

# NYBG Herbarium Imaging Equipment Suggestions and Specifications

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1. **Camera: Full-frame sensor, ≥20 Megapixels, RAW file format, software to operate the camera from the computer.**

| Nikon – (*NYBG Preferred option) |  |                                |
|----------------------------------|--|--------------------------------|
| 1                                | <b>Nikon D850 DSLR Camera (Body Only)</b> = Full Frame, 45 MP<br><a href="https://www.bhphotovideo.com/c/product/1351688-REG/nikon_d850_dslr_camera_body.html">https://www.bhphotovideo.com/c/product/1351688-REG/nikon_d850_dslr_camera_body.html</a>               | \$2,396.95                     |
| 1                                | <b>Nikon EH-5D AC Adapter</b><br><a href="https://www.bhphotovideo.com/c/product/1478448-REG/nikon_27202_eh_5d_ac_adapter.html">https://www.bhphotovideo.com/c/product/1478448-REG/nikon_27202_eh_5d_ac_adapter.html</a>   | \$99.95                        |
| 1                                | <b>Nikon EP-5B Power Supply Connector</b><br><a href="https://www.bhphotovideo.com/c/product/742056-REG/Nikon_27014_EP_5B_Power_Supply_Connector.html">https://www.bhphotovideo.com/c/product/742056-REG/Nikon_27014_EP_5B_Power_Supply_Connector.html</a>           | \$48.00                        |
| 1                                | <b>USB 3.0 A Male to Micro B Male Cable</b> >= 6ft (cable supplied w/ camera is 3ft)<br><a href="http://www.bhphotovideo.com/c/product/743674-REG/CablesToGo_54177_6_5_2_m_USB.html">www.bhphotovideo.com/c/product/743674-REG/CablesToGo_54177_6_5_2_m_USB.html</a> | \$22.99                        |
| 1                                | <b>Nikon Camera Control Pro 2.0 Software (30 day trial, then must purchase)</b><br><a href="https://downloadcenter.nikonimglib.com/en/download/sw/252.html">https://downloadcenter.nikonimglib.com/en/download/sw/252.html</a>                                       | \$179.00<br>(price may change) |
|                                  | Total  | \$2746.89                      |

| Nikon – Option 2 |  |                                |
|------------------|--|--------------------------------|
| 1                | <b>Nikon D810 DSLR Camera (Body Only)</b> = Full Frame, 36 MP<br>Discontinued, but can be purchased used/refurbished from <a href="#">B&amp;H Photo</a> or <a href="#">Adorama</a> , stock availability and prices vary  | \$600-\$750                    |
| 1                | <b>Nikon EH-5D AC Adapter</b><br><a href="https://www.bhphotovideo.com/c/product/1478448-REG/nikon_27202_eh_5d_ac_adapter.html">https://www.bhphotovideo.com/c/product/1478448-REG/nikon_27202_eh_5d_ac_adapter.html</a>   | 99.95                          |
| 1                | <b>Nikon EP-5B Power Supply Connector</b><br><a href="http://www.bhphotovideo.com/c/product/742056-REG/Nikon_27014_EP_5B_Power_Supply_Connector.html">www.bhphotovideo.com/c/product/742056-REG/Nikon_27014_EP_5B_Power_Supply_Connector.html</a>                    | \$48.00                        |
| 1                | <b>USB 3.0 A Male to Micro B Male Cable</b> >= 6ft (cable supplied w/ camera is 3ft)<br><a href="http://www.bhphotovideo.com/c/product/743674-REG/CablesToGo_54177_6_5_2_m_USB.html">www.bhphotovideo.com/c/product/743674-REG/CablesToGo_54177_6_5_2_m_USB.html</a> | \$22.99                        |
| 1                | <b>Nikon Camera Control Pro 2.0 Software (30 day trial, then must purchase)</b><br><a href="https://downloadcenter.nikonimglib.com/en/download/sw/252.html">https://downloadcenter.nikonimglib.com/en/download/sw/252.html</a>                                       | \$179.00<br>(price may change) |
|                  | Total  | \$949.94-<br>\$1,099.94        |

| <b>Canon – Option 1</b> |   |  |
|-------------------------|---|--|
| 1                       | <b>Canon EOS 5D Mark IV DSLR Camera (Body Only) = Full Frame, 30 MP</b><br><a href="https://www.bhphotovideo.com/c/product/1274705-REG/canon_eos_5d_mark_iv.html?ap=y&amp;smpadsrd=&amp;store=420&amp;gad_source=1&amp;gad_campaignid=21058084064&amp;gclid=Cj0KCQjwjrCBhCXARIsAI5x66W7vT51ASLsYRTzK4YfPZ9_9LPXcc6jKc-UOkYBkuXIEah3nXS6cRAaAvSDEALw_wcB">https://www.bhphotovideo.com/c/product/1274705-REG/canon_eos_5d_mark_iv.html?ap=y&amp;smpadsrd=&amp;store=420&amp;gad_source=1&amp;gad_campaignid=21058084064&amp;gclid=Cj0KCQjwjrCBhCXARIsAI5x66W7vT51ASLsYRTzK4YfPZ9_9LPXcc6jKc-UOkYBkuXIEah3nXS6cRAaAvSDEALw_wcB</a>  | \$2299.00<br>(can also purchase refurbished for lower price) |
| 1                       | <b>Canon AC-E6N AC Adapter and DC Coupler DR-E6 Kit (B&amp;H# CADRE6K)</b><br>AC-E6N AC Adapter with DC Coupler DR-E6<br><a href="http://www.bhphotovideo.com/c/product/1278814-REG/canon_ac_e6n_ac_adapter_and.html">www.bhphotovideo.com/c/product/1278814-REG/canon_ac_e6n_ac_adapter_and.html</a><br>AC Adapter AC-E6N: <a href="https://shop.usa.canon.com/shop/en/catalog/ac-adapter-ac-e6n-kit">https://shop.usa.canon.com/shop/en/catalog/ac-adapter-ac-e6n-kit</a><br>DC Coupler DR-E6: <a href="https://shop.usa.canon.com/shop/en/catalog/dc-coupler-dr-e6">https://shop.usa.canon.com/shop/en/catalog/dc-coupler-dr-e6</a><br>Is compatible with EOS 5D Mark IV | \$138.00   |
| 1                       | <b>Canon EOS Utility Software</b> (included with camera)  | \$0.00   |
|                         | Total   | \$2437.00  |

## 2. Lens: Macro, with 1:1 magnification ratio.

Although the macro lens will usually be positioned beyond its minimum focus distance from the herbarium sheet during routine specimen digitization, macro lenses generally tend to produce sharper images than non-macro lenses regardless of the focusing distance. In addition, should one want to move the camera closer to the herbarium sheet in order to capture small details of a specimen, a macro lens will allow a much shorter minimum focus distance, meaning one can fill more of the frame with the subject matter of interest at 1:1 magnification. Therefore, a macro is recommended for its increased sharpness and greater specimen digitization use-case flexibility.

A full-frame camera with a 50mm lens and a subject distance of  $\pm 29$ " (distance between sensor and shooting surface) works well with the MK Digital Direct Photo-eBox workstation (discontinued January 2017; see details below). The hole in the top of the lightbox is too small for use with NIKKOR 60mm Micro lens, or the NIKKOR 55mm lens.

It is presumed that a 50mm lens will also work well with the Ortery Photosimile 50. It has not been tested at NYBG, however it was used by many among the Consortium of Pacific Northwest Herbaria with a full frame camera (<http://www.pnwherbaria.org/documentation/specimenimaging.php>).

### **Nikon Options (select 1):**

Lenses ordered below according to sharpness (perceptual megapixels = P-Mpix) rating on dxomark when used with a Nikon D850 (45MP).

|                          |   |            |
|--------------------------|---|------------|
| <b>Tested, recommend</b> | <b>Sigma 50mm f/1.4 DG HSM Art Lens for Nikon F</b> (1:5.6 at 40 cm, 46.8° AoV, <b>42 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/1045459-REG/sigma_311306_50mm_f_1_4_dg_hsm.html">https://www.bhphotovideo.com/c/product/1045459-REG/sigma_311306_50mm_f_1_4_dg_hsm.html</a><br>(*NYBG Preferred option) | \$949.00   |
| <b>Tested</b>            | <b>Zeiss Milvus 50mm f/1.4 ZF.2 Lens for Nikon F</b> (1:6.7 at 45 cm, 46° AoV, <b>39 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/1185210-REG/zeiss_2096_556_milvus_1_4_50_zf_2_lens.html">https://www.bhphotovideo.com/c/product/1185210-REG/zeiss_2096_556_milvus_1_4_50_zf_2_lens.html</a>              | \$1,274.00 |
| <b>Not Tested</b>        | <b>Zeiss Milvus 50mm f/2M ZF.2 Lens for Nikon F</b> (1:2 at 24 cm, 45° AoV, <b>31 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/1185213-REG/zeiss_2096_558_milvus_2_50m_zf_2_lens.html">https://www.bhphotovideo.com/c/product/1185213-REG/zeiss_2096_558_milvus_2_50m_zf_2_lens.html</a>                   | \$1,358.00 |
| <b>Not Tested</b>        | <b>Nikon AF Nikkor 50mm f/1.8 D Lens</b> (1:7 at 46 cm, 46° AoV, <b>26 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/247091-USA/Nikon_2137_Normal_AF_Nikkor_50mm.html">https://www.bhphotovideo.com/c/product/247091-USA/Nikon_2137_Normal_AF_Nikkor_50mm.html</a>  | \$131.95   |
| <b>Not Tested</b>        | <b>Nikon AF-S Nikkor 50mm f/1.4G Lens</b> (1:7 at 46 cm, 46° AoV, <b>23 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/585343-USA/Nikon_2180_AF_S_Nikkor_50mm_f_1_4G.html">https://www.bhphotovideo.com/c/product/585343-USA/Nikon_2180_AF_S_Nikkor_50mm_f_1_4G.html</a>                                     | \$446.95   |

|   |   |            |
|---|---|------------|
| <b>Canon Options (select 1):</b><br>Lenses ordered according to sharpness (perceptual megapixels = P-Mpix) rating on dxomark when used with a Canon 5DSR (50MP) |   |            |
| <b>Not Tested, Recommend</b>  | <b>Sigma 50mm F1.4 DG HSM Art Lens for Canon EF</b> (1:5.6, 46.8° AoV, <b>40 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/1045458-REG/sigma_311101_50mm_f_1_4_dg_hsm.html">https://www.bhphotovideo.com/c/product/1045458-REG/sigma_311101_50mm_f_1_4_dg_hsm.html</a>                        | \$1,049.00 |
| <b>Not Tested</b>   | <b>Zeiss Milvus 50mm f/1.4 ZE Lens for Canon EF</b> (1:6.7, 46° AoV, <b>29 P-Mpix</b> ) No Autofocus<br><a href="https://www.bhphotovideo.com/c/product/1185204-REG/zeiss_2096_557_milvus_1_4_50_ze_lens.html">https://www.bhphotovideo.com/c/product/1185204-REG/zeiss_2096_557_milvus_1_4_50_ze_lens.html</a> | \$1,274.00 |
| <b>Not Tested</b>   | <b>Canon EF 50mm f/1.8 STM Lens</b> (1:5, 46° AoV, <b>29 P-Mpix</b> )<br><a href="https://www.bhphotovideo.com/c/product/1143786-REG/canon_0570c002_ef_50mm_f_1_8_stm.html">https://www.bhphotovideo.com/c/product/1143786-REG/canon_0570c002_ef_50mm_f_1_8_stm.html</a>  | \$125.00   |
| <b>Not Tested</b>   | <b>Zeiss Milvus 50mm f/2M ZE Lens for Canon EF</b><br>( <a href="https://www.bhphotovideo.com/c/product/1185206-REG/zeiss_2096_559_milvus_2_50m_ze_lens.html">https://www.bhphotovideo.com/c/product/1185206-REG/zeiss_2096_559_milvus_2_50m_ze_lens.html</a> )   | \$1,078.00 |

Resource for exploring lens/camera body combinations:

[DXOMARK's comprehensive camera lens test result database allows you to browse and select lenses for comparison based on their characteristics, brand, price, lens type, lens size, focal range and aperture. You can also select a camera to see the results for all the lenses tested on it.](#)

**3. Copystand:** minimum 40" column, can support weight of DSLR camera, positions the camera sensor over the top hole of a Photo-eBox. If not using a Photo-eBox, baseboard should accommodate standard 17" herbarium sheet plus ruler and color target, and allow for lights to clamp to baseboard. A full-frame camera with a lens of focal length greater than 50mm will require a copy stand column longer than 40 inches. If using the Ortery Photosimile 120, no copystand is required.

| Options (select 1)  | Cost  |
|---|---|
| <p><b>Beseler CS Digital/Photo-Video Copy Stand, 44" Column, 22x28" baseboard</b><br/>           B&amp;H # BECSDPV MFR # 4211-02<br/>           Ideal for use with Photo-e-Box Bio.<br/>           Not recommended for use with <b>Kaiser RB 218N HF Lighting Unit</b>, as baseboard lacks feet.<br/> <a href="http://www.bhphotovideo.com/c/product/197255-REG/Beseler_4211_02_CS_Digital_Photo_Video_Copy_Stand.html">http://www.bhphotovideo.com/c/product/197255-REG/Beseler_4211_02_CS_Digital_Photo_Video_Copy_Stand.html</a> (**NYBG Preferred option)</p>   | \$1,199.99  |
| <p><b>For a complete listing of all Kaiser Fototechnik Copy Stands and Lighting Units:</b><br/> <a href="https://www.kaiserfotous.com/">https://www.kaiserfotous.com/</a></p> <p><b>Kaiser Copy Stand RSX with RTX Arm, 48" Column, 20x24" Baseboard</b><br/>           B&amp;H # KACRSRX MFR # 205512<br/>           **Untested with Photo-e-Box Bio. May require arm extension.<br/> <a href="http://www.bhphotovideo.com/c/product/93111-REG/Kaiser_205512_Copy_Stand_RSX_with.html">http://www.bhphotovideo.com/c/product/93111-REG/Kaiser_205512_Copy_Stand_RSX_with.html</a></p>  | \$2,403.79  |
| <p><b>Kaiser Copy Stand RS 1 with RA-1 Arm, 40" Counterbalanced Column, 18x20" baseboard</b><br/>           B&amp;H # KACRSR1RA1 MFR # 205510<br/>           **Not recommended for use with MK Digital Direct ORTechLightbox with built-in infinity curve. (Beseler CS Digital Copy Stand recommended instead)<br/> <a href="http://www.bhphotovideo.com/c/product/93109-REG/Kaiser_205510_Copy_Stand_RS_1.html">http://www.bhphotovideo.com/c/product/93109-REG/Kaiser_205510_Copy_Stand_RS_1.html</a></p> <p><b>Use with MK Digital Direct Lightbox requires arm extension:</b></p> <p>Or</p> <ul style="list-style-type: none"> <li>· <a href="#">Kaiser Extension Arm</a> (\$189.99) Preferred</li> <li>· <a href="#">Manfrotto 3/8" + 1/4" Adapter Spigot</a> (\$6.16)</li> <li>· <a href="#">Manfrotto 066 Double Female Stud for Super Clamp</a> (\$5.60)</li> </ul> | \$1,034.00<br><br>+ \$189.99 (pref)<br><br>Or<br>+ \$10 |
| <p><b>Kaiser Copylizer Executive LED Copy Stand</b><br/>           40" Column, 14.2 x 19" baseboard<br/>           Includes LED side lighting unit, CRI 95<br/>           Height adjustable feet<br/>           RTP Camera arm<br/>           Illuminated baseboard<br/> <a href="https://www.bhphotovideo.com/c/product/1480006-REG/kaiser_205215_copylizer_executive_hf_led.html">https://www.bhphotovideo.com/c/product/1480006-REG/kaiser_205215_copylizer_executive_hf_led.html</a></p>  | \$4288.00 (special order)                               |

#### 4. Lighting.

\*\*NYBG uses the discontinued MK Digital Direct ORTech Photo-eBox Bio = “NYBG Modified” version Official NYBG 14 x 19 Box = Part Number 777000.\*\*

There are many commercially available light tents, primarily advertised for “product photography.” When looking for a light tent suitable for photographing herbarium sheets, consider the size of the opening (not just the footprint of the tent platform). An opening that is wide enough to easily insert/remove herbarium sheets with minimal manipulation is preferred. Also consider the CRI value of the light source, we recommend a CRI value of 90 or better.

You may also consider constructing your own light tent. Many tutorials are available online from photography enthusiasts on how to make “DIY Light Tents” or “DIY Table-top Photography Tents” If you decide to go this route, consider these tips from iDigBio:

<https://www.idigbio.org/content/how-and-how-not-design-light-box-cautionary-tale>

| Options (select 1)  | Cost             |
|---|------------------|
| <p><b>Ortery Photosimile 120 - Desktop Product Photography Studio</b><br/> <a href="https://www.bhphotovideo.com/c/product/1406090-REG/ortery_2d_photobench_120.html">https://www.bhphotovideo.com/c/product/1406090-REG/ortery_2d_photobench_120.html</a><br/>           Mobile 24 x 24 x 28” tabletop photography studio, 37 lbs.<br/>           Shoot objects up to 20” x 20” x 22”<br/>           Maximum Top Shots: 16” x 20”<br/>           LED light source (92 CRI, 30,000 hours). Separate light control from front, rear and backlight. Top and side shot capabilities.</p> <p>*** Note: No copystand is required; however, a camera mount must be purchased or made and mounted on the top of the box. Helpful documentation provided by Consortium of Pacific Northwest Herbaria: <a href="http://www.pnwherbaria.org/documentation/specimenimaging.php">http://www.pnwherbaria.org/documentation/specimenimaging.php</a></p> | <p>\$5130.00</p> |
| <p><b>Godox LSD60 Light Tent (23.6 x 23.6 x 23.6”)</b><br/> <a href="#">Godox LST60 Light Tent (23.6 x 23.6 x 23.6”) LST60 B&amp;H Photo (bhphotovideo.com)</a></p> <p>*** NYBG has not tested. This option would likely need modifications, specifically, the opening at the top of the tent would need to be enlarged if imaging full herbarium sheets using the camera/lens combinations suggested by NYBG. The front tent flap opening is adjustable (see additional images provided by B&amp;H). If not suitable for rapid full sheet imaging, this could still be a good option for packets and boxed material.</p> <p>5600K Color Temperature<br/>           96 CRI</p>  | <p>\$79.00</p>   |

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| <p><b>Strobe Lighting with Power Pack:</b><br/>Requires power pack, 2 lampheads, 2 softboxes, 2 light stands, copystand for camera</p> <p><b>Could purchase parts individually or as a kit:</b><br/><b>Kit example:</b><br/><b>Speedotron 1005 CC Digital Studio 2 Head Kit B&amp;H # SP1005S2K (B&amp;H Kit)</b><br/><a href="https://www.bhphotovideo.com/c/product/399941-REG/Speedotron_405_CC_Digital_Studio.html">https://www.bhphotovideo.com/c/product/399941-REG/Speedotron_405_CC_Digital_Studio.html</a></p> <p><b>NYBG currently uses the following strobe lighting equipment:</b></p> <p><b>Speedotron 102 Black Line: 2400 Watt/Second Lamphead with 7" Reflector &amp; Flashtube</b> B&amp;H # SP102UV7 MFR # 850315<br/>Replacement lampheads for existing NYBG flash lighting stations.<br/><a href="https://www.bhphotovideo.com/c/product/50009-REG/Speedotron_12231_7_102_Lamphead_with_7.html">https://www.bhphotovideo.com/c/product/50009-REG/Speedotron_12231_7_102_Lamphead_with_7.html</a></p> <p><b>Power supply:</b> Speedotron #805 - 800W/Sec, 120VAC, Discontinued.<br/><a href="https://www.bhphotovideo.com/c/product/613754-DEMO/Speedotron_11245_805_800_Watt_Second.html">https://www.bhphotovideo.com/c/product/613754-DEMO/Speedotron_11245_805_800_Watt_Second.html</a><br/>Alternative: Speedotron 1005 Power Supply (120VAC) B&amp;H # SP1005 MFR # 850100<br/><a href="https://www.bhphotovideo.com/c/product/634188-REG/Speedotron_11243_1005_Power_Supply_120VAC.html">https://www.bhphotovideo.com/c/product/634188-REG/Speedotron_11243_1005_Power_Supply_120VAC.html</a></p> <p><b>Softbox:</b> Speedotron Softbox - 36x48" (90x120cm) B&amp;H # SPSB3648M11 MFR # 853115<br/><a href="https://www.bhphotovideo.com/c/product/157132-REG/Speedotron_24528_Softbox_36x48_90x120cm.html/pagelD/accessory">https://www.bhphotovideo.com/c/product/157132-REG/Speedotron_24528_Softbox_36x48_90x120cm.html/pagelD/accessory</a></p> | <p>\$2698</p> <p>2x<br/>\$499.95</p> <p>\$948.95</p> <p>2 x \$289.95</p> |
|--|--|

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|---|-------------------------------|
| <p><b>NYBG currently uses discontinued Dracast Yoga Series LED 500 flexible LED panels. A suitable substitute for retrofitting NYBG lightboxes is the Godox FH50Bi-Color LED Flexible Light Panel</b></p> <p><a href="https://www.bhphotovideo.com/c/product/1781743-REG/godox_fh50bi_bi_color_led_flexible.html/?ap=y&amp;ap=y&amp;smp=y&amp;smp=y&amp;store=420&amp;smpm=ba_f2_lar&amp;lsf=BI%3A514&amp;qad_source=1&amp;qad_campaignid=1413135038&amp;gclid=Cj0KCQjwjJrCBhCXARIsAl5x66Xlv-FEuM5tutesBF2YLJOyGXPasUjpt_wTqSV2z50wQSzvon5Y3M0aAmj1EALw_wcB">https://www.bhphotovideo.com/c/product/1781743-REG/godox_fh50bi_bi_color_led_flexible.html/?ap=y&amp;ap=y&amp;smp=y&amp;smp=y&amp;store=420&amp;smpm=ba_f2_lar&amp;lsf=BI%3A514&amp;qad_source=1&amp;qad_campaignid=1413135038&amp;gclid=Cj0KCQjwjJrCBhCXARIsAl5x66Xlv-FEuM5tutesBF2YLJOyGXPasUjpt_wTqSV2z50wQSzvon5Y3M0aAmj1EALw_wcB</a></p>  | <p>4 x 169.00</p>             |
| <p><b>NYBG currently uses the following LED lights for supplemental light (LED affixed to lightbox to provide even exposure when doors are not attached)</b></p> <p><b>Viltrox L132T On-Camera Bi-Color LED Light with LCD Display</b><br/><a href="https://www.bhphotovideo.com/c/product/1459173-REG/viltrox_l132t_l132t_professional_ultra_thin_led.html">https://www.bhphotovideo.com/c/product/1459173-REG/viltrox_l132t_l132t_professional_ultra_thin_led.html</a></p> <p>Additional supplies used to affix light to lightbox and power continuously:<br/><b>Watson Pro 12V 2A Power Supply (2.1mm)</b><br/><a href="https://www.bhphotovideo.com/c/product/1411731-REG/watson_ps_12v2a_21_12v_2a_power_supply">https://www.bhphotovideo.com/c/product/1411731-REG/watson_ps_12v2a_21_12v_2a_power_supply</a></p> <p><b>SmallRig Super Clamp with Ball Head Arm</b><br/><a href="https://www.bhphotovideo.com/c/product/1421786-REG/smallrig_1138_multi_function_double_ballhead_with.html">https://www.bhphotovideo.com/c/product/1421786-REG/smallrig_1138_multi_function_double_ballhead_with.html</a></p> | <p>\$36.95</p> <p>\$11.03</p> |

|   |                               |
|---|-------------------------------|
| <p><b>SmallRig Articulating Arm (9.5")</b><br/> <a href="https://www.bhphotovideo.com/c/product/1652194-REG/smallrig_2066b_articulating_arm_9_5.html">https://www.bhphotovideo.com/c/product/1652194-REG/smallrig_2066b_articulating_arm_9_5.html</a></p> | <p>\$14.90</p> <p>\$15.90</p> |
|---|-------------------------------|

## 5. Additional Items:

### Laptop or Desktop computer

- Recommended minimum: i5 processor, 16GB RAM, 500GB hard drive (1TB preferred)
- If laptop, recommend at least 17.3" display, USB mouse
- **NYBG Preferred: Dell Optiplex AIO 7490, 24" screen, i9 processor, 16GB RAM, 1TB SSD, nVidia GeForce Graphics card 1794.52**

**Barcode scanner:** to rename images as specimen barcode number at moment of image capture. Scanner stand may be preferred, for hands-free use.

[Wasp WCS3900 CCD Barcode Scanner](#), USB, 6ft Cable, LED light source = \$88.19

**Color Target:** to be captured in every image to ensure consistent color balance and exposure

- [Image Science Associates ColorGauge Nano Target](#) (Matte Version)= \$330  
Unclear if calibrating software is included  
[http://www.imagescienceassociates.com/mm5/software/ColorGauge\\_Targets\\_comparison.pdf](http://www.imagescienceassociates.com/mm5/software/ColorGauge_Targets_comparison.pdf)

**Ruler or scale bar:** to be captured in every image for use in specimen morphometrics

[Image Science Associates Object-Level Target Family](#)

0.5X = \$478.50, combines color target with ruler

**Black background:** non-reflective, durable.

[Savage Velvetine Paper Background, Midnight Black](#) 52"x20' roll = \$49.95 (Discontinued but may still be available from some photography retailers)

Alternative to photography paper (tested at NYBG):

<https://www.amazon.com/Adhesive-Velvet-Contact-Jewelry-Drawer/dp/B07DPSGXQC>

**Black Gaffer Tape:** to secure background paper, color checker, and ruler

[ProTapes Pro Gaffer Tape \(2" x 55 yd, Black\)](#) \$19.95

**Adobe Photoshop Lightroom Software:** image post-processing, RAW conversion, image management

[Adobe Creative Cloud Photography Plan with 1TB Cloud Storage \(12-Month Subscription, Download Card\)](#) 239.88

Teacher's discount may be available, or a monthly subscription to [Adobe Creative Cloud](#)

**External Drive:** (optional) for image storage/transport

[Western Digital 2TB Elements Portable USB 3.0 External Hard Drive](#) = \$79.99