**https://JHUBlueJays.zoom.us/j/98512705583?pwd=TTVuU0VtTitucDVjajBFWUpNT2Uxdz09**

**Part 1**

Figure 1: Full-field frame-averaged offset image (average 50 frame) and noise image (variance 50 frames)

Discuss: Uniformity? Bad pixels? Importance of uniformity and bad pixels?

Figure 2: Graph with exposure time on x-axis, mean offset value of specific AOI on y axis (take 100 images at exposure, get average image, find desirable AOI of average and find average value for all those pixels)

Discuss: Relationship between exposure time and mean offset, and importance in imaging

Figure 3: Graph with exposure time on x-axis, readout noise aka variance of specific AOI on y-axis (take 100 images at exposure, get average image, find desirable AOI of average and find variance value for all those pixels)

Discuss: Relationship between exposure time and readout noise, and importance in imaging

Part 2

Figure 4: Averaged offset (mean) and noise (variance) images from 50 frames at good exposure time (determined by no saturation and not too noisy)

\*\*Determine saturation here too for next part\*\*

Figure 5: Noise (variance) vs exposure time graph, separating signal and no-signal effects

* For 3 AOIs (diff flat gray regions, 100x100 pixels), take 100 frames over range of exposures (15 values from close to 0 to over saturation), find 15 mean and 15 variance images

Figure 6: Curve of signal-to-noise ratio vs exposure time (with AOI data)

* Signal to noise ratio = signal level / square root of noise (aka st dev, command np.std(array, axis = #))
* Cap off: camera noise + light noise
* Cap on: camera noise

Figure 7: Discuss optimal strategies for imaging

* Strategy so all three regions have max SNR
  + Set aperture, take 50 frames at 15 different exposures, for each exposure calculate SNR as described above, print in a lost
  + Repeat with 5 aperture values (marking servo positions), have 5 lists of 15 SNRs
  + Pick highest value, that pair is optimal image settings
  + Do on middle gray color
* Strategy where only interested in the darkest region of interest
  + Same as above, but only on darkest AOI?
  + Aperture settings (note servo position for repeatability)
  + Exposure time

Part 3: Create an auto exposure tool

* Create with lens cap off, test with lens cap on
* Idea: take 25 frames at various different exposure, calculate SNRs at those exposures, pick exposure w highest SNR (same location on lists), set exposure to that