



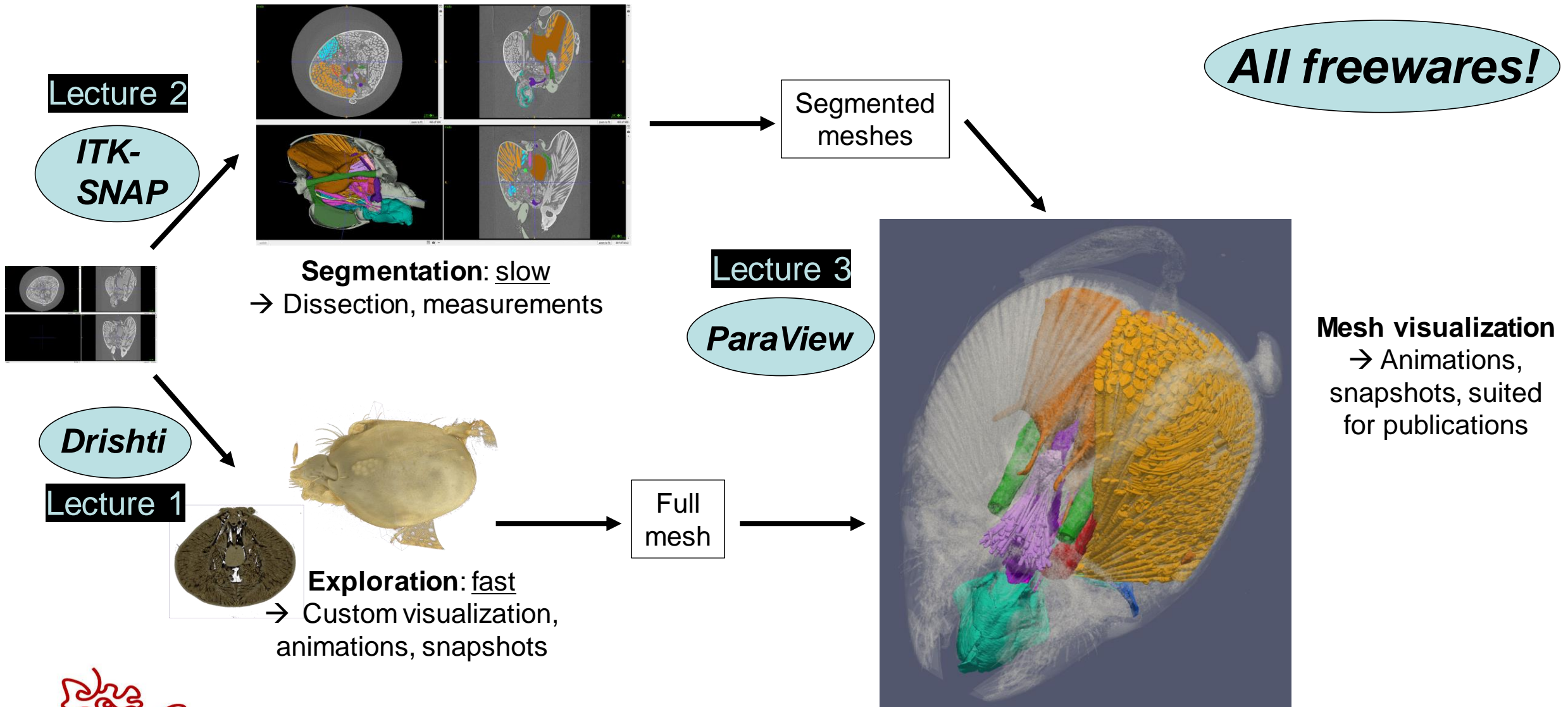
SKILL PILLS

SKILL PILL: Visualizing Tomography Data (for free!)

Lecture I: Drishti



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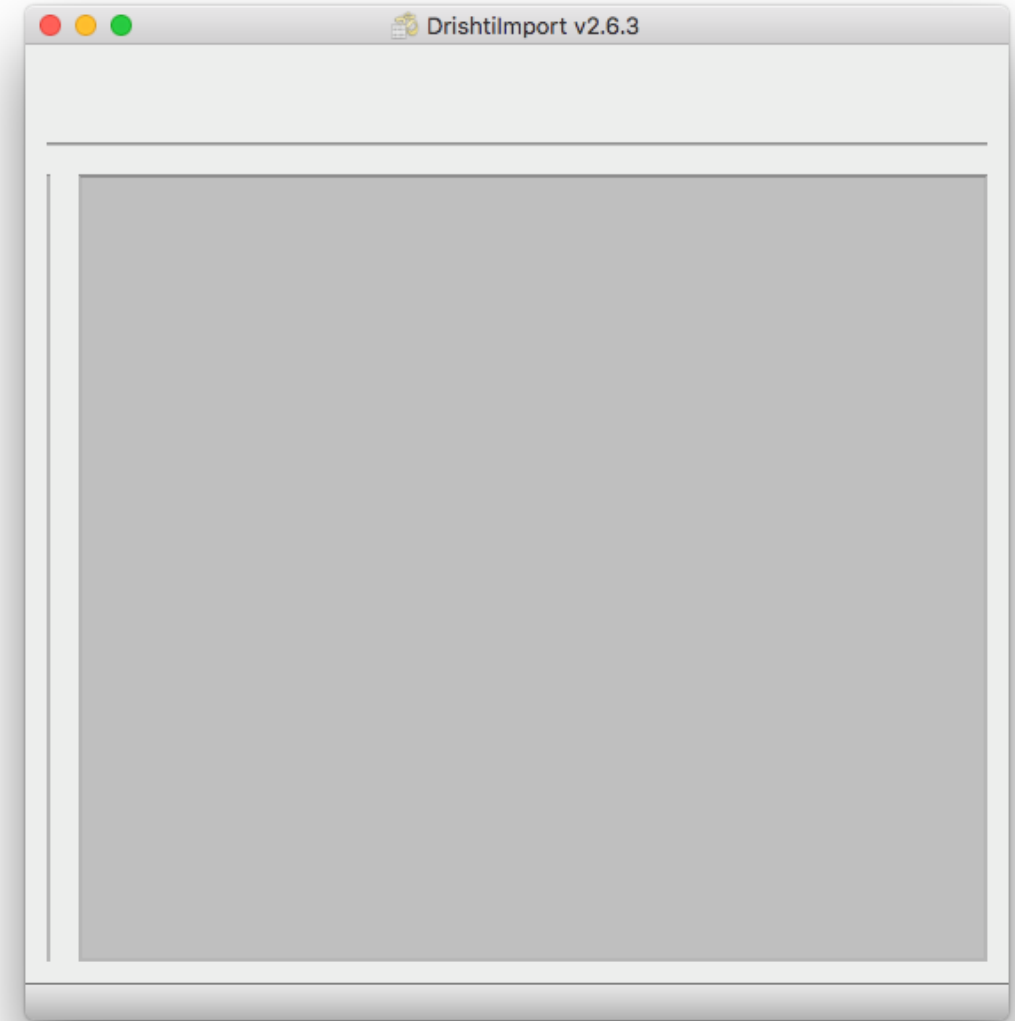


- Open-source scientific visualization software
- Designed by Ajay Limaye (Australian National University)
- Drishti = Sanskrit word for vision/insight
- Visit <https://github.com/nci/drishti> for code, tutorials, issues...
- Drishti has 3 sub-software:
 - Import (create Drishti-specific files)
 - Render (visualize data)
 - Paint (segment data)

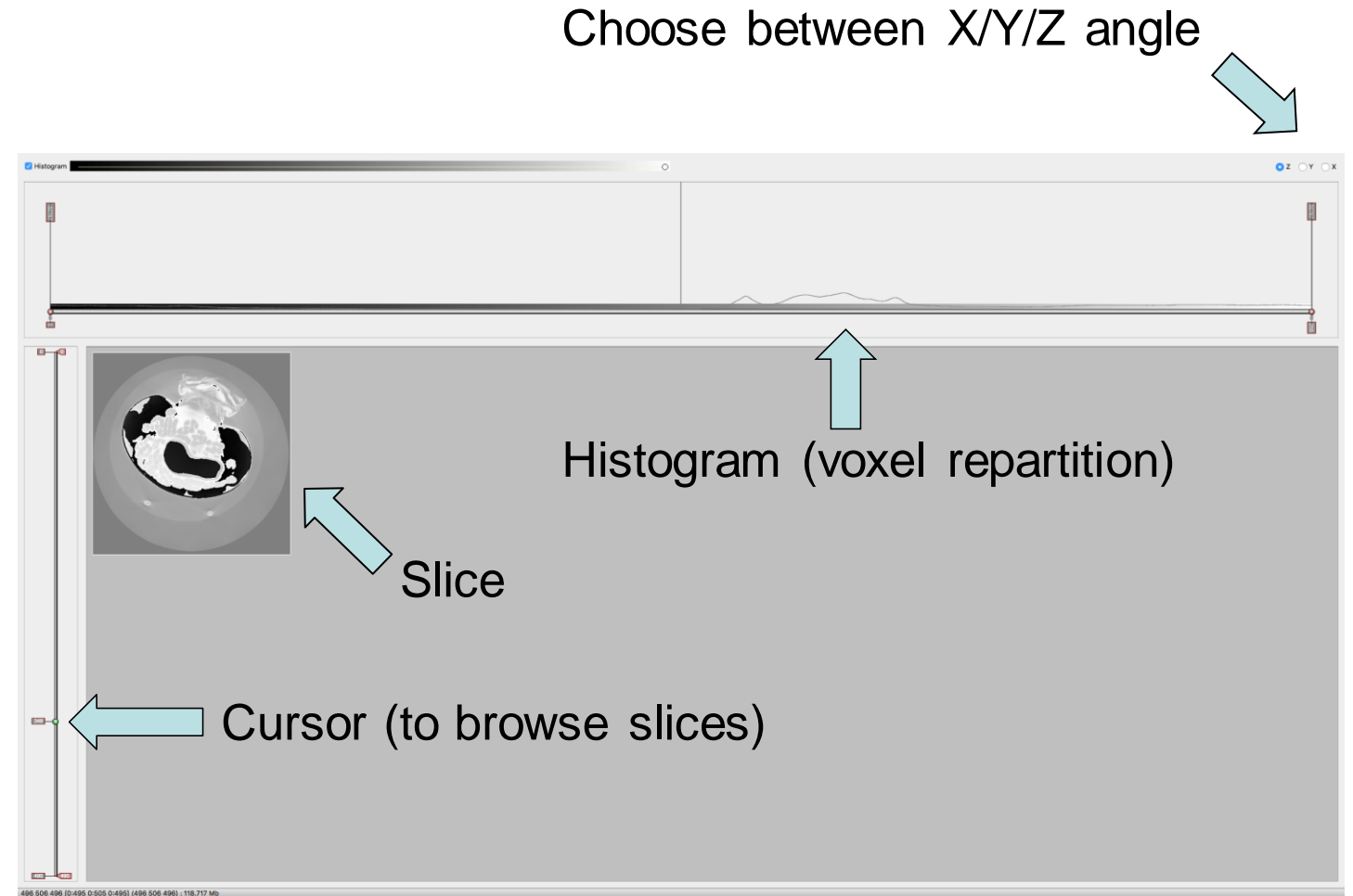
Drishti Import

- Data previsualization (is my data OK?)
- Subsampling (do I want to get rid of some slices?)
- Creation of standalone files for Drishti other modules

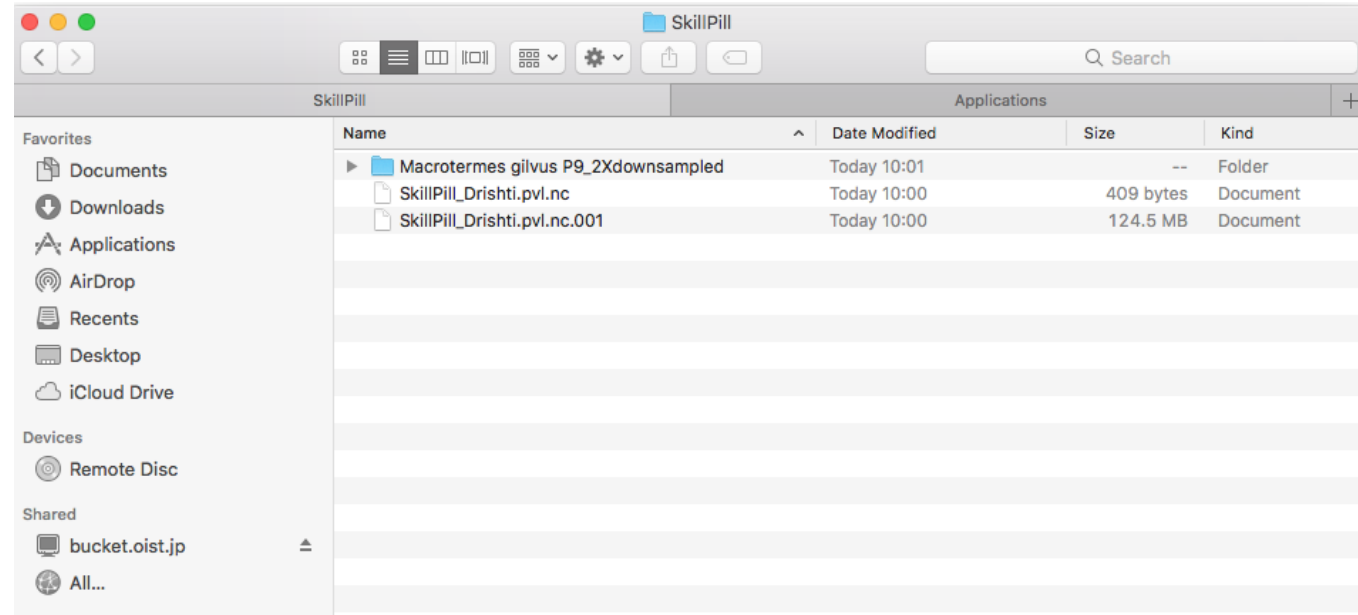
- Open Drishti Import
- A plain window should appear (image on the right)
- Drag and drop your file folder
- A pop-up should appear, check the detected file format, click OK



- When files are loaded, a new pop-up appears
- Ignore it, close it
- You should get the image on the right



- Only mission: create files for Drishti Render
- File > Save As (shortcut S)
- You can accept the defaults
- Check the final information (voxel size)
- Done → click OK
- Check if new files are here
 - .pvl.nc: opened in Render, shortcut to second file (small)
 - .pvl.nc.001: standalone scan data for Drishti (big)



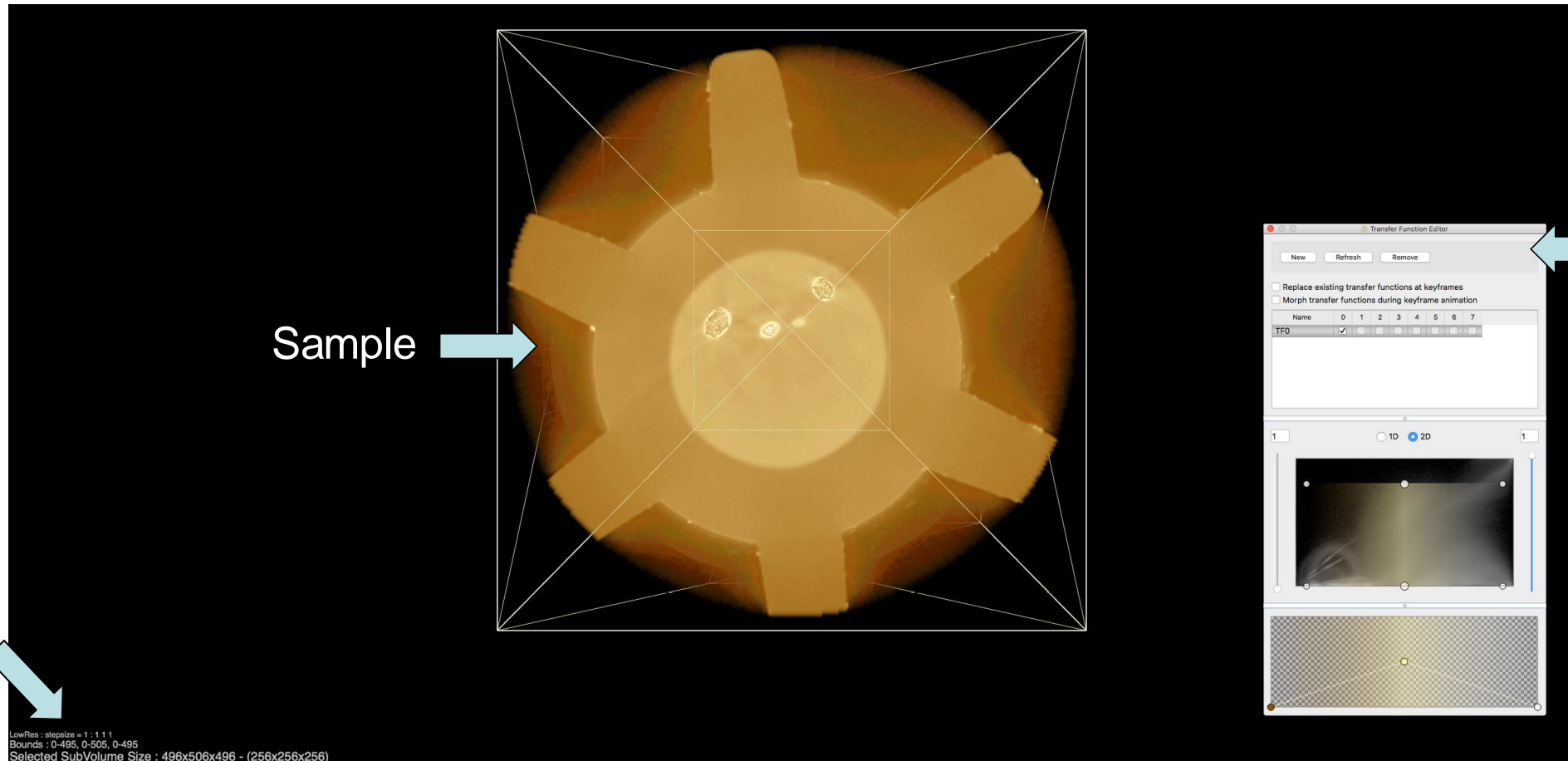
Drishti Render

- Data visualization (what is inside my sample?)
- Customized exploration: global illumination settings, point/string lights, clipping planes, viewports (highlight regions of interest)
- Snapshots and Animation (qualitative analysis, suited for publication)
- Measurements: linear, curved (quantitative analysis)

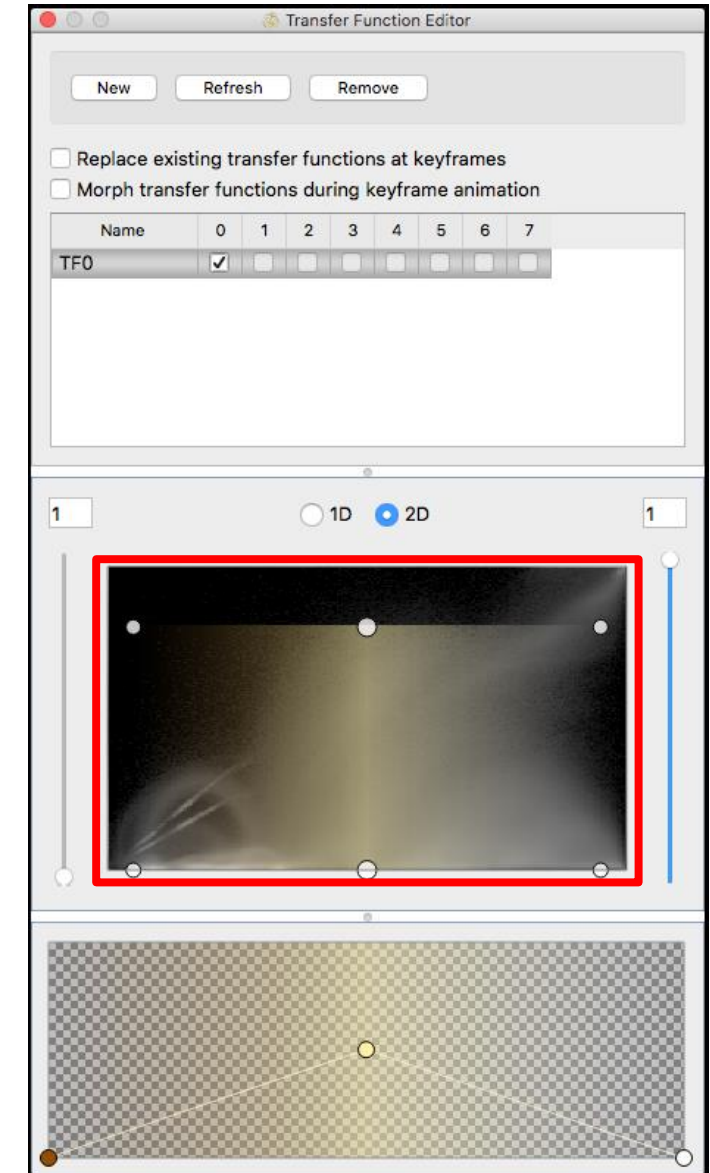
- Open Drishti Render
- Drag and drop the .pvl.nc file
- Wait...



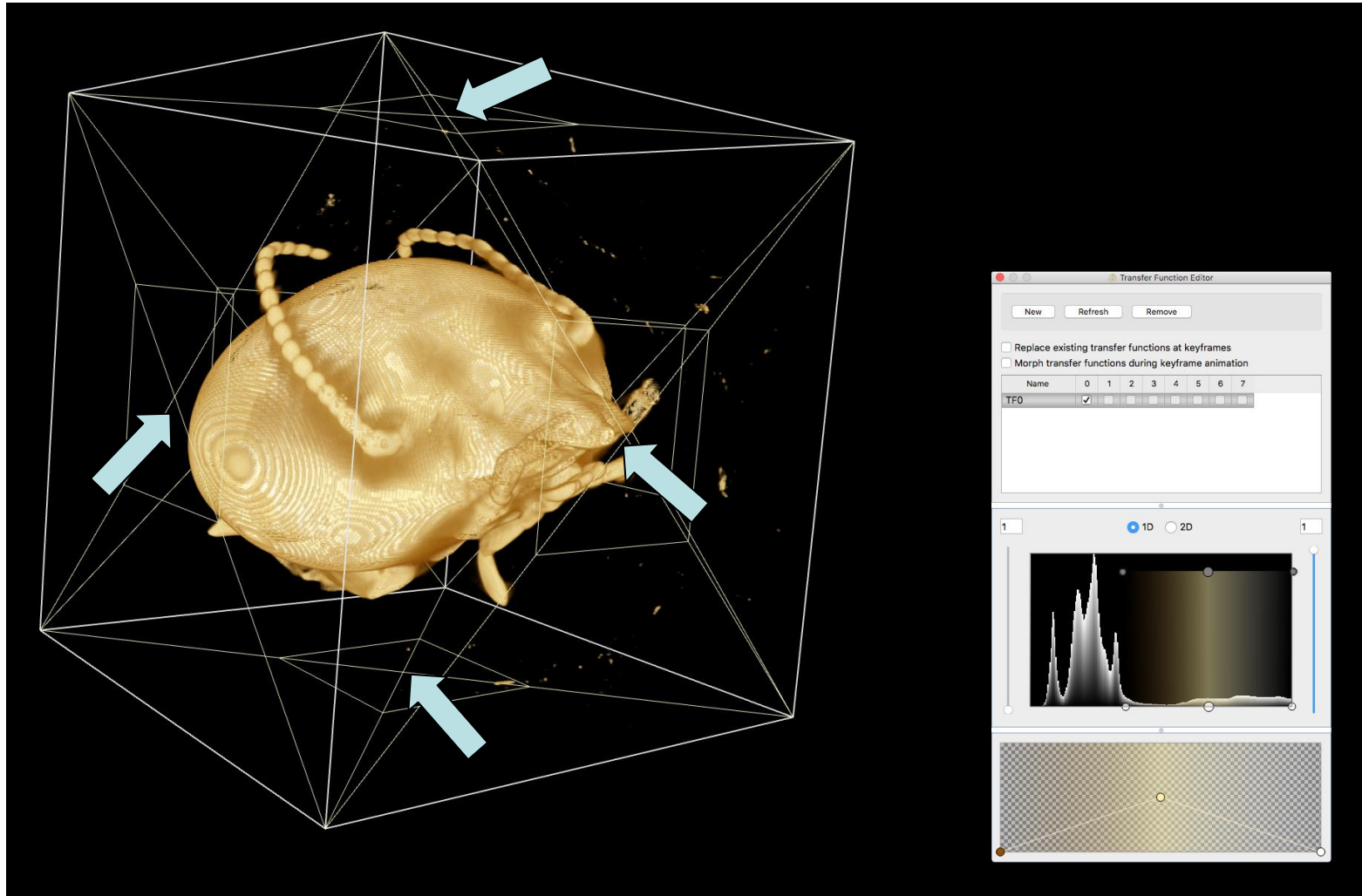
- A volume has appeared... but not exactly what we expected!



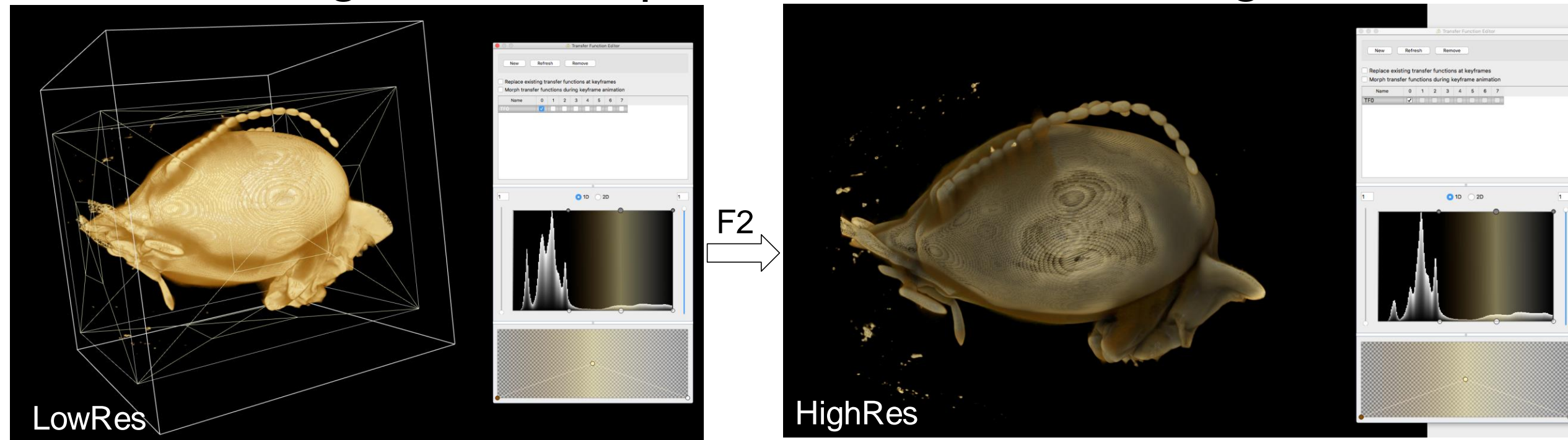
- Transfer Function Editor (TFE): 3 panels
 - Function creation/deletion and toggling
 - **Voxel mapping** (1D/2D)
 - Color gradient
- Adjust the window in the voxel mapping panel to visualize the termite head



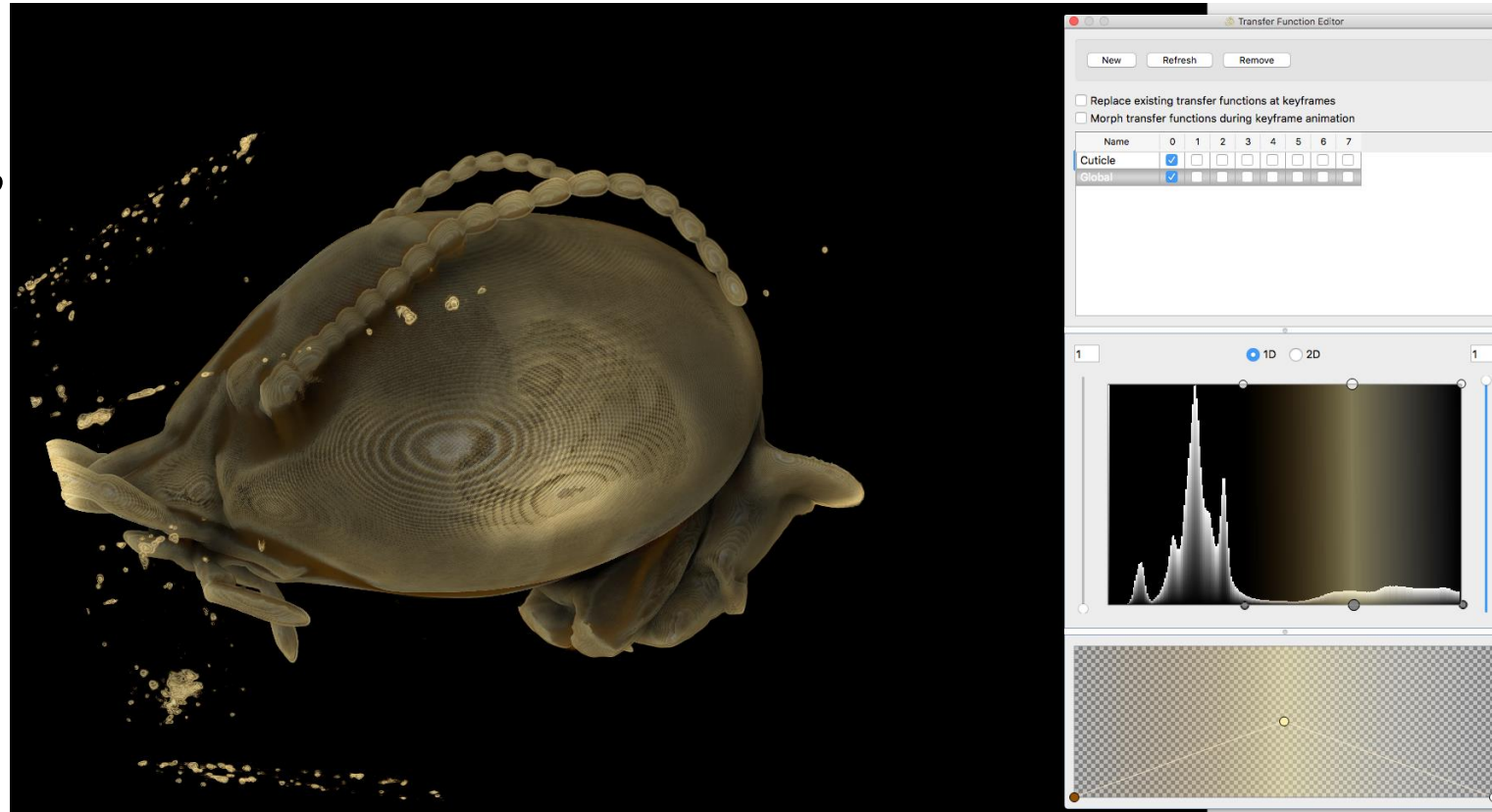
- Here it is, good job!
- Now use the crop box to isolate the termite head



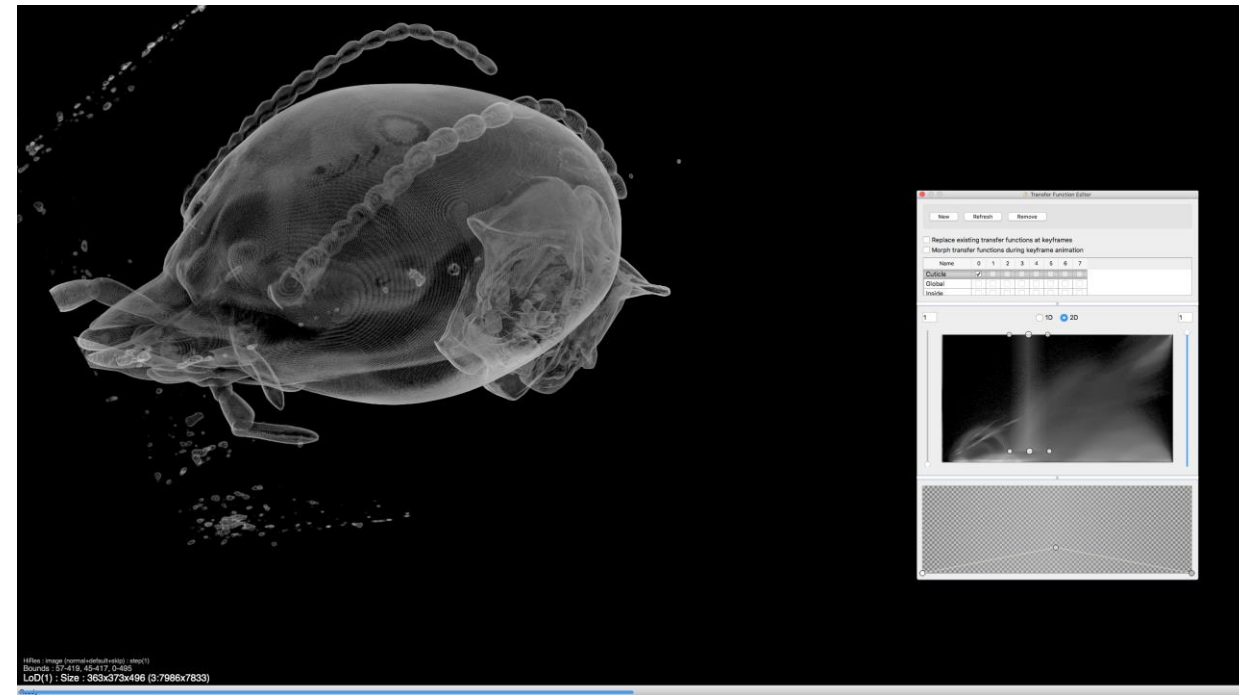
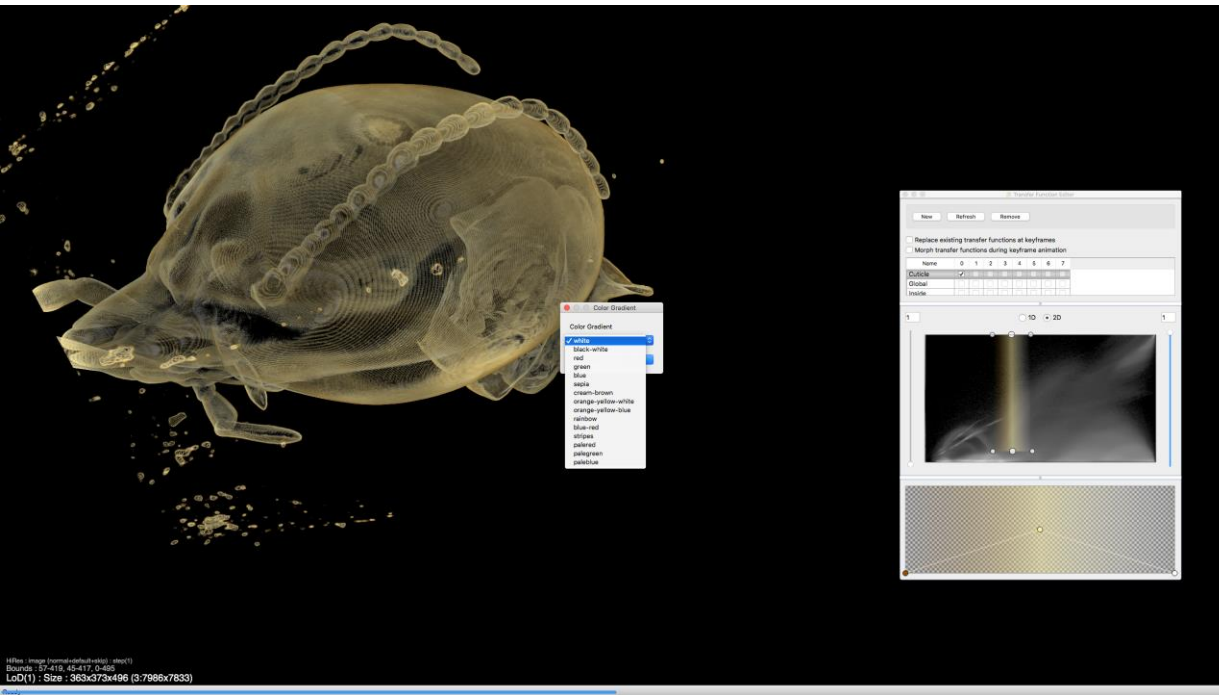
- Satisfied with your cropping?
- Press F2/Shift-F2 (Mac/Windows): LowRes → HighRes
- When HighRes loaded, press B to hide the bounding box



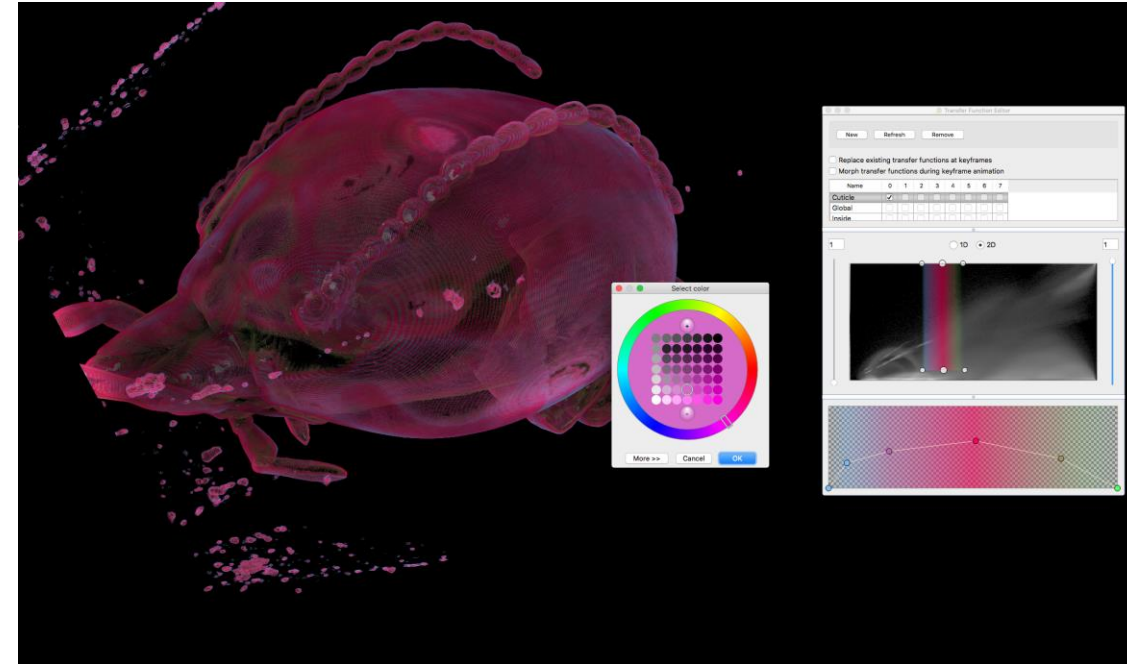
- Back to the TFE
 - Rename TF0 (click on it, then press SpaceBar)
 - Duplicate it (Ctrl+D)
 - Hide one (untick 0)
 - Adjust the other one to highlight the cuticle



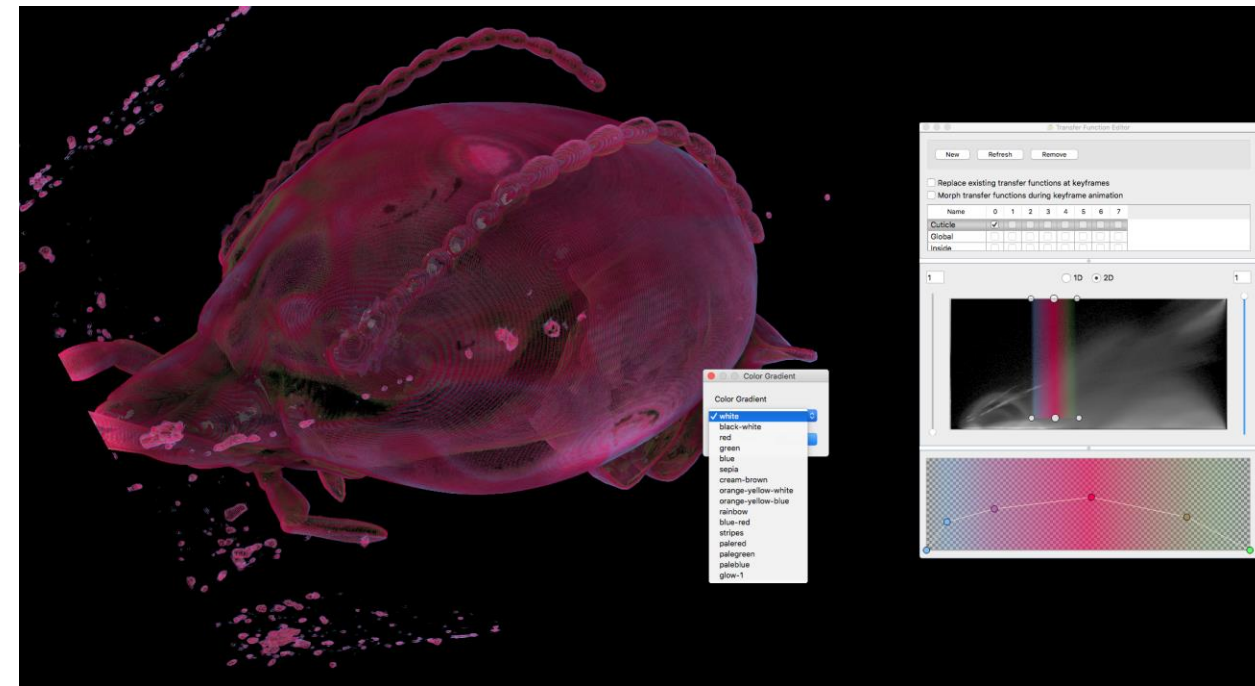
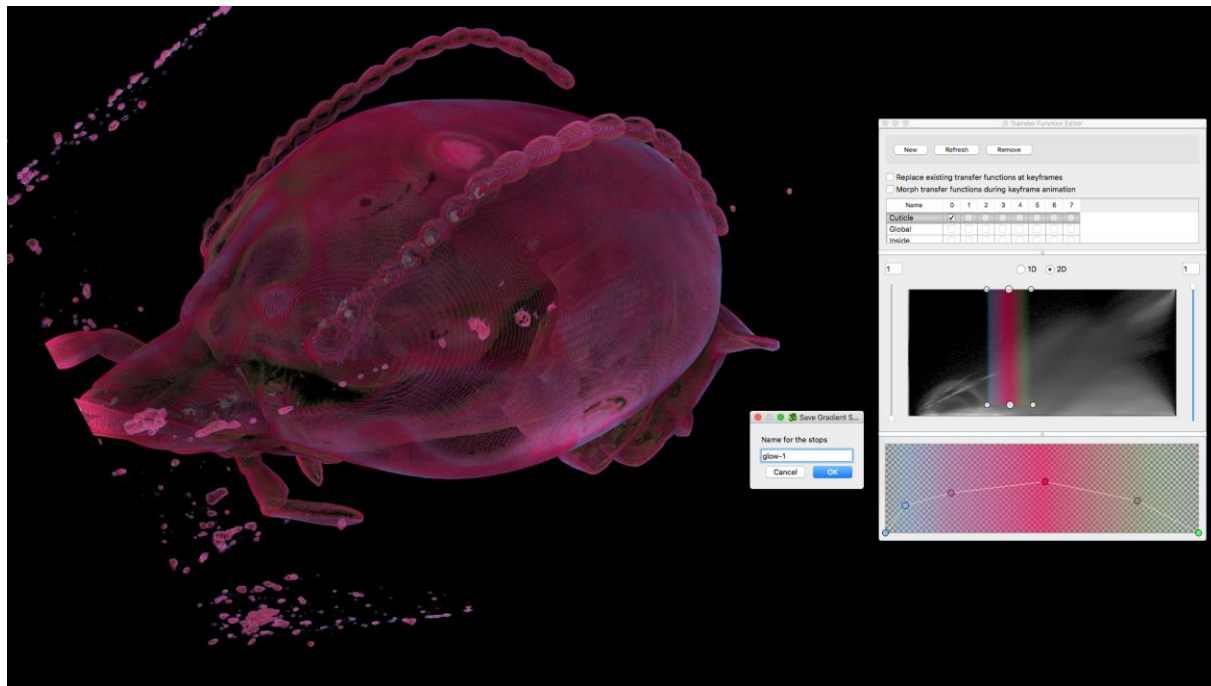
- Hover the color gradient panel
- Press Spacebar: a list of color gradients appears
- Pick one, and click on OK to apply it



- Now try to create your own color gradient!
 - Left click on existing point: drag (up/down: intensity, left/right: color)
 - Left click: create new point
 - Double click on point: change color

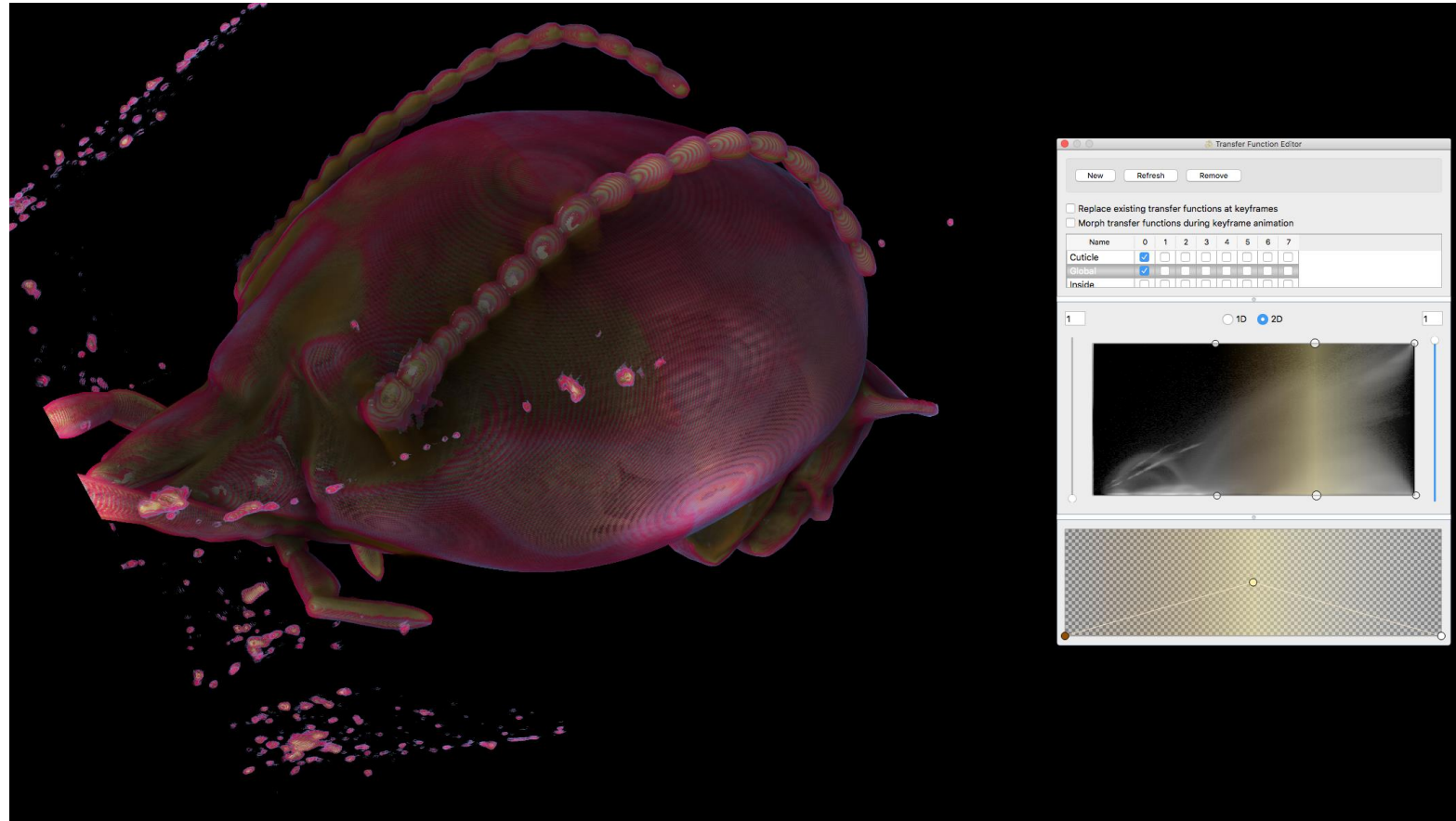


- To save it: still hover the color gradient panel and press S
- Name it, and it will appear next time you choose a gradient!

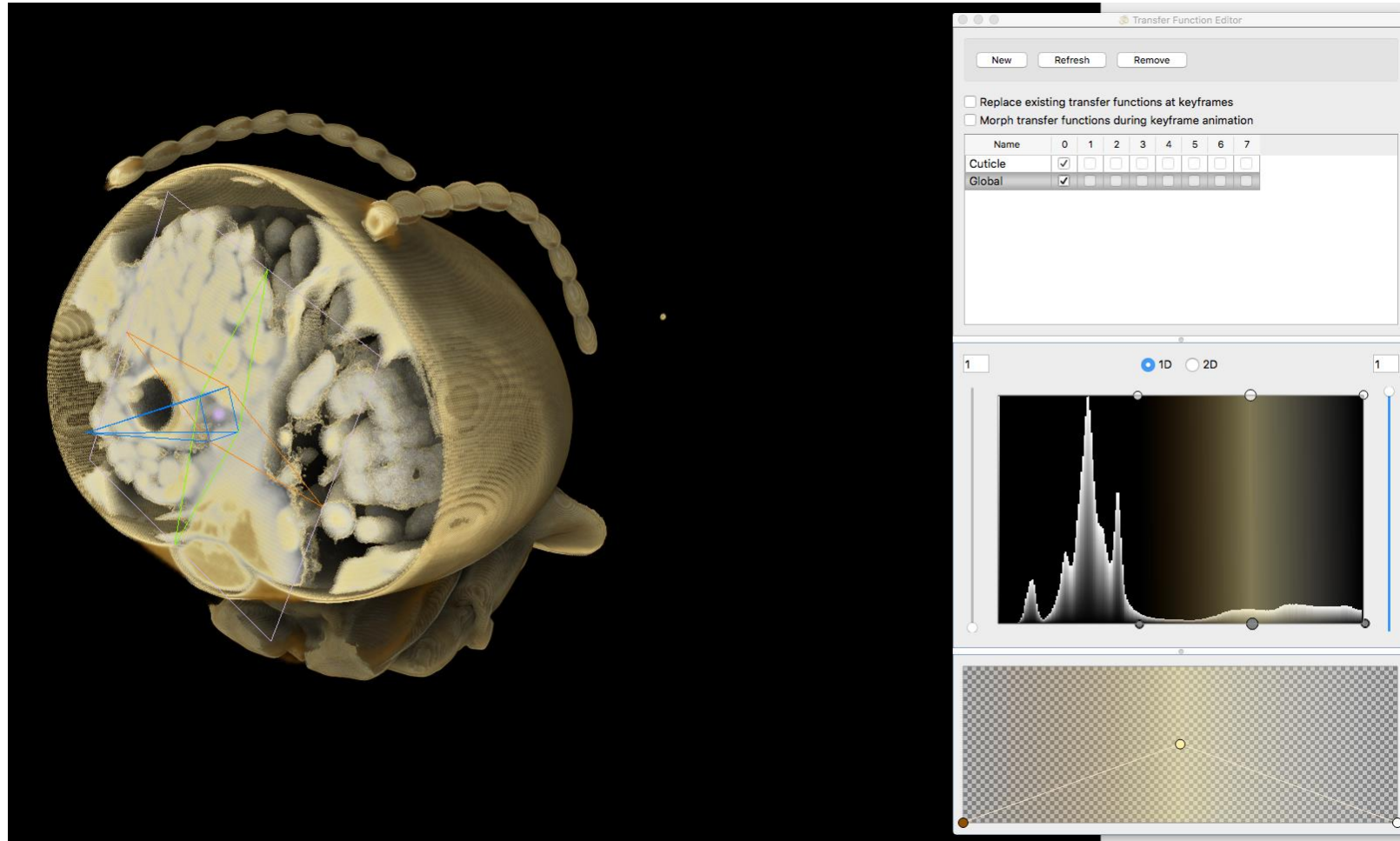


- Visualize the overlap
- Toggle off the cuticle

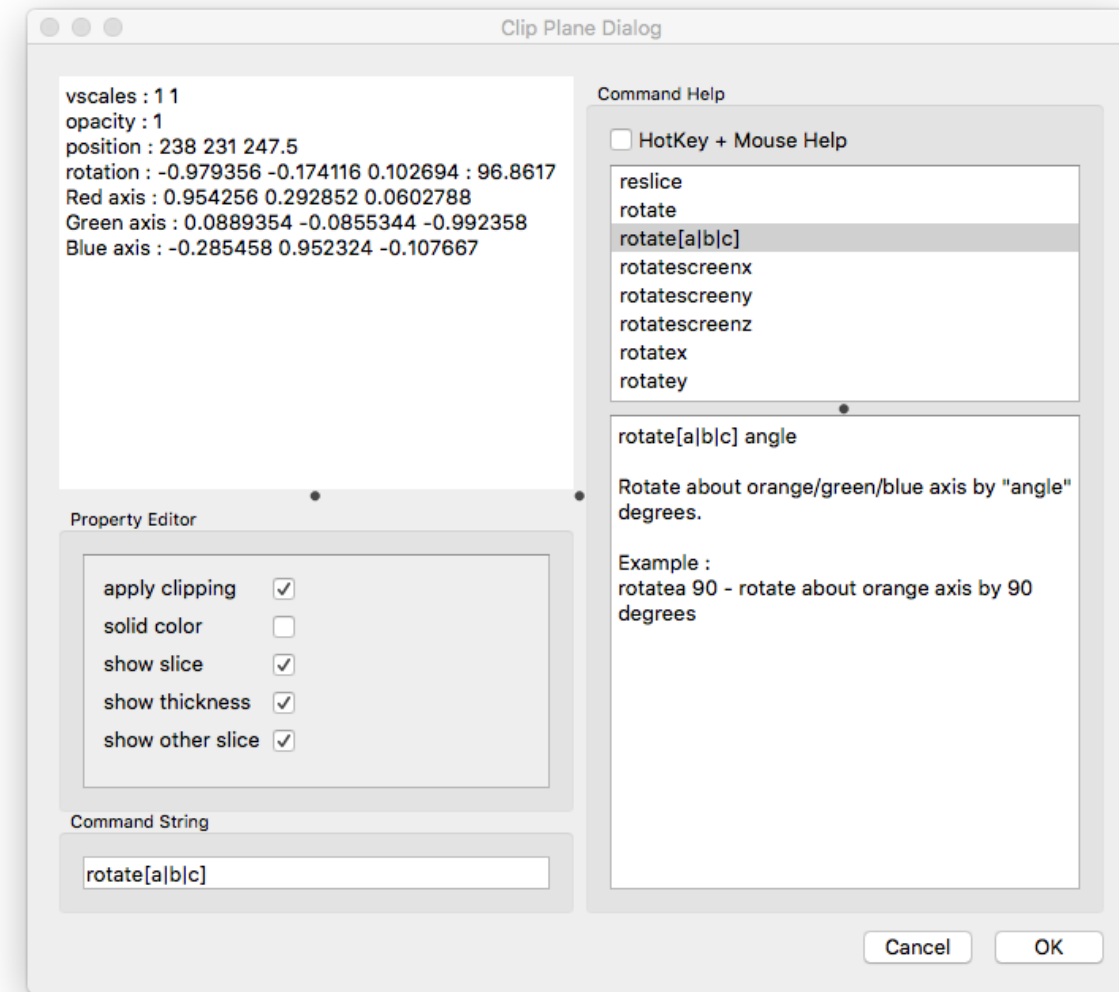
So far so good?



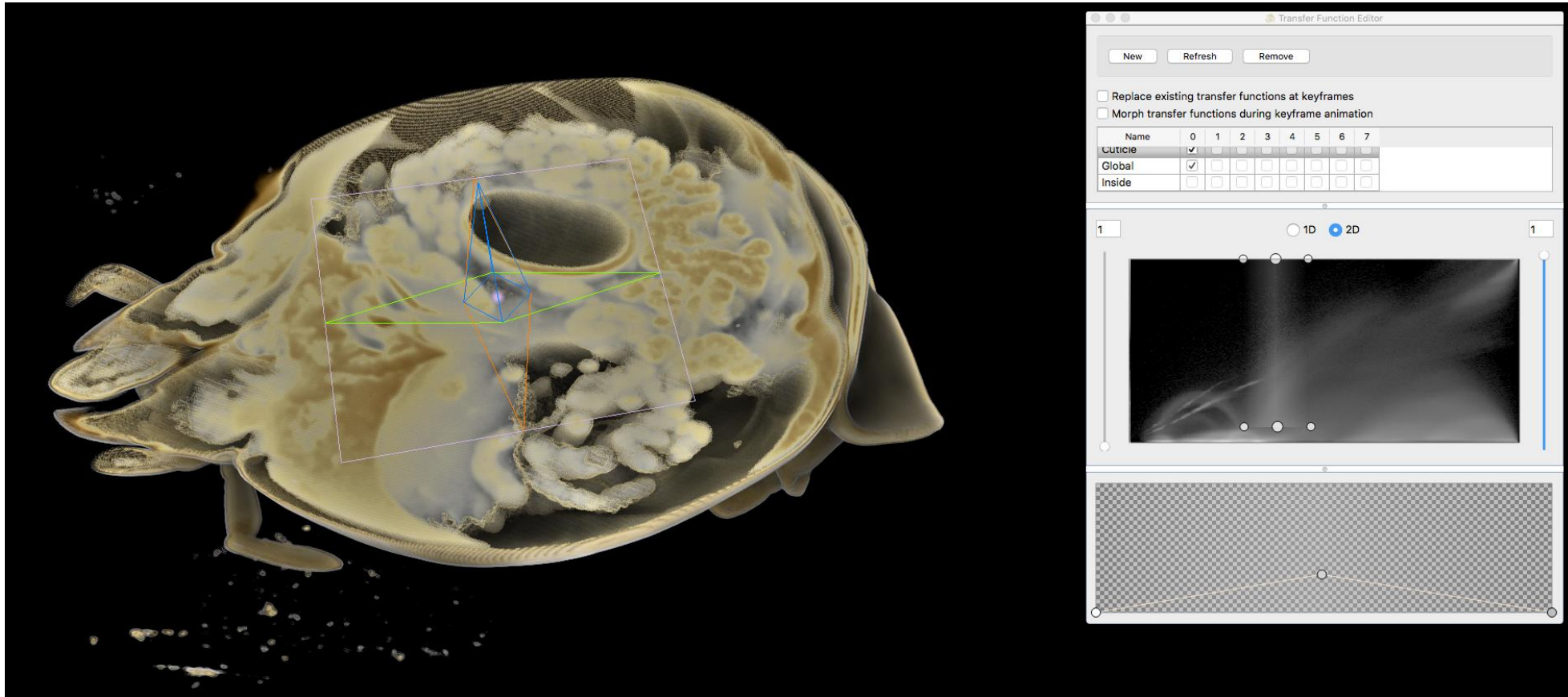
- Hover your model
- Press C
- A clipping plane appears!
 - Orange axis (a)
 - Green axis (b)
 - Blue axis (c)



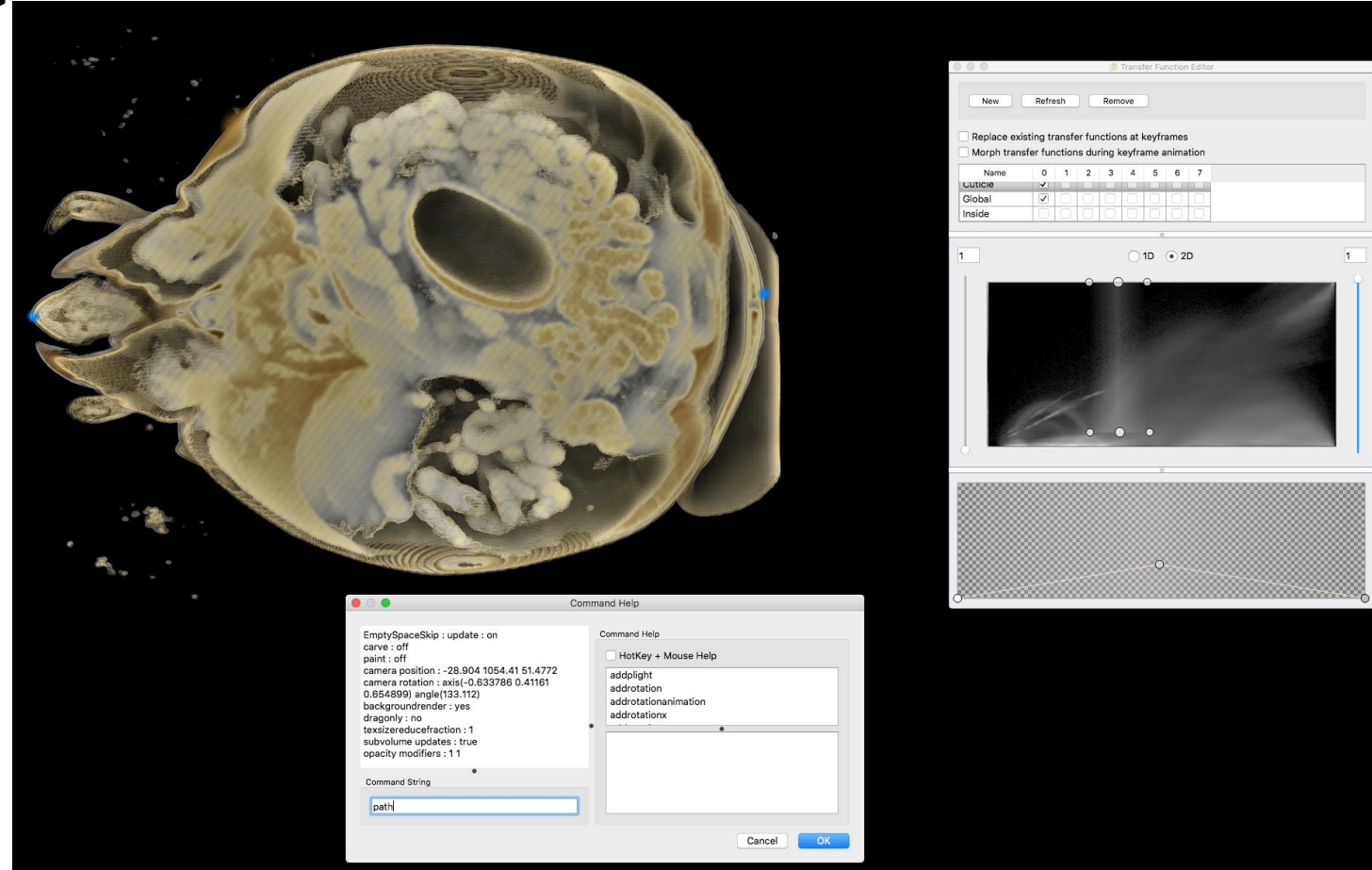
- Try to play with it (use the axes)
 - Left click: rotate
 - Right click: translate
 - Spacebar on center of the plane:
open the Clip Plane Dialog
 - Try the rotate a/b/c function



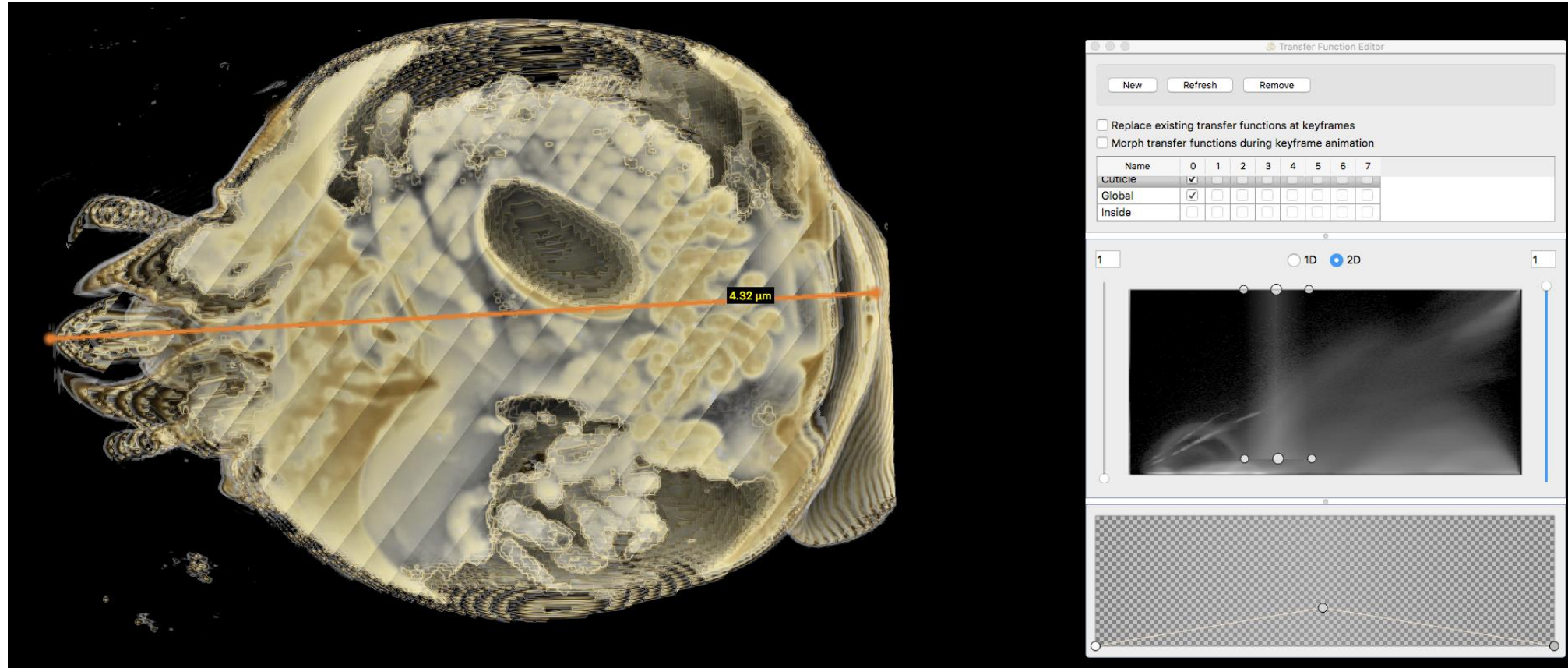
- Adjust the plane to cut the termite head in its longest dimension (from above, see picture below)



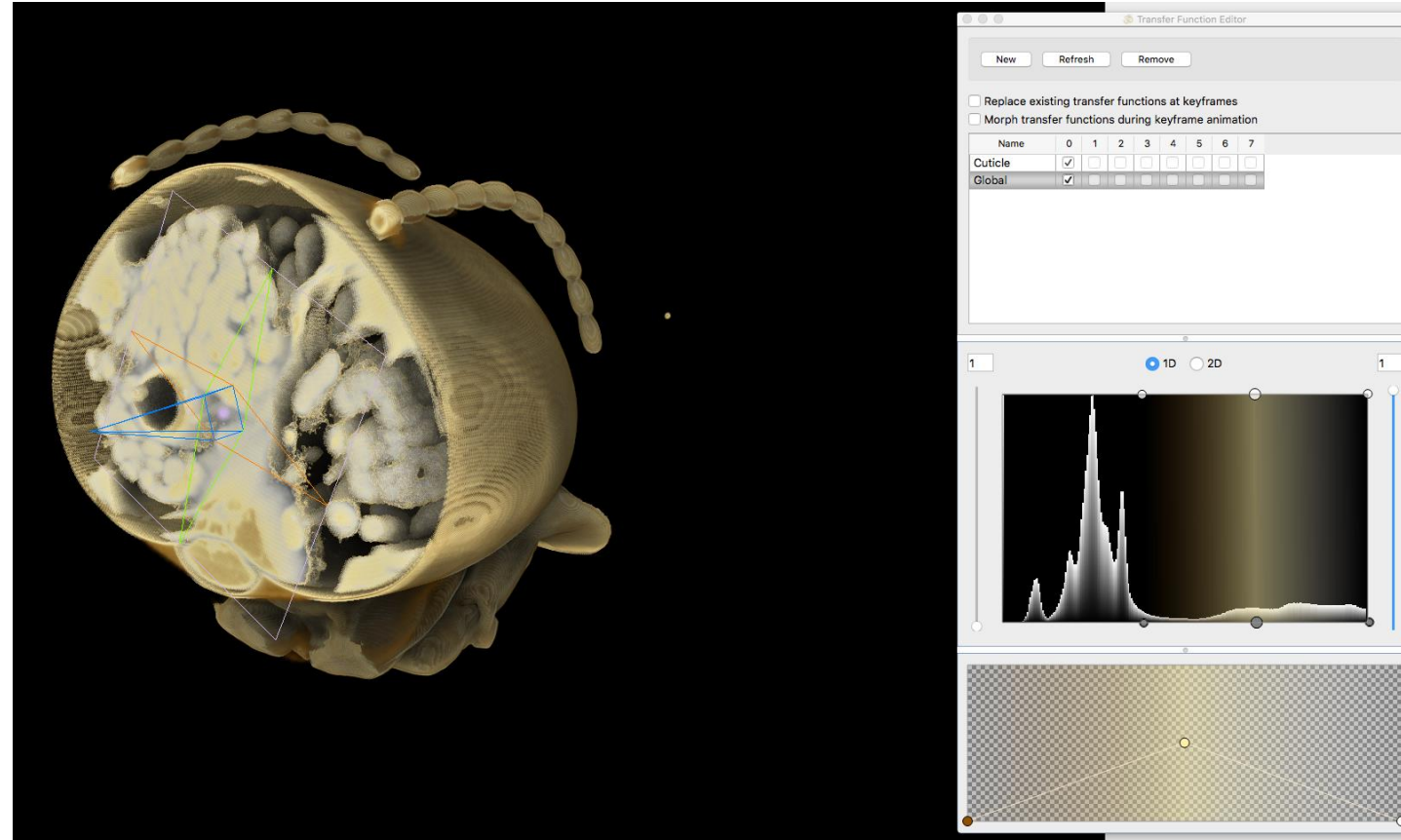
- Press V to hide the plane
- Create two points using Shift + Left Click (move them with Left Click)
- Press Spacebar
- Use the path function



- An orange path has appeared!
- Hover it with your cursor: what can you read?



- Delete the path
- Delete the clipping plane
- Press C to recreate the default clipping plane

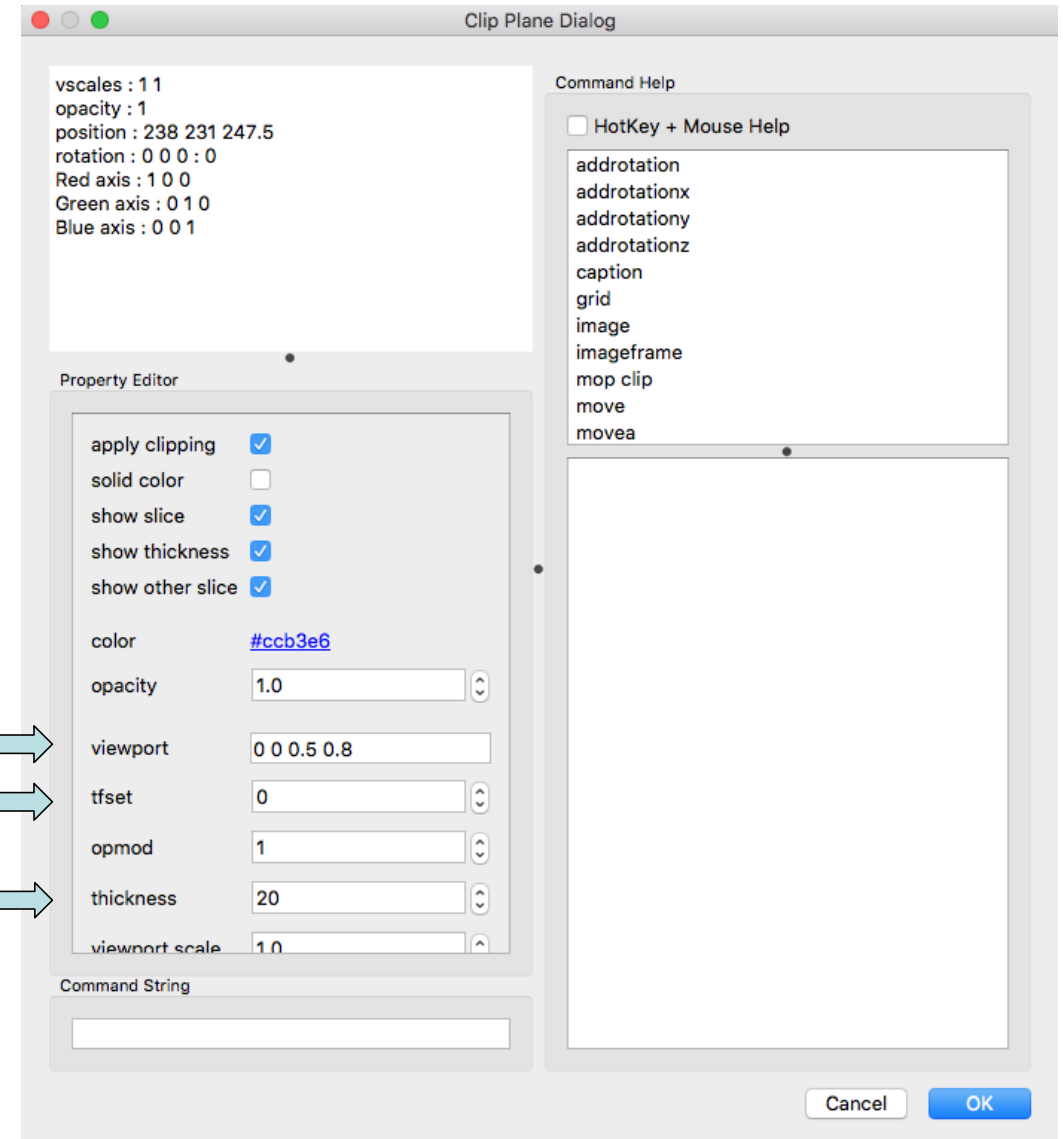


- Hover the middle of the plane
- Press Spacebar
- Create a Viewport (camera to visualize 2D stacks through a clipping plane)

4 numbers: left-bottom point coordinates(x,y), length (x,y) →

TFs with this number ticked in the TFE will be used →

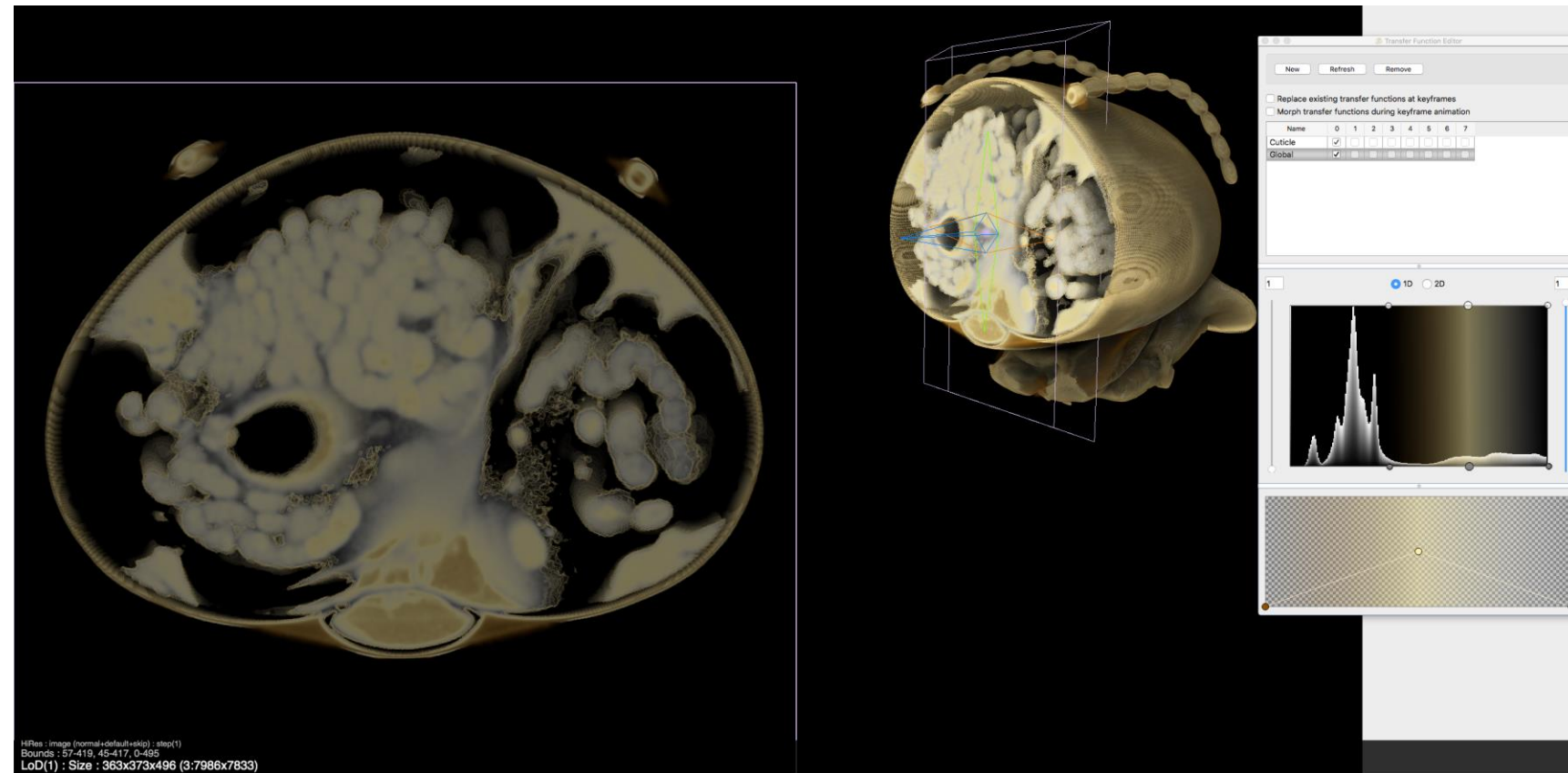
Number of slices used for the Viewport →



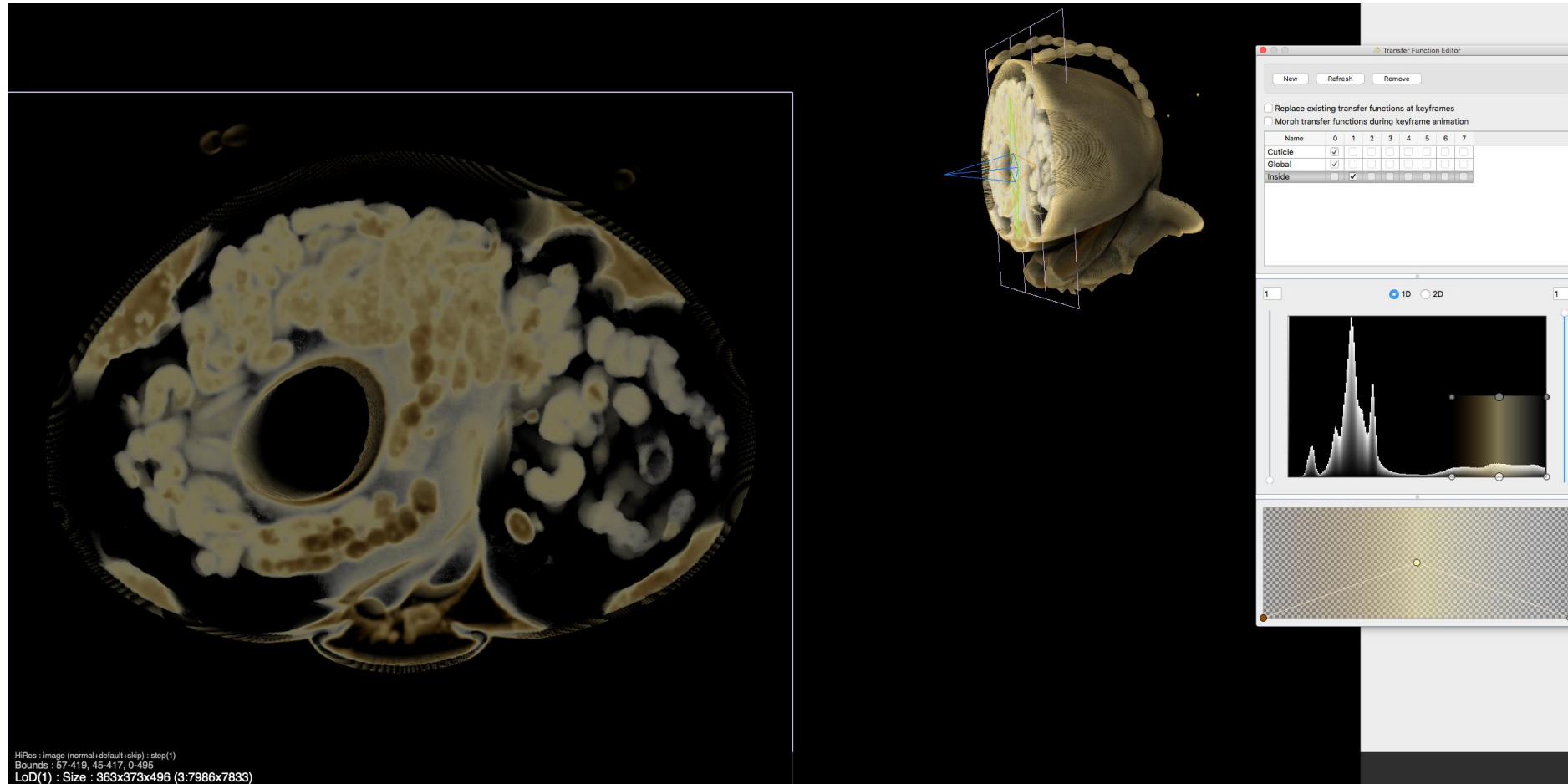
- The Viewport is now visible!
- Try to change its parameters and navigate through the sample

Exercise:

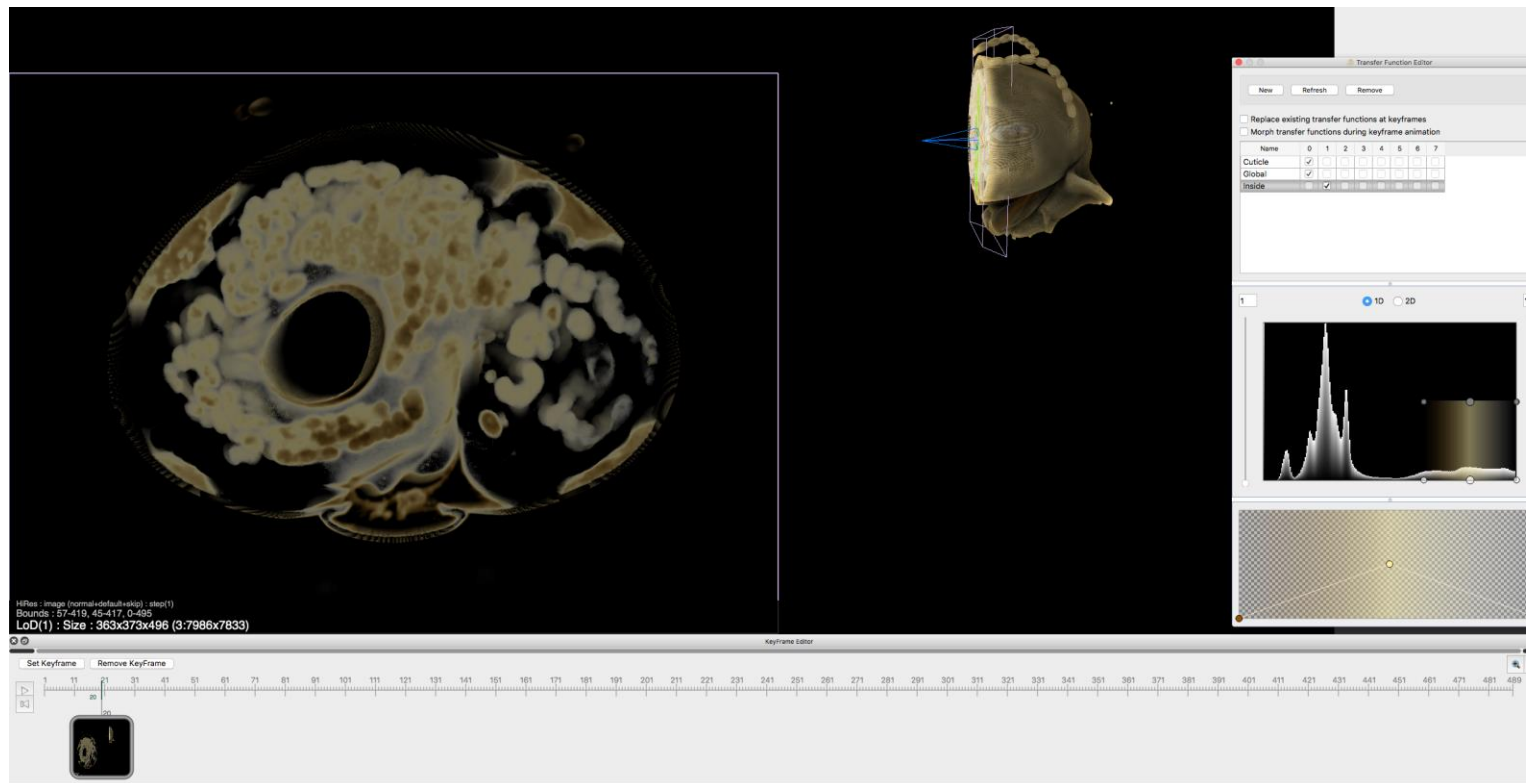
Try to create a new TF, **only visible on the Viewport**, to exclusively show the **inside** of the termite head.



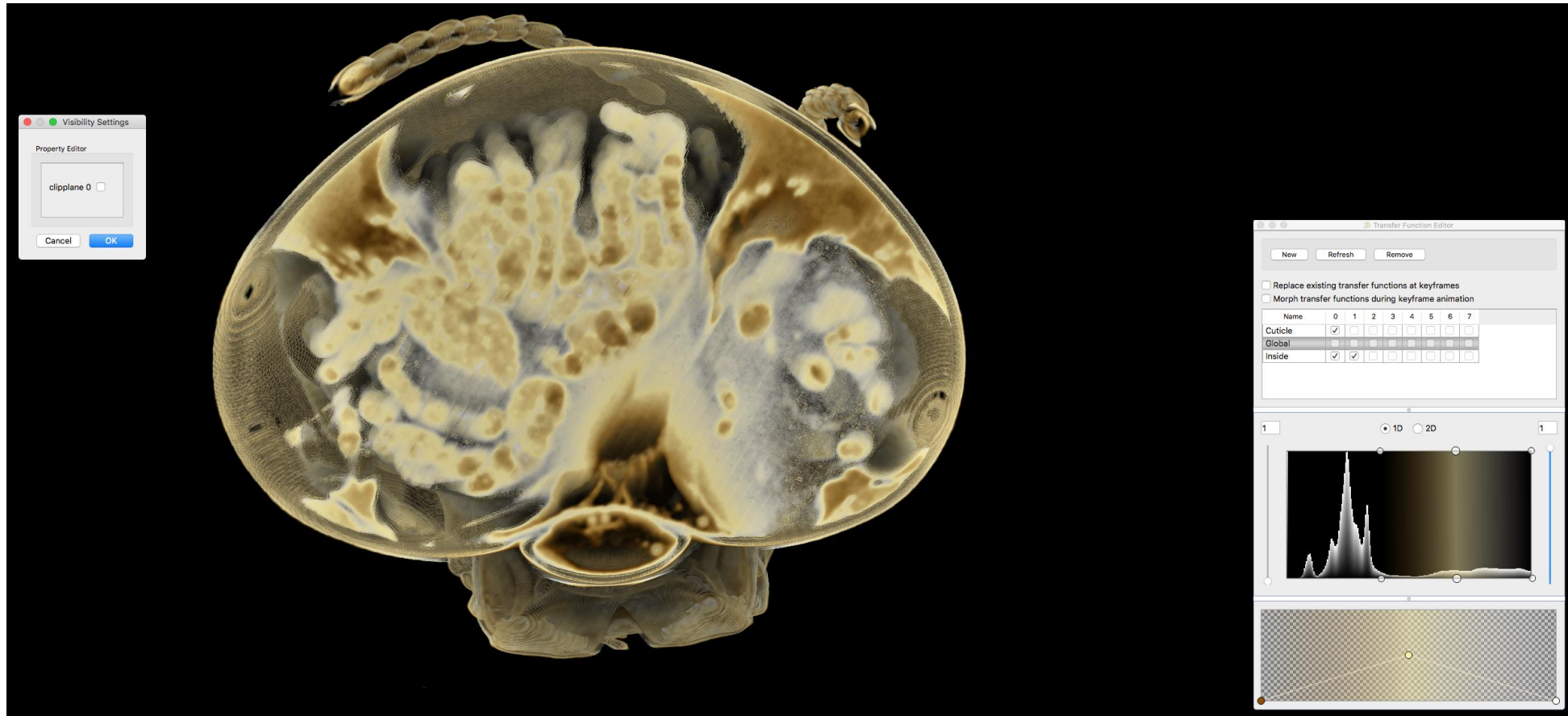
- Well done!
- Remember you can set multiple:
 - Planes
 - Viewports
 - TFs



- Open the KeyFrame Editor
- Click on a number and then on Set Keyframe: you will be able to come back to this view anytime if you click on the keyframe

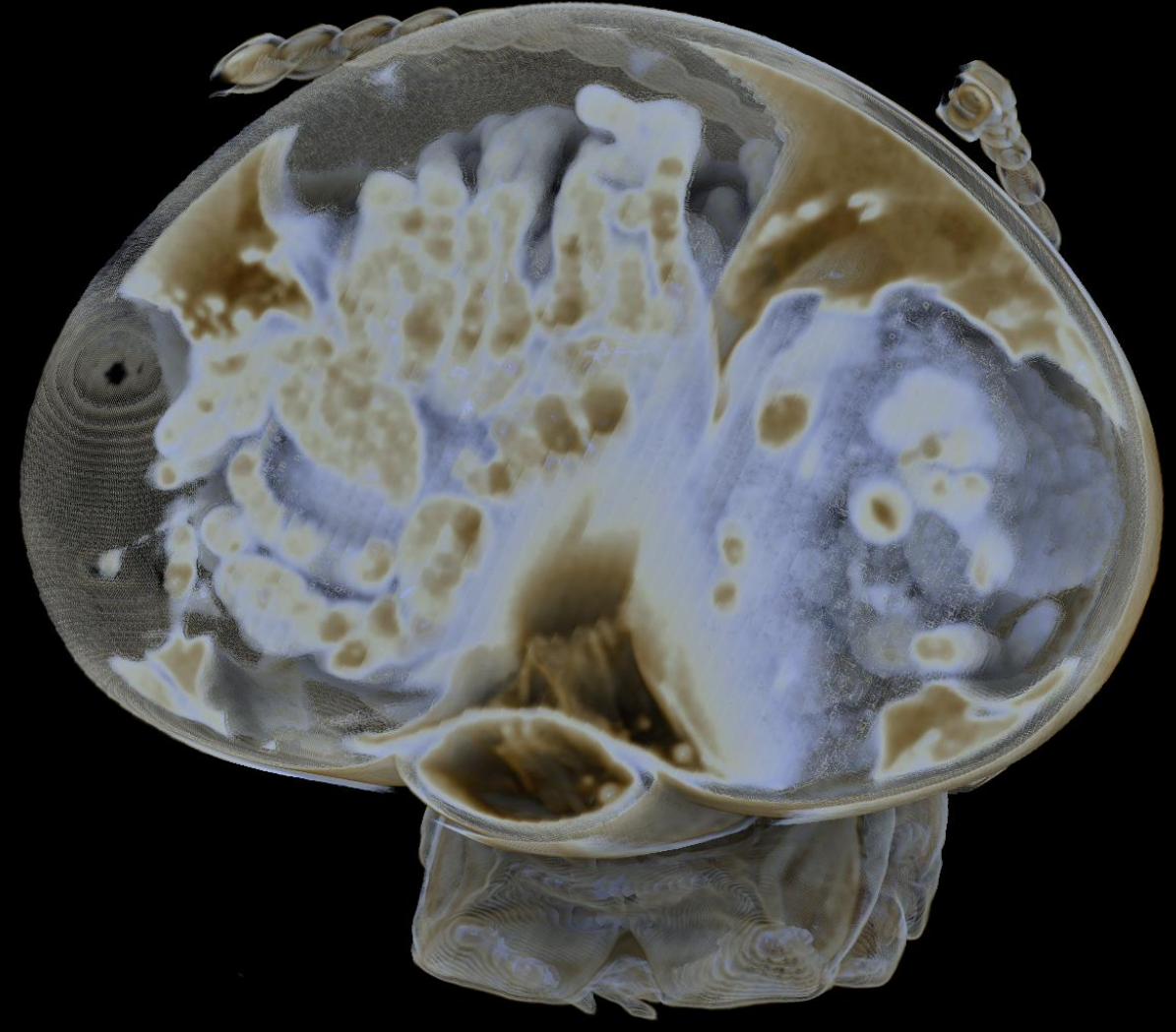
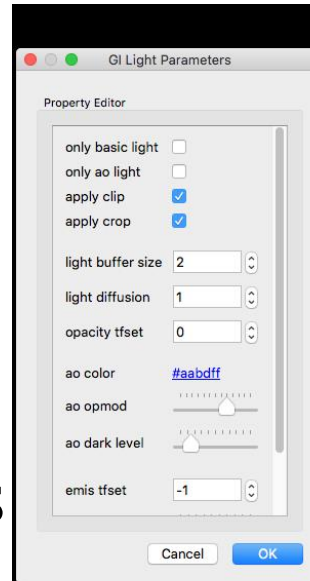


- Hide the Viewport
- Hide the clipping plane (Visibility / Press V)

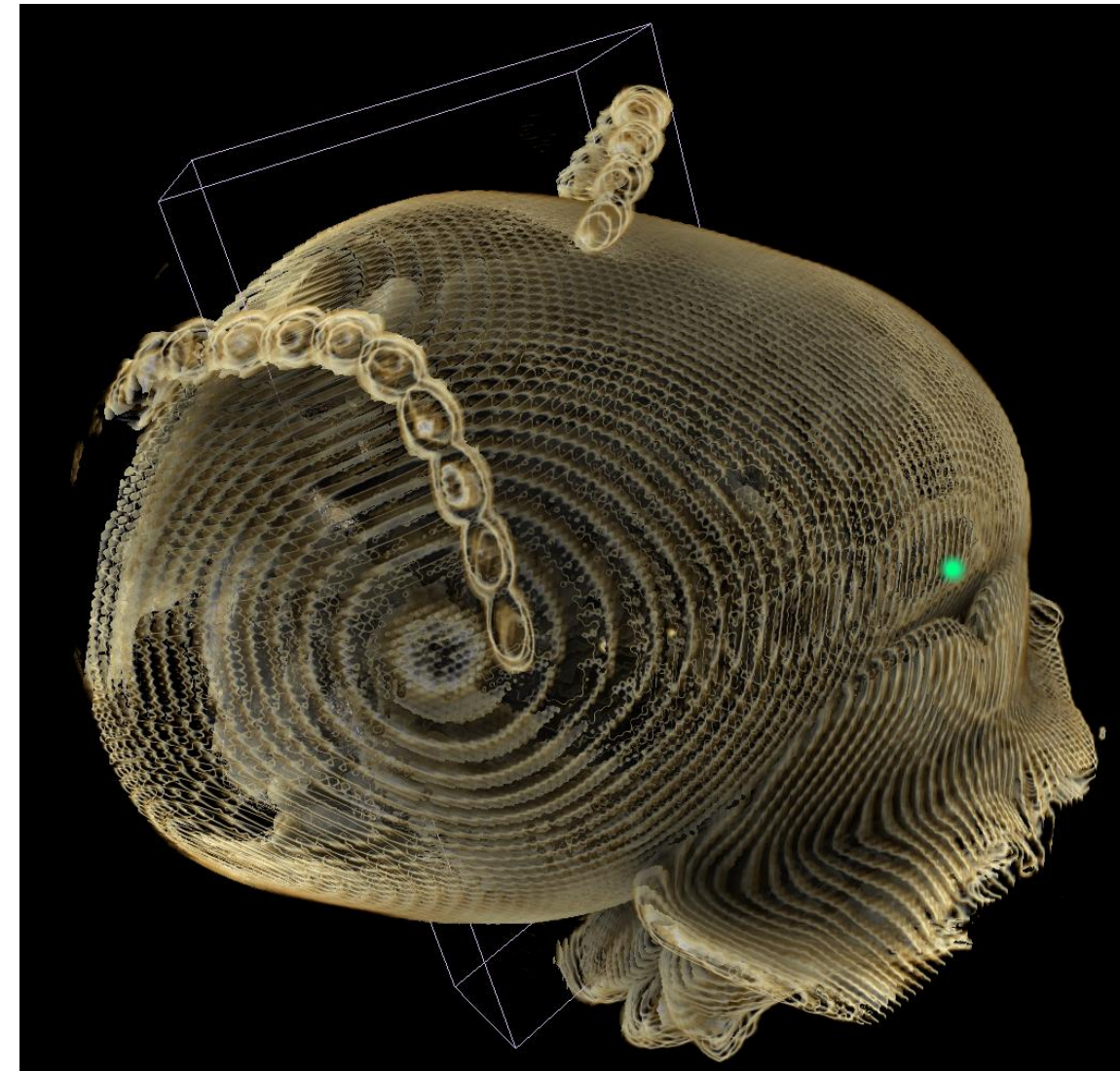
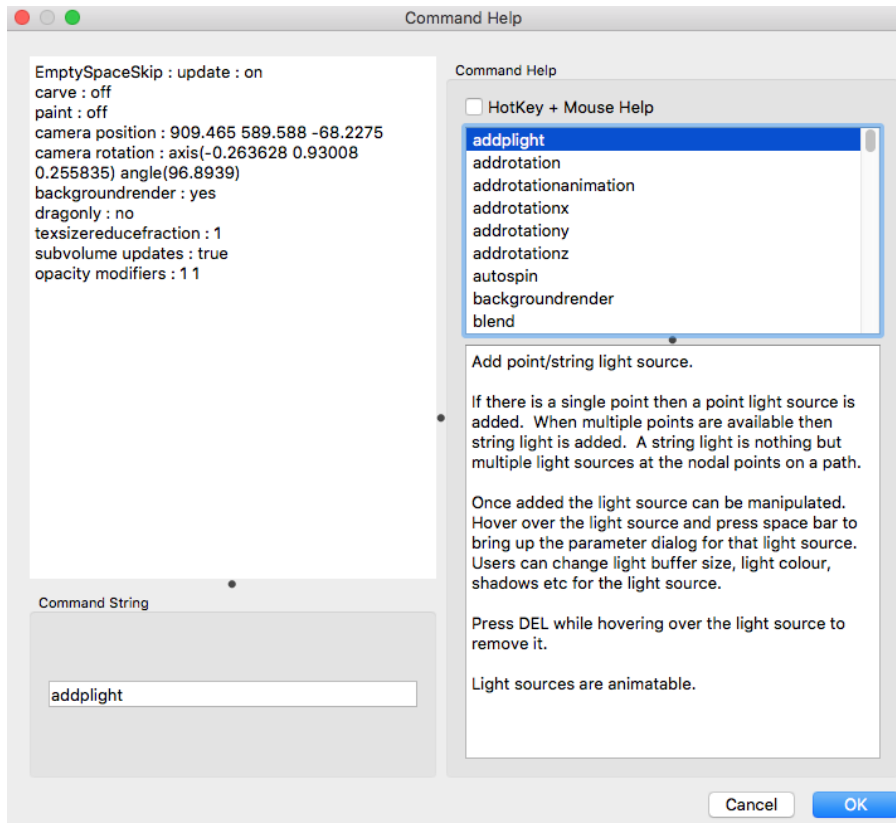


- Drishti offers a variety of possibilities of light settings:
 - GI Lighting (Global Illumination): accessed by pressing Tab/Ctrl+Tab
 - Basic light
 - AO light (Ambient Occlusion)
 - Point/String Lights: set on the 3D view
 - Shader Widget

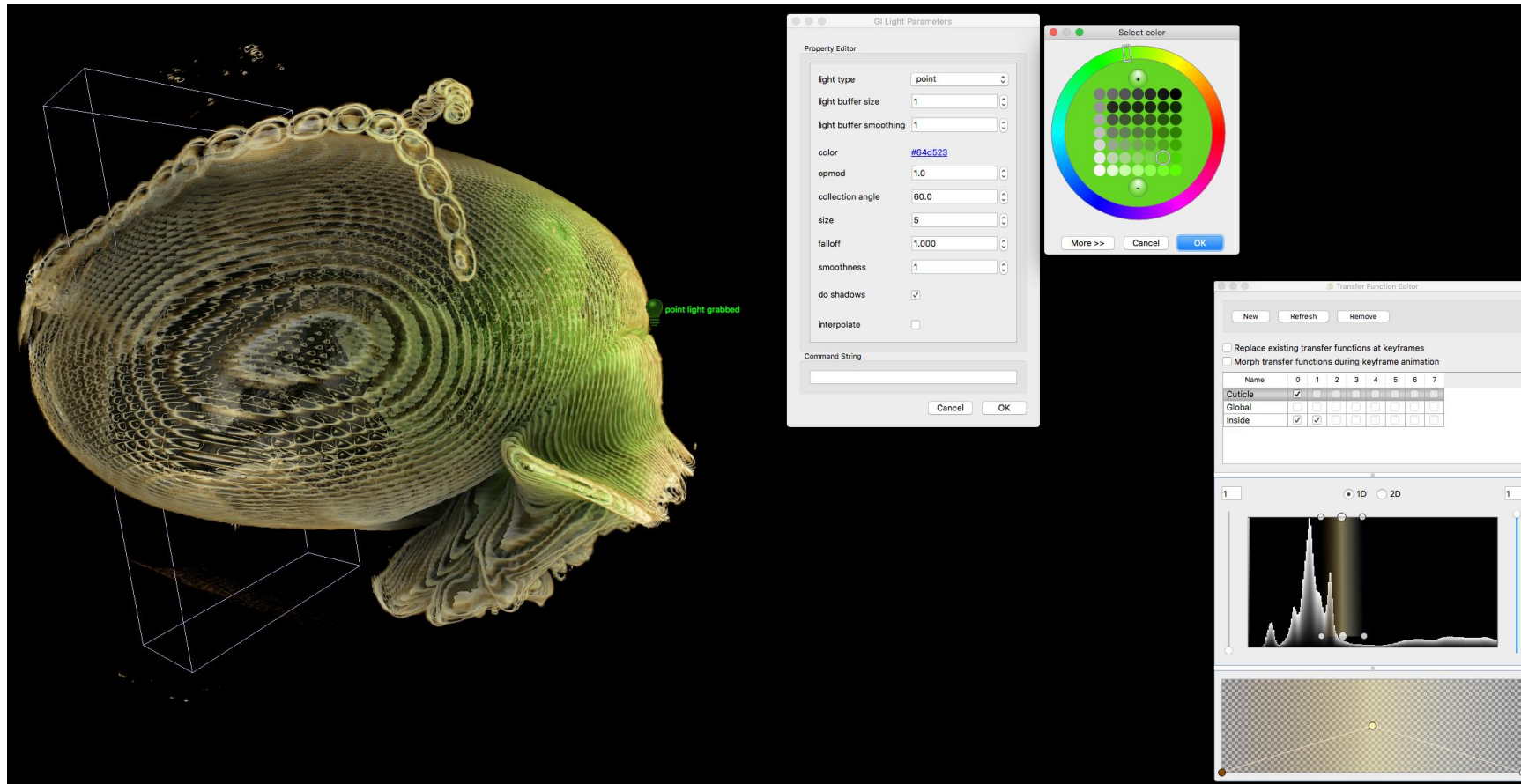
- Open the GI Light Parameters
- Play with basic/ao light settings to try various illuminations



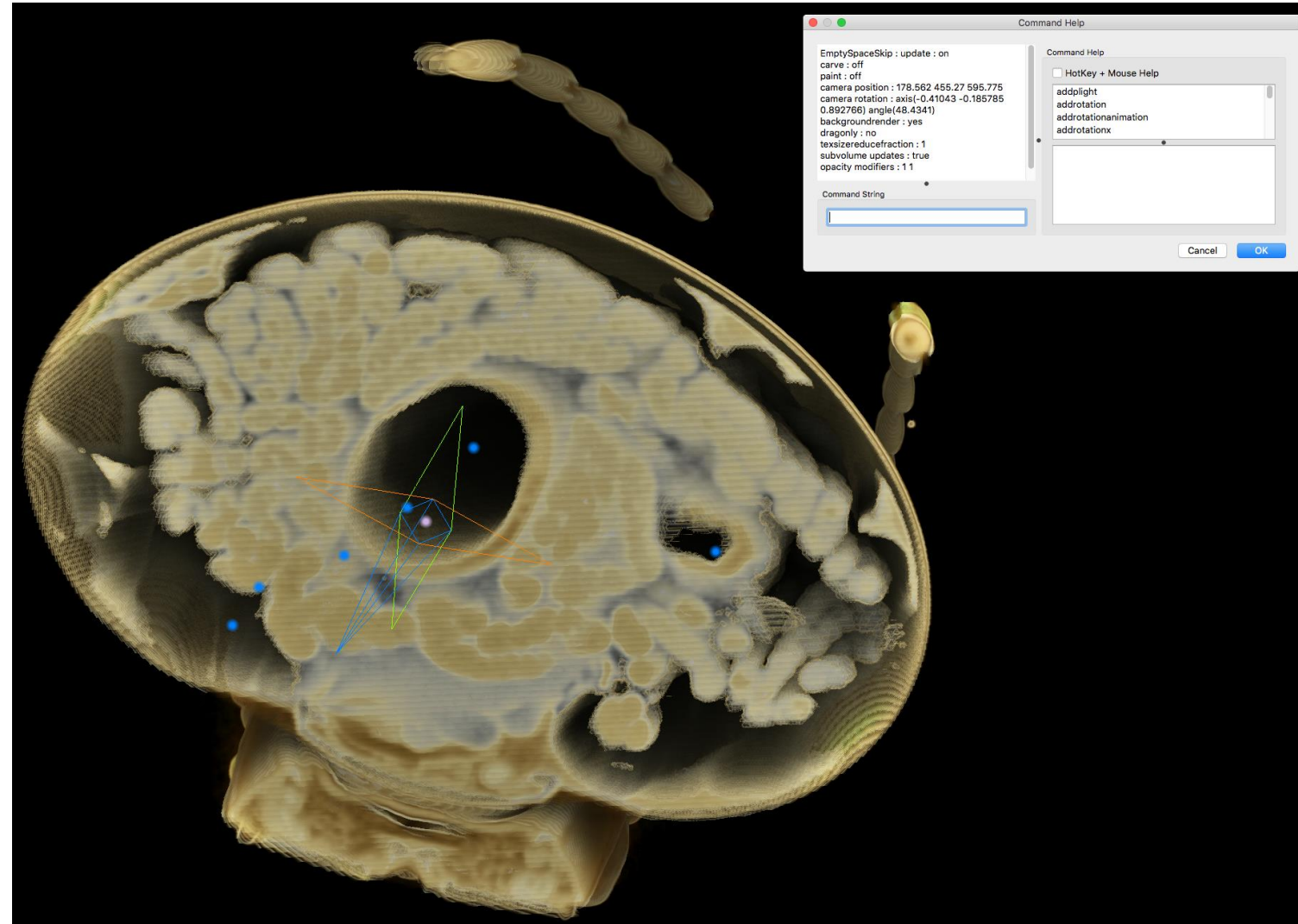
- Create a point
- Use the addplight function



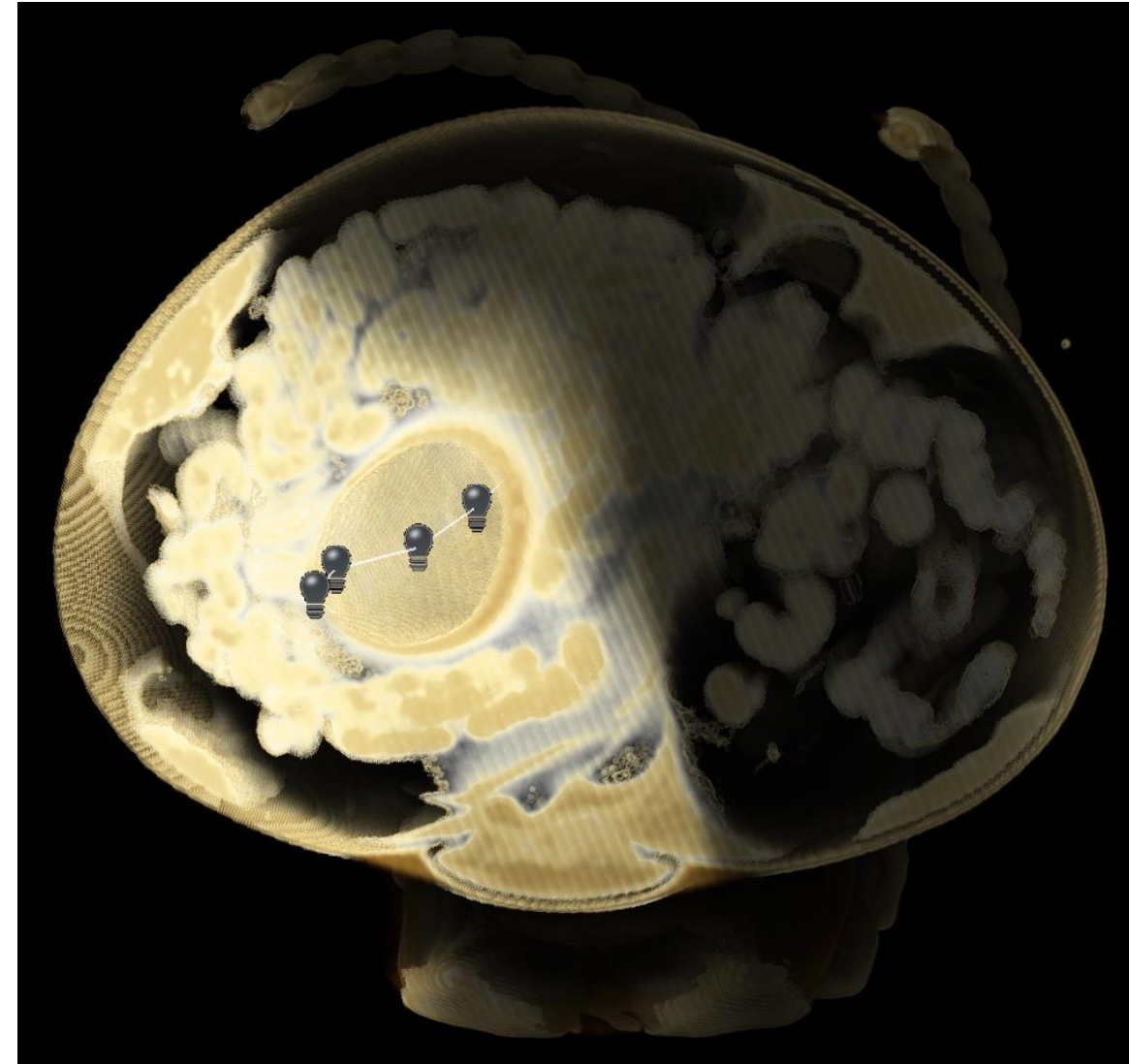
- The point is now a new light source!
- Play with its position and parameters



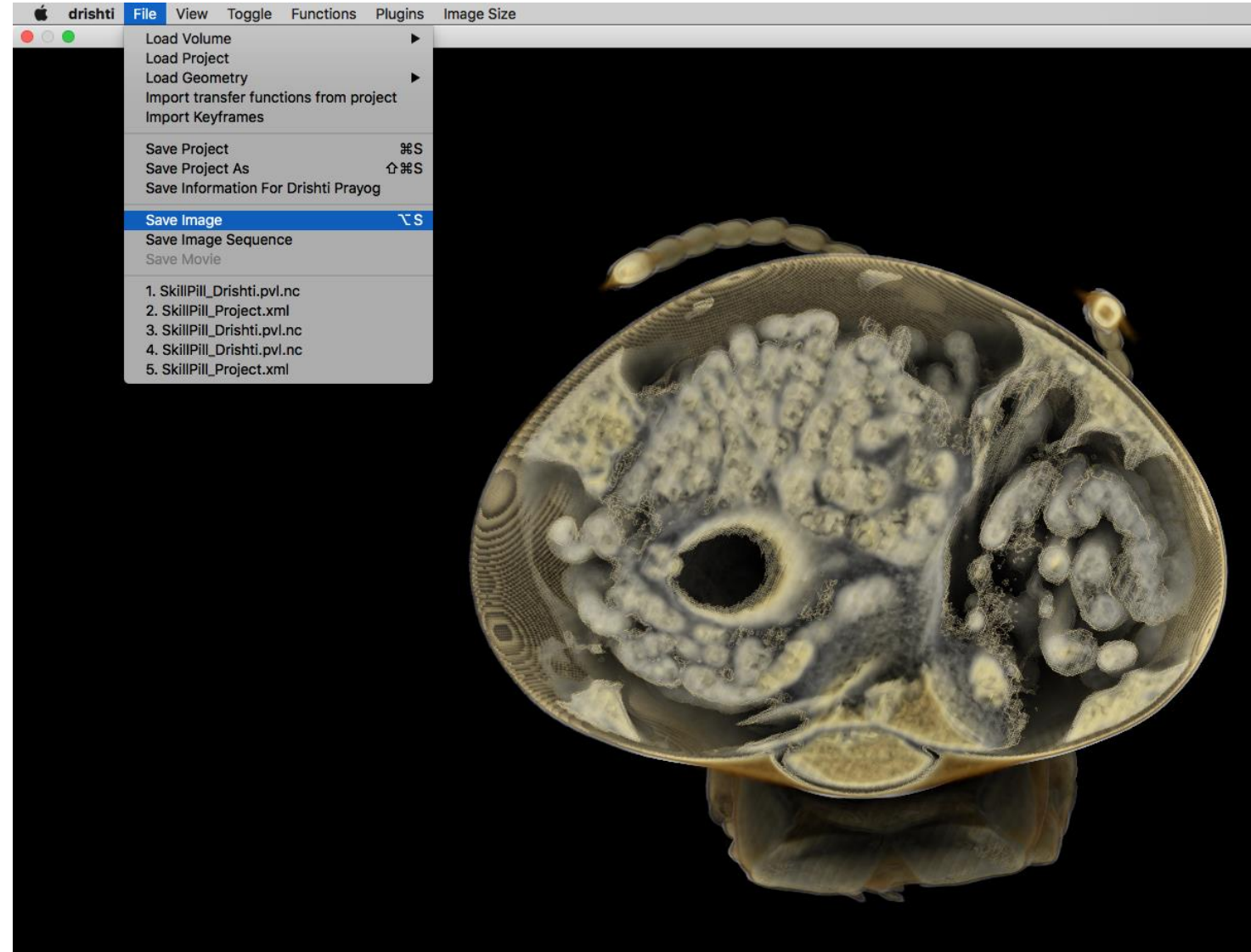
- Delete this point light
- Create a sequence of points along a structure (the order is crucial!)
- Use addplight again



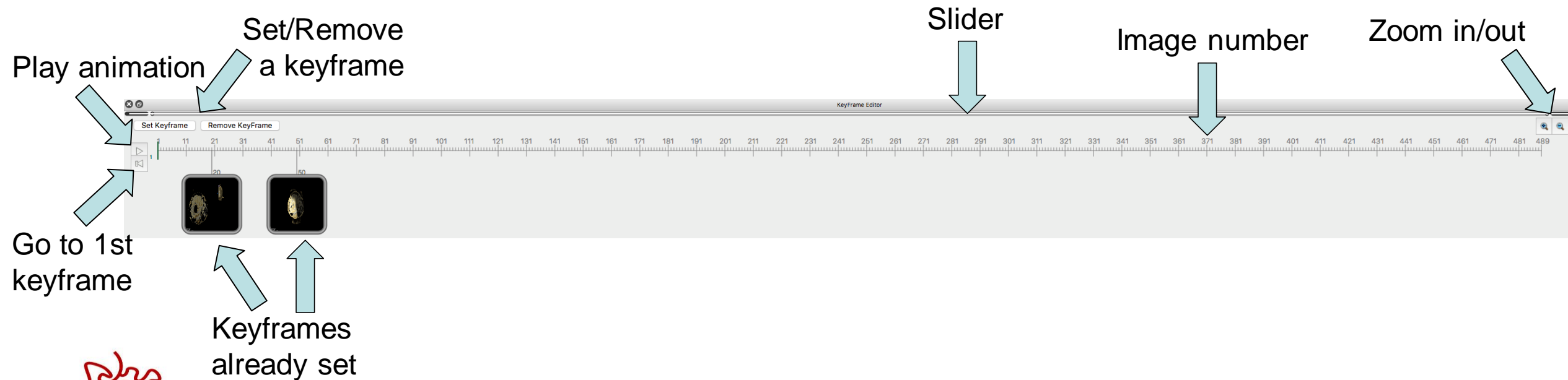
- You just created a string of light!
- Point/String lights can be used as:
 - torches to explore your sample
 - studio lights for snapshots



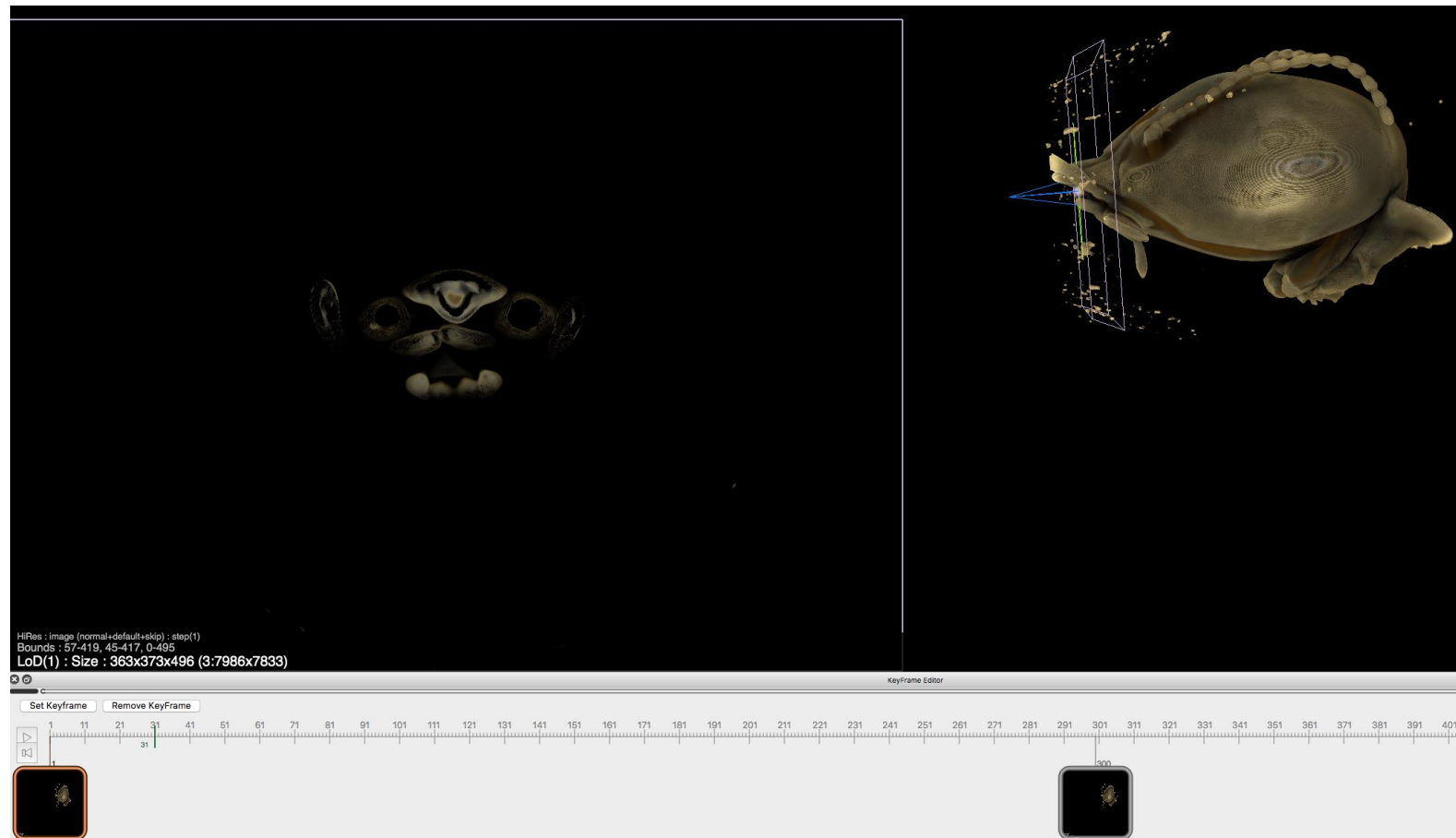
- Make snapshots with:
 - File > Save Image
 - Shortcut Alt+S
- Name the file and write the extension you want (.jpg, .png, .tiff...)



- Open again the KeyFrame Editor
- Creating an animation in Drishiti is a two-step process:
 - Keyframes are set on specific image numbers (your work)
 - The images between two keyframes are interpolated (Drishiti's work)

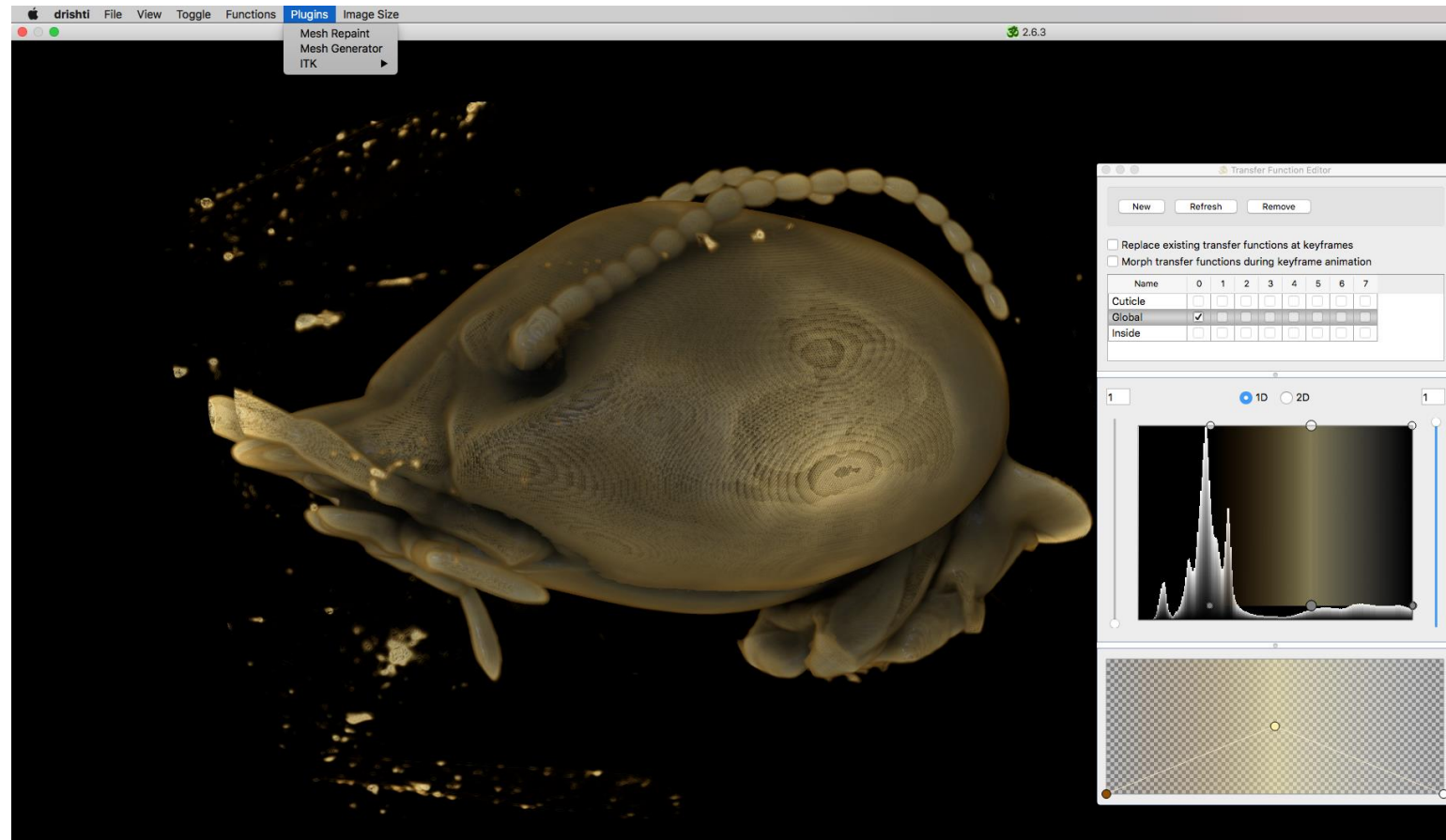


- Create an animation of a Viewport going through the termite head (from the mandible tip to the posterior end of the head)

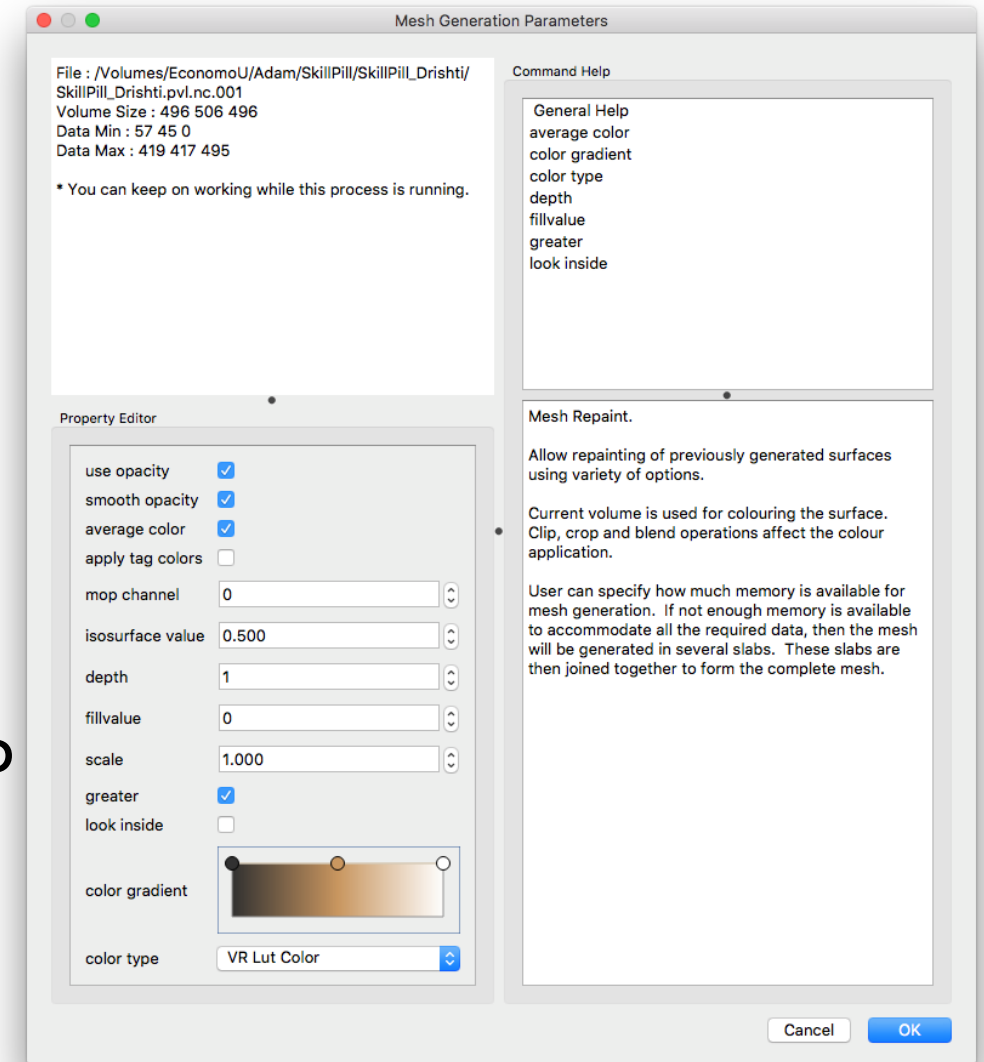


- How to save an animation?
 - Windows: File > Save Movie (add .mp4 after the name of your file)
 - Mac/Linux: feature not available (yet?)
 - File > Save Image Sequence
 - Use a video-making software to get a movie
- What can I change during an animation?
 - Everything! Lights, planes, size changes, specimen rotation, TFs...
 - Add a keyframe one frame before/after another to toggle/untoggle something quickly
 - Your only limit is your creativity!

- Get the best TF to render inside and outside the termite
- Go to Plugins > Mesh Generator to create a .ply file



- Many parameters, explained in the Command Help panel
- Defaults are good for the rest of the workflow, you can click OK
- Drishti asks how much memory it can use:
 - High value → mesh generated in one step
 - Low value → multiple submeshes are generated and then assembled



Questions?

- Ask me now
- Ask me later
 - OIST mail: adam.khalife@oist.jp
 - UPMC mail: adam.khalife@etu-upmc.fr
- Ask the software itself (Spacebar opens contextual helps)
- Ask Ajay Limaye himself: <https://github.com/nci/drishti>