# Imaging Station Recommendations, Setup, and Installation

last updated July 25, 2019

###### **Goals:** This document describes the hardware and software used by the California Phenology Collections Network to image herbarium specimens, then process and web-host the resulting images. This document consists of four sections:

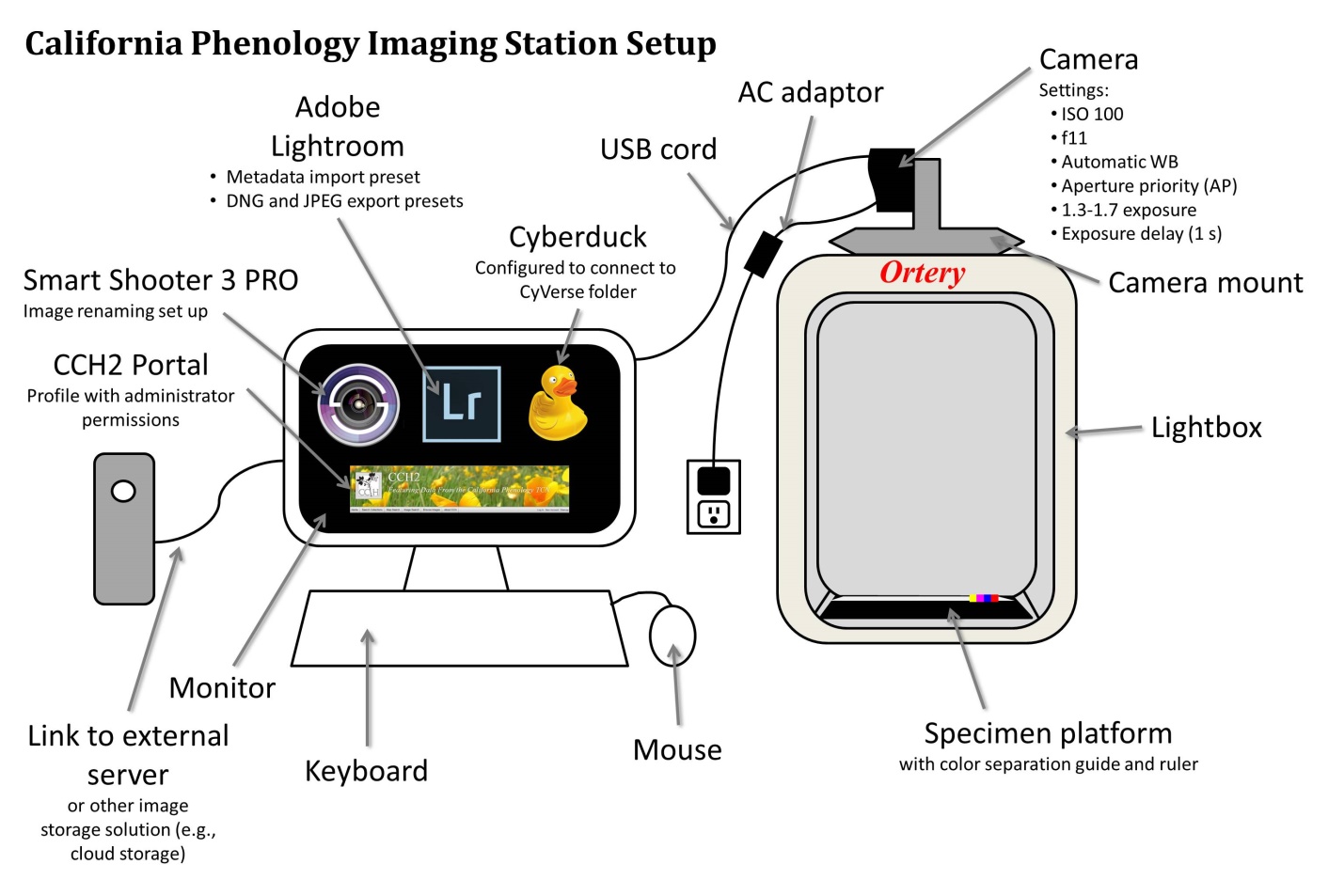
1. General Imaging Station Setup
2. Equipment Recommendations
3. Imaging Software
4. Construction and Installation of Custom Imaging Equipment

4.1 Camera Mount System

4.2 Specimen Backdrop

## 1. General Imaging Station Setup

A simplified diagram of the general imaging station setup is shown below. Camera setting recommendations for the Nikon D800E with AF-S 50 mm f/1.8D lens (see Section 2) are also provided.



## 2. Equipment Recommendations

The following equipment was recommended for institutions that did not already have imaging stations at the start of the project. Many institutions were able to use preexisting equipment.

|  |  |  |
| --- | --- | --- |
| Item | Expected price | Source(s) |
| Nikon D800E 36.3 MP CMOS FX-Format Digital SLR Camera  (if you cannot find this model, a D800 or D810 would also work) | $1000-1500 | [Amazon](https://www.amazon.com/Nikon-D800E-FX-Format-Digital-Camera/dp/B005OL2ID2), etc. (note that this model is no longer supplied by Nikon, you will need to purchase from a third party) |
| Nikon AF-S FX NIKKOR 50mm f/1.8D Lens | $150-220 | [Amazon](https://www.amazon.com/Nikon-NIKKOR-50mm-1-8D-Cameras/dp/B00005LEN4), [Best Buy](https://www.bestbuy.com/site/nikon-af-s-nikkor-50mm-f-1-8g-standard-lens-black/3188049.p?skuId=3188049&cmp=RMX&extStoreId=396&ref=212&loc=1&gclid=CjwKCAjwo_HdBRBjEiwAiPPXpHPcJ2rM1MBaTivTtK0bL22F5s-utAJm0Bh29GgIt7SOxauh0cMfaBoCKiIQAvD_BwE&gclsrc=aw.ds), etc. |
| Nikon EP-5B Power Supply Connector | $48 | [Amazon](https://www.amazon.com/Nikon-EP-5B-Power-Supply-Connector/dp/B004FPQH5I), etc. |
| Nikon EH-5b AC Adapter | $100 | [Amazon](https://www.amazon.com/Nikon-27055-Adapter-Requires-Connector/dp/B005THFGWG), etc. |
| Ortery Photosimile 50 lightbox | $1500 + ~$300 shipping | Direct contact with Ortery |
| Symbol LS2208 General Purpose Barcode Scanner | $80 | [Amazon](https://www.amazon.com/Symbol-General-Purpose-Barcode-Scanner/dp/B002W2USO2/), etc. |
| Goose neck stand for Symbol Scanner LS2208 | $13 | [Amazon](https://www.amazon.com/Goose-Stand-Symbol-Scanner-LS2208/dp/B002KEQ7FG), etc. |
| Tiffen Q-13 Color Separation Guide (Small) | $32 | [B&H Photo](https://www.bhphotovideo.com/c/product/714596-REG/Tiffen_EK1527654T_Q_13_Color_Separation_Guide.html?ap=y&gclid=EAIaIQobChMIgaqO2uX-3QIVFcNkCh33qgEtEAQYAiABEgKMkvD_BwE&smp=y) |
| Imaging computer with 4+ GB of RAM and 500+ GB of internal storage, preferably with a solid state drive (SSD), reasonable graphics card, more than three USB ports (USB 3.0 preferred); Mac or PC OK | up to $1200 | Best Buy, Costco, Amazon, etc.  Examples: [HP Pavilion i3](https://www.bestbuy.com/site/hp-pavilion-desktop-intel-core-i3-8gb-memory-1tb-hard-drive-128gb-solid-state-drive-hp-finish-in-twinkle-black/6203109.p?skuId=6203109), faster = [HP Pavilion i5](https://www.bestbuy.com/site/hp-pavilion-desktop-intel-core-i5-8gb-memory-1tb-hard-drive-16gb-solid-state-drive-gray-silver/6255034.p?skuId=6255034) |
| (If desktop computer) Good quality computer monitor |  |
| (If desktop computer) Mouse and keyboard |  |
| Ethernet cable | $5 (likely available for free through IT department) | |
| Smart Shooter 3 PRO | $195 | [Smart Shooter 3 website](https://kuvacode.com/buy) |
| Adobe Lightroom 6 or Adobe Lightroom Classic CC | $150 | [Adobe website](https://www.adobe.com/products/catalog.html?filters=cd_252Fphotography&page=2) or institutional license |
| Camera Mount System (see Section 4) | ~$60\* | \*Manufactured at Cal Poly and provided to partner institutions free of charge |
| Specimen Backdrop (see Section 4) | ~$7 | Craft store or online materials source |
| Barcodes | see Barcode recommendations document |  |

## 3. Imaging Software

We recommend the following software:

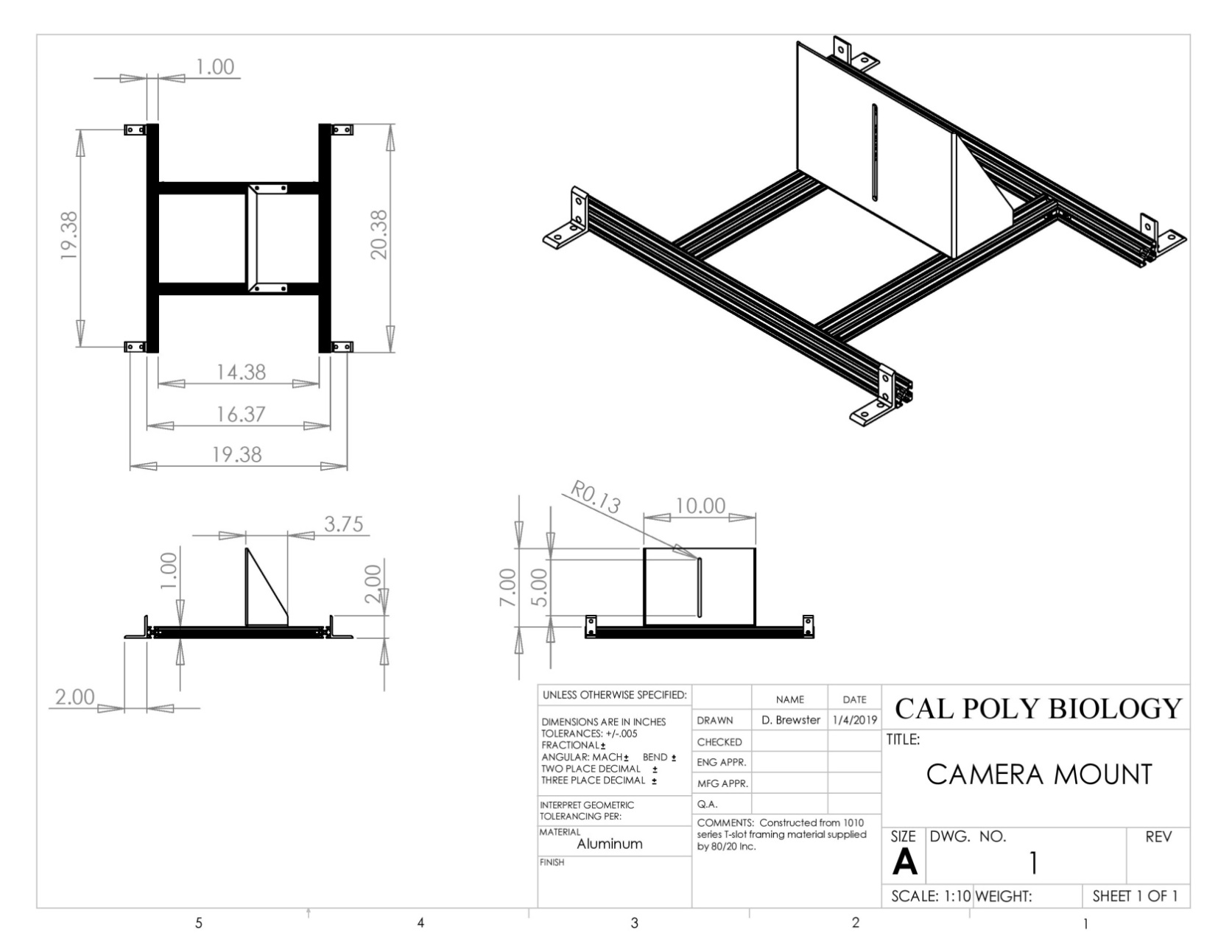
* **Smart Shooter 3 PRO:** This camera tethering software enables the user to (1) change camera settings on the computer screen (except for exposure delay mode), (2) set the focal point on a specimen and autofocus, (3) take images by clicking a button, and, most importantly, (4) automatically rename images according to their barcode number by clicking a button. Once the name policy is set (see imaging protocol), Smart Shooter 3 PRO will scan the images for barcodes and rename them each according to their barcode number.
* **Adobe Lightroom 6 or Classic CC:** This software is used to process images and create derivative files. The processing steps include adding metadata (i.e., copyright information, including funding source and institution name), rotating images, cropping, enhancing sharpening, and exporting digital negative (DNG, archival format) and jpeg files for each image.
* **Cyberduck:** This free software is used to facilitate transfer of jpeg images into the CAP TCN community data folder in CyVerse. CyVerse will then make the images web-accessible and assign a URL to each image. The user will then run a process in the CCH2 portal that will link these image URLs to their appropriate specimen records in CCH2.

## 4. Construction and Installation of Custom Imaging Equipment

Institutions using the Ortery Photosimile 50 will need a camera mount system and specimen backdrop. The Cal Poly machine shop designed and manufactured camera mount systems for institutions that needed them at the beginning of the grant. The specifications for this camera mount system are provided in Section 4.1. Each institution should build a specimen backdrop (Section 4.2).

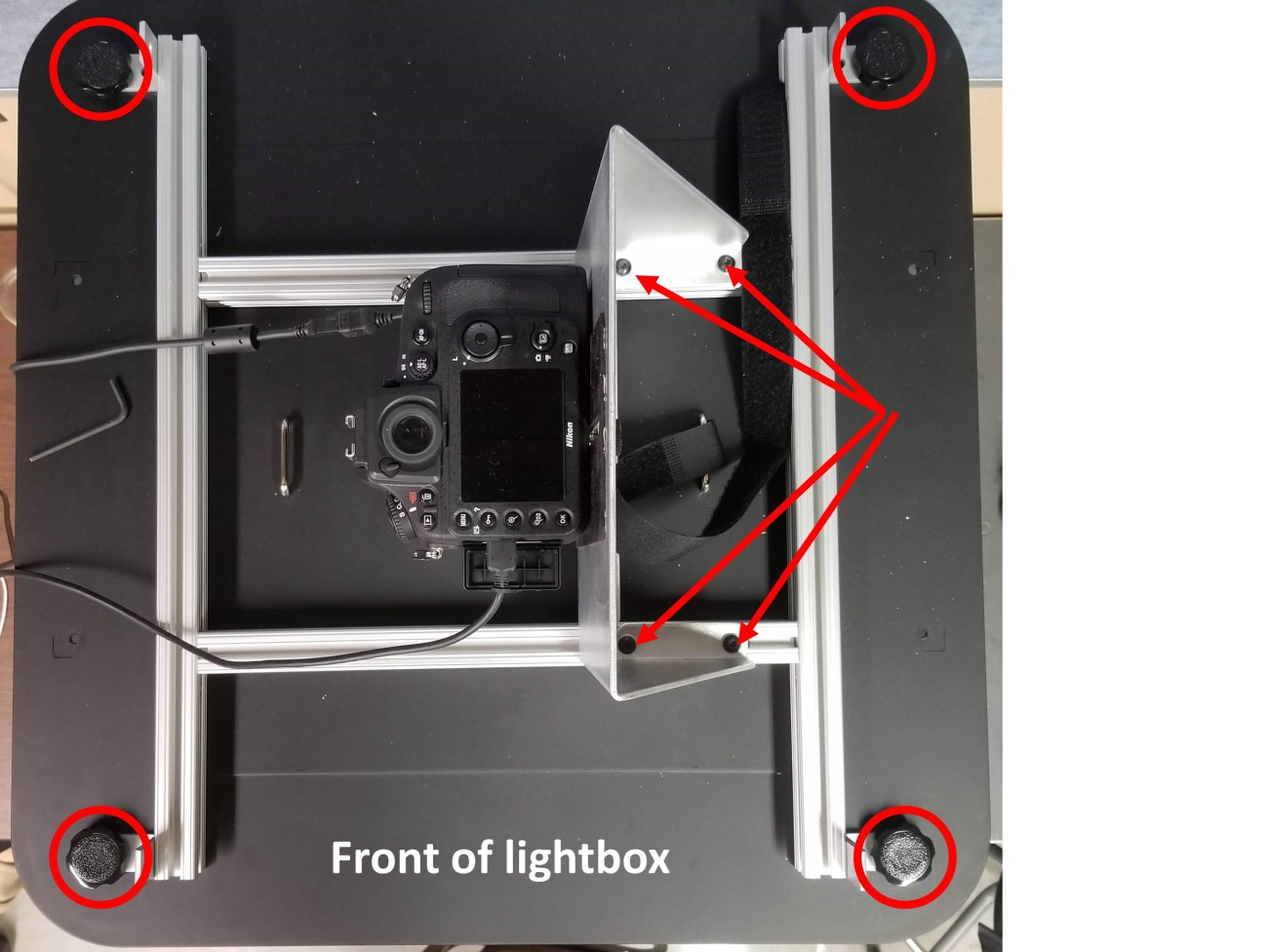
### 4.1 Camera Mount System

The camera mount shown below was constructed for each institution that purchased an Ortery lightbox.

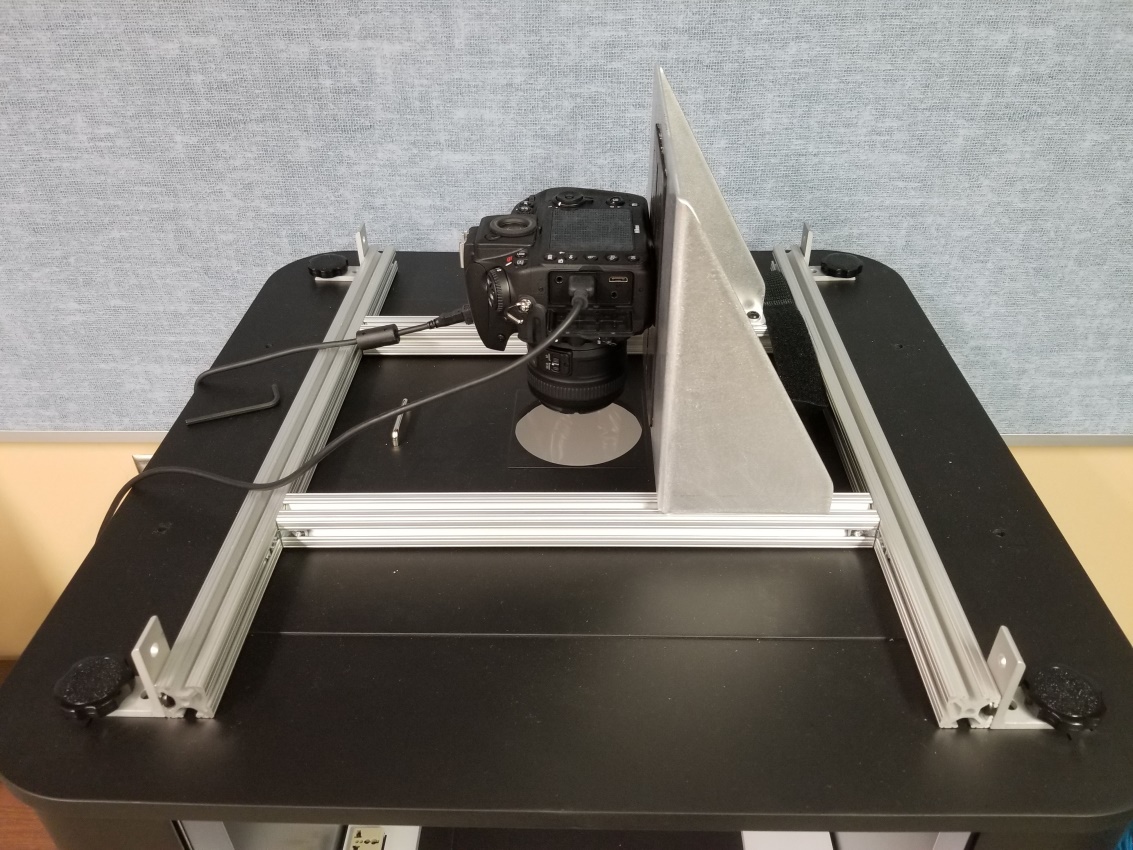


#### Installing the Camera Mount System

1. Unscrew the four white knobs from the top four corners of the lightbox.
2. Place the camera mount on the lightbox with the black rubber pad of the flat, upright piece facing left (see image below).
3. Use the black knobs to fasten the four corners of the mount to the lightbox (circled in Figure 4.1).
4. Mount the camera on the flat, upright piece by placing the bottom of the camera along the black rubber strip, fitting a black screw through the slot, and tightening it into place
5. Adjust the positioning of the camera to be able to fit an entire specimen and the color bar into the camera’s field of view. You can accomplish this by:
   1. moving the camera up or down in the camera mount slot,
   2. using a 4 mm Allen wrench to loosen and tighten the black screws (see arrows on Figure 4.1) that hold the flat, upright piece to the aluminum bars
   3. and using a 2.5 mm Allen wrench to loosen and tighten small hex-head screws in the gussets (L-shaped connectors) that connect the aluminum bars to one another (see arrows on Figure 4.2).
6. Once you have tightened all the screws, double-check the field of view. Even slight adjustments can change the angle of the camera lens and greatly affect the resulting field of view.



**Figure 4.1** Top view of lightbox with installed camera mount. The knobs that secure the mount to the lightbox are circled in red, and the arrows indicate screws that can be tightened or loosened with a 4 mm Allen wrench to move the camera left or right.



**Figure 4.2** Angled view of top of lightbox with installed camera mount. The arrows indicate screws that can be tightened or loosened with a 2.5 mm Allen wrench to move the camera away from or toward the door of the lightbox.

### 4.2 Specimen Backdrop

(Adapted from Legler 2010, Assembling the Custom Components for Specimen Imaging, Consortium of Pacific Northwest Herbaria)

###### Supplies

* Black foamboard or fiberboard (approximately 1/8” thick) CLEANLY cut into the following pieces
  + 15” x 20”
  + 15” x 1.5”
  + 18.5” x 1.75”
* Double-sided tape
* Razor blade or X-acto knife
* Metal ruler or other straight-edge for cutting
* Tiffen Q-13 color separation guide (see Section 2) or other color guide
* Color printout of your institution’s logo, no taller than 2.5 centimeters

###### Assembly and Installation

1. Cut the foamboard into the necessary sizes, making sure that cuts are clean and straight. Use outside edges whenever possible, which are already straight.
2. Use double-sided tape to attach the 15” x 1.5” strip to one of the 15” ends of the large (15” x 20”) sheet. Carefully align the outside edges of the strip with the outside edges of the large sheet. The edge will form the top of the holder.
3. Use double-sided tape to attach the 18.5” by 1.75” strip to the left side of the sheet and under the 15” strip at the top. The strip should tightly abut the previously attached strip, and its outside edge should align with the outside edge of the uncut sheet.
4. Cut the Tiffen color separation guide such that it will completely fit on the 1.5” strip at the top of the specimen backdrop. This will mean cutting off the text of the color control patch (see dashed line below). Do not discard either piece of the color control patch.



1. Cut the ruler at the top of the Tiffen color separation guide down to about 13 centimeters.
2. Use double-sided tape to affix the colored strip, the printout of your institution’s logo, and the shortened ruler to the top 1.5” strip, as seen in the photo below.
3. Lay the specimen platform in the lightbox such that the raised strips are to the top and left. The color bar and ruler should be furthest away from the lightbox opening.
4. Before affixing the specimen platform to the lightbox floor with double-sided tape, install the camera mount system. You may need to adjust the position of the specimen platform as you adjust the camera mount so that your images are properly aligned.

