**Image Processing and Data Visualization**

Biologists encounter a variety of image data that could be tackled with computational tools, including multidimensional images (3D or stacked), time lapses, peak data (mass spec, ephys, etc.), movies (behavior), or images from public datasets (phenotypic, geographic). Image processing and data visualization in Python is often overlooked in favor of R tools like ggplot. However, Python has a stronger community and development of analysis tools for bioimages.

This project proposes several Python or Jupyter notebook scripts to import images, vectorize visual data, conduct statistical analyses, and visualize outputs for a variety of image data types. Data types would be chosen dependent on participant interest and scripts would be modular for specific implementations. Stacked images of cells can be converted to vector data for counts, morphology, and intensity. Similar data extraction can be applied to time lapse images. Peak data can be analyzed for position, quantification, intensity, or time patterns. Analysis of movies, for example animal behavior, would require an introduction to machine learning tools. Phenotypic or geographic images would include finely tuned of trait detection.

This project is a tool and statistics-heavy use of Python. Image processing and data visualization will utilize several commonly used tools including Scikit, Numpy/SciPy, PyPlot, and Matplot lib. Additional niche tools are available for specific data types or interacting with other imaging software, such as ImageJ. Participants will have to assess new-to-them tools for appropriateness, implementation, and simplicity of analysis.

In addition to analyzed outputs from image inputs, this project could be expanded to include common examples of data visualization, such as volcano plots, heat maps, Manhattan plots, alignment charts, or classical statistical analyses. These plots are generally created with ggplot in R, but Python is better ;)