ABOUT THE LAB:

The lab will use HHSim, a matlab-based simulator of action potential generated according to the Hodgkin-Huxley model.

1. Download HHSim.m
We will download the software together.

2. Baseline simulations.
Run the simulations under baseline conditions. Describe the simulation results. In the popular simplifcations of the model, the Hodgkin-Huxley equations are reduced to a system of two equations, one for membrane potential, one for m, one of the Na^+ channels. Explain (by looking at the figures) why it is plausible that one can eliminate the other two variables n and h from the original equation. (Hint: think about the how quickly each variable settles to a steady state.)

3. Ion concentrations.
Increase the concentration of Na^+ outside the cell. What is the effect of this on the reversal potential, E_{Na}? How does the change in the reversal potential change the results? (Think about how the voltage changes as a result of the reversal potential.) Verify your answers using HHSim. What would happen if the external concentration of potassium changed?

4. Blocking the sodium channels.
Block the sodium channel using TTX. What do you see? Explain your observation in terms of ion channels and membrane potentials.

5. Stimulus.
Use stimulus 1. Describe what happens if you increase the stimulus magnitude, duration or both.