# **ASU Herbarium Digitization Workflow**

By F. Bungartz, Curator of Lichens and Digital Data

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## Selecting specimens

- 1. Take specimens from Photo Cabinet
- 2. Select barcodes starting with high numbers (>300,000+) for new specimens, lower numbers (<1000,000) if specimens that were previously accessioned to the herbarium
- 3. Glue barcodes near the label, ideally place them at lower right corner of the sheet, just above or alongside of the label

# Take Pictures of general herbarium specimens with the Repro Table (*Cameras*: Canon EOS Rebel T2i or T1i)

- Start up the Computer, make sure all cables are connected (USB, AC adapter or fully charged battery)
- 2. Turn the lights on
- 3. Turn the Camera on (Canon EOS Utility should start automatically)
- 4. Start Capture and verify settings:
  - a. Camera set to capture Raw+JPG pairs at highest quality and resolution ( $L_{fine}$ )
  - Camera and lens set to Av (= aperture priority mode)
  - c. Aperture f/8 (best compromise between diffraction and resolution)
  - d. Exposure time is automatically selected by the camera
  - e. Exposure correction +1.3 Ev (to compensate for overall white background of herbarium sheets)
  - f. ISO 100
- 5. Place specimens onto the macro table



- Switch to Live View and zoom camera lens out/in to make sure entire sheet, scale bar & color checker are captured (depending on collection make sure correct scale is used; ASU, Desert Botanical Garden, etc. etc.)
- In Live View magnify to zoom in at the label, manually adjust camera focus (when taking the picture make sure not to touch the camera or lens again, regularly check if focus still correct)
- 8. Take the picture
- Regularly verify image quality (especially curve and sharpness), adjust exposure compensation if images too dark, manually correct focus if pictures are out-of-focus

#### Take Pictures of Type specimens using HerbScan

(NOTE: not routinely done by students; all students please skip to the next section "Barcode Renamer")

- 1. Check if specimen already has barcodes, if not attach barcode to the sheet.
- 2. Plug Scanner into USB Port, turn scanner on.
- 3. Open Photoshop.
- 4. Lower the scanner lever and load specimen, add ASU Ruler and Color Calibration Panel
- 5. Move the scanner lever up again, specimen ready for scanning
- File Import Epson [Choose Professional Mode, 600 dpi, 24 bit color, AdobeRGB (from "Configuration")]



- 7. Click "Preview", if necessary crop the image to achieve a better fit
- 8. Scan the image [600 dpi, 24 bit color, AdobeRGB]
- 9. Close the Scanner Application once the image has been loaded into Photoshop
- 10. In Photoshop: Rotate specimen 90°CCW
- 11. Adjust Auto-Tone



12. Apply UnsharpMask (Filter – Sharpen – Unsharpen Mask; do not apply excessive sharpening; Amount 50%, Radius 1.0 pixel, Treshold 5 levels is about right)



- 13. Lower scanner lever and remove specimen
- 14. Save Image as TIFF using the barcode reader to make sure the file name is the same as the barcode.
- 15. When all specimens have been scanned, shut down the computer, turn off the scanner, unplug the scanner, make sure the scanner lever is in the upward position and the scanning foam cushion covering the scanner so that no dust can accumulate (Maintenance: If the scanner gets dirty *never* use aggressive cleaners; some moderate dust is accumulation is unavoidable and should be left in place, if an undesired amount of dust has accumulated, first try wiping the glass surface with a dry microfiber cloth; grease can be removed with distilled water, only if necessary adding a few drops of dishwasher soap; don't scratch!!!)

#### Barcode Renamer (BCR)

# [not necessary for type specimens as those files will be named using the barcode scanner immediately after scanning]

- 1. Start BCR
- 2. Navigate to the Folder OCR & To Do
- 3. Make sure Barcode Position "Bottom" is selected, according to where the barcode is located
- 4. Make sure Rotate (Cwise) is set to "90)
- 5. Hit Execute

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# Lightroom Processing

- 1. Start Lightroom
- 2. Go to the *Library* tab Import



- 3. Drag OCR Folder into the import box
- 4. Hit Import
- 5. Select al images and rotate left
- 6. Go to *Develop* tab



- 7. Select all images and then apply the User Preset "Auto Adjust Herbarium Photos"
- 8. Click "Sync" and make sure the defaults are checked (everything but *local adjustments, spot removal* & *Crop*), then click "synchronize"
- 9. Now the images should all have a tiny adjustment symbol

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- 10. File Export (check the settings: same folder as original, subfolder "LR", File format "JPEG", quality "80", Color Space "sRGB"; resolution 300 ppi; no re-sizing; no sharpening; no metadata; no watermark; no post-processing)
- 11. Wait until Export process terminates



12. Close Lightroom

#### ABBYY Fine Reader Procedure (using Automation Manager)

- 1. Launch ABBYY FineReader 10 Pro
- 2. CTRL+T (launch Tools Automation Manager)
- 3. Select "OCR Vascular Plant Herbarium Sheets"



- 4. Hit "Run"
- 5. Wait until Opening Process terminates



6. Ignore Error Messages, wait until Reading Process terminates



7. Wait until Save Process terminates



- 8. When the process is complete close the progress box, close down ABBY Fine Reader (you will need to restart the program for the next batch, else you will generate duplicate OCR files): if asked, say "No" to saving the document "Untitled"
- 9. In Windows Explorer go to the ABBY folder and select all files, right-click 7-Zip Add to archive

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10. Select "zip" as the format of the archive and add the current date to the name of the archive, e.g.: 2017-08-31\_ABBYY.zip, click OK to generate the Zip archive

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- 11. Before doing another batch, remember to restart ABBYY FineReader otherwise you end up with OCR duplicate text files!!!
- 12. Navigate to the next folder, which has no ABBYY subfolder yet, start over...

## Archiving the Image Files

At the end of your session, it is VERY IMPORTANT to archive all files so that the working folder will again be empty for the next person, who takes pictures.

For normal specimens (not types), the working folder is located in D:\Herbarium Images\OCR & To Do\normal specimens:



For Type Specimens, the working folder is located in D:\Herbarium Images\OCR & To Do\type specimens.

*Before* the next person can again start another session of taking photos and *before* the images can be uploaded to the SEINet server, all files in this folder must be transferred into the archive folder:

- 1. Copy *all* images (JPG+Raw originals, LR derivatives) with *all* subfolders (ABBYY and LR) from D:\Herbarium Images\OCR & To Do\normal specimens
- 2. Navigate to D:\Herbarium Images\Archive Normal Specimens\"YEAR"\..
- Create a new folder named according to the current date you have been taking the images (format: yyyy-mm-dd) and label this folder as "Add to SEINet". For today, September 8, 2020, the folder name would look like this: ...\2020-09-08 Add to SEINET (see screenshot below)

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- Paste all photos and folders from D:\Herbarium Images\OCR & To Do\normal specimens into the newly created archive folder (e.g., D:\Herbarium Images\Archive Normal Specimens\2020\2020-09-08 Add to SEINet)
- 5. Only after the original files and folders were successfully transferred into the archive will the original images need to be removed from the "working folders" in D:\Herbarium Images\OCR & To Do\normal specimens. After copying please make sure that all original images (JPG+RAW) in this folder are deleted, also delete all images in the LR and ABBYY subfolders, but leave these

empty folders on the disk (these folders need to be available, but empty, for the next person to come, who will start taking images again...).

# ATTENTION: All subsequent steps cannot be done by a student, but require the necessary privileges/authorization for uploading images to SEINet.

#### **Connecting to ASU's Secure VPN Network**

1. Start Cisco AnyConnect Mobility Client



2. Connect to sslvpn.asu.edu/2fa



3. Enter your username, password and the preferred method of authenticitation (i.e., entering the words "push" will activate the DuoApp on your phone, "phone" will call your phone, and "sms" will send a text to your phone):

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4. Once you authenticated the connection the secure VPN connection to the server to permit image uploads will be established:



## Uploading Images to ASU's Web Server

- MOVE all *original* files folder "C:\Users\Public\Documents\Herbarium Images\OCR & To Do" into the folder "C:\Users\Public\Documents\Herbarium Images\Archive \..." –creating a new subfolder for each year with subfolders for the dates, e.g.: "..\2017\2017-08-10\"
- MOVE all OCR files folder "C:\Users\Public\Documents\Herbarium Images\OCR & To Do\ABBYY" into the folder "C:\Users\Public\Documents\Herbarium Images\Archive \YEAR\DATE\ABBYY", e.g.: "..\2017\2017-08-10\ABBYY"
- MOVE all Lightroom derivative files folder "C:\Users\Public\Documents\Herbarium Images\OCR & To Do\LR" into the folder "C:\Users\Public\Documents\Herbarium Images\Archive \YEAR\DATE\LR", e.g.: "..\2017\2017-08-10\LR"
- 4. Launch FileZilla
- 5. Connect to the server "biokic1.rc.asu.edu", port 22 using ASUrite credentials; you will be connected to .. /home/bungartz)
- Change to .. /mnt/storage/image\_processing/images/ASU [in case of DBG images use: .. /mnt/storage/image\_processing/images/DES/]
- Drag & Drop the files images from local hard disk (LR folder) into /mnt/storage/image\_processing/images/ASU:

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8. Open PuTTY and logon using ASUrite credentials



- 9. When you click "open", the Command Line Window will open; use the ASUrite to login
- 10. Then change directory to the imageProcessing folder via "cd /mnt/storage/image\_processing/scripts"
- 11. In the directory together with the images should be a script called "ImageBatchHandler.php"; run this script with the following command: "sudo php ImageBatchHandler.php"



12. A CSV file is being generated (e.g.: ASU\_imagedata\_2017-08-18\_1503074653.csv); in FileZilla, go to /mnt/storage/image\_processing/logs and copy this CSV file to the LR folder, where the images for uploading are stored:

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- 13. Upload images to ASU collection within SEINet
  - Navigate to ASU management menu => Processing Toolbox => Image Loading tab (<u>http://swbiodiversity.org/seinet/collections/specprocessor/index.php?collid=1</u>)
  - b. From the New Profile panel, select "Image URL Mapping File" from the pulldown
  - c. Click Choose File button and select CSV image report file (e.g.: ASU\_imagedata\_2017-08-18\_1503074653.csv)

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Select image mapping file:				
Choose File No file chosen				
Analyze Image Data Dia				

- d. Click "Analyze Image Data File"
- e. On the next page, click "Load Image Data" to accept default file mapping and upload image file URLs into the system



f. Review the results that are being displayed in the following window; for some images where no data exist in SEINet, a new records is created, for others the new image mappings will replace the previous, older ones.

g. Copy the data from the screen and save as a Log File:

rganize 🕶 🧻 Open 💌 Print E-n	mail Burn New folder	
2013	Documents library	
3014	LR LR	
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2017-03-23	* ASU0296215.pm Existing image replaced with new image mapping: ASU0016459	
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h. Using the LogFile you can now check if images got uploaded correctly...

## Upload ABBYY OCR to SEINet

- 1. The image must be loaded and integrated into SEINet the before OCR is submitted!!!
- 2. DO NOT upload OCR Data where images are not!
- 3. Login to SEINet and migrate to ASU management menu. (e.g. go to My Profile => Specimen Management tab => ASU Collections within the Collection Management panel)

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SEINET Arizona - New Mexico Chapter	
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4. Select "Processing Toolbox" within the Administration Control Panel and then click on the OCR

tab	
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← → C ① Swbiodwersity.org/toinet/collections/misc/collprofiles.php?collid=1&emode=1	* :
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Oracle New Records Using Image     Add Sector Records     Add Sector Records	
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The Arizona State University Vascular Plant Herbarum is the second largest in the And Southwest with over 285,000 specimens. Our collection of Cactaceae is one of the best in the world, being particularly rich in cytological vouchers.	
ASU Type Specimens: http://swbiodiversity.org/seinet/checklists/checklist.php?d=2638	
Postsche Electronic (Electronic Materiane (Construction)	

5. The OCR Batch Import Tool panel displayed at the bottom of the page is what you want to use. The regular expression textbox should be already filled in with "/^(ASU\d{7})\D+/". Simply enter "ABBYY" in the source text box (the upload script will append the date to the text entered in the database). Click the Choose File button to browse your local system and select the OCR input zip file.



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← → C	☆
III Apps 🗅 SElNet 🖞 ASU Herbarium Mani 🕛 ASU Lichen Manageri	
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Home Specimen Search Images Flora Projects Agency Floras Dynamic Floras Additional Portals Resources Vielcome Pranki My Profile Logout Sitemap	
Arizona State University Vascular Plant Herbarium Introduction Image Loading Crowdsourcing OCR Reports Exporter Specimenen Image Statistics Total specimenes with images: 111572 "emprocessed" specimenes with images: 4075 without OCR: 1375 Custom Query: Select Processing Status  Reset Statistics	
Batch OCR Images using the Tesseract OCR Engine Processing Status [unprocessed  Number of records to process: 100 Run Batch OCR Note: This feature is dependent on the proper installation of the Tesseract OCR Engine on the hosting server	
OCR Batch Import Tool	

6. Click the Load OCR Files button to start the upload process...

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The results are then being displayed:



7. Copy the data from the screen and save as a Log File:

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2017-05-02	ASU0299667.bt	ocessing OCR File: ASU0299772.txt			
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2017-08-15	ASU0299680.txt	16-Aug-207 103 Test Document	188		

# Processing Image Data in SEINet

- 1. Log into SEINet
- 2. Got to the ASU-Plants Site
- 3. Select "Edit Existing Occurrence Records"

diversity.org/seinet/collections/misc/collprofiles.php?collid=1	
Processor	
SEINET Arizona - New Mexico Chapter	
Home Specimen Search Images Flora Projects Agency Floras Dynamic Floras Additional Portals Resources	Welcome Franki My Profile Logout Sitemap
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4. Select Processing Status "unprocessed" and then click "Display Table"

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5. This gives you a Table with everything that needs editing

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Arizona	State Univ	ersity V	ascular Plan	t Herbarium (ASU:Pla	ants) 🖉	2						
Home >> C	ollection Man	agement	>> Occurrence	Record Table View	1-1000 of 4156 records   >	>>		2				
Symbiota ID	Catalog Number	Other Catalog	Family	Scientific Name	Author	Collector	Number	Associated Collectors	Event Date	Verbatim Date	Identified By	
7849519 🖻	ASU0071998		Poaceae	Panicum hirticaule	J. Presi							_
8662565 🗷	ASU0096061		Cupressaceae	Thuja orientalis	L.	D.J. Pinkava	6361					
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11053685 🗷	ASU0102359		/									
11053694 🖬	ASU0102368	242926	Cactaceae	Grusonia aggeria	(Raiston & Hilsenb.) E.F.Anderson	Wellerts & Rogers			1999-03-04	Flowers collected 28 May 2002	J. Festermacher	
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#### ALTERNATIVELY without Automation Manager

#### ABBYY Fine Reader Procedure (without Tools – Automation Manager)

- 1. Open Windows Explorer, go to the Image folder that needs OCR (image folder names named by date of digitization yyyy-mm-dd, e.g., 2017-08-31)
- 2. Open ABBY FineReader
- 3. Click "open" and navigate to the folder you want to OCR
- 4. Select all images and click open

A progress bar indicates that the files are being scanned, wait until finished
 Adding the image to the document... 5% complete.



- 6. File Save Document As... Text Document
- 7. Navigate to the Folder that you have just opened to be OCR'd and create a new Folder called ABBYY



- 8. Navigate to the ABBY Folder
- 9. In the Save As dialog select the following options: Selected pages, Name files as source images

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INELWOIK	File name: N	Name of source image	-	Save
	Save as type: T	Fext (*txt)	•	Cancel
	Dpen document after s	saving		
Save pages: 🔘	All pages 💿 Curi	rent page	ed pages	
File options: Na	me files as source imag	oes 🔻	Options	

10. Click Save

11. Wait for the progress bar to finish...

Saving to file 20% complete.	
Processing	
	Cancel

12. In Windows Explorer go to the ABBY folder and select all files, right-click – 7-Zip – Add to archive

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ASU0105811.bit		Text Document		1 KB					
ASU0105812.txt		Text Document		1 KB					
ES						5			

13. Select "zip" as the format of the archive and add the folder name (i.e., file date) to the name of the archive, e.g.: 2017-08-31 ABBYY.zip

Archive:				
2017-04-07_ABBYY.zp				•
Archive format:	zip	•	Update mode:	
Compression level:	Normal	•	Add and replace files	•
Compression method:	Deflate	•	Create SFX archive	
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Word size:	32	•	Encryption	
Solid Block size:		Ŧ	Enter password:	
Number of CPU threads:	2 🔹	/2	Reenter password:	
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Memory usage for Decompression	assing:	2 MB	Show Password	
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14. Send the archive(s) to Ed Gilbert (egbot@asu.edu), so he can upload them into SEINet (Symbiota)

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Public Documents	ASU0082688.txt	Text Document	1 KB	
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2017 Images	ASI/0105906.pd	Text Document	1 KB	
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2017-04-05	ASOUTO3811.64	Test Document	1 KB	
Jacob 2017-04-07	ASU0105612.bit	Test Document	1 KB	
ABBVY	ASU0103613.64	Feit Document	1 KU	
2017-04-07_A88YV.sip	ASU0105814.txt	Test Document	1 KB	
2017-04-14	ASU0105815.txt	Test Document	1 KB	
ABBY	ASU0105816.ht	Test Document	1 KB	
05	ASU0105817.txt	Test Document	1 K8	
	P ACLEDOTION - A	Total Designed	2.070	

- 15. Before doing another batch, remember to restart ABBYY FineReader otherwise you end up with OCR duplicate text files!!!
- 16. Navigate to the next folder, which has no ABBYY subfolder yet, start over...