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Integrated Digitized Biocollections

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Focus Stacking for Improved Depth of Field

Leveraging Digitization Practices across Multiple Domains
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Focus or Z-Stacking

Recording and merging several images of a single subject taken from the same angle and from several focus distances through a process that preserves the sharpest pixels in each image to ensure the greatest depth of field (DOF) in the merged image.

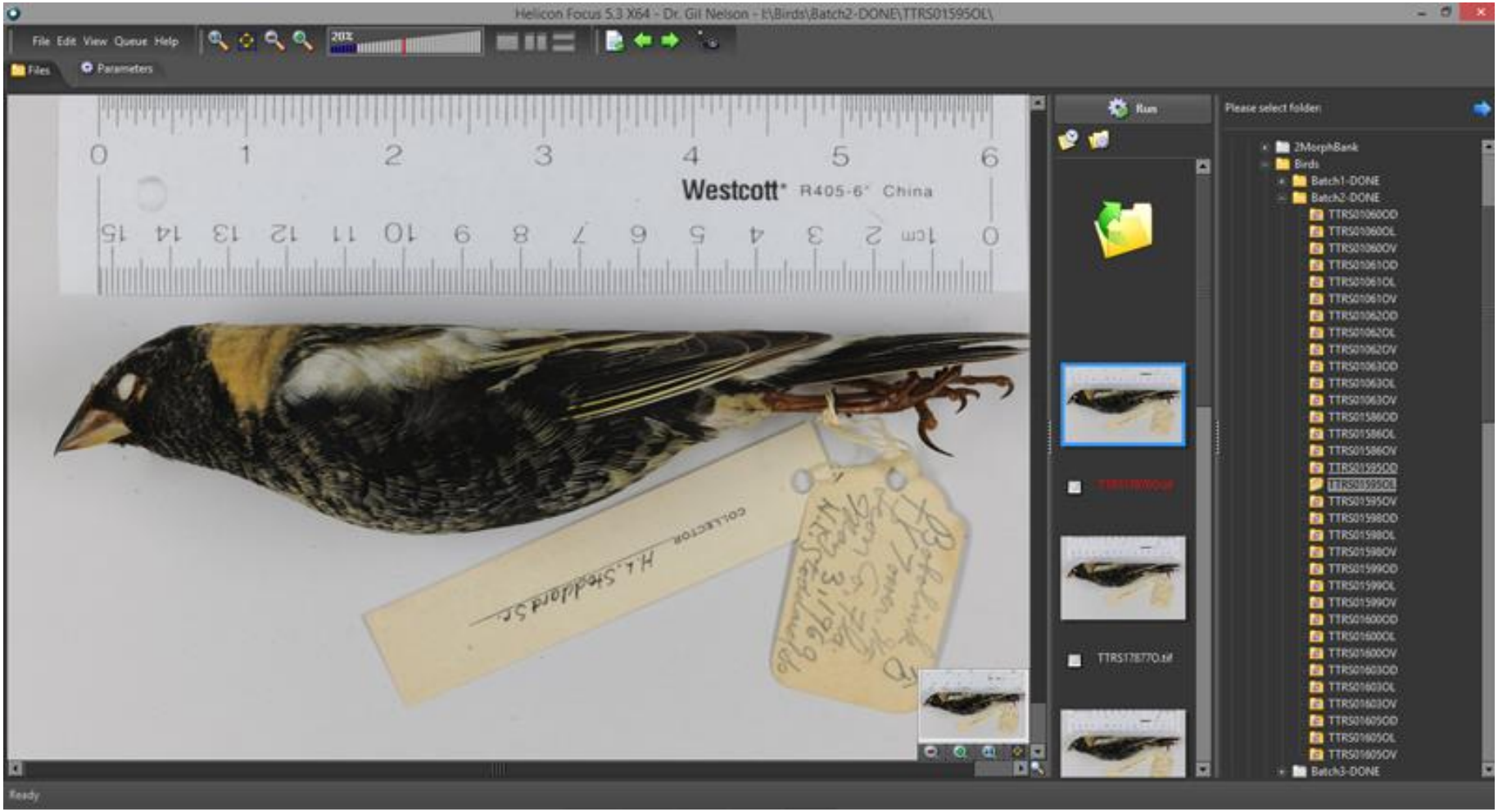
Challenges

- Overcome the limitations of aperture and magnification in obtaining maximum DOF.
- Preserve consistent aperture, ISO (light sensitivity of sensor), shutter speed, and white balance in recording layers.

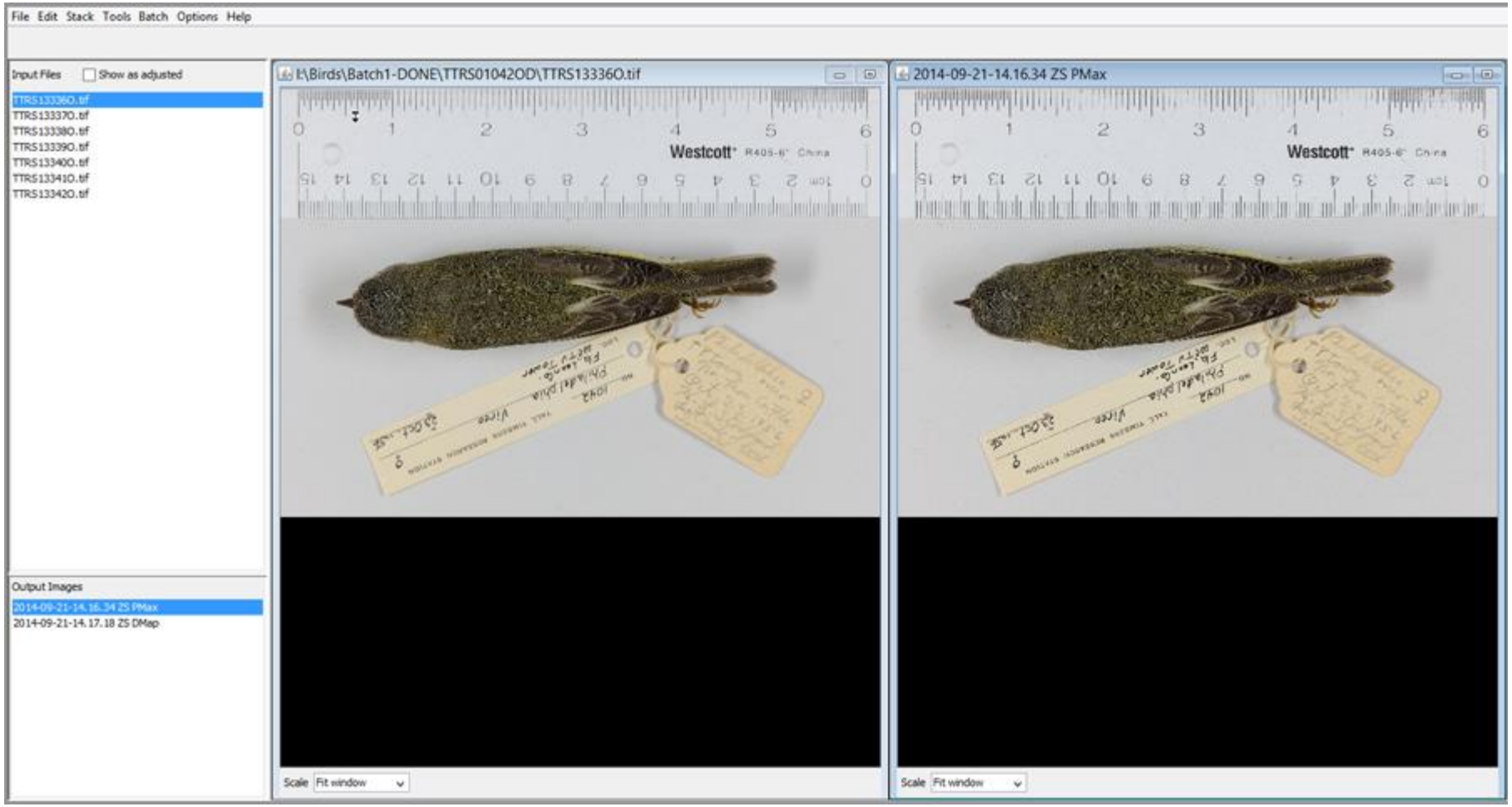
Focus Stacking Options

Software
CombineZP
Helicon Focus
Zerene Stacker
Photoshop

Hardware
Stackshot
Automontage (Syncroscopy)



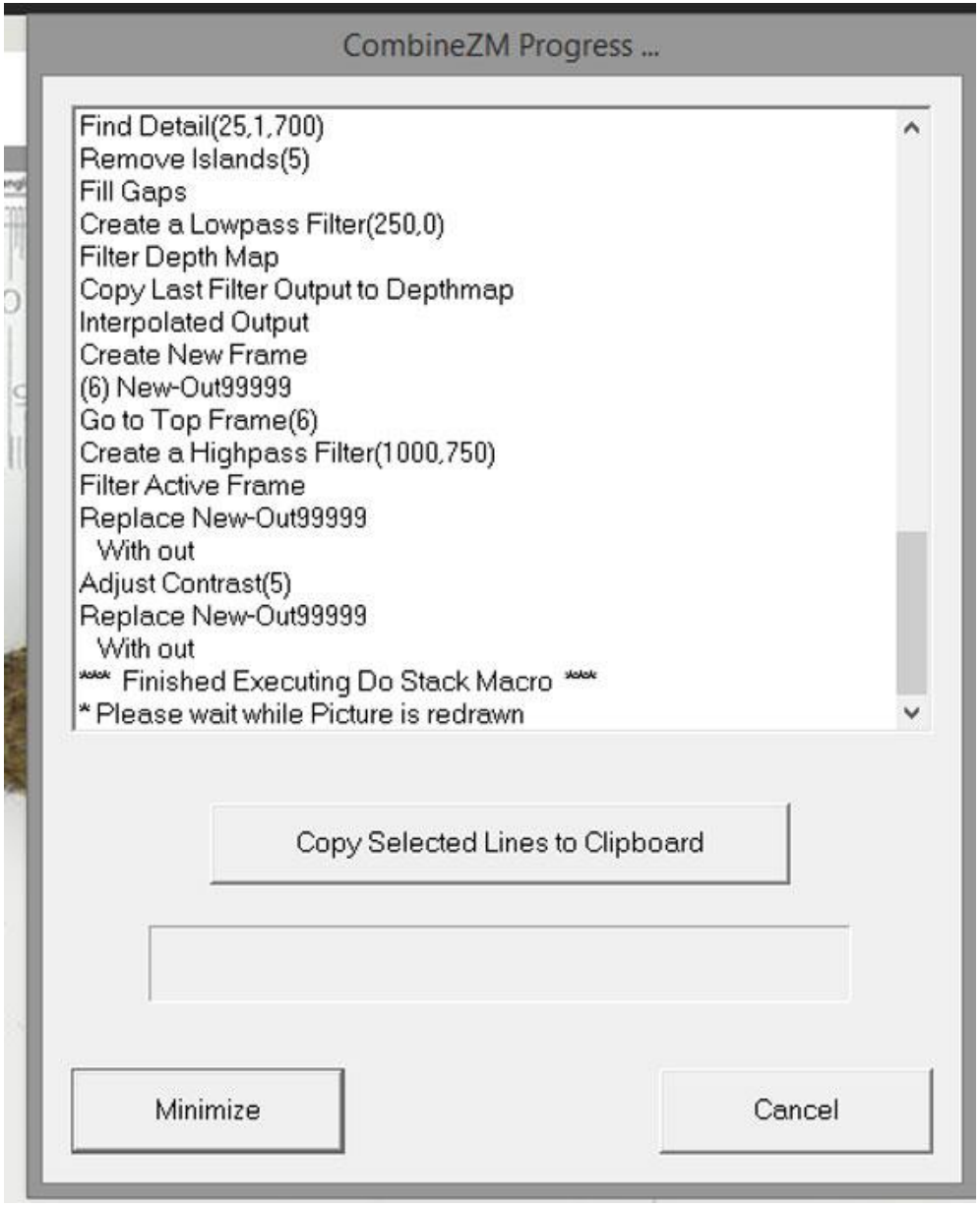
Helicon Focus

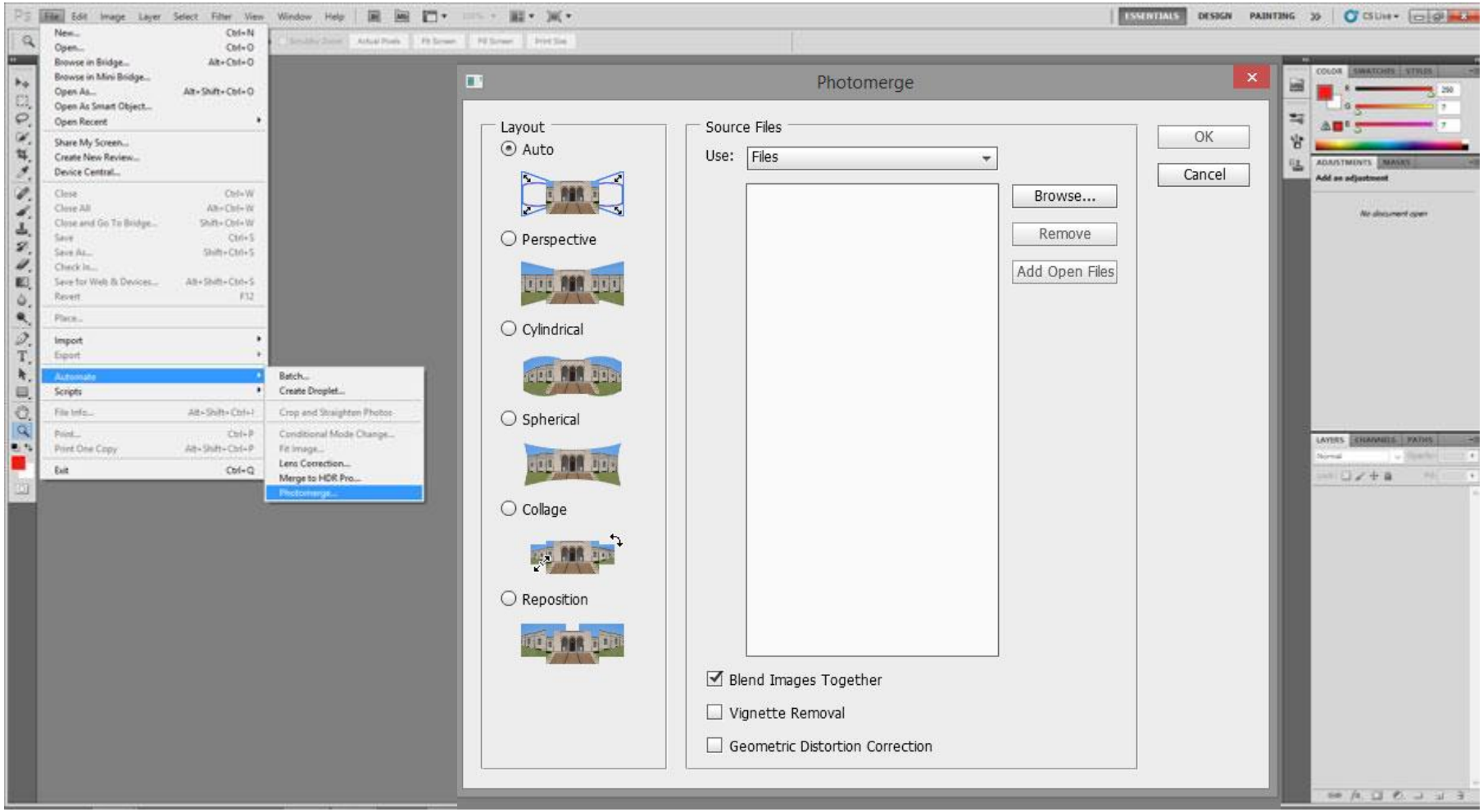


Zerene Stacker


T=None M=Select VFull=New-Out99999* A1=New-Out99999* A2=None
File Macro View Stack Frame Rectangle Points Filter Movie Help Undo
Westcott R405-6 China
TALL TIMBERS RESEARCH STATION

CombineZ


CombineZM Progress ...
Find Detail(25,1,700)
Remove Islands(5)
Fill Gaps
Create a Lowpass Filter(250,0)
Filter Depth Map
Copy Last Filter Output to Depthmap
Interpolated Output
Create New Frame
(6) New-Out99999
Go to Top Frame(6)
Create a Highpass Filter(1000,750)
Filter Active Frame
Replace New-Out99999
With out
Adjust Contrast(5)
Replace New-Out99999
With out
**** Finished Executing Do Stack Macro ****
* Please wait while Picture is redrawn
Copy Selected Lines to Clipboard
Minimize
Cancel



Photoshop CS5

Methods for building stacks

Adjusting focus
- manually with focus ring
- manually with tethering software and remote release
- automatically with batch remote shooting

Moving the subject

Moving the camera (rail system, StackShot)

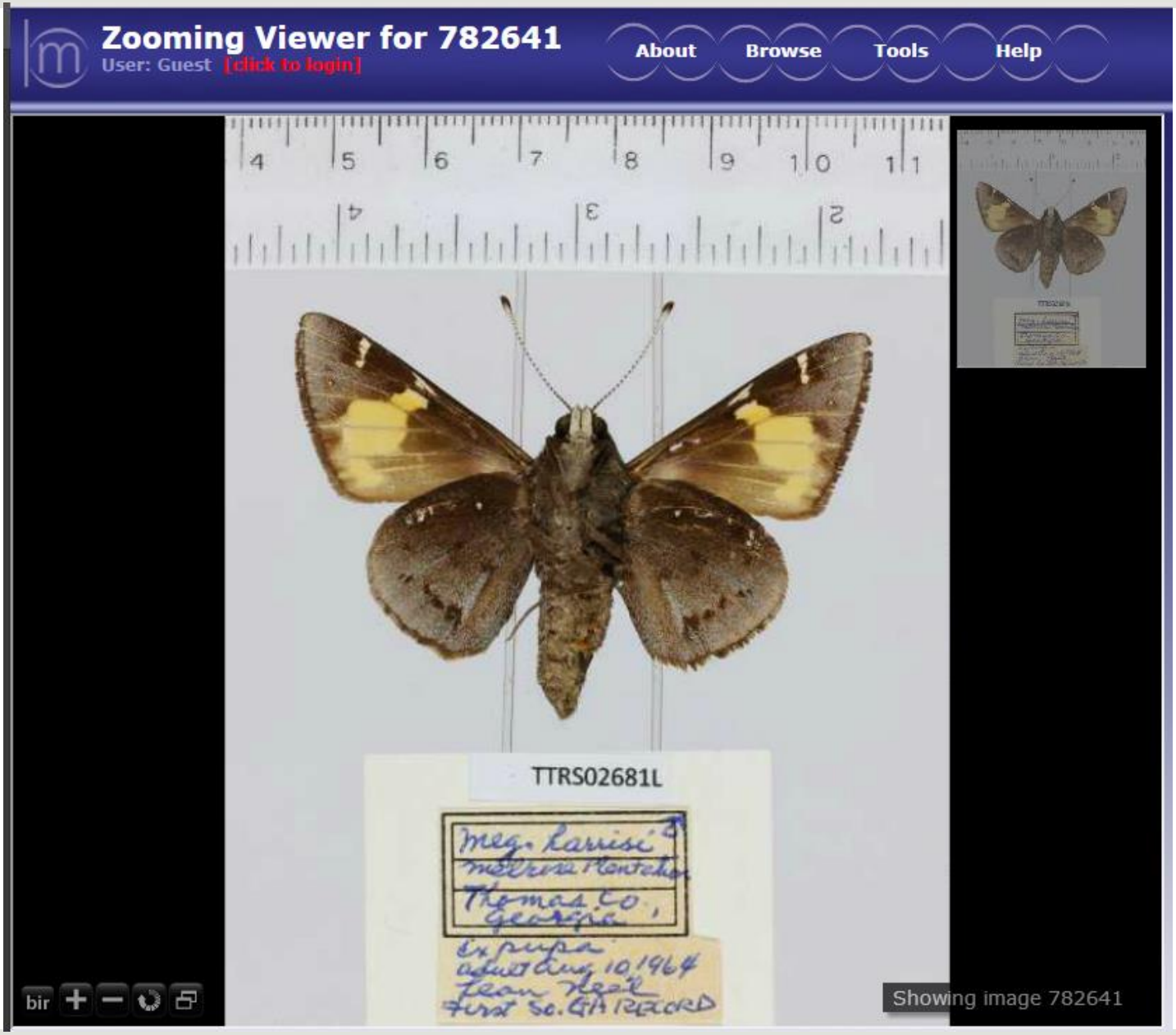
Advantages of moving the camera versus internal focusing?

- Used mostly in field-recorded images.
- Generally not recommended for studio-recorded images.
- Risks camera shake and misalignment in final image.

Manual focus

When to use focus stacking?

Virtually any image of a specimen will be improved by focus stacking.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About
Browse
Tools
Help
TTRS02681L
Showing image 782641


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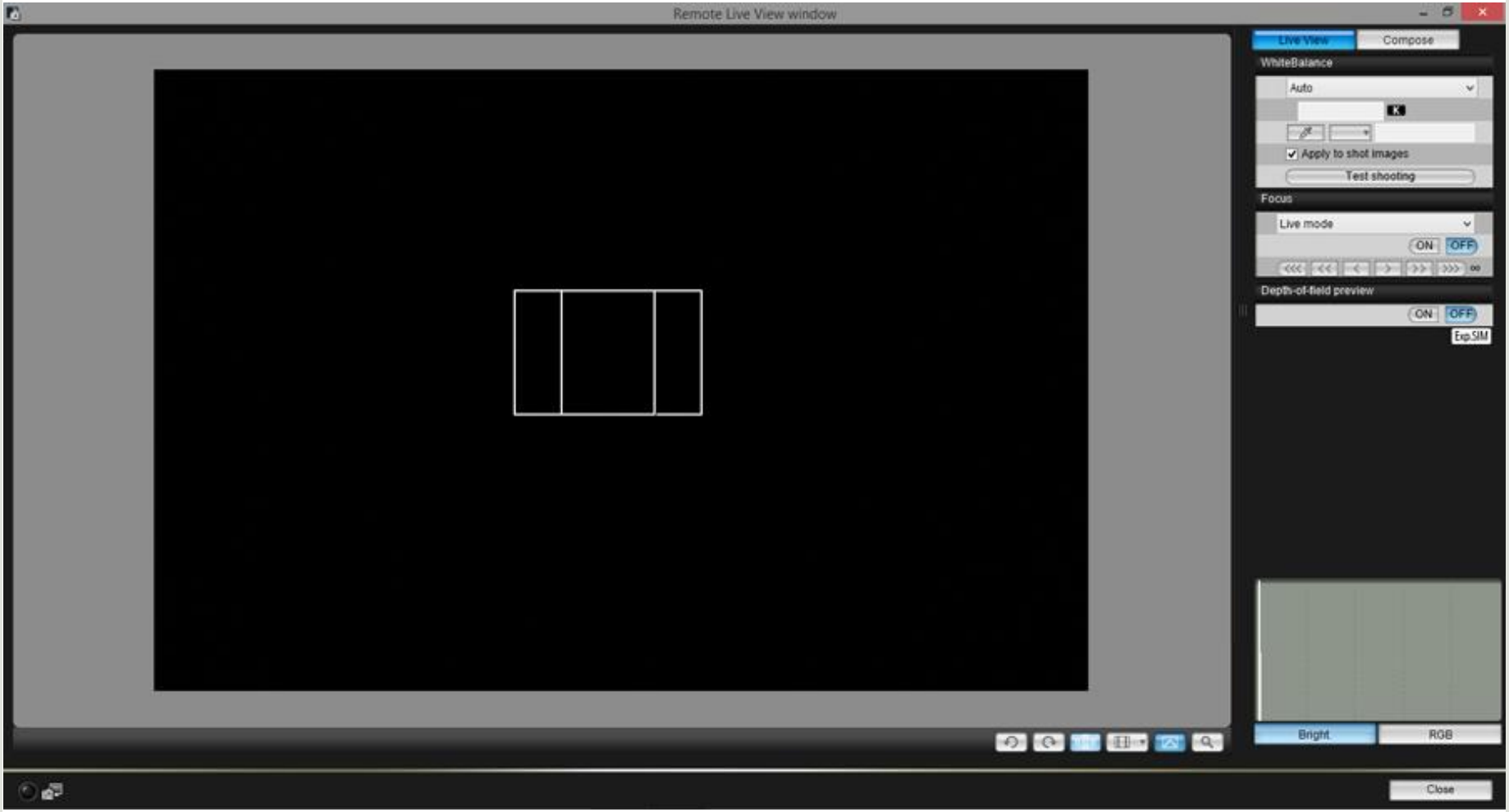
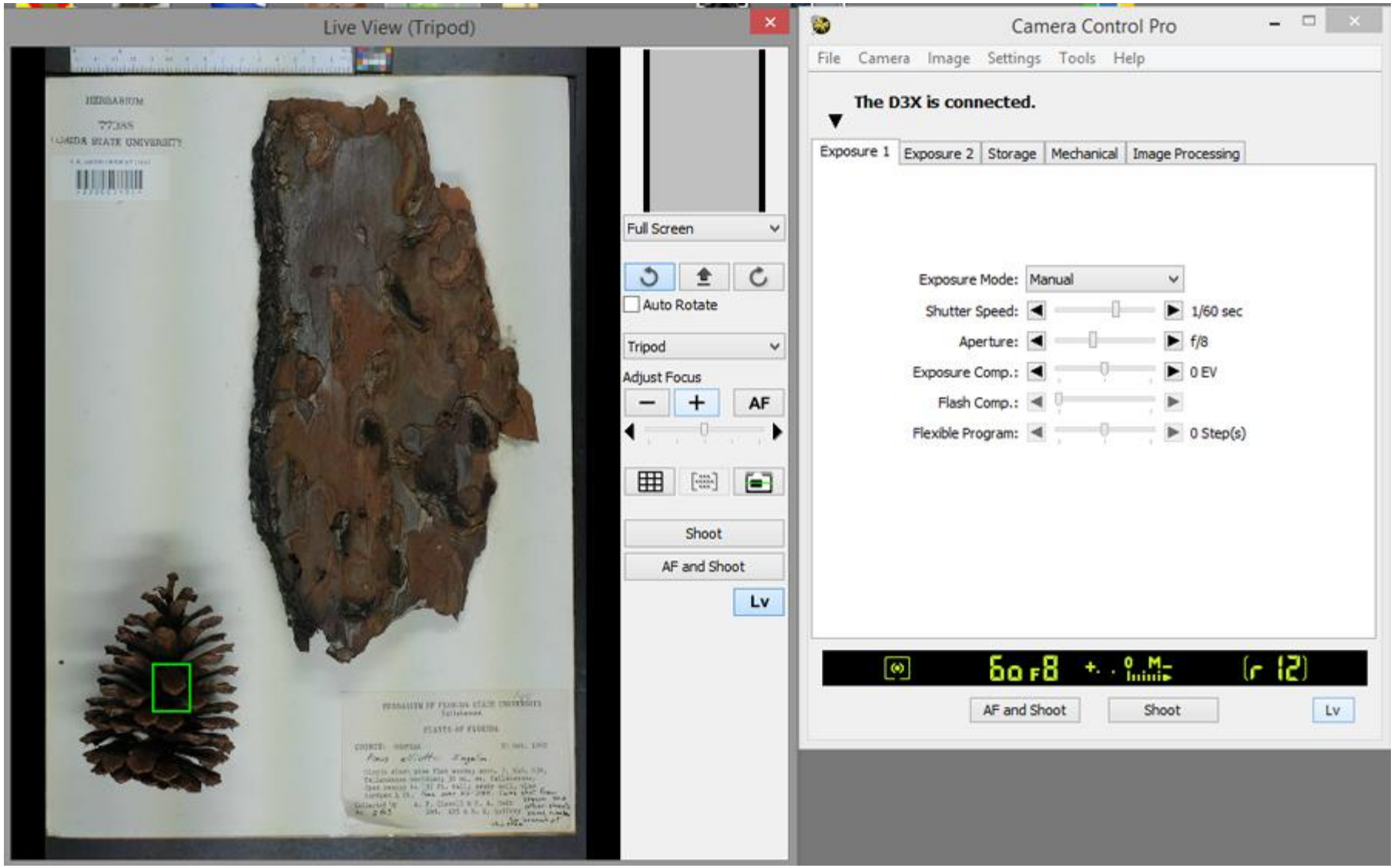
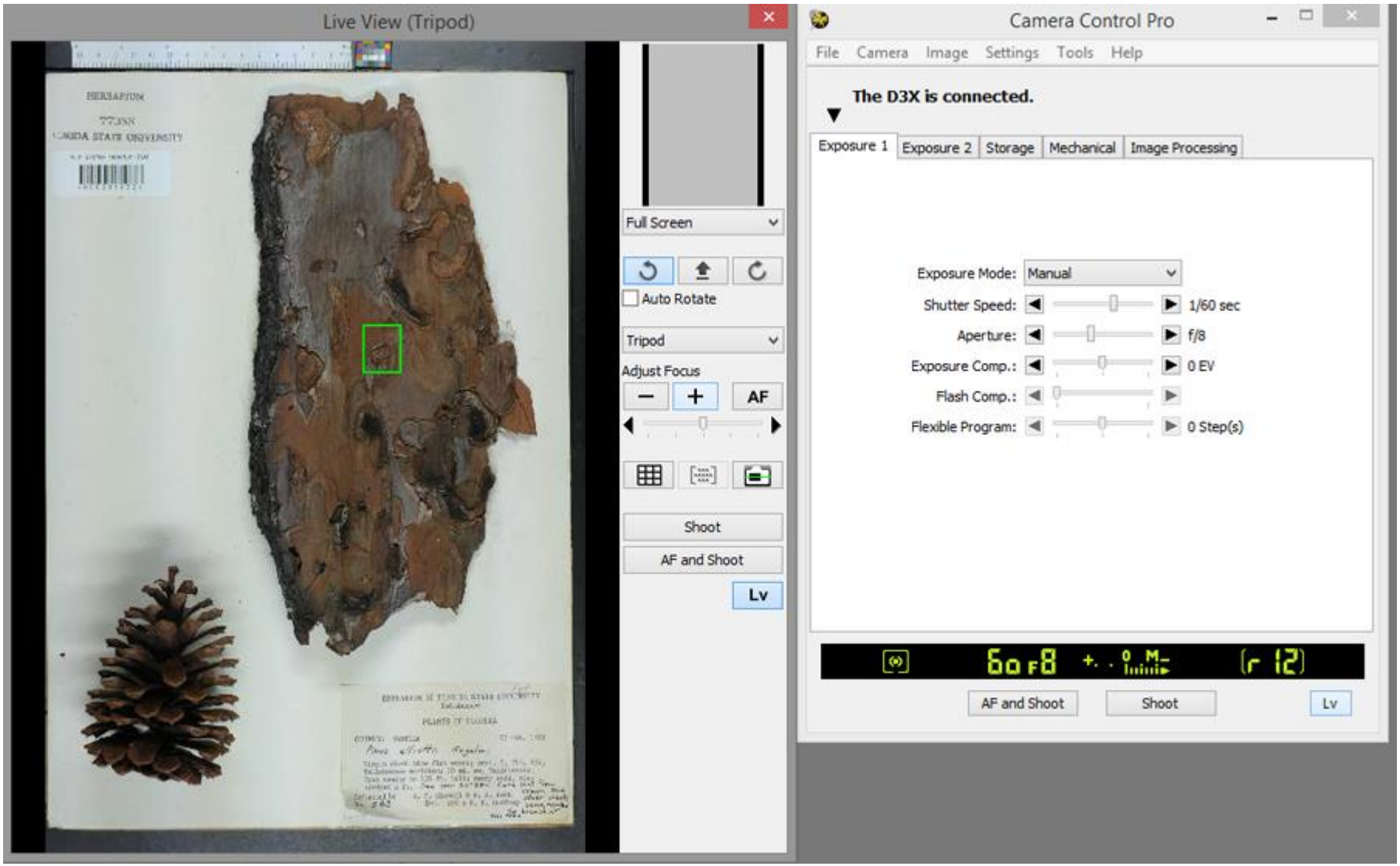
Showing image 782641



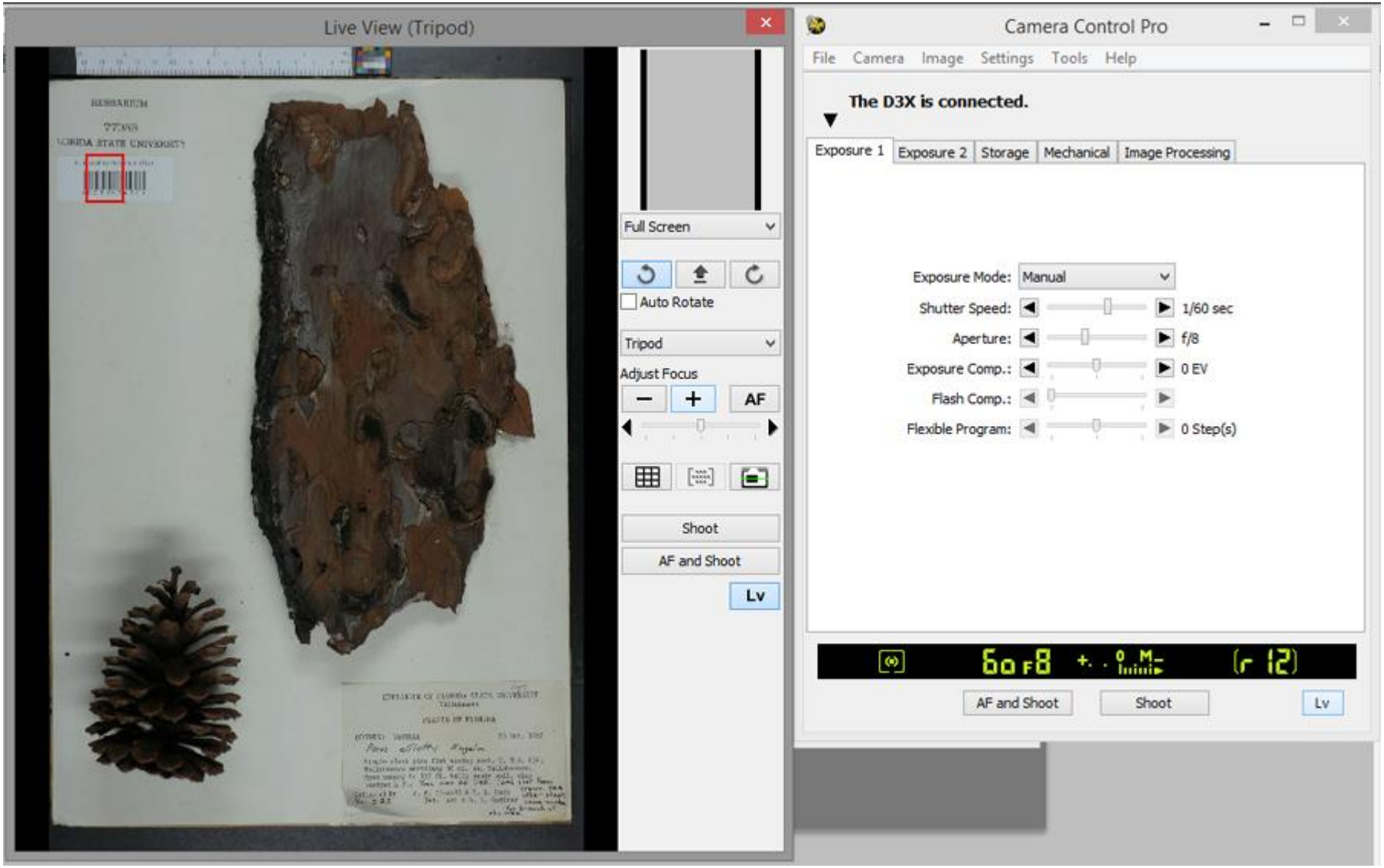
Canon EOS Utility



Nikon Camera Control Pro 2



Nikon Camera Control Pro 2

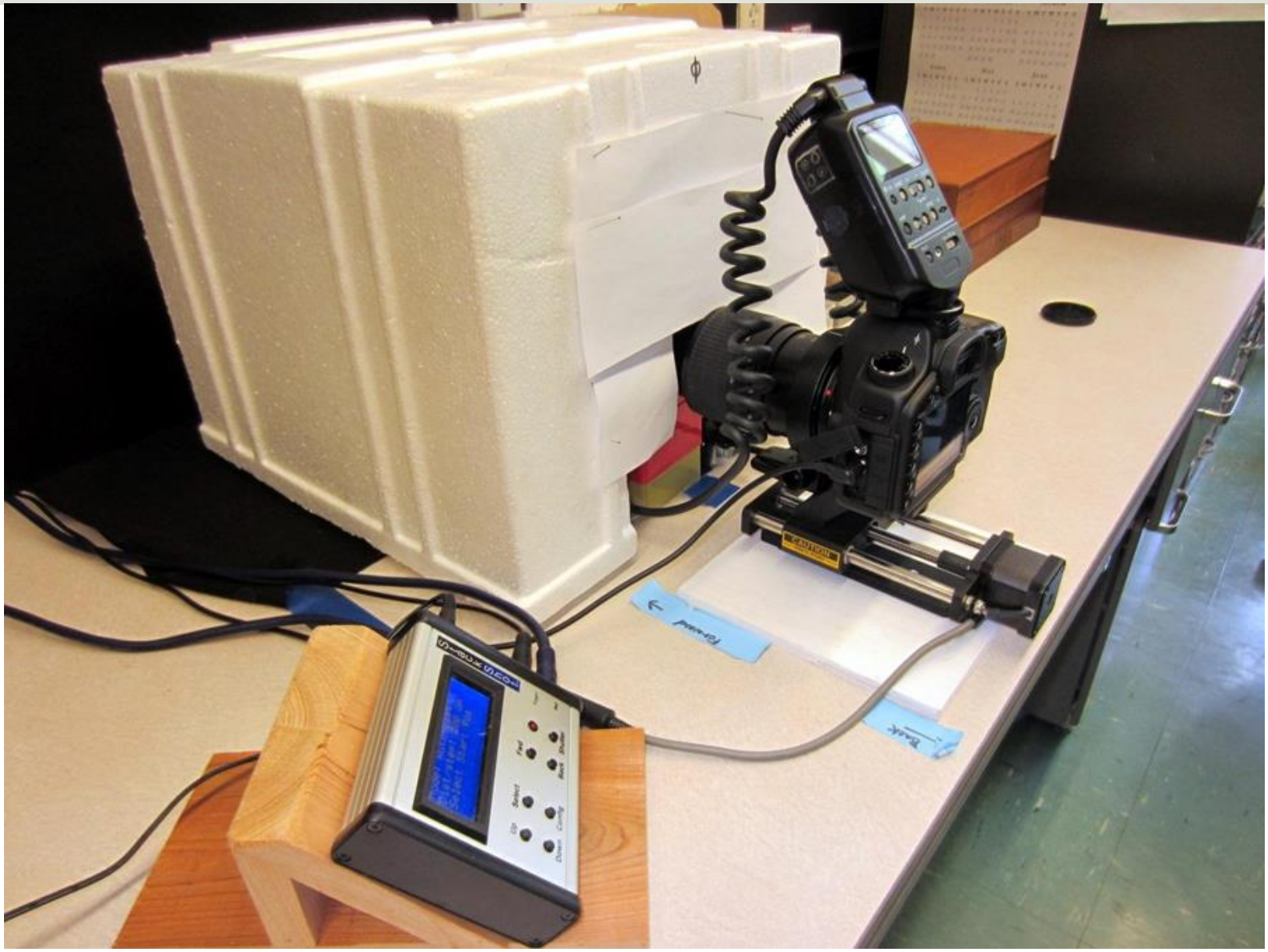


Nikon Camera Control Pro 2

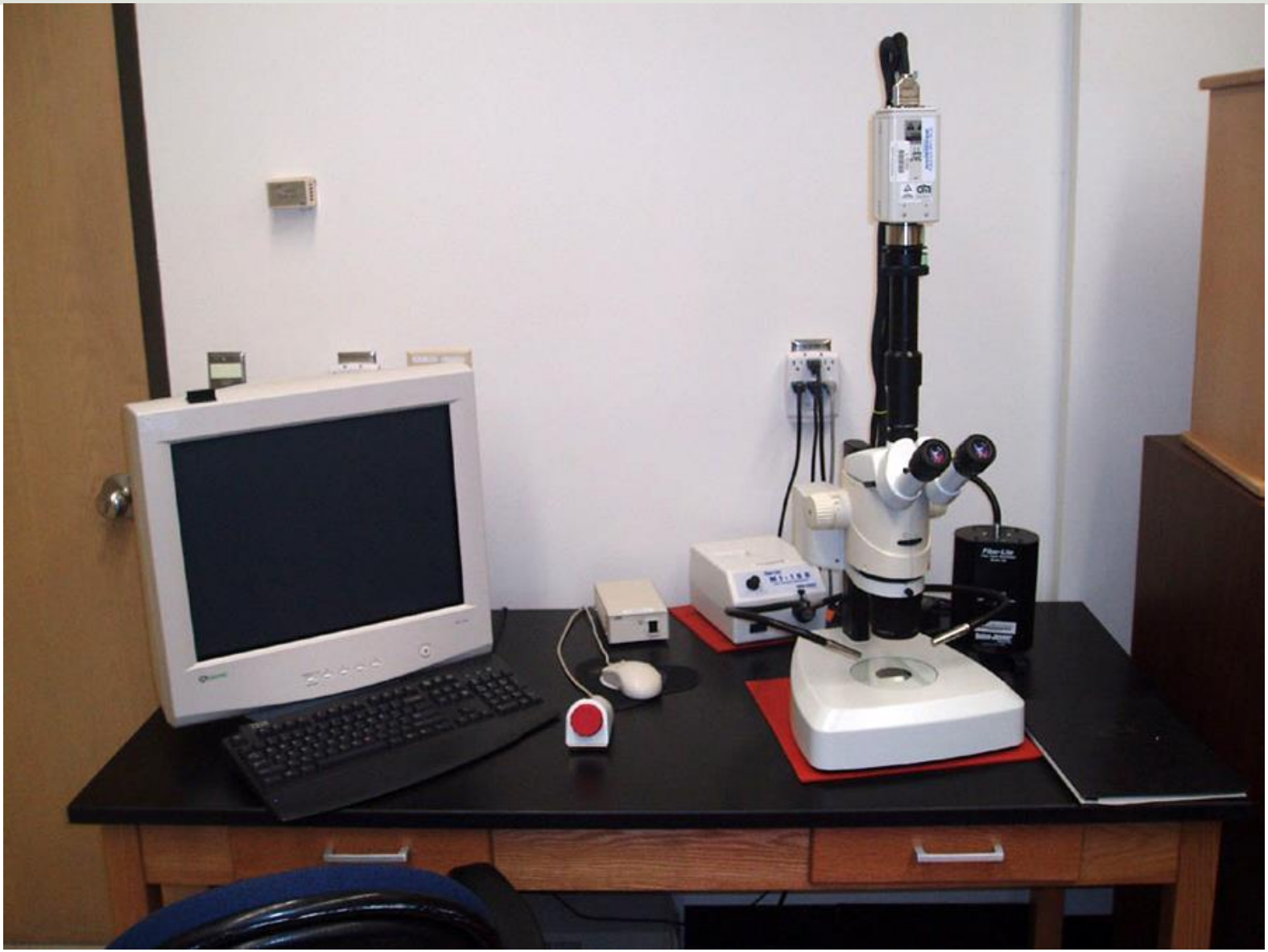
Remote Release

Stackshot Rail

StackShot Controller



Sam Droege (USGS) Stackshot setup



AutoMontage

Recommended Workflow

1. Shoot to raw (NEF, CR2, etc.) using live view and camera manufacturer or 3rd party tethering software that allows targeted focusing and remote shutter release.
2. Save all images of each specimen into a discreet folder, preferably a folder within a master folder that contains the specimen folders.
3. Convert all images to uncompressed TIFF or JPEG using the same softwared and consistent parameters, preferably as a batch process using manufacturer software or a 3rd party image processing software (e.g. Photoshop). Converted images should be saved within the folder referenced in Step 2 provided that the stacking software used will not accept raw images, otherwise, save converted images into a second set of folders.
4. Process image stacks, directing output to a discreet output folder. Output file type and size should be determined by intended use of the image files.
5. If cropping is required, crop the resulting TIFF or JPEG images, not the intermediary images produced in Step 3.
6. If step 4 results in archival TIFF images, use these images to create other derivatives, such as JPEG files for web display; avoid editing the TIFF archival images.
7. Archive raw images.

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