# Method

- Use ImageMagick to Extract RGB values from the image, from which grayscale and L*a*b* can be obtained.

See next slide for images

  - Use the cropped image
    - Initial size for 50 µm pixel for a 6.6 cm x 150 cm image is 1320 x 30,000 pixels. Actual images may be a bit wider and longer. For example, for U1333C-14H-4-cropped.jpg

```
% identify U1333C-14H-4-cropped.jpg
JPEG 1364x30128 1364x30128+0+0 8-bit sRGB 4.79075MiB
```

  - Reduce image size to 25% of original, which reduces the resolution from 50 to 200 microns, or 0.2 mm
    - Each resulting image is about 340 x 7500 pixels
  - Extract the center portion of the core image, which is the most undisturbed part of the core
    - Exactly 100 pixels across each depth are extracted
    - The resulting image is 100 x ~7500 pixels
  - Convert this image to a text file that has RGB values

# Method

Section = U1333C-14H-4-cropped.jpg

Reduce to 25% or analyze 100%

SECTION= U1333C-14H-4-cropped.jpg
identify $SECTION
convert $SECTION -resize 25% temp.jpg

1320 x 30000 → 340 x 7500

Image sizes for a typical 150 cm section vary plus or minus by a few tens of pixels.

150 cm x 10000 µm/1 cm x 1 pixel/50 µm = 30000 pixels

6.6 cm x 10000 µm/1 cm x 1 pixel/50 µm = 1320 pixels

Often the width is 6.8 cm (1360 pixels) and includes some of the liner. The periphery of the core is often disturbed. The most pristine core is the central couple centimeters. That would be the central 400 pixels at full resolution or 100 pixels at 25% resolution.

→

Crop all but central 100 pixels to get a 100 x 7500 image or, for the original 50 µm resolution data, crop the central 400 pixels for a 400 x 30000 image.

Use ImageMagick to convert jpg image into a text file with RGB, CIE L*a*b*, and Gray Scale.

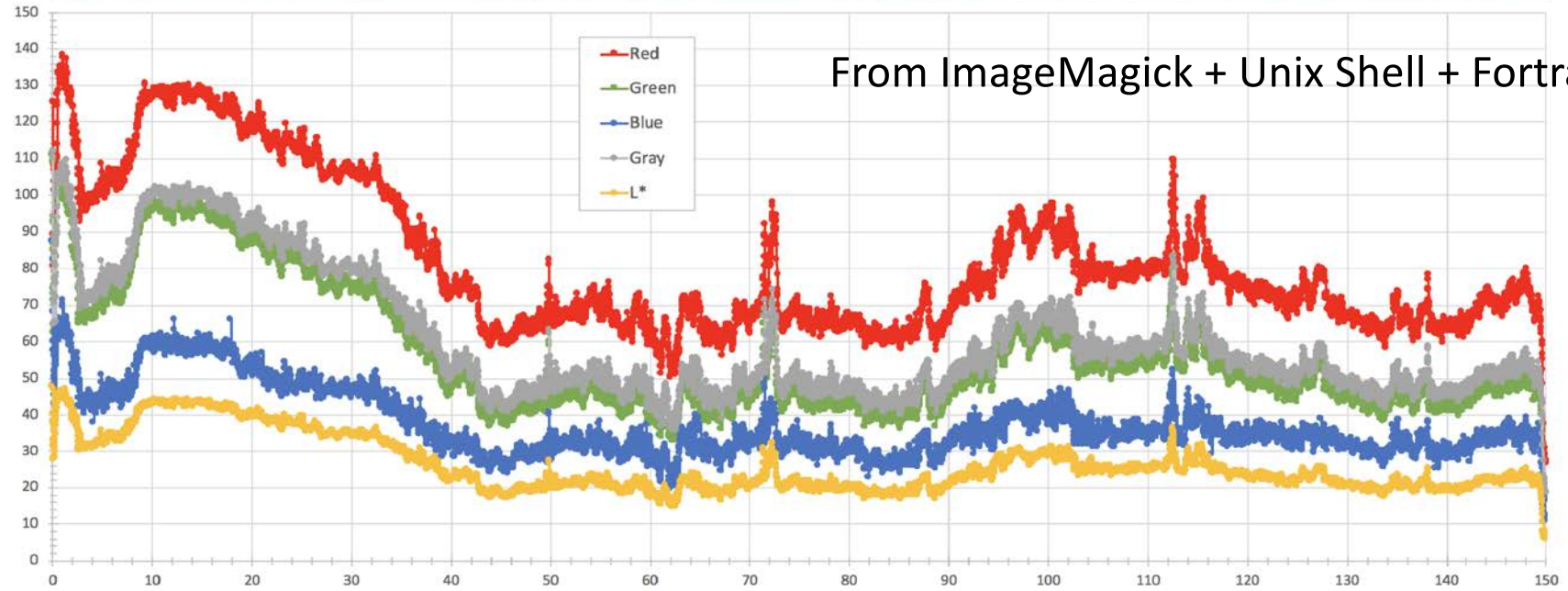
Analyze each row or group of rows of pixels by doing the following

- Using L*, remove darkest 35% (shadows, cracks, gaps, and iron sulfide blebs and patches) and the lightest 15% (reflections off wet areas).
- Take the mean of the remaining 50%.

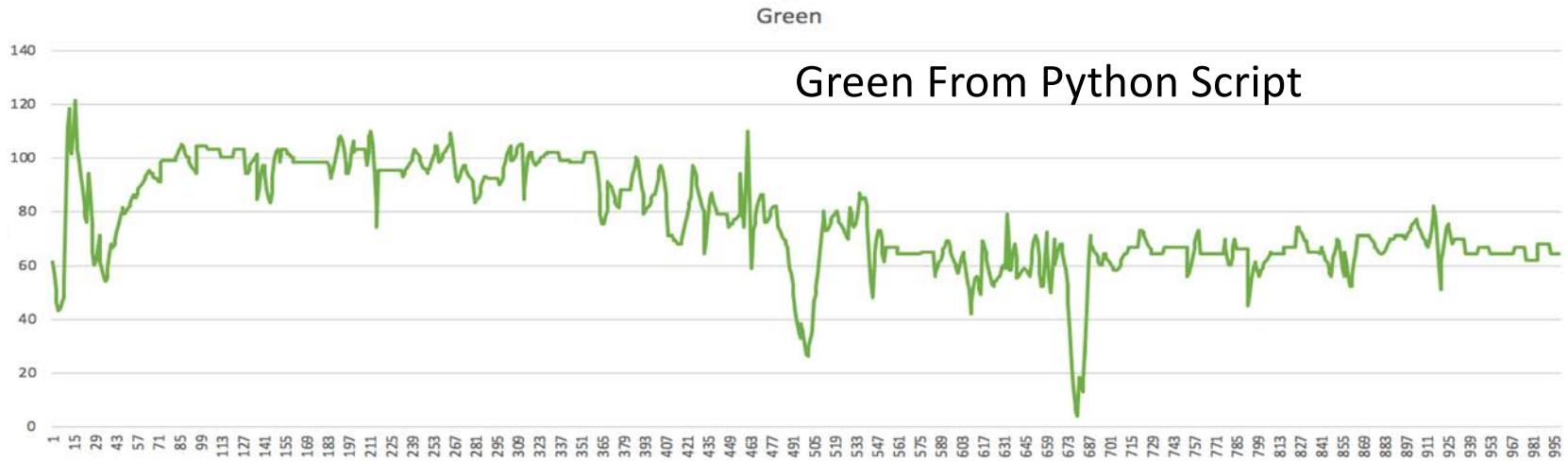
Group of rows: These would be the number of rows one might want to average to a lower resolution record. For example, to get a cm resolution record from the original 50 µm resolution data, average all data for the 400 columns by every 2000 rows.

# Example

Section U1333A-01H-1




From ImageMagick + Unix Shell + Fortran77




Green From Python Script

# Method

- Use a Fortran Program (color-stats.f, formerly color-median.f) to find the average R, G, and B values for each row of pixels
  - Toss out the darkest 35% because shadows can cause dark pixels and this can be common
  - Toss out the lightest 15% because wet spots can cause bright spots
  - Average the remaining values (50% of the total)
  - Attempt to normalize the records using the RGB values of the gray card in the core image
    - This is not 100% successful
  - OLD → Compute the L* a* b* values from the RGB values
    - No need to do this as L*a*b* and gray scale can also be obtained from ImageMagick

# Python Progress: Thing Done

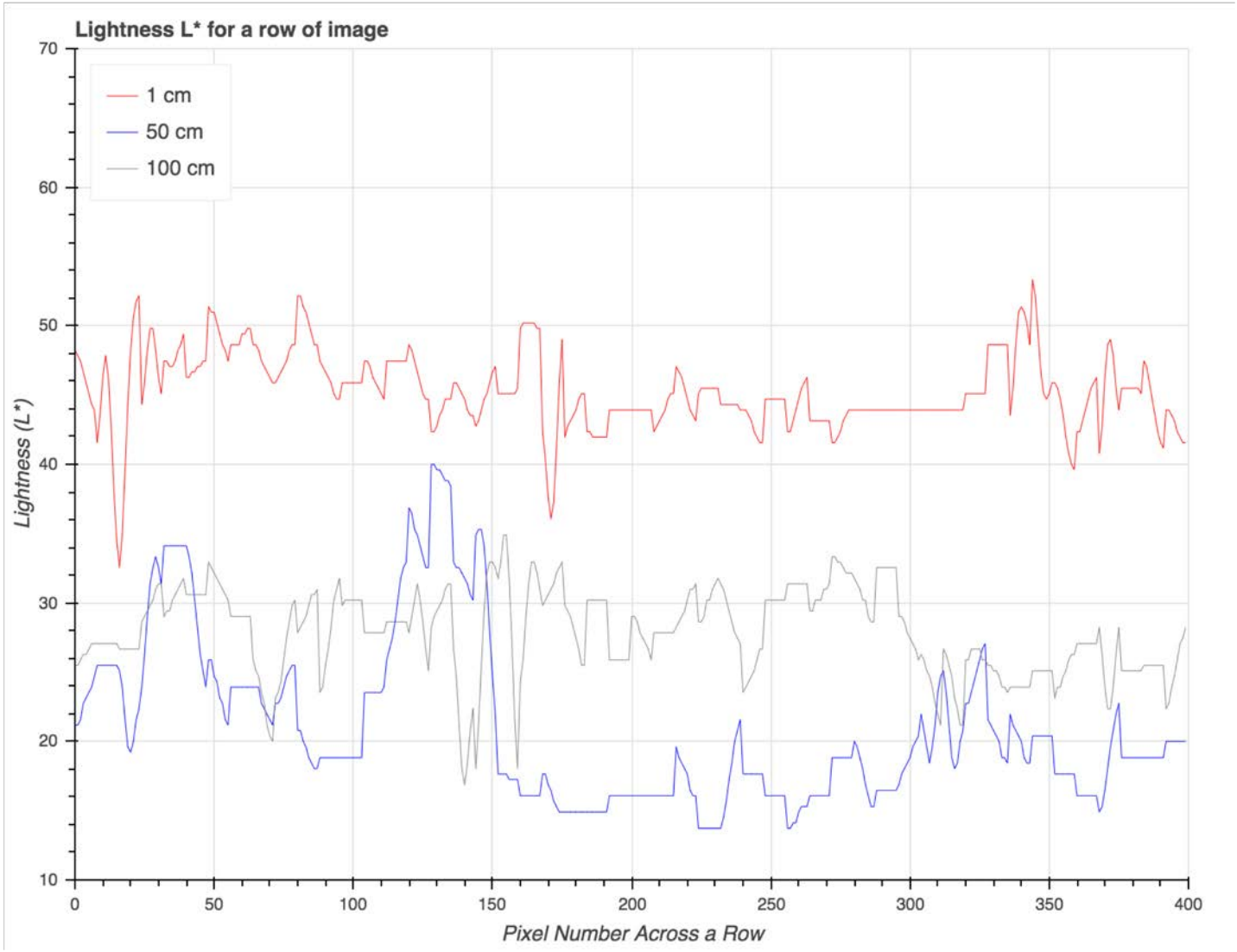
- Use Jupyter Notebook to open images and extract RGB, grayscale, and L*a*b* values
  - Use the cropped image
    - Initial size for 50 µm pixel for a 6.6 cm x 150 cm image is 1320 x 30,000 pixels. Actual images may be a bit wider and longer. For example, for U1333C-14H-4-cropped.jpg
  - Extract the center portion of the core image, which is the most undisturbed part of the core
    - Exactly  400 pixels across each depth are extracted
    - The resulting image is 400 x 30000 pixels

# Python: Things To Do

- From the 400 column x 30000 row array, find the representative color value for each row
  - Exclude darkest 35% and lightest 15%
    - Again, this is arbitrary but based on experience. Varying these cutoff a little one way or the other changes the results imperceptibly.
  - Average remaining 50% for each row, resulting in a 1 column x 30000 array
    - Save the standard deviation because it will tell us something about how laminated or mottled (bioturbated) the sedimentary layers are.
  - Compare with ImageMagick results
    - I provided an Excel worksheet to Peter and they are shown above in the example
  - Correct for lightness variation from one core image to another
    - This will be a hard task
    - Use color cards that are in the uncropped images or use the L* data from the Color Reflectance dataset

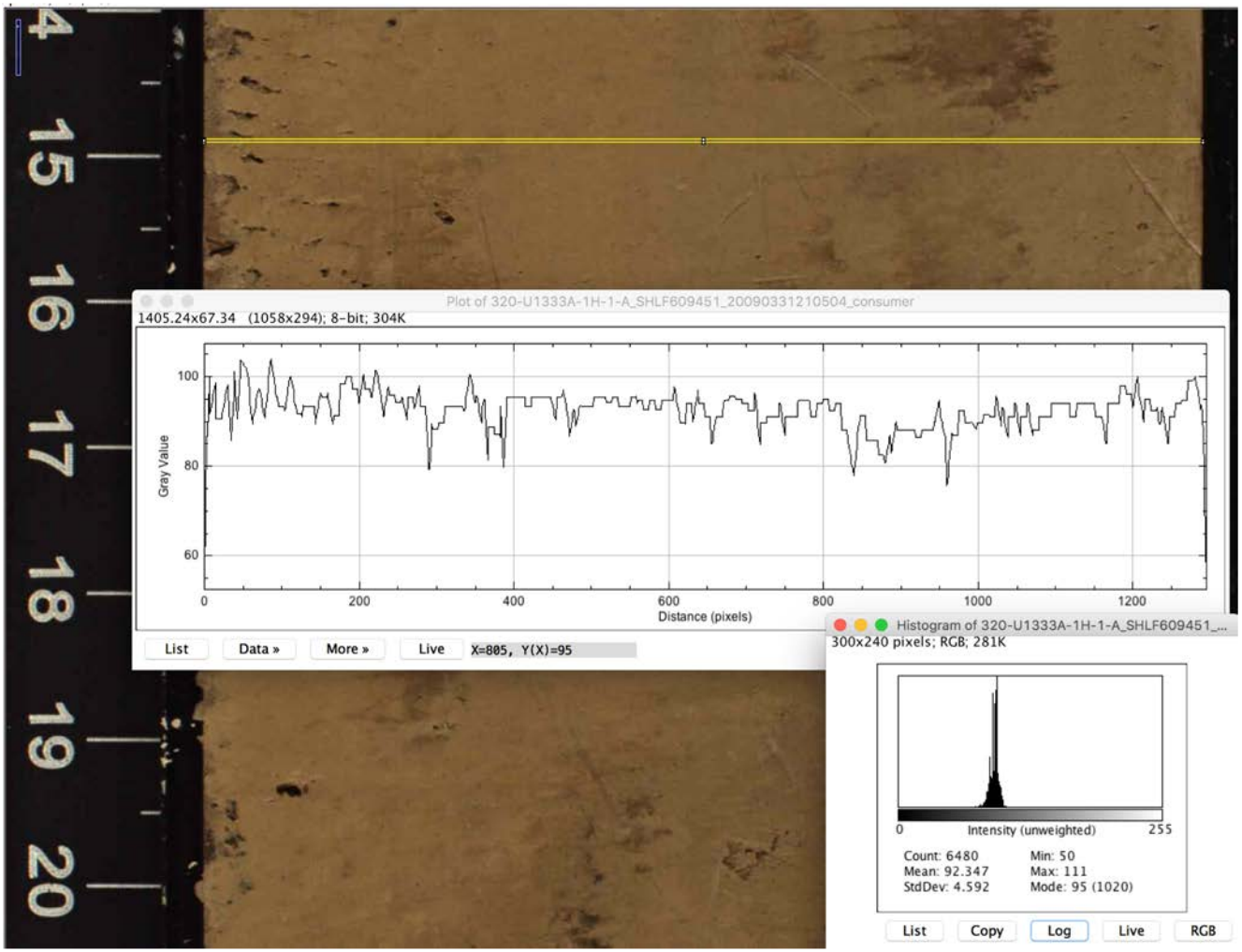
# Example of Row of Data

The data are from 3 different intervals from 320-U1333A-1H-1 using Python coding. Note the blocky nature of the data, which merely reflects that many pixels along the line have the same L* value.



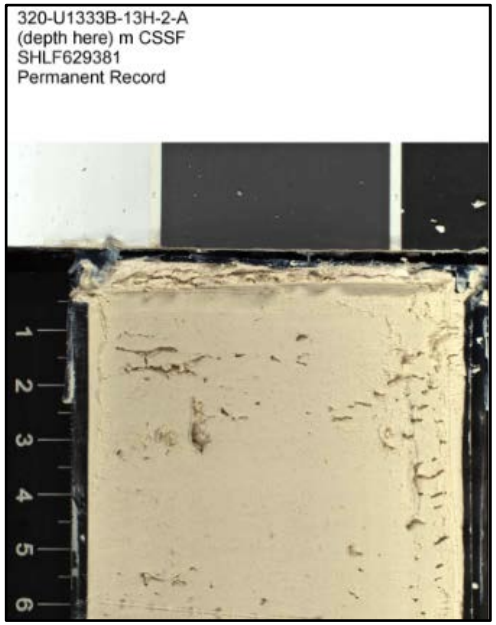
# Example of Row of Data

The data are from ImageJ software with a histogram and profile from the yellow strip. Note the blocky nature of the data, which merely reflects that many pixels along the line have the same grayscale value.



# Python: Things To Do

- Use Python to cropped older images, like those from Expedition 306 (see next image)
  - ✧ Need to crop them in to rectangular core image
  - ✧ If possible crop out the gray card and/or determine the RGB, L*a*b*, and grayscale values for the card

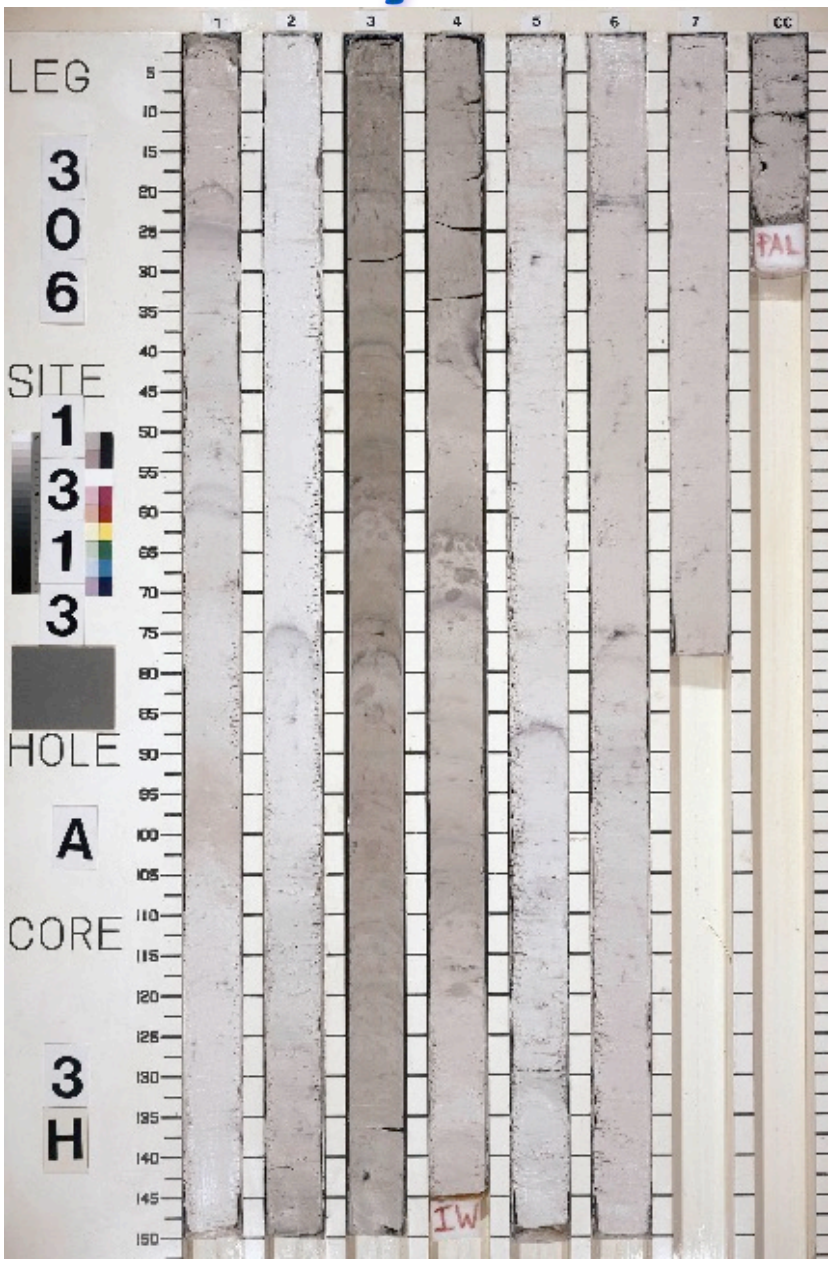



Example of the color card for an uncropped image for Section U1333B-13H-2, which shows the medium gray card and ruler. Ideally the gray card would have a L* value of 48 in all images but in reality it varies from about 48 to 68, with occasionally higher values for darker cores. The sRGB values should be (80, 80, 80) for the dark gray card, (119, 119, 119) for the middle gray card, and (245, 245, 245) for the white card.

The L* for QPcards are listed as
L* = 95 white
L* = 48 for the 18% gray
L* = 35 for the dark gray

Example of the color card for an uncropped image for Section U1313A-3H-1, which shows the medium gray card and ruler. I checked with David Houpt and with Tim Fulton and they were not sure of the values of the card. It is probably an Xrite Mini 3-step card with a white, 18% gray, and black swatch. The sRGB and L*a*b* are estimate at https://xritephoto.com/ph_product_overview.aspx?ID=1257&Action=Support&SupportID=5159 .
The L* is
L* = 97 white
L* = 51 for the 18% gray (probably 48)
L* = 20 for the black

# Early Versions of Core Photos




Core
306-1313A-3H

← Core Table Photo

Digital Image System (DIS) →

The DIS is now referred to as the Section Half Image Logger (SHIL)

Note how the cores look different in different lighting.


Core Catcher not shown. Data from the Core Catcher generally should not be used.

# Python: Things To Do

- Machine Learning
  - Predict carbonate, oxygen isotope ratio (directly tied to glacial/interglacial stages), and leaf wax (a dust proxy) data from color data using measurements of carbonate, oxygen isotope, and leaf wax from samples.
    - I am still working on getting a data set together with proper IODP sample labels, original depths, subsequent new depth scales, and ages.