THE NEW YORK BOTANICAL GARDEN

Specimen Imaging:

From photography basics to backing up an archive

Part 2 of 5

Presented by Kimberly Watson

17 January 2014

Data Capture Course – Accra, Ghana

Overview

- ✓ Terminology
- Equipment
  - Hardware
  - Software
- Image capture process
  - Herbarium sheets, packets
  - Pinned objects (Christiane)
  - Spirit collections (Christiane)
- Image processing post-capture
- Image storage

EQUIPMENT

Imaging Equipment: Hardware

- Camera, scanner
- Lens
- Structural support for camera
- Light source
- Computer
- Cables
- Image storage space

Camera

Recommended:

- Digital single lens reflex (DSLR) camera
- At least 18 megapixels
- Full frame image sensor
- Capture RAW image file format

Image Sensor

Converts optical image to an electronic signal

Recommend full frame sensor

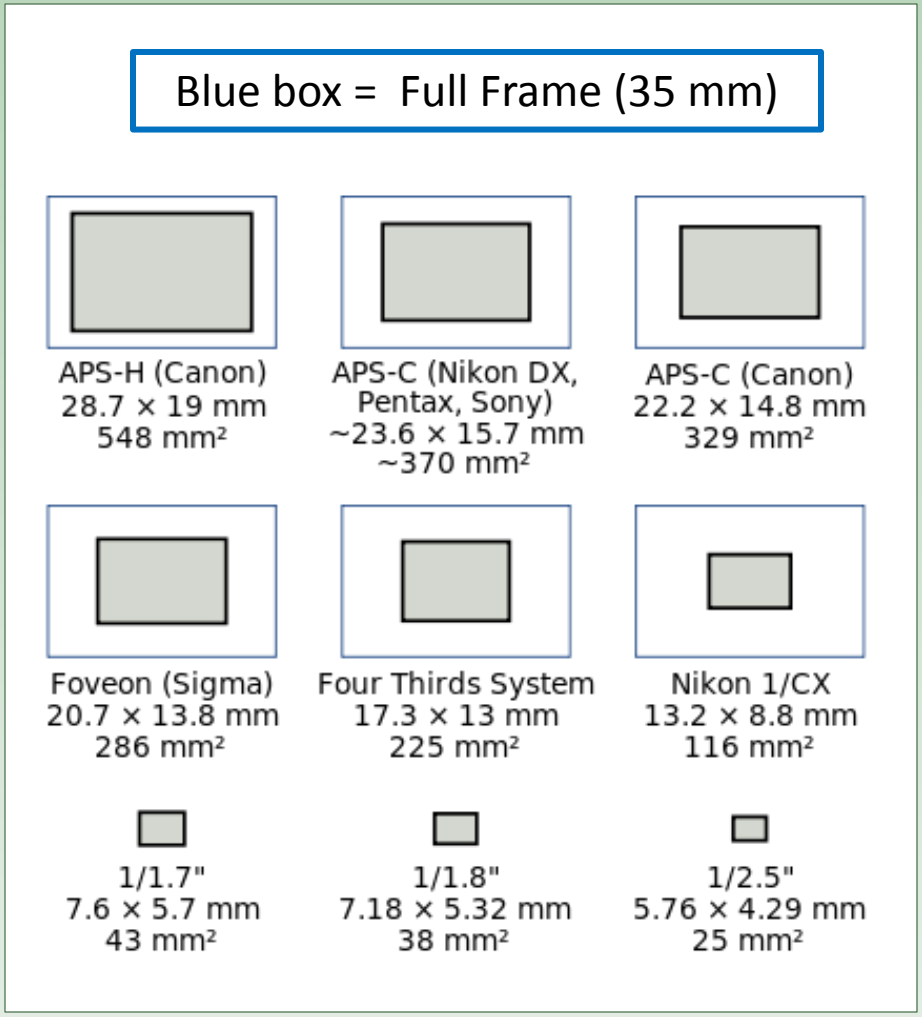
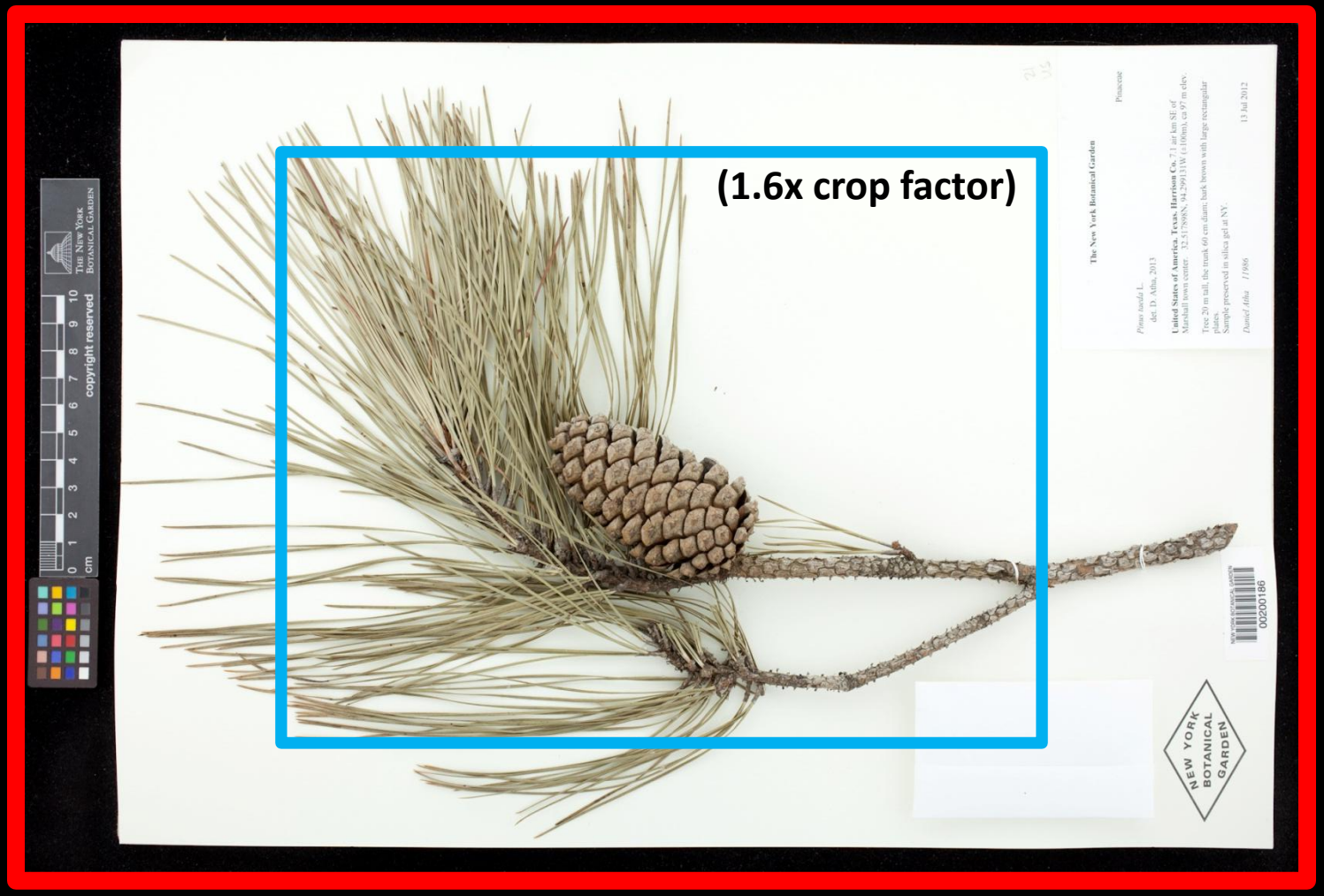


Image source: http://en.wikipedia.org/wiki/File:SensorSizes.svg

Full Frame vs. Cropped sensor

(36 × 24 mm) **(25.1 × 16.7 mm)**

Same lens, same distance from specimen, different sensor size



Camera

Less expensive alternatives

Mirrorless interchangeable-lens camera:

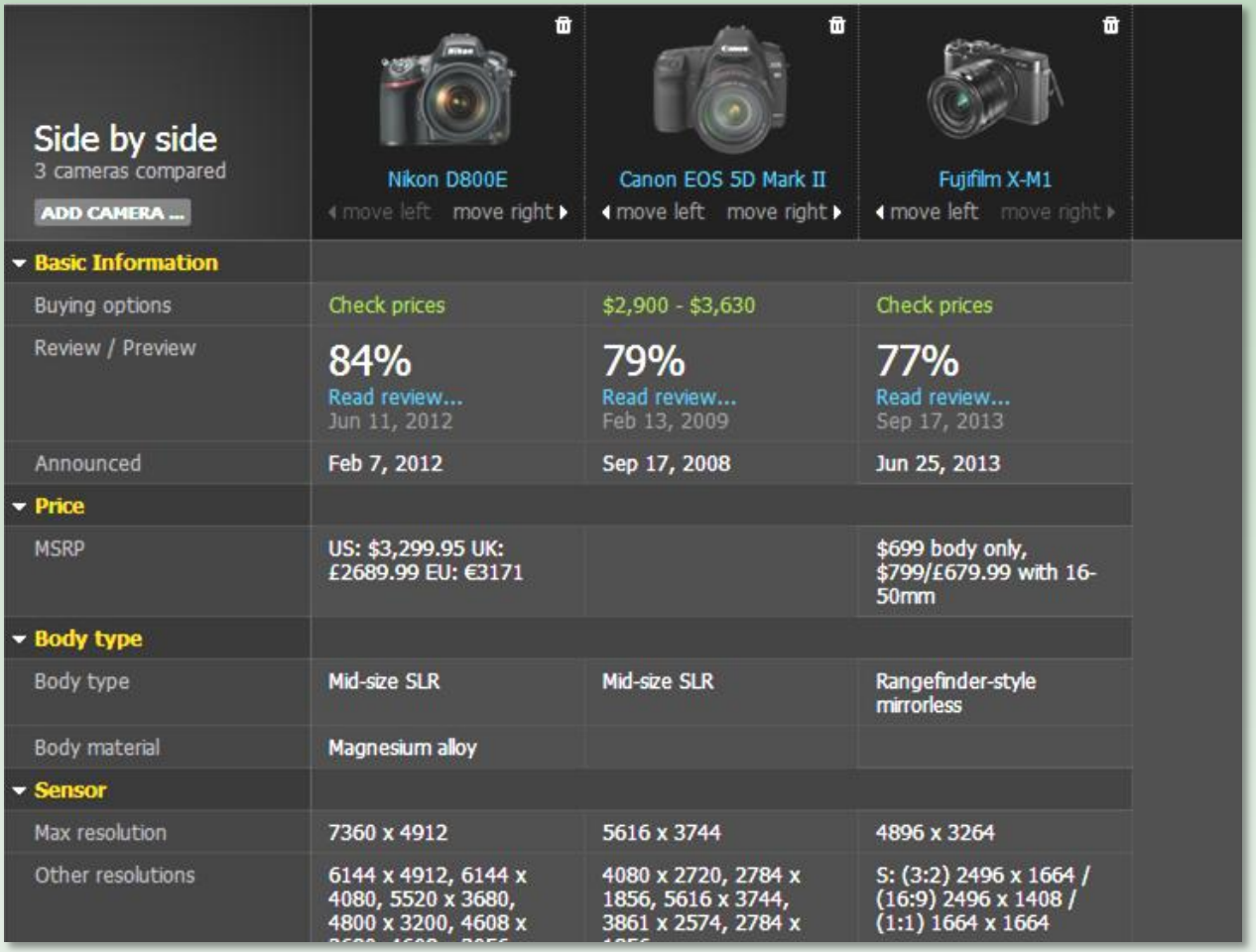
- Highest number of megapixels possible
- With full frame image sensor
- Captures RAW image file format
- Macro lens

Point and shoot camera:

- Highest number of megapixels possible
- Largest image sensor possible
- RAW image file format, if possible

Compare Camera Specifications

Digital Photography Review: search for and compare cameras
http://www.dpreview.com/products/compare/cameras



Side by side 3 cameras compared ADD CAMERA ...	Nikon D800E move left move right	Canon EOS 5D Mark II move left move right	Fujifilm X-M1 move left move right
Basic Information			
Buying options	Check prices	$2,900 - $3,630	Check prices
Review / Preview	84% Read review... Jun 11, 2012	79% Read review... Feb 13, 2009	77% Read review... Sep 17, 2013
Announced	Feb 7, 2012	Sep 17, 2008	Jun 25, 2013
Price			
MSRP	US: $3,299.95 UK: £2689.99 EU: €3171		$699 body only, $799/£679.99 with 16-50mm
Body type			
Body type	Mid-size SLR	Mid-size SLR	Rangefinder-style mirrorless
Body material	Magnesium alloy		
Sensor			
Max resolution	7360 x 4912	5616 x 3744	4896 x 3264
Other resolutions	6144 x 4912, 6144 x 4080, 5520 x 3680, 4800 x 3200, 4608 x	4080 x 2720, 2784 x 1856, 5616 x 3744, 3861 x 2574, 2784 x	S: (3:2) 2496 x 1664 / (16:9) 2496 x 1408 / (1:1) 1664 x 1664

Camera Lens

For photographing herbarium specimens with a full frame image sensor, you will need:
50 – 60 mm Macro Lens

Goal: size of the object on the sensor ≥ the size of the actual object
Reproduction ratio greater than 1:1

Example

Canon EF 50mm f/2.5 Compact Macro

Example

Sigma 50mm f/2.8 EX DG Macro Lens for Nikon DSLR Cameras

Full Frame Sensor vs. Cropped Sensor

With 50 mm and 70 mm lenses

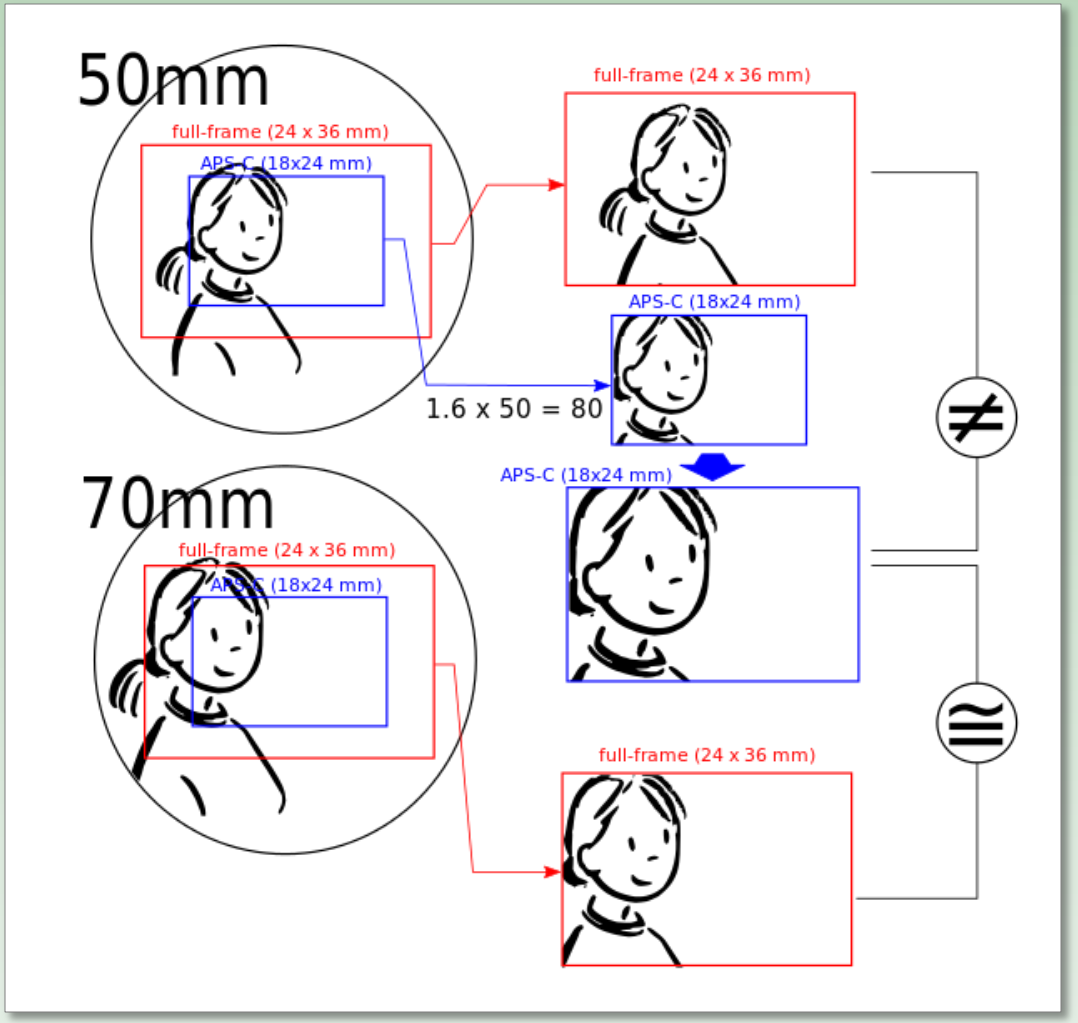
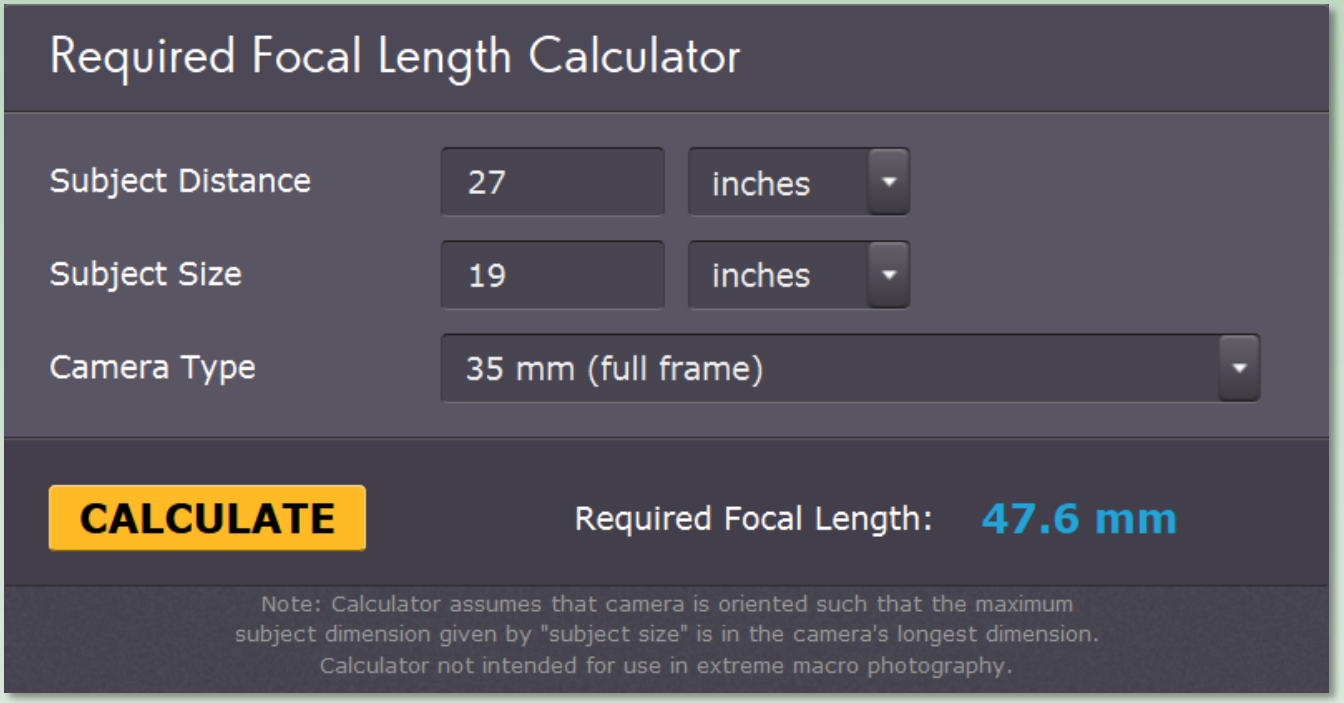


Image Source: http://upload.wikimedia.org/wikipedia/commons/f/f5/Full-frame_vs_APS-C.svg

Calculate Focal Length

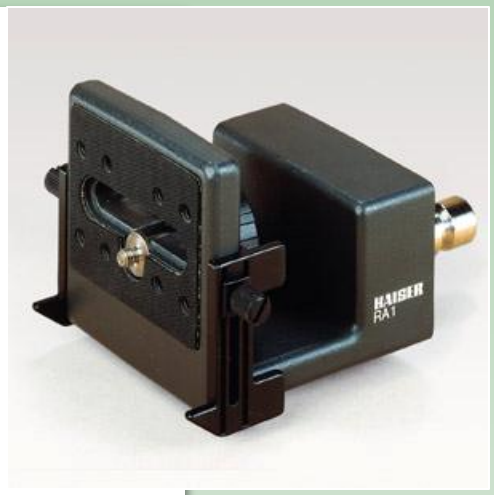
Be sure the combination of camera image sensor and lens focal length will capture the entire specimen in the image.

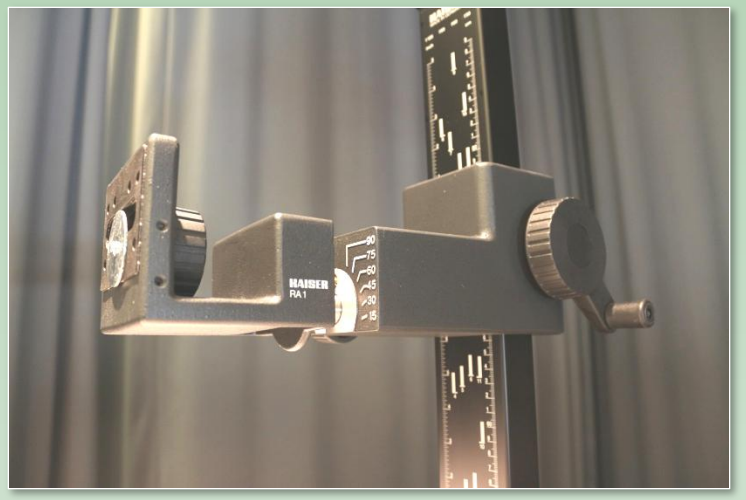


A camera with full frame sensor raised 27 inches above an herbarium specimen with a long edge of 19 inches requires a focal length of 47 mm.

http://www.cambridgeincolour.com/tutorials/camera-lenses.htm

Kaiser RS 1 Tabletop Copy Stand





- RA-1 Arm
- 40” counterbalanced, “low vibration” column
- 18 x 20 inch baseboard
- Can place MK Photo eBox on baseboard or use other light source

Bencher Copymate II Tabletop Copy Stand

- Fluorescent lights included
- Color temperature 5200K
- Working Area 20"W x 16"D
- Column 36" long

http://www.bencher.com/photo/copymate2_90061.php

Copy Stand

Advantages:

- Easy to assemble
- Adjustable
- Lights may be included

Disadvantages:

- Lights may not be included
- Environmental illumination
- Shadows

Example: imaging workstation with Bencher Copymate II copystand, lights included

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...

Now.

Using the Photo-eBox
Improved 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

HerbScan: Inverted Flatbed Scanner

<u>Advantages:</u>

- Very large images
- Consistent results
- Easy to operate

<u>Disadvantages:</u>

- Slow (5-6 min./scan)
- Limited subject matter
- May be discontinued

Computer

- Laptop or Desktop computer
  - Recommended minimum:
    - i5 processor
    - 4GB RAM (preferably more if plan to run image editing/processing software)
    - 500GB hard drive
  - Laptop: 17.3” display, USB mouse

Cables

- **AC Adapter** – connect to wall outlet, replaces dependence on battery. Is camera specific. May need to purchase separately.

- **USB Interface Cable** – connect camera to computer
  - Allows for remote shooting
  - Save images directly to computer hard drive

Image Storage Space

- Multiple external hard drives
- Optical Disks (CDs, DVDs, Blu-Ray)
- Network server space
- Consider using backup storage space online:
  - Article: "*40 Online Backup Services Reviewed*" http://pcsupport.about.com/od/maintenance/tp/online_backup_services.htm
  - Google Drive Storage 100 GB for $5/month or 200 GB for $10/month http://www.google.com/drive/storage.html

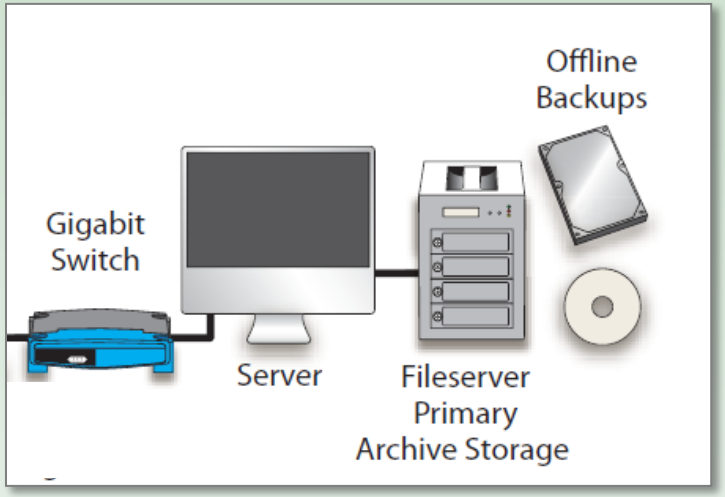


Image Source: Krogh, P. *The DAM Book, 2nd Edition*. O'Reilly Media, Inc. 2009. 196.

Station Assembly: MK Photo e-Box

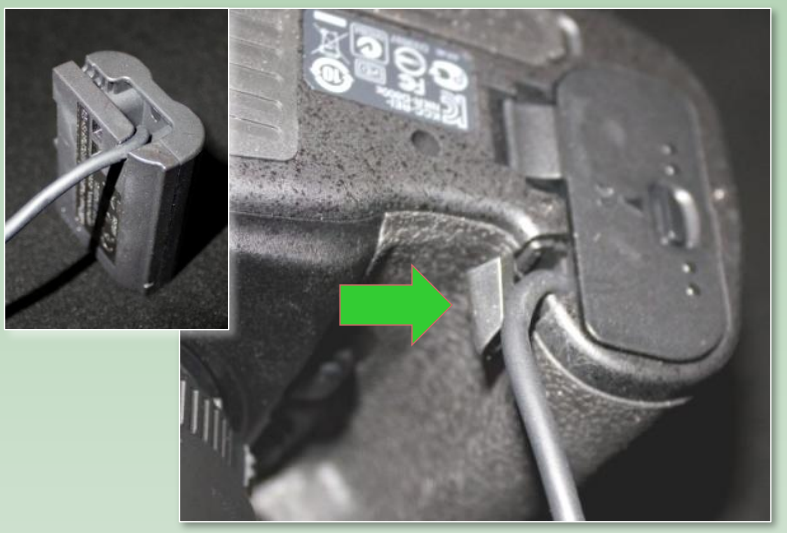
- Assemble copy stand
- Remove center feet from bottom of box*
- Remove plastic, lay velvetine on the glass*
- Place velvetine between box and copy stand*
- Center box on copy stand

Station Assembly

If using the MK Photo-eBox and the Kaiser RS 1 Copy Stand, an adapter is needed to extend the camera over the opening in the top of the light box.

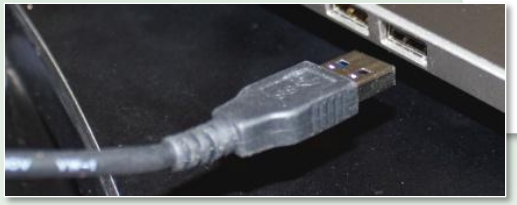
Station Assembly: Camera set-up

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



Station Assembly: Camera set-up

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



Station Assembly: Camera set-up

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

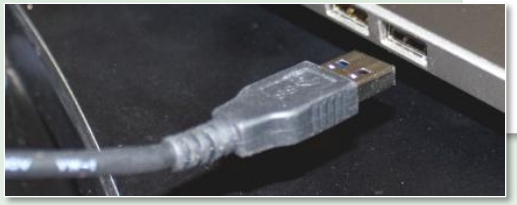


Photo e-Box vs. Copy stand

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

Copy stand
1/80 of a second at f20

Both photographed using 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

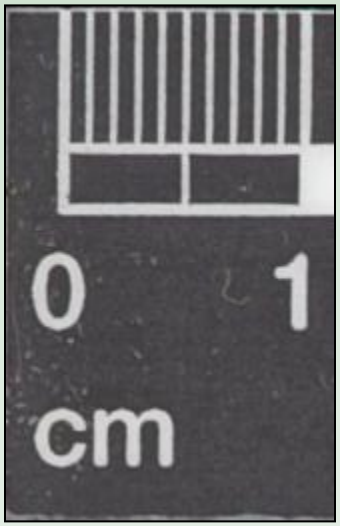
HerbScan

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 for NYBG Set-up

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
TOTAL	$2,690.63

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

Imaging Equipment: Software

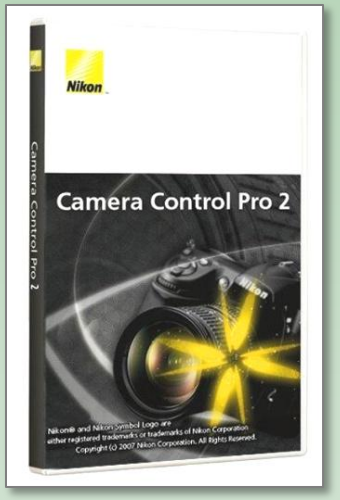
- Remote image capture software
- Image viewing software
- Image editing software
- Image cataloging software

- Image focus-stacking software (if photographing insects)

Remote Image Capture Software

Canon camera
- EOS Utility
- Free with camera
- Windows or Mac

Nikon camera
- Camera Control Pro 2
- Sold separately
- Windows or Mac



Adobe Photoshop Lightroom
- Independent of camera brand
- Windows or Mac
- Costs $150 (Student & Teacher Edition $79)

Aperture
- Independent of camera brand
- Mac only
- Costs $80

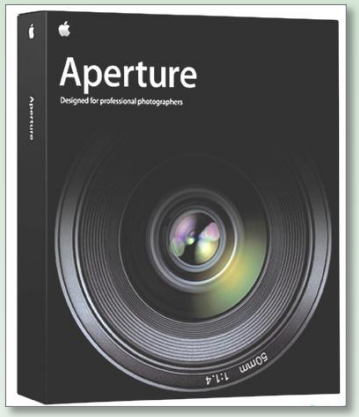
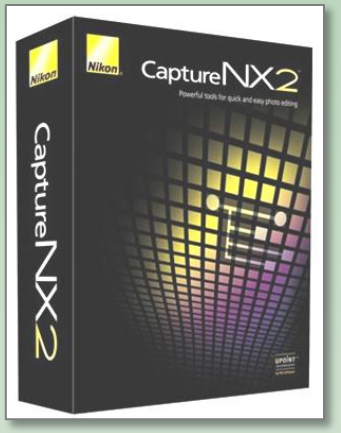


Image Viewing Software

Canon camera
- Digital Photo Professional
- Free with camera
- Windows or Mac

Nikon camera
- Capture NX2
- Sold separately
- Windows or Mac



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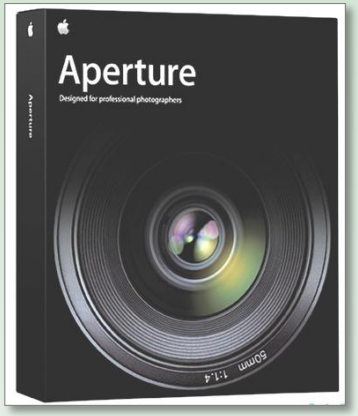
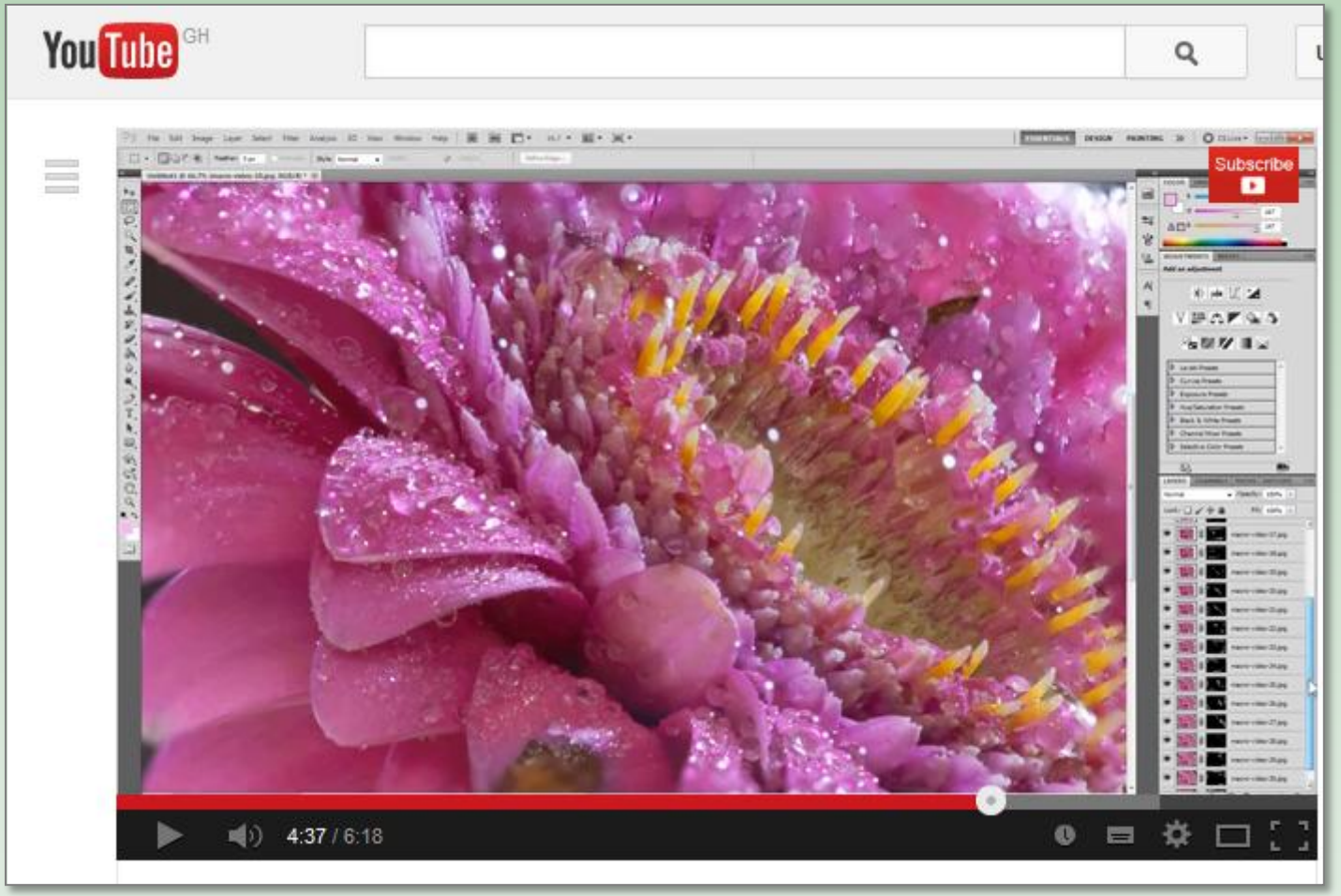


Image Editing & Cataloging Software

Software	Image Editor	Non-destructive image editing	Image Catalog	Cost	Operating System
Lightroom	X	X	X	$134	Win/Mac
Photoshop	X			$670, $20/month	Win/Mac
Aperture	X	X	X	$80	Mac
Capture 1 Pro 7	X	X	X	$300	Win/Mac
GIMP	X			Free	Win/Mac/Linux
AfterShot Pro	X	X	X	$50	Win/Mac/Linux

Select Software of interest in table above and link to website.

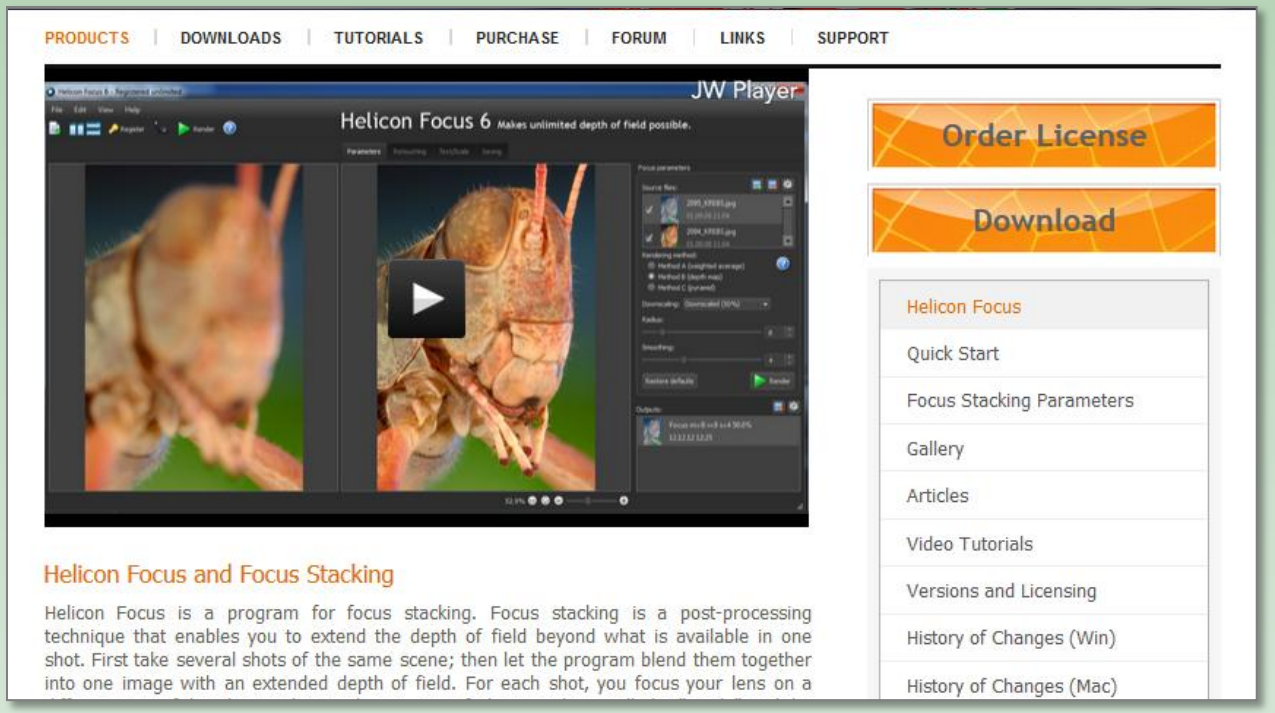
Image Stacking: Photoshop



Macro Focus Stacking/Image Stacking Tutorial

http://www.youtube.com/watch?v=F3Dz34MMjQ0

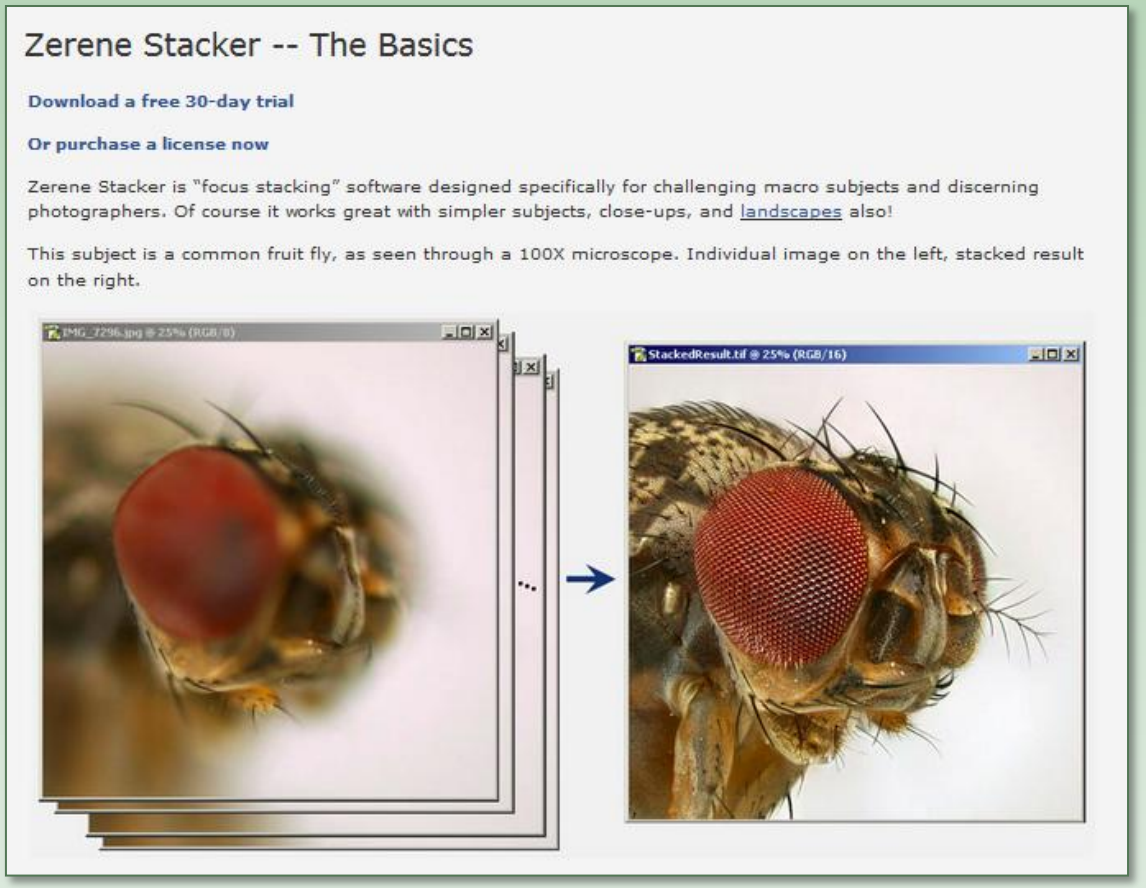
Image stacking: Helicon Focus Pro



Helicon Focus:	Stacks the images.
Helicon Remote:	Control Canon or Nikon DSLR cameras remotely and automates focus (DoF) bracketing.
Helicon Focus Pro:	Includes Focus and Remote. Annual subscription $55, Unlimited license $200.

http://www.heliconsoft.com/helicon-focus-licenses-swreg/

Image stacking: Zerene Stacker



$40 Student Edition, up to $290 for Professional Edition
Windows, Mac, Linux

http://zerenesystems.com/cms/stacker

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