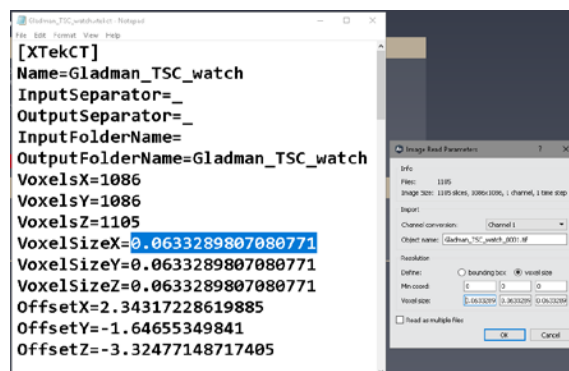# Avizo Operating Procedure – The Basics

Overview

1. Import .tiff stack
2. Invert data to proper orientation
3. Ortho Slice
4. Volume Rendering
5. Create a surface
6. Take images and create simple animation

Import your reconstructed tiff stack:

1. Open Avizo (preferably "Lite")
2. Click **Open Data**
3. Navigate to Reconstructed Tiff Stack (not raw projections) and open all images (Shift + all images)
4. If an "Out-of-Core Data" message pops up, then change the Loading Policy to **Read complete volume into memory** and click **OK**
   a. *Chose the LDA format to convert imported tiff stack into a more manageable format on computers with inadequate graphics card or processor. Most actions in this OP can still be performed, with the exception that surfaces can NOT be produced from this format.*
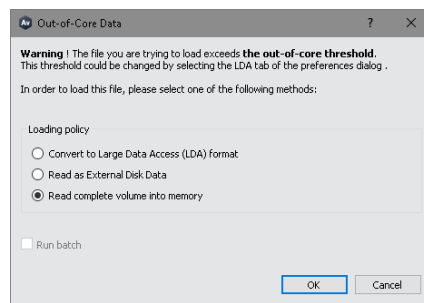
5. In the "Image Read Parameters" window fill in the Voxel size information with the proper value taken from the ".xtekct" metadata file


6. Reconstructed tiff stack appears as green bubble. Actions that can be done to this appear in yellow, orange and red. To activate (display) an action **click on the orange square** to the left of the bubble title.

Invert data to proper orientation

1. Left click on the green bubble with your reconstructed .tiff stack.
2. In the Properties box find and left click the **Crop Editor** button.
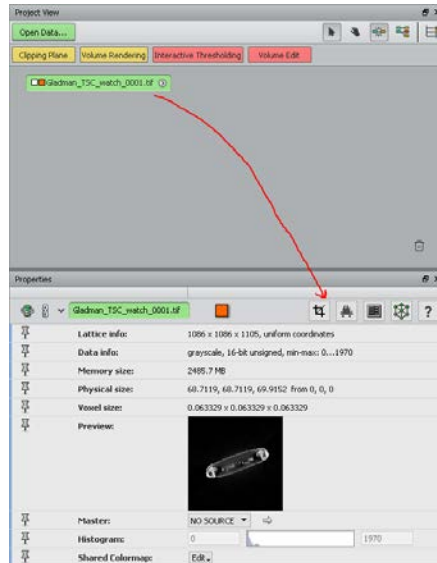
3. Click **flip Z** and press **OK**. Now your data should be in its original orientation.
4. Change the viewing mode to "Orthographic" (from "Perspective") for more realistic images

*For all actions look for the "?" button in the Properties menus. These Help menus offer detailed information about all available settings for that function. Examples and Tutorials are also available through the Help menu.

Other Basics:

1) **Save Project to new folder within data in order to easily come back to work.**
2) **Right click rotates or translates object in viewer (depending on mode), spinning the mouse wheel zooms in and out, depressing wheel and moving translates object.**
3) **Preset XY, XZ, YZ perspectives can help reset to defined views, or a "home" view can be set for any custom orientation.**

Add an Ortho Slice

1. Left click on green bubble representing the reconstructed tiff stack. Look for "Ortho Slice" in the hot keys in the top of the Project View. If not there, right click on the green bubble and look for "Ortho Slice" in the favorites list or search for this action. Click on that action and **Create**.
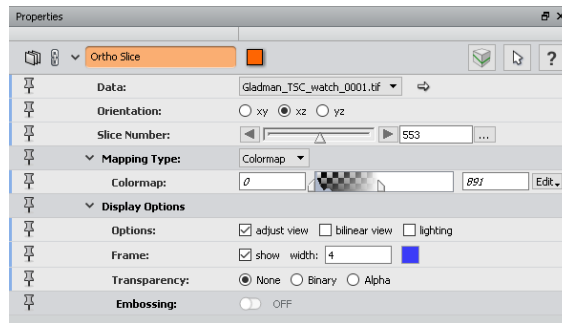

   a. Change Orientation (XY, XZ or YZ) to view one of three orthogonal views.
   b. Slide through Slice Number to view cross-sections of entire image stack.
   c. Change Colormap to add/reduce contrast to the image stack.
   d. Under "Display Options", you can change the color, size and visibility of the Ortho Slice frame.
2. Any work bubble can be permanently deleted by dragging it down to the trashcan icon at the bottom of the Project View window.
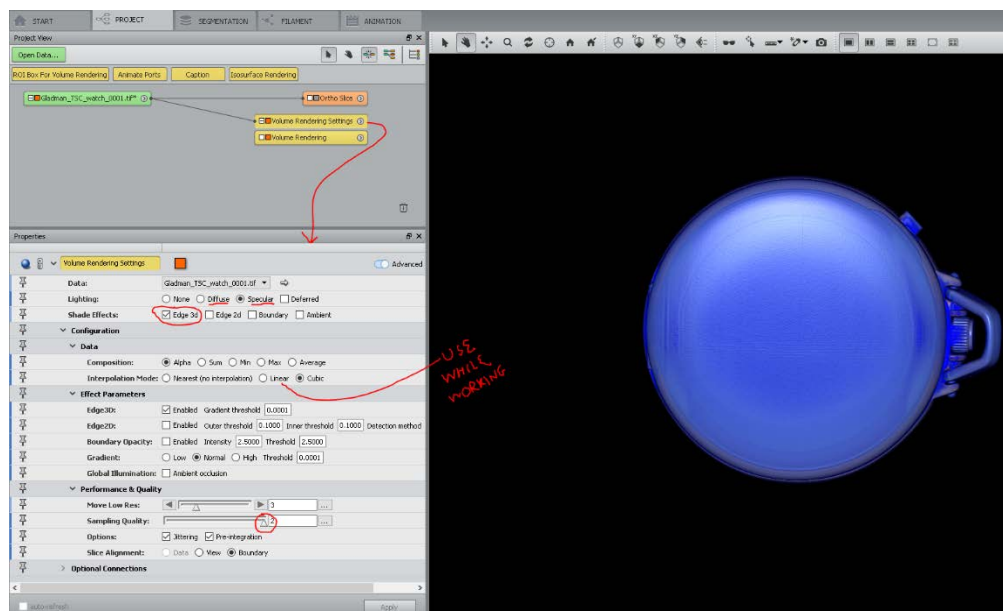
Add a Volume Rendering

1. Click on green bubble representing the reconstructed tiff stack. Look for "Volume Rendering" in the hot keys in the top of the Project View. If not there, right click on the green bubble and look for "Volume Rendering" in the favorites list or search for this action. Click on that action and **Create**.
2. Two yellow bubbles appear with a new Volume Rendering. The bottom bubble – Volume Rendering – includes the colormap tools for the rendering.
   a. Selecting values for the colormap lets you highlight different peaks and valleys (densities) in your sample. In the drop-down Edit menu are a number of color map options, all which provide different treatments to your data.
   b. Colormap lookup in RGBA displays color, in luminance alpha displays greyscale, and in alpha displays a more saturated greyscale.

    c. Opacity (from 0-1) can be used to see through external structures without a clipping plane.
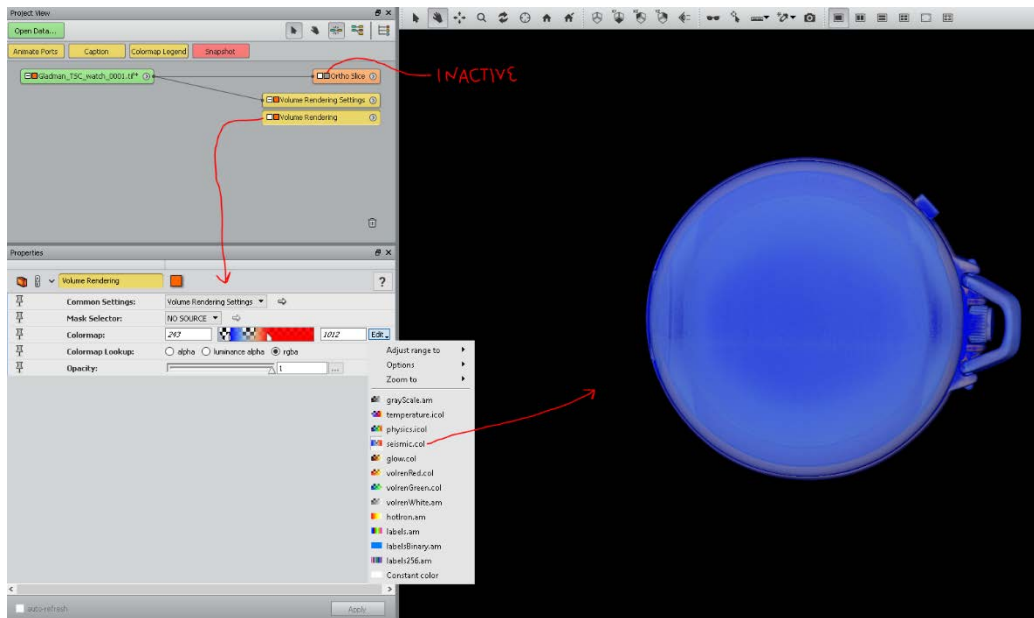

3. The top bubble – Volume Rendering Settings – includes several backgrounds settings for the rendering (turn on Advanced to see extra options).
    a. Lighting: Diffuse gives a flat finish while Specular adds a metallic shine
    b. Applying Edge 3d or Edge 2d can help bring out detail in the rendering.
    c. Cubic Interpolation mode is the highest quality, but slows down the image processing. Stick with Linear until a final image or animation is needed.
   d. Change Sampling Quality to the highest setting.

4. A clipping plane can be added to peel back regions of the Volume Rendering. Right click on the green bubbles representing the tiff stack, and select or search for Clipping plane. Pick an orientation and where you want the slice (translation), and click the **Clip** icon at the top of the box (cube with teal slice inside).
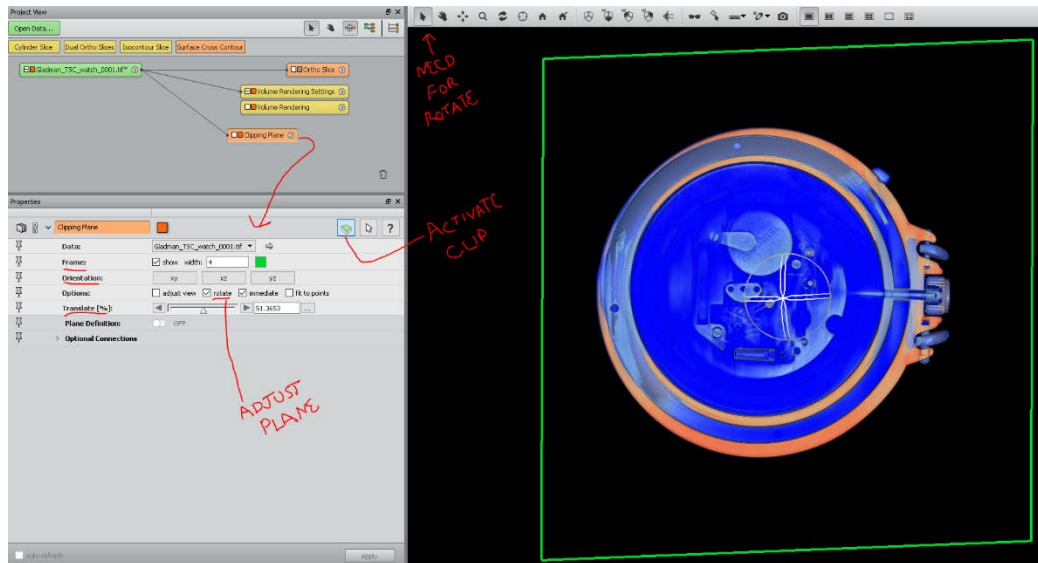
Make a surface

1. Right click on the green bubble tiff stack and press "Edit New Label Field" (or just move to the Segmentation Tab). This takes you to a new window where you can highlight materials to make into a surface.
2. Once in the segmentation window choose the paintbrush or magic wand tool toward the bottom of the screen. When choosing magic wand just click on the material you would like to make a surface of. This will highlight a single slice. Use the masking tool to choose a specific range of your data to be selected.
   a. Choose "All Slices" to spread this selection to the entire scan.
   b. Press the "add" icon (+) under Selection to add that material to the label.
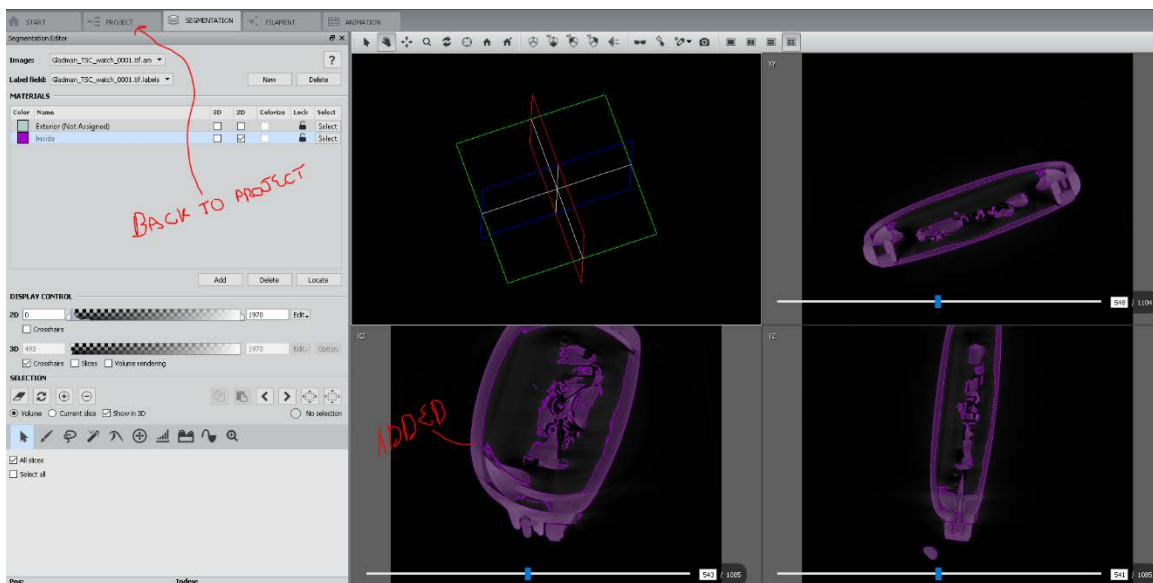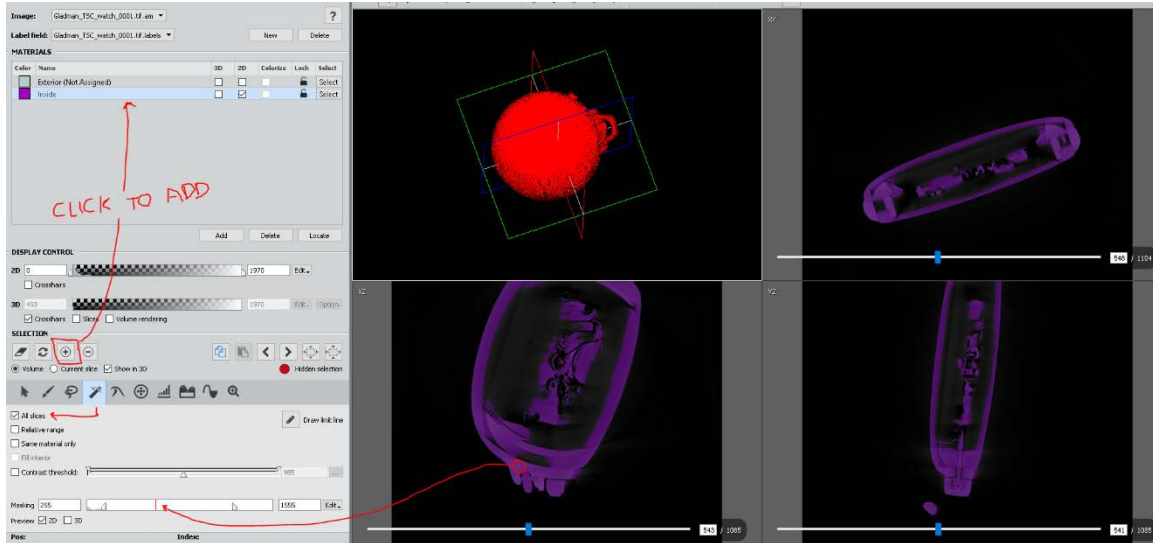
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3. Move from Segmentation tab back to Project Tab. Now the green tiff bubble has an extra label bubble below original tiff stack. Right click on this label and select/search "Generate Surface" and press **Create**.
    a. Change smoothing method to preferred setting and press **Apply**.
    b. Accept any warning message about large file size.
4. A new ".surf" file will appeal. Right click on this and search/select "Surface View" and press **Create**.
    a. In Surface View change "Colors" to constant and adjust colormap by double clicking.
5. Export the surface as a ".ply" or ".stl" by right-clicking on the ".surf" file, and "Export Data As"

Updated 2.1.18
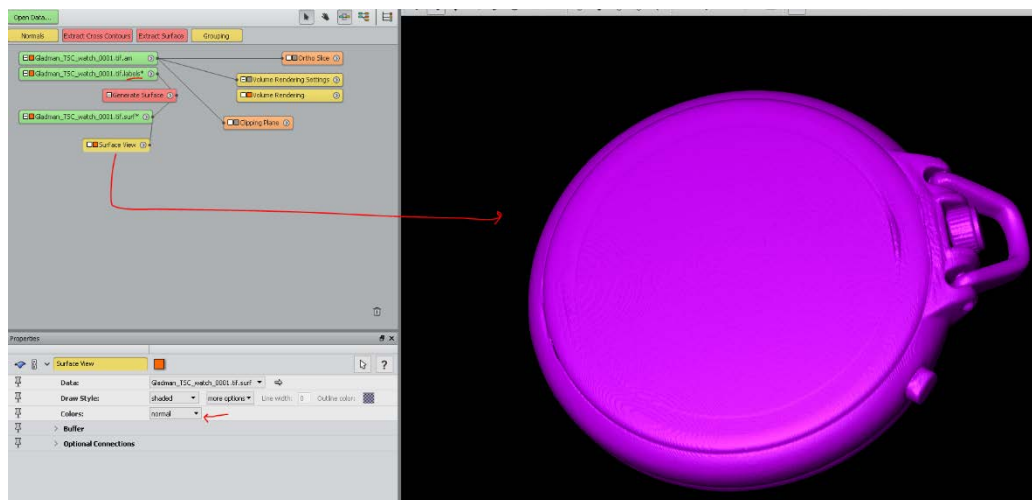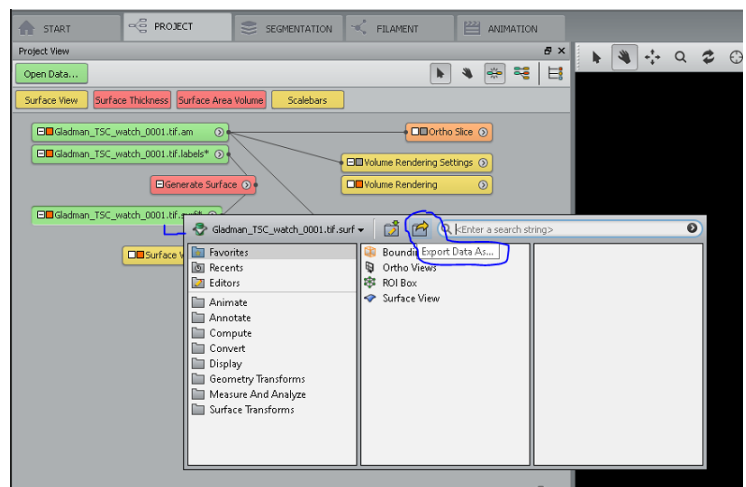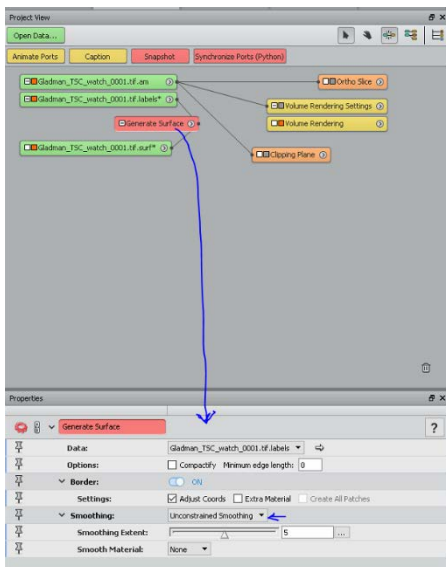
Save Image or Animation

1. Save an image with the Snapshot camera icon at the top of the viewing window. Choose a location to save it and the image type.
   a. Hide unwanted boxes by deselecting (click on orange square near bubble name to turn grey) or delete (move to trash can in project view). Some actions can be hidden but still remain in effect, such as a clipping plane.
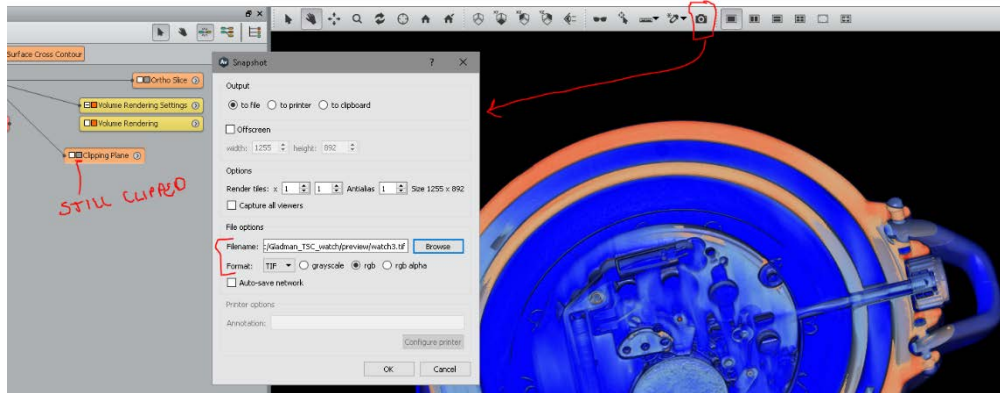

2. Make a simple animation by choosing the animation tab above your workflow.
   a. Clocks appear to the left of all actions that you could do in your workflow. This allows you to choose the time for various features to begin/end in the Animation Director.
   b. For a simple animation first right click in a blank spot in your workflow and choose Create Object – Camera Orbit – Create. Adjust the second dropdown in the Action row to choose which direction your object rotates. Scroll through the Time function to see full rotation.
   c. Once you've settled on a rotation, choose a starting point in the Time line and click the Clock (Time – Value). This should place a marker at the time 0:00 in your Animation Direct.
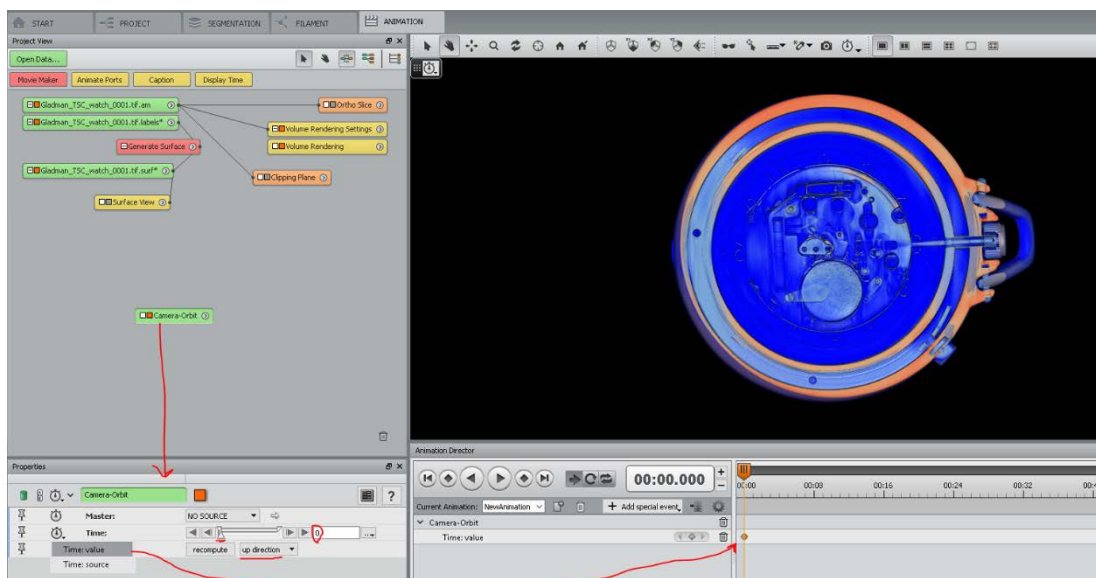
d. In the Animation Director window move the orange tab above the timeline to a new time (e.g., 10 second mark). Then choose a new spot in your Camera Orbit Time (if started at 0 then going to 360 will ultimately complete a full spin). Click the Clock (Time – Value) to set the end point. Scroll the orange tab above the timeline to see the final result.

   i. NOTE: You must adjust your orange tab in the timeline BEFORE adjusting the value that you wish to change. If you adjust before changing the time, then it will overwrite your first position with the adjusted value.
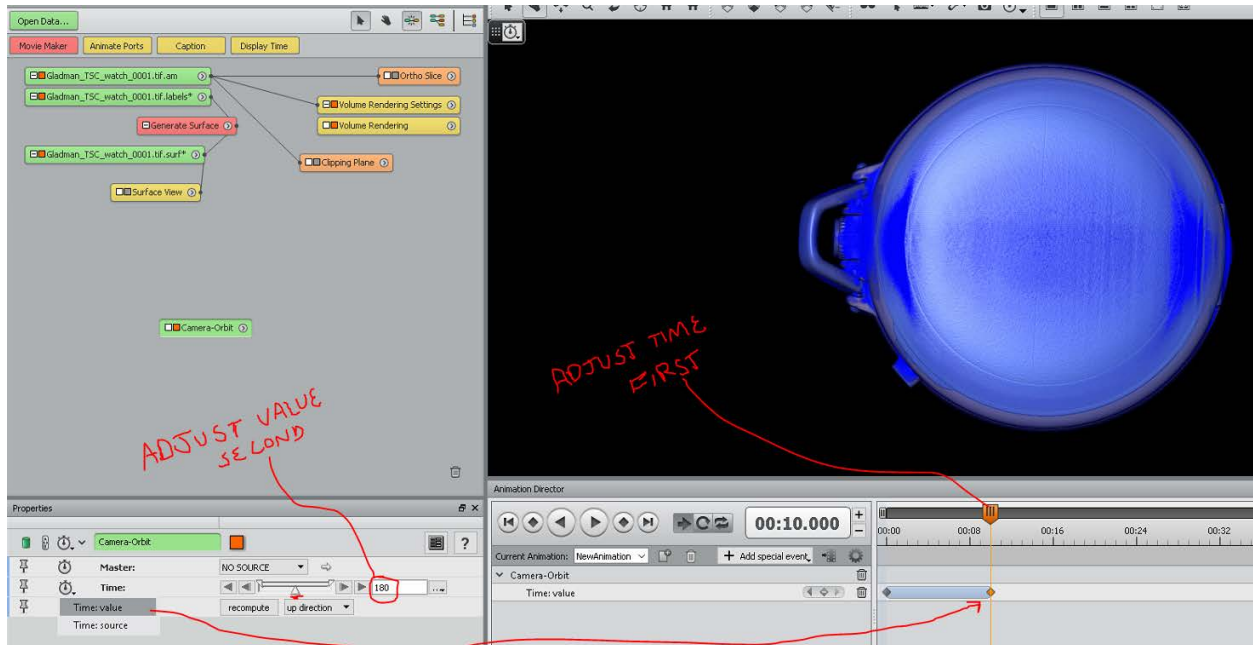
e. Any feature with a clock symbol can be included in the animation. Some useful effects include translating a clipping plane, changing the color map on a volume rending, and adding a scale and caption.

f. Go to the Movie Creation button under the Current Time box. This will take you to the final settings for your animation. For best results choose the following:
  i. AntiAlias 4
  ii. MPEG movie
  iii. Browse to save your file location
  iv. 25 or 30 Frame Rate
  v. Quality to 1
  vi. Size 1080p
  vii. Click **Create** and leave the computer alone – it saves each frame individually and you cannot work while this is happening.