3D Data Loading and Visualization

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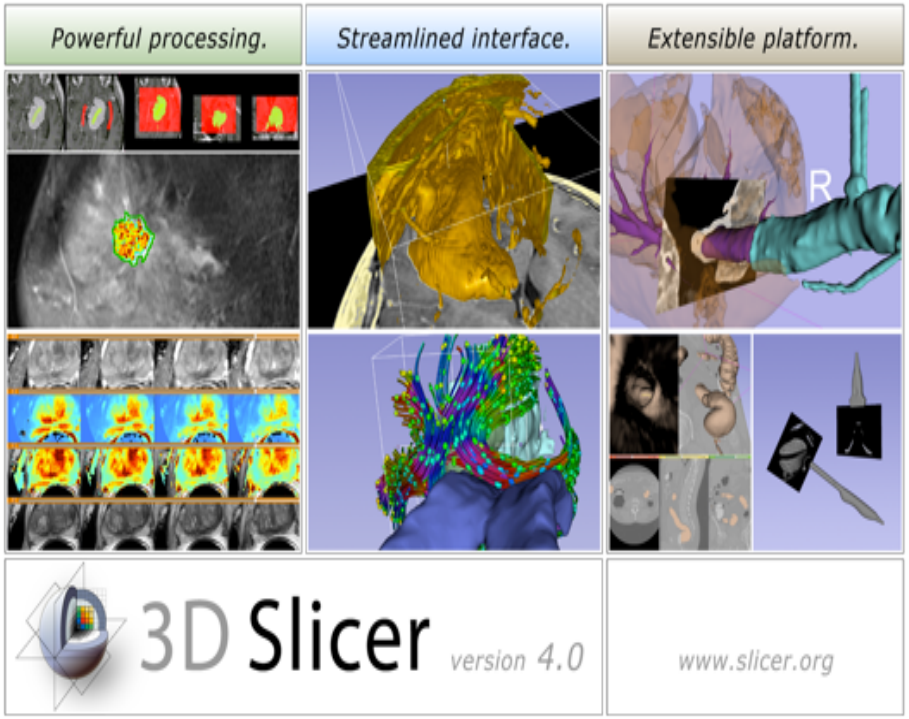
Harvard University

3DSlicer

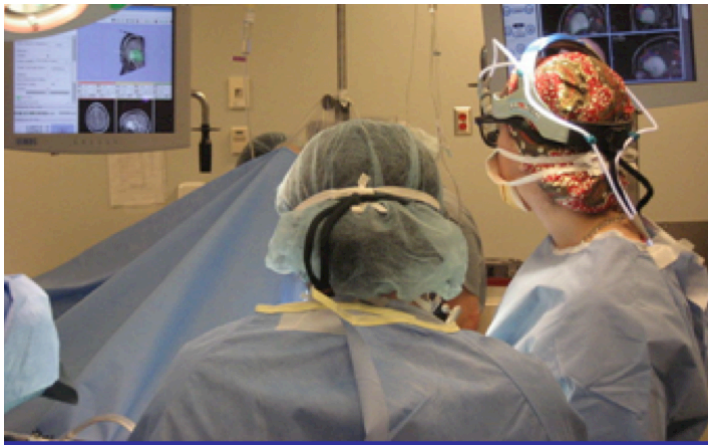


Slicer is a freely available open-source platform for segmentation, registration and 3D visualization of medical imaging data.

3DSlicer is a multi-institutional effort supported by the National Institute of Health.

Translational research

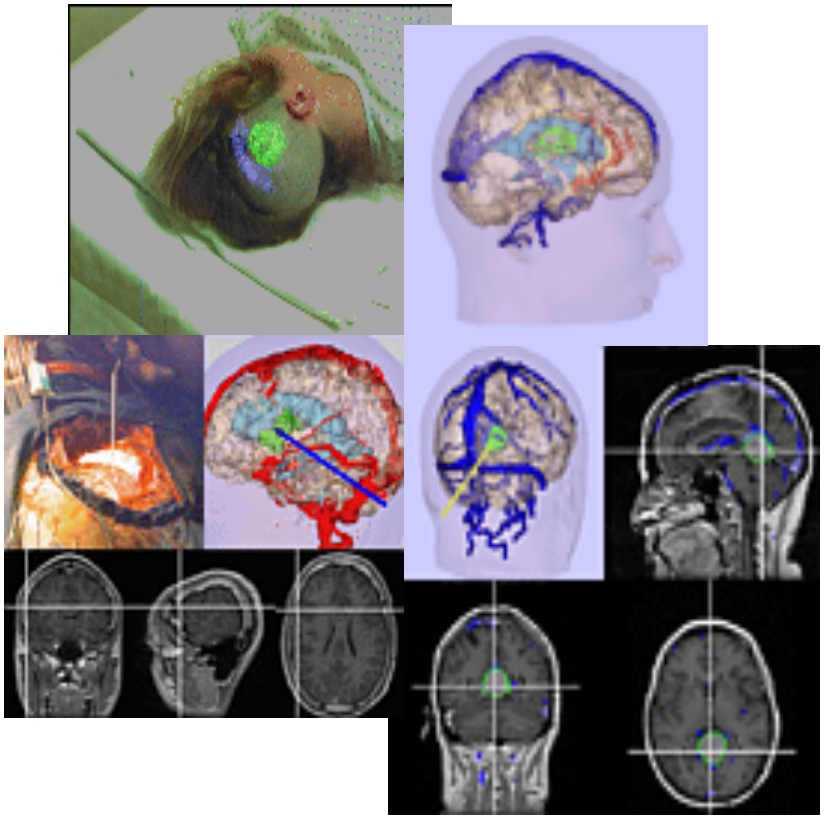
An open-source environment
for software developers



An end-user application
for clinical investigators
and scientists

3D Slicer: an open-source platform for
translating innovative algorithms into
clinical research applications

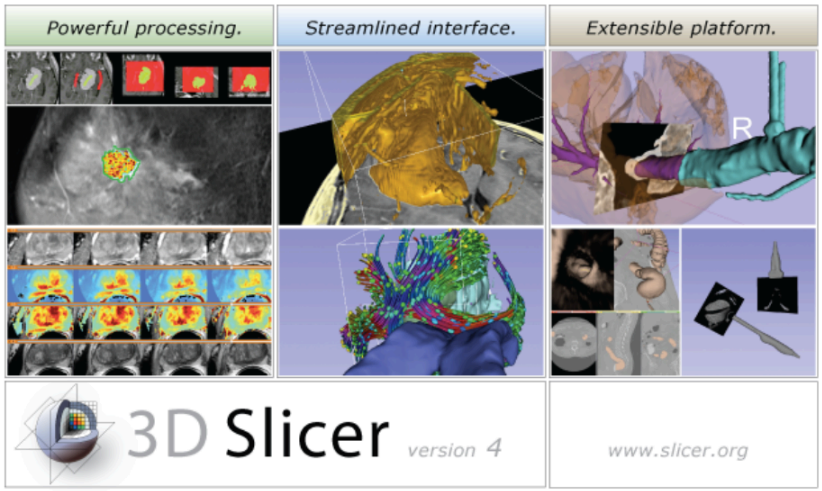
3DSlicer History



- 1997: Slicer started as a research project between the Surgical Planning Lab (Harvard) and the CSAIL (MIT)

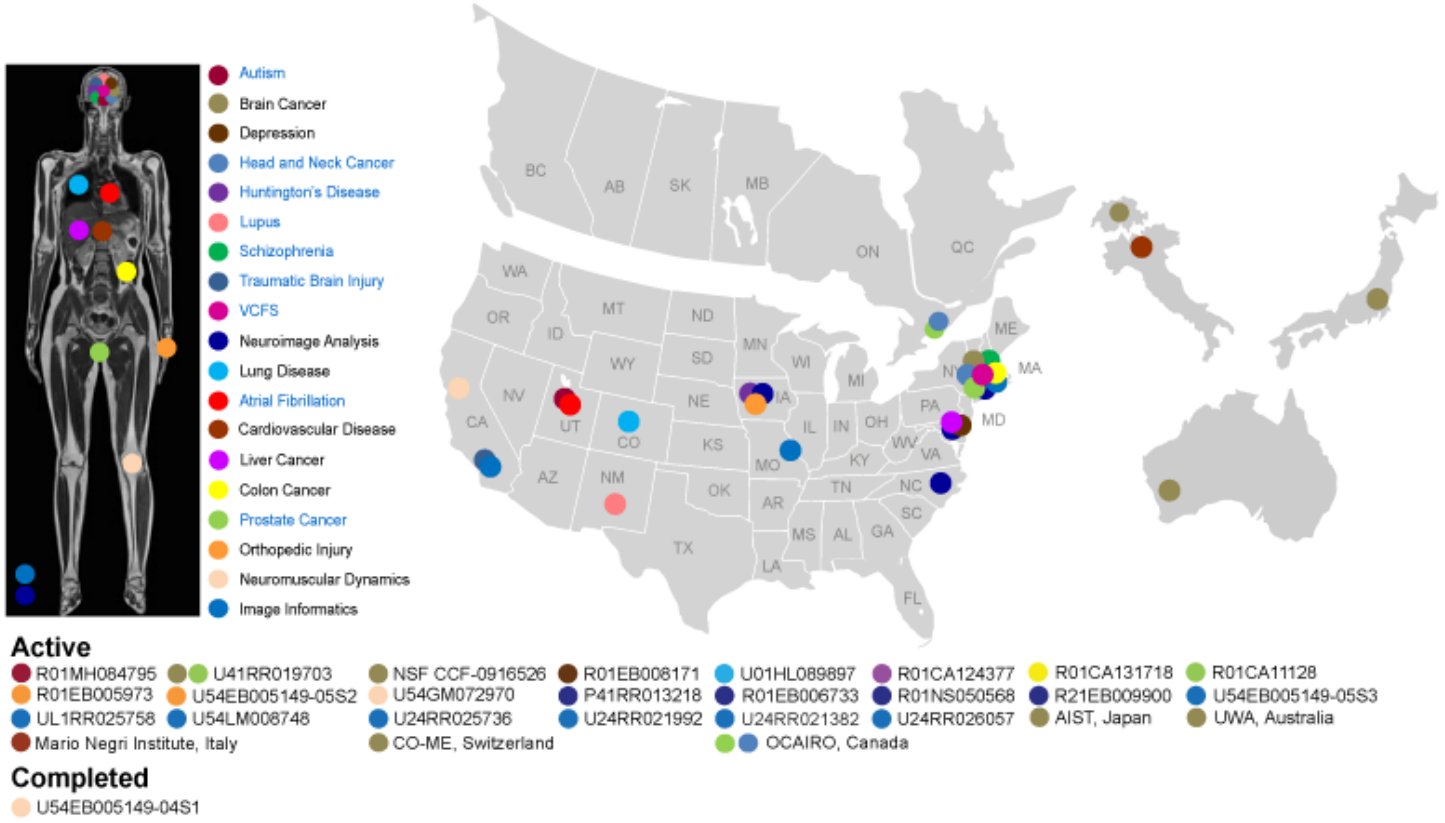
Image Courtesy of the CSAIL, MIT

3DSlicer History



- 1997: Slicer started as a research project between the Surgical Planning Lab (Harvard) and the CSAIL (MIT)
- 2016: Multi-institution effort to share the latest advances in image analysis with clinicians and scientists

A Multi-institution Effort



Active

R01MH084795, U41RR019703, NSF CCF-0916526, R01EB008171, U01HL089897, R01CA124377, R01CA131718, R01CA11128
R01EB005973, U54EB005149-05S2, U54GM072970, P41RR013218, R01EB006733, R01NS050568, R21EB009900, U54EB005149-05S3
UL1RR025758, U54LM008748, U24RR025736, U24RR021992, U24RR021382, U24RR026057, AIST, Japan, UWA, Australia
Mario Negri Institute, Italy, CO-ME, Switzerland, OCAIRO, Canada

Completed

U54EB005149-04S1

- Infrastructure grants fund the platform
- Collaborative projects (e.g. Canada, Japan, Australia, Italy) fund the application packages

Slicer Is Open

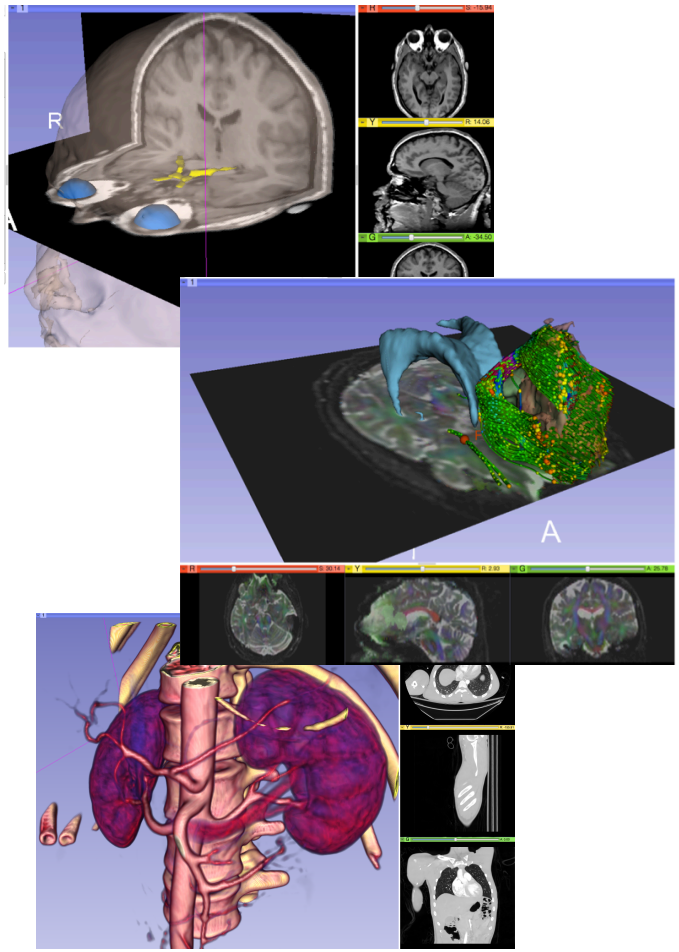
- Open Science
  =
  Open Source
  +
  Open Data
  +
  Open Community

Madrid 2012

Iowa City, USA 2012

Courtesy R. Kikinis

Slicer Open Community

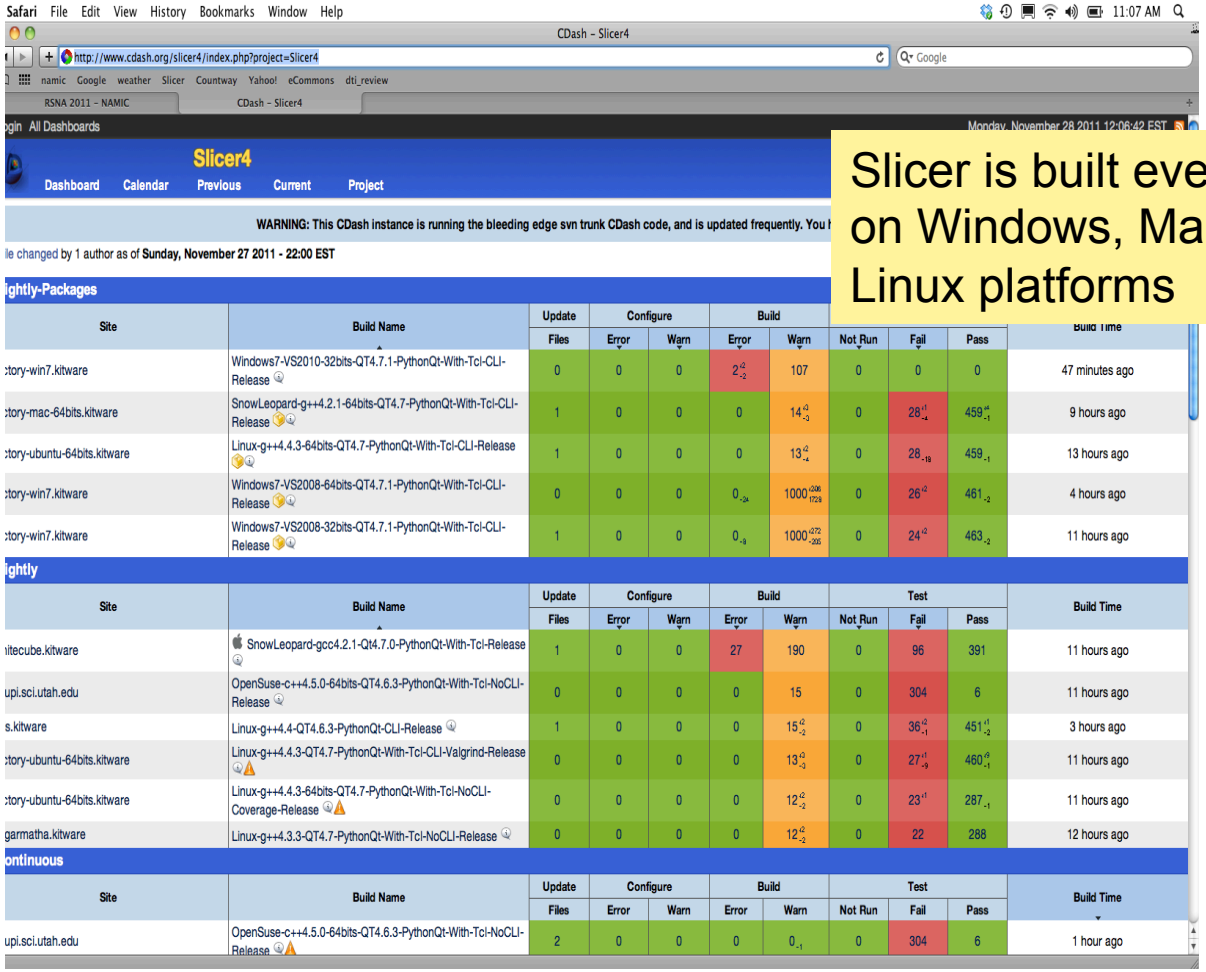


- 80 authorized developers contributing to the source code of Slicer
- Over 700 subscribers on Slicer user and Slicer developer mailing list

3D Slicer in practice

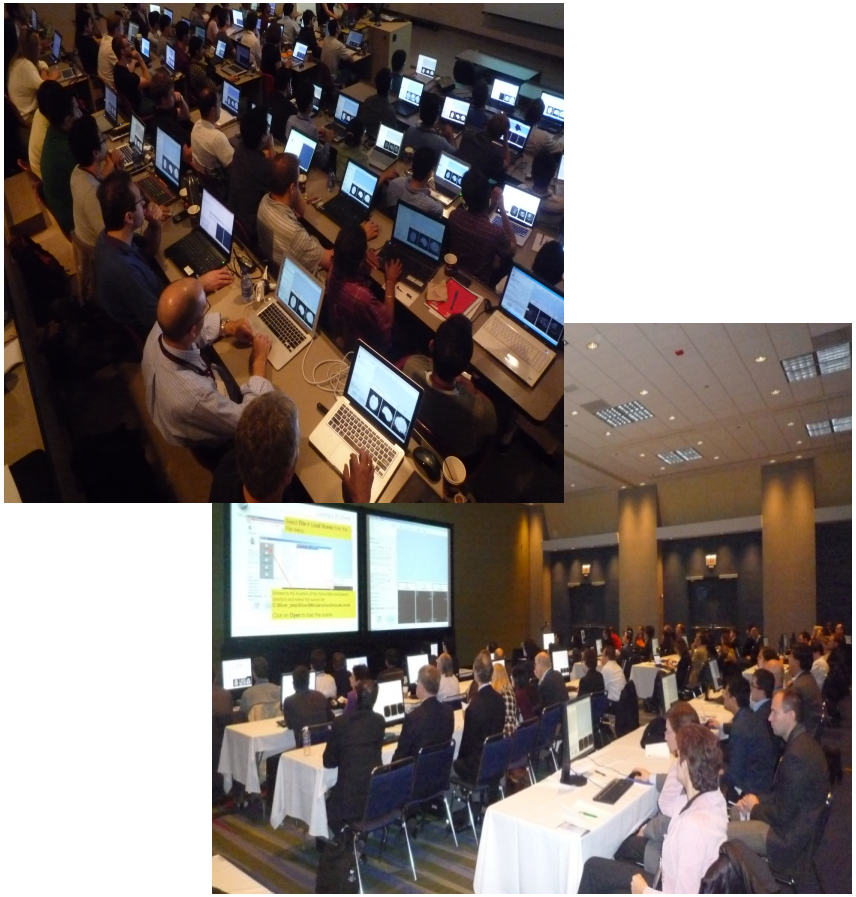
- Slicer is open-source
- Slicer works on Windows, Linux, and Mac
- Slicer is distributed under a BSD-style license agreement with no restriction on use

Slicer: Behind the scenes



Slicer is built every night on Windows, Mac and Linux platforms

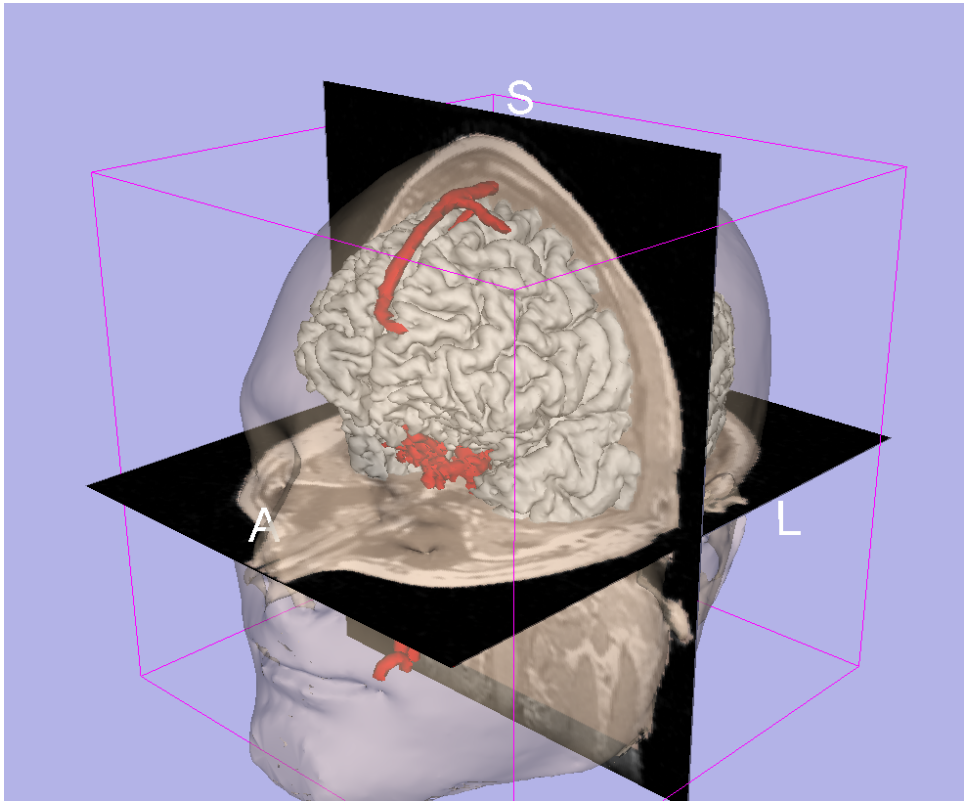
Slicer Training



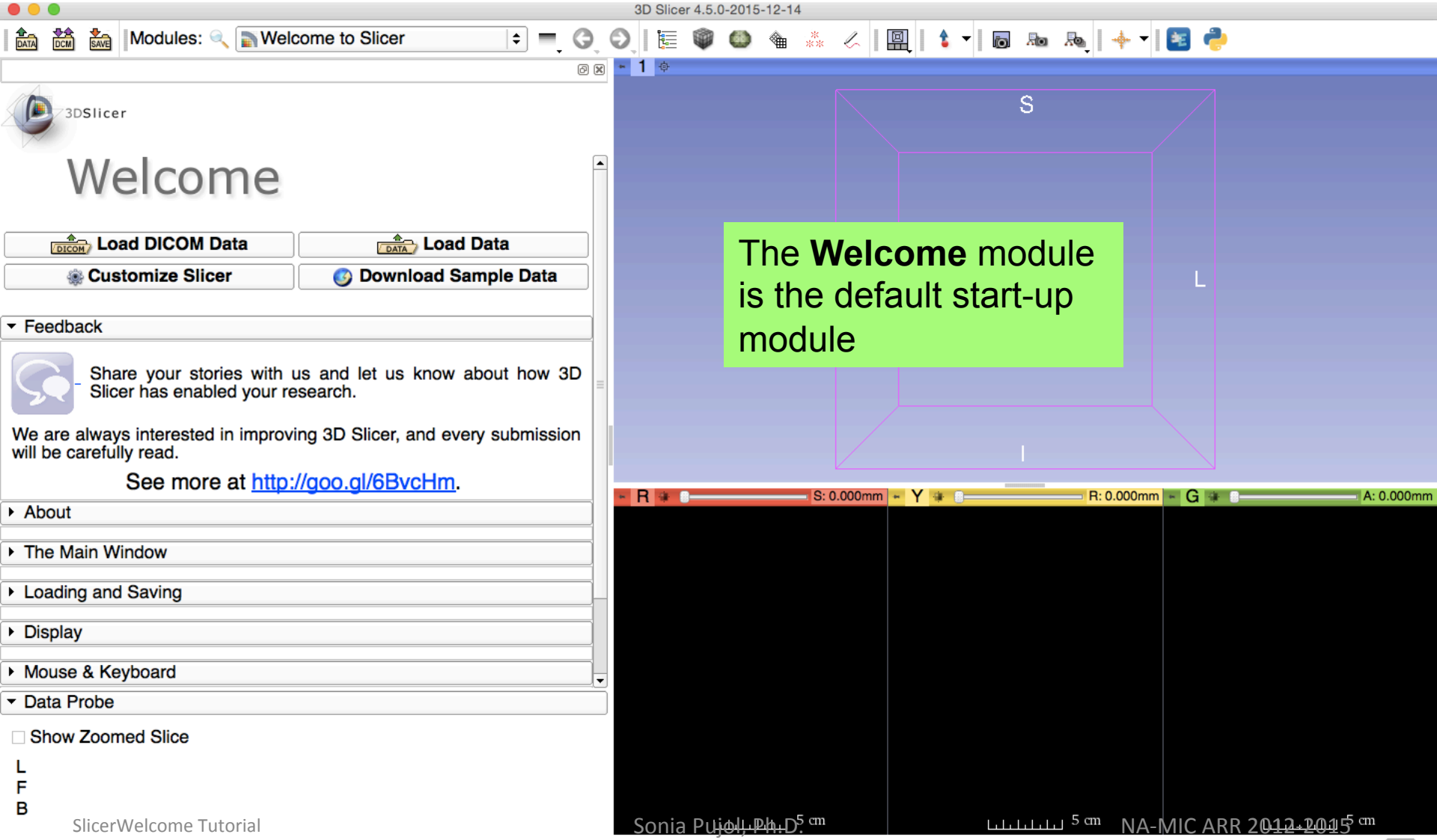
- Hands-on training workshops at national and international venues
- >2,300 clinicians, clinical researchers and scientists trained since 2005

3D Visualization of the Anatomy

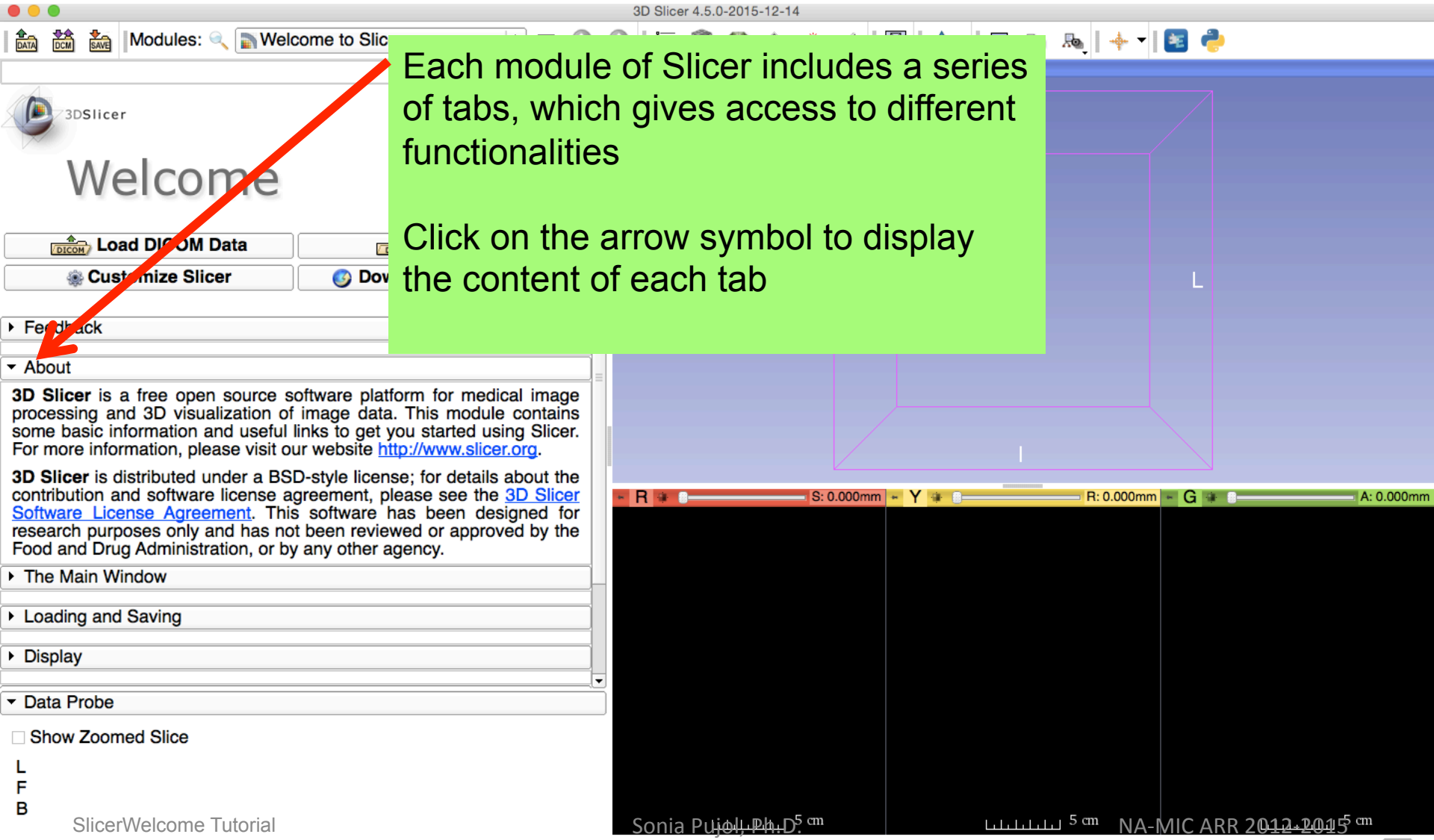
Following this tutorial, you will be able to load and visualize volumes within Slicer4, and to interact in 3D with structural images and models of the anatomy.



3DSlicer Version4



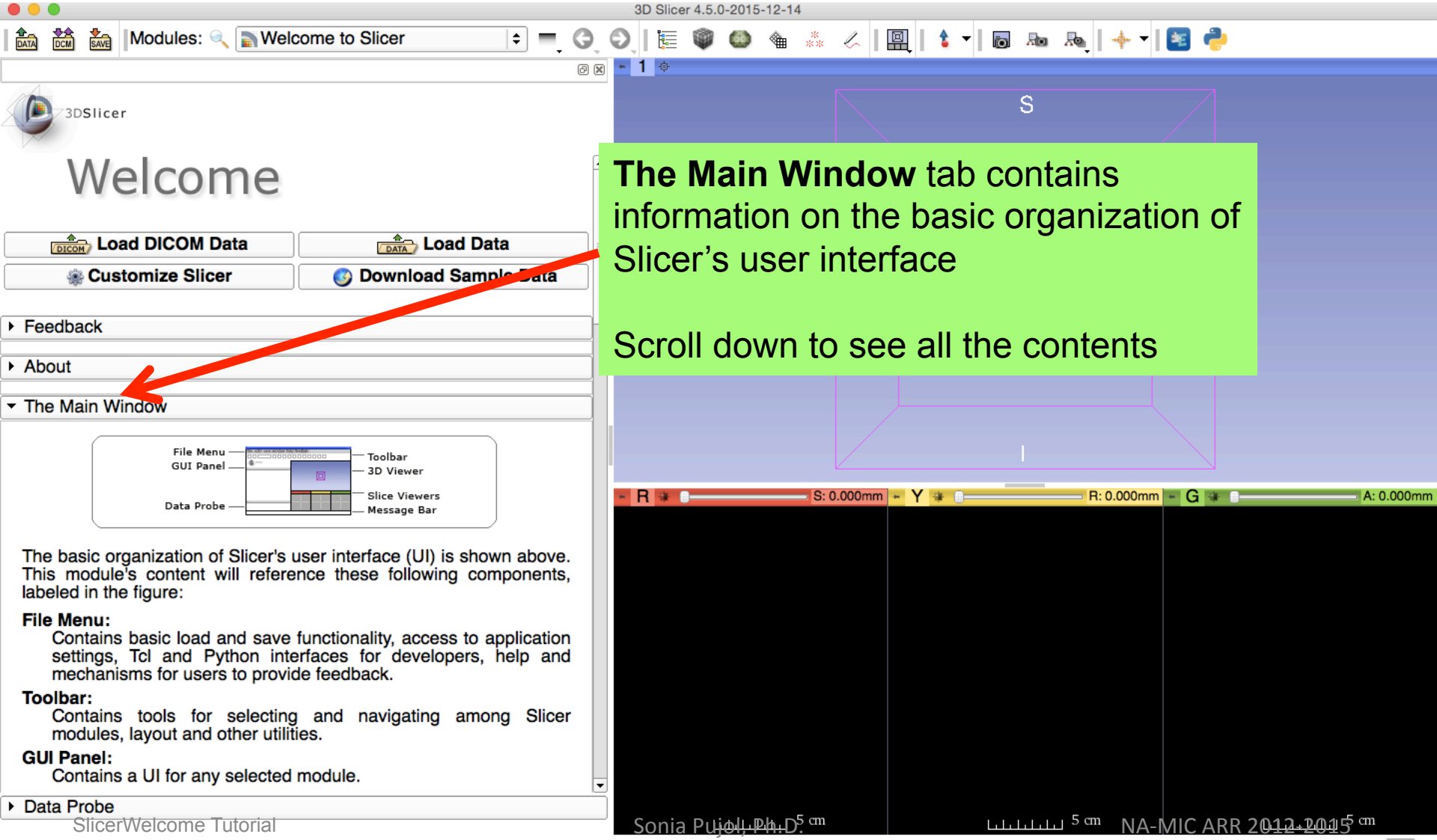
3DSlicer Version4



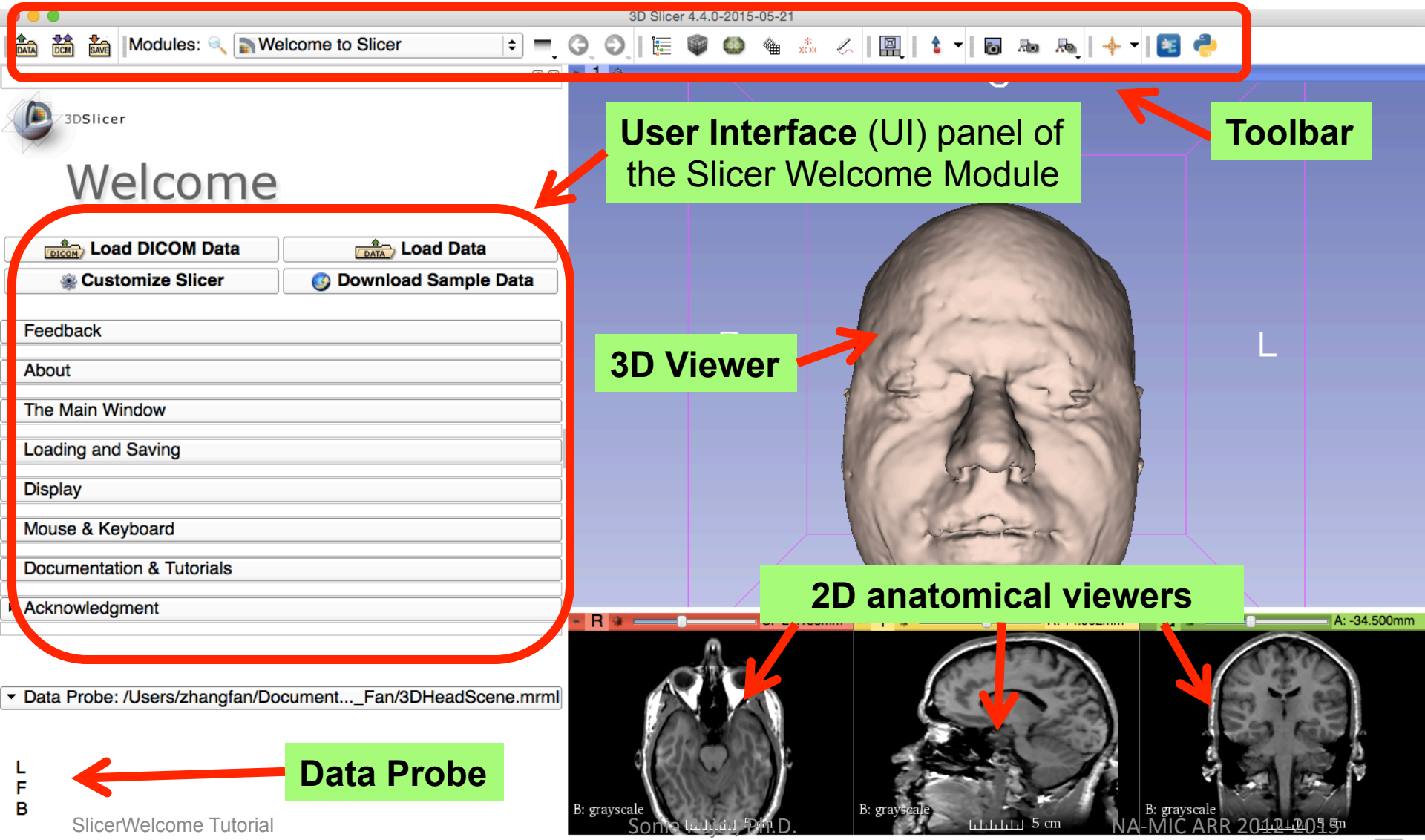
Each module of Slicer includes a series of tabs, which gives access to different functionalities

Click on the arrow symbol to display the content of each tab

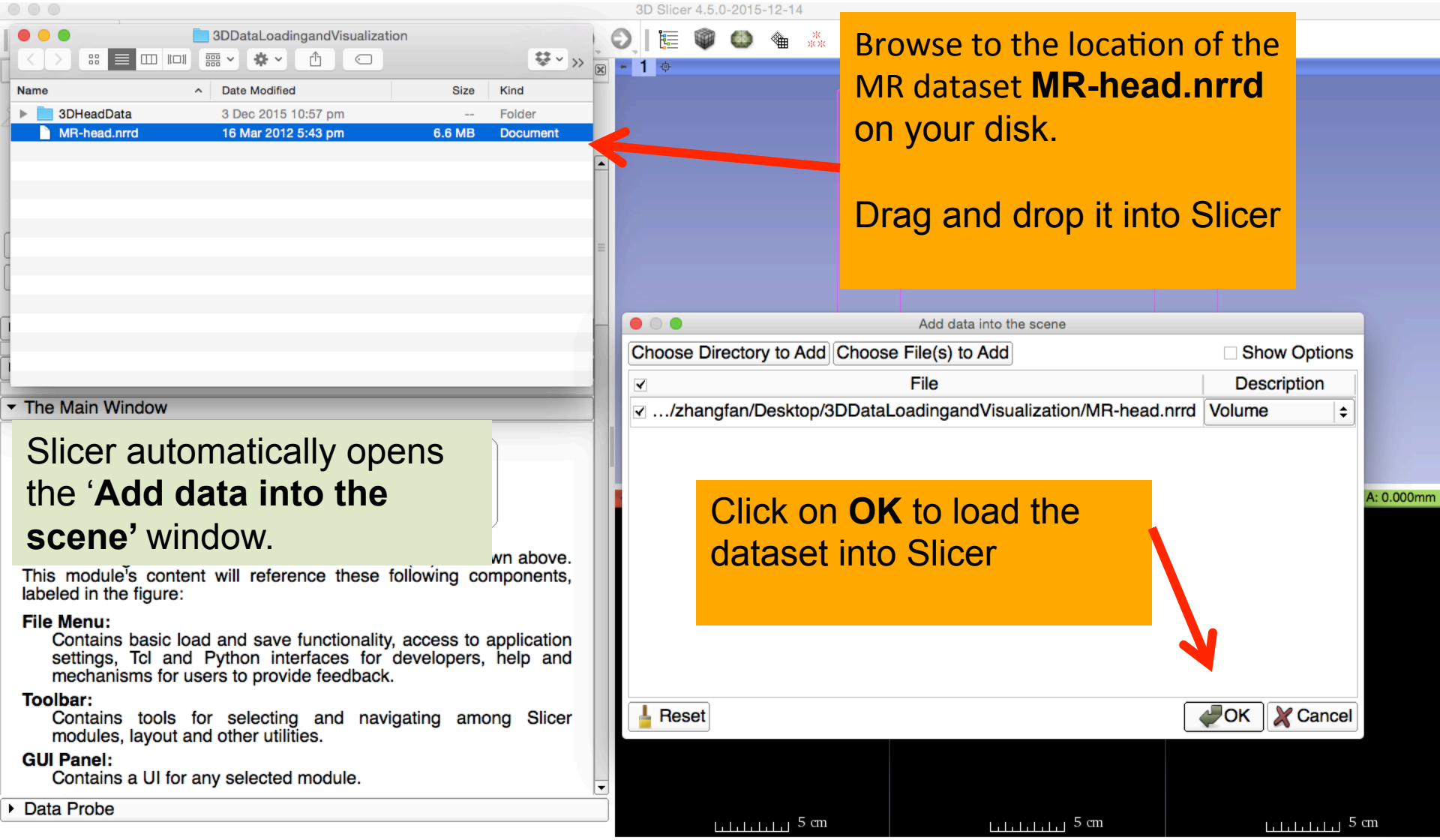
3DSlicer Version4



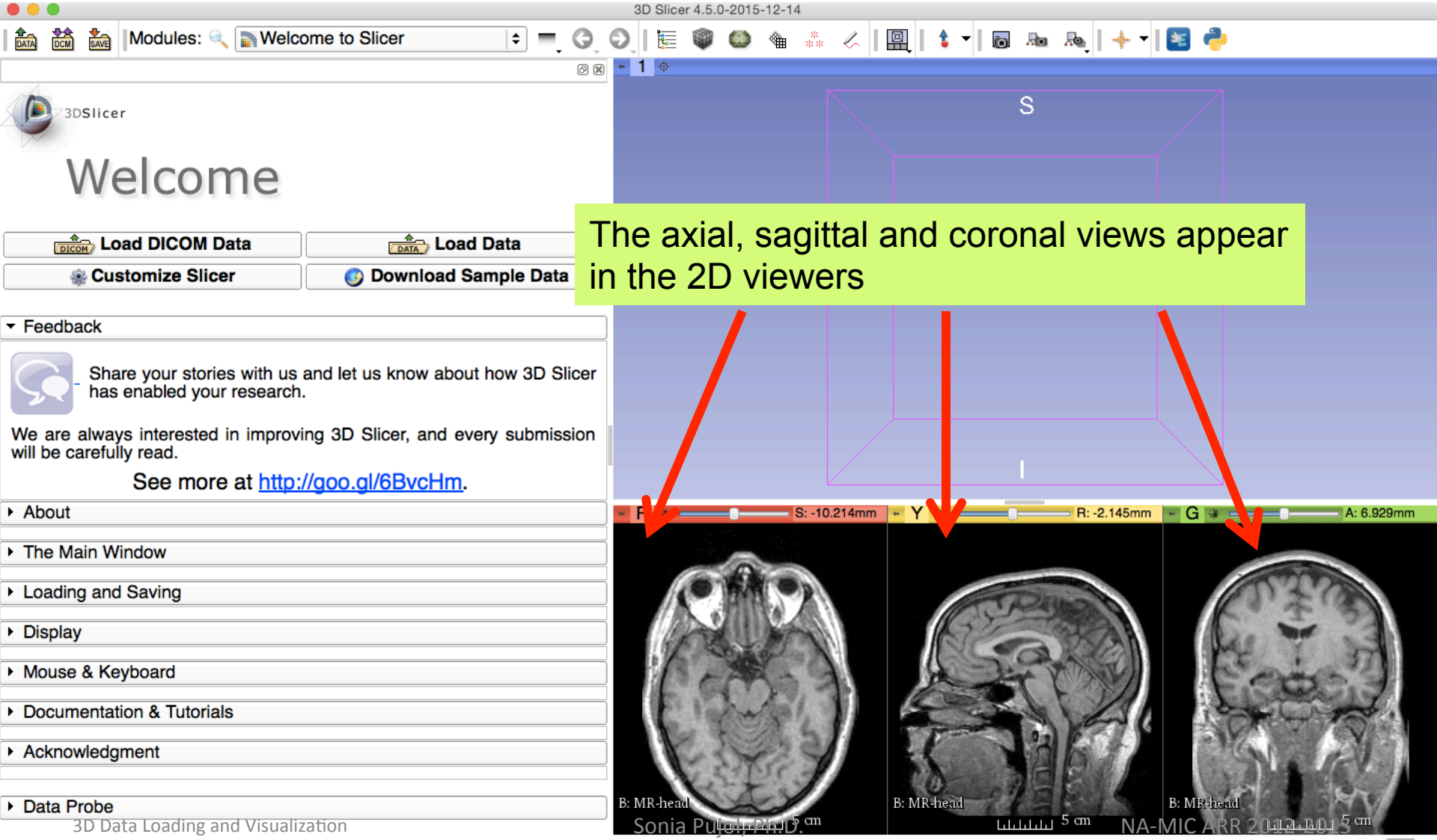
Slicer User Interface



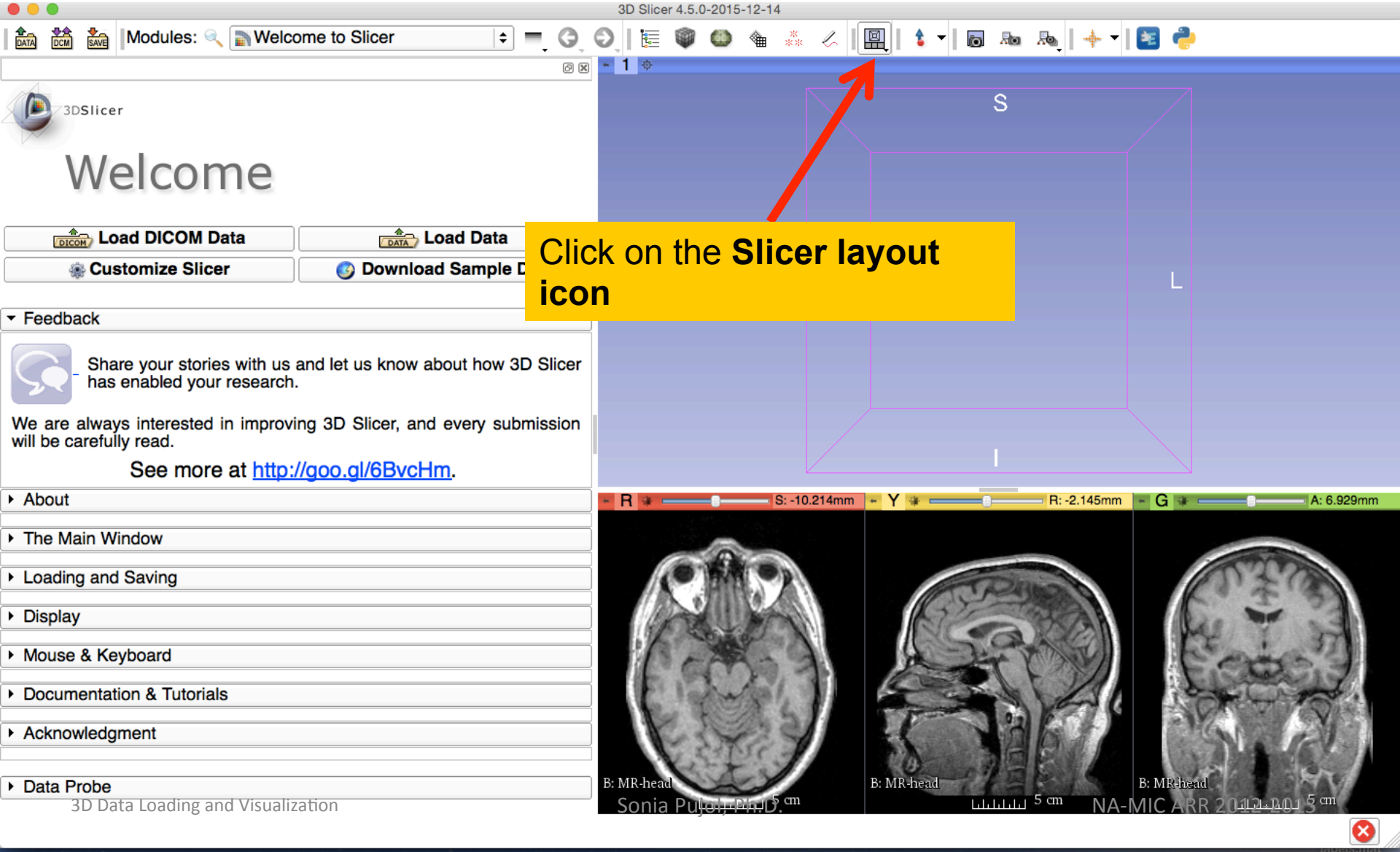
Slicer4


3D Slicer 4.5.0-2015-12-14
3DDataLoadingandVisualization
Name
Date Modified
Size
Kind
3DHeadData
3 Dec 2015 10:57 pm
Folder
MR-head.nrrd
16 Mar 2012 5:43 pm
6.6 MB
Document
Browse to the location of the MR dataset MR-head.nrrd on your disk.
Drag and drop it into Slicer
Add data into the scene
Choose Directory to Add
Choose File(s) to Add
Show Options
File
Description
.../zhangfan/Desktop/3DDataLoadingandVisualization/MR-head.nrrd
Volume
Click on OK to load the dataset into Slicer
Reset
OK
Cancel
The Main Window
Slicer automatically opens the 'Add data into the scene' window.
This module's content will reference these following components, labeled in the figure:
File Menu:
Contains basic load and save functionality, access to application settings, Tcl and Python interfaces for developers, help and mechanisms for users to provide feedback.
Toolbar:
Contains tools for selecting and navigating among Slicer modules, layout and other utilities.
GUI Panel:
Contains a UI for any selected module.
Data Probe
5 cm
5 cm
5 cm

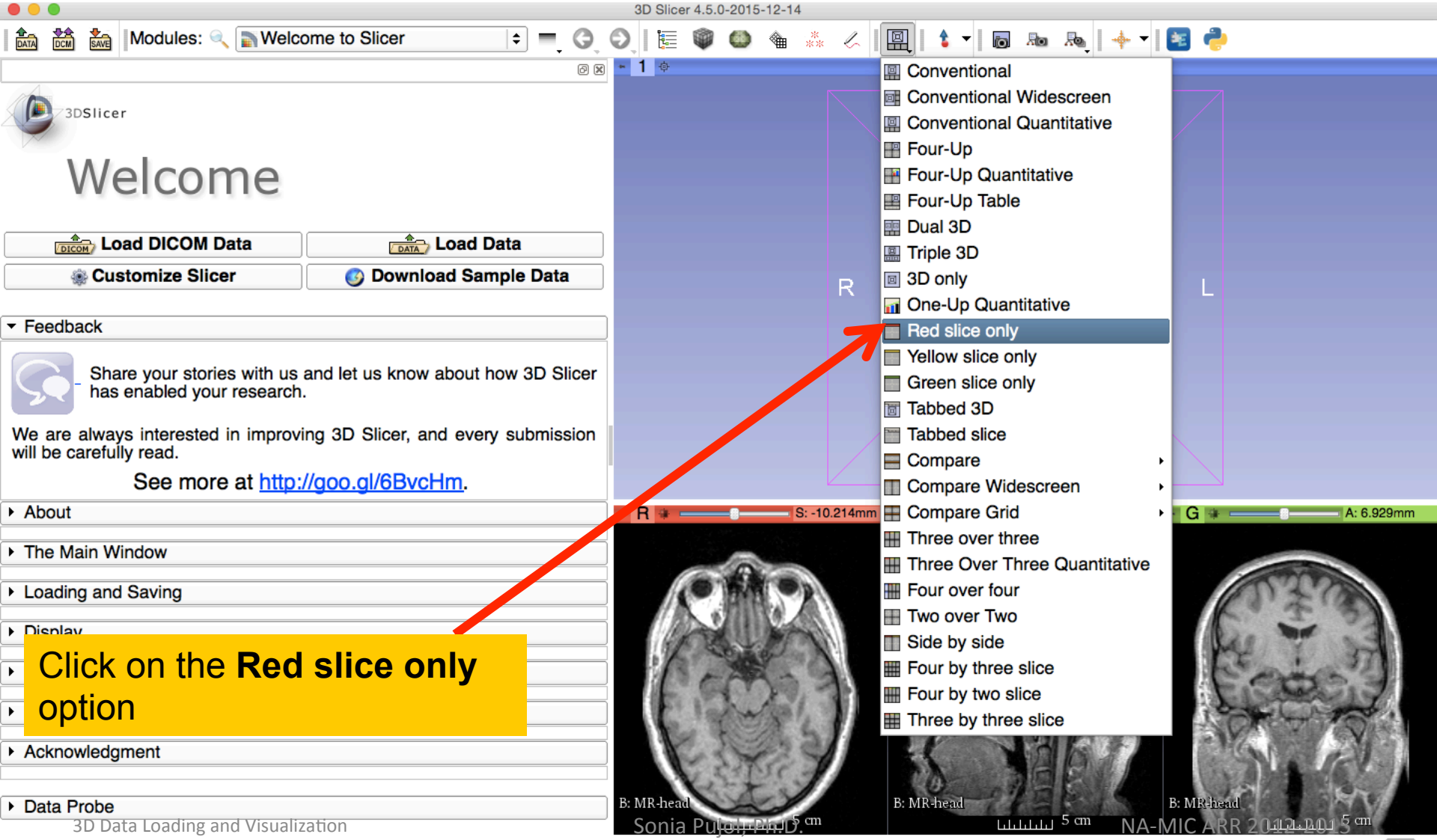
Loading a volume



Loading a volume

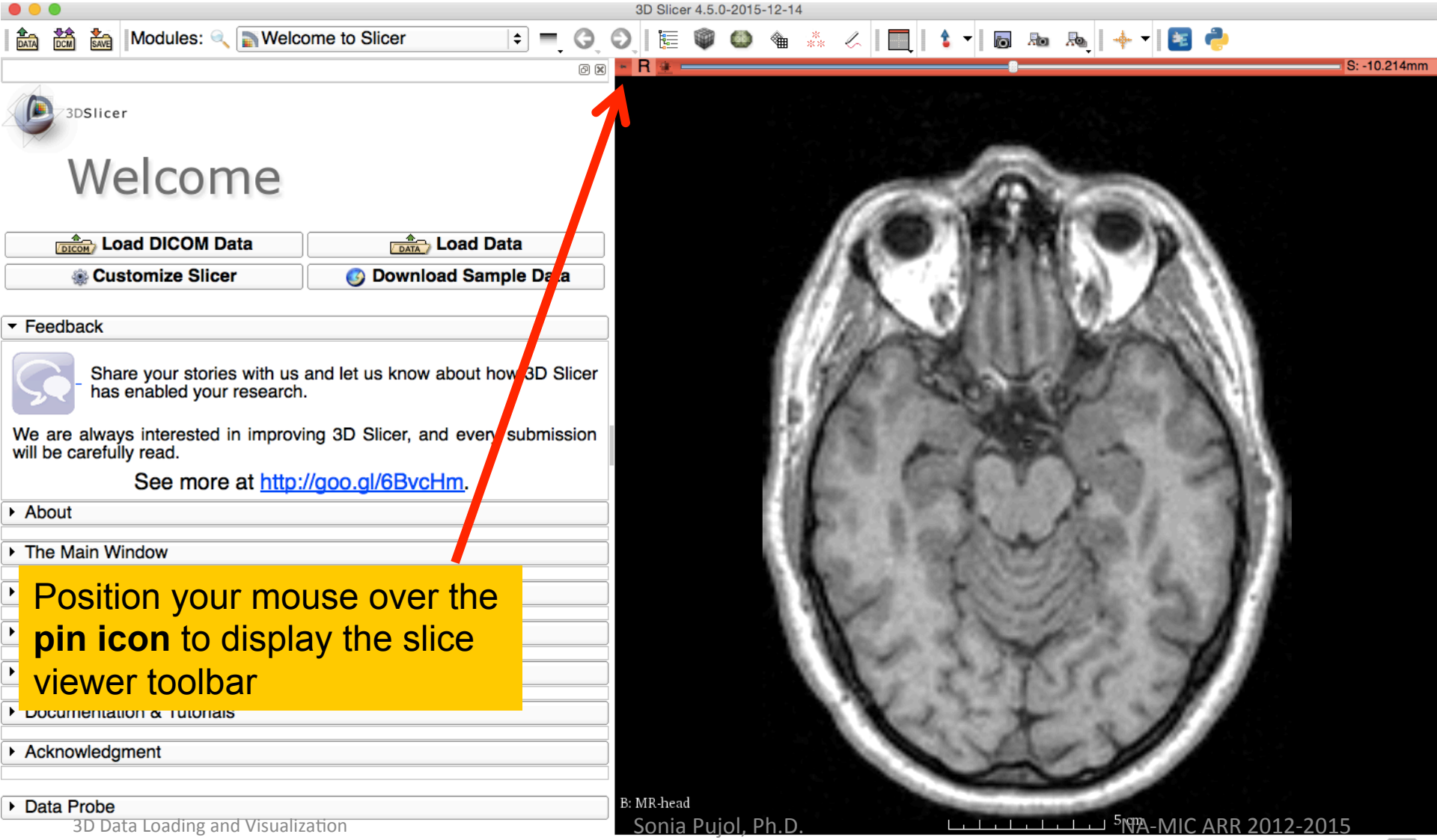


Loading a volume

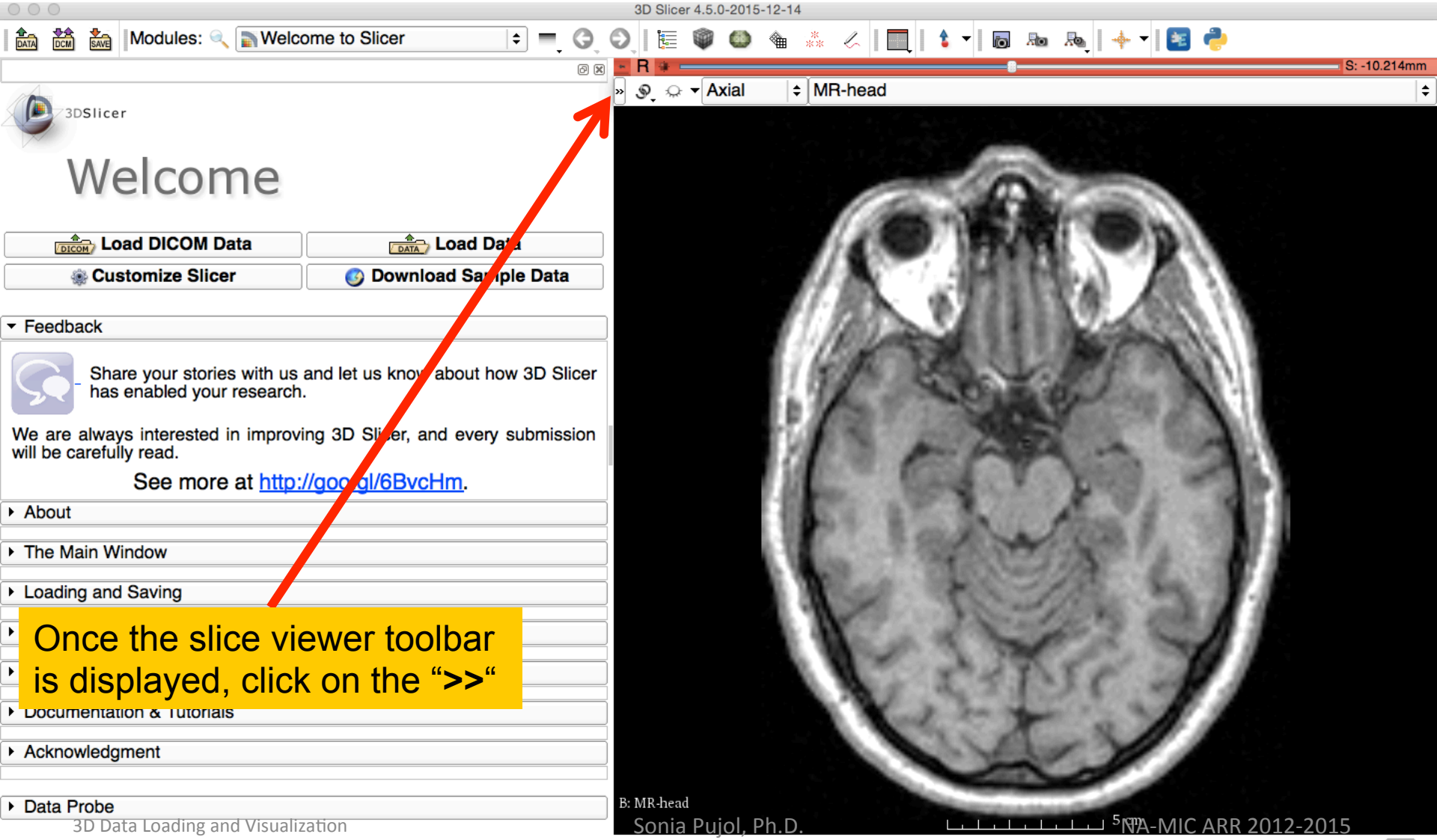


Click on the **Red slice only** option

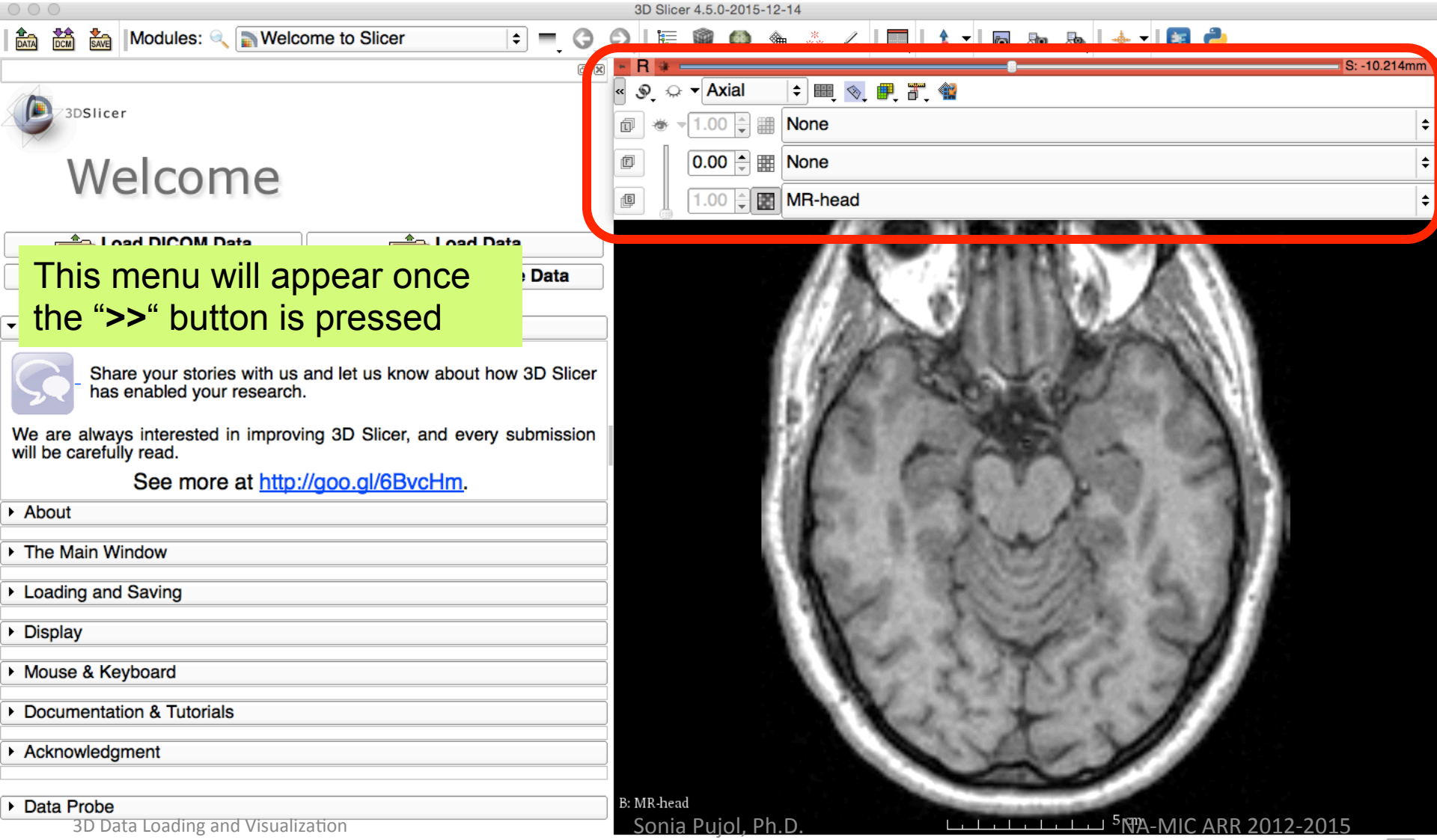
Loading a volume



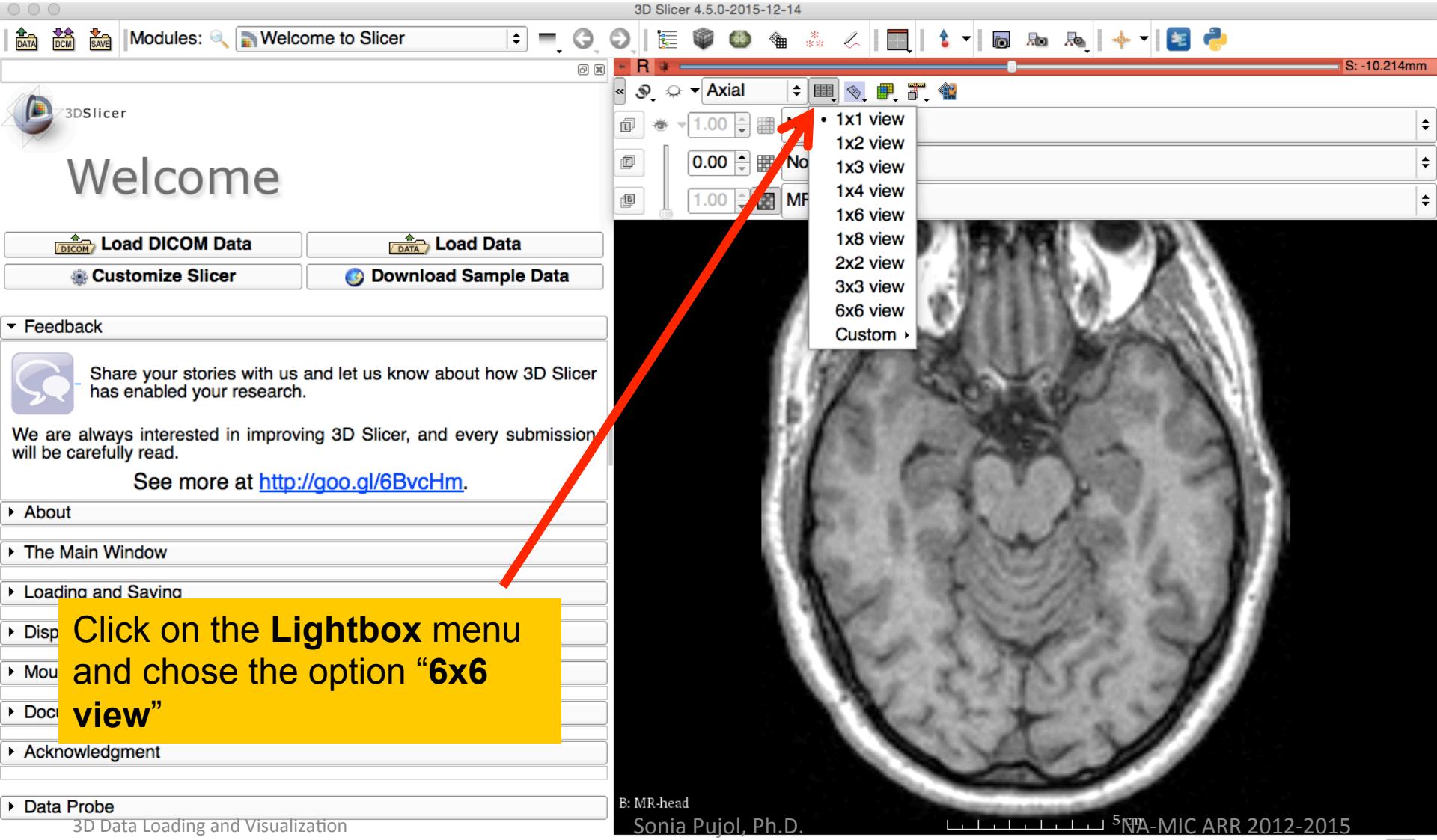
Loading a volume



Loading a volume

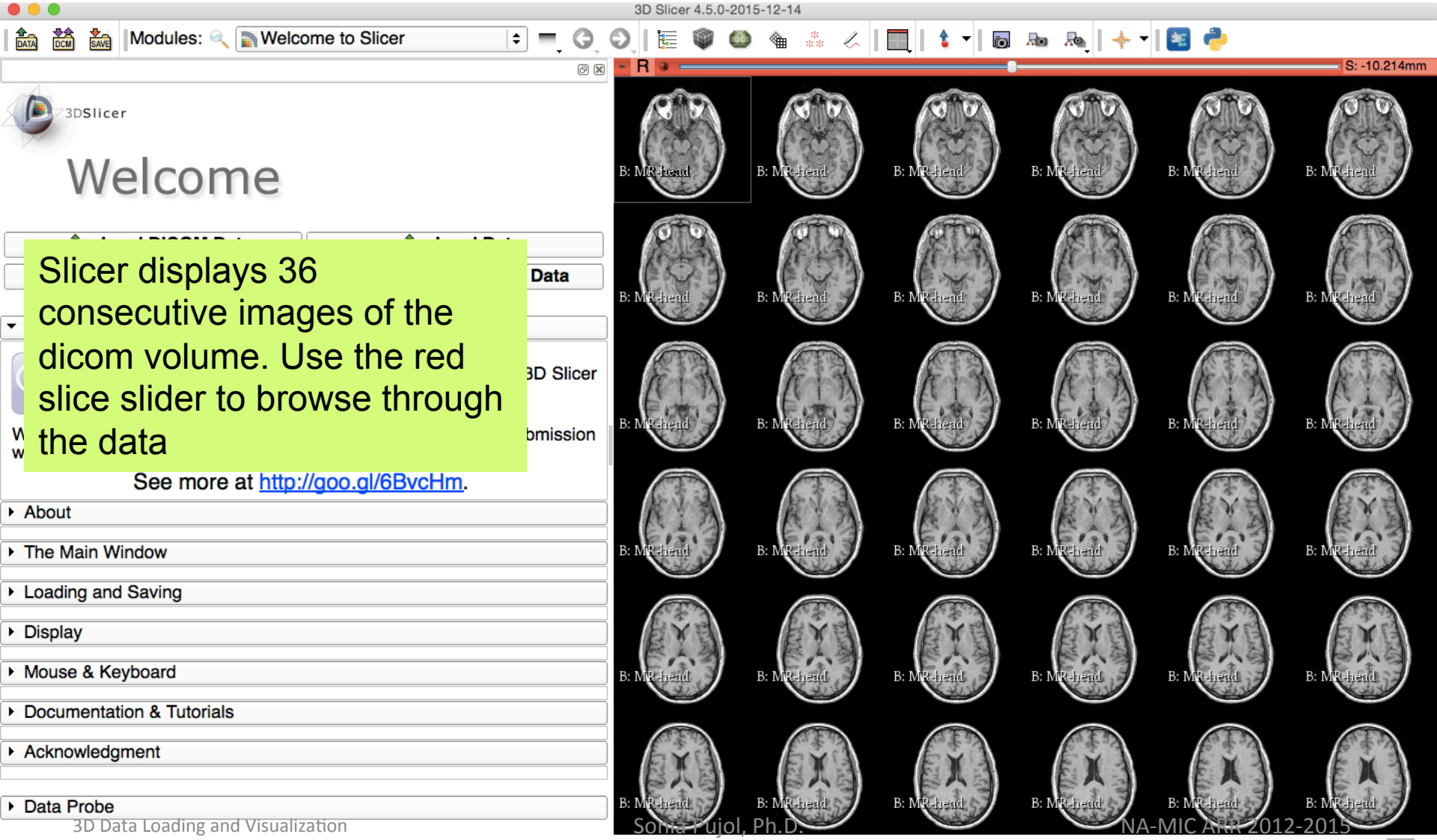


Loading a volume



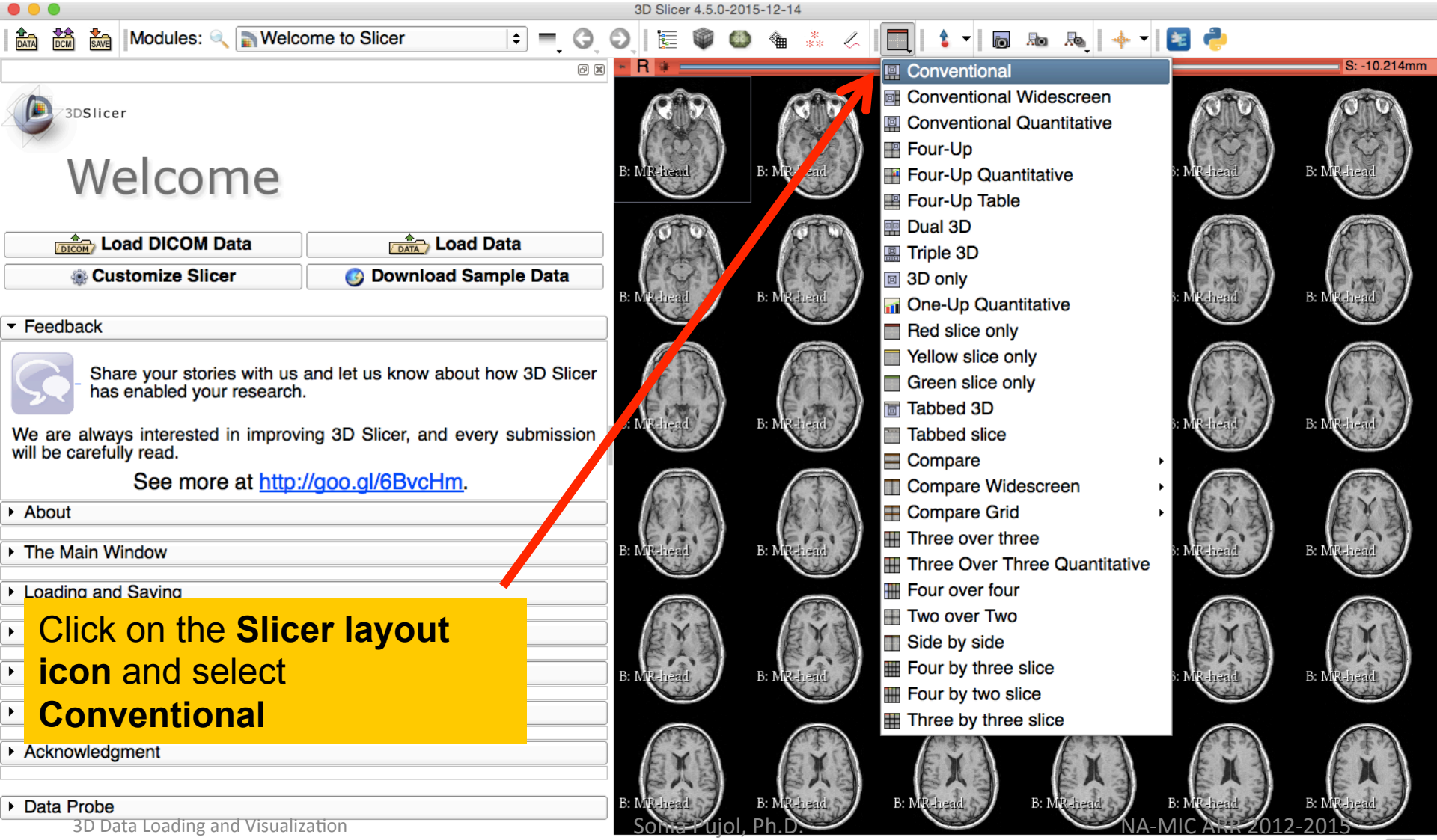
Click on the **Lightbox** menu and chose the option "**6x6 view**"

Loading a volume



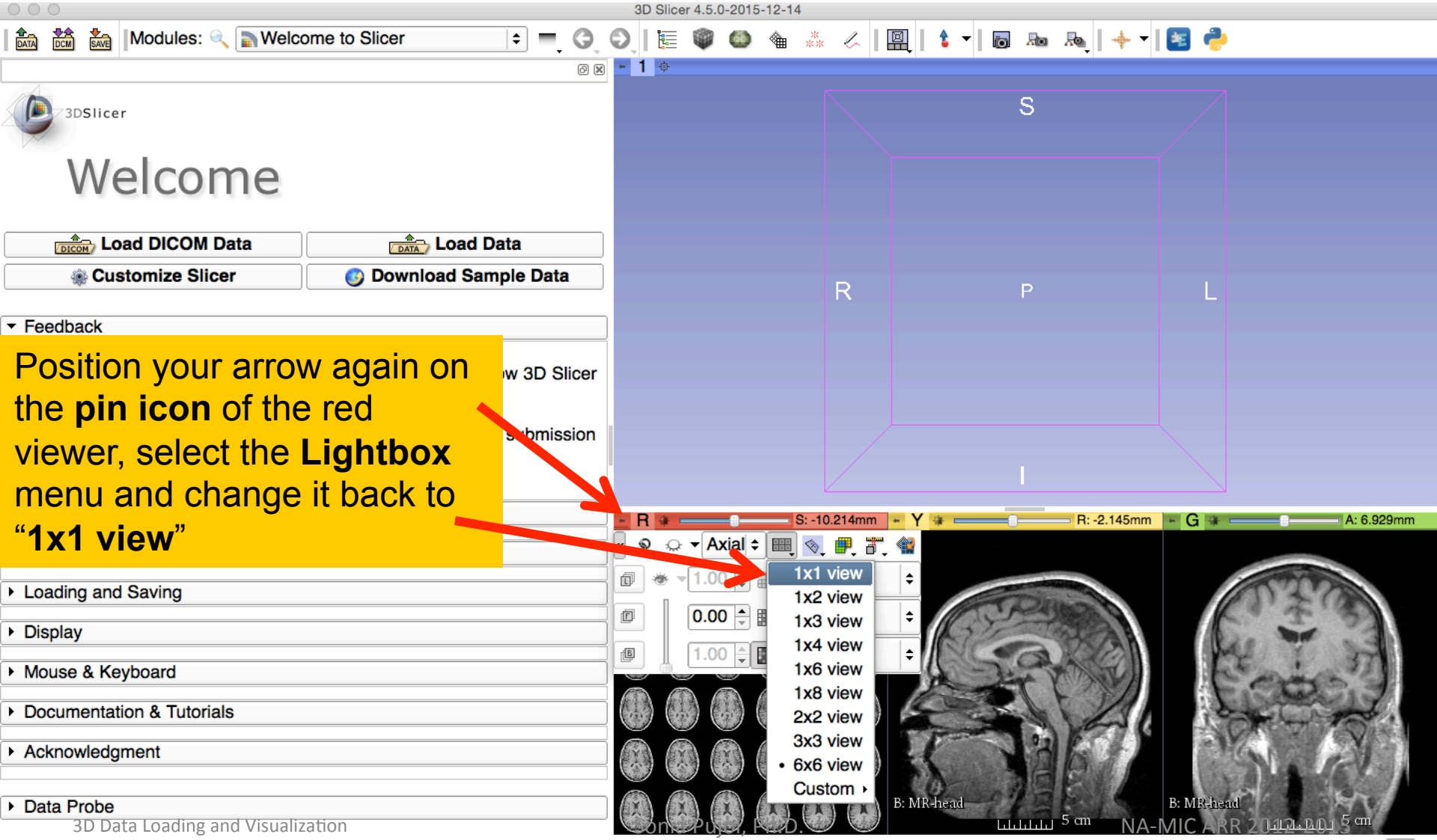
Slicer displays 36 consecutive images of the dicom volume. Use the red slice slider to browse through the data

Loading a volume



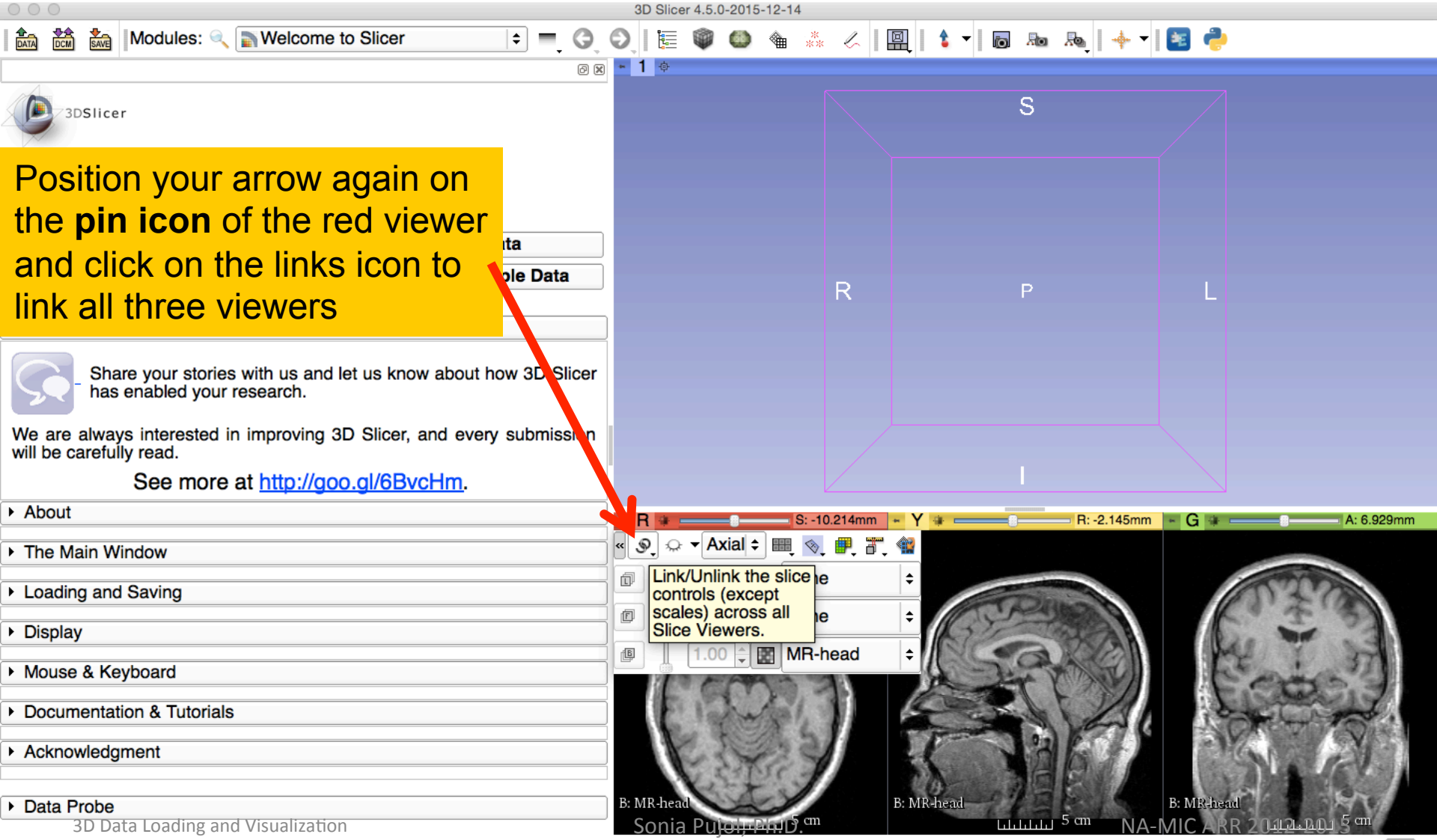
Click on the **Slicer layout icon** and select **Conventional**

Loading a volume

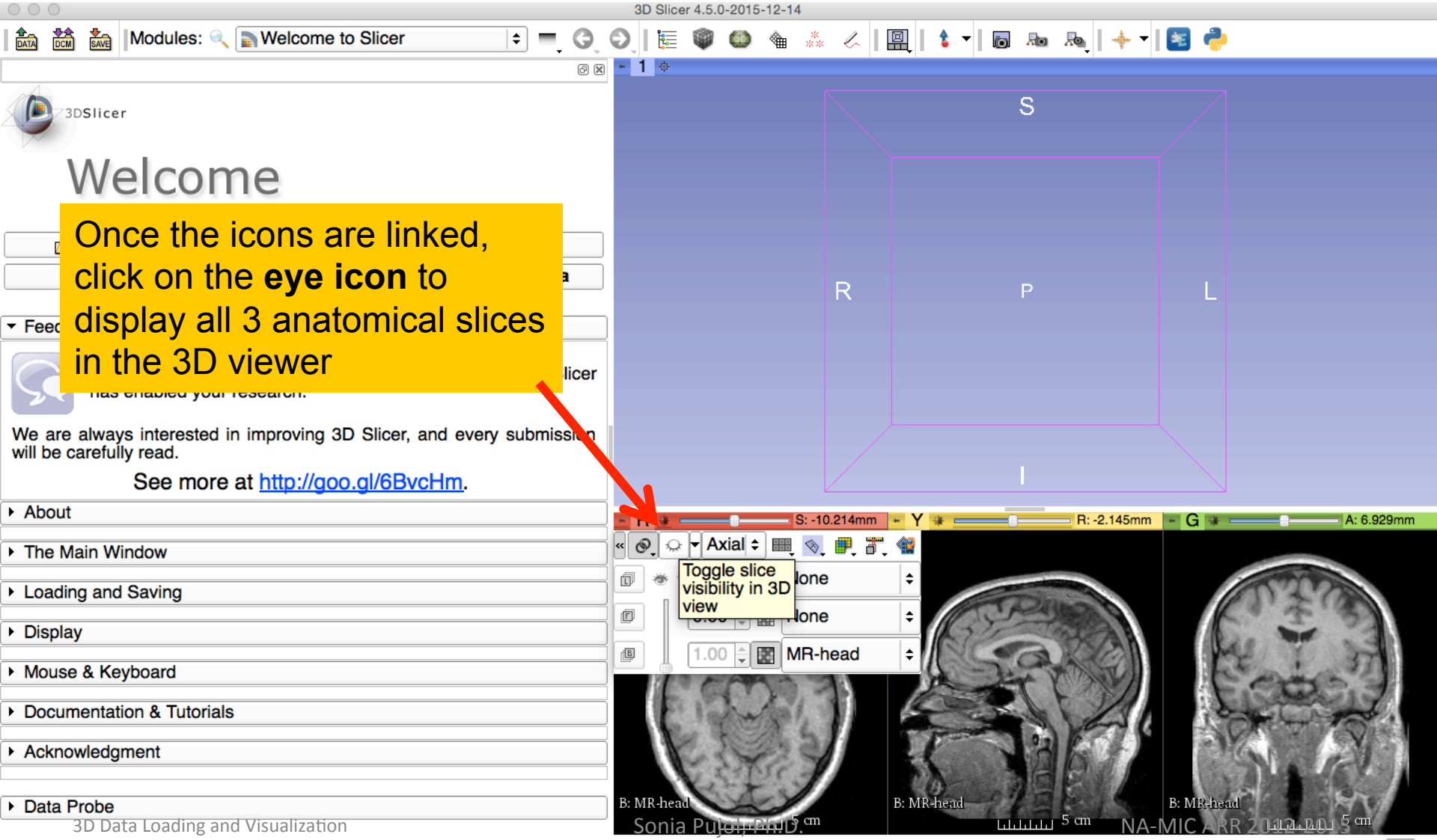


Position your arrow again on the **pin icon** of the red viewer, select the **Lightbox** menu and change it back to "**1x1 view**"

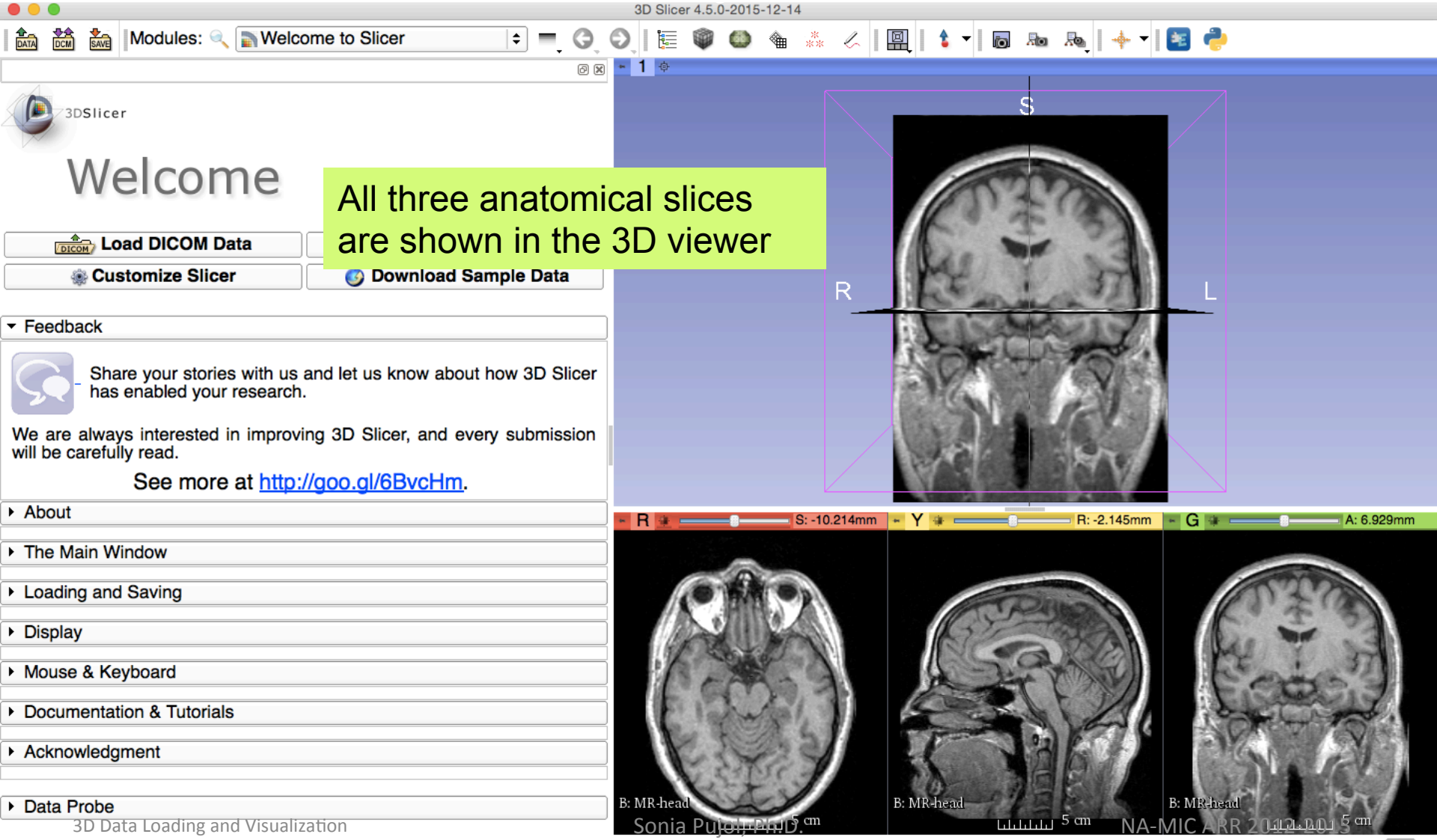
Loading a volume



Loading a volume

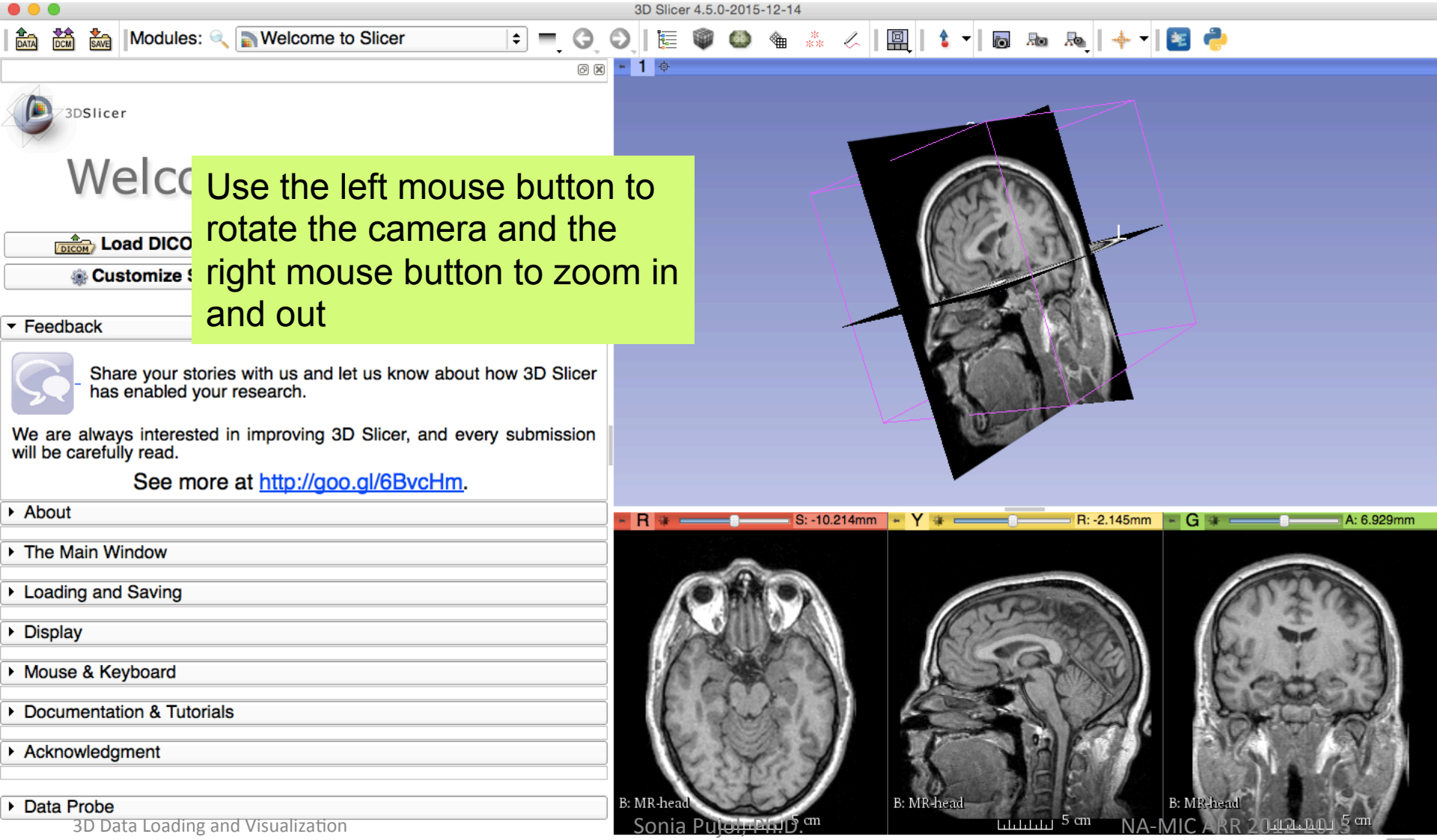


Loading a volume

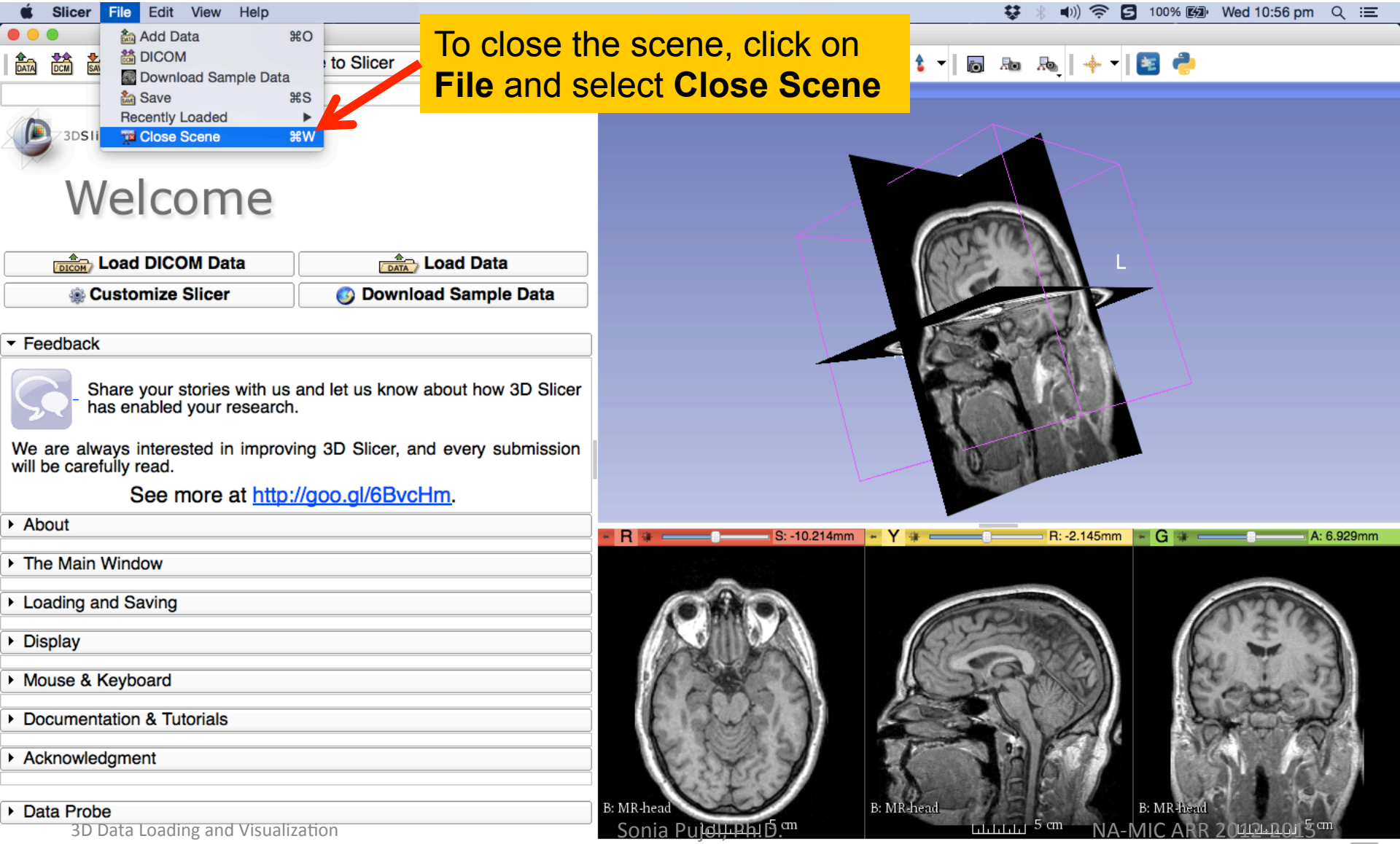


All three anatomical slices are shown in the 3D viewer

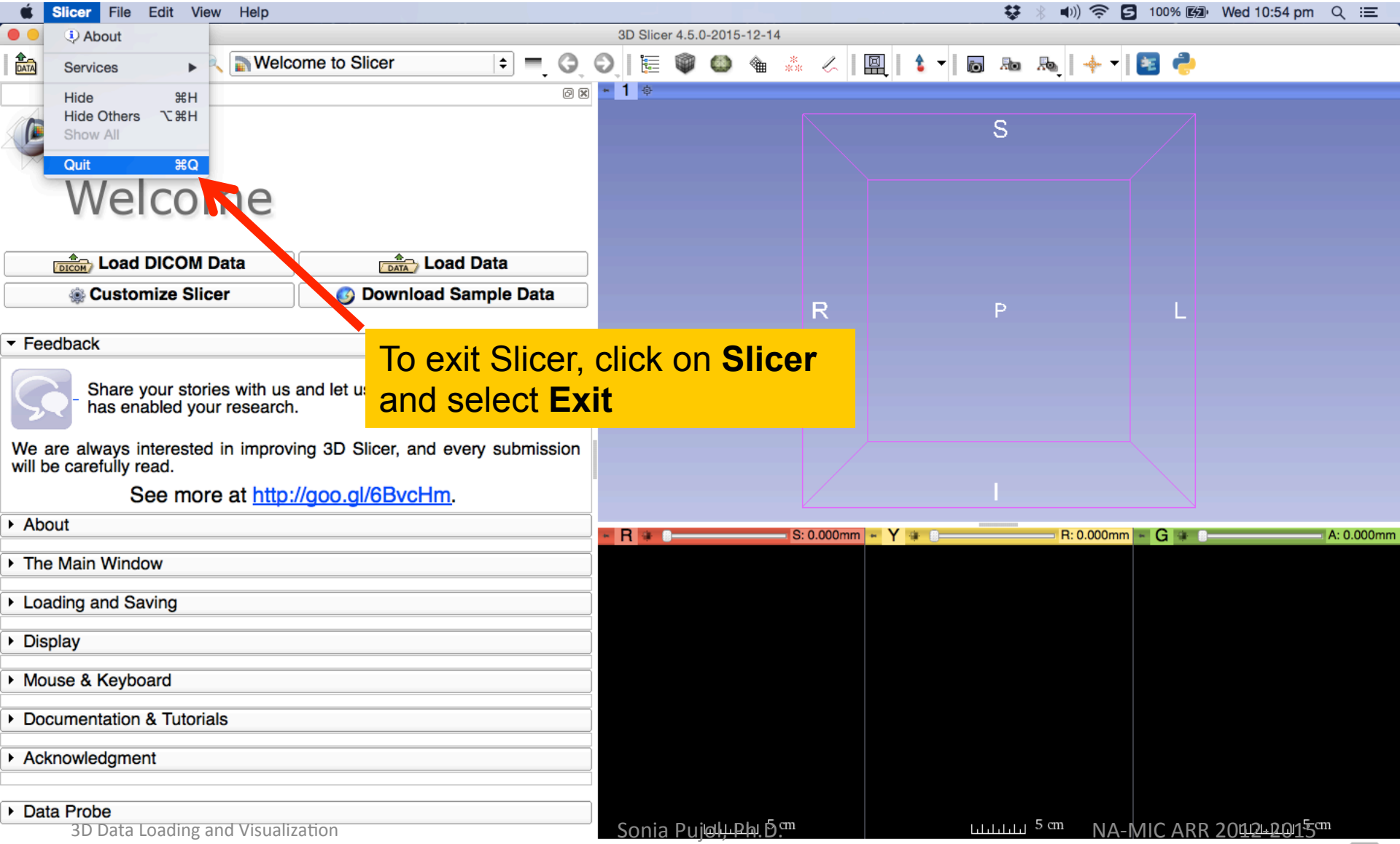
Loading a volume

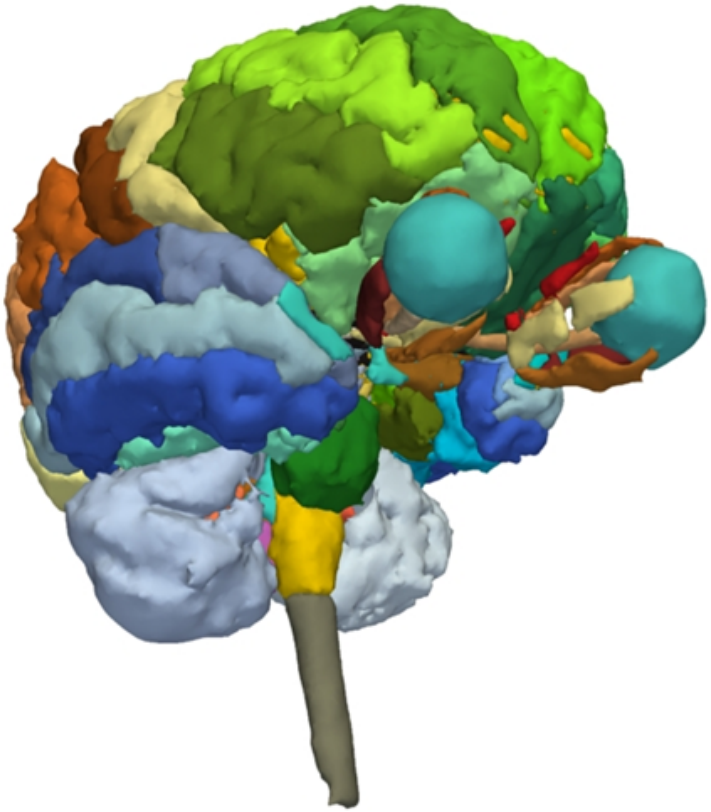


Close the scene



Exit Slicer

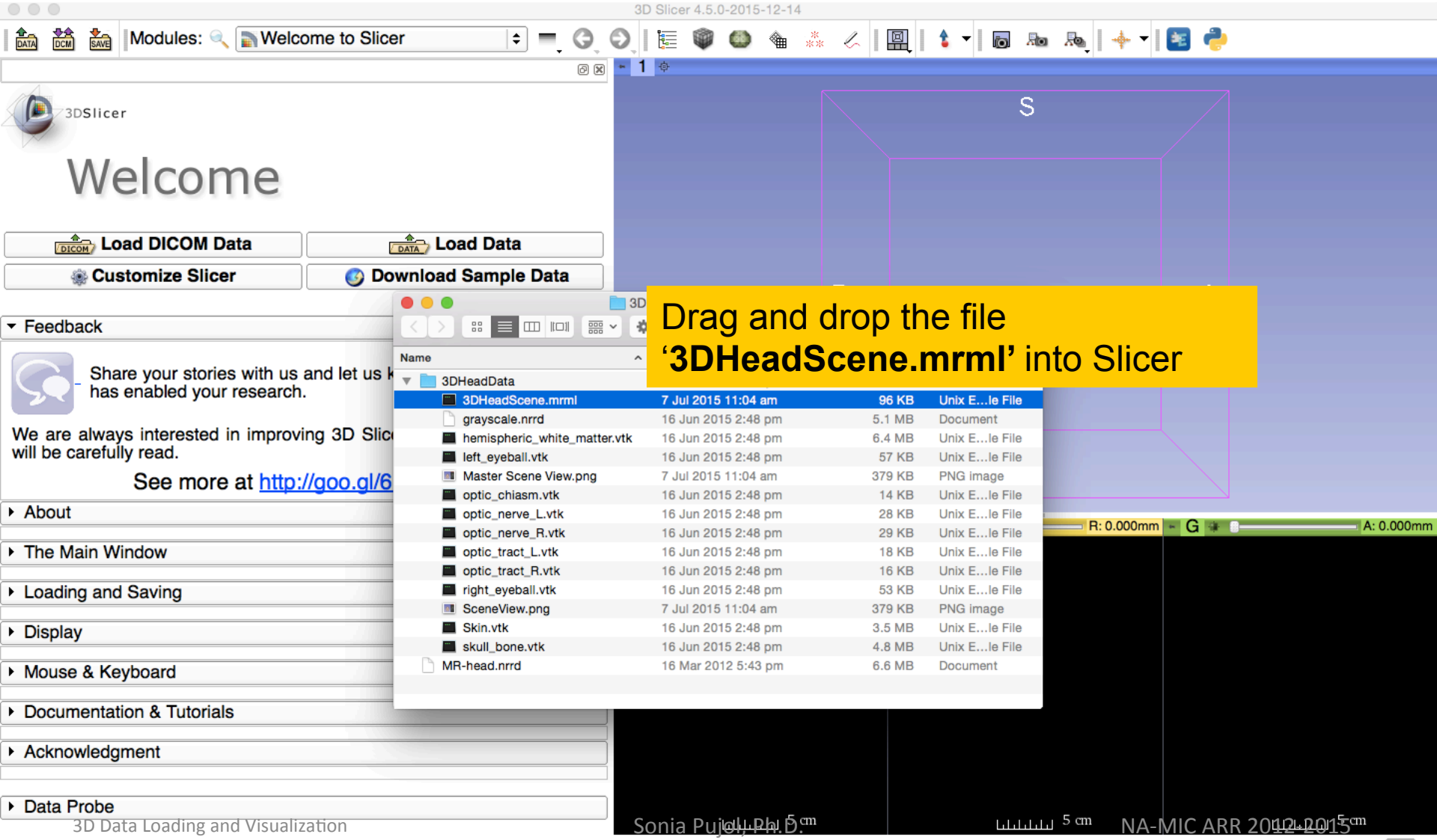

Slicer File Edit View Help
About
Services
Hide ⌘H
Hide Others ⌥⌘H
Show All
Quit ⌘Q
3D Slicer 4.5.0-2015-12-14
Welcome to Slicer
Welcome
Load DICOM Data
Load Data
Customize Slicer
Download Sample Data
Feedback
Share your stories with us and let us
has enabled your research.
We are always interested in improving 3D Slicer, and every submission will be carefully read.
See more at http://goo.gl/6BvcHm.
About
The Main Window
Loading and Saving
Display
Mouse & Keyboard
Documentation & Tutorials
Acknowledgment
Data Probe
S
R
P
L
I
To exit Slicer, click on Slicer and select Exit



Part 2:

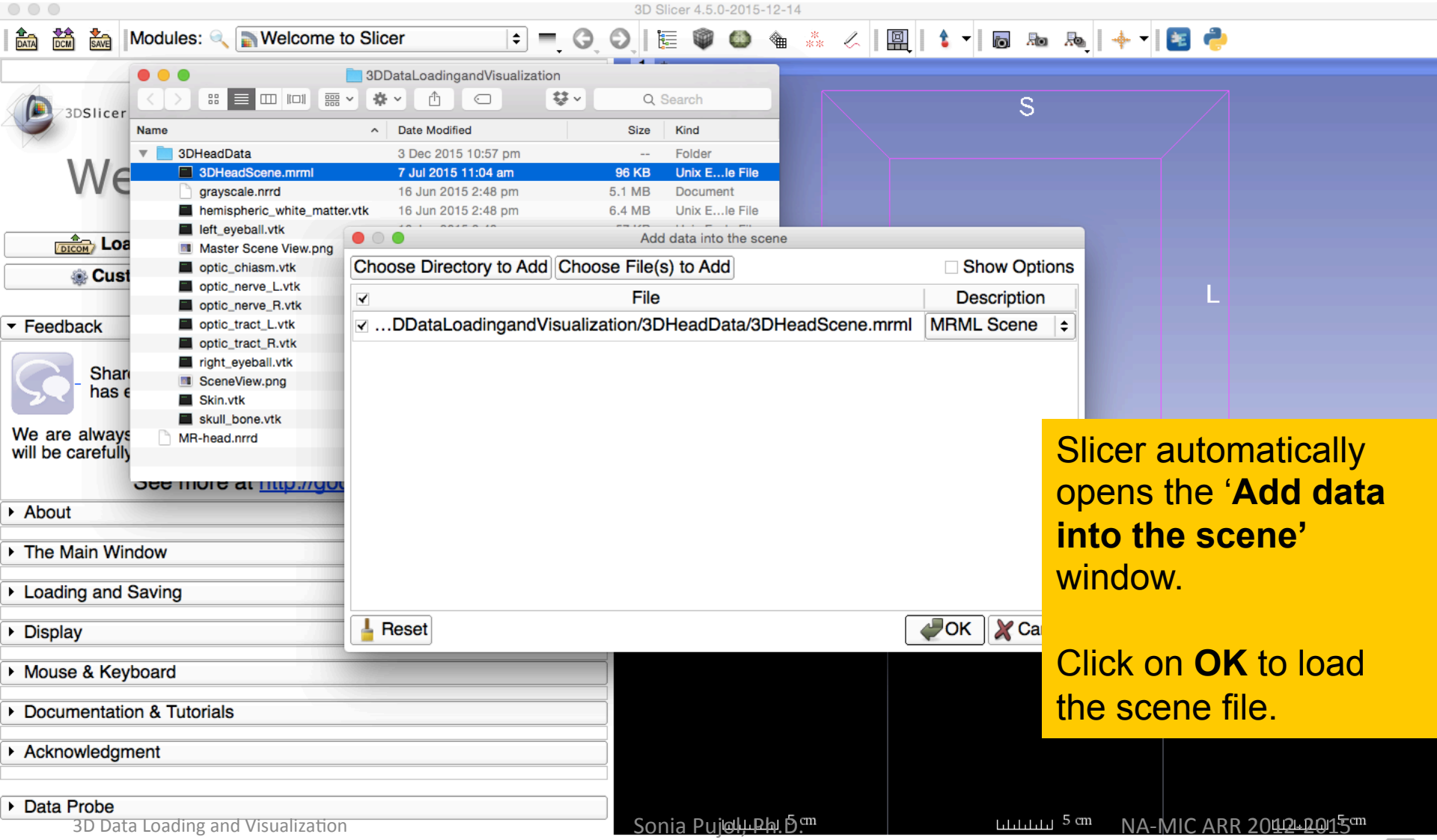
3D visualization of surface models of the brain

Loading a Scene



Drag and drop the file '**3DHeadScene.mrml**' into Slicer

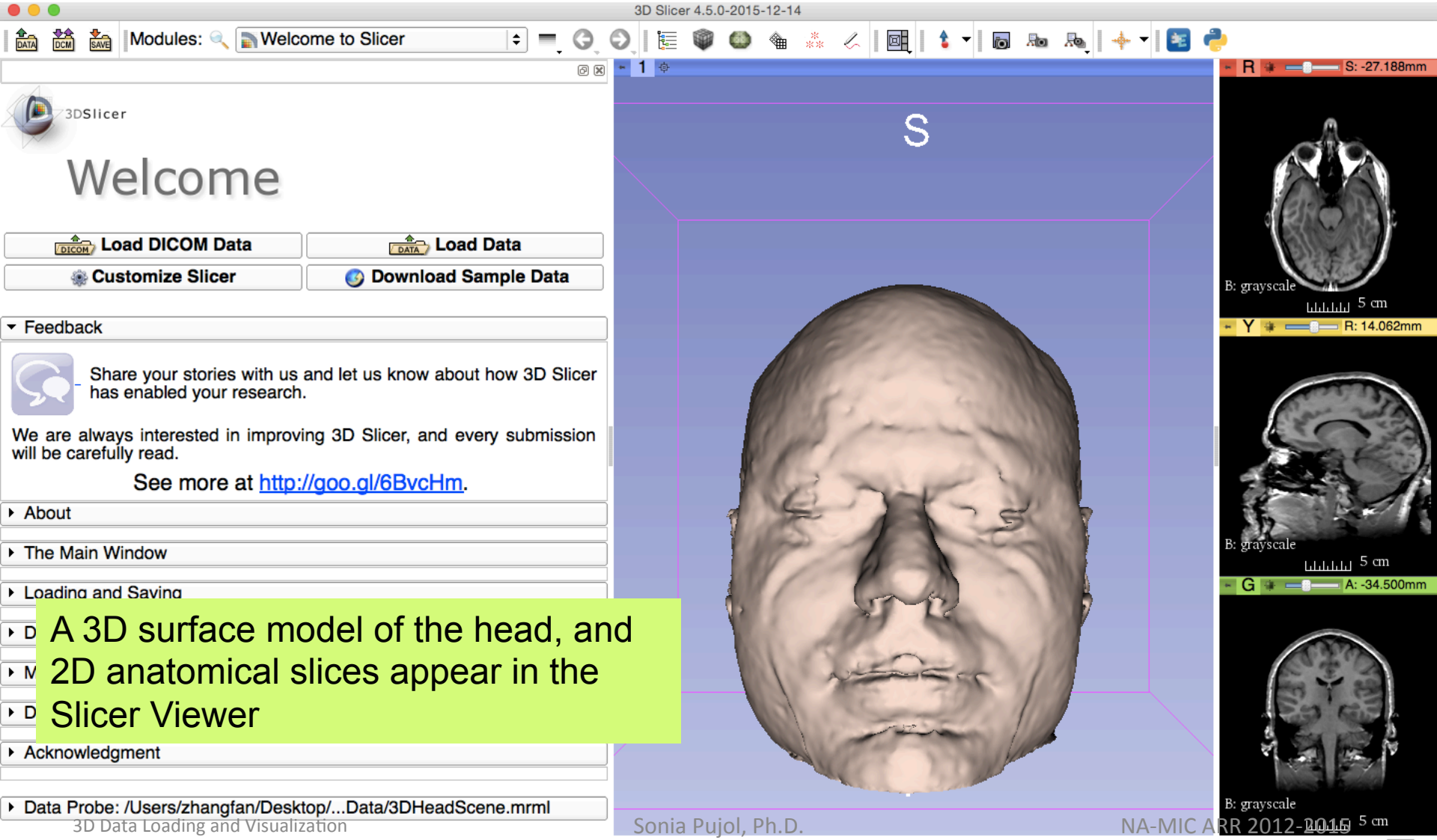
Loading a Scene



Slicer automatically opens the '**Add data into the scene**' window.

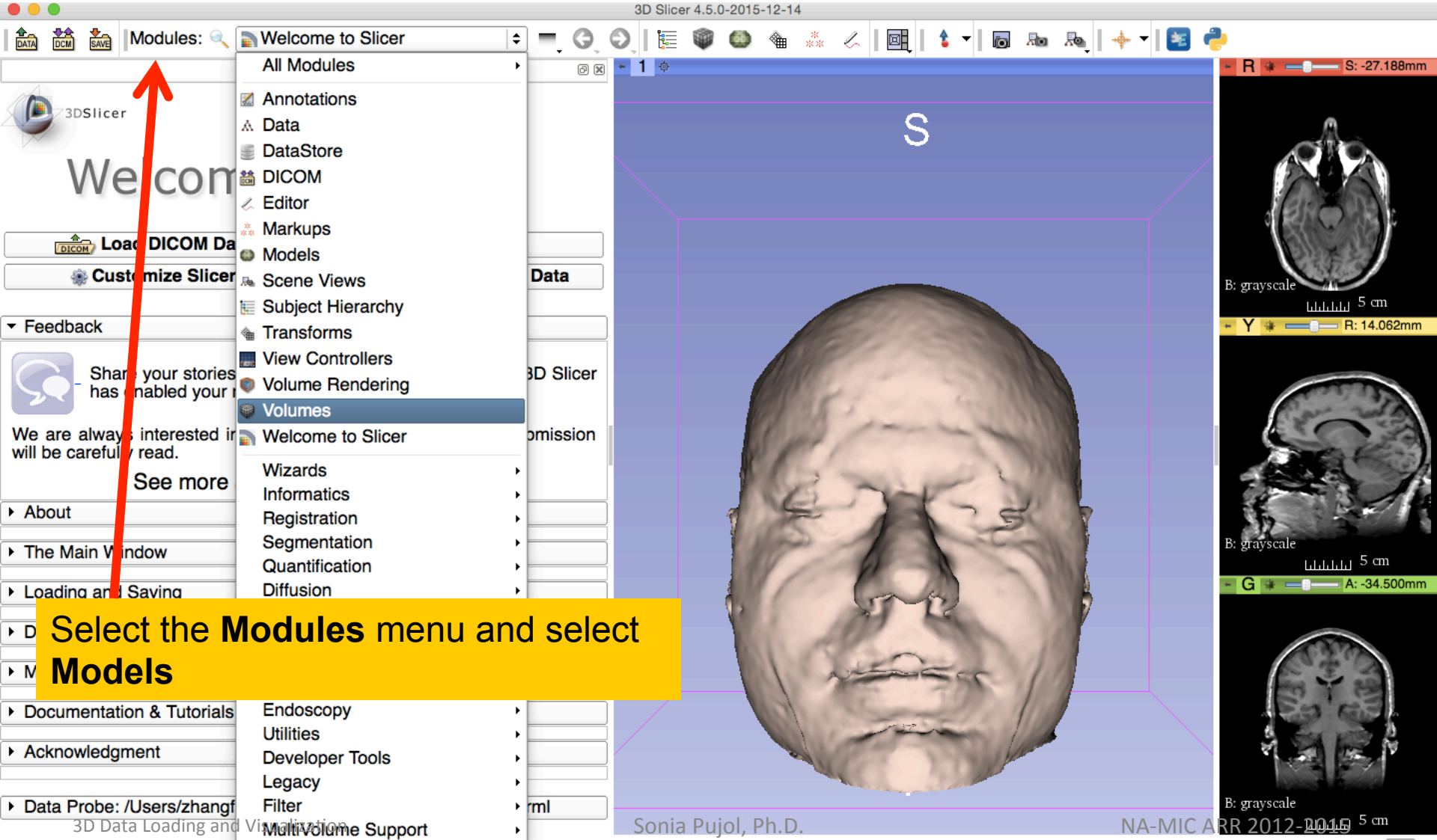
Click on **OK** to load the scene file.

Loading the Slicer Scene

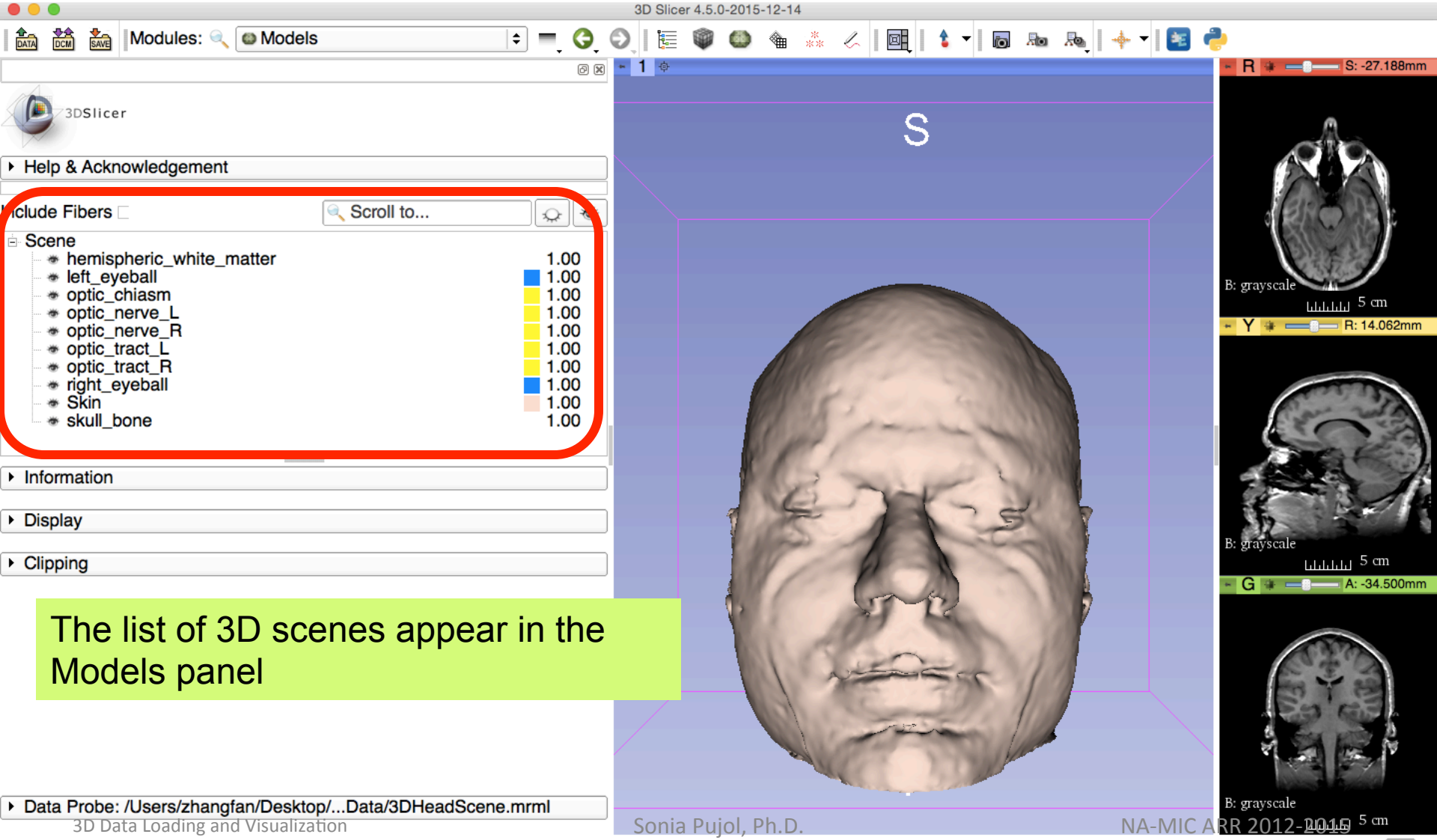


A 3D surface model of the head, and 2D anatomical slices appear in the Slicer Viewer

Loading the Slicer Scene

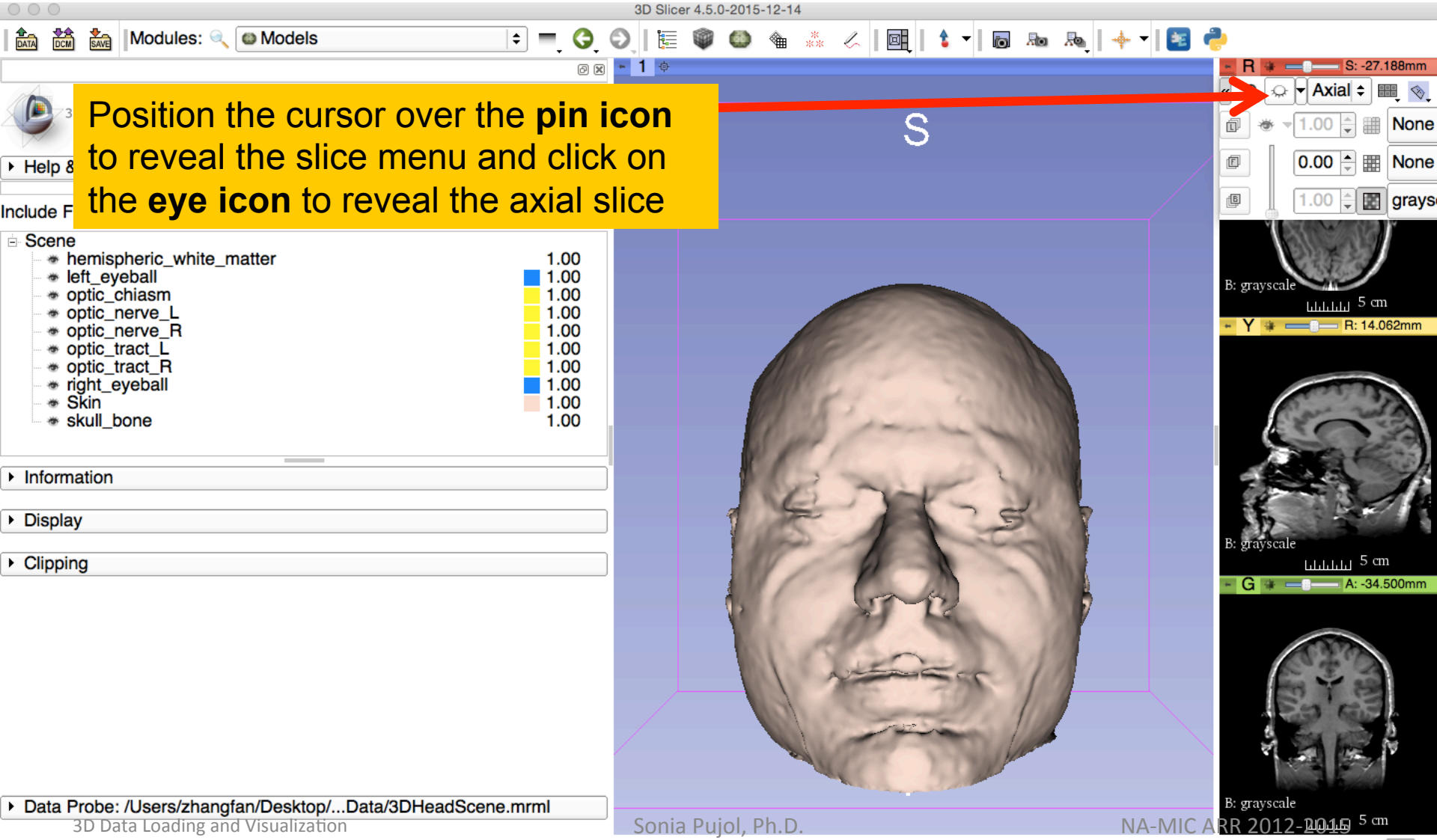


Models Module

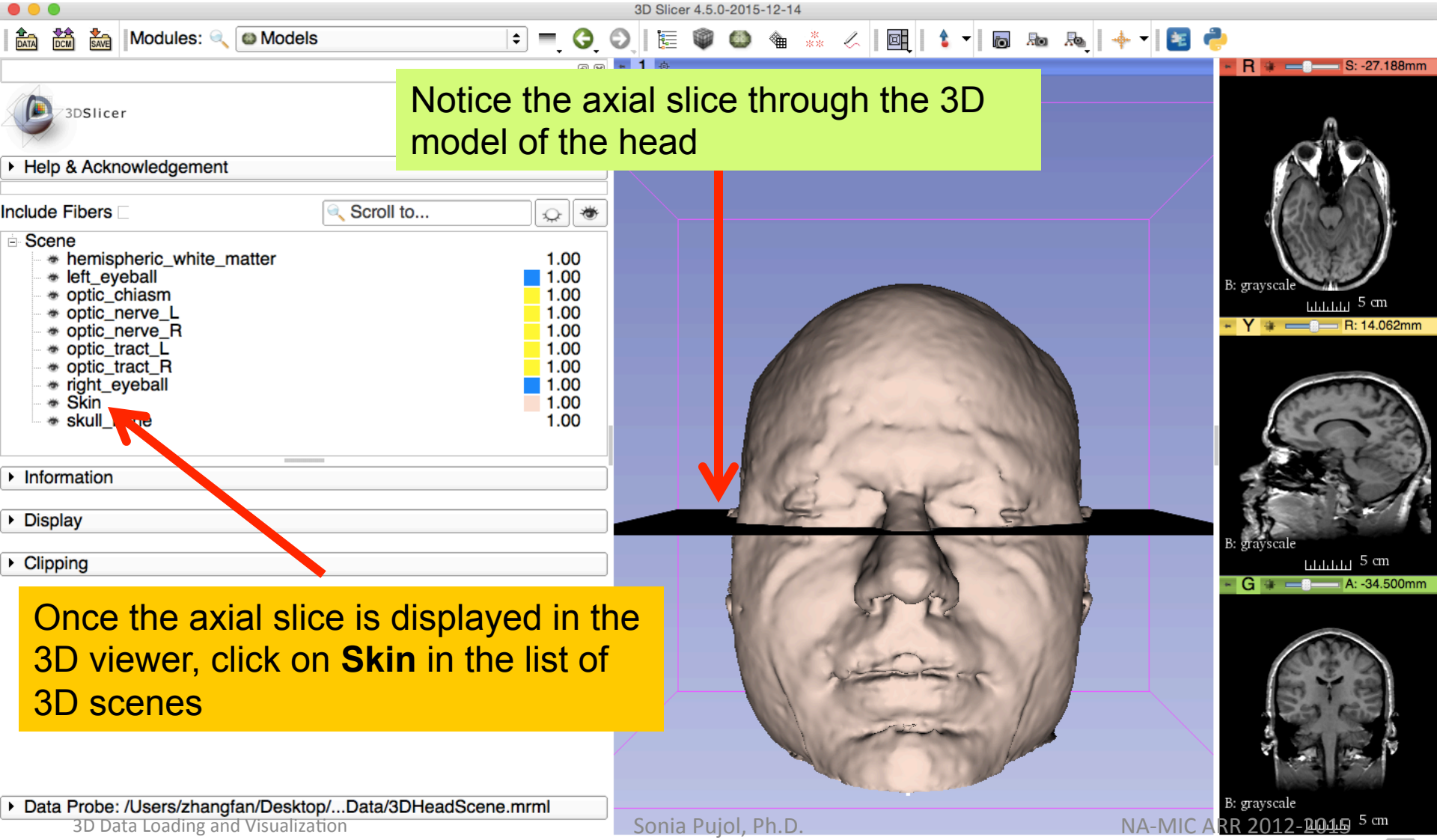


The list of 3D scenes appear in the Models panel

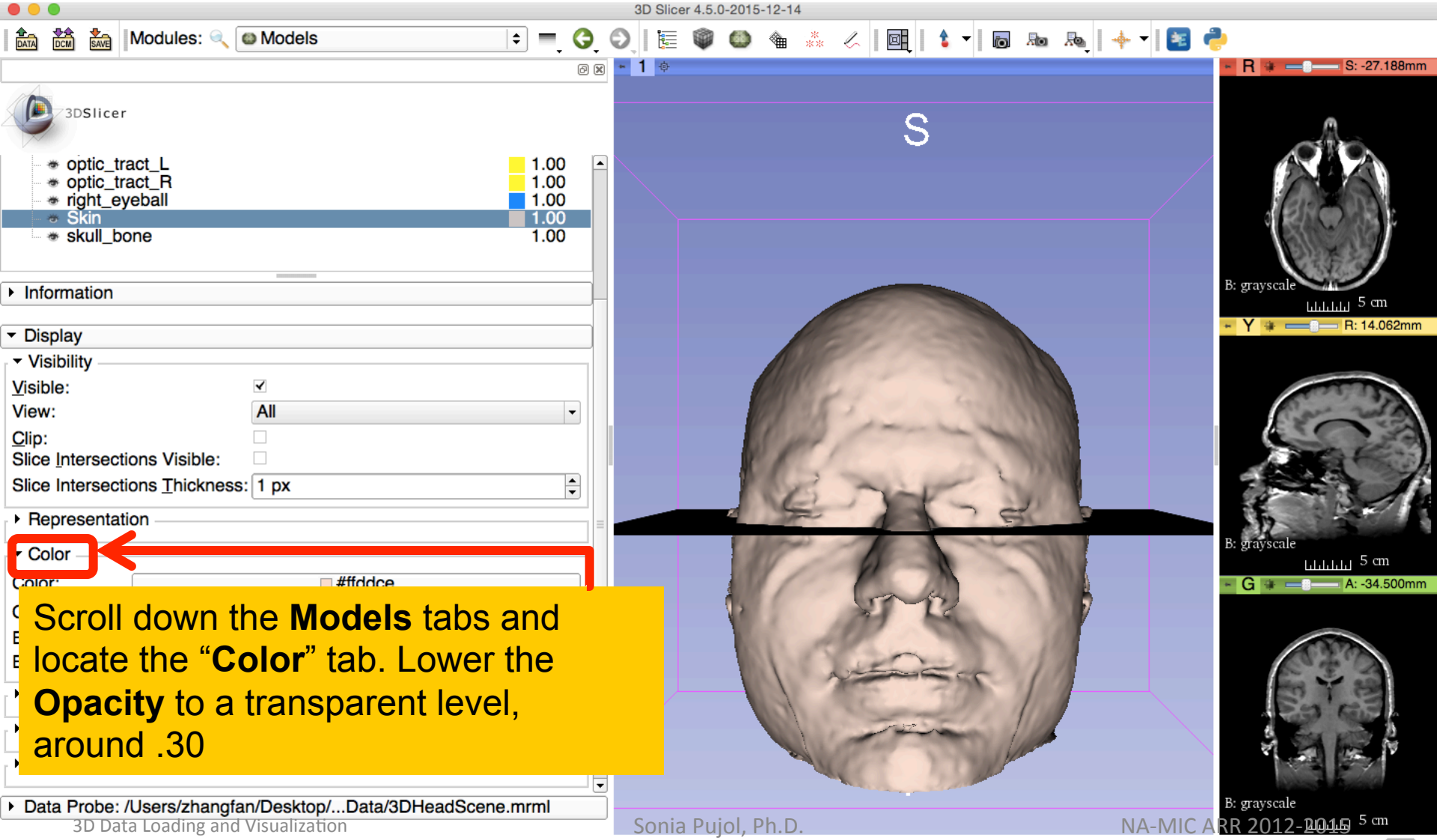
3D Visualization



3D Visualization

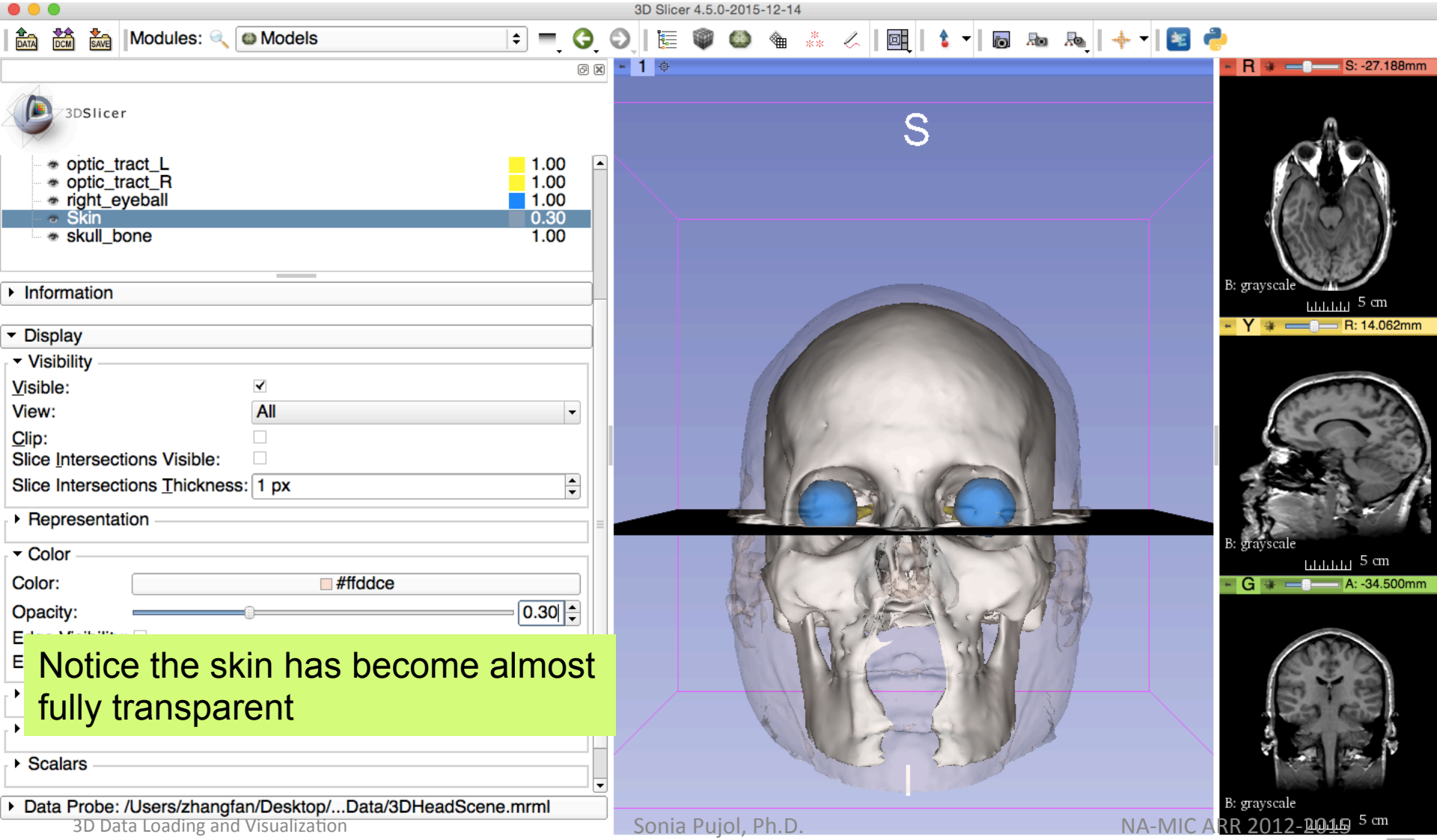


3D Visualization



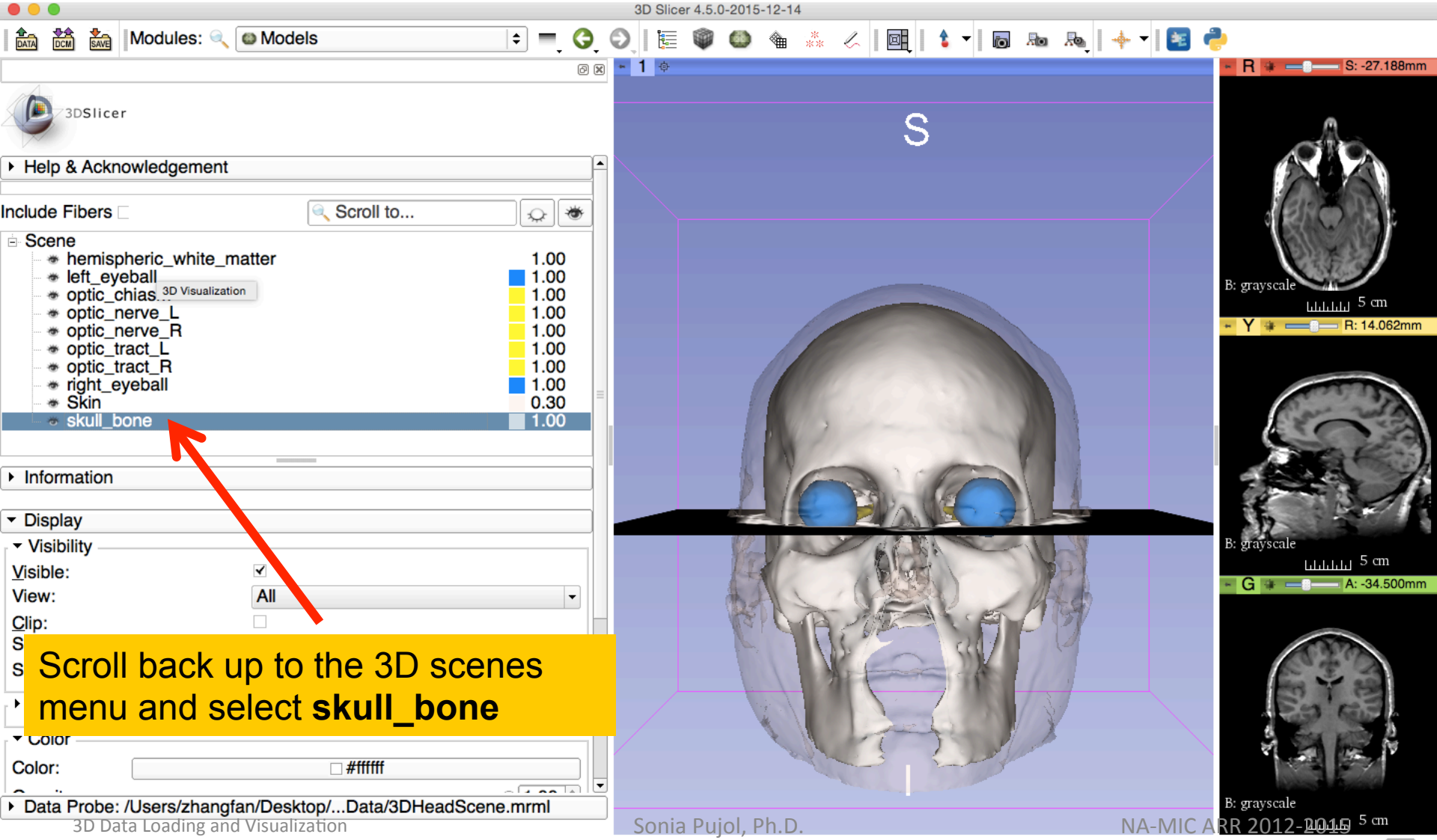
Scroll down the **Models** tabs and locate the "**Color**" tab. Lower the **Opacity** to a transparent level, around .30

3D Visualization



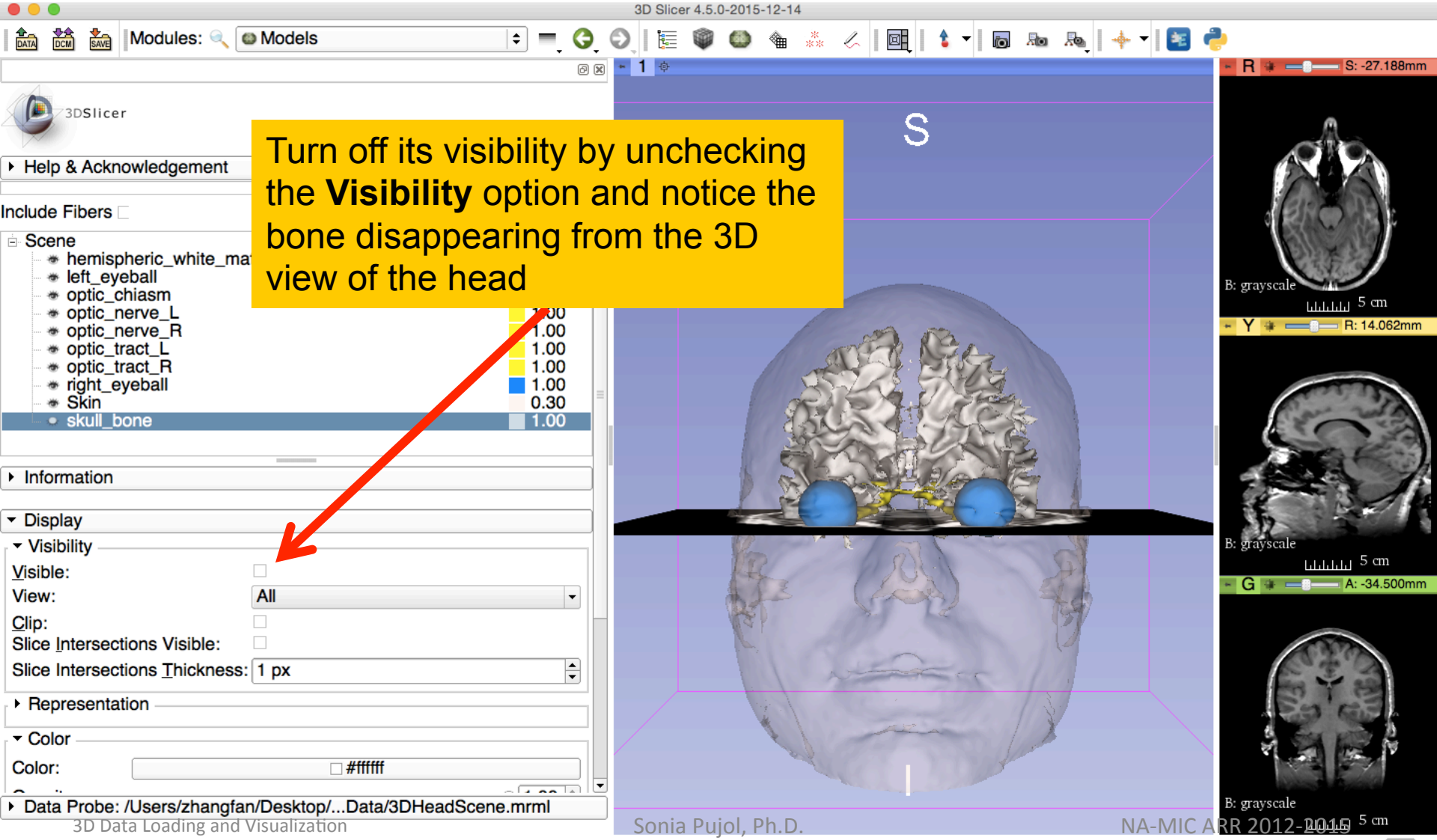
Notice the skin has become almost fully transparent

3D Visualization

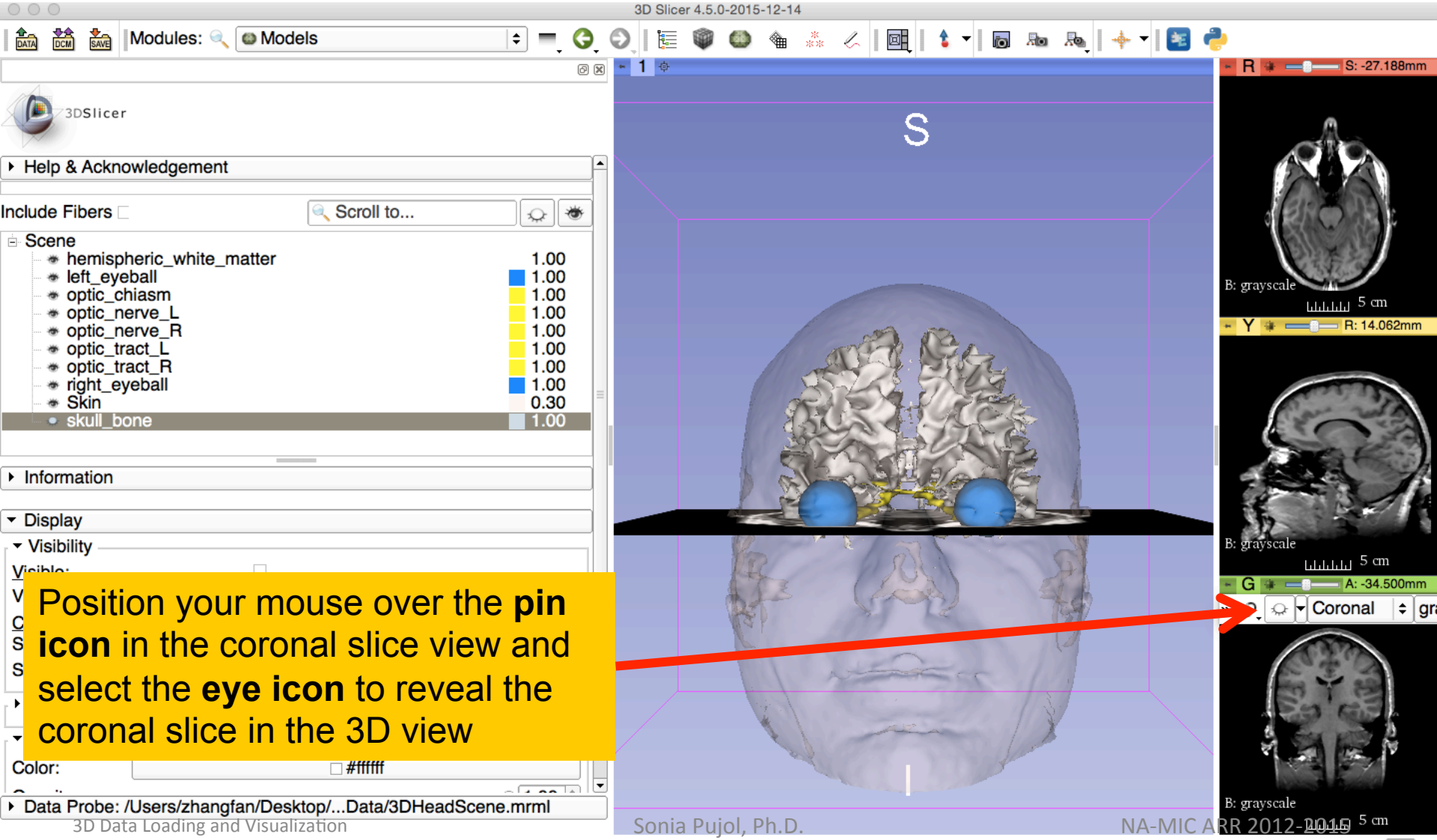


Scroll back up to the 3D scenes menu and select **skull_bone**

3D Visualization

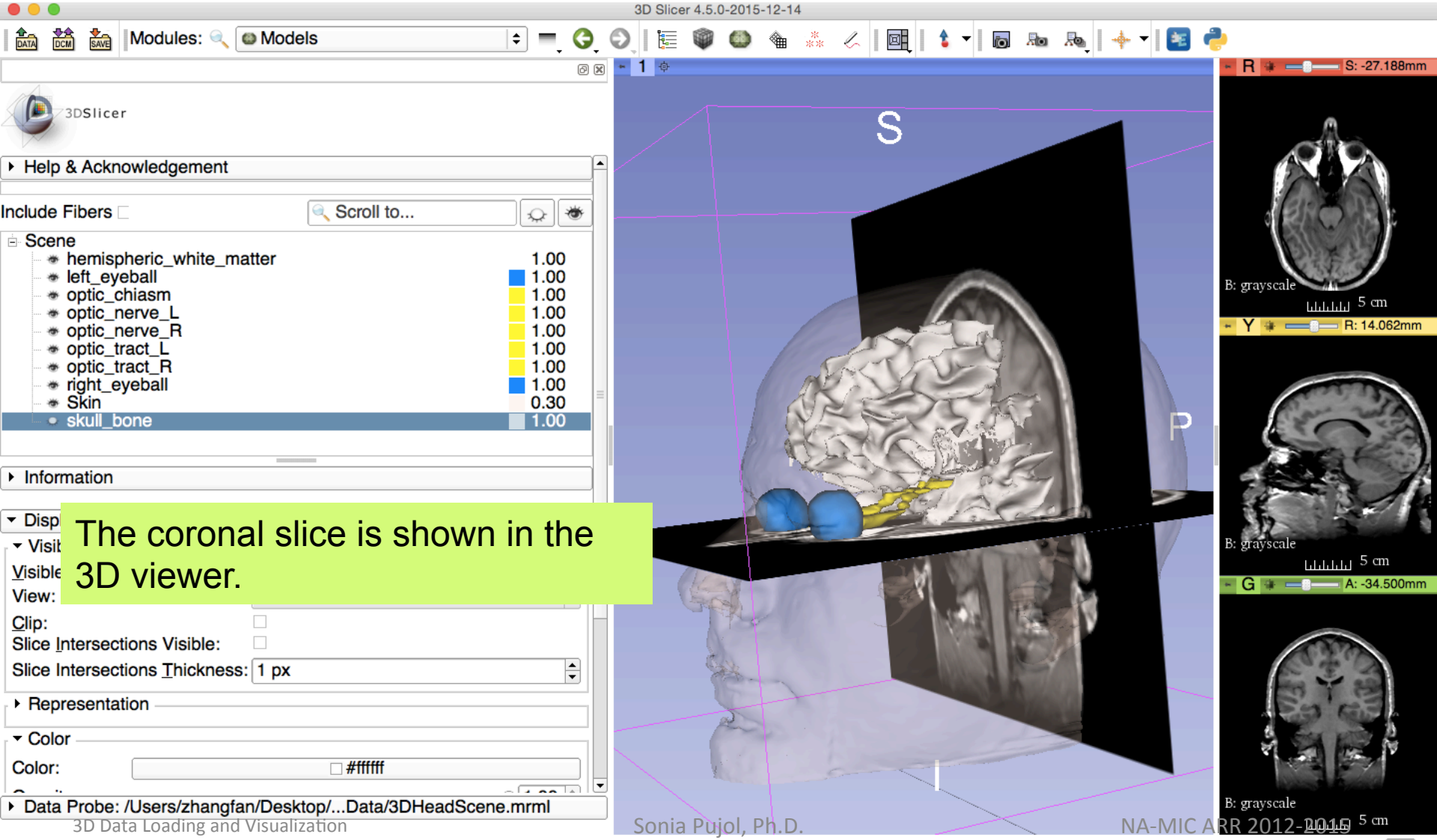


3D Visualization



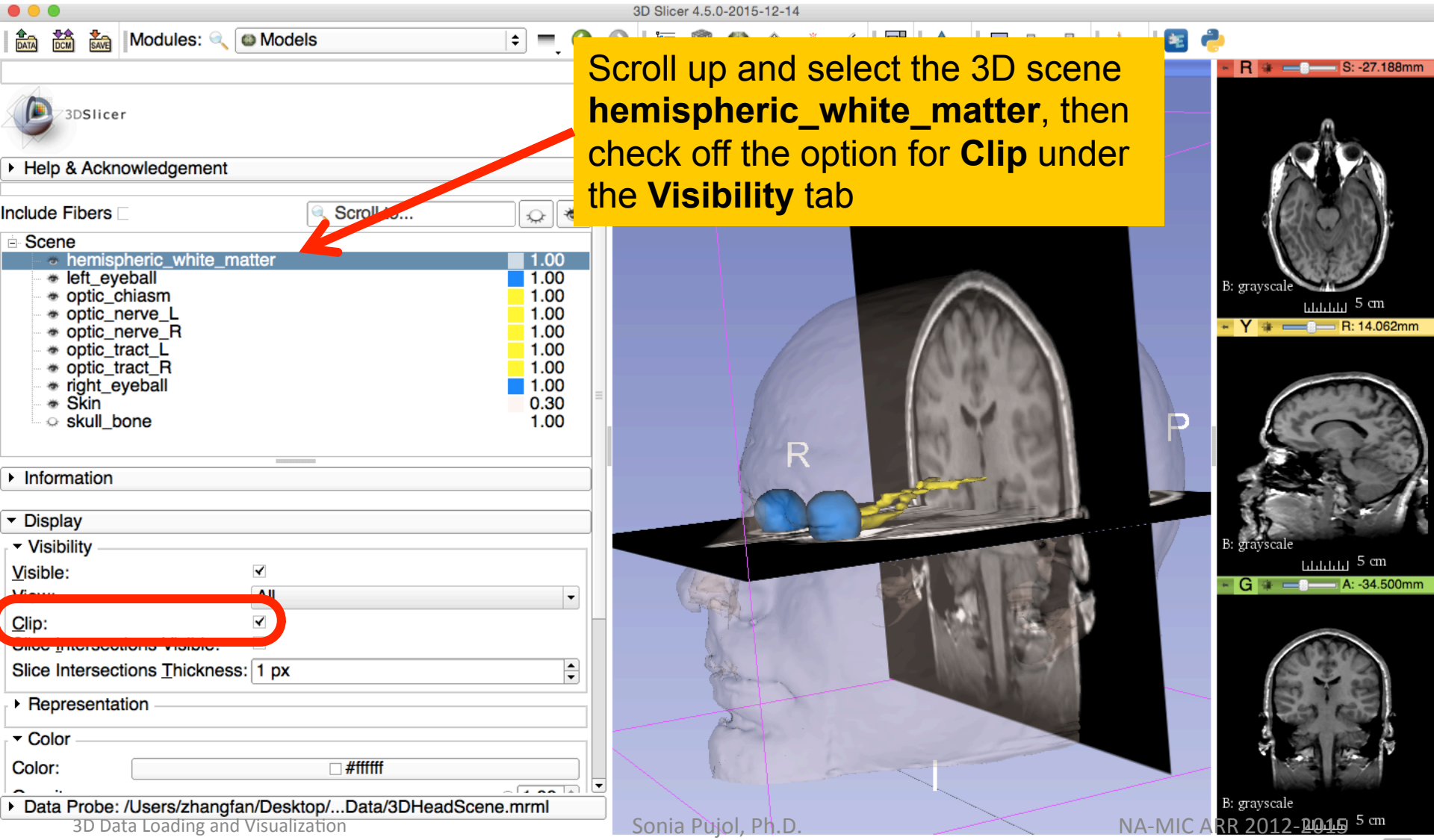
Position your mouse over the **pin icon** in the coronal slice view and select the **eye icon** to reveal the coronal slice in the 3D view

3D Visualization

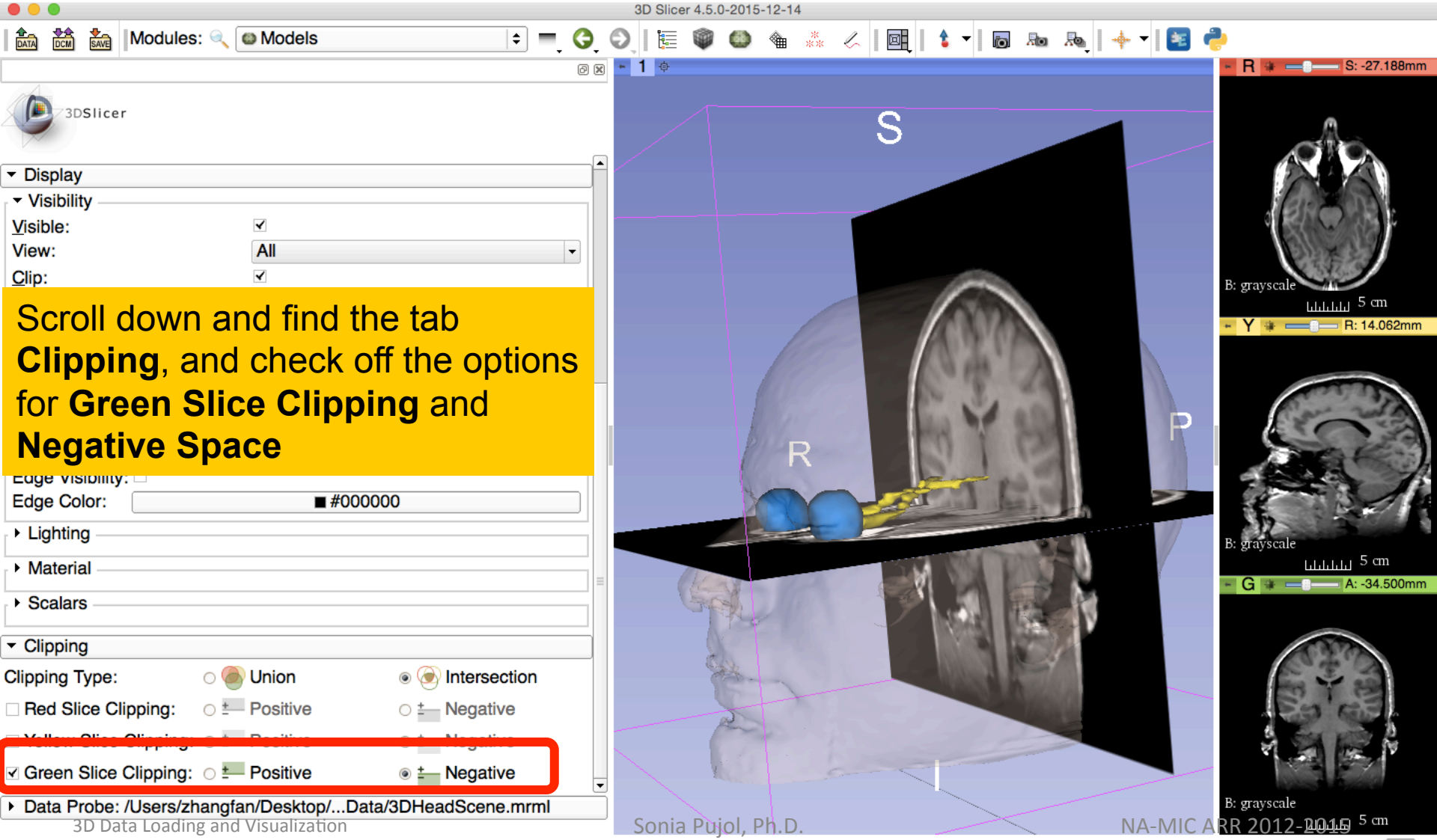


The coronal slice is shown in the 3D viewer.

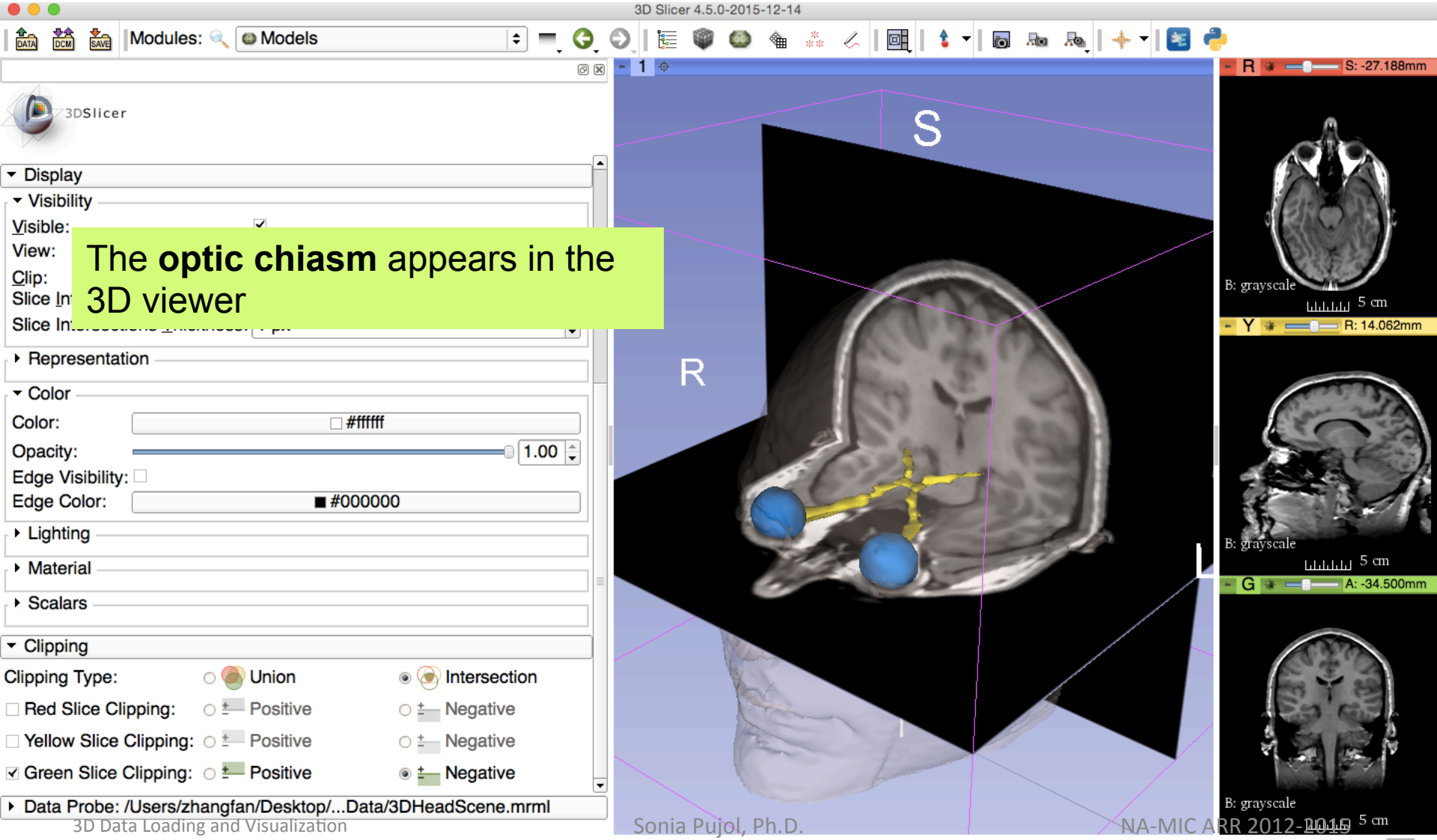
3D Visualization



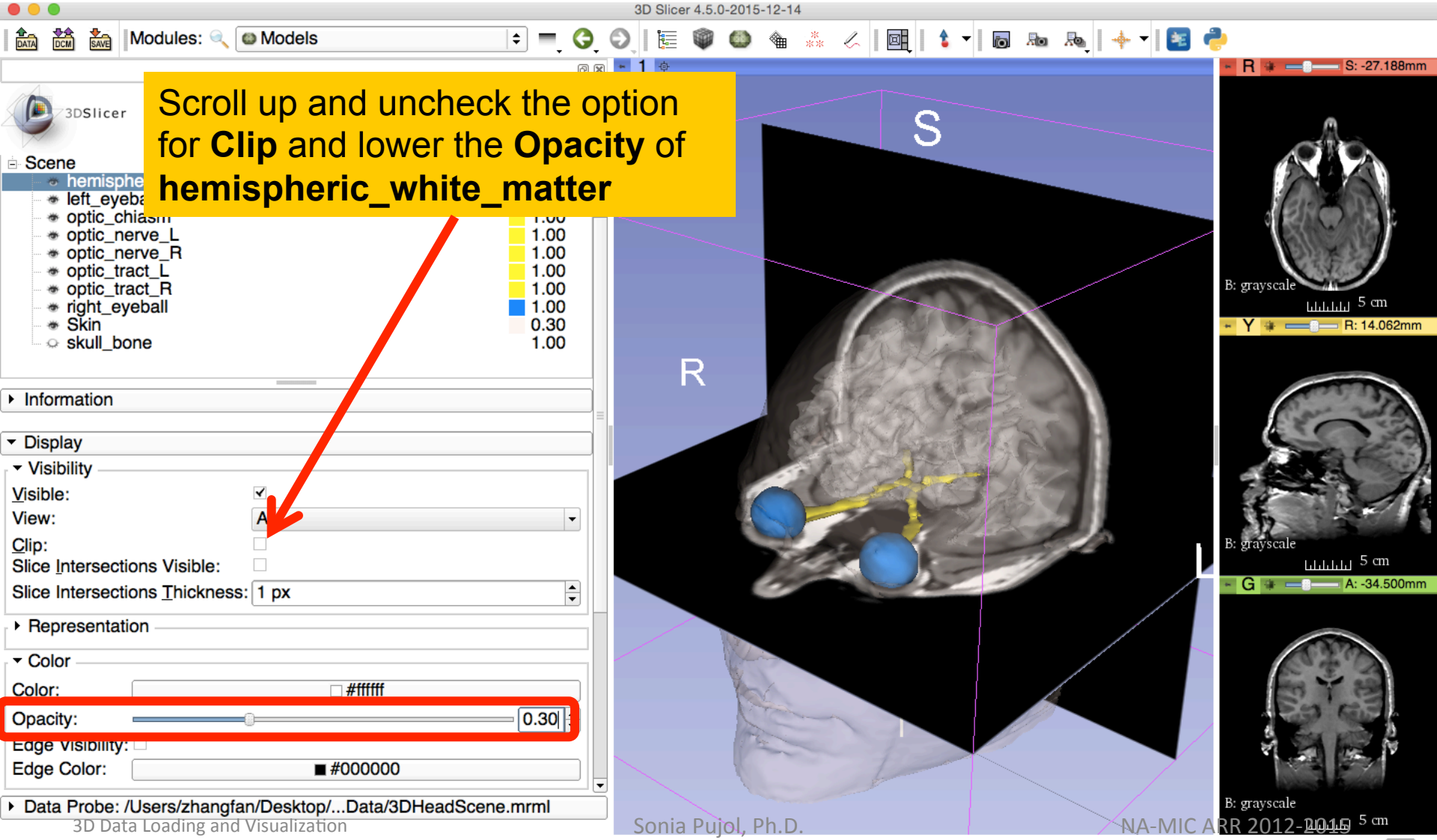
3D Visualization



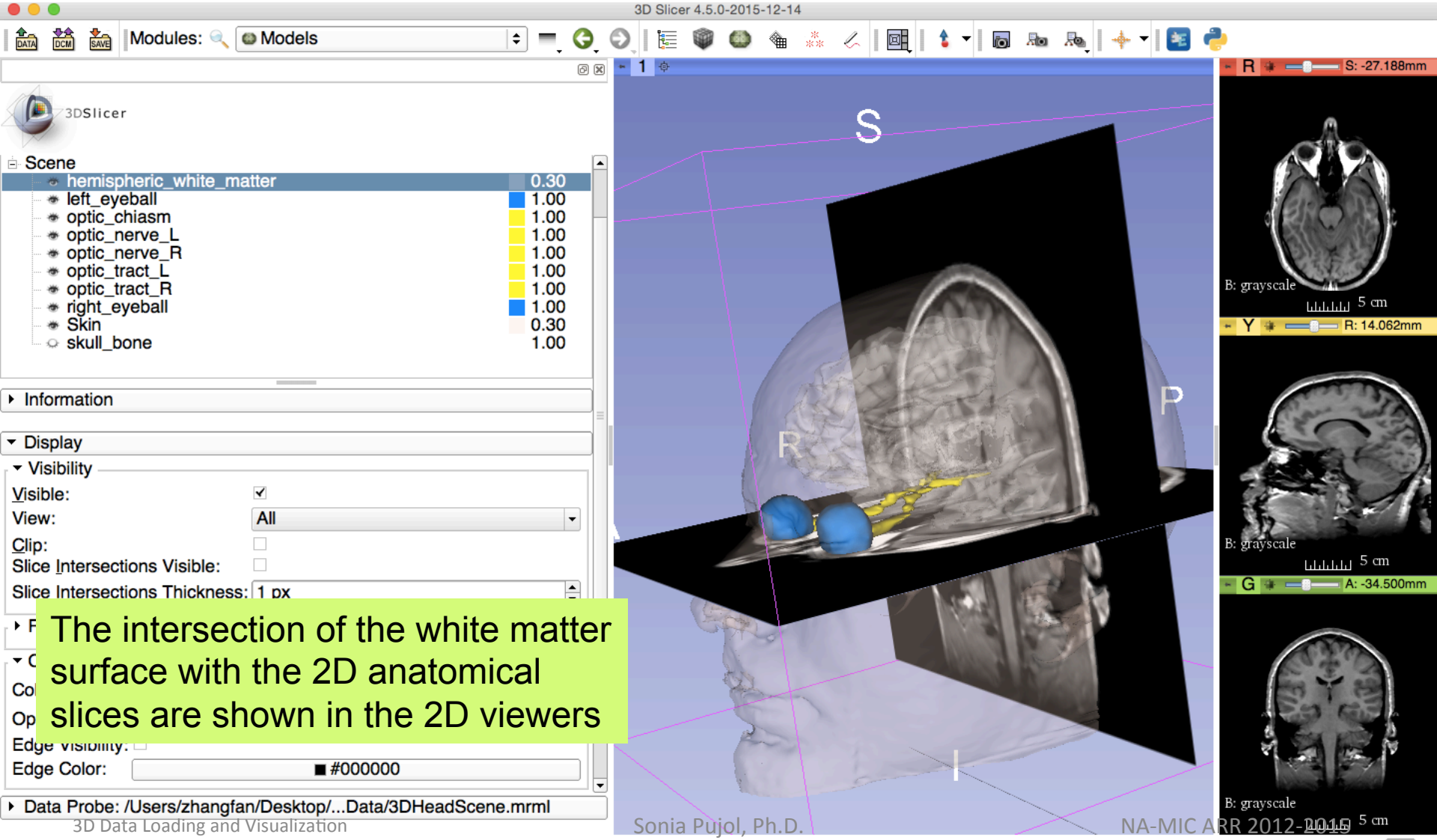
3D Visualization



3D Visualization

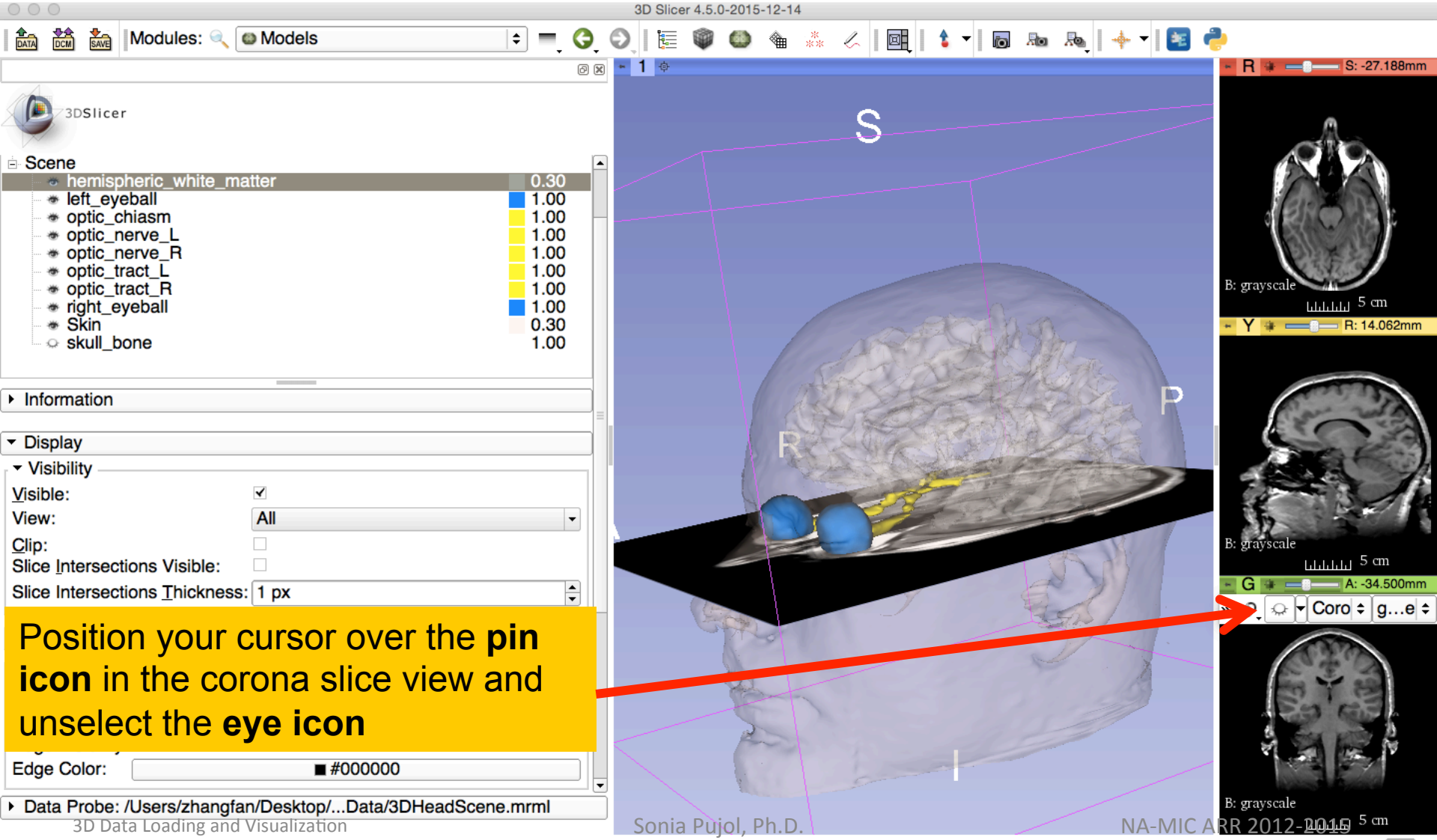


3D Visualization



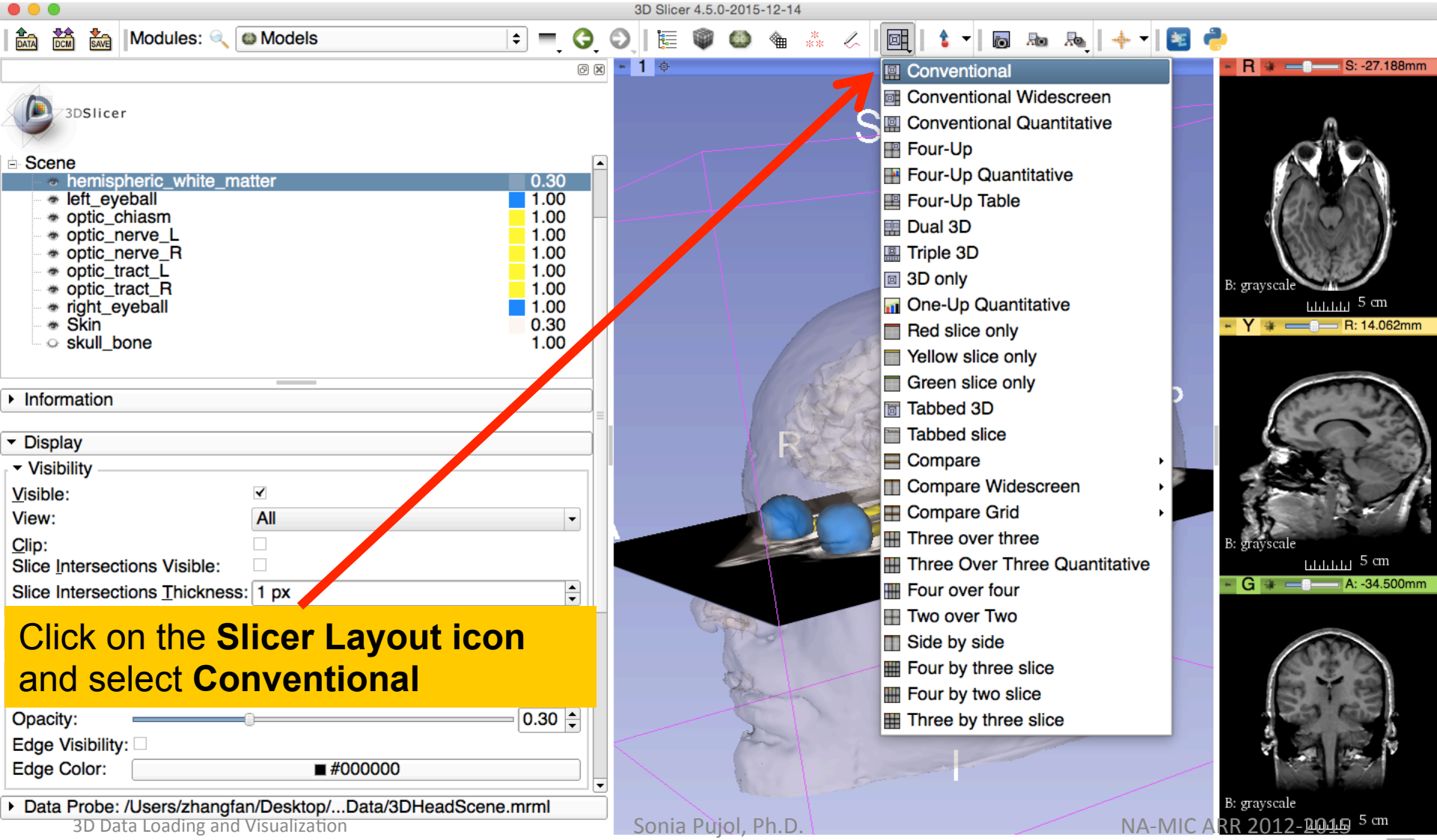
The intersection of the white matter surface with the 2D anatomical slices are shown in the 2D viewers

3D Visualization



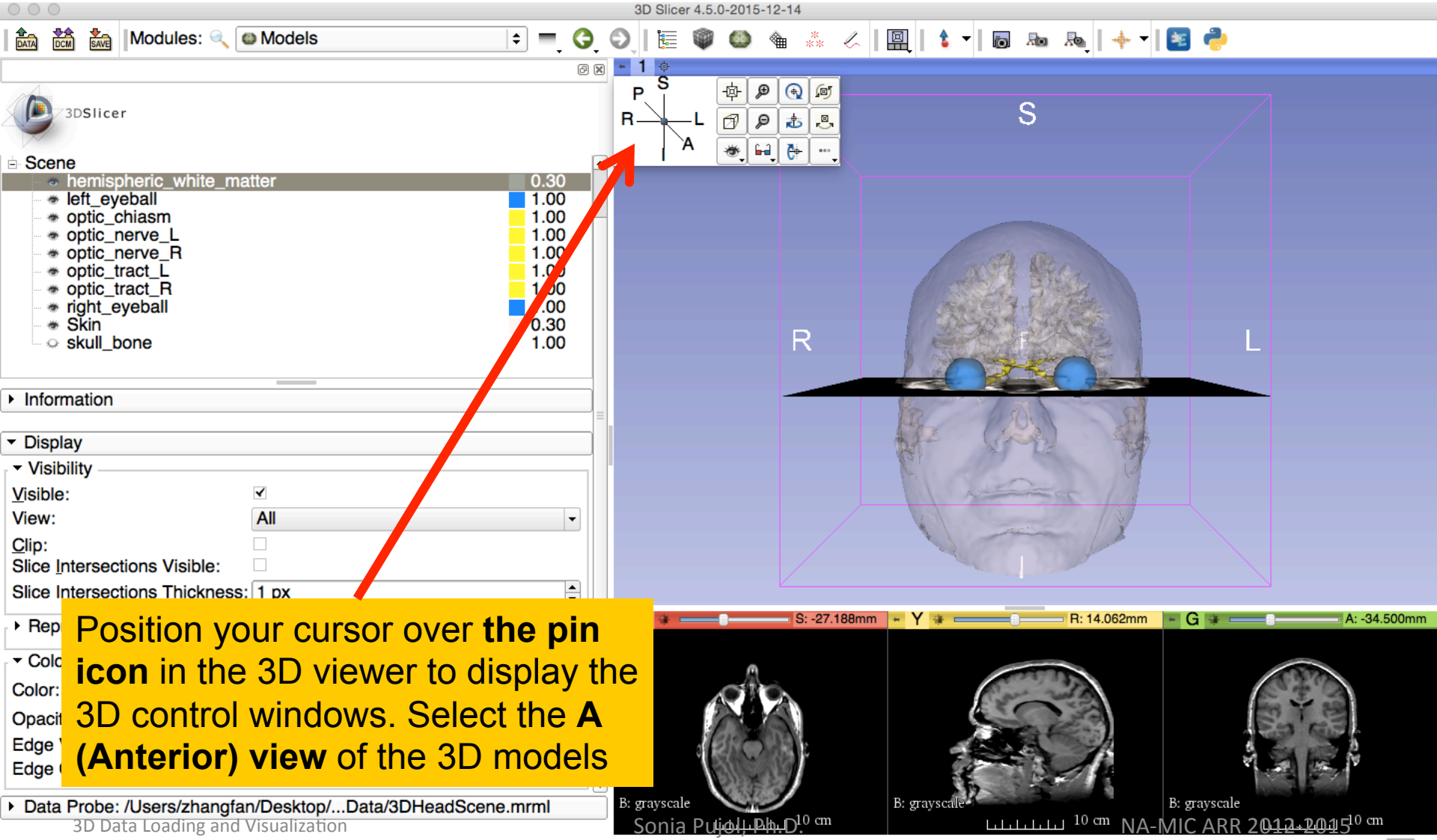
Position your cursor over the **pin icon** in the corona slice view and unselect the **eye icon**

3D Visualization

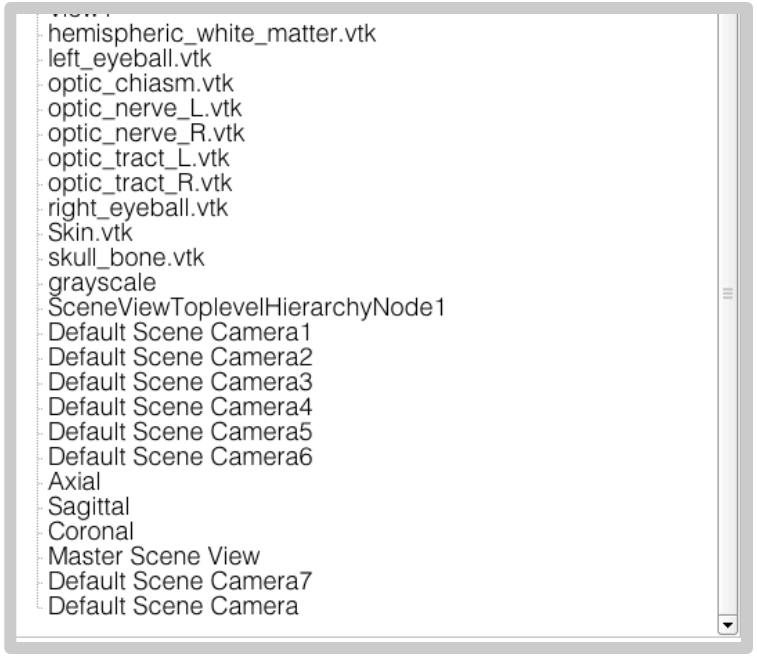


Click on the **Slicer Layout icon** and select **Conventional**

3D Visualization



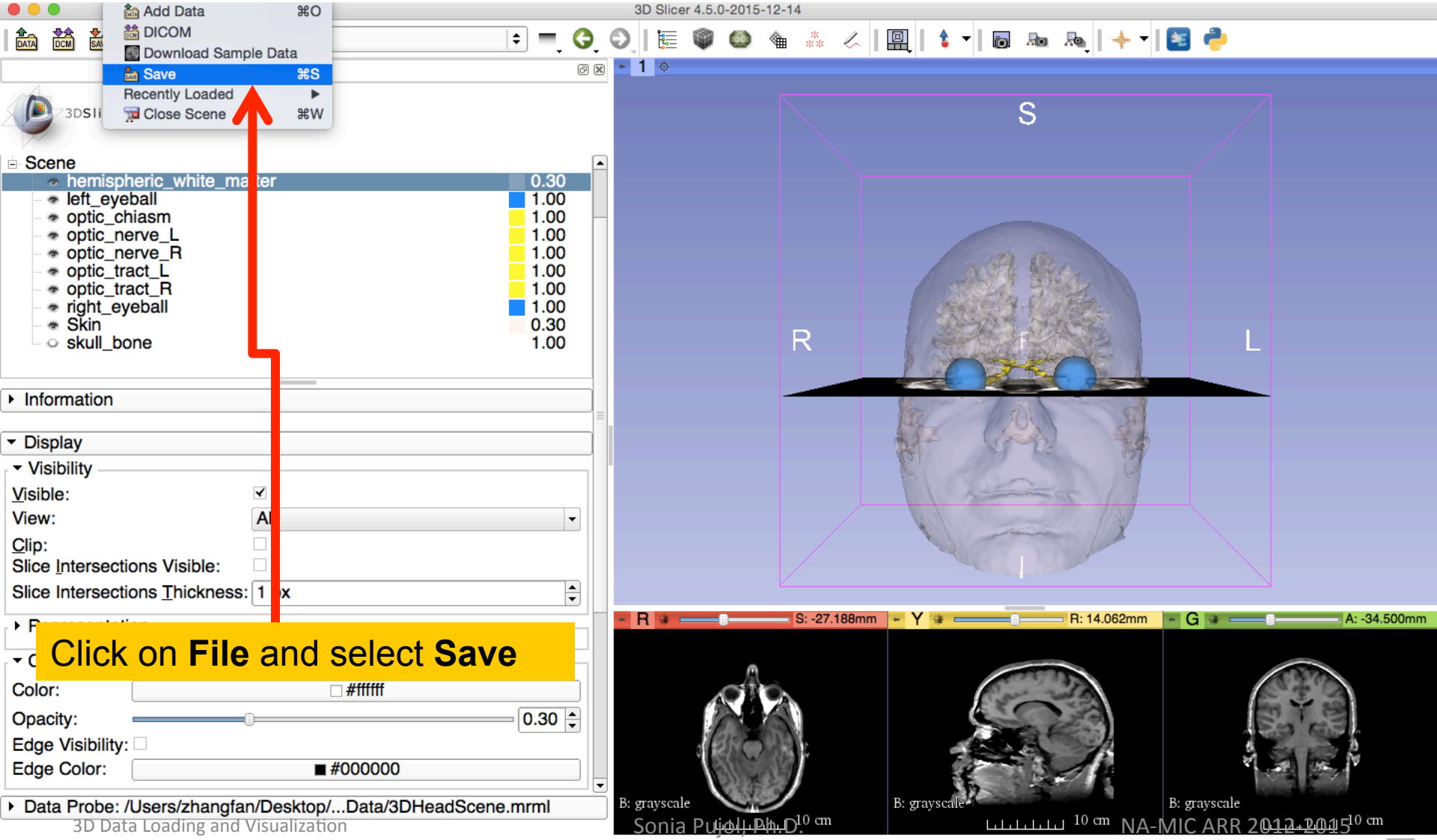
Position your cursor over **the pin icon** in the 3D viewer to display the 3D control windows. Select the **A (Anterior) view** of the 3D models



Part 3:

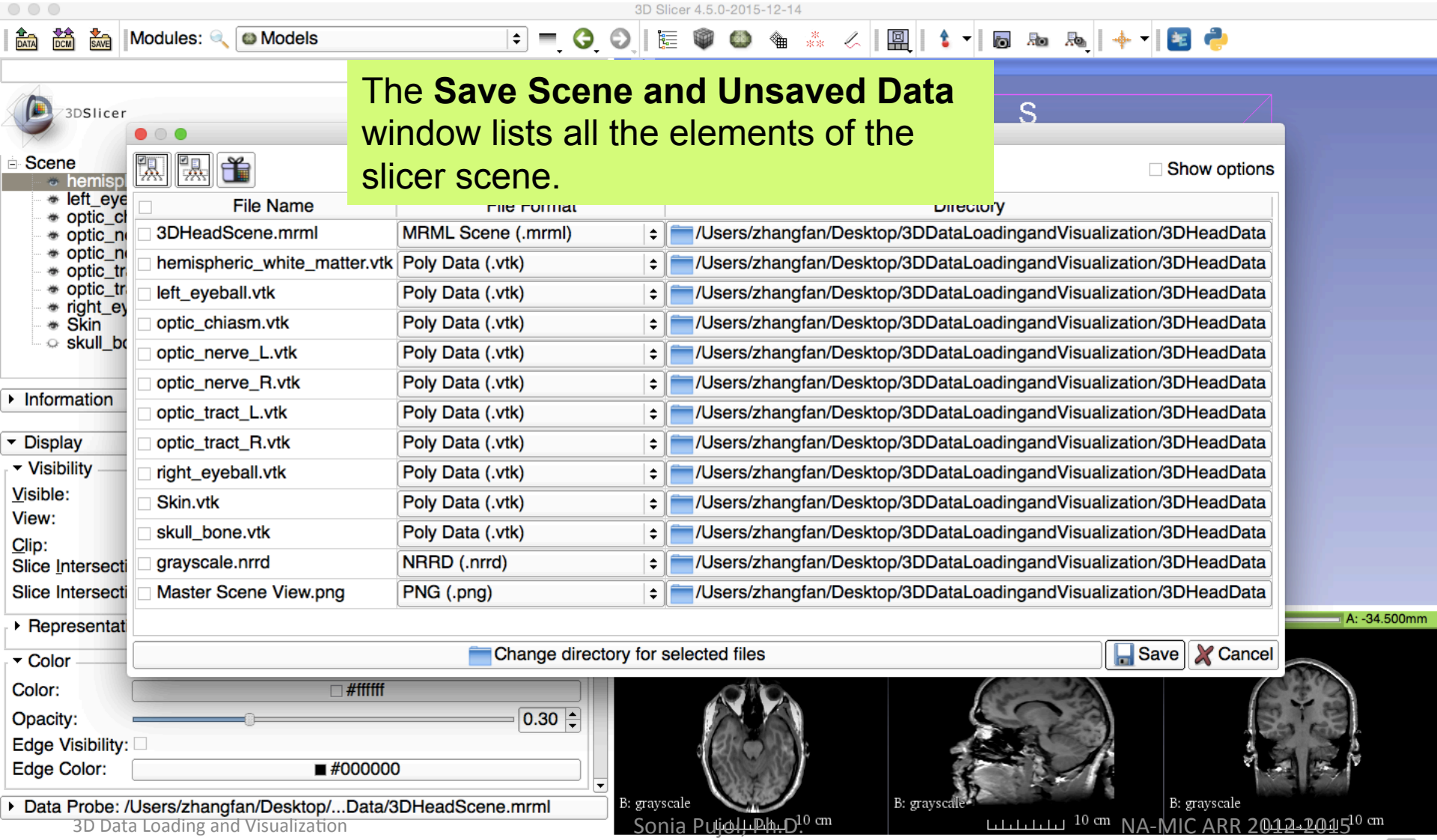
Saving a scene

Saving a Scene

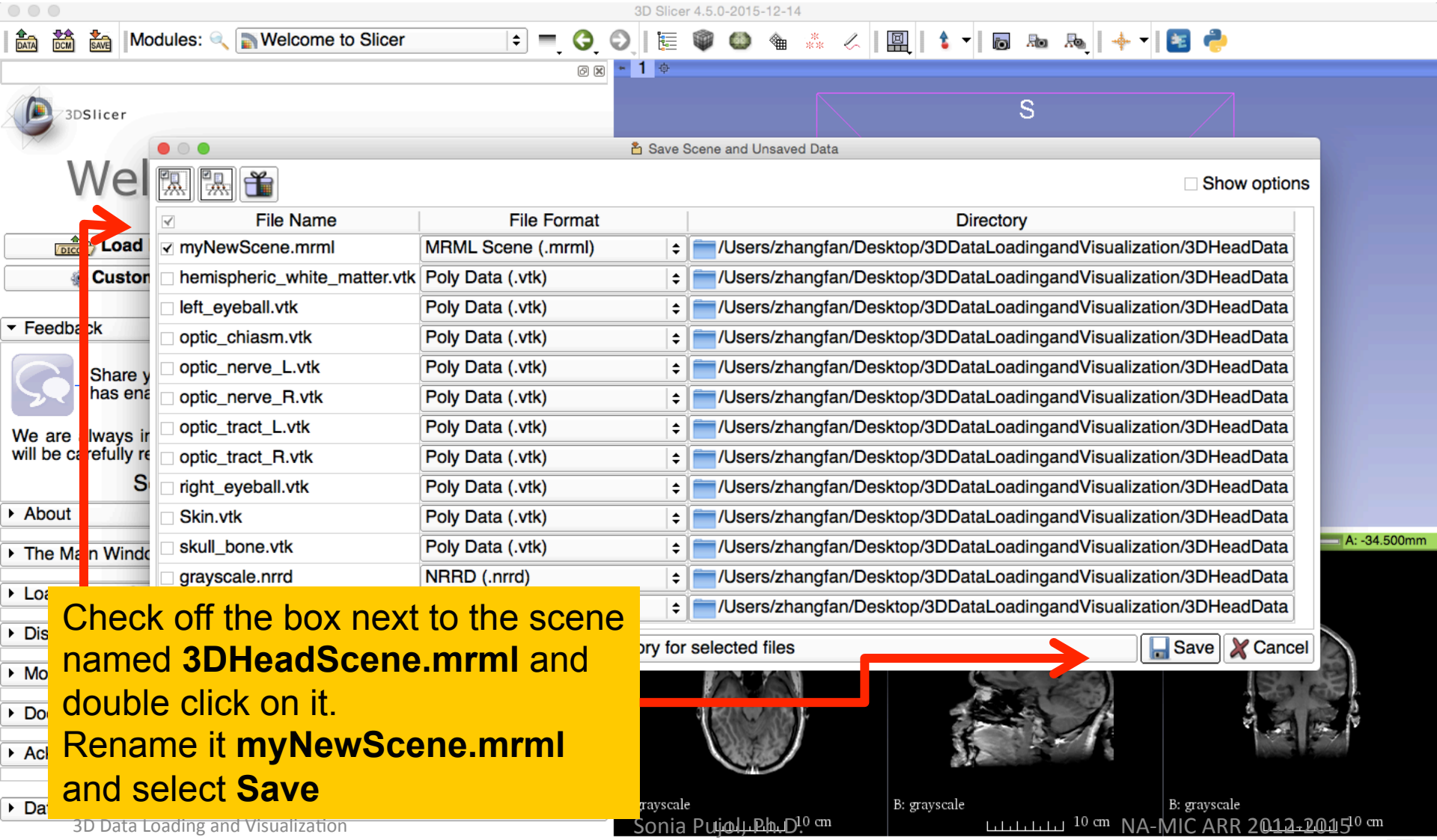


Click on **File** and select **Save**

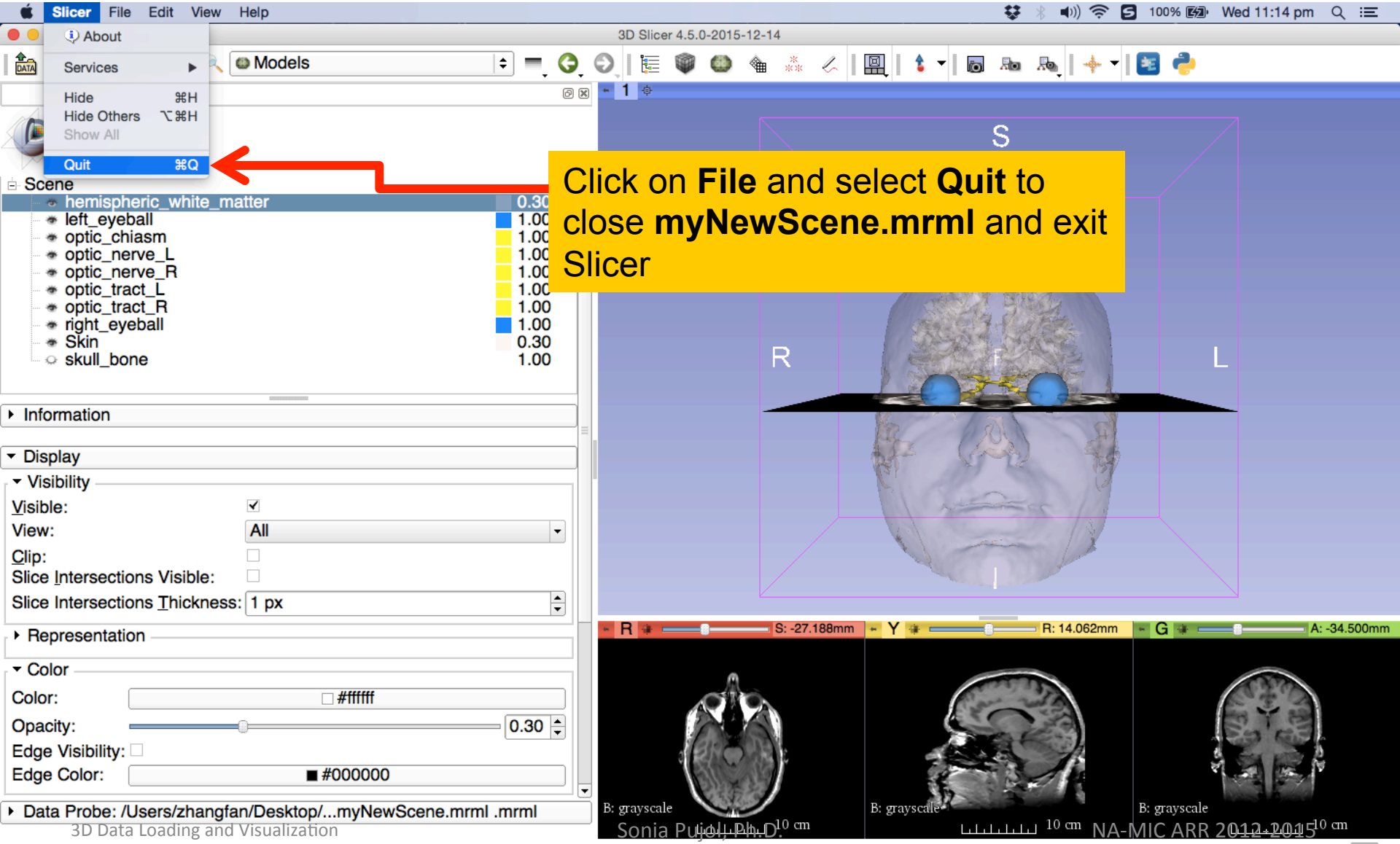
Saving a Scene



Saving a Scene

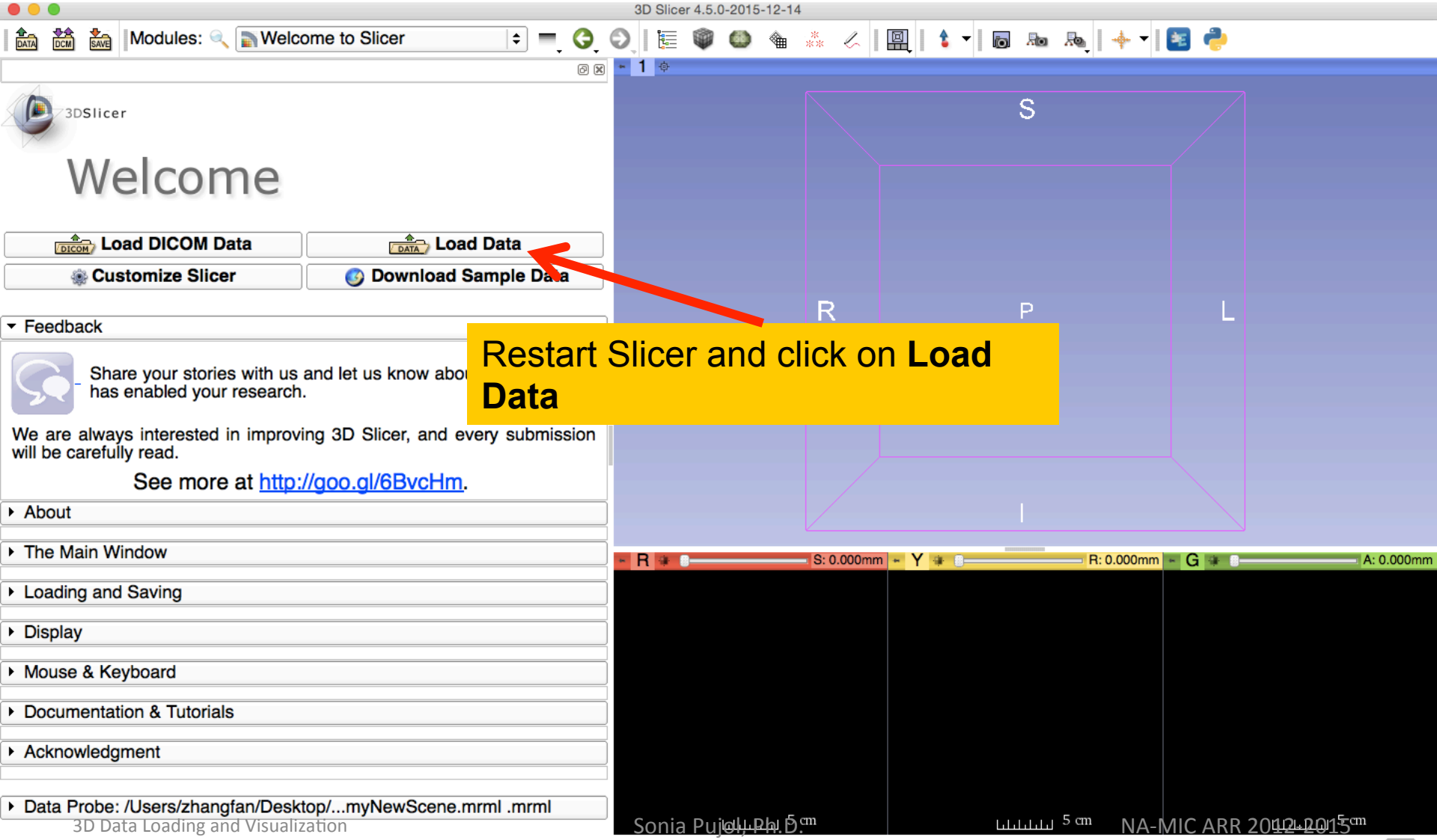


Saving a Scene



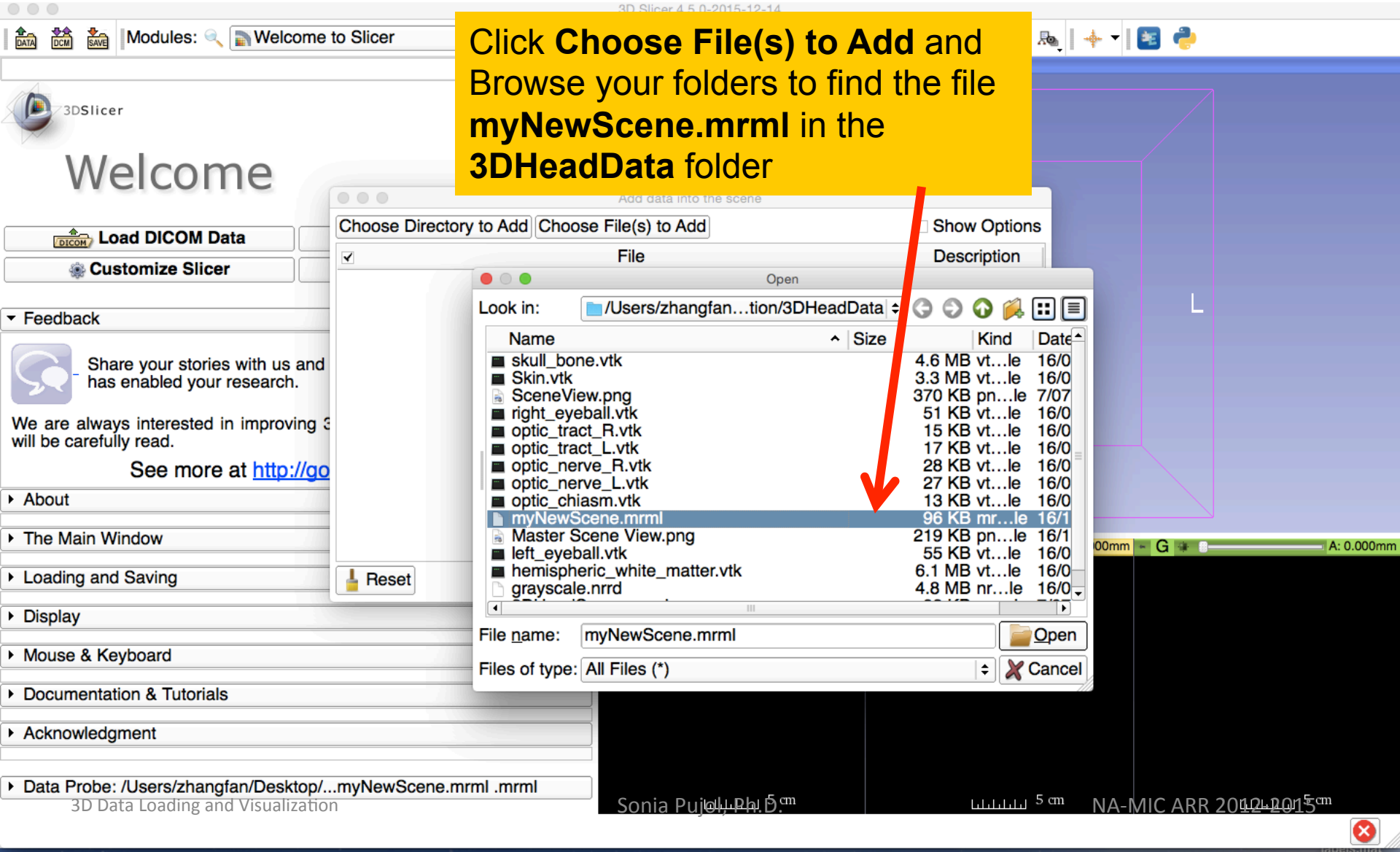
Click on **File** and select **Quit** to close **myNewScene.mrml** and exit Slicer

Scene Restore

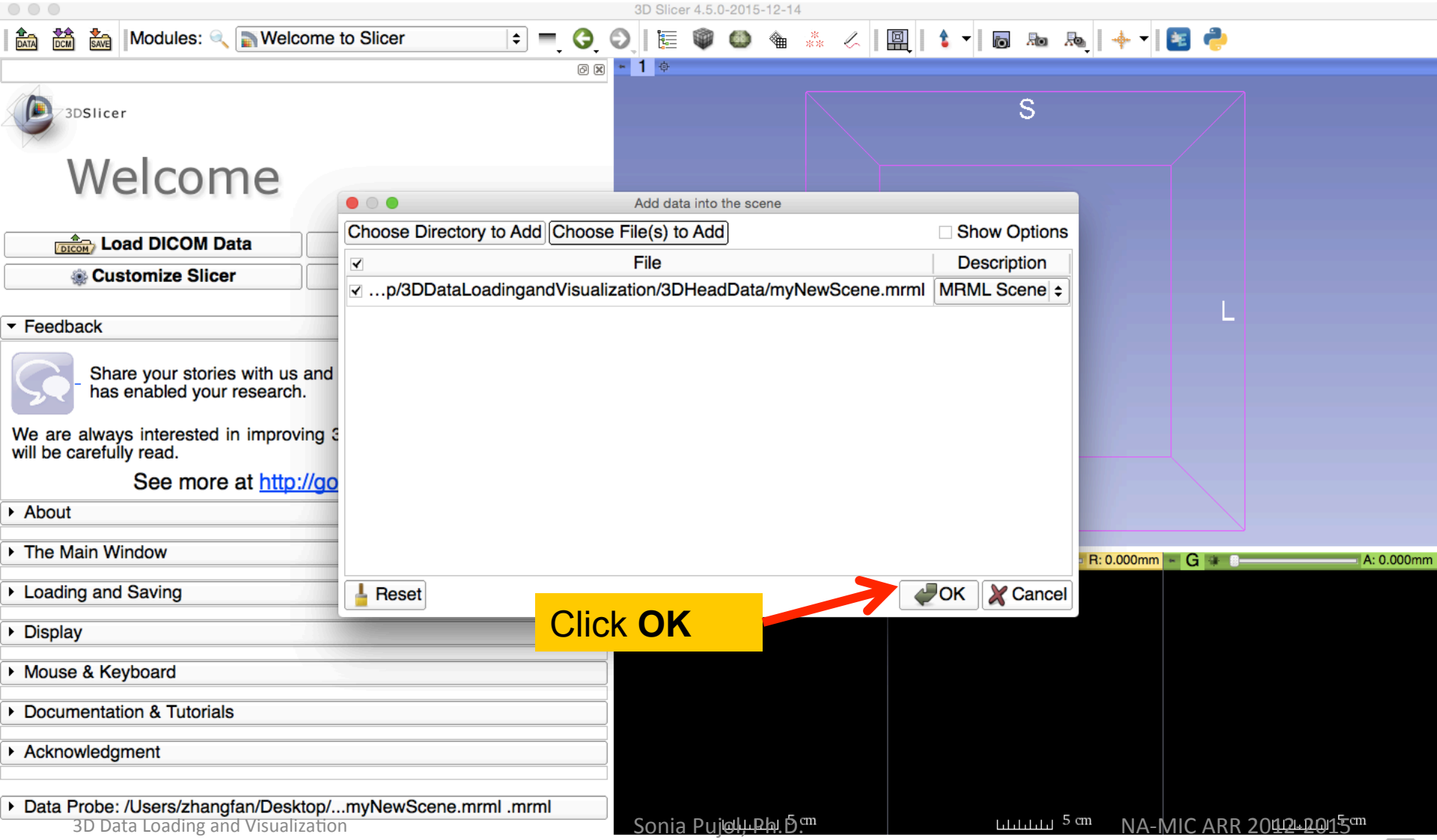


Restart Slicer and click on **Load Data**

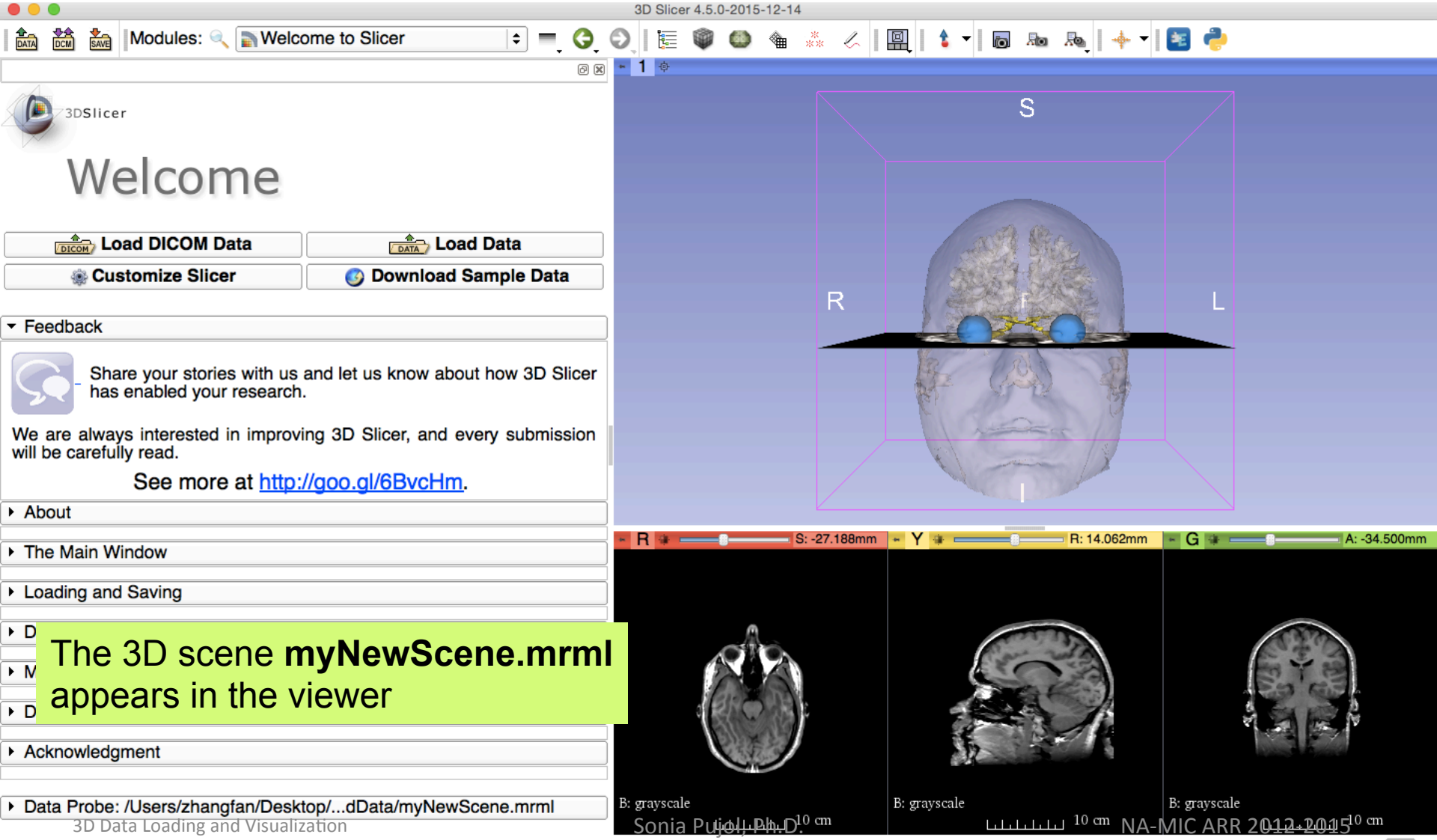
Scene Restore



Scene Restore



Slicer4



The 3D scene **myNewScene.mrml** appears in the viewer

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