1. **Read in several images: SN17135_r.0103.fits, flat_r.0015.fits, bias.0001.fits. Display them from inside a software package (IDL/atv or Python/pyds9/tv/imshow) and get familiar with using that.**

2. **Construct image histograms for several images: SN17135_r.0103.fits, flat_r.0015.fits, bias.0001.fits. See if you can explain where all of the different values are coming from.**

3. **Choose some sky subregions in SN17135_r.0103.fits, excluding objects in the field. Look at some pixel histograms of these regions. Determine the mean and standard deviation in the regions. What do you expect for the standard deviations? Are the standard deviations what you expect? Is the standard deviation in a region with an object a meaningful/useful quantity to look at?**

4. **Note the overscan region at the right side of the image (look at SN17135_r.0103.fits or flat_r.0015.fits). This gives the bias level, a constant that is added to the image to insure that readout noise does not lead to any negative values. Determine the mean in the bias region, as well as the standard deviation, using image statistics. What do you think the standard deviation is giving you information about?**

5. **Using the mean bias level, use image arithmetic to subtract this level off of the entire image. How will this affect the previously calculated means and standard deviations in the image subregions? Are the standard deviations what you expect?**

6. **For many astronomical detectors, the numbers recorded are not the number of photons incident on each pixel, but are related to the number of photons by a multiplicative factor, called the gain. For SPICAM, the gain is about 4, i.e., the number of photons incident on each pixel is given by 4 times the data numbers. Convert the images to photon counts by multiplying the image by this factor. How will this affect the previously calculated means and standard deviations?**

7. **Now that you've subtracted bias level and accounted for gain, are the standard deviations in your subregions closer to your expectations?**

8. **There is still some extra scatter coming from pixel-to-pixel sensitivity variations. Looking at flat_r.0015.fits, estimate the level of this variation.**

9. **To correct for pixel-to-pixel variation, we divide raw image by a normalized flat field. Normalize the flat field by dividing it by the mean in the central region, then divide the object frame by the normalized flat field. Recalculate the image statistics in the subregion and comment on how they have changed.**

10. **Write a program to loop over ALL images taken on UT061215 and compute and output the mean bias level and the mean sky level (for Python, check mmm routines (in tv.tv); for IDL, check out Astronomy Users Library sky**

command). Make a single plot of vertical cross sections in the overscan regions, averaging over the width of the overscan region.