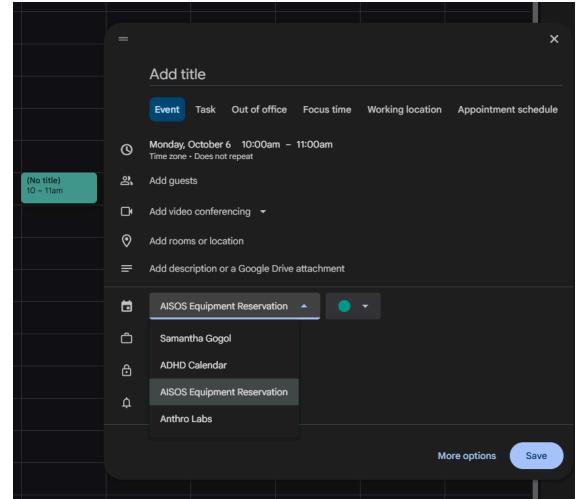


Schedule time in the AISOS calendar

1. Select the proper day and time
2. **TITLE:** Last name - Artec & Megan thee Laptop OR Artec & Gucci (x500@umn.edu)
 - a. We will be using Megan Thee Laptop with Artec unless Megan is in use by others!
3. Adjust duration as needed
 - a. If you do not attend your scheduled time you must remove your reservation from the calendar so that others know it's available
 - b. If you extend your time past the schedule in the calendar, or end your scanning session prior to the scheduled time, you must adjust your calendar reservation
4. Change the calendar to “AISOS Equipment Reservation”, if you choose this calendar the machine and computer will not be reserved
 - a. AISOS will sometimes have class presentations, meetings with university admin to secure funding, etc. They reserve the right to alter or override your booking.
 - i. Tessa Cicak and Samantha Porter are likely the names you will see on the altered reservation, “all of 431”, “all AISOS equipment”, etc.
5. [AISOS is Heller Hall 431](#)



AISOS RULES

1. You can be in the building anytime regardless of building hours you just need to have your student ID on hand to get into the building
 - a. There have been recent break-ins, items stolen, and people locking themselves in the restrooms on heller 4th floor to sleep. Your safety is always the highest priority so make good choices.
2. If you leave 431 for ANY reason and for ANY duration of time. You must close the door behind you. As noted above there have been items stolen from this floor. Please keep our equipment safe behind a door code access only room.
3. Do not share your code with anyone. The access code for the door is yours and yours alone. If someone you know wishes to engage with AISOS on any project (personal or professional) they are able to do so by emailing aisos@umn.edu
 - a. Access to the lab is free to U of M students but they must obtain the proper permissions and training!
4. Food and drink are permitted, however, the drink must have a lid and the food may not be eaten near the scanners nor the objects being scanned
 - a. All of Samantha's silicone molds touched real bone and some of those bones were dragged through poop by some lovely large cats at a zoo.
 - b. All food/drink related trash must be taken to the trash cans in front of the elevators (and of course shut the door behind you on our way out to complete that task!)

- i. We have seen the mice that live on this floor, we're trying to keep them away from the expensive machines.

Heller Hall 4th Floor Exits and Restrooms

1. Heller 431 (AISOS) exit the elevator, turn **right** and walk through the door way, turn **left** at the dead end
2. North Stairwell: down the same hall as 431, across from room 460
 - a. exit the elevator, turn **right** and walk through the door way, turn **right** at the dead end
3. Gender-Neutral single use restroom: down the same hallway as room 431, across from Heller 464, just past the North Stairwell.
4. South Stairwell: on opposite hall from 431 across from Heller 415
 - a. Exit elevators, turn **left**, turn **left** again at the dead end
5. Women's multi-person restroom: just past the South Stairwell (opposite hallway of 431), across from Heller 412
 - a. Water fountain just past the women's restroom
6. Skyway to Blegen Hall & Social Sciences: Opposite hallway of 431 past the south stairwell and womens restroom
 - a. Exit elevators, turn **left**, turn **left** again at the dead end, continue all the way down the hallway past Heller 470

Contacts

1. Slack or email Samantha for all project and scanning related questions (gogol006@umn.edu)
 - a. Slack has audio and video chatting capabilities
2. AISOS Staff for space/tech emergencies
 - a. Samantha Thi Porter port0228@umn.edu
 - b. Tessa Cicak cicak001@umn.edu
3. Safety
 - a. **CALL 911 for emergencies**
 - b. Non-emergencies: call 612-624-2677 (612-624-COPS)
 - c. **624-Walk:** Call 612-624-9255(WALK) or make an [online request](#) to have someone walk you home or to your transportation connection point
 - d. [Gopher Chauffeur](#): request a ride if you're feeling unsafe, for free
 - e. [Rave Guardian Safety App](#): Assign someone to monitor your progress during your commute to assure you make it to your destination safely.
 - f. [UMN Facilities](#): Facility-Related Emergencies, CALL (612) 624-2900
 - i. Flood? Part of the ceiling is falling down? Broken locks?
 - ii. Non-emergency reports can be made to Samantha Porter and Tessa Cicak or to the [online facilities reporting form](#)

⭐ Scanning Protocol Starts Here! ⭐ [follow along](#) [with the video](#)

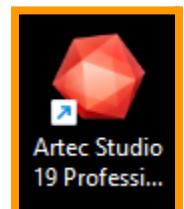
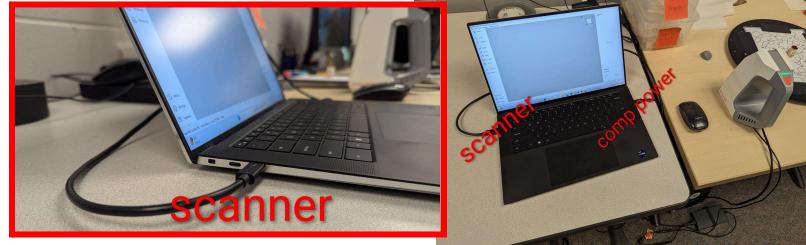


● Step 1: Gathering Materials

1. Retrieve the zipped pouch with your name on it from the **Bone Room (Blegen 320)**
 - a. Pink. 3-drawer bin to the left of the table, second drawer
2. **Bone Room Code: 2657***
3. **AISOS DOOR CODE: 95502#**
4. Computer login info:
 - a. Username: **aisos** Password: **aisos**
 - b. Username: **aisos admin** Password: **aisosadmin**

● Step 2: Hardware Setup

1. The scanner is located in a black hard case in the cabinet near the door. It has a red label on it that says "Artec Spider II"
2. Lift the foam out of the box covering the scanner and place on a flat surface **gently**.
 - a. HANDLE WITH CARE it houses the glass calibration panels.
3. Remove the Artec scanner (should always have two cables attached to the base), place on its base on a flat surface far from edges of tables
4. Remove the power cable and usb cable from the box and connect to the corresponding cords at the base of the Artec scanner
5. Plug the usb cable into the computer
 - a. **If working on the laptop, connect**
 - b. **Artec to the left side of the computer and the power cable to the right**
 - c. **If working on desktop, connect to the BACK of the computer tower**
6. Plug in the power cable to any available power strip
7. **Plug in your external hard drive**
8. Locate **Artec Studio 19 Professional** on the desktop, click to open
 - a. The scanner will flash white until it has registered a connection to the software
9. **You do not need to calibrate the scanner. The AISOS staff does this on a regular basis for us.**



● Step 3: Turntable and object setup

1. For all silicone molds collected by Samantha Gogol, you will be using the small turntable
2. Clear space on the table, remove any objects from view as that will be more data for you to delete later!
3. **Choose a mold to scan, make sure it is free from any bone debris, use the dedicated toothbrush from your pouch for this purpose.**



4. Place the mold in the center of the small turntable

-  **Step 4: Spreadsheet data collection**

1. Record the specimen data in the [spreadsheet](#)

-  **Step 5: Scan Preview**

1. Under the **Home** tab, **Open** a recent project to continue working or start a **New Project**

2. Select the **Scan** button

a. [Help! It says my scanner is not connected!](#)

b. In the list of check box options:

i. Show distance color is **on**

ii. Enable real-time processing is **on**

iii. All other options are off

c. Scanning speed should be set to **15 fps**

d. Texture brightness should be set to **Normal** with **Auto-adjust brightness** **on**

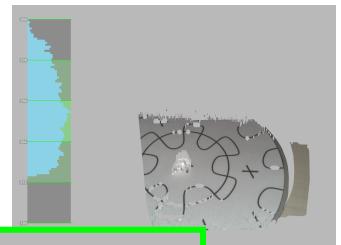
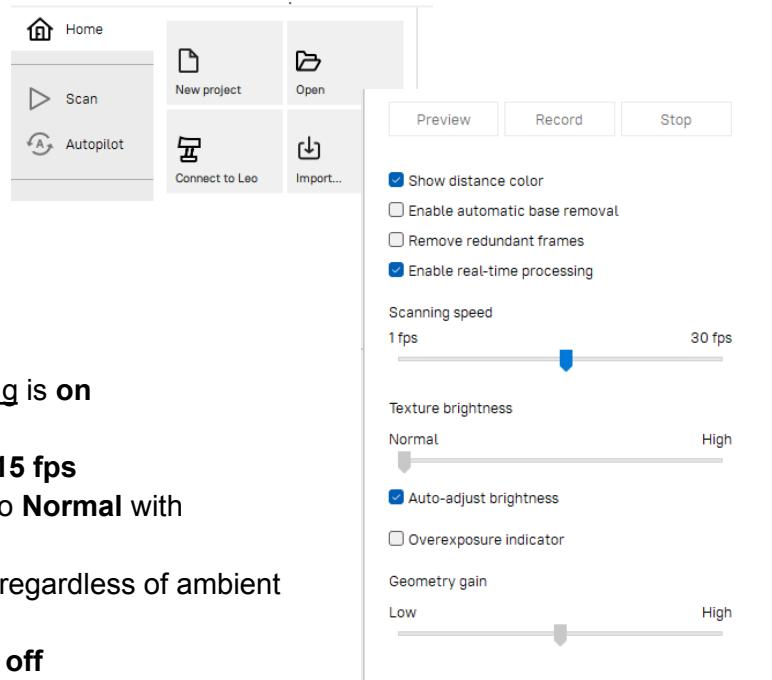
i. This ensures a good scan regardless of ambient room lighting

e. Overexposure indicator should be **off**

f. Geometry gain should be set to the **middle**

3. Short press the red button to enter **Preview mode**. This is where you can adjust your angle and distance from the object for optimal image capture.

a. Examine your distance by looking at the histogram on the left side of the screen, the highest values should be near the middle (between 234 and 278) near 300 is too far away and 190 is too close.



-  **Step 6: Scanning**

1. In preview mode, short press the button to enter scanning mode

2. Once you enter scan mode you will see your object on the platform on the screen in a gradient of color. You want your object to be highlighted in **green**, this means you are the proper distance from the object.

a. **Blue** means you are too far, **red** means you're too close.

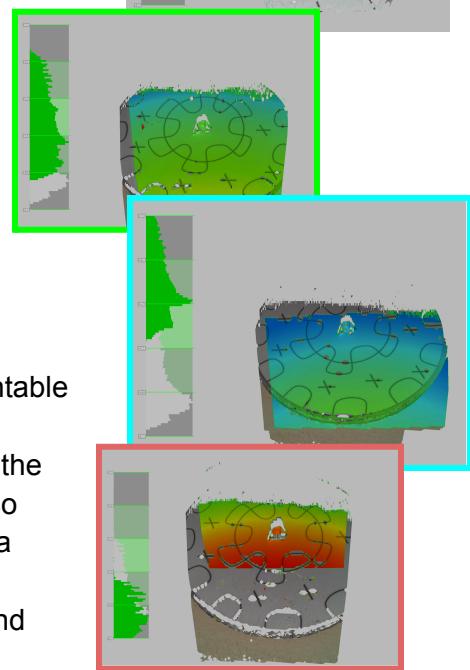
3. Keep your hand in one position with the object in blue and the turntable visible and rotate the turntable 360 degrees.

a. The slower you do this the more data will be captured and the better the scan will be, it does capture data at a high rate so you can move quickly just not too quickly! You'll figure out a rhythm

4. Move your hand along an arc to capture data in different angles and rotate the turntable again

5. Rotate your wrist **90 degrees** and rotate the turntable again this offers more angles to collect more data

6. **Long press** the red button to exit scanning mode

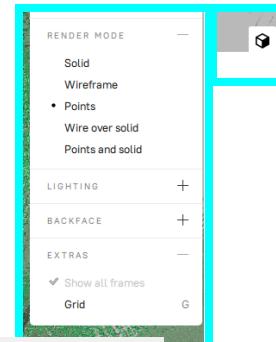
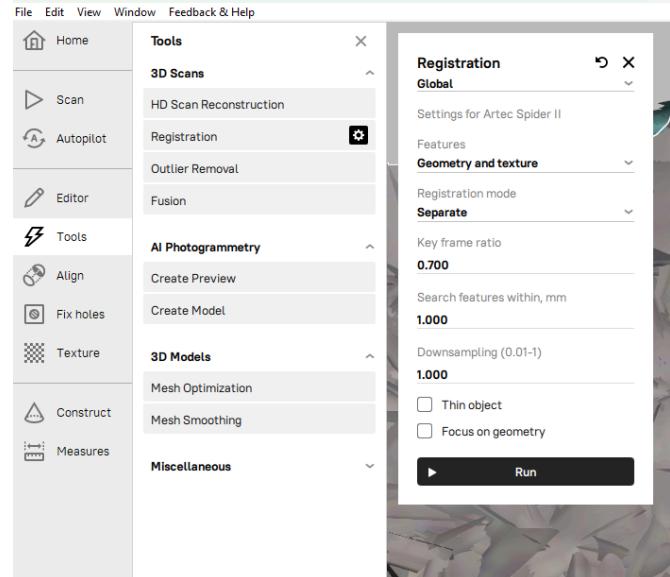


Objects					
Name	Error	Frames			
Group 1					
Spider II 1	0.1	690			
Spider II 2	0.1	714			

- a. If you short press, that is okay it'll just put the scanner back in preview mode. Long press to exit.
- 7. Once you have exited scanning mode, congratulations! You should have a 3D model that looks like clumped together shards of glass, don't worry, that's normal.
- 8. **HELP! I somehow have multiple scans** In the Objects window on the right hand side of the screen

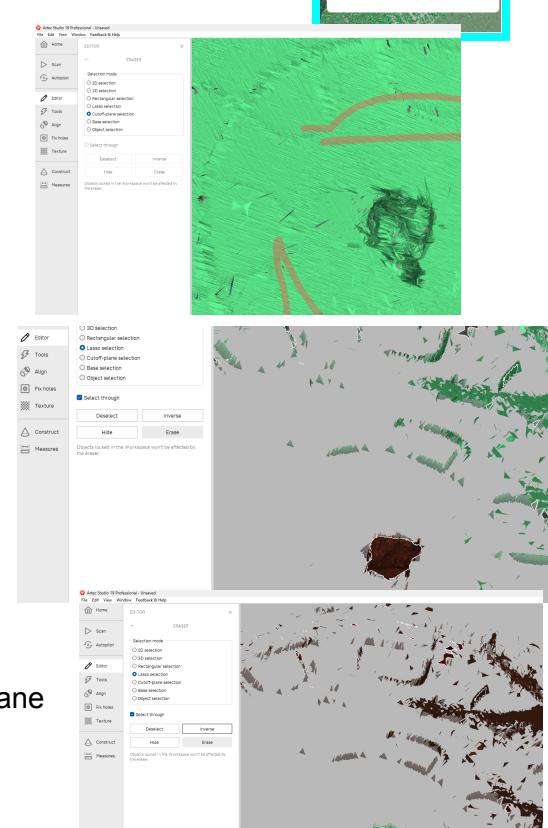
-  **Step 7: Registration-Aligning the frames *within* my most recent scan**

1. Navigate to the **Tools** tab
2. Under **3D Scans**, select **Registration**
 - a. Registration: Global
 - b. Features: Geometry and texture
 - i. This tells it to align based on the shape of the object plus the black and white pattern on the small turntable
 - c. Registration mode: Separate
 - d. Key frame ratio: 0.700
 - e. Search features within, mm: 1
 - f. Downsampling: 1
 - g. Thin object is OFF
 - h. Focus on geometry is OFF
3. **Select Run**
 - a. You will know it has worked once you see your scans settle into place it'll look like a slight rotation. It will still look like broken glass.
 - b. If you want to see the scan a bit clearer, on the right hand side of the screen click the cube and toggle between solid and points

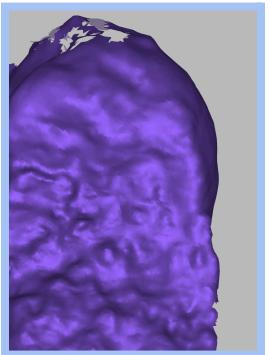


-  **Step 8: Erasing unnecessary data**

1. Navigate to the **Editor** tab
2. Select the **Eraser** editing tool. Make sure **Select Through** is ON.
3. Select **Cutoff-plane selection** this will allow you to draw on the mesh surface to give the software points from which to select all points within the same plane
 - a. Hold CTRL + click and drag to draw on the turntable, release when you have a small portion of the turntable selected.
 - b. Release CTRL and click and wait while the software generates the plane selection.
 - c. You will know the step is complete when the turntable mesh turns red
 - d. If you wish to move the plane lower or higher, rotate your mesh so you are looking at the side of the turntable (so you can see where the object meets the turntable), left click and drag
 - i. hold **ctrl + shift** and **scroll** to adjust the plane

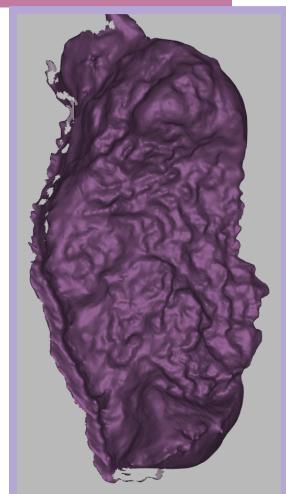
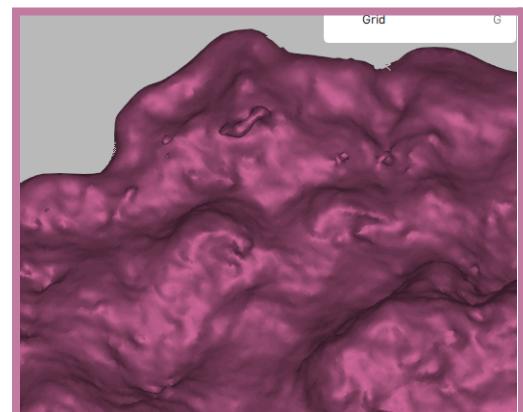


- ii. Within the eraser tab select **Erase**
- 4. Choose the **Lasso selection**, hold **ctrl + click** and drag to select your object.
 - a. Release **ctrl** and your mouse click to select your object.
 - b. Within the eraser tab, select **Inverse**. This will select everything but your lasso selection
 - c. Within the eraser tab, select **erase**.
 - d. **Help!** I accidentally depleted the object rather than the floating data, I forgot to click inverse!
 - i. Have no fear, press **CTRL Z** on the keyboard to undo, repeat step 8:4 again
- 5. Repeat [Step 6-Step 8](#) if additional data is needed
 - a. If there are obvious holes, you will need to go through steps 4-6
 - b. Otherwise navigate to "[Do I need to collect more data?](#)"



- **Do I need to collect more data?**

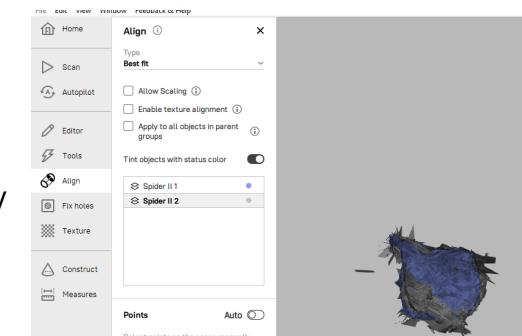
1. Toggle between solid and points to see any obvious holes in the data. If there are obvious missing data, repeat steps 6-8
2. If your scans look good after 1 go around, great! Move on to [Step 9](#)
3. If you can't tell, that's totally normal! Move on to [Step 11](#) to fuse the scan. There you can see the complete mesh and can decide if you require more data.
4. **Bad scan data looks like:**
 - a. **Very pixelated.** If you fused together multiple scans and it looks pixelated, it's more likely the sharpness is too high.
 - i. Turn your original scans back on, turn the fused scan off. Repeat [step 11](#) but turn the sharpness down to 20.
 - b. Has lots of parallel lines that do not appear on the object in real life. This is a clear indicator that you don't have enough data to connect an area of high topographic relief to an area of low topographic relief and the software is just doing its best.
 - c. **Has dangling bits** that do not exist on the object (kind of like a wart or a mole)
 - i. The sharpness is too high or there may just be too much scan data. Try fusing with ZERO sharpness.
 - d. **Seems to be quite textured, bumpier than it should be** in small areas
 - i. The sharpness is too high or there may just be too much scan data. Try fusing with ZERO sharpness.
 - e. **When in doubt, contact the project overlord (Samantha)**
 - f. See the purple outlined image as an example of a good scan



Objects					
	Name	Lock	Error	Frames	
✓	Group 1				
✓	Spider II 1		0.1	690	
✓	Spider II 2		0.1	714	

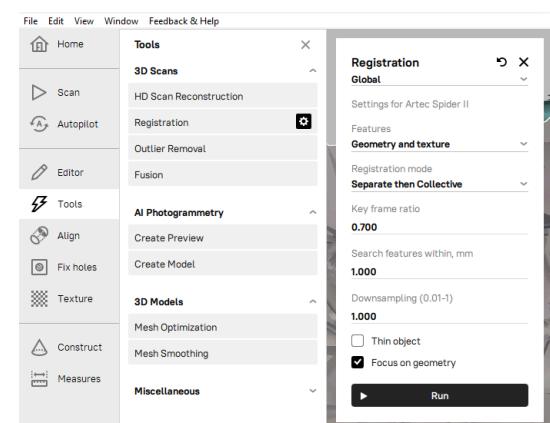
-  Step 9: Align the frames between all scans

1. Only perform this step if you have gone through the scanning process more than once for a single object!
2. On the right side of the screen in **Objects**, make sure the scans you are wanting to align both have a check mark next to them indicating they are both visible
3. Navigate to the **Align** tab
4. **Hold Shift + Left click and drag** to rotate the a single set of scans to get it into the same orientation as the stationary scan
 - a. **Hold shift + Left & Right Click and drag** to pan (slide the scan along a plane)
 - b. The moving scan will always be the scan that was created most recently!
5. Once the two scans are in relatively the same orientation, you will want to identify choose three points that span the surface of the object that you can reasonably find
6. Select your first point on mesh 1 by left clicking the mesh. Left click on **mesh 2** in the same spot you clicked in mesh 1
 - a. Select your second point on meshes 1 and 2
 - b. Select your third point on meshes 1 and 2
7. **Click align markers**
 - a. This should place the two meshes in relatively the same alignment but maybe not perfect but thats okay!
8. At the very bottom of the align tab select **Align**
 - a. This should get them aligned the rest of the way!



-  Step 10: Registering your multiscan alignment

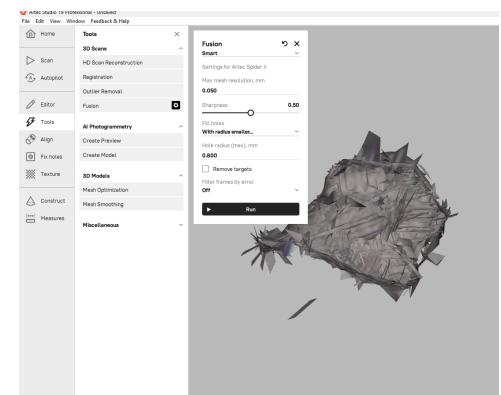
1. Only complete this step if you have completed step 9
2. Navigate to the **Tools** tab
3. Under **3D Scans**, select **Registration**
 - a. Registration: Global
 - b. Features: Geometry and texture
 - c. Registration mode: Separate then Collective
 - d. Key frame ratio: 0.700
 - e. Search features within, mm: 1
 - f. Downsampling: 1
 - g. Thin object is OFF
 - h. Focus on geometry is ON
- a. **Select Run**



-  Step 11: Fusing

1. Make sure the scans you want to fuse are visible (they should have check marks next to them in **Objects**)

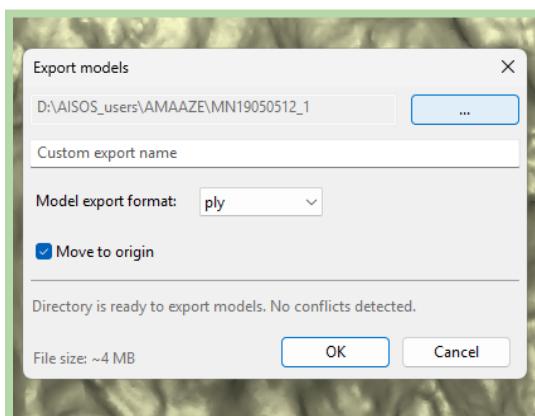
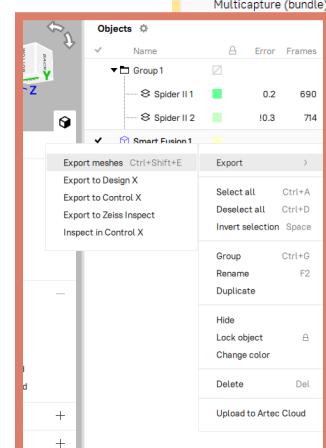
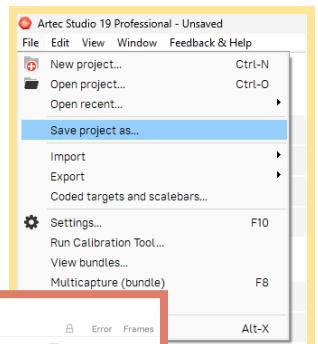
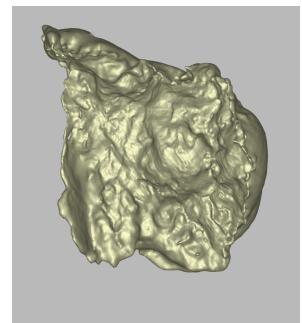
2. Navigate to **Tools, Fusion**
 - a. **Fusion: Smart**
 - b. **Max Mesh Resolution: 0.050 mm**
 - c. **Sharpness:**
 - i. For 1 scan: **0.5**
 - ii. 2 scans **0.2-0.4**
 - iii. 3 or more scans **0-0.2**
 - d. **Fix Holes: Width Radius smaller..**
 - e. **Holes radius (max), mm: 0.800**
 - f. **Remove targets: OFF**
 - g. **Filter frame by error: OFF**



3. Select **Run**
4. Record the specimen and fusion data in the [spreadsheet](#)

• Step 12: Saving and Exporting

1. You did it! You should have something in the object that says Spider II Fusion!
5/SDOn the top left of the screen in the nav bar select **File, Save Project As**
 - a. Navigate to the **Artec Projects** folder in the **External Harddrive**. This is where you will save your file.
 - b. **Save the file as the specimen number and mold number written on the bag or written on the card in the bag**
 - i. Ex: NAO2-3 Mold A1
 - ii. Ex: 709881 Mold A
 - iii. Ex: SWT015-3 Mold B3
2. Find your fused specimen on the **Objects** on the right side of the screen.
 - a. Right click on your fusion
 - b. **Export Meshes**
 - c. Click the 3 dots to navigate to the **Artec Fused Scans** folder
 - i. Change the name to specimen number and mold number written on the bag or written on the card in the bag
 - ii. **Model export format: ply**
 - iii. **Move to origin: YES**
 - d. **Select OK**



-  **HELP**

Help! It says my scanner is not connected!

- i. If your light is green and the software says you don't have a scanner connected, you may have opened more than one Artec Studio 19. Close the one without a connected scanner
- ii. If the light on the scanner is green but you cannot find software with a connected scanner, close the software and reopen
- iii. If your light is not green, check the scanner connections to the computer and to power. If there is no light it does not have power, if it is blinking white you likely do not have enough power connecting it to the computer
 1. Ensure the usb is securely connected to the power bank or the BACK of the computer

HELP! I somehow have multiple scans In the **Objects** window on the right hand side of the screen

- iv. If the scanner loses position while scanning it will sometimes start a new scan which is okay! You can either go through steps [5](#) and [6](#) for each then [step 7](#) for both **OR** you can delete both scans and start over.
 1. Since it goes quickly I'd recommend deleting both scans since the aligning would be extra unnecessary time!



[Start a new scanning project with a new specimen](#)

1. If you wish to continue scanning, File → New Project then return to step 3.
 - a. I'd recommend continue scanning as we are on an every other week scanning schedule
2. If you would like to move on to geomagic cutout protocol you may do so!



[Move on to Geomagic Mold Cutout Protocol](#)