A written report is required from each student. You are encouraged to work together to analyze the data but be certain to list with whom you have collaborated. Your report should include the following:

- A brief description of the experiment.
- A sketch of the experimental apparatus, with all relevant dimensions, and the coordinate system.
- A description of the experimental set-up and procedure, including data reduction methods, and the value of all relevant parameters. Be sure to discuss your calibration approach.
- Your analyzed data should include the following plots:
  - A dye linearity test. Pick 4 – 10 representative locations within the image of the aquarium and plot the measured concentration vs. the actual concentration for the different calibration concentrations used. Is the behavior linear?
  - A pseudocolored image of the mean concentration field, \( \bar{c} \left( \frac{x}{d}, \frac{y}{r_{1/2}} \right) \).
  - \( \frac{\bar{c} \left( \frac{x}{d}, \frac{y}{r_{1/2}} \right)}{C_0} \) - pick at least 4 different \( x/d \) locations within the image to plot profiles nondimensionally on the same plot. Work at \( x/d \) locations contained within the calibrated region of the image.
  - A pseudocolored image of the rms concentration field, \( \sqrt{c''} \left( \frac{x}{d}, \frac{y}{r_{1/2}} \right) \).
  - \( \frac{\sqrt{c''} \left( \frac{x}{d}, \frac{y}{r_{1/2}} \right)}{C_0} \) - pick the same \( x/d \) locations used above and plot profiles nondimensionally on the same plot.
  - Solve for the jet concentration decay parameter, \( B_c \), the jet virtual origin, \( x_{0c} \) (you may assume that Eq 3.40 in the notes is the valid form with the new constants), and the jet-spreading rate, \( S_c \) (again assume Eq 3.41 is the valid form).
- A brief discussion of your results.

Notes: The source concentration, \( C_J \), will be provided at the lab and the jet diameter is \( D = 15/64'' \). The calibration image concentrations will also be provided.
Images were collected at 5 Hz. We used a 50 mm lens with an aperture of f1.4. A Number 16 filter was placed on the lens to remove particles from the image.

After quality control, there are 1329 images provided covering 266 seconds.

The image files have been provided in five zip files, each containing 266 images. Images follow the naming convention "i_xxxxxx.tif" and are 16 bit uncompressed TIFF images. You are only required to work with the first of the five sets (i.e., a minimum of 266 files) but you are welcome to use more if you would like to.

To read the images into Matlab's workspace, try the following commands from the image directory:

```matlab
image1 = double( imread( 'i_000175.tif' ) );
imagesc( image1 )
set(gca,'clim', [0 255] )
```

Calibration data is provided in the calibration.zip file. The calibration levels start with a blank (i.e. 0 concentration fluorescein) and are incremented at 16.75 ppb. The number after calibration in the filename specifies how many increments above the blank have been added.

For example, cal3_filtered_*.tif would have 3 x 16.75 ppb of fluorescein added.

Only a portion of the field of view (FOV) was calibrated due to the size of the fish tank. You are welcome to only work within this FOV or you may extrapolate your calibration to the regions of the LIF images that were not covered by the calibration, the choice is yours.

The source concentration for the jet was 2.0 mL of a 1 g/100 mL of water solution mixed into a 50 x 24.7 x 27 cm volume of water. The target source concentration was ~480 ppb. You need to calculate the source concentration yourself to see what the actual source concentration used was.

The calibration folder includes a series of ruler images, which you will use for your spatial calibration, just as you did for the PIV lab. Not the ruler is in the vertical direction. The left edge of the image (column 1) was located at 180 mm from the jet orifice.