

# Basics of Data Loading and 3D Visualization in 3D Slicer

Sonia Pujol, Ph.D.

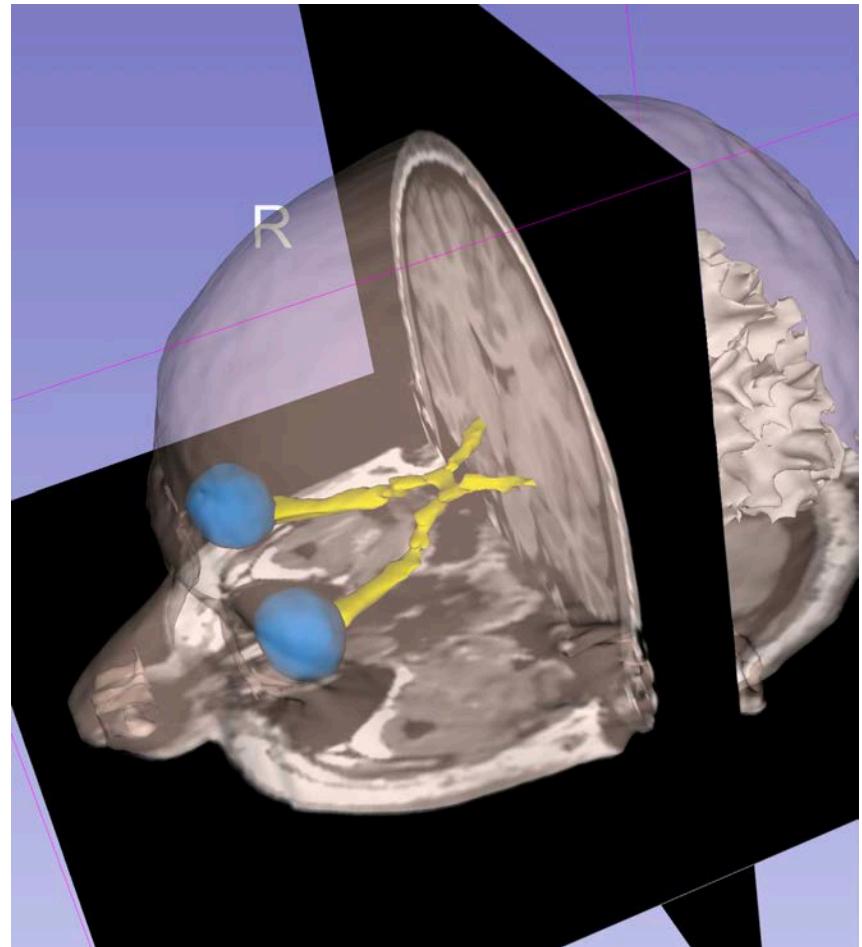
Director of 3D Slicer Training & Education

Assistant Professor of Radiology  
Brigham and Women's Hospital  
Harvard Medical School



# Overall Goal

This tutorial is an introduction to the basics of loading and viewing DICOM images and 3D models in 3D Slicer.

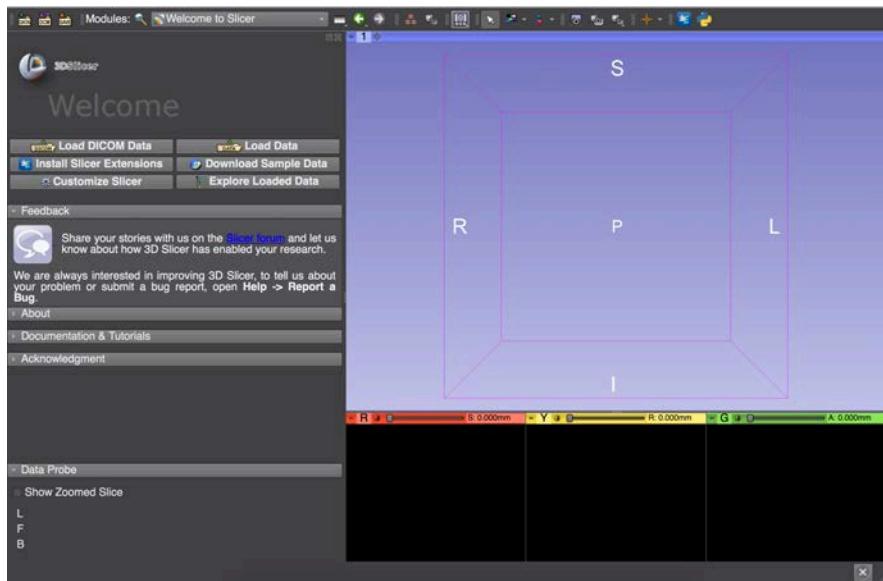


# Learning Objectives

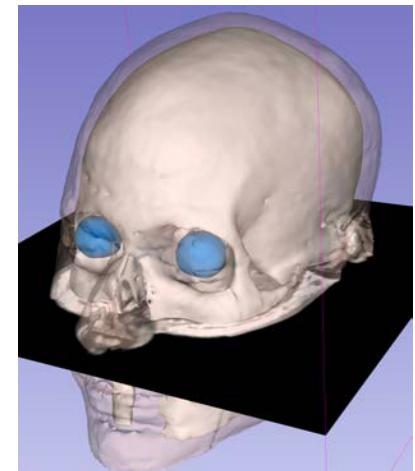
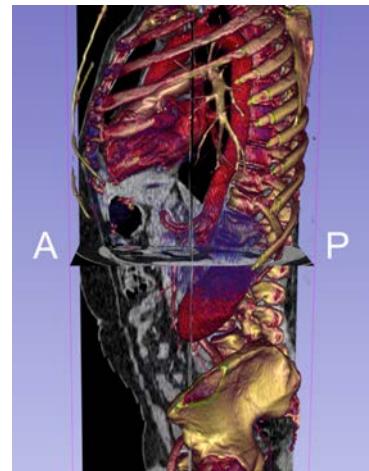
Following this tutorial, you will be able

- to load and visualize DICOM images in Slicer
- to perform volume rendering of CT datas
- to load and visualize 3D models reconstructed from MRI data

# Tutorial materials



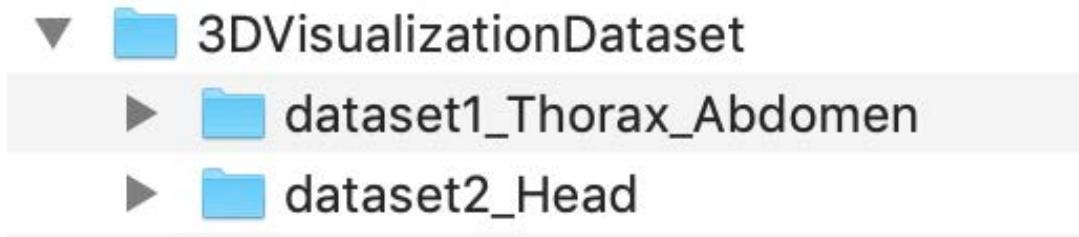
3D Slicer version 4.11.0



3DVisualizationDataset.zip

# Tutorial dataset

- The file 3DVisualizationDataset.zip contains two directories:
  - dataset1\_Thorax\_Abdomen
  - dataset2\_Head
- Unzip the file 3DVisualizationDataset.zip on your computer to access the datasets



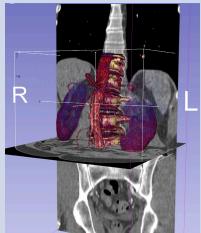
# Disclaimer

- 3D Slicer is a free open source software application distributed under a BSD style license.
- The software is not FDA approved or CE-Marked, and is for research use only.

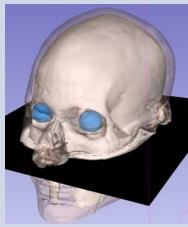
# Tutorial Outline



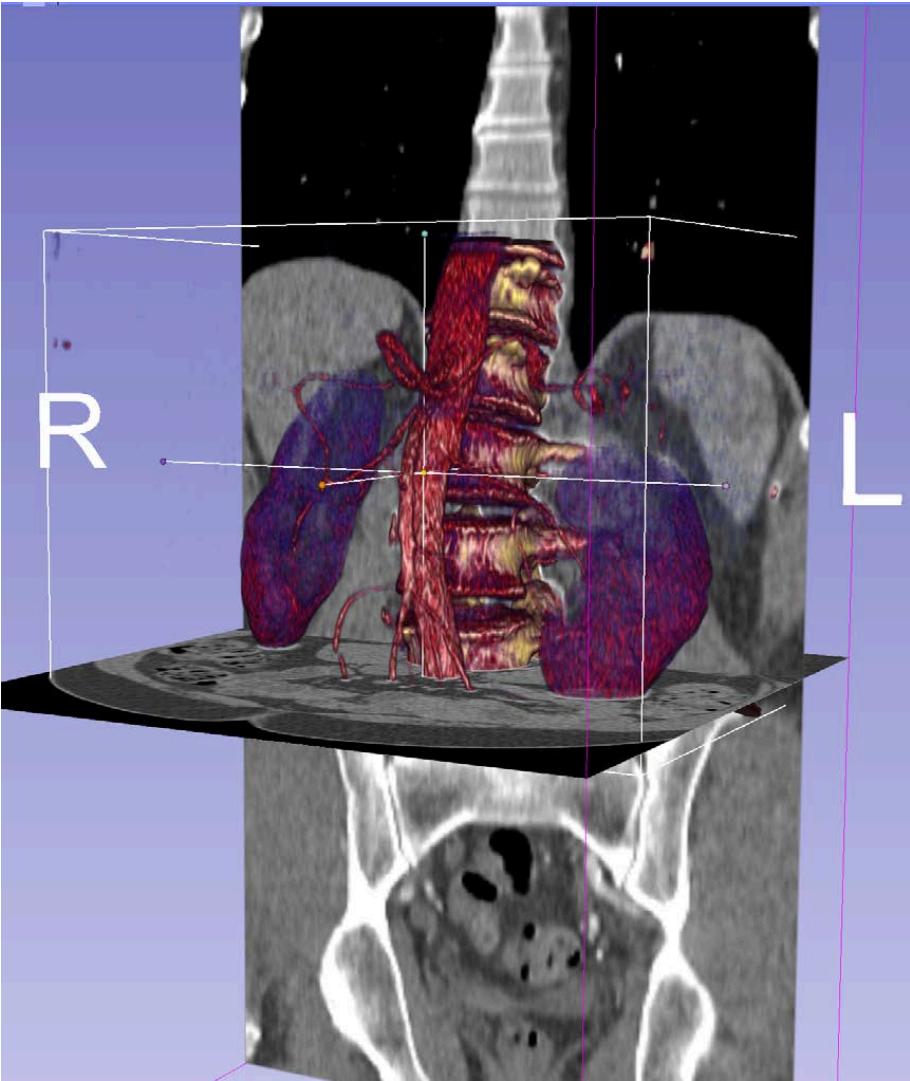
Part 1: Loading and Viewing DICOM data



Part 2: Volume Rendering



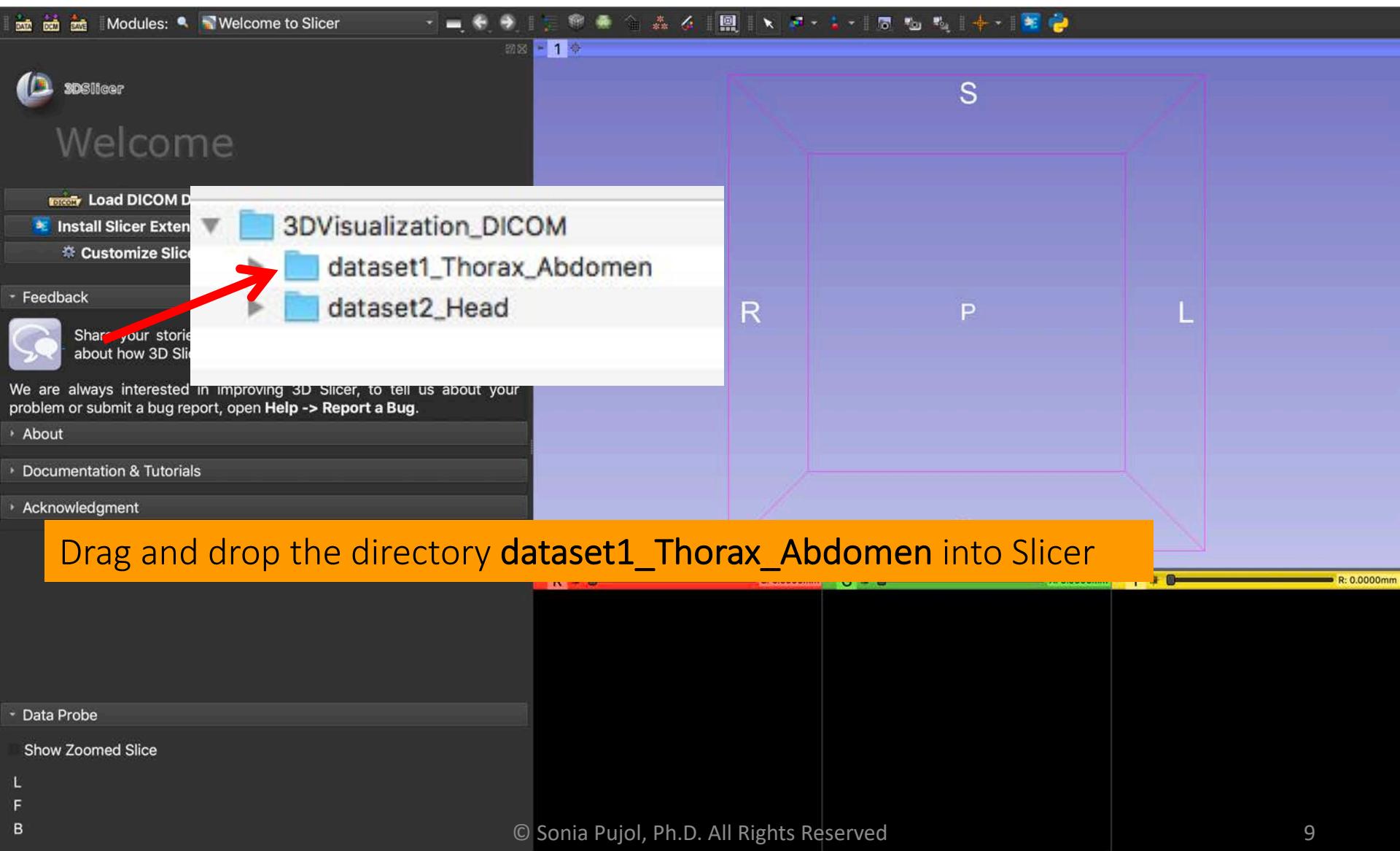
Part 3: Loading and Viewing 3D models



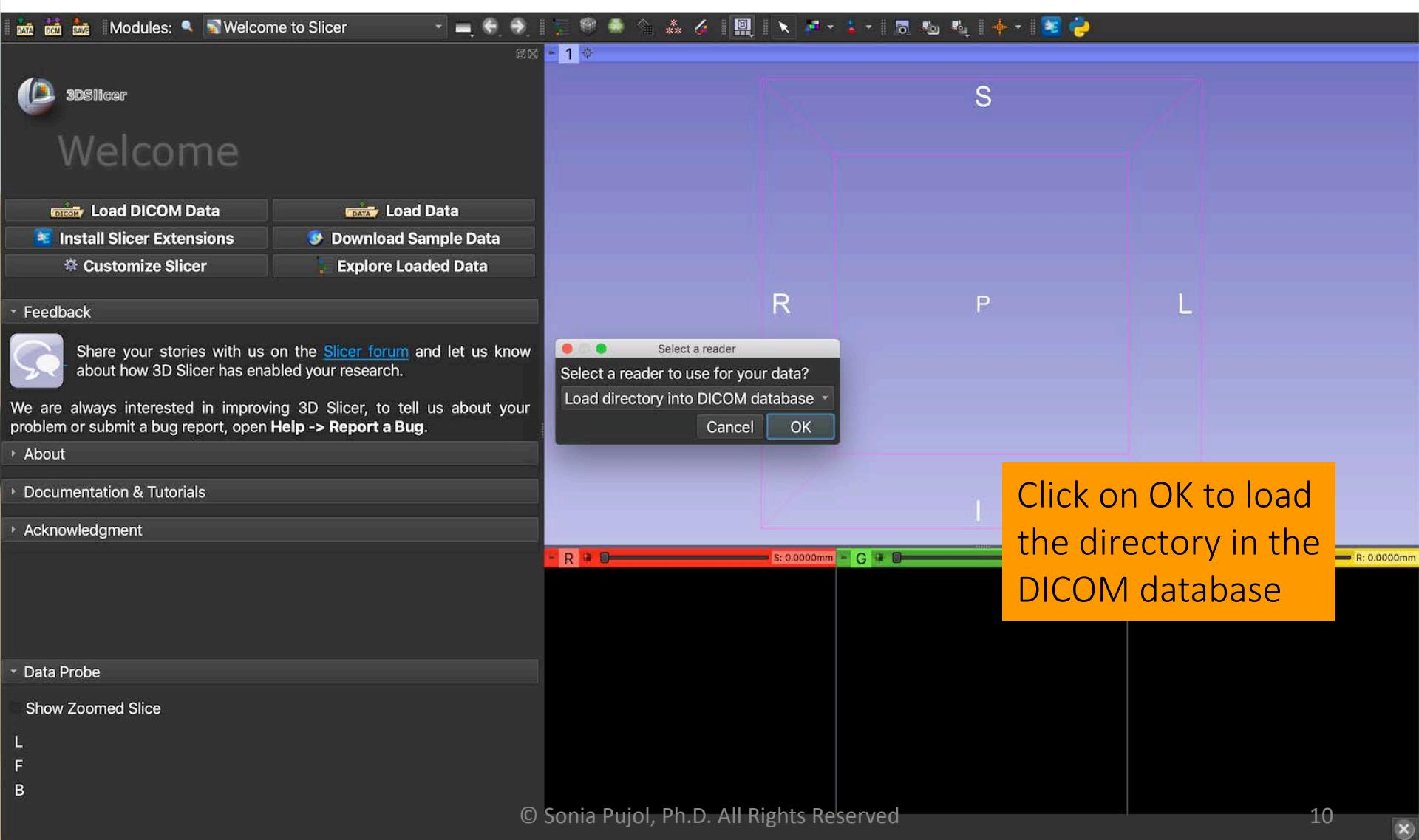
# Part 1

## DICOM Data Loading

# Loading a DICOM volume



# Loading a DICOM volume



# Loading a DICOM volume

The screenshot shows the 3DSlicer application window. At the top, there's a toolbar with various icons. Below it, the title bar says "Modules: DICOM". On the left, there's a vertical sidebar with links like "Help & Acknowledgement", "DICOM networking", and "DICOM database settings". The main area is titled "DICOM database". It has three search fields: "Patients:", "Studies:", and "Series:". Below these is a table with columns: Patient name, Patient ID, Birth date, Sex, Studies, Last study, and Date added. One row is highlighted for "patient1". Another table below shows Study details: Study date, Study ID, Study description, Series, and Date added. A third table at the bottom shows Series details: Series #, Series description, Modality, Size, Count, and Date added. The "CT\_Thorax\_Abdomen" series is listed. At the bottom right, there's a "Load" button and a page number "11 Advanced".

Slicer displays the user interface of the DICOM module

The patient1 study contains a CT Thorax Abdomen dataset

Patient name	Patient ID	Birth date	Sex	Studies	Last study	Date added
patient1	patient1_ID			1	Wed Jun 1 2005	2020...953

Study date	Study ID	Study description	Series	Date added
20050601	6936864	CT Thorax Abdomen	1	2020...953

Series #	Series description	Modality	Size	Count	Date added
6	CT_Thorax_Abdomen	CT	512x512	291	2020...953

DICOM networking

DICOM database settings

Load

11 Advanced

# Loading a DICOM volume

The screenshot shows the DS Slicer application interface. At the top, there is a toolbar with various icons. Below the toolbar, the title bar displays "Modules: DICOM". The main window is divided into several panels:

- DICOM database panel:** Shows a table of patients. A red arrow points to the row for "patient1".

Patient name	Patient ID	Birth date	Sex	Studies	Last study	Date added
patient1	patient1_ID			1	Wed Jun 1 2005	2020...953
- Loaded data panel:** Shows a table of studies.

Study ID	Study description	Series	Date added
6936864	CT Thorax Abdomen	1	2020...953
- Series panel:** Shows a table of series.

Series #	Series description	Modality	Size	Count	Date added
6	CT_Thorax_Abdomen	CT	512x512	291	2020...953
- Bottom right corner:** A red circle highlights the "Load" button in the bottom right corner of the Loaded data panel.

**Select patient1 and click on Load to load the dataset in Slicer**

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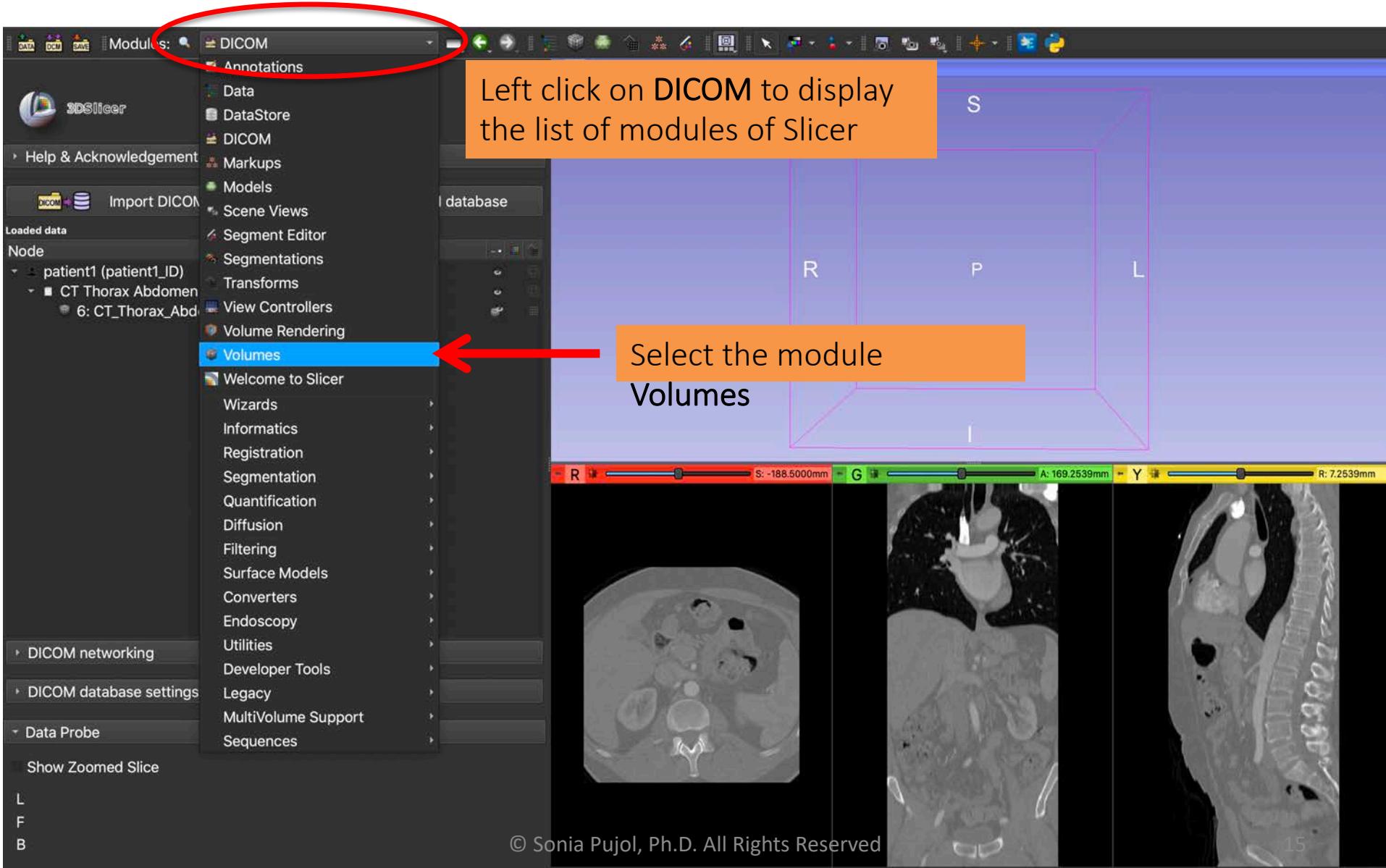
# Loading a DICOM volume



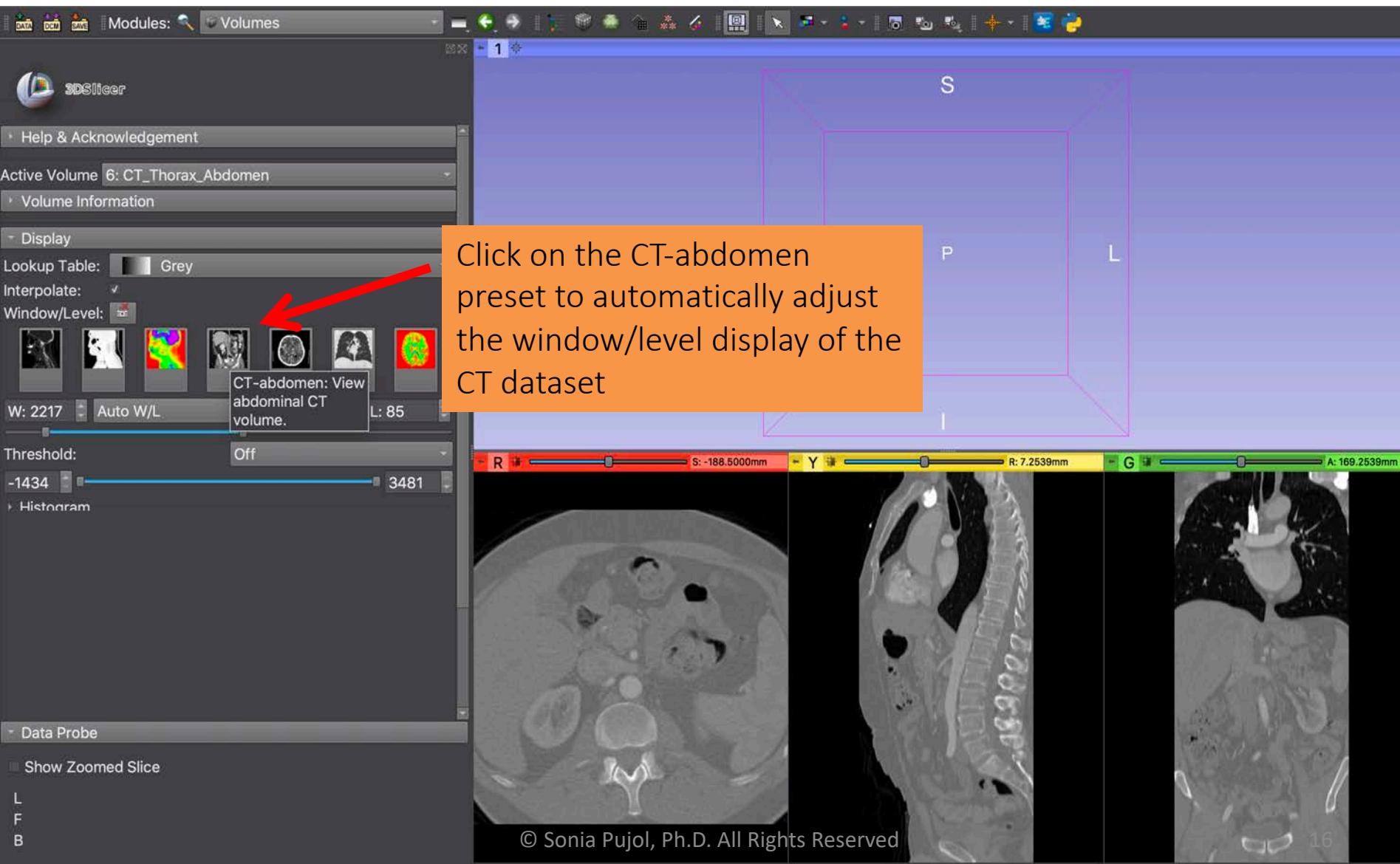
# Loading a DICOM volume



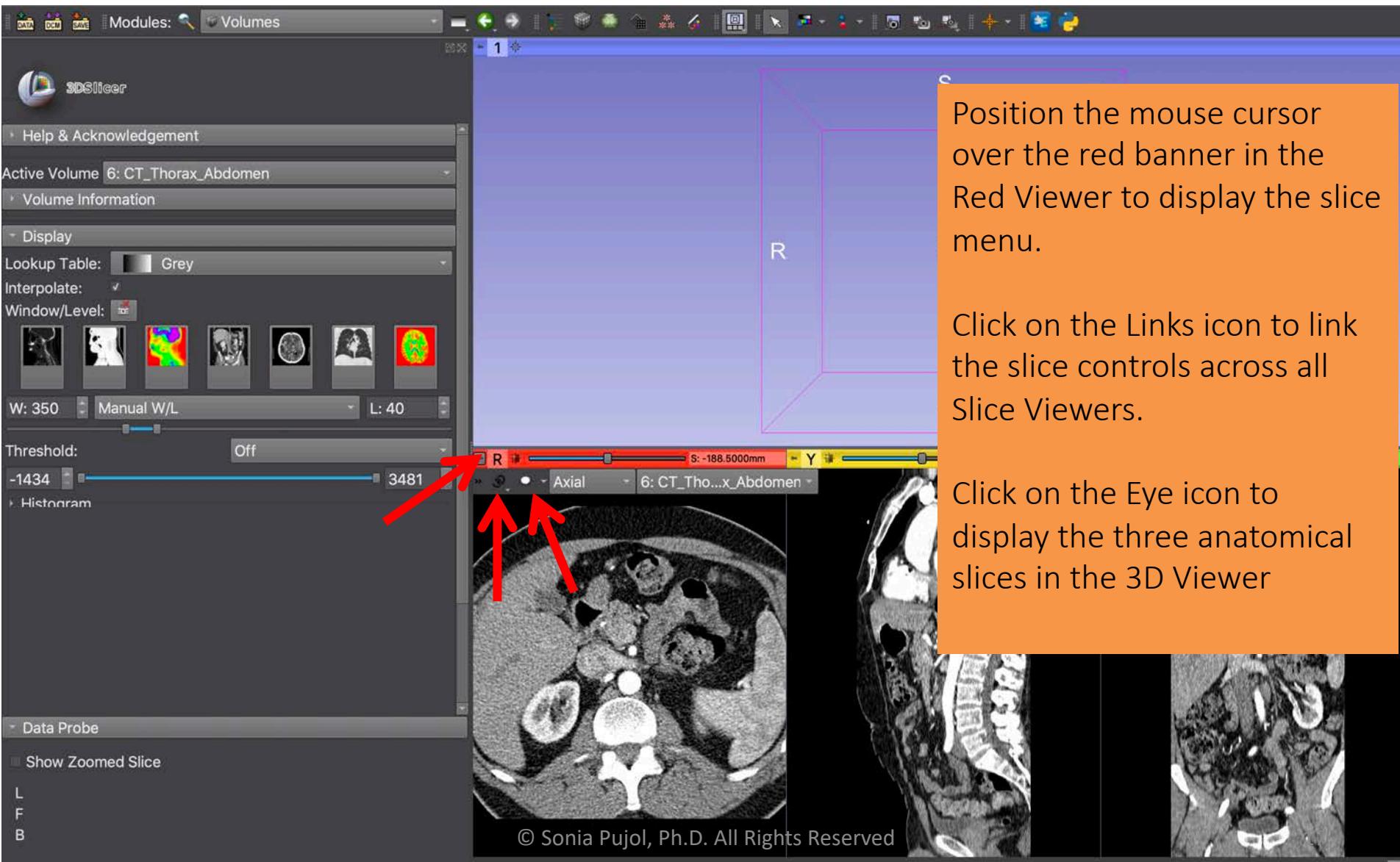
# Loading a DICOM volume



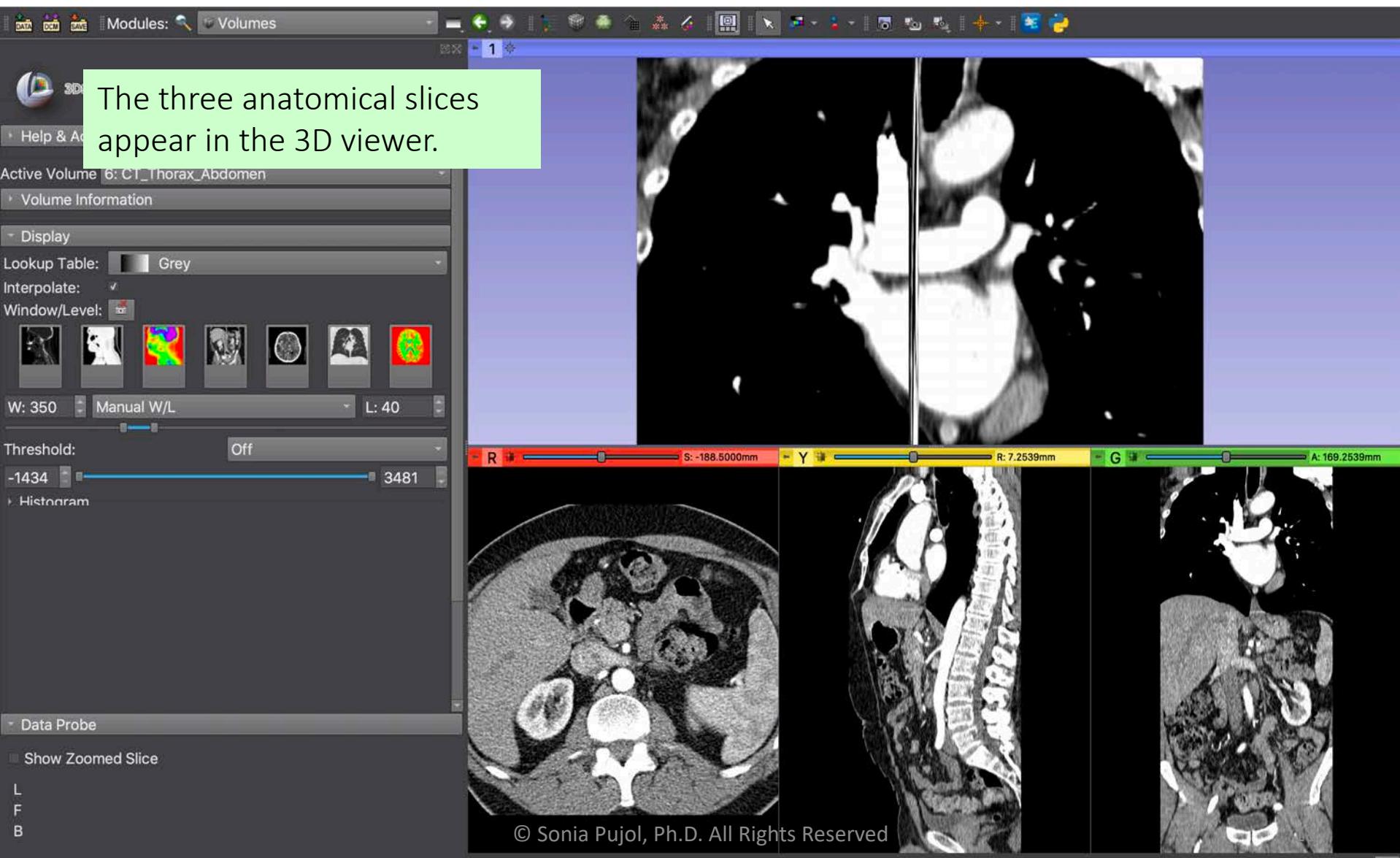
# Loading a DICOM volume



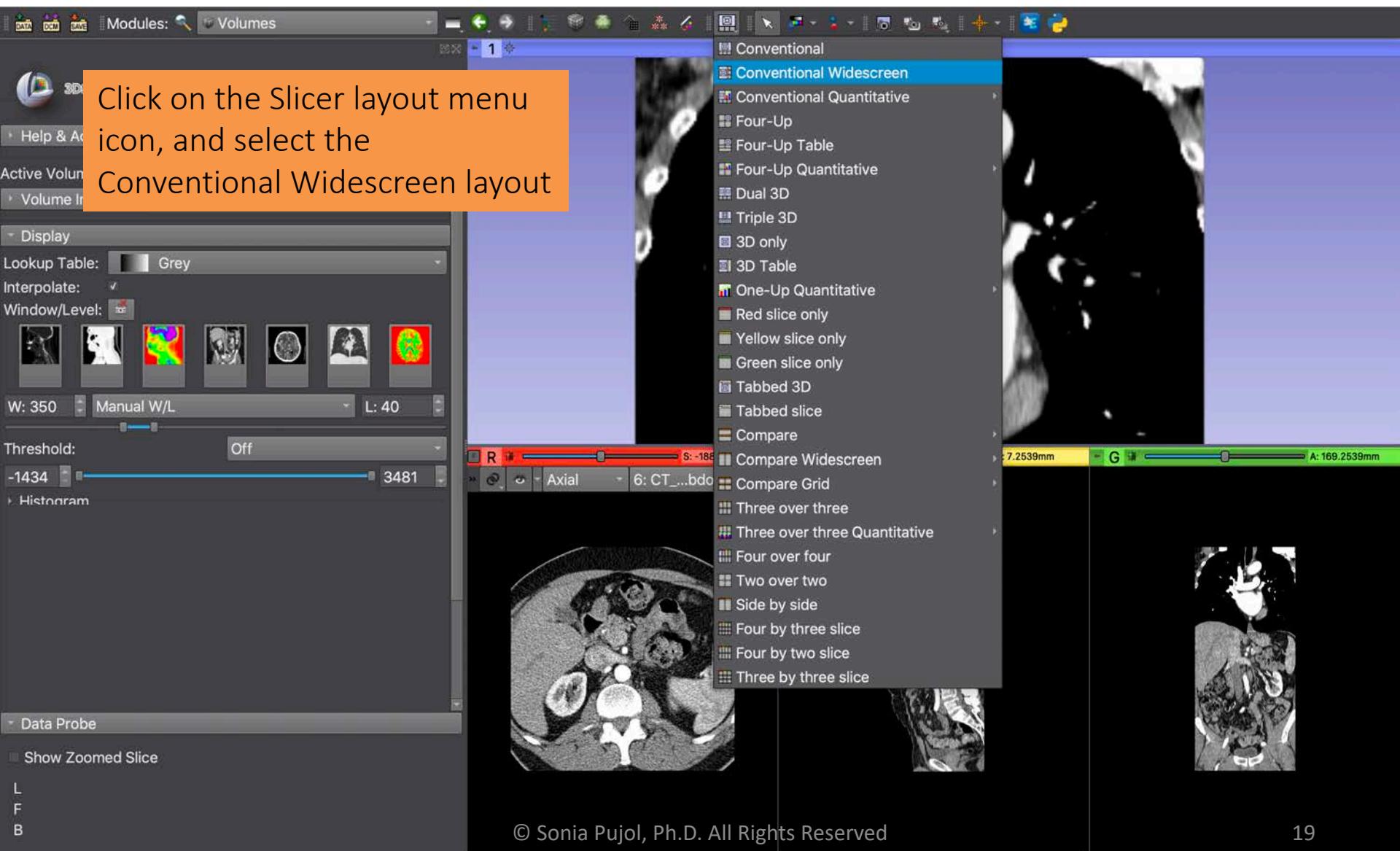
# Loading a DICOM volume



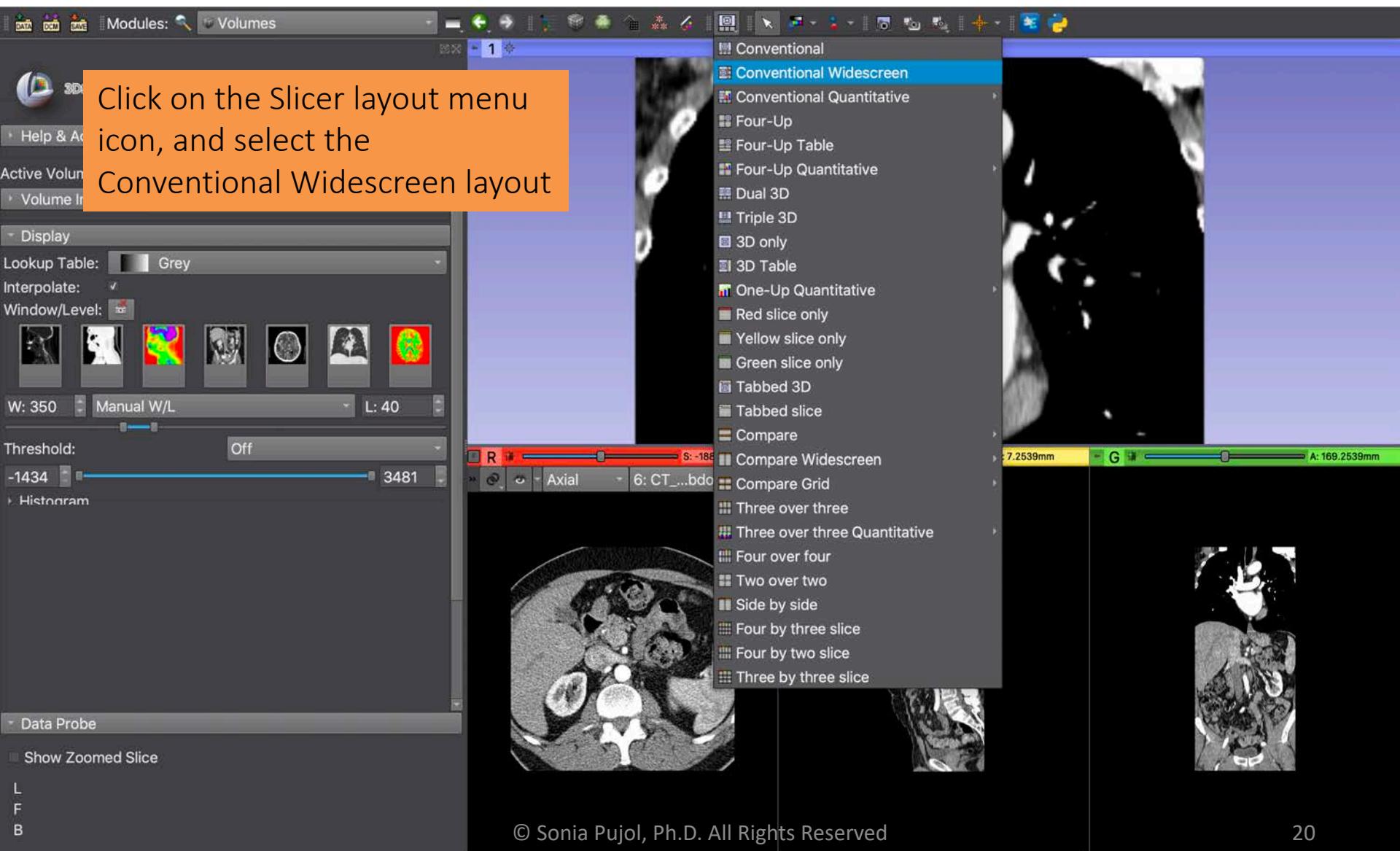
# Visualizing DICOM images



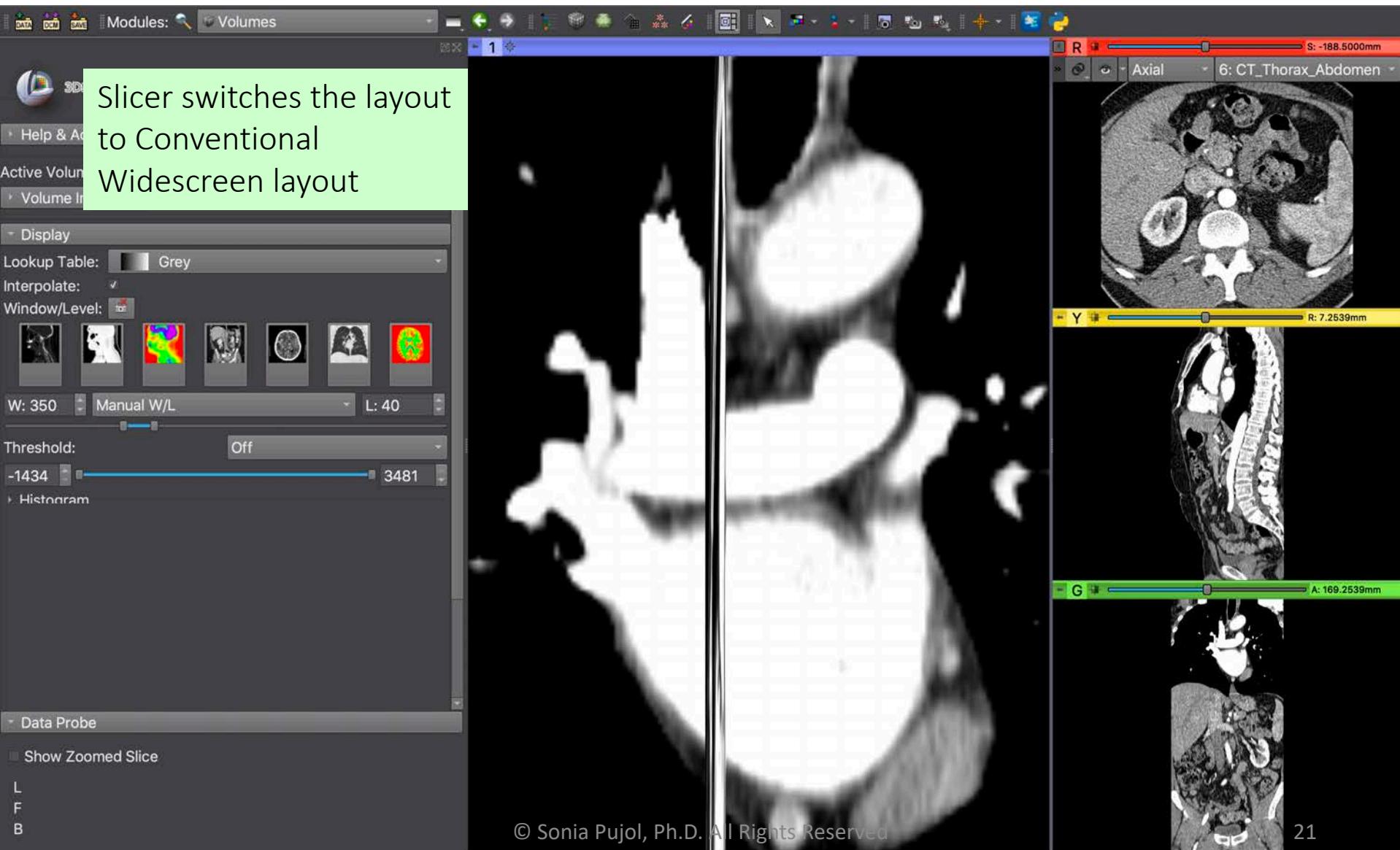
# Visualizing DICOM images



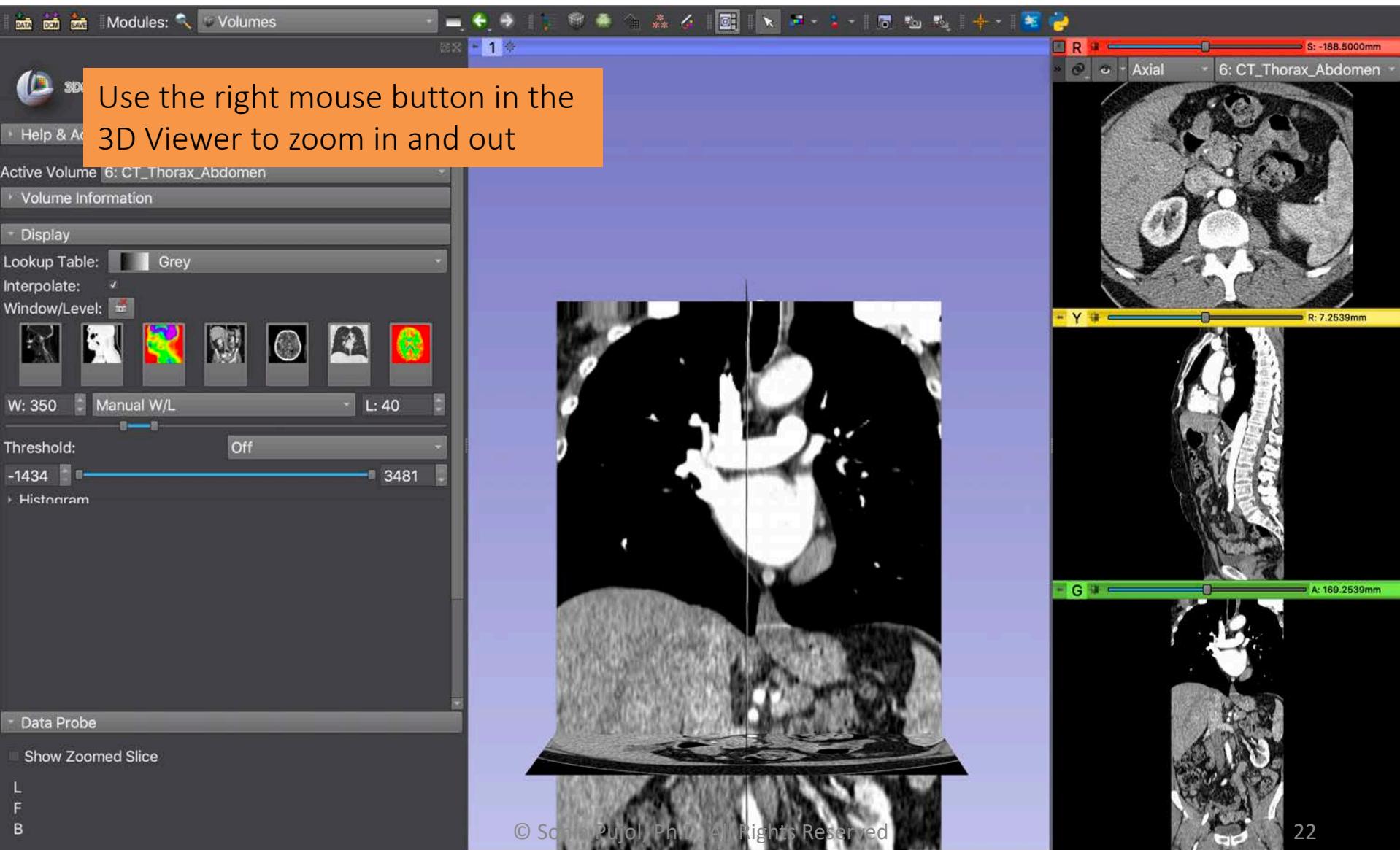
# Visualizing DICOM images



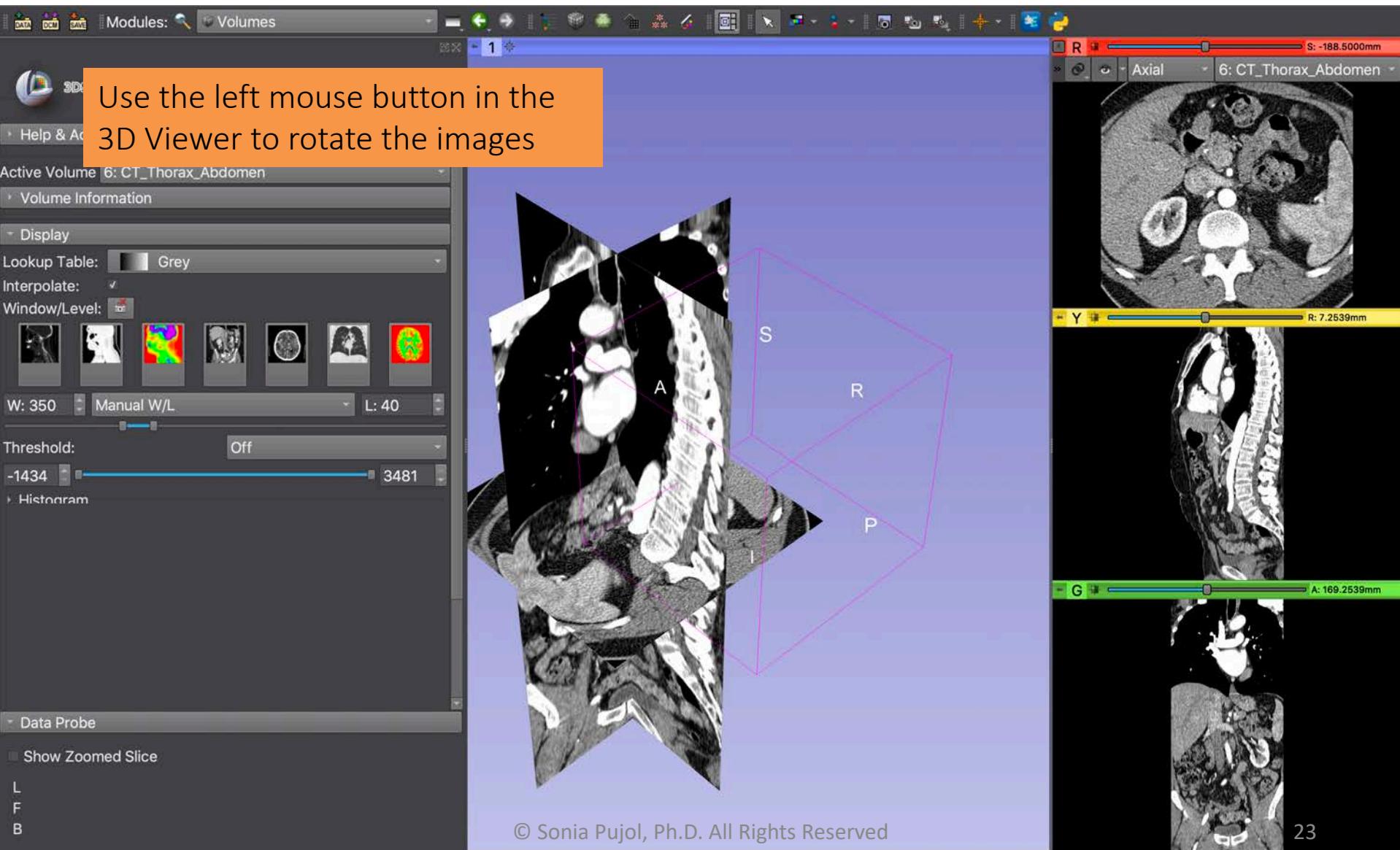
# Visualizing DICOM images



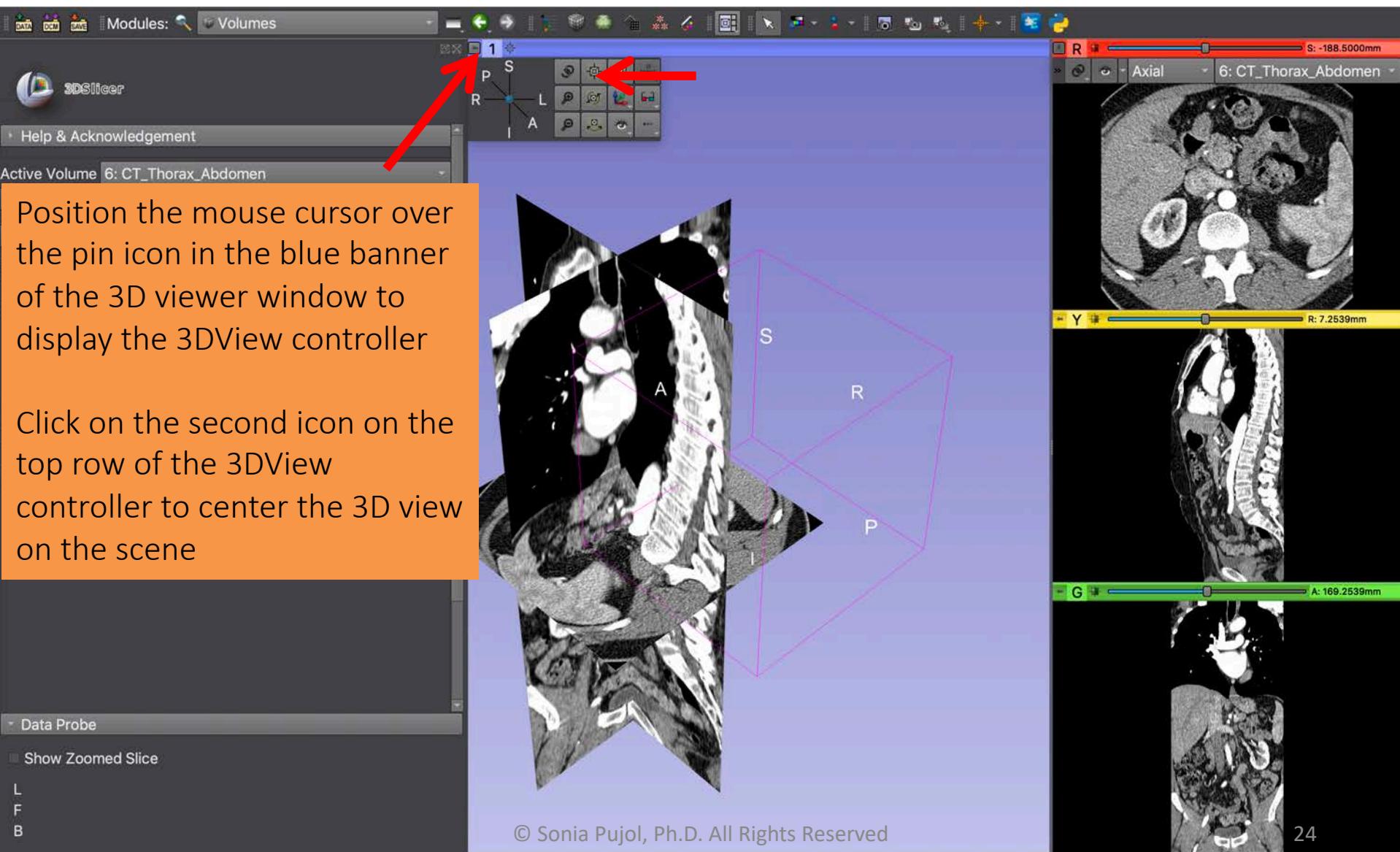
# Visualizing DICOM images



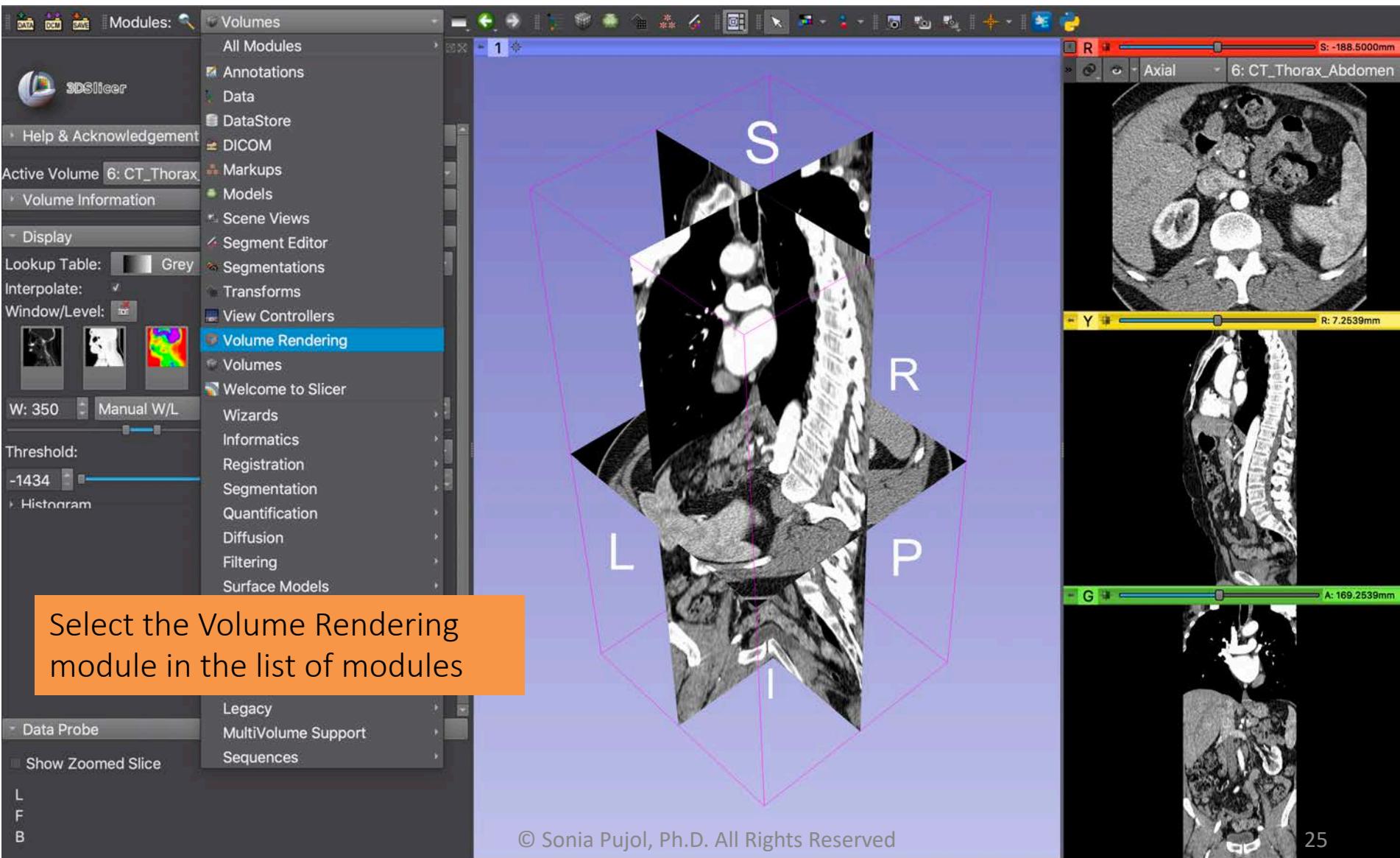
# Visualizing DICOM images

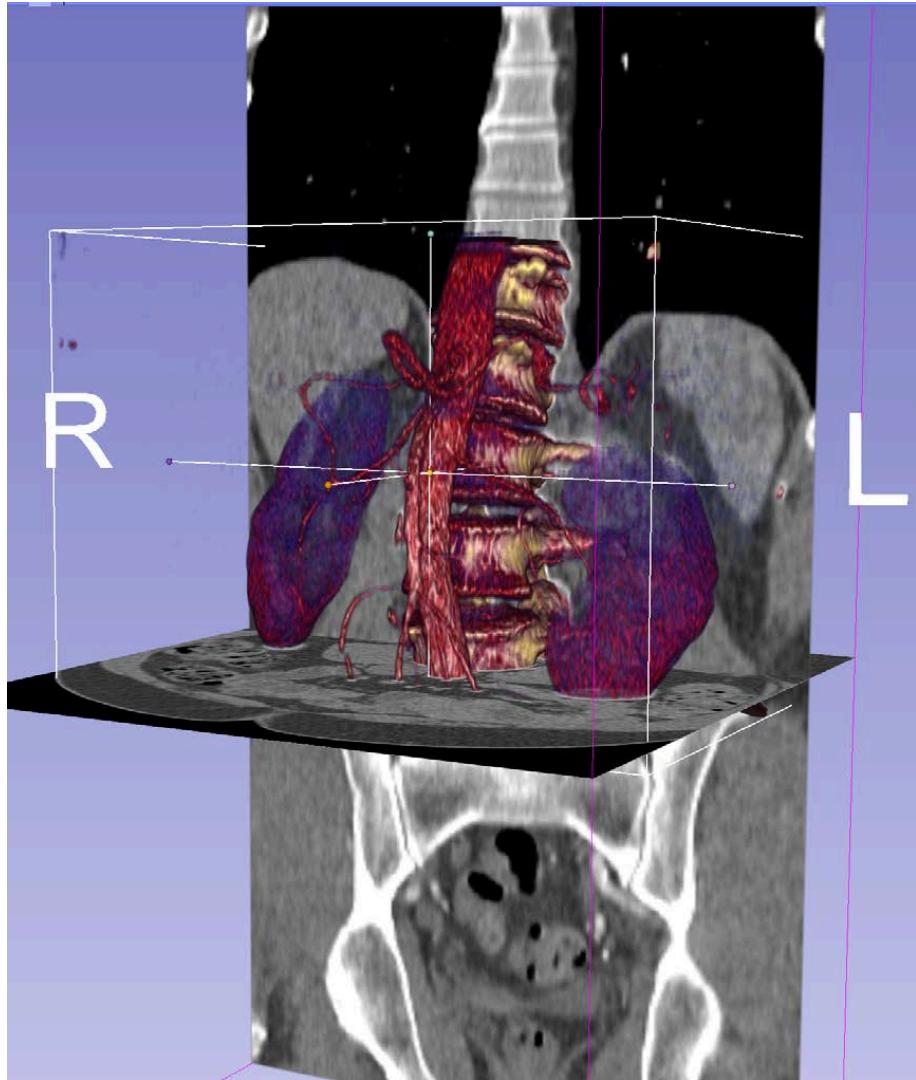


# 3D Viewer Controller



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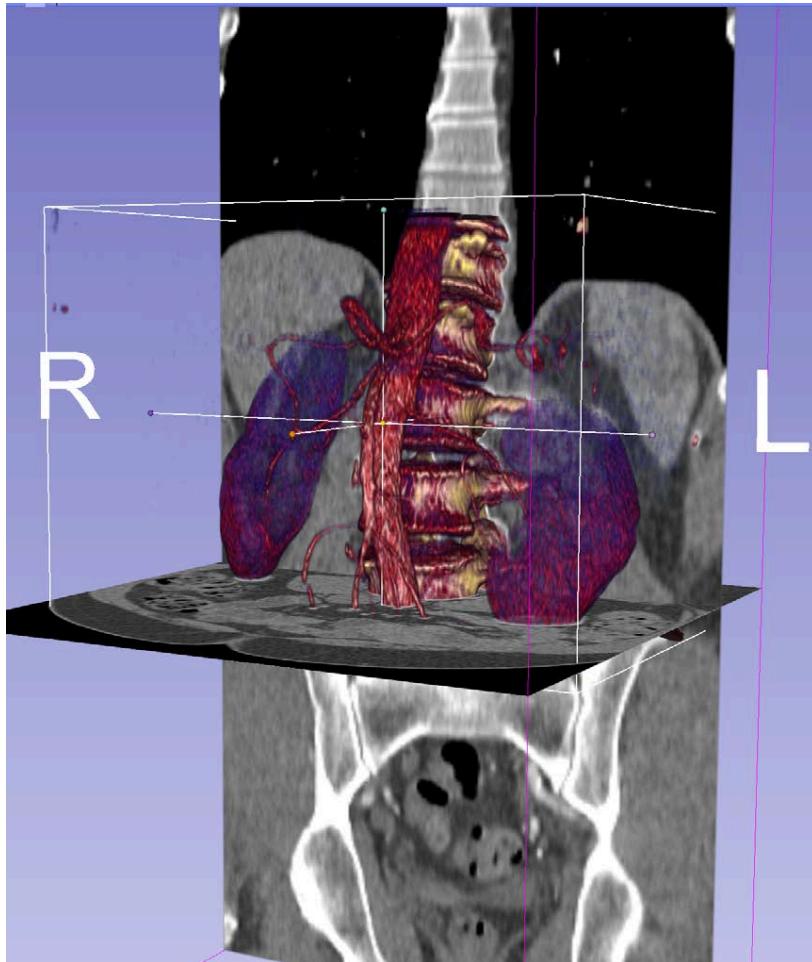




## Part 2

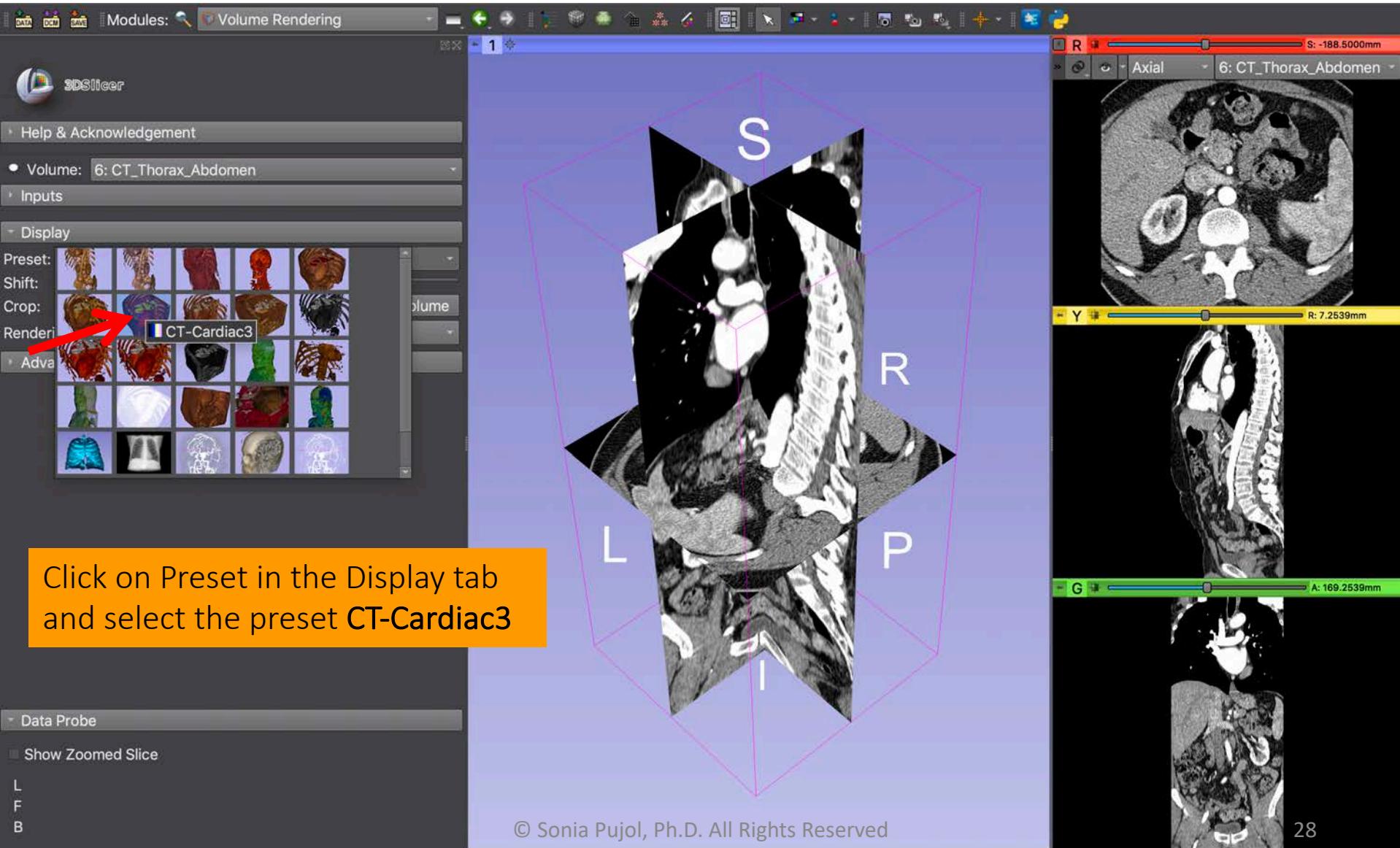
# Volume Rendering

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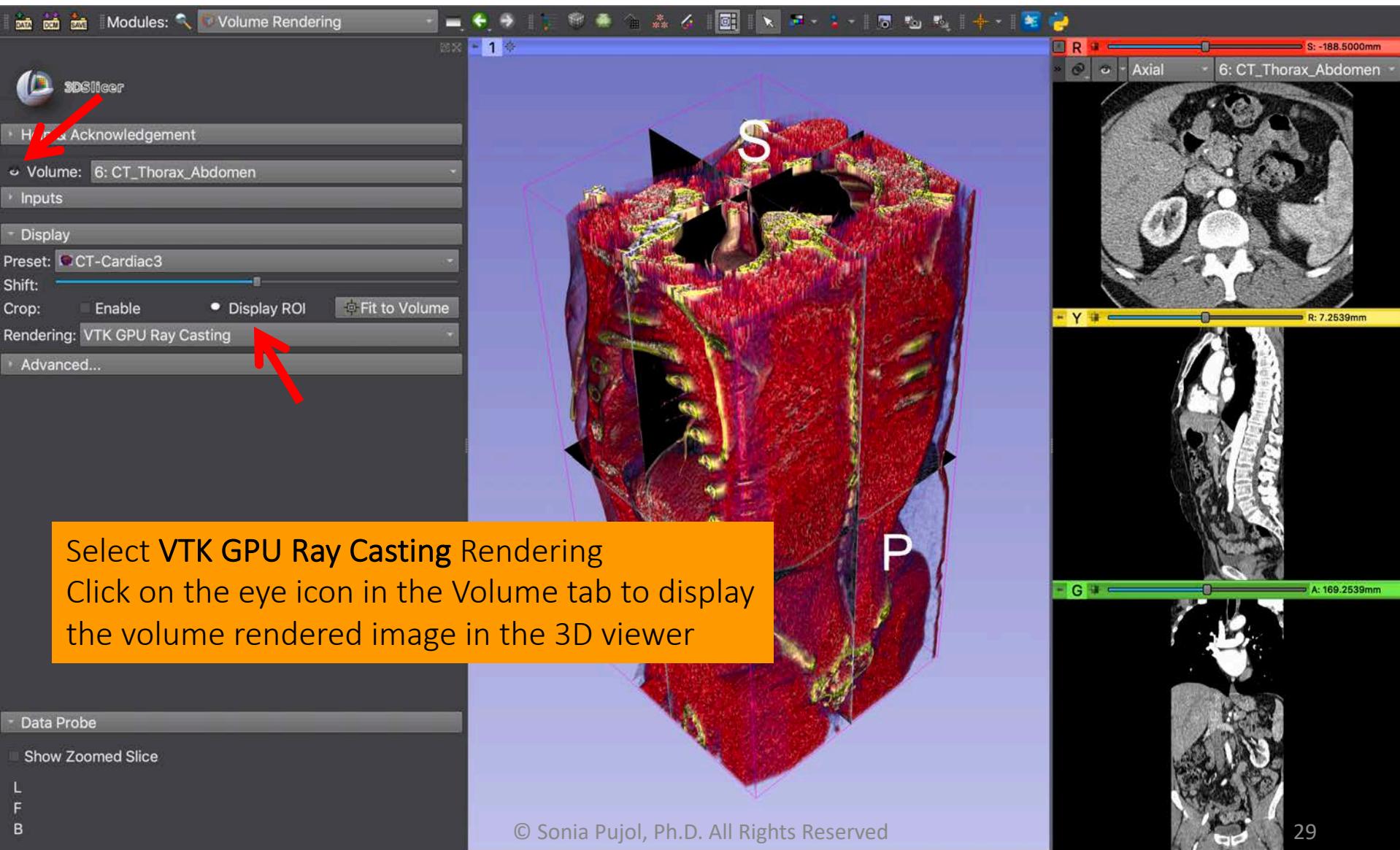


- Volume rendering techniques enable 3D visualization of 3D datasets
- The Volume Rendering module in Slicer enables interactive 3D visualization of DICOM images

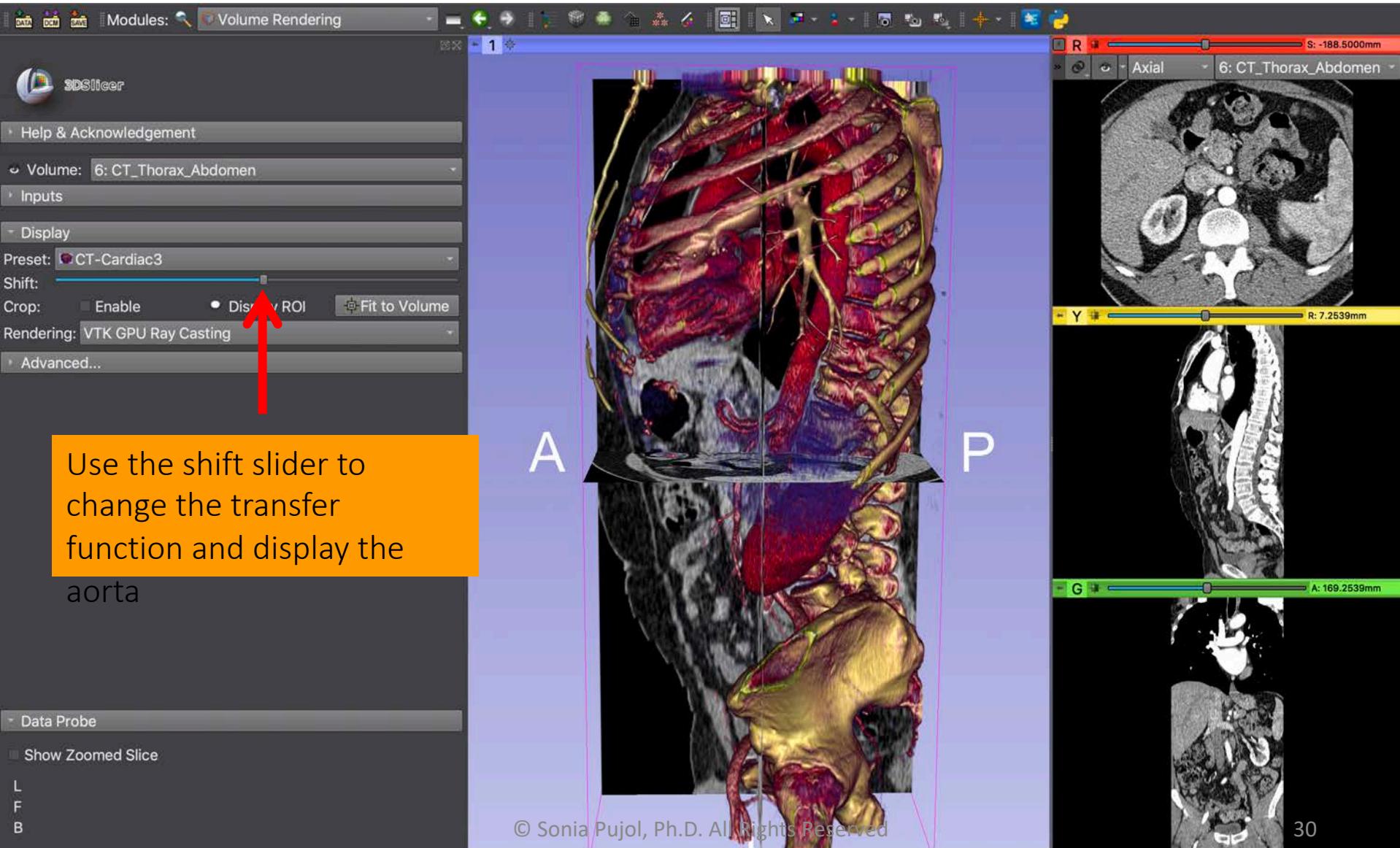
# Volume Rendering



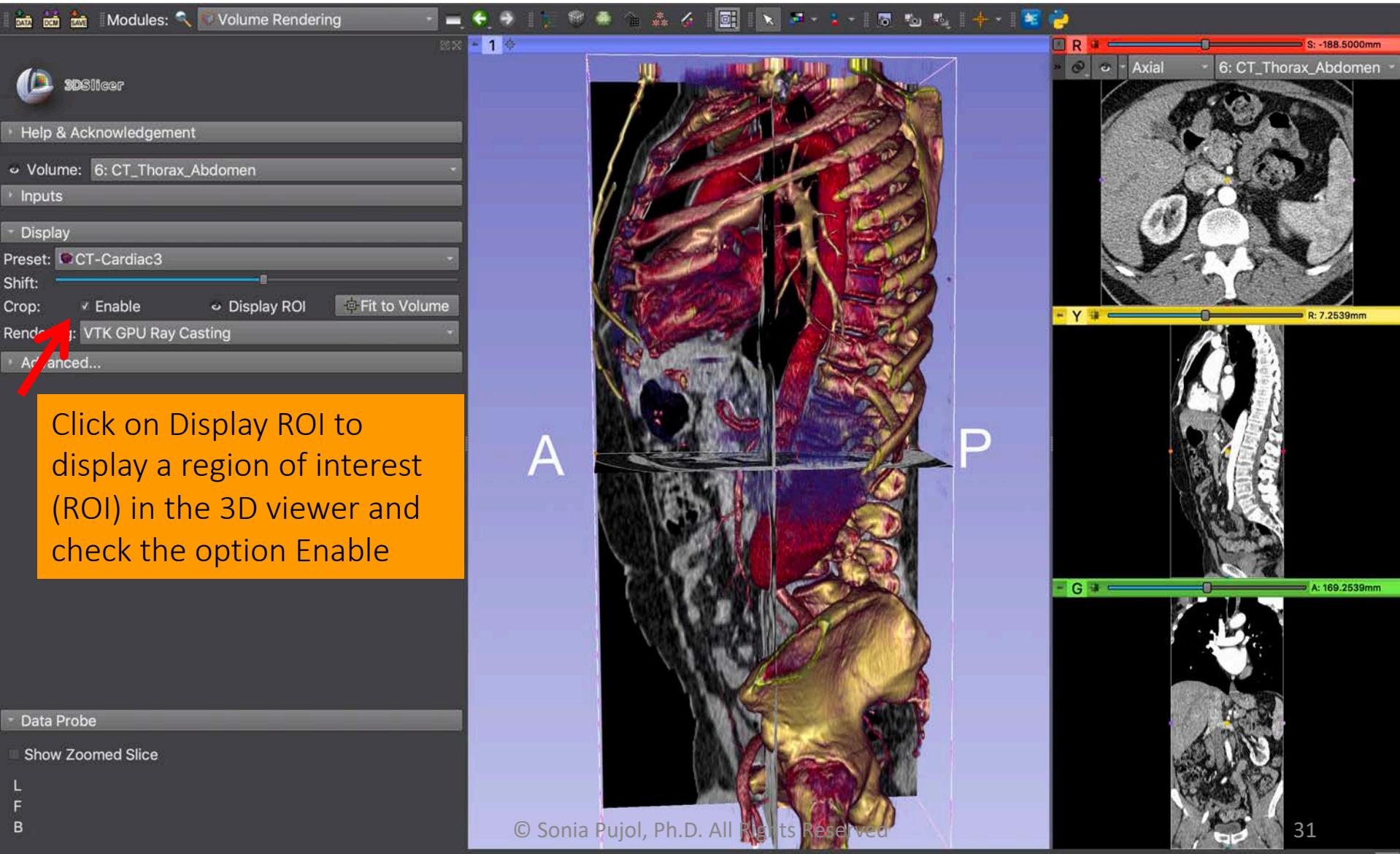
# Volume Rendering



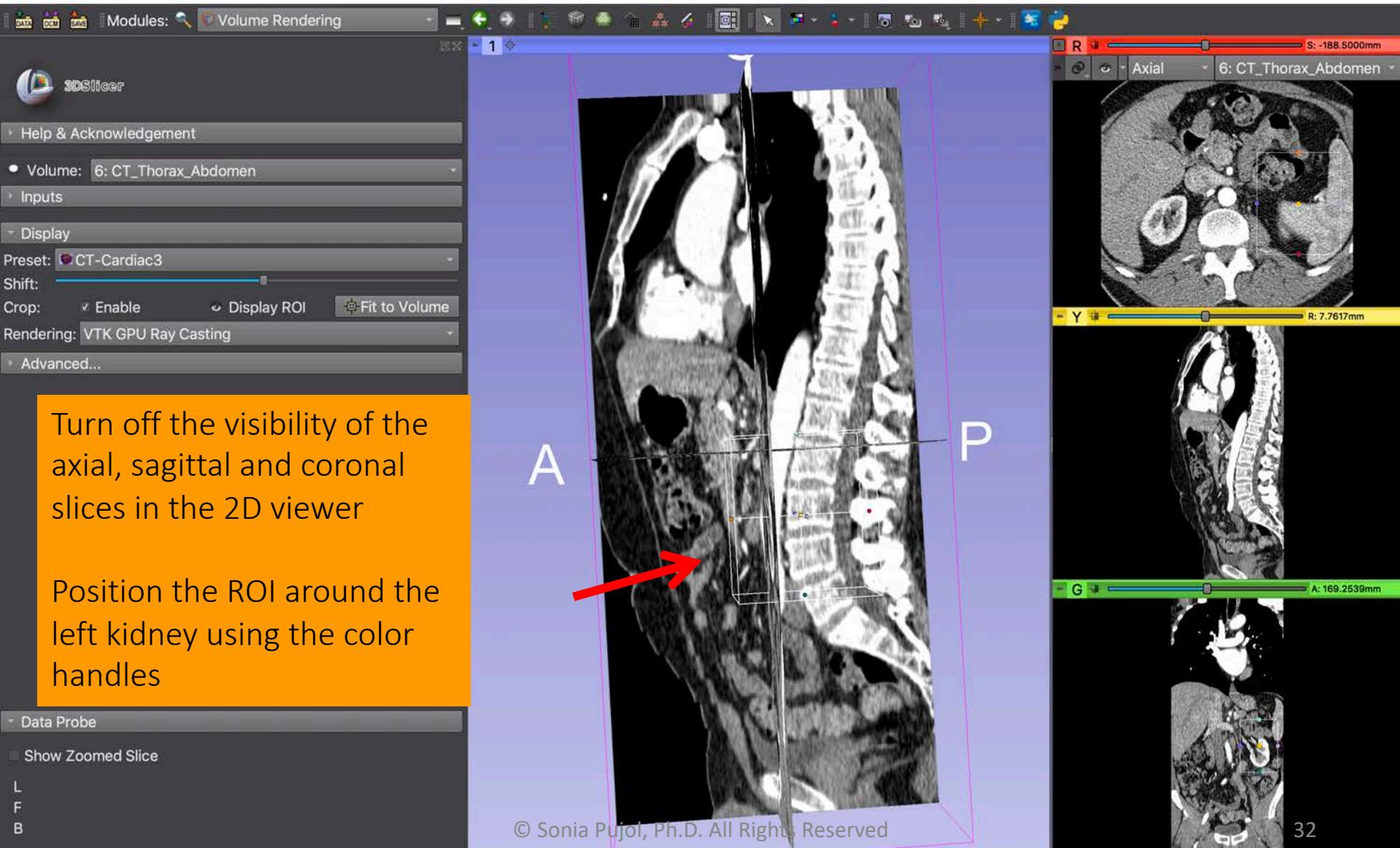
# Volume Rendering



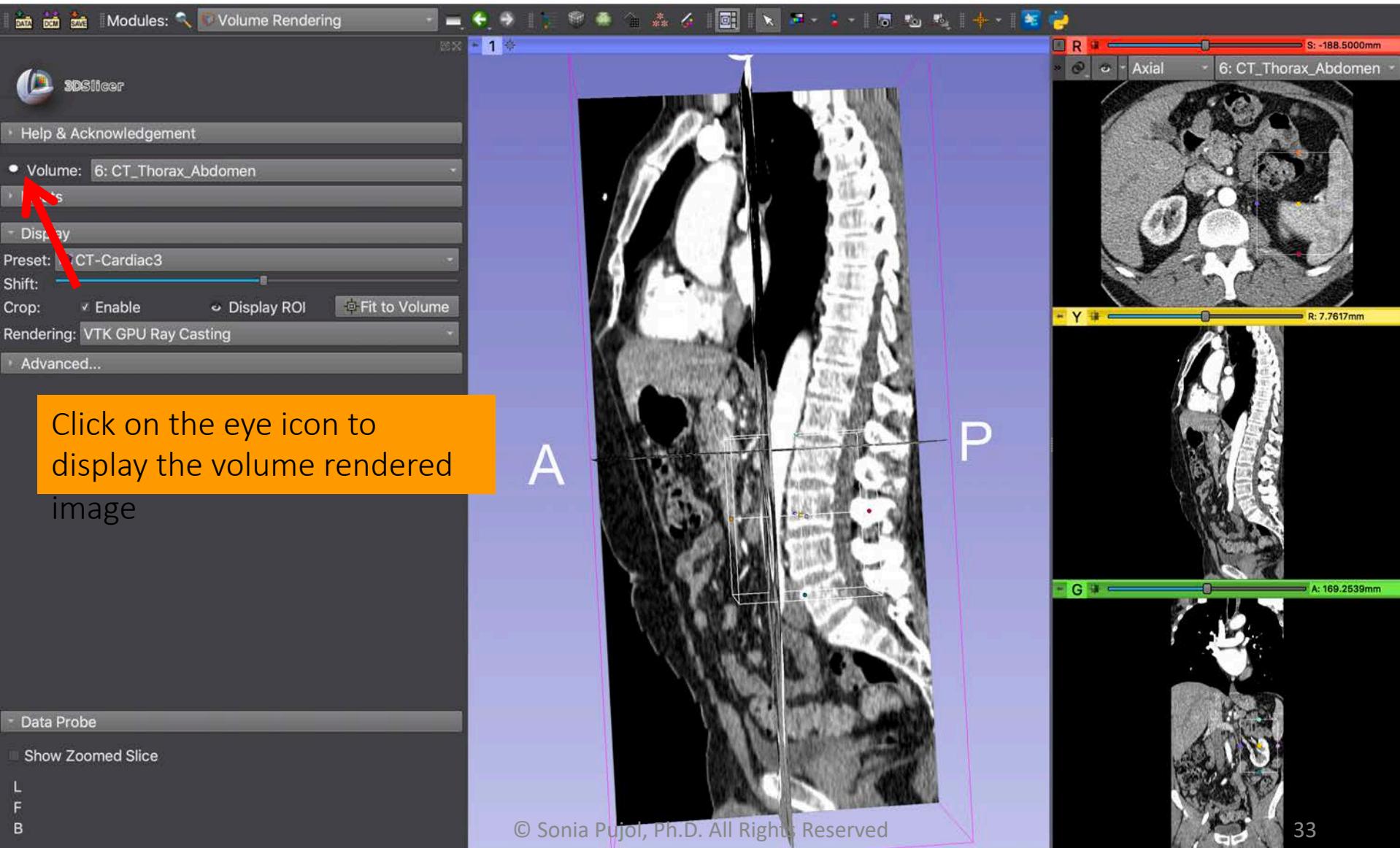
# Volume Rendering



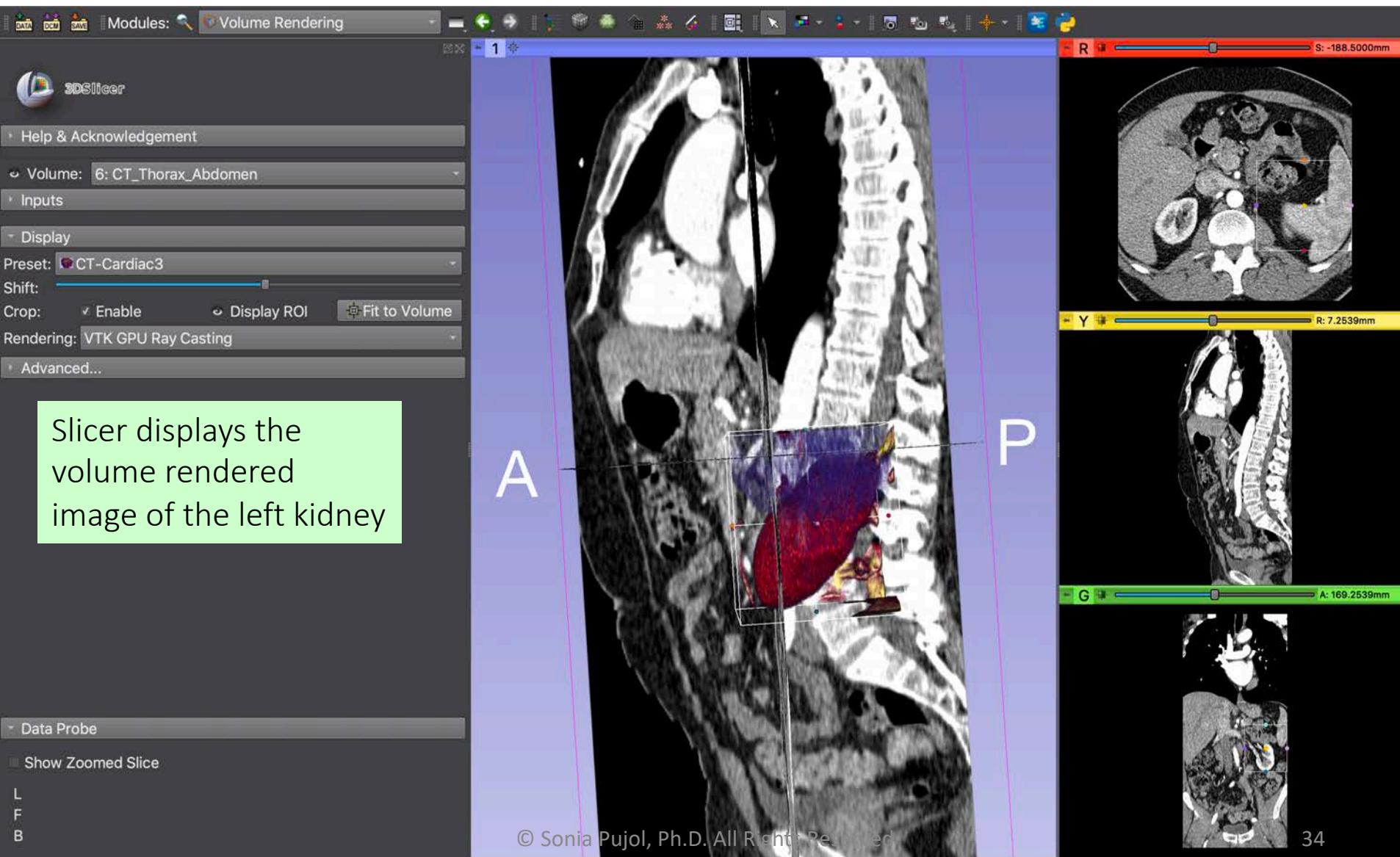
# Volume Rendering



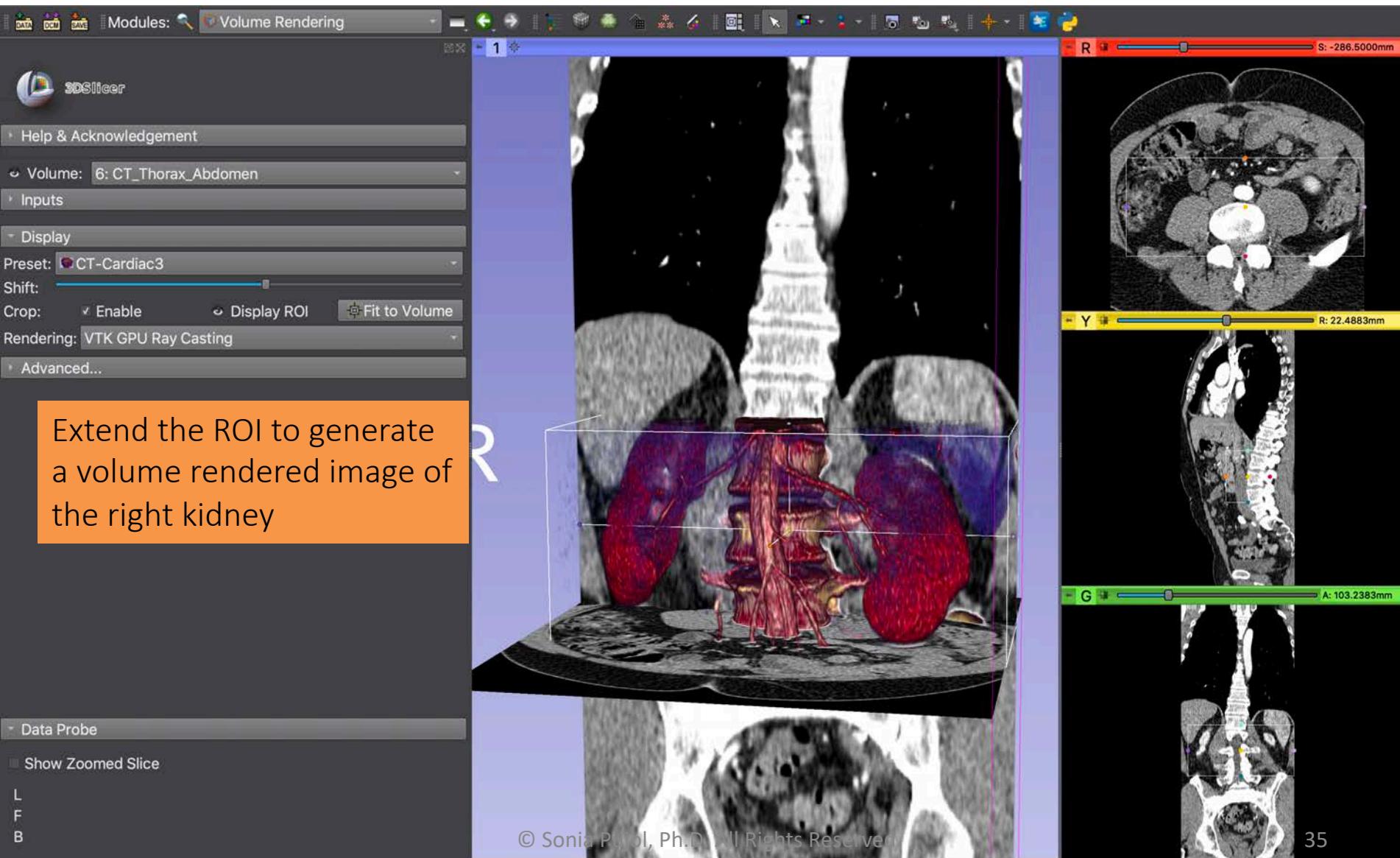
# Volume Rendering



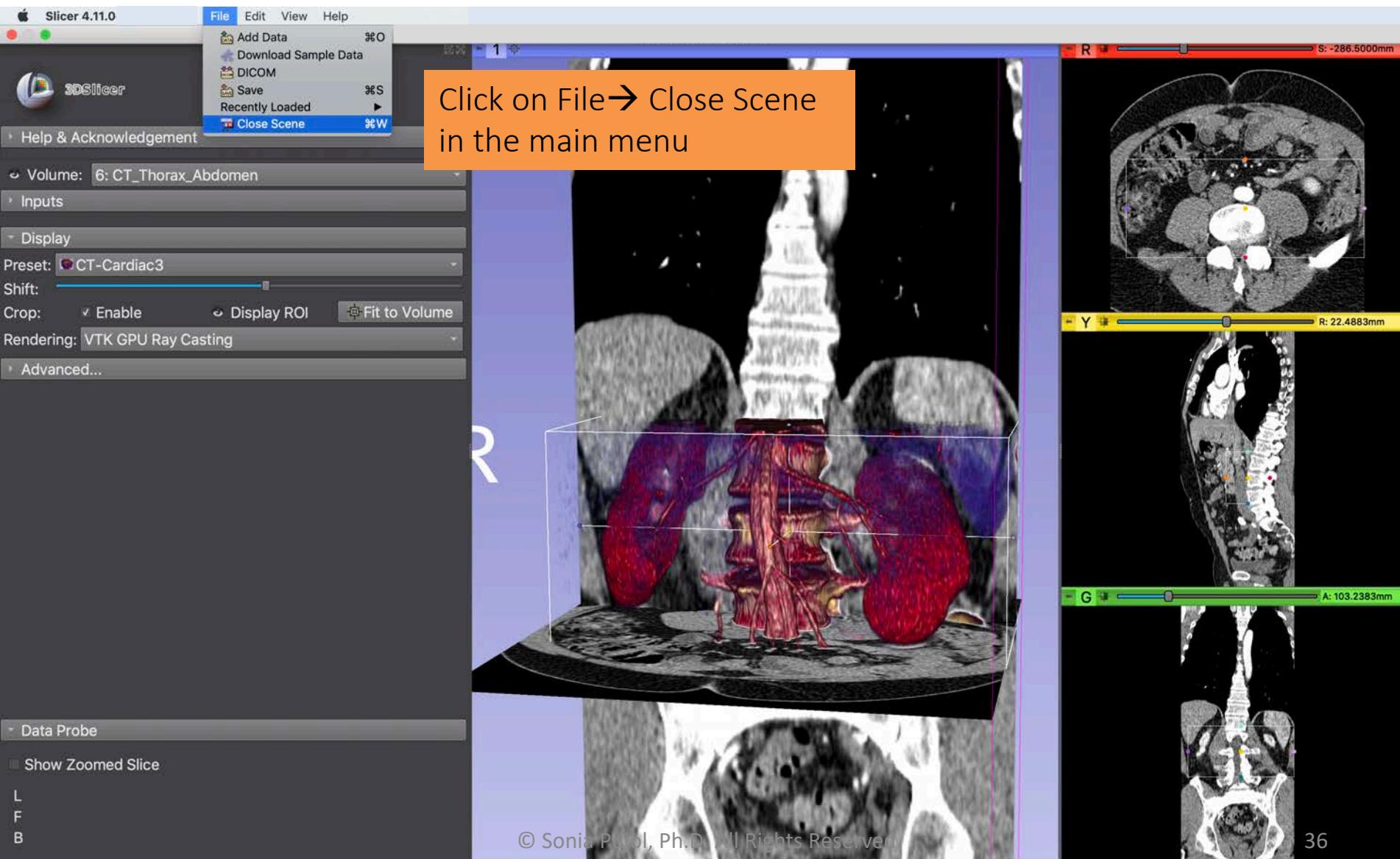
# Volume Rendering

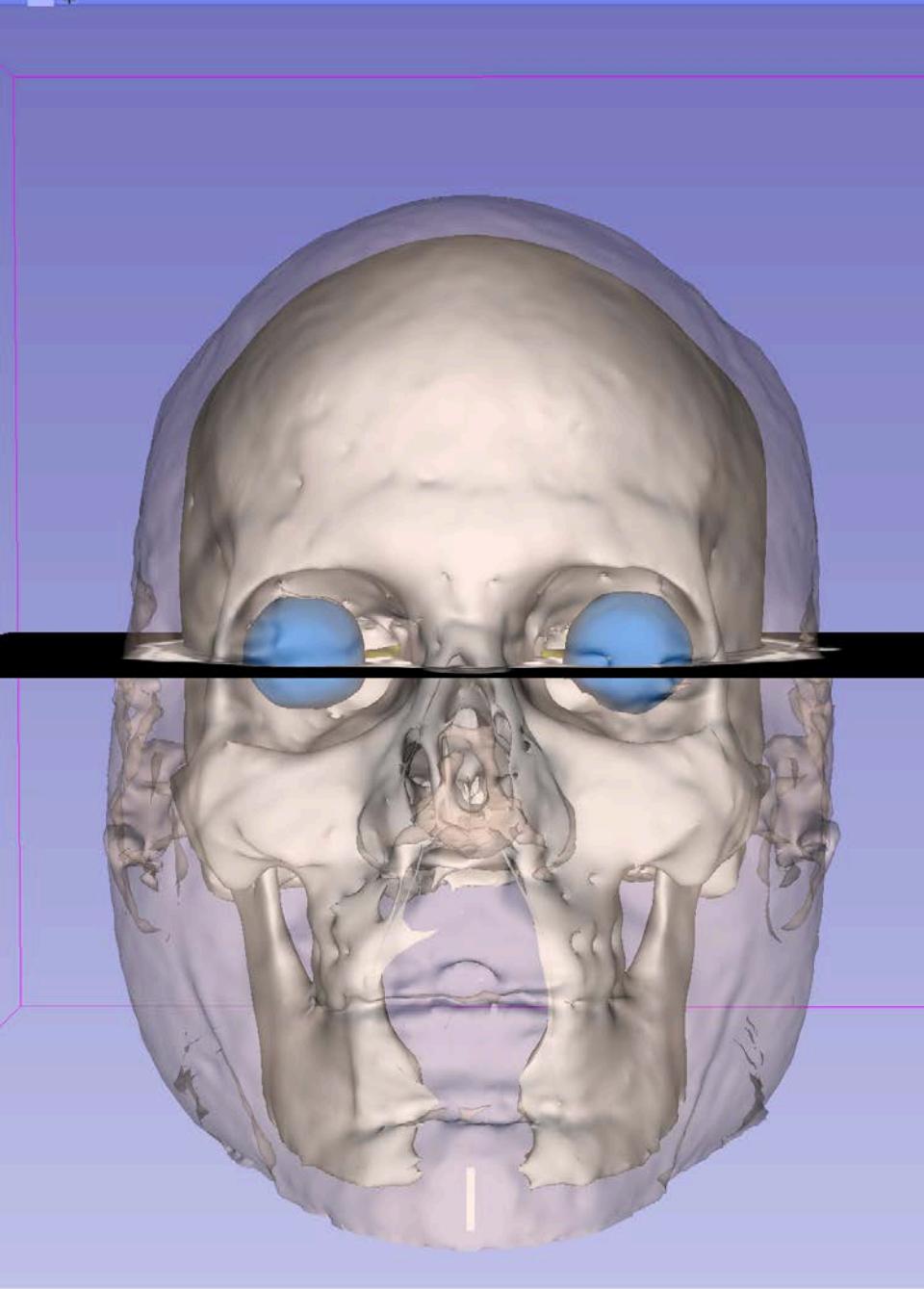


# Volume Rendering



# Volume Rendering

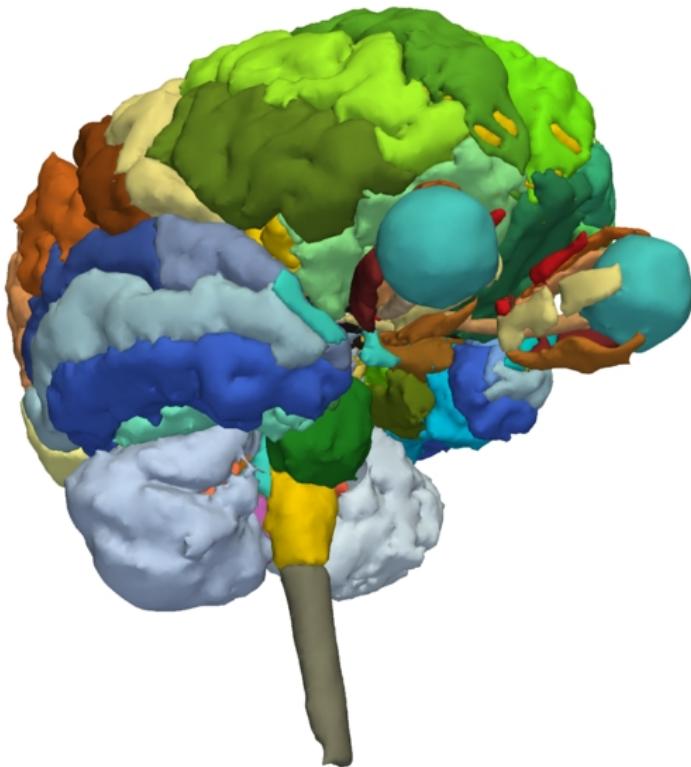




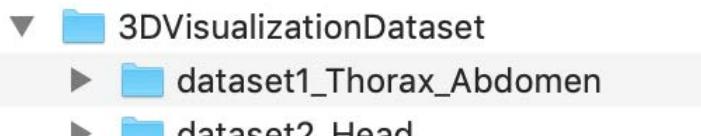
# Part 3

## Loading and viewing 3D models

# Tutorial dataset



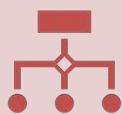
- The directory **dataset2\_Head** contains the Slicer scene called **Head\_scene.mrb**
- The scene contains 3D models from the **SPL brain atlas** developed by the department of Radiology at Brigham and Women's Hospital, Harvard Medical School (NIH P41 RR013218, NIH R01 MH05074)



# Slicer Scene



Slicer stores all loaded data in a repository called a scene

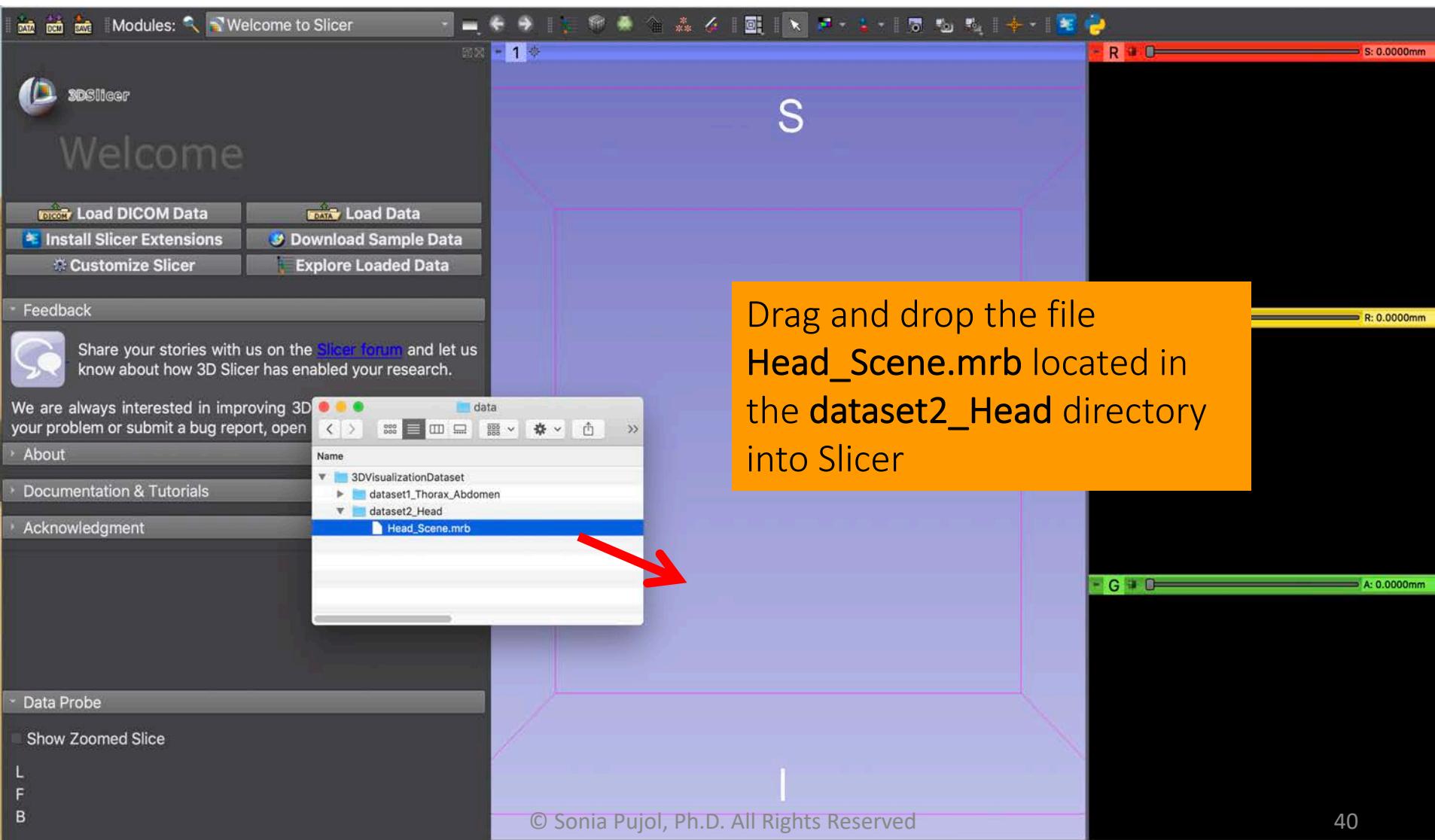


Each data set, such as an image volume, surface model, or point set, is represented as a node in a Slicer scene.

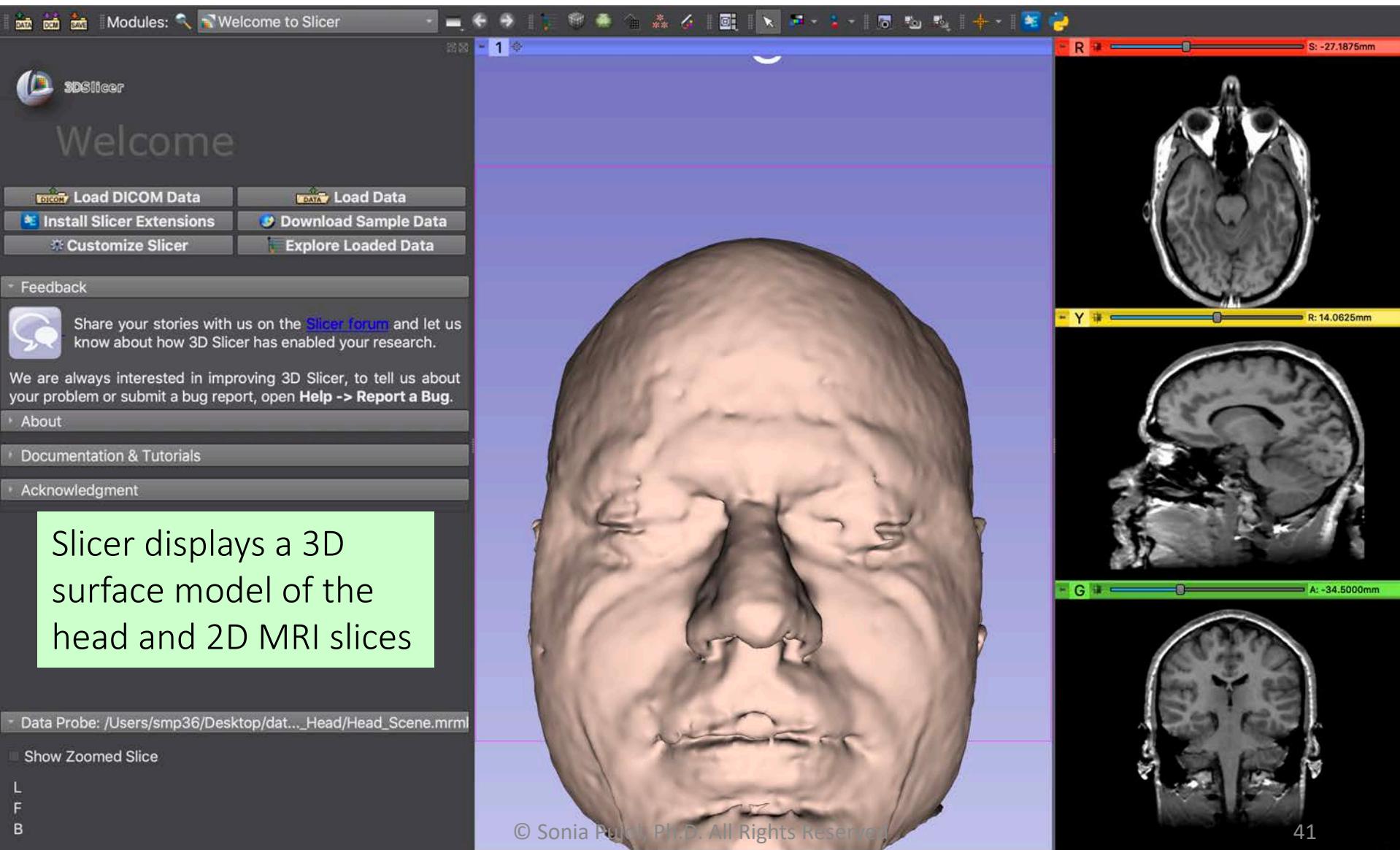


All Slicer modules operate on the data stored in a Slicer scene.

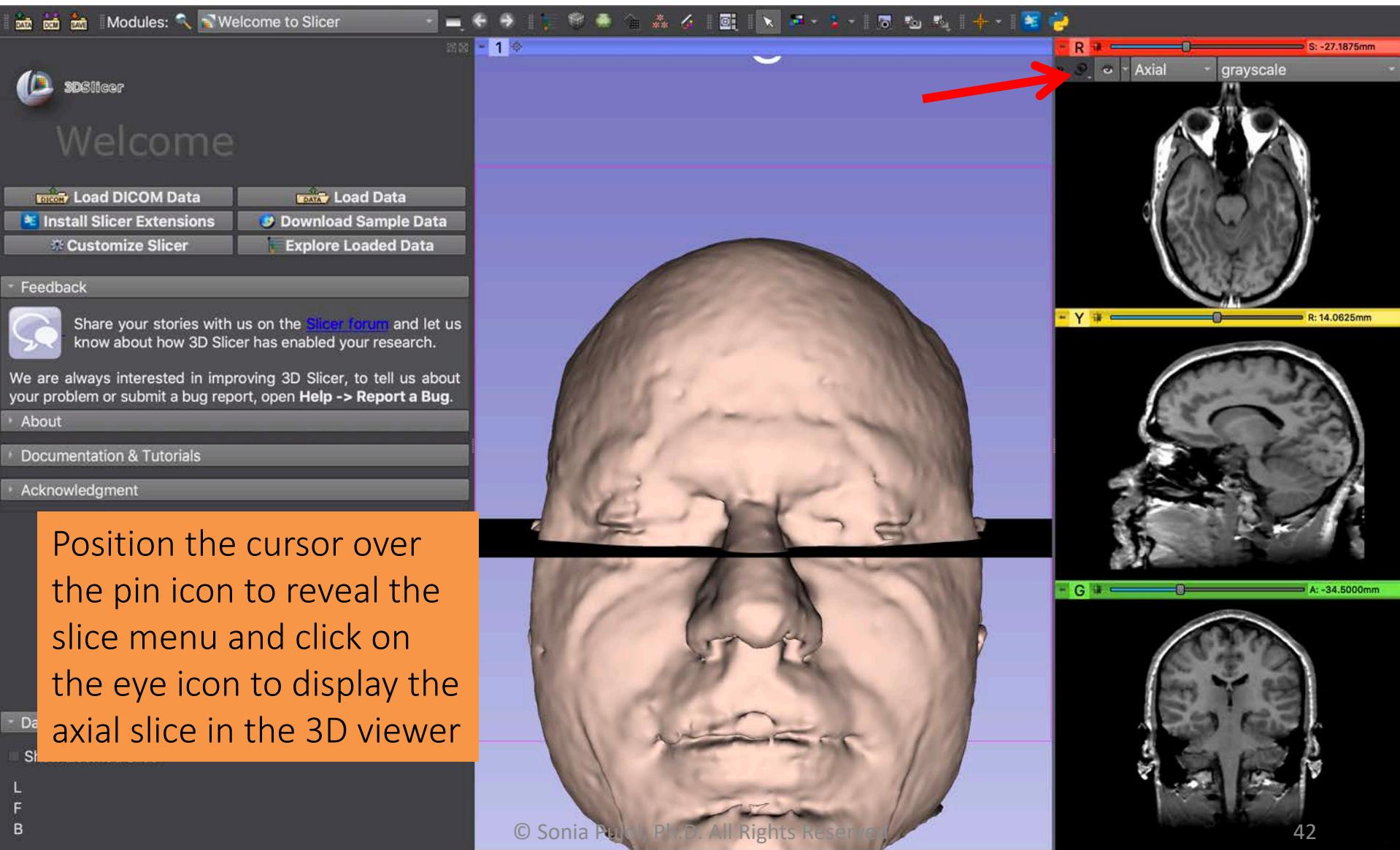
# Loading a Scene



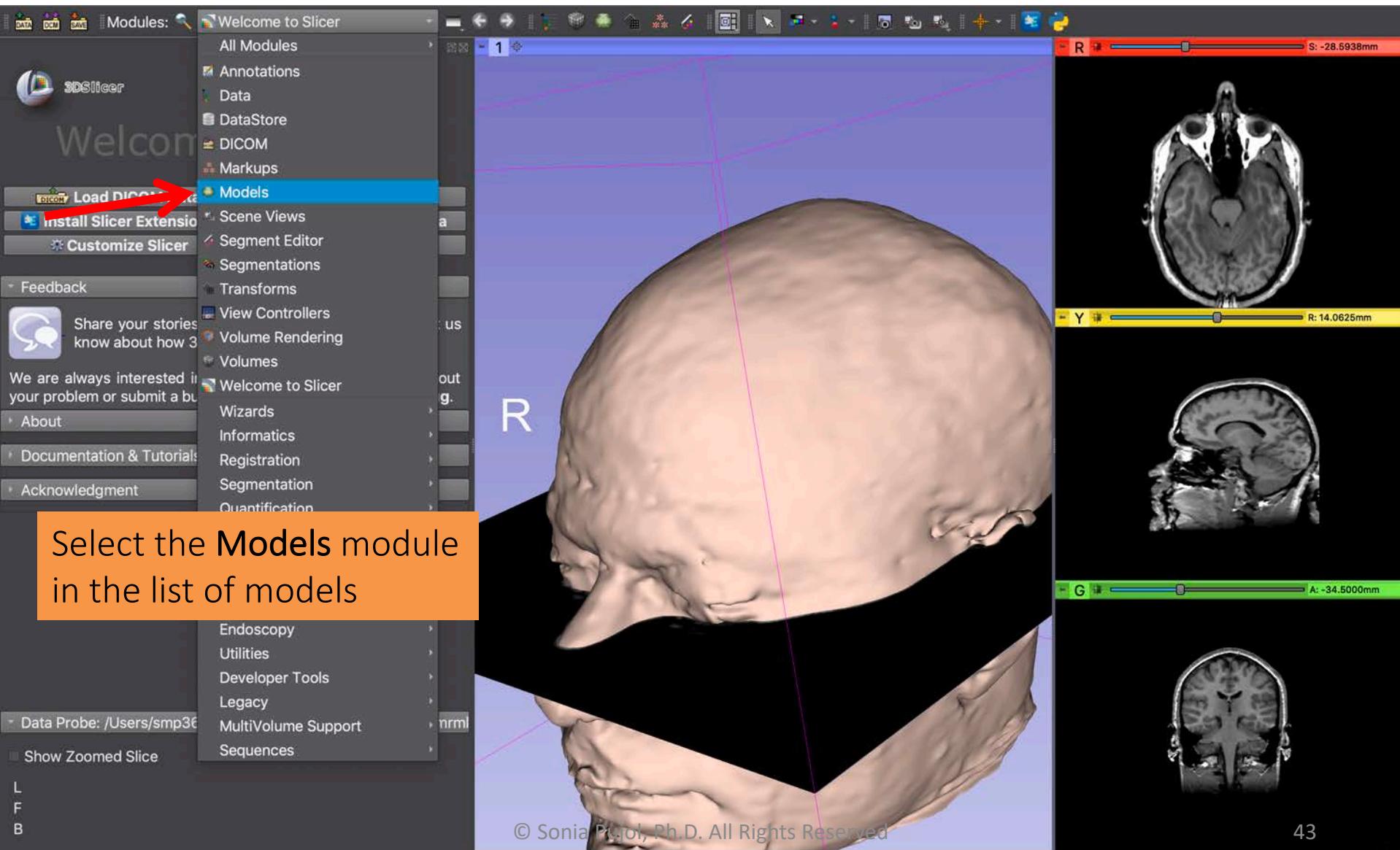
# Loading a Scene



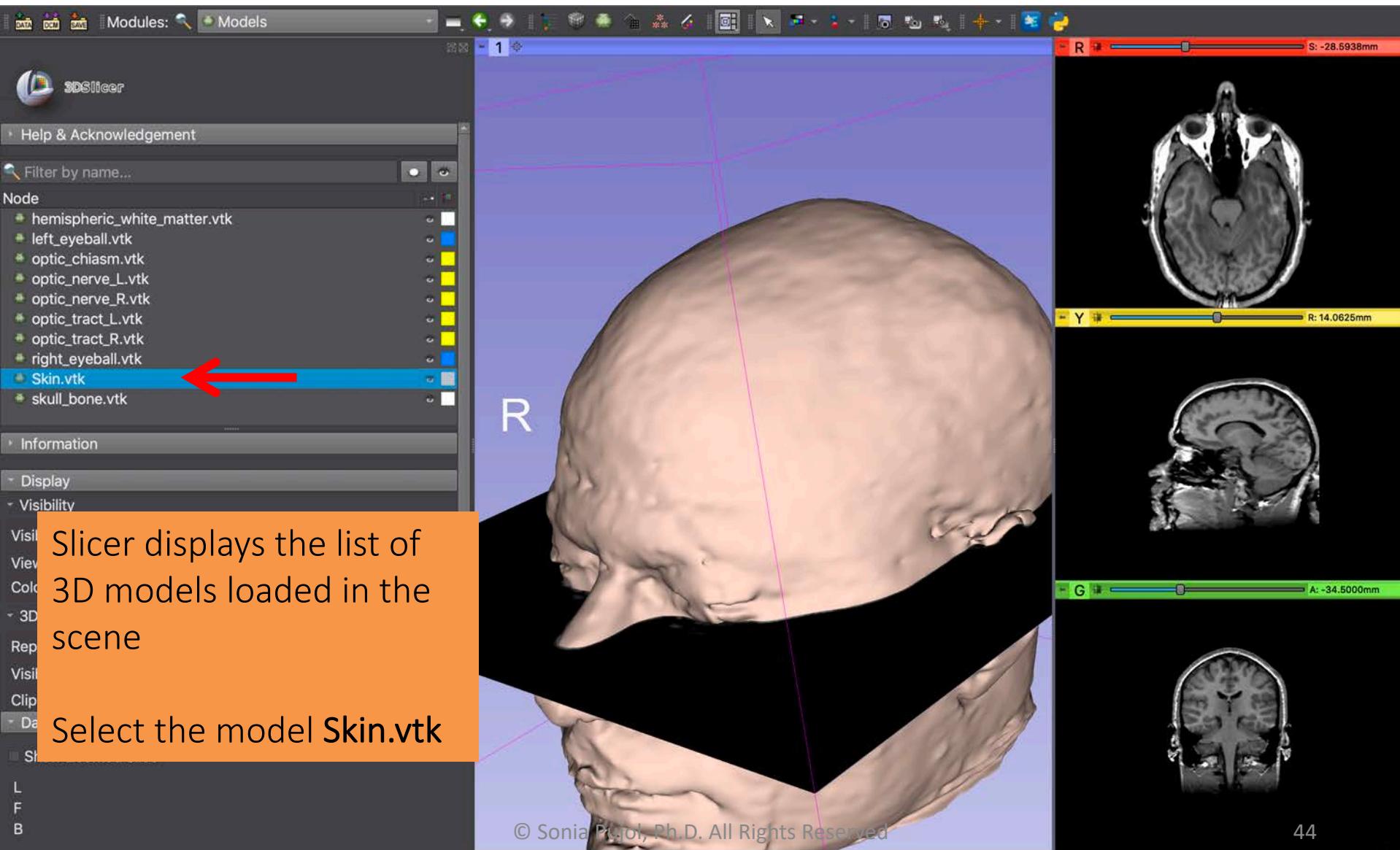
# Viewing 3D models



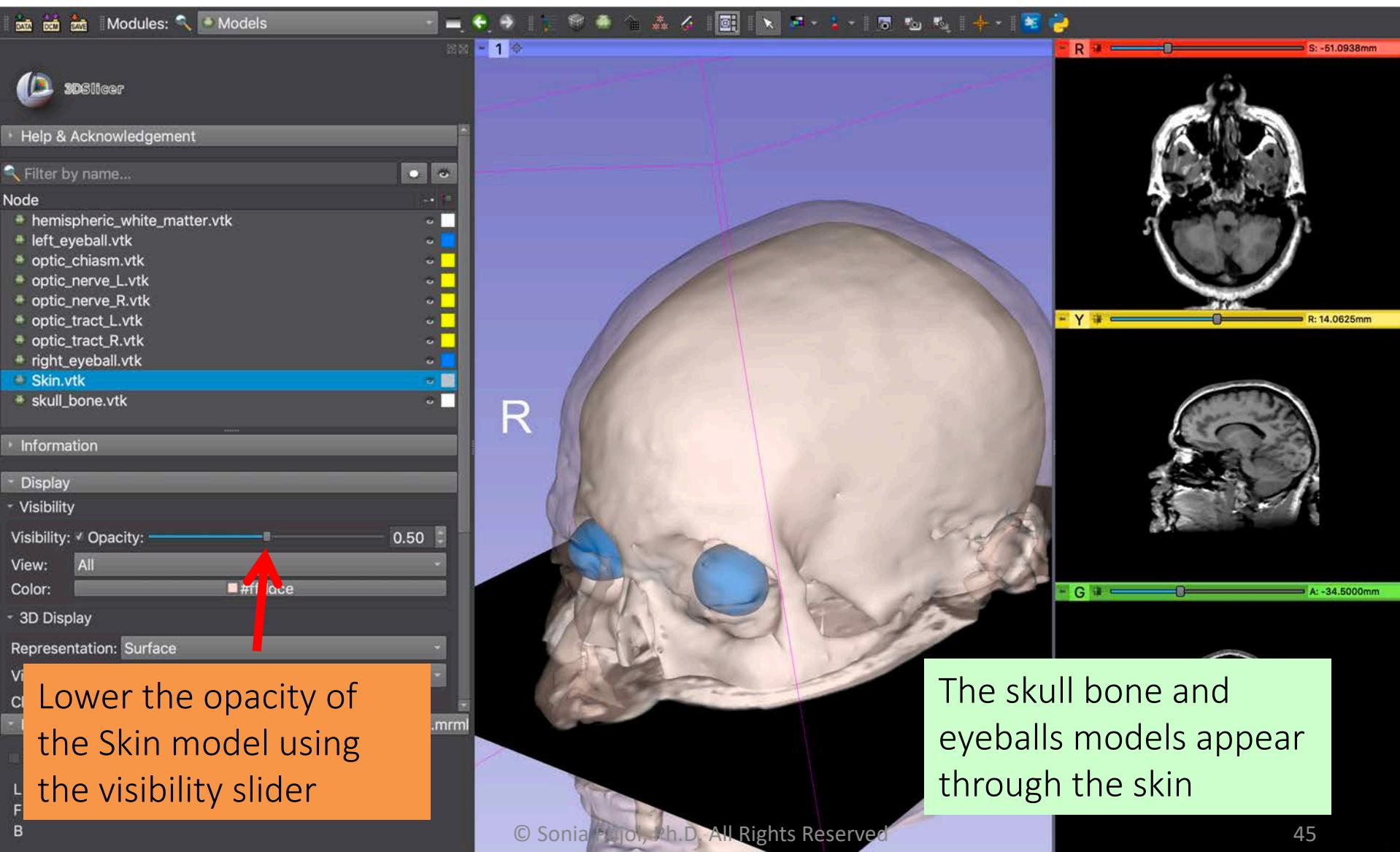
# Viewing 3D models



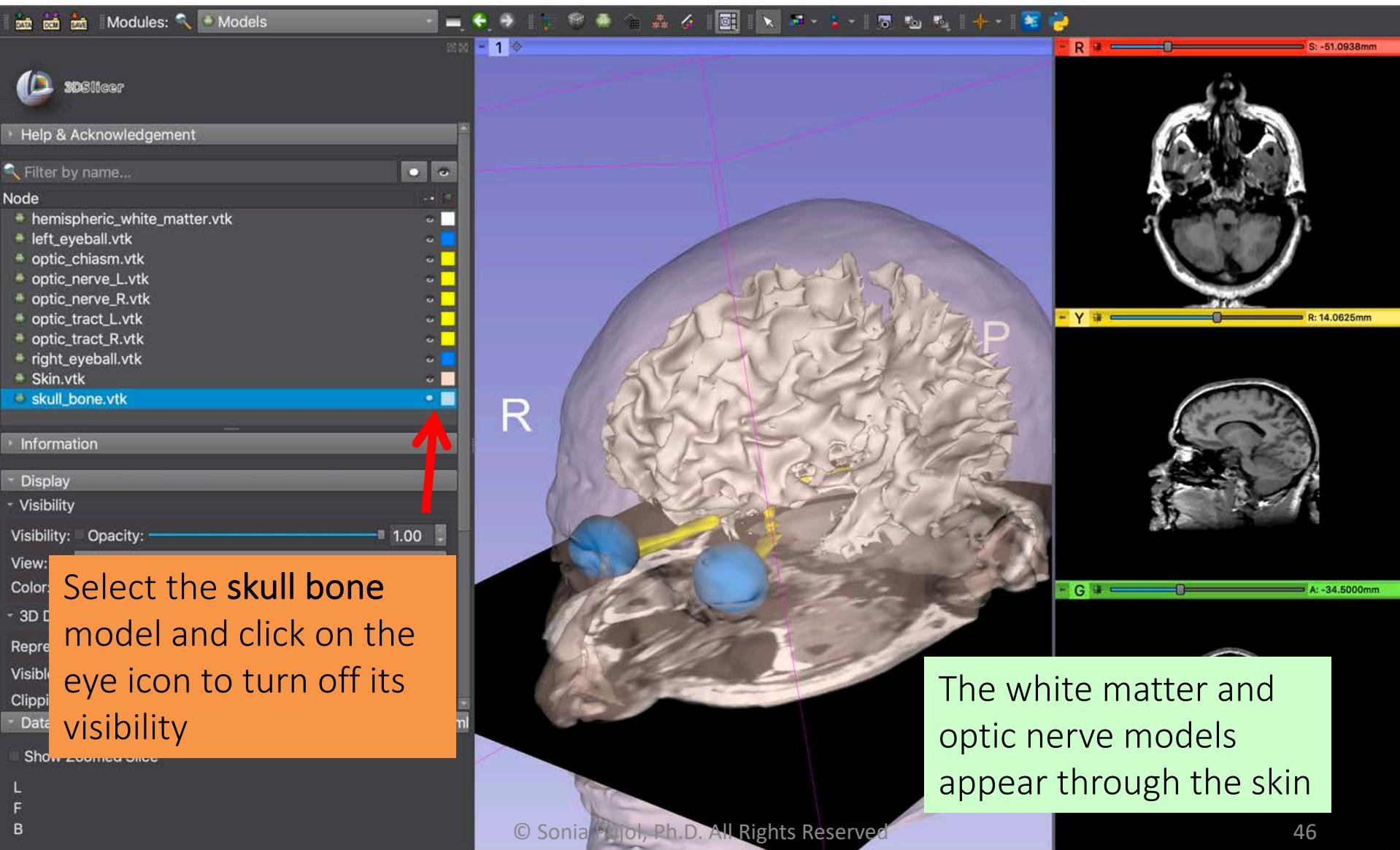
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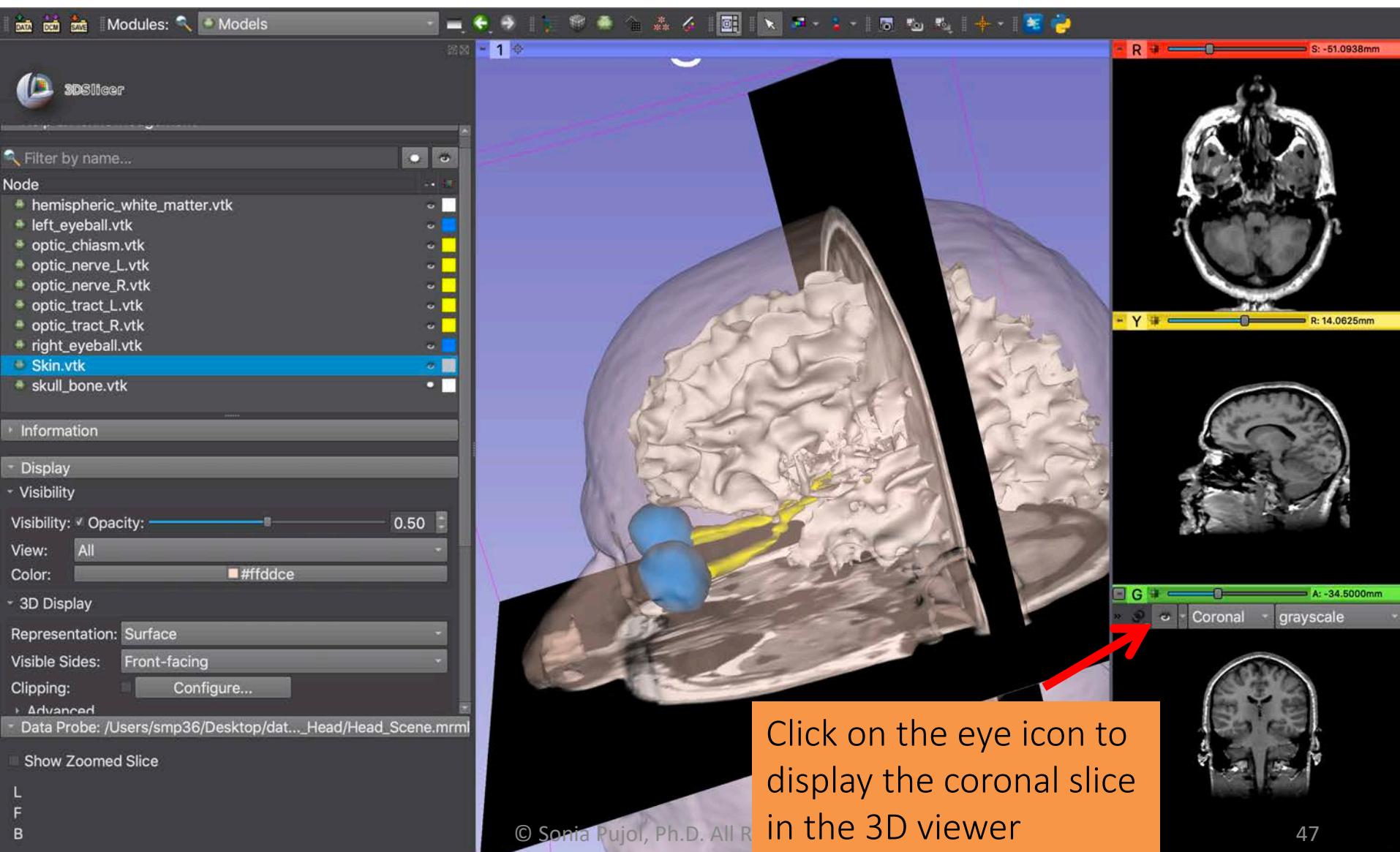
# Viewing 3D models



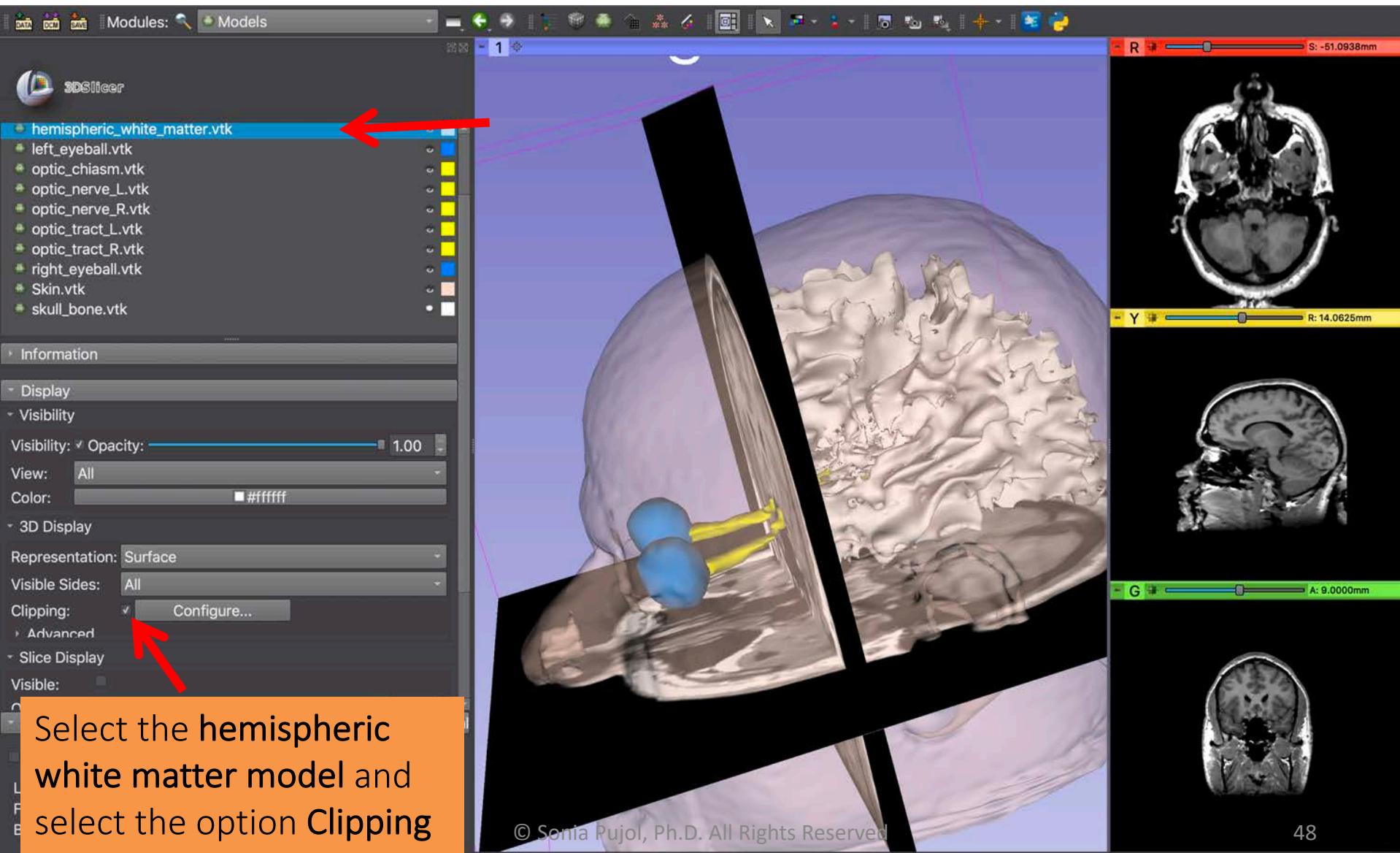
# Viewing 3D models



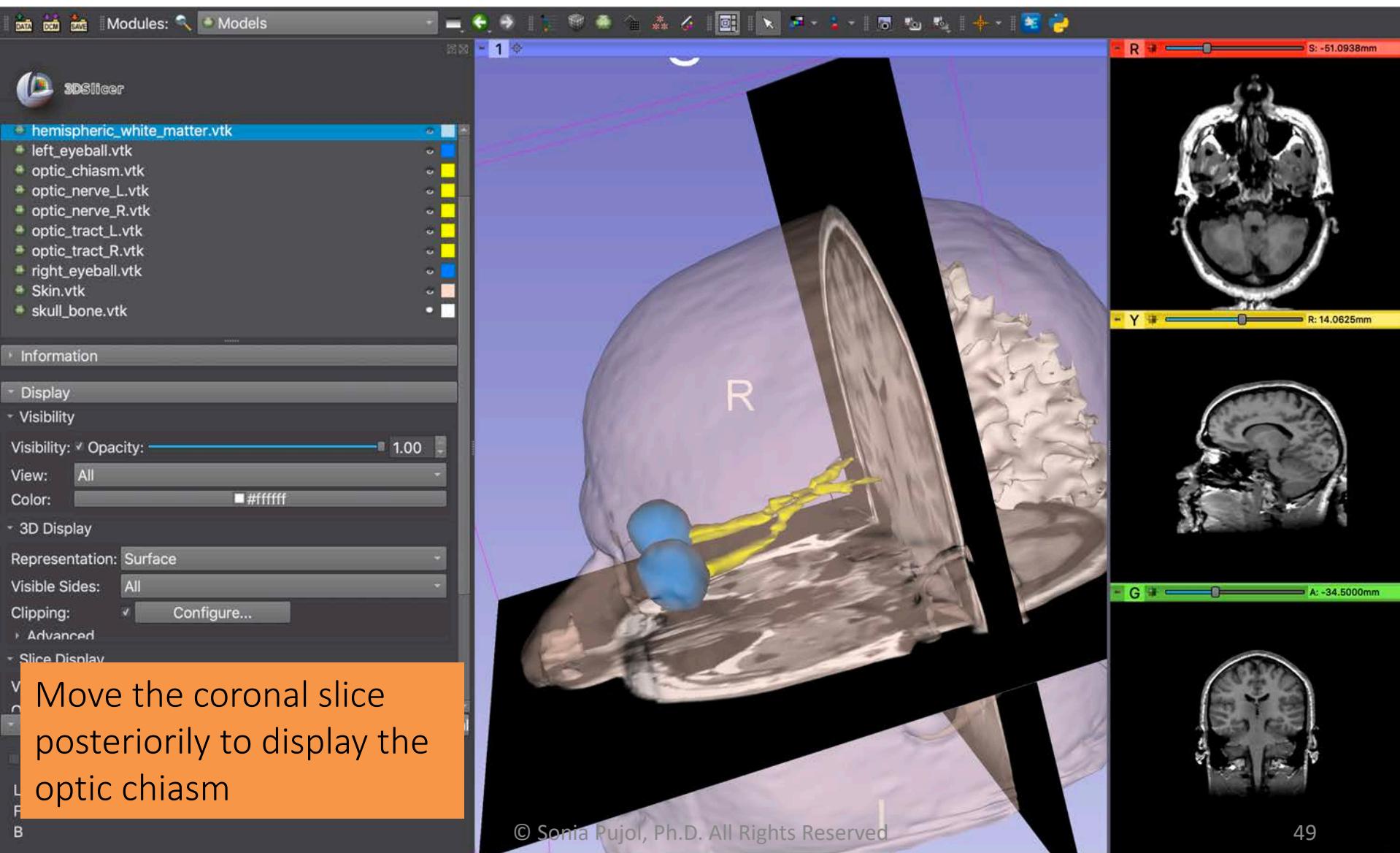
# Interacting with 3D models



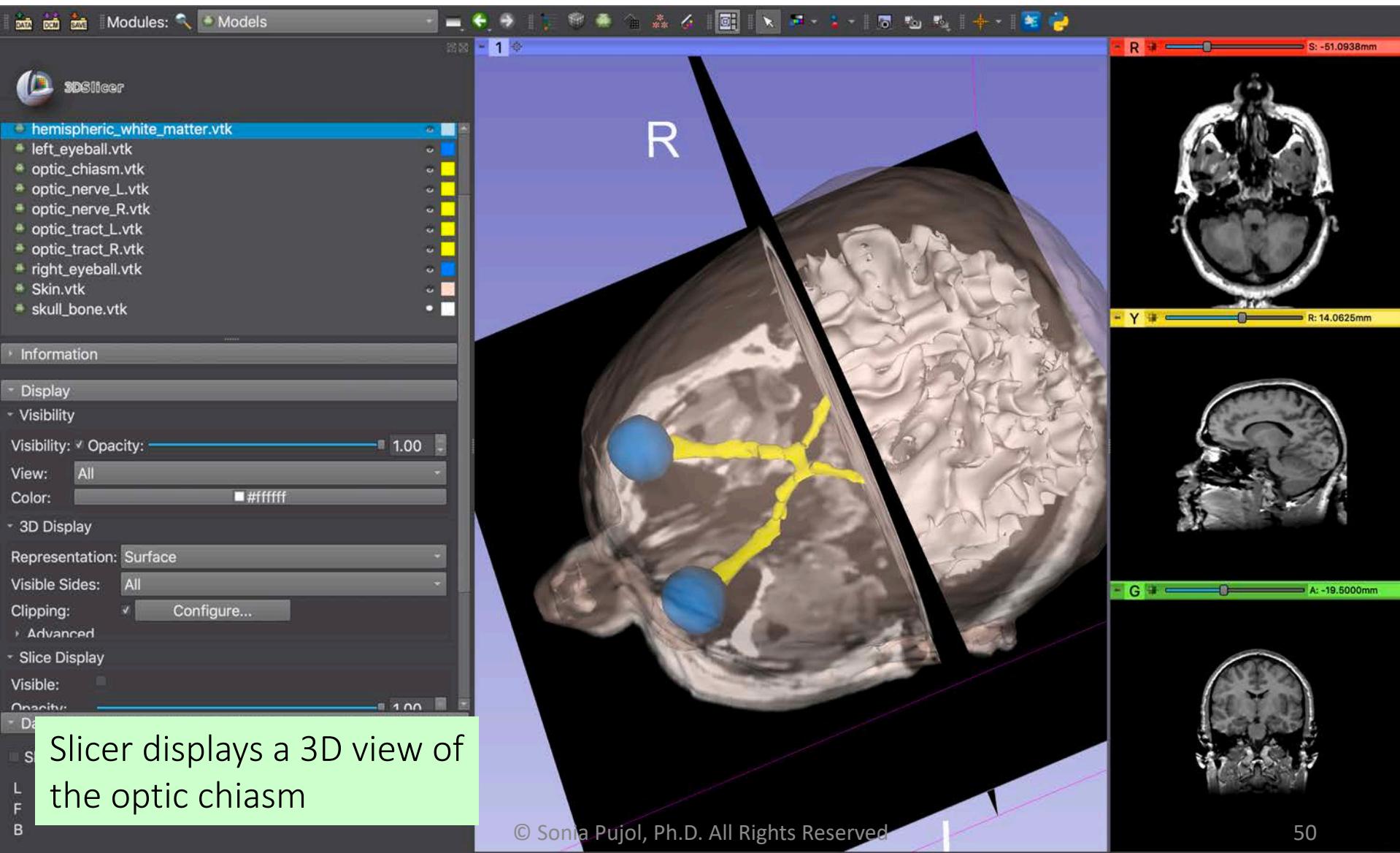
# Interacting with 3D models



# Interacting with 3D models



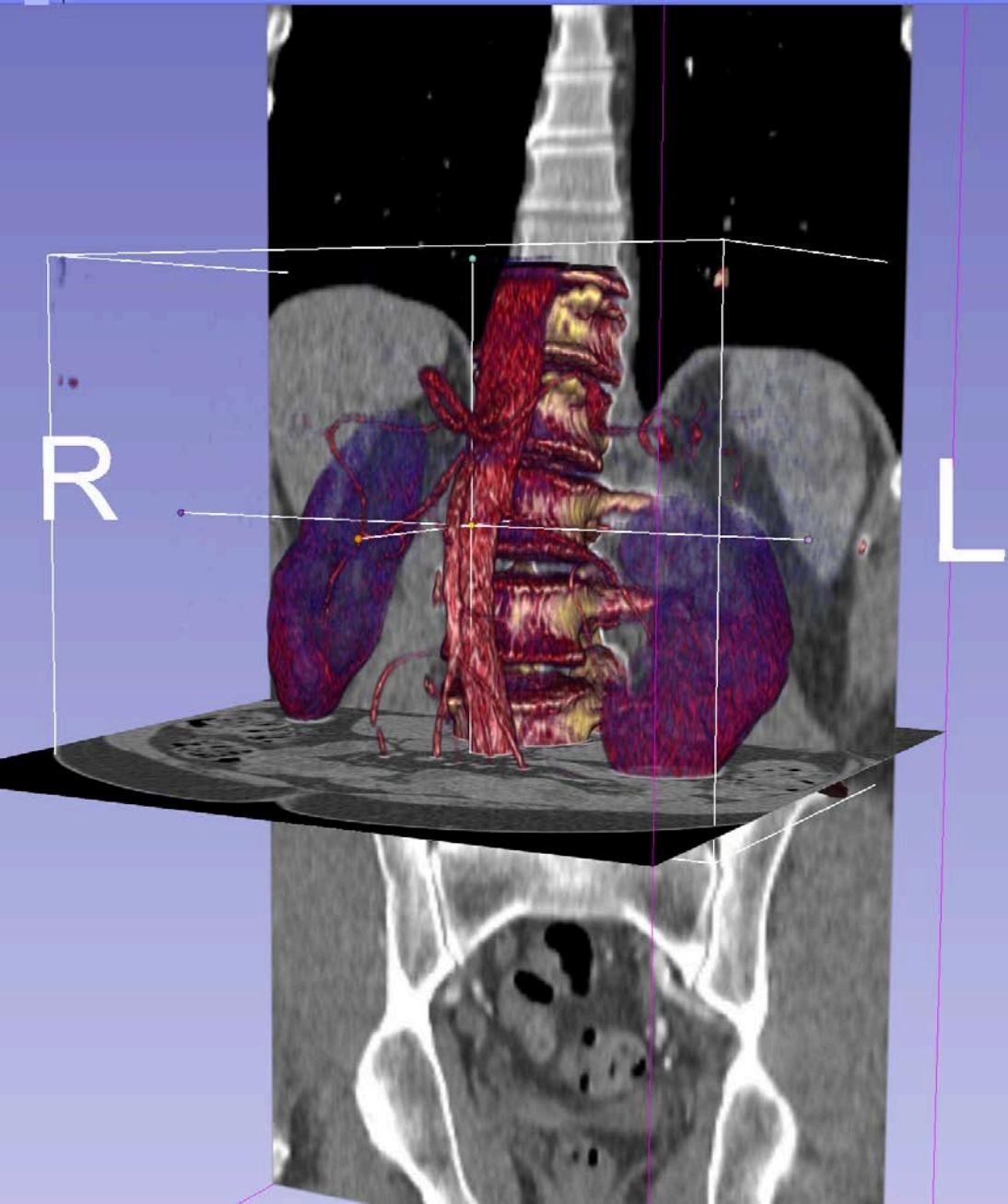
# Interacting with 3D models



# Conclusion

- 3D Slicer provides advanced functionalities for loading and viewing 3D medical imaging data
- The tutorial demonstrates how to use volume rendering and 3D surface modeling for interactive visualization of CT and MRI data

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# Acknowledgments



Neuroimage Analysis  
Center  
(NIBIB P41 EB015902)