into an *Slc17a7*-Cre transgenic mouse (*Slc17a7* is a marker gene for neurons that release glutamate). The gene that codes for GFP in my virus is not flanked by loxP sites. Which neurons will express GFP?

I inject a virus that codes for tdTomato into a wild-type mouse (no Cre present). The gene that codes for tdTomato in my virus is flanked by loxP sites. Which neurons will express tdTomato?

I inject a virus that codes for GFP into a *Gad1*-Cre transgenic mouse (*Gad1* is a marker gene for neurons that release GABA). The gene that codes for GFP in my virus is flanked by loxP sites. Which neurons will express GFP?

I inject a virus that codes for tdTomato, and a virus that codes for GFP into a *Chat*-Cre transgenic mouse (*Chat* is a marker gene for neurons that release acetylcholine). The gene that codes for tdTomato is flanked by loxP sites. The gene that codes for GFP is not flanked by loxP sites. What color will *Chat*+ neurons be? What color will *Chat*- neurons be?