***Tools of the Trade: Gavornik Lab***

June 4, 2018

* **The Plan**
  + Introductions / Lab Tour (~15 mins)
  + Arduinos, Circuits, Electricity (~1 hr)
  + Break (~10 mins)
  + In-vivo Electrophysiology Demonstration / Open Ephys (~25 mins)
  + Basic Data Visualization / Analysis, Jupyter Notebooks (~40 mins)
* **Arduinos, Circuits, Electricity**
  + General Idea: Have fun, play around with electricity, learn about Arduinos and why they’re useful in experimental neuroscience
  + To download software for the Arduino and some example code: [www.github.com/byronprice/Tools-Of-The-Trade](http://www.github.com/byronprice/Tools-Of-The-Trade)
  + Things to figure out by playing around with batteries, resistors, and multimeters:
    - What’s the difference between batteries in series and batteries in parallel? What voltage do they output?
    - What’s the difference between AA and AAA batteries?
    - What do all of these weird-looking circuit elements / devices do? (e.g. the small metal disk with the red and black wires coming off … if you already know, try to let your friends figure it out)
    - What does “diode” mean? (as in LED, light-emitting diode)
    - How many volts does it take to light up one of the LEDs?
    - How many volts does it take to destroy one of the LEDs?
      * Is voltage the only thing that matters?
  + Things to figure out by playing around with the Arduinos:
    - What do they do?
    - Can you change the script I gave you to make the LED stay on?
    - Can you write a basic program?
    - What voltage do the digital outs produce?
  + Questions to consider:
    - What might you use an Arduino for in an experiment?
    - How much do you need to know about electricity before you study electrical signals in the brain?
* **In-vivo Electrophysiology Demonstration**
  + General Idea: See how the Open Ephys works, think about shielding from environmental electromagnetic noise, consider grounding strategies and locations (look through mouse brain atlas, discuss stereotaxic coordinates)
  + Questions to consider:
    - How much do experimental groups try to limit electromagnetic noise in their ephys recordings?
    - Does such noise impact recordings and/or conclusions?
    - Where do most labs put their ground electrodes?
    - Why were those locations chosen? Are there alternatives?
* **Basic Data Visualization and Analysis**
  + General Idea: look through a Jupyter notebook with some basic neuroscience data that I recorded recently, play around with the data
  + Grab the MATLAB data and check out the notebook at:
    - [www.github.com/byronprice/Tools-Of-The-Trade](http://www.github.com/byronprice/Tools-Of-The-Trade)
    - The notebook is the .html file, just open it in a web browser, then read through it
  + Questions to consider:
    - Does movement seem to impact the recording?
    - What implications might this have, if any, for studies that use electrophysiology?
    - How do we coordinate the timing of images coming on and off the screen with the recording?
    - What other analyses could we do?