

# Herbarium Specimen Digitization: using the MK Photo-eBox™

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Mobilizing Small Herbaria for Digitization Workshop



THE NEW YORK BOTANICAL GARDEN

# Equipment

- Camera
- Lens
- Copy Stand
- Lighting System
- Computer



# Camera and Lens



**Canon EOS 5D Mark II (discontinued)**  
21.1 Megapixel Full-Frame Sensor



**Canon EF 50mm f/2.5 Compact Macro**



**USB Interface Cable**

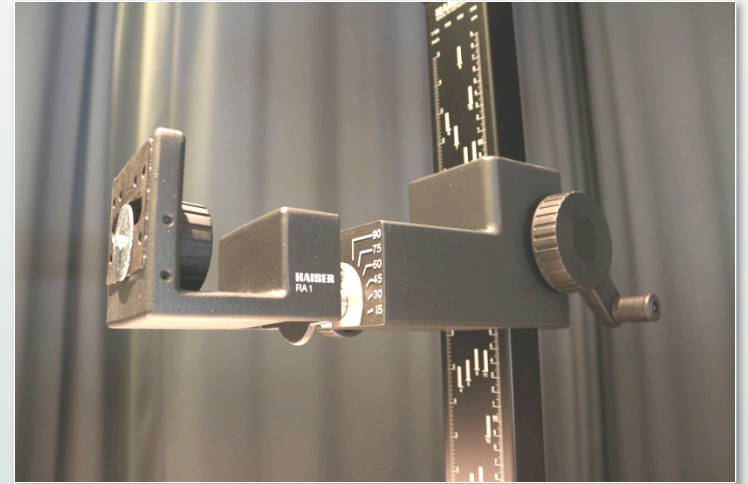


**Canon AC Adapter Kit ACK-E6**



**EOS Utility**  
**Digital Photo Professional**

# Copy Stand



## Kaiser RS 1 Copy Stand

- RA-1 Arm
- 40" counterbalanced, "low vibration" column
- 18 x 20 inch baseboard

# MK Photo-eBox™

“NYBG Modified Version – Model 777000”

## Advantages:

- Even illumination
  - 8 Fluorescent lights, 2 per side 28W, 6500K (“flicker-free”)
  - 1.5 ft. strip LEDs, 5500K
- Self-contained
- Easy to operate
- No need to crop image
- Small footprint: 2 ft. x 4 ft.



<http://mkdigitaldirect.com/products/lighting-systems/mk-photo-ebox.html>

# Then...



# Then...



# Now.

# Image Quality *and* Quantity

## Then...



50-60 exposures/hour

## Now.



80-90 (-120) exposures/hour

# MK Photo-eBox™

“NYBG Modified Version – Model 777000”

## Disadvantages:

- Limited size of subject
- Shipping lead time: 5 weeks
- Price = \$1,780 + shipping
- Replace bulb, fan
- No door knobs
- Some assembly required



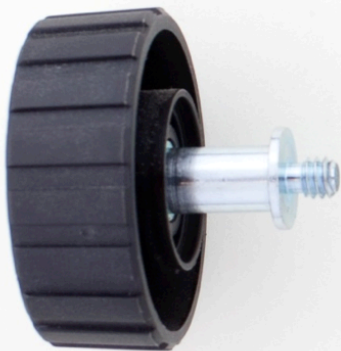
# Station Assembly

- Assemble copy stand
- Remove center feet from bottom of box\*
- Remove plastic, lay velveteen on the glass\*
- Place velveteen between box and copy stand\*
- Center box on copy stand



# Station Assembly

Attach camera body  
to copy stand

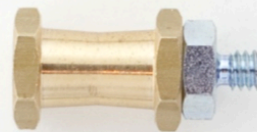


1/4" screw

Fender washer



1/4" + 3/8"  
Double Female Stud



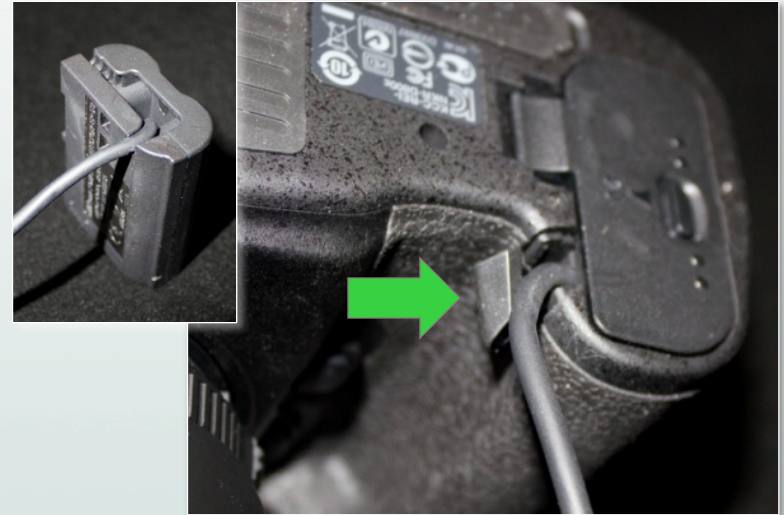
3/8" + 1/4"  
Adapter Spigot



Flat washer

# Station Assembly

- Insert AC adapter
- Install & update software
  - Canon EOS Utility
  - Digital Photo Professional



# Station Assembly

- Insert AC adapter
- Install & update software
  - Canon EOS Utility
  - Digital Photo Professional
- Connect camera to computer

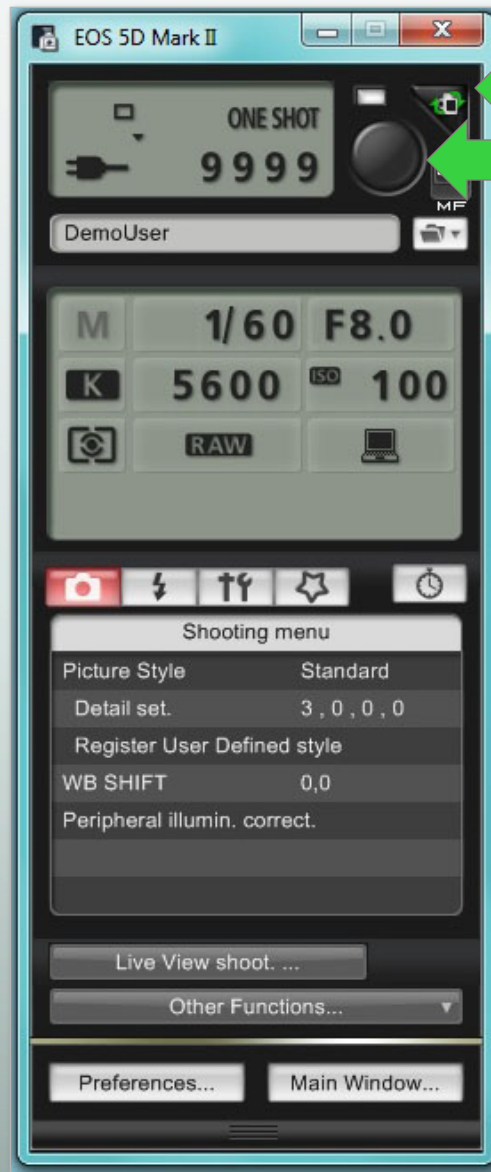


# Station Assembly

- Insert AC adapter
- Install & update software
  - Canon EOS Utility
  - Digital Photo Professional
- Connect camera to computer
- Shooting mode: Manual
- Power: On



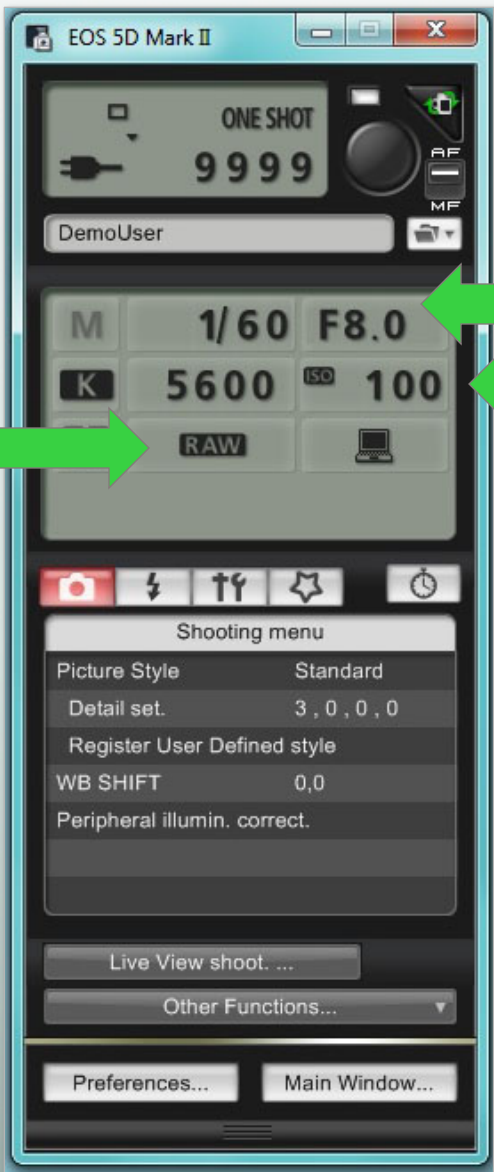
# Remote Shooting



Rotate Image

Shutter Release  
(mouse click or space bar)

# Camera Settings



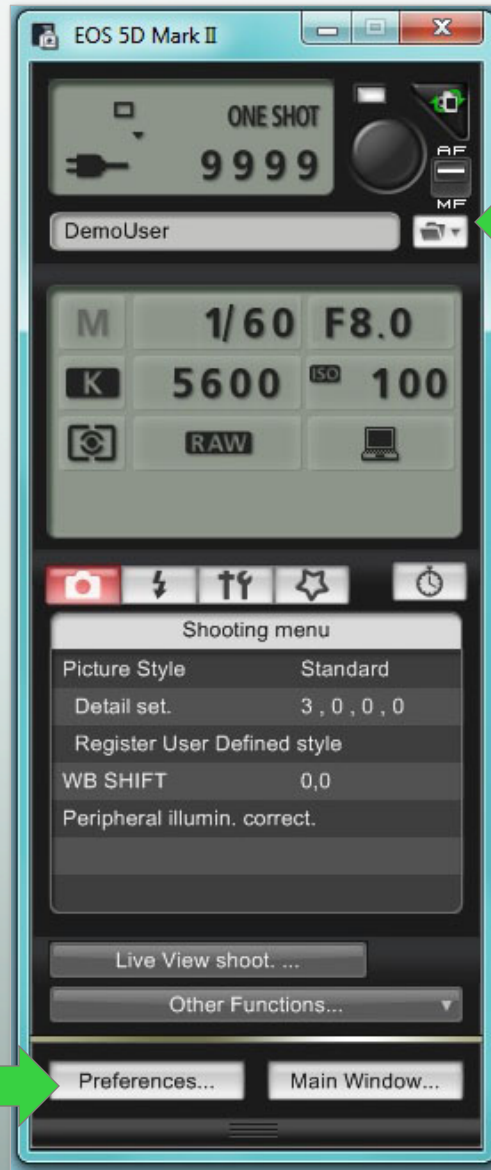
The screenshot shows the camera's menu interface. At the top, it says 'EOS 5D Mark II'. Below that, 'ONE SHOT' and '9999' are displayed. A 'DemoUser' login field is present. The main settings area shows 'M' (Manual mode), '1/60' (shutter speed), 'F8.0' (f-stop), 'K' (Kelvin color temperature), '5600' (ISO), and '100' (ISO speed). A 'RAW' button is also visible. Below this is a 'Shooting menu' with options: 'Picture Style' (Standard), 'Detail set.' (3, 0, 0, 0), 'Register User Defined style', 'WB SHIFT' (0,0), and 'Peripheral illumin. correct.'. At the bottom, there are buttons for 'Live View shoot. ...', 'Other Functions...', 'Preferences...', and 'Main Window...'.

**Capture RAW images** →

→ **Set shutter speed & f-stop**

→ **Set ISO and color temperature in Kelvin (K)**

# Camera Settings



Destination Folder  
User vs. Public Folder

Select Preferences:  
Destination Folder  
File Name

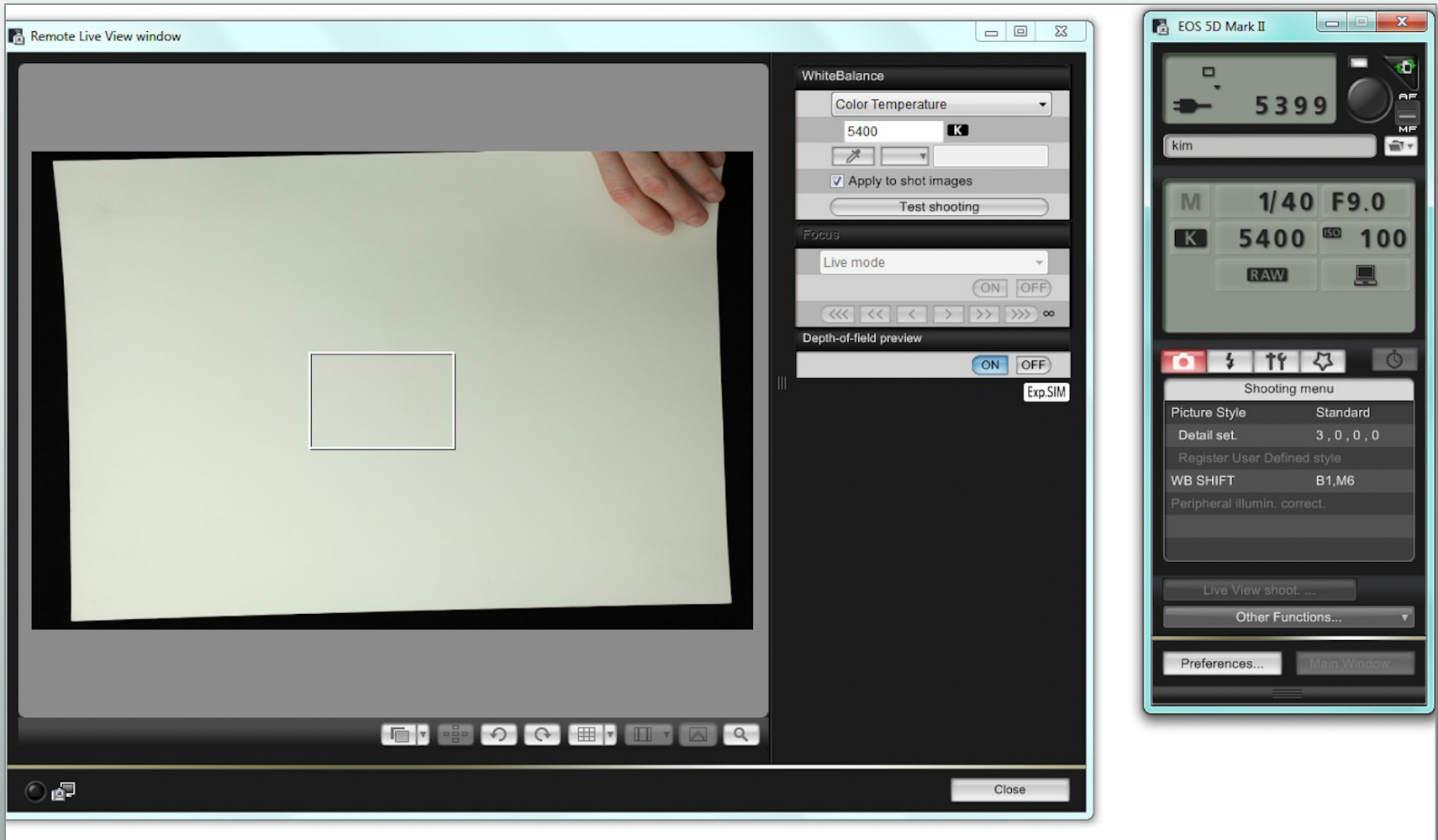
# Camera Settings



Live View Shoot

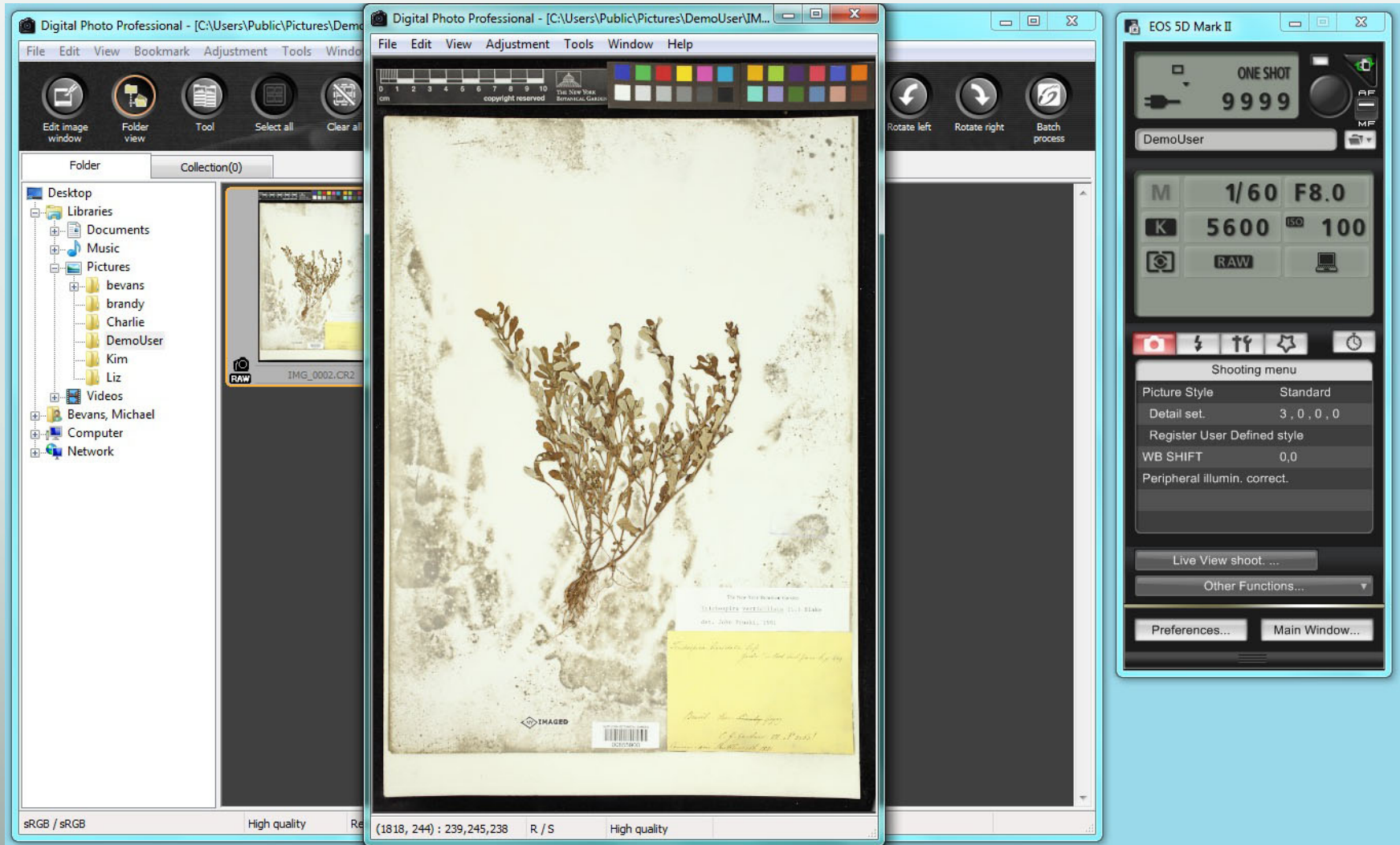
# Live View Shoot

Center camera over box, center template sheet,  
adjust manual focus



# Image Capture

## Digital Photo Professional for viewing RAW files



# Image Capture Goals

## Focus



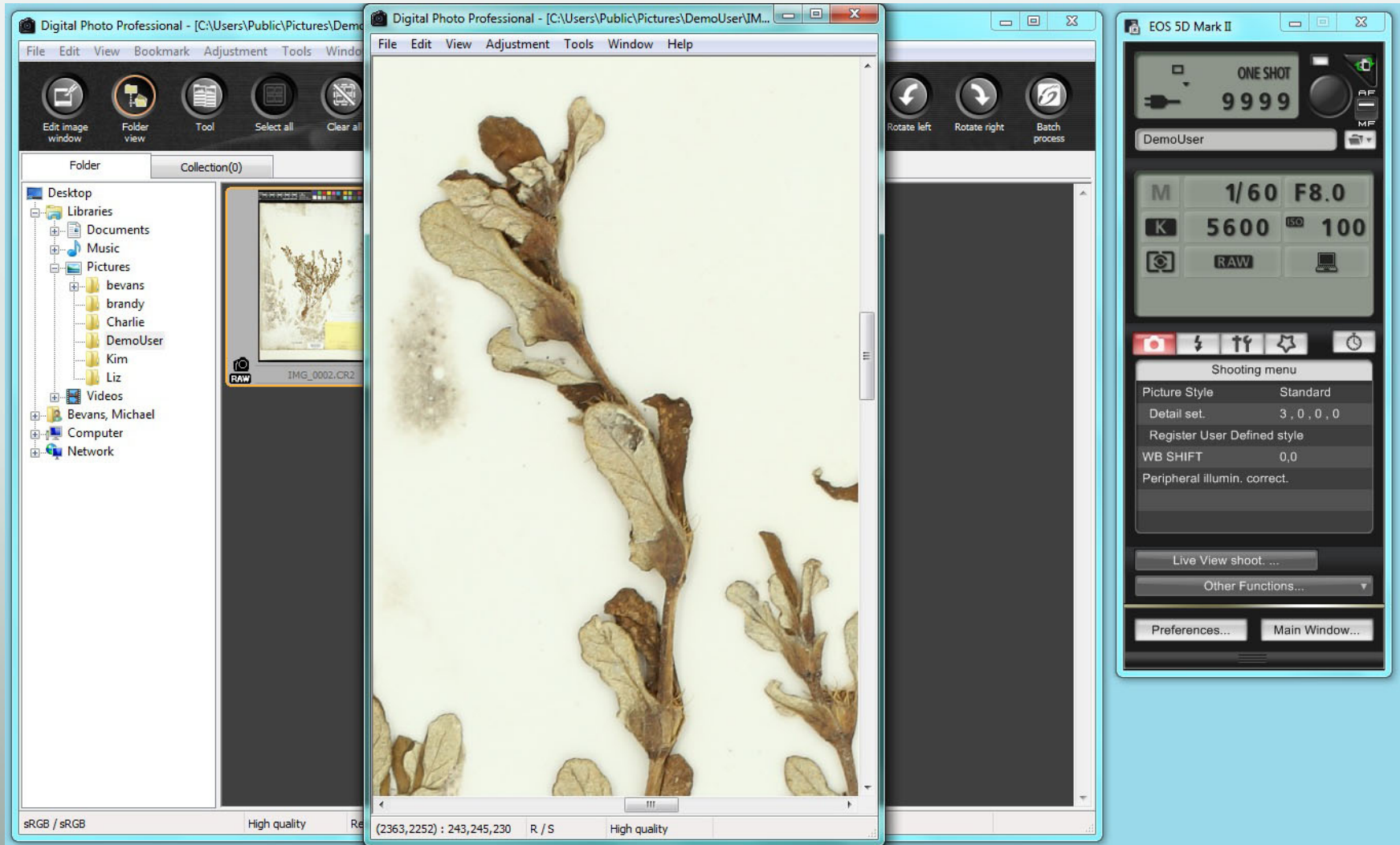
## Exposure



## Color Balance



# Image Capture Focus



# Image Capture

## Exposure & Color Balance



| No. | Number               | sRGB |     |     | CIE L*a*b* |         |         | Munsell Notation<br>Hue Value / Chroma |            |
|-----|----------------------|------|-----|-----|------------|---------|---------|----------------------------------------|------------|
|     |                      | R    | G   | B   | L*         | a*      | b*      |                                        |            |
| 1.  | dark skin            | 115  | 82  | 68  | 37.986     | 13.555  | 14.059  | 3 YR                                   | 3.7 / 3.2  |
| 2.  | light skin           | 194  | 150 | 130 | 65.711     | 18.13   | 17.81   | 2.2 YR                                 | 6.47 / 4.1 |
| 3.  | blue sky             | 98   | 122 | 157 | 49.927     | -4.88   | -21.925 | 4.3 PB                                 | 4.95 / 5.5 |
| 4.  | foliage              | 87   | 108 | 67  | 43.139     | -13.095 | 21.905  | 6.7 GY                                 | 4.2 / 4.1  |
| 5.  | blue flower          | 133  | 128 | 177 | 55.112     | 8.844   | -25.399 | 9.7 PB                                 | 5.47 / 6.7 |
| 6.  | bluish green         | 103  | 189 | 170 | 70.719     | -33.397 | -0.199  | 2.5 BG                                 | 7 / 6      |
| 7.  | orange               | 214  | 126 | 44  | 62.661     | 36.067  | 57.096  | 5 YR                                   | 6 / 11     |
| 8.  | purplish blue        | 80   | 91  | 166 | 40.02      | 10.41   | -45.964 | 7.5 PB                                 | 4 / 10.7   |
| 9.  | moderate red         | 193  | 90  | 99  | 51.124     | 48.239  | 16.248  | 2.5 R                                  | 5 / 10     |
| 10. | purple               | 94   | 60  | 108 | 30.325     | 22.976  | -21.587 | 5 P                                    | 3 / 7      |
| 11. | yellow green         | 157  | 188 | 64  | 72.532     | -23.709 | 57.255  | 5 GY                                   | 7.1 / 9.1  |
| 12. | orange yellow        | 224  | 163 | 46  | 71.941     | 19.363  | 67.857  | 10 YR                                  | 7 / 10.5   |
| 13. | blue                 | 56   | 61  | 150 | 28.778     | 14.179  | -50.297 | 7.5 PB                                 | 2.9 / 12.7 |
| 14. | green                | 70   | 148 | 73  | 55.261     | -38.342 | 31.37   | 0.25 G                                 | 5.4 / 8.65 |
| 15. | red                  | 175  | 54  | 60  | 42.101     | 53.378  | 28.19   | 5 R                                    | 4 / 12     |
| 16. | yellow               | 231  | 199 | 31  | 81.733     | 4.039   | 79.819  | 5 Y                                    | 8 / 11.1   |
| 17. | magenta              | 187  | 86  | 149 | 51.935     | 49.986  | -14.574 | 2.5 RP                                 | 5 / 12     |
| 18. | cyan                 | 8    | 133 | 161 | 51.038     | -28.631 | -28.638 | 5 B                                    | 5 / 8      |
| 19. | white (.05*)         | 243  | 243 | 242 | 96.539     | -0.425  | 1.186   | N                                      | 9.5 /      |
| 20. | neutral 8 (.23*)     | 200  | 200 | 200 | 81.257     | -0.638  | -0.335  | N                                      | 8 /        |
| 21. | neutral 6.5 (.44*)   | 160  | 160 | 160 | 66.766     | -0.734  | -0.504  | N                                      | 6.5 /      |
| 22. | neutral 5 (.70*)     | 122  | 122 | 121 | 50.867     | -0.153  | -0.27   | N                                      | 5 /        |
| 23. | neutral 3.5 (.1.05*) | 85   | 85  | 85  | 35.656     | -0.421  | -1.231  | N                                      | 3.5 /      |
| 24. | black (1.50*)        | 52   | 52  | 52  | 20.461     | -0.079  | -0.973  | N                                      | 2 /        |

050 2 degree observer sRGB values for Illuminate D65.

**R G B**

|     |                      |     |     |     |        |        |        |   |       |
|-----|----------------------|-----|-----|-----|--------|--------|--------|---|-------|
| 19. | white (.05*)         | 243 | 243 | 242 | 96.539 | -0.425 | 1.186  | N | 9.5 / |
| 20. | neutral 8 (.23*)     | 200 | 200 | 200 | 81.257 | -0.638 | -0.335 | N | 8 /   |
| 21. | neutral 6.5 (.44*)   | 160 | 160 | 160 | 66.766 | -0.734 | -0.504 | N | 6.5 / |
| 22. | neutral 5 (.70*)     | 122 | 122 | 121 | 50.867 | -0.153 | -0.27  | N | 5 /   |
| 23. | neutral 3.5 (.1.05*) | 85  | 85  | 85  | 35.656 | -0.421 | -1.231 | N | 3.5 / |
| 24. | black (1.50*)        | 52  | 52  | 52  | 20.461 | -0.079 | -0.973 | N | 2 /   |

# Image Capture

## Exposure & Color Balance

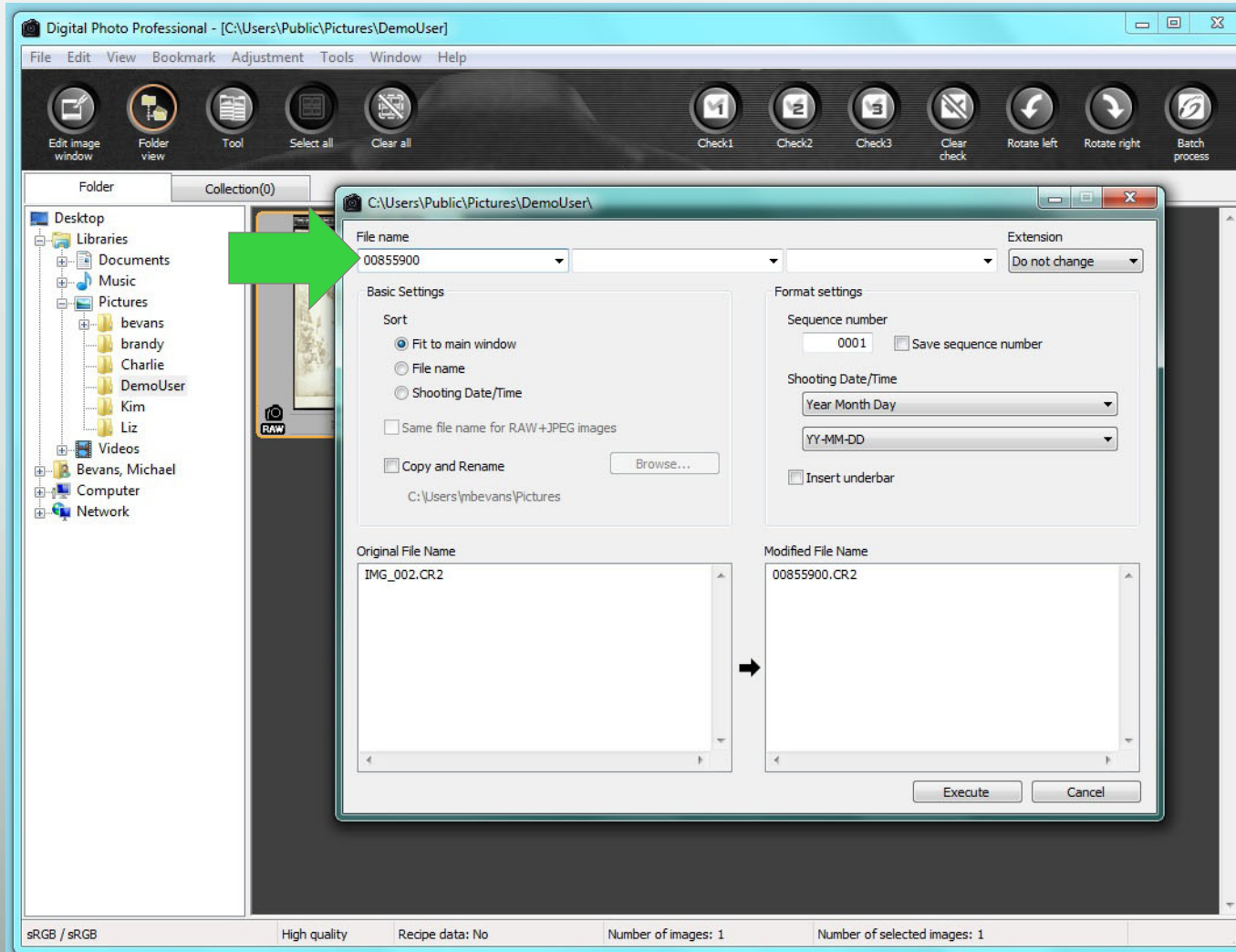
The image illustrates the process of capturing and balancing colors in a photograph of a botanical specimen. The workflow is as follows:

- File Explorer:** Shows the file structure, including folders like Desktop, Libraries, Documents, Music, Pictures, and Videos.
- Photo:** A photograph of a dried plant specimen on a light background. A green arrow points from the photo to the color calibration chart.
- Color Calibration Chart:** A standard color chart used for ensuring color accuracy. A green arrow points from the chart to the camera's LCD screen.
- Camera Settings (EOS 5D Mark II):** The LCD screen shows various settings:
  - ONE SHOT, 9999
  - M, 1/60, F8.0
  - K, 5200, ISO 100
  - RAW
  - WB SHIFT: A color balance wheel with a cursor pointing to the 'M' (Master) position.
  - Buttons: Rotate left, Rotate right, Batch process, Live View shoot..., Other Functions..., Preferences..., Main Window...
- Color Data Table:** A table at the bottom showing color data for the photo. A red arrow points from the photo to this table.
 

|                  | R   | G   | B   |
|------------------|-----|-----|-----|
| 19. white (.05*) | 243 | 243 | 242 |

# Image Capture

## Rename as Barcode

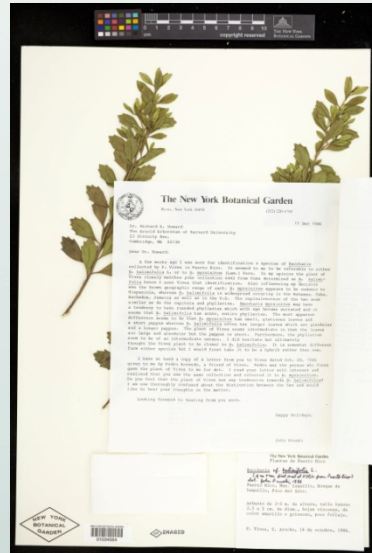


# Image Capture

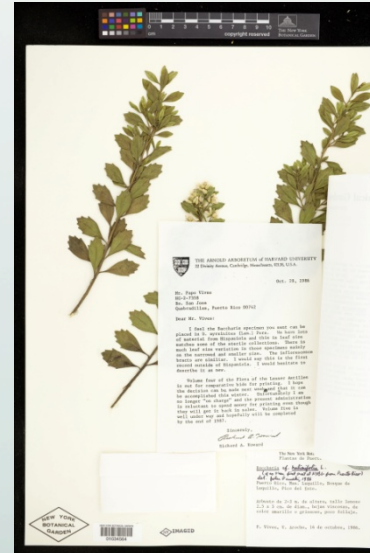
## Rename as Barcode



01034564 - 01



01034564 - 02



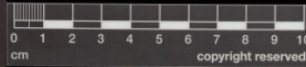
01034564 - 03



01034564 - 04

Multiple images of one specimen may be necessary.  
Add sequential numbers to file name.

Color checker



Scale bar

NY IMAGED

Stamped as Imaged

Fully in frame

ID number



All text visible

34  
US

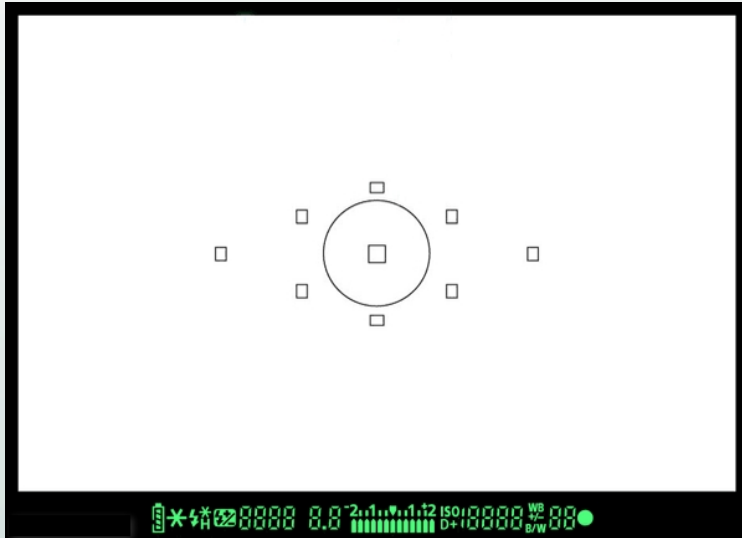
WISCONSIN  
DADE CO.

*Sorghum*  
*halapense*  
(L.) Pers.  
(or *S. bicolor*?  
or *S. sudanense*?)

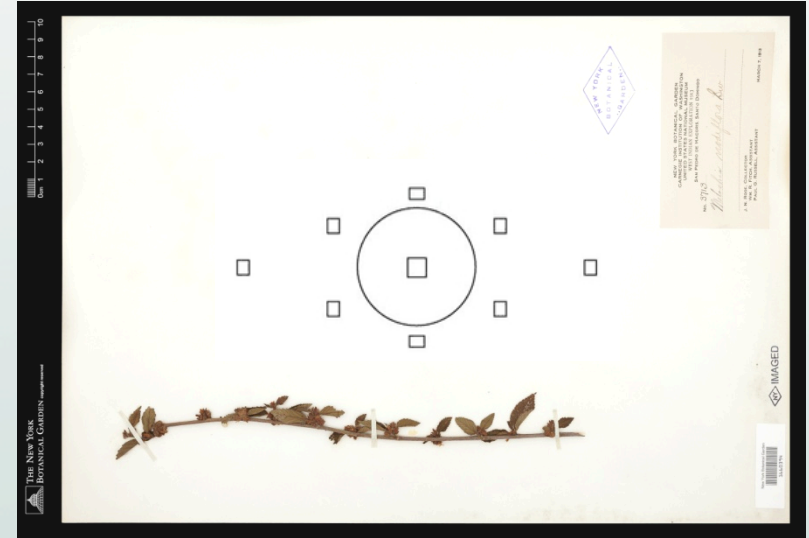
Probably not truly escaped.  
Robust (perennial?)  
culms to 2.5 m tall. Weed; pri-  
marily local on edges of but also sparsely  
scattered throughout cult. field of corn.  
(V 5 N; 8 8 E; sec. 10. E side 60. Hwy. PB.  
S of jct. with Hwy. 69, 4½ mi. S of VERONA.  
Data: Sept. 6, 1981 No.:  
Coll.: T. S. and B. A. Cochrane 9468

# Image Capture

## Auto vs. Manual Focus



**Auto Focus**



**Focus Failure**

**Points**

### Troubleshooting Options

- Place item in center, AF then toggle to Manual
- Focus and shoot in Manual, tape lens in place

# Photo e-Box vs. Copy stand



**MK Photo e-Box 1419**  
1/50 of a second at f11



**Copy stand**  
1/80 of a second at f20

Canon EOS -1Ds Mark III with a 50mm Macro lens

Image from e-Box shows more detail, due in part to the wider aperture, but also to the wrap-around lighting.

<http://digitalphotorepro.blogspot.com/2011/06/mk-direct-photo-e-box-1419-v-copystand.html>

# Camera vs. HerbScan

100% Magnification

**HerbScan**

7158 x 10144 pixels , 600 dpi

**Canon EOS 5D Mark II**

50 mm lens,  
f/9, 1/40 sec

3744 x 5616 pixels  
300 dpi



# Equipment Costs

## NYBG Herbarium Imaging and Equipment Specifications

|                                                                 |                   |
|-----------------------------------------------------------------|-------------------|
| Kaiser Copy Stand RS 1 with RA-1 Arm, 40" Column, 18 x 20" Base | \$575.74          |
| Manfrotto 3/8" + 1/4" Adapter Spigot                            | \$5.59            |
| Manfrotto 066 Double Female Stud for Super Clamp                | \$4.50            |
| MK Direct Photo-eBox , Model #777000 (shipping not included)    | \$1,780           |
| ColorGauge Nano Target                                          | \$165             |
| Rosco 48mm x 25 m Gaffer Tape (Black)                           | \$10.80           |
| Photoshop Lightroom (optional)                                  | \$149             |
| <b>TOTAL</b>                                                    | <b>\$2,690.63</b> |

**Total does not include camera, lens, computer, barcode scanner,  
or image storage space.**