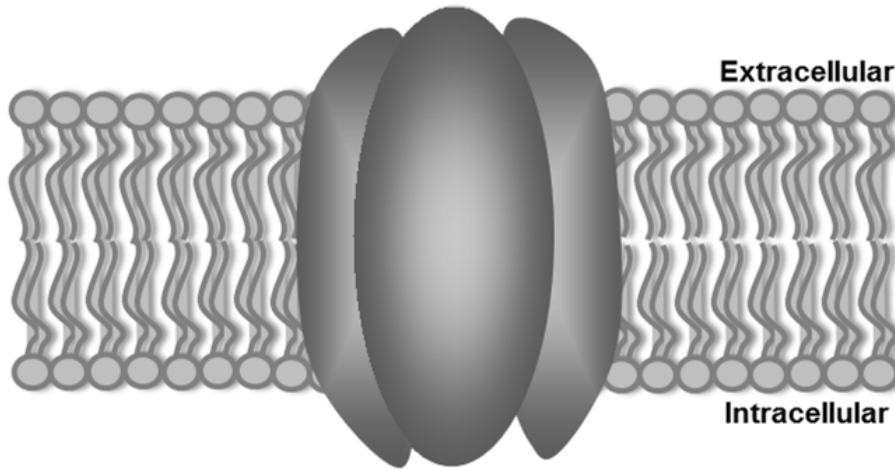


## **Problem Set 1: Cells (and Membranes)**

40 pts

1. Draw and label a “generic” cell. For at least 5 components, include a brief (few words) description. (10 pts)

2. Use the cartoon of a cell membrane to answer the following questions. (10 pts)



What parts of the cell membrane are hydrophobic? Clearly indicate them on the diagram by drawing boxes around them and adding a label, and explain your reasoning.

What parts of the cell membrane are hydrophilic? Clearly indicate them on the diagram by shading them in and adding a label, and explain your reasoning.

This patch of membrane includes a transmembrane protein. Label it "P" on the diagram. List two possible functions of this transmembrane protein.

What parts of the membrane protein are hydrophobic? Indicate them on the diagram by circling them and adding a label, and explain your reasoning.

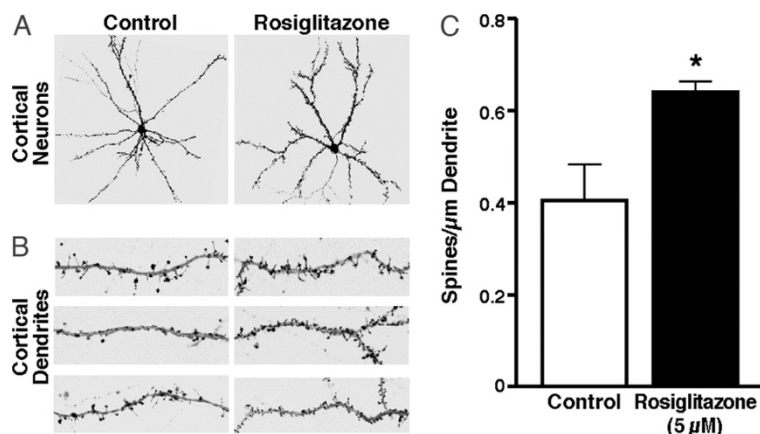
What parts of the membrane protein are hydrophilic? Indicate them on the diagram by drawing boxes around them and adding a label, and explain your reasoning.

3. Create a meaningful paragraph, using the following terms, to explain the role of the cytoskeleton in an animal cell (10 pts):

cytoplasm, cytoskeleton, intracellular, microtubules, actin filaments, shape, transport

4. List 5 similarities and 5 differences between a “generic” animal cell and a neuron. (10 pts)

## Flipped Exercise 1: Cellular Neuropathology



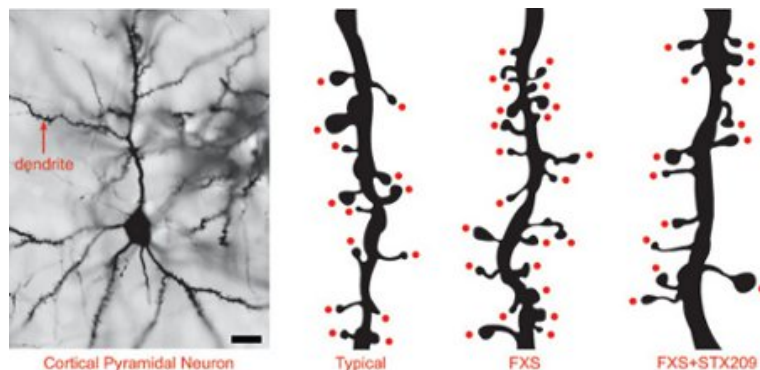
From Brodbeck J<sup>1</sup>, Balestra ME, Saunders AM, Roses AD, Mahley RW, Huang Y. Rosiglitazone increases dendritic spine density and rescues spine loss caused by apolipoprotein E4 in primary cortical neurons. *Proc Natl Acad Sci U S A*. 2008;105(4):1343-6.

### Discussion Question:

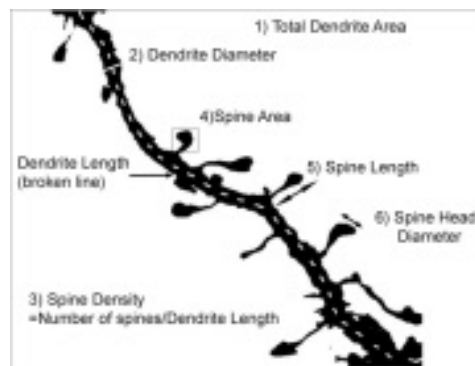
What are some ways we could *measure* changes in neuronal structure?

### Discussion Question:

What are some potential cellular changes (mechanisms) that could lead to these structural changes?



From Henderson C, Wijetunge L, Kinoshita MN, et al. Reversal of Disease-Related Pathologies in the Fragile X Mouse Model by Selective Activation of GABA<sub>B</sub> Receptors with Arbaclofen. *Sci Transl Med*. 2012; 4(152): 152ra128.



Smith DL<sup>1</sup>, Pozueta J, Gong B, Arancio O, Shelanski M. Reversal of long-term dendritic spine alterations in Alzheimer disease models. *Proc Natl Acad Sci U S A*. 2009; 106(39):16877-82.

### Discussion Question:

How should we *interpret* changes in neuronal structure?