



NA-MIC

National Alliance for Medical Image Computing

<http://na-mic.org>

Interactive Editor tutorial

Sonia Pujol, Ph.D.

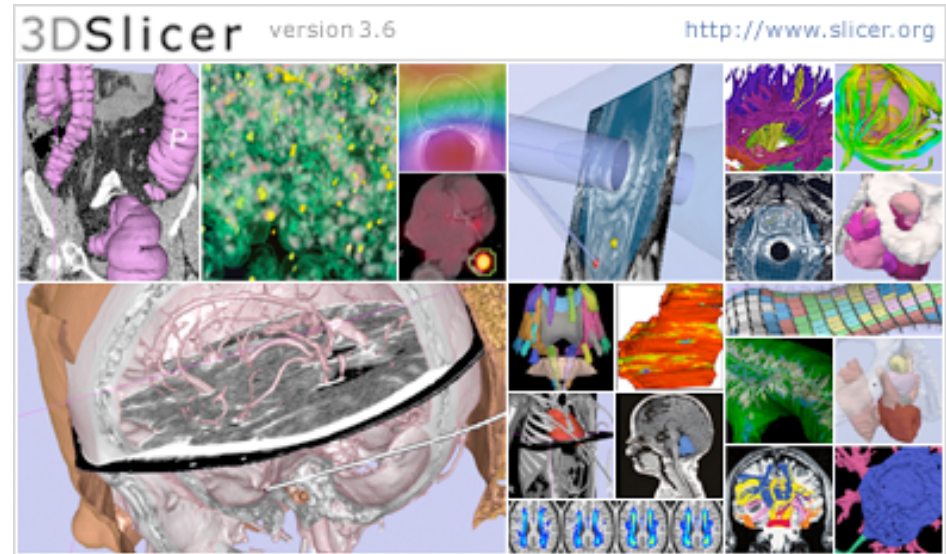
Surgical Planning Laboratory

Harvard Medical School



Slicer3.6

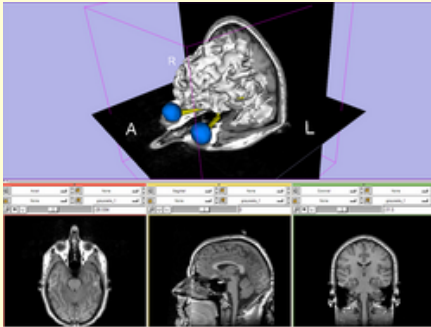
- An **end-user application** for image analysis
- An **open-source environment** for software development
- A software platform that is both **easy to use for clinical researchers** and **easy to extend for programmers**





Pre-requisite

- This course supposes that you have taken the following tutorial:



‘Slicer3 Data Loading and Visualization’
Sonia Pujol, PhD

http://www.slicer.org/slicerWiki/index.php/Slicer3.6:Training#Software_tutorials



Material

This course requires the following material

- Slicer3.6 release version available at

<http://www.slicer.org/pages/Special:SlicerDownloads>

- EditorTutorialData.zip available at

<http://www.slicer.org/slicerWiki/index.php/File:EditorTutorialDataset.zip>

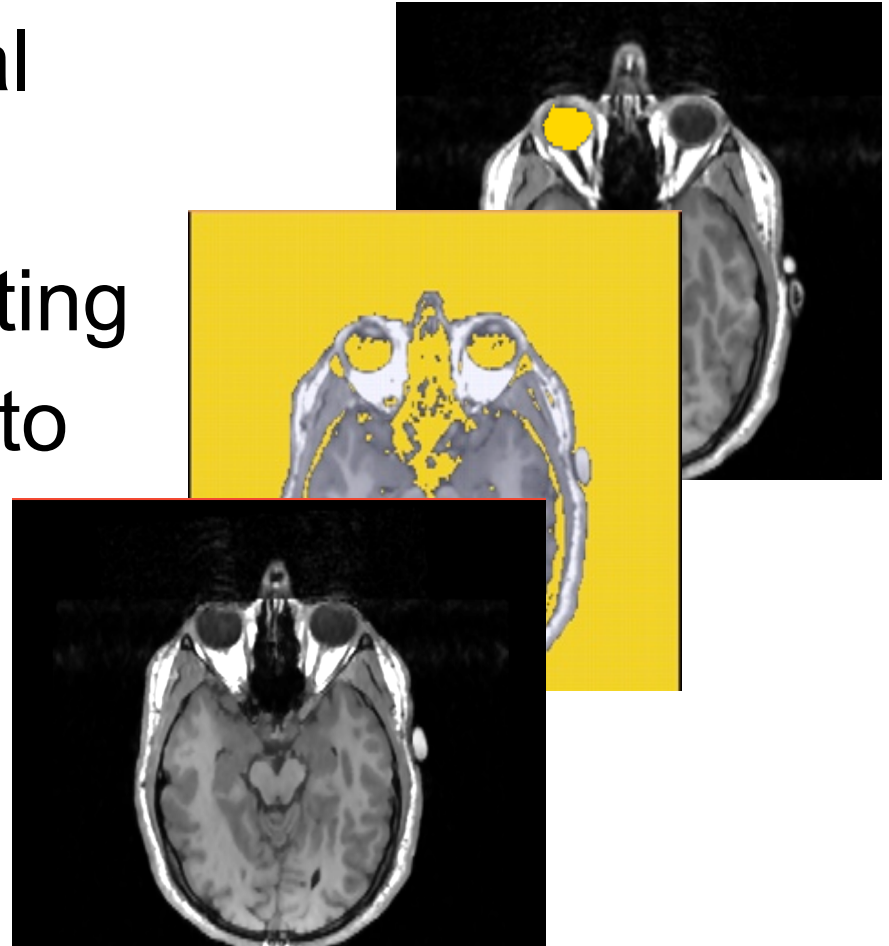
Disclaimer

It is the responsibility of the user of 3DSlicer to comply with both the terms of the license and with the applicable laws, regulations and rules.



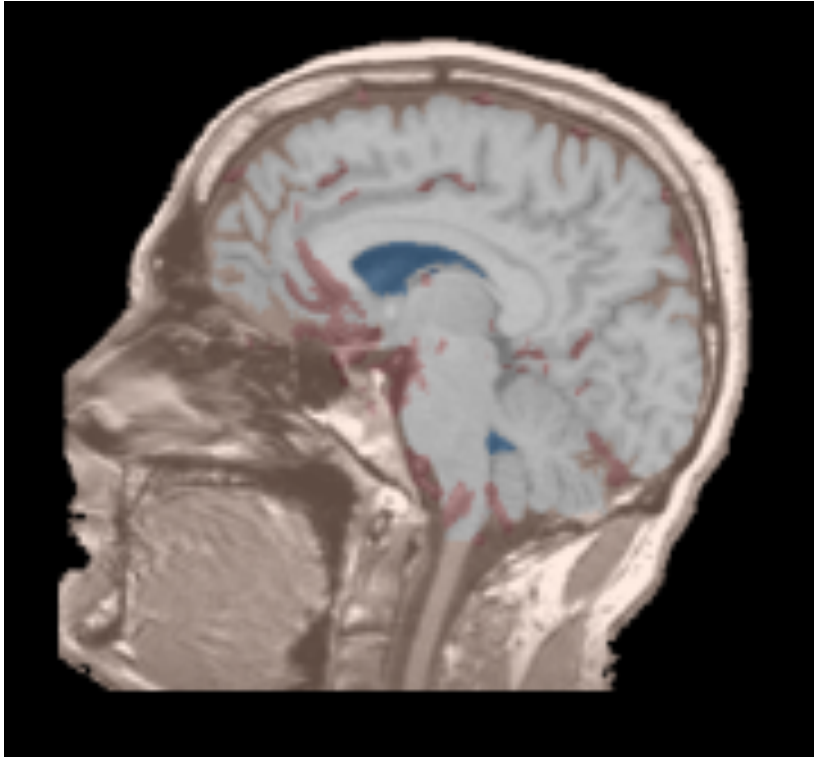
Learning Objective

The goal of this tutorial to train you to use the suite of interactive editing tools built in Slicer3.6 to create and edit label maps.





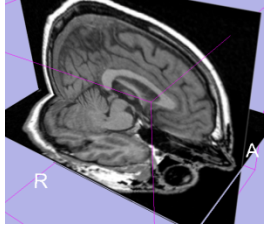
Label map



A **label map** has a number at each pixel representing the anatomy present at that point.



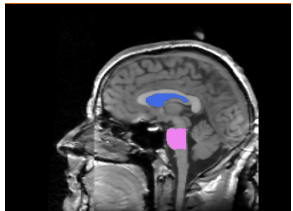
Overview



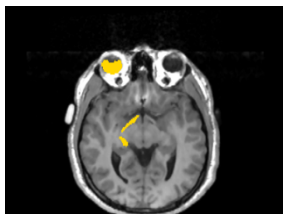
Part 1: Creating a single label map

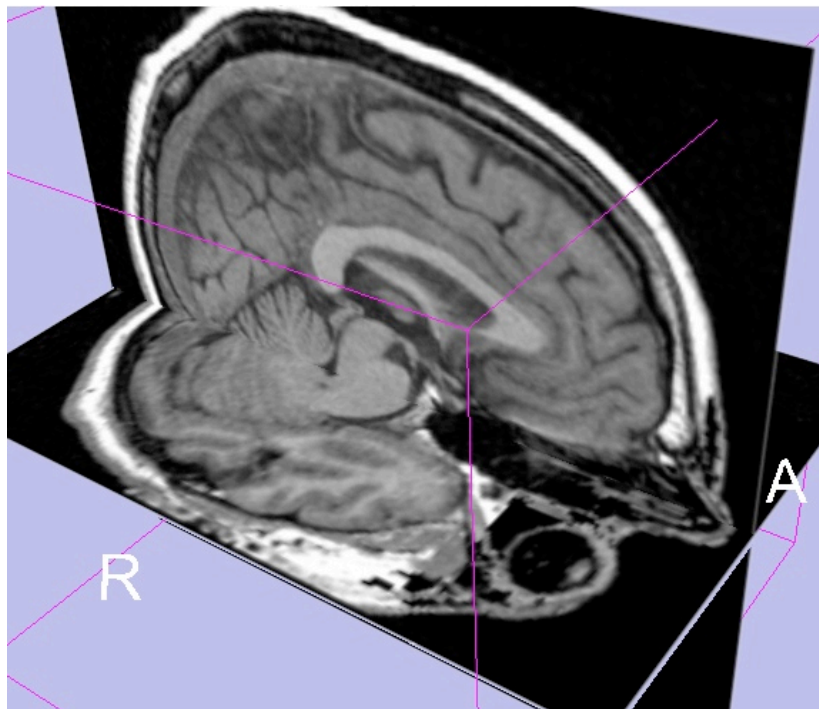


Part 2: Editing a single label map



Part 3: Creating and editing a label map with multiple labels

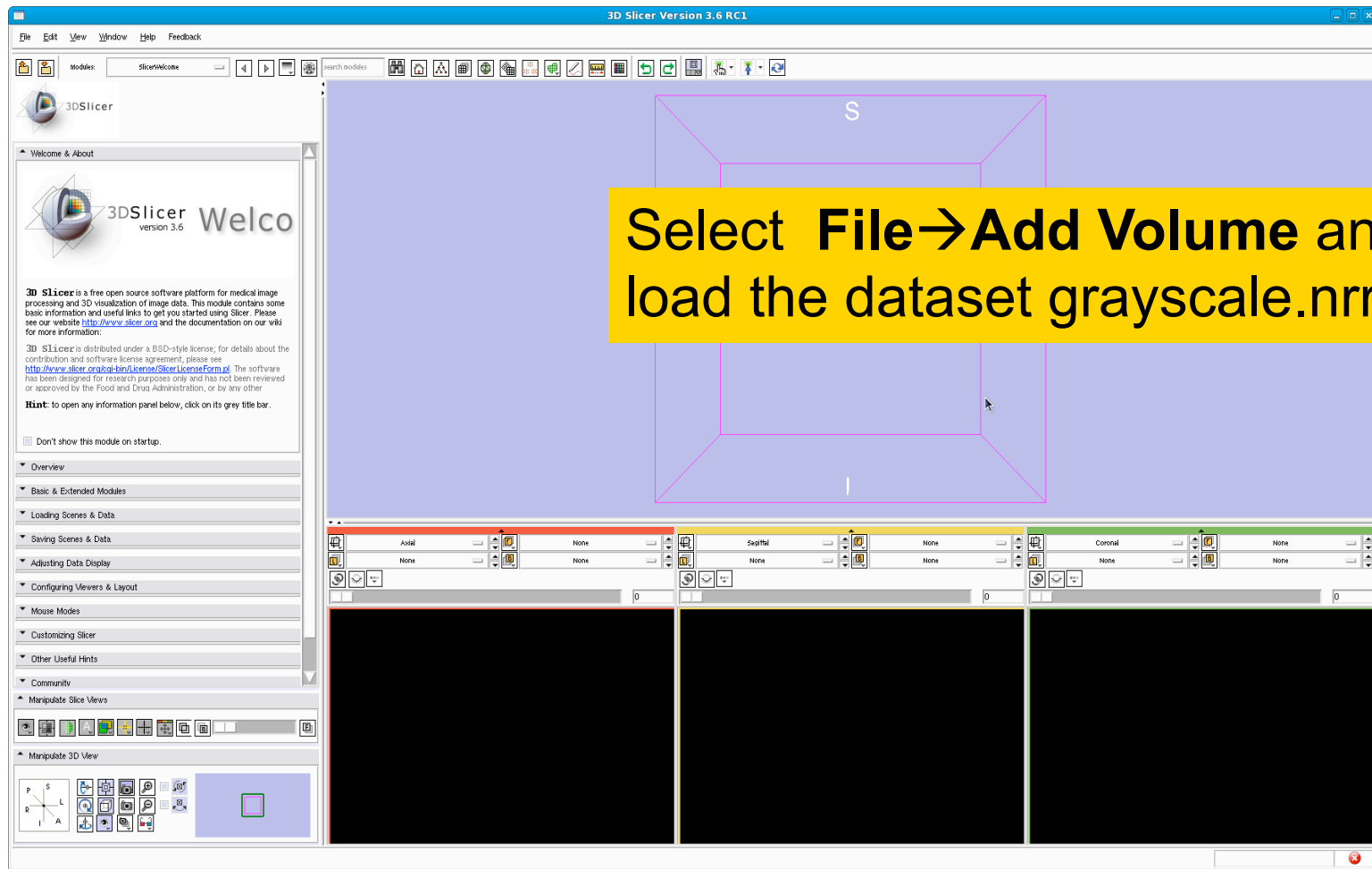




Part 1: Creating a single label map



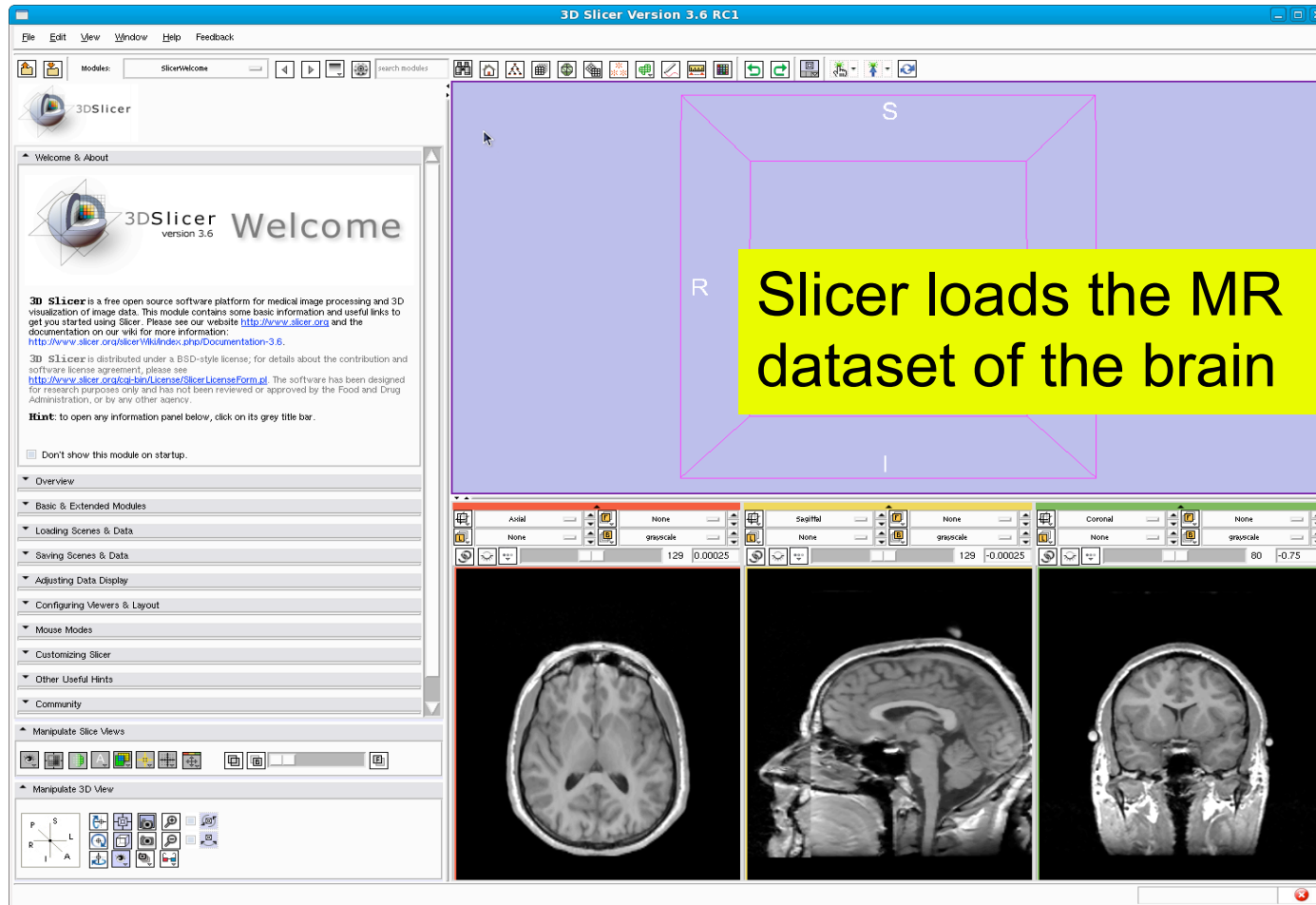
Data Loading



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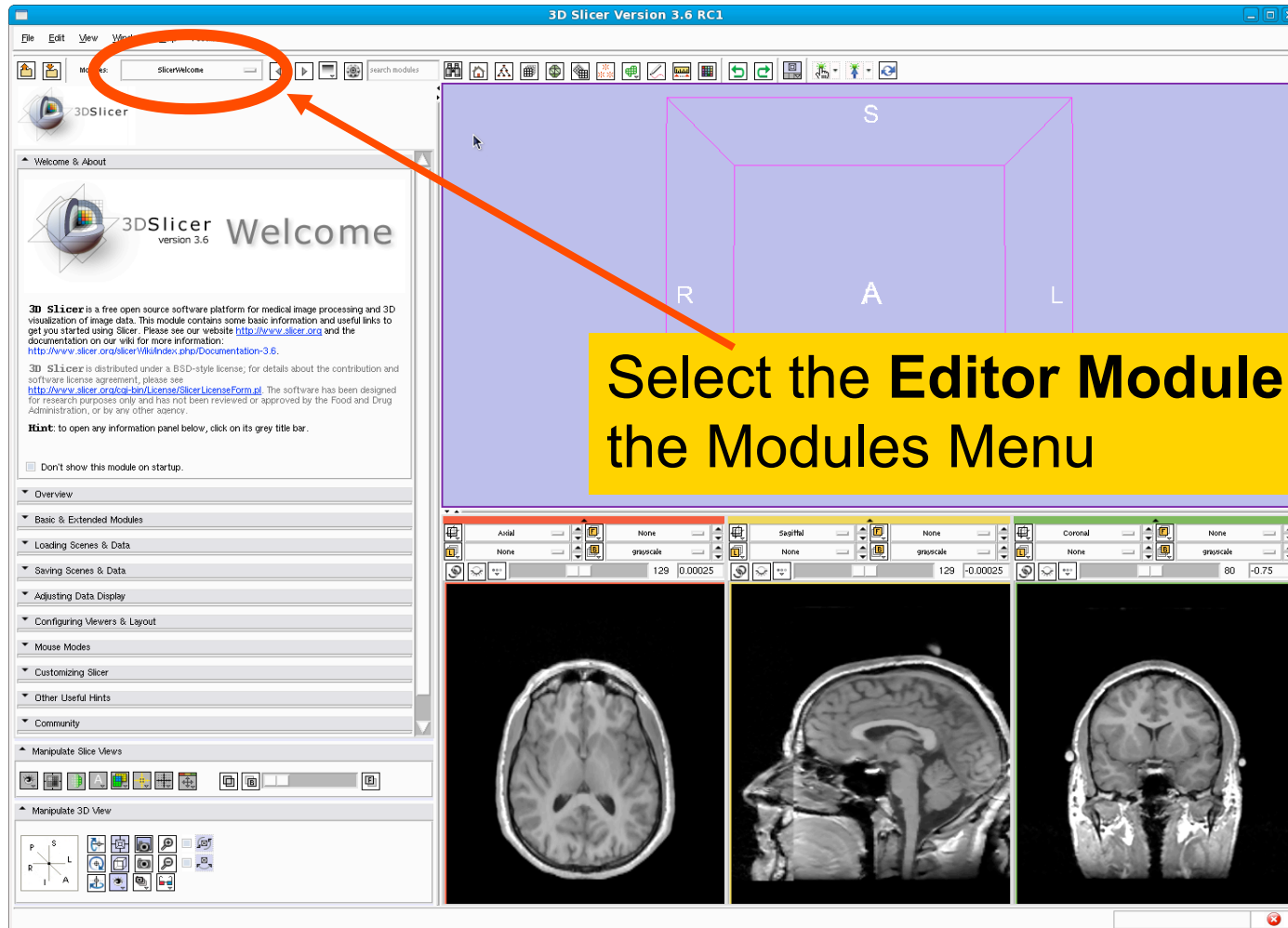
Data Loading



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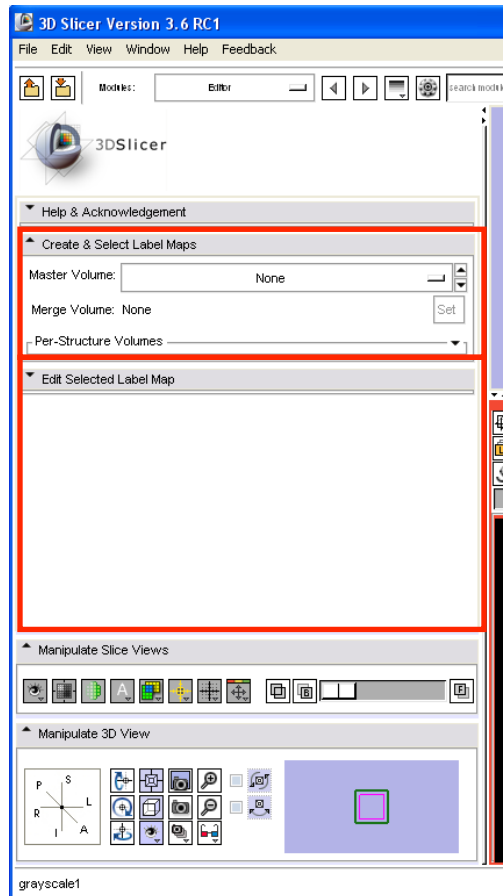
Data Loading



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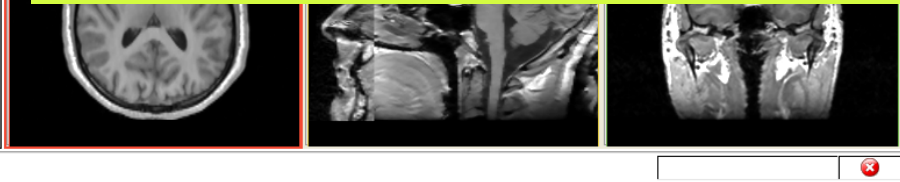


Editor Module



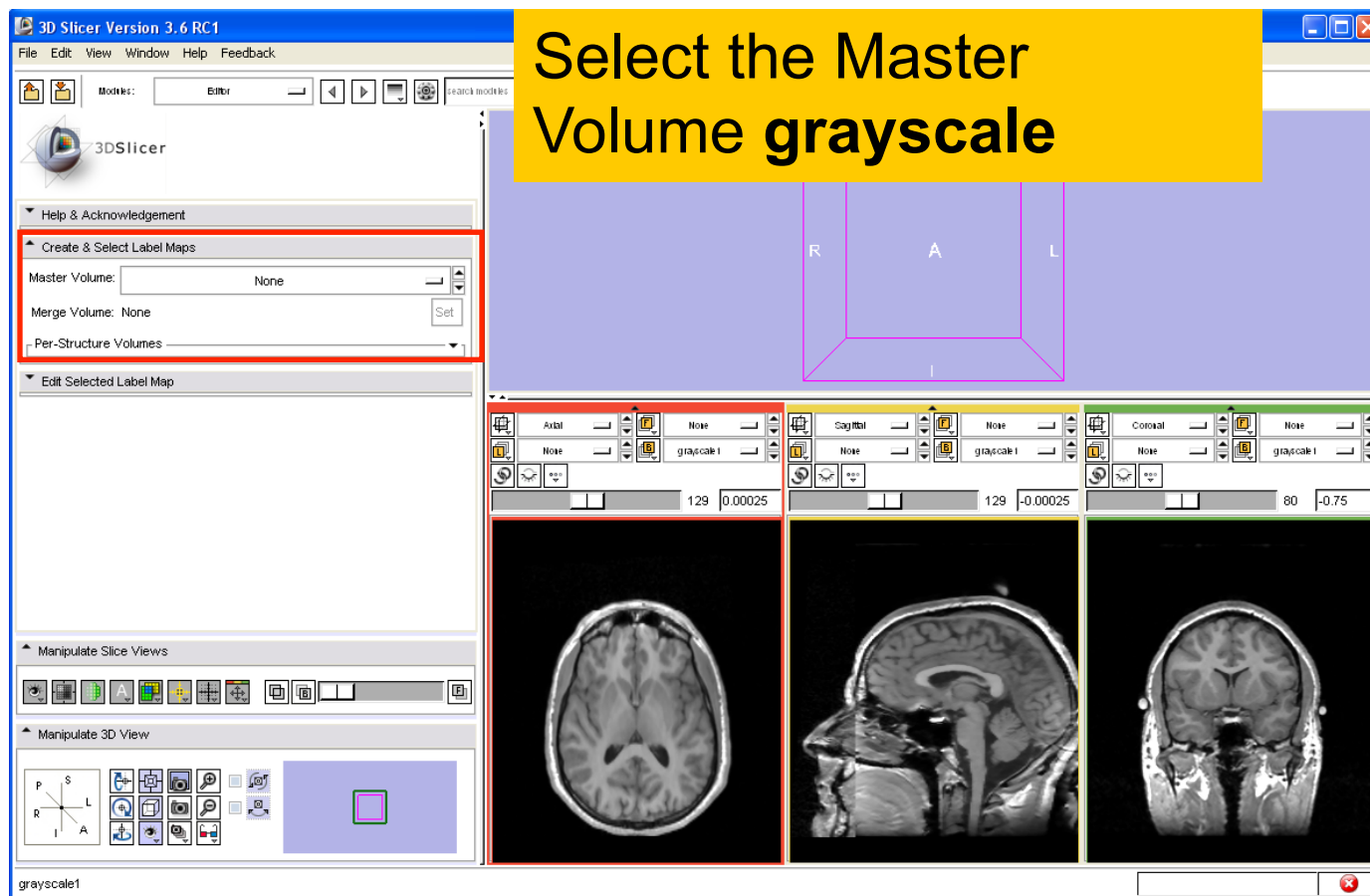
The Editor module GUI is composed of two parts:

- the upper part contains the functionalities for creating single or multiple label maps,
- the lower part contains the functionalities for editing label maps.



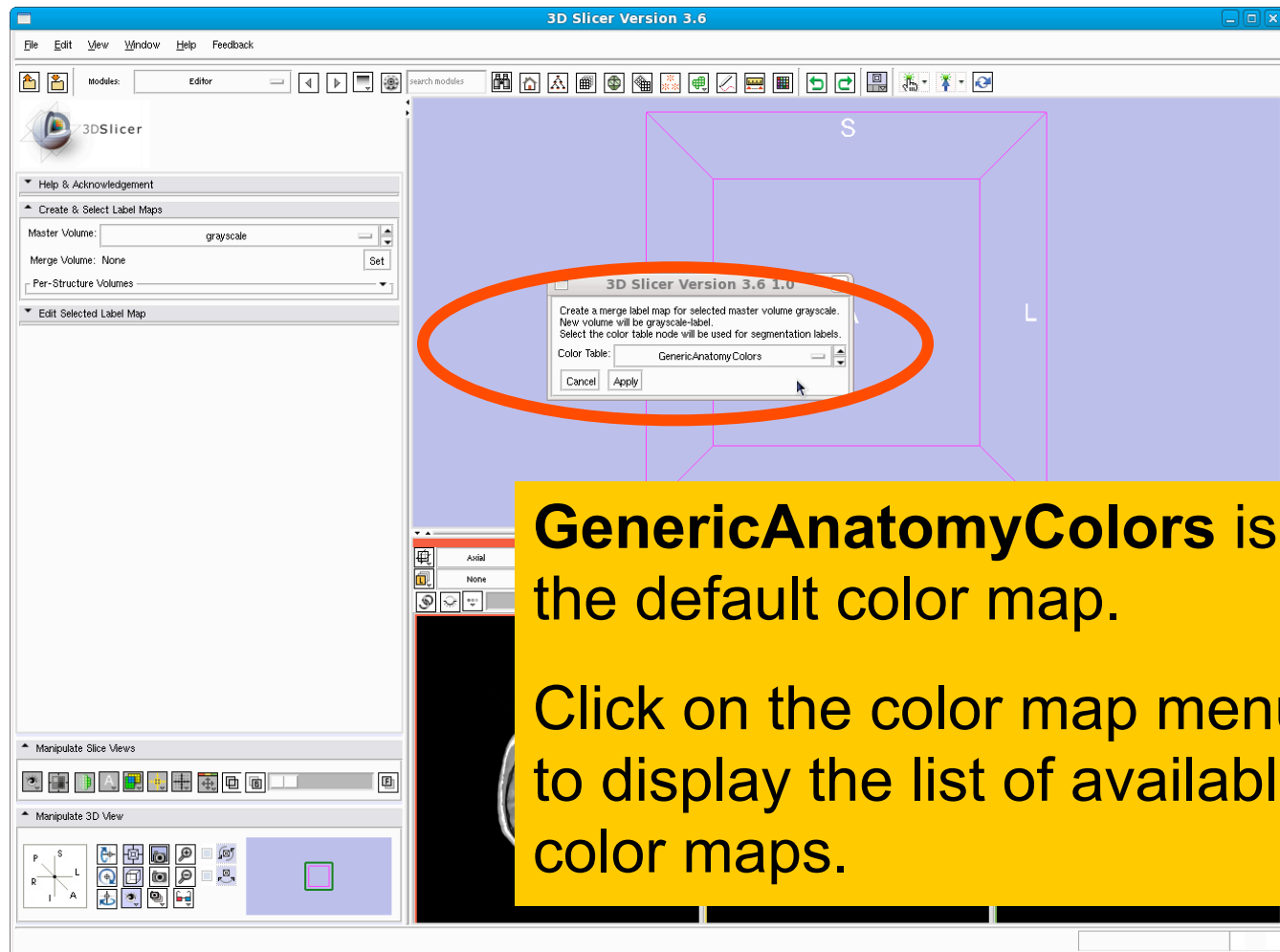


Label Map Creation



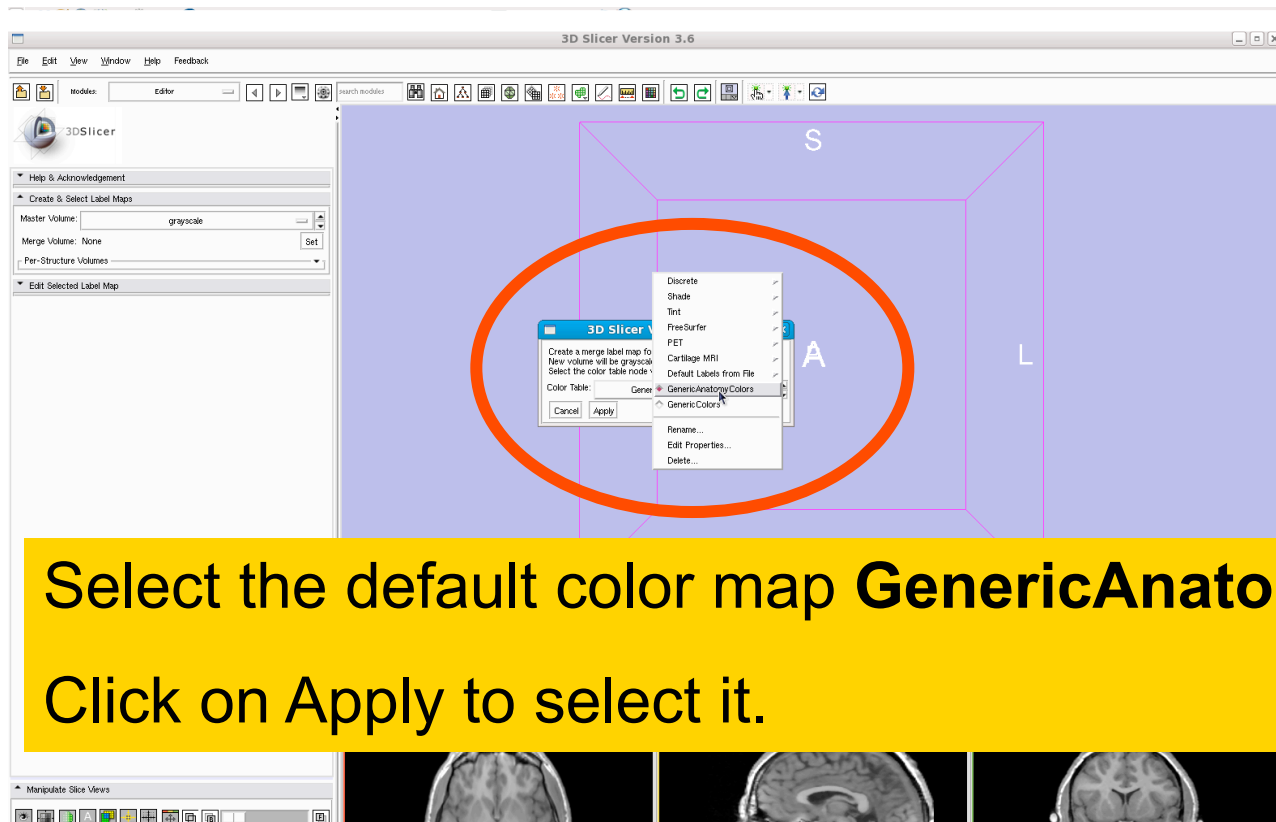


Label Map Creation





Label Map Creation

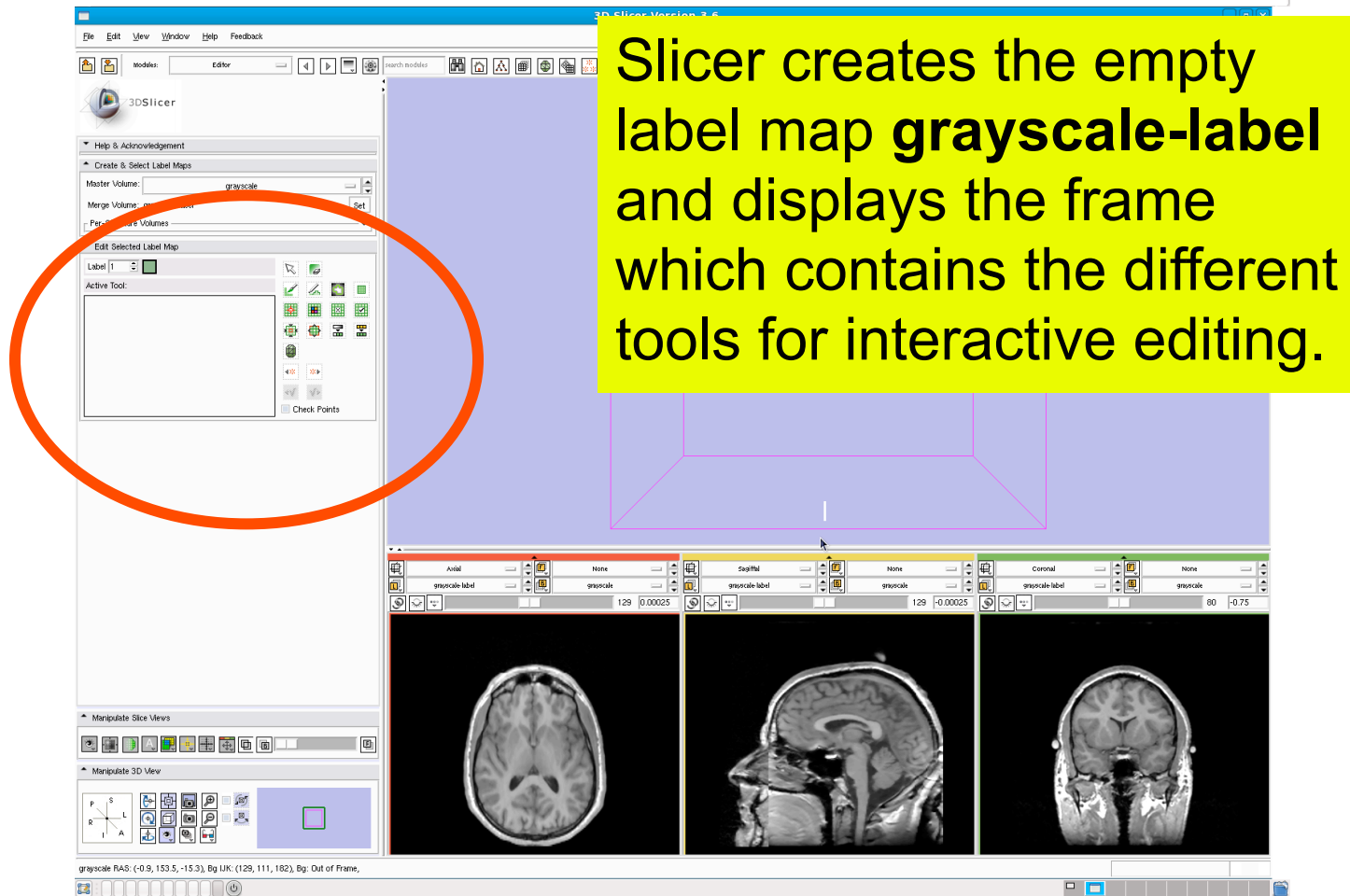


Select the default color map **GenericAnatomyColors**
Click on Apply to select it.

Note: You may use the Colors module if you need a custom or application specific color map



Label Map Creation

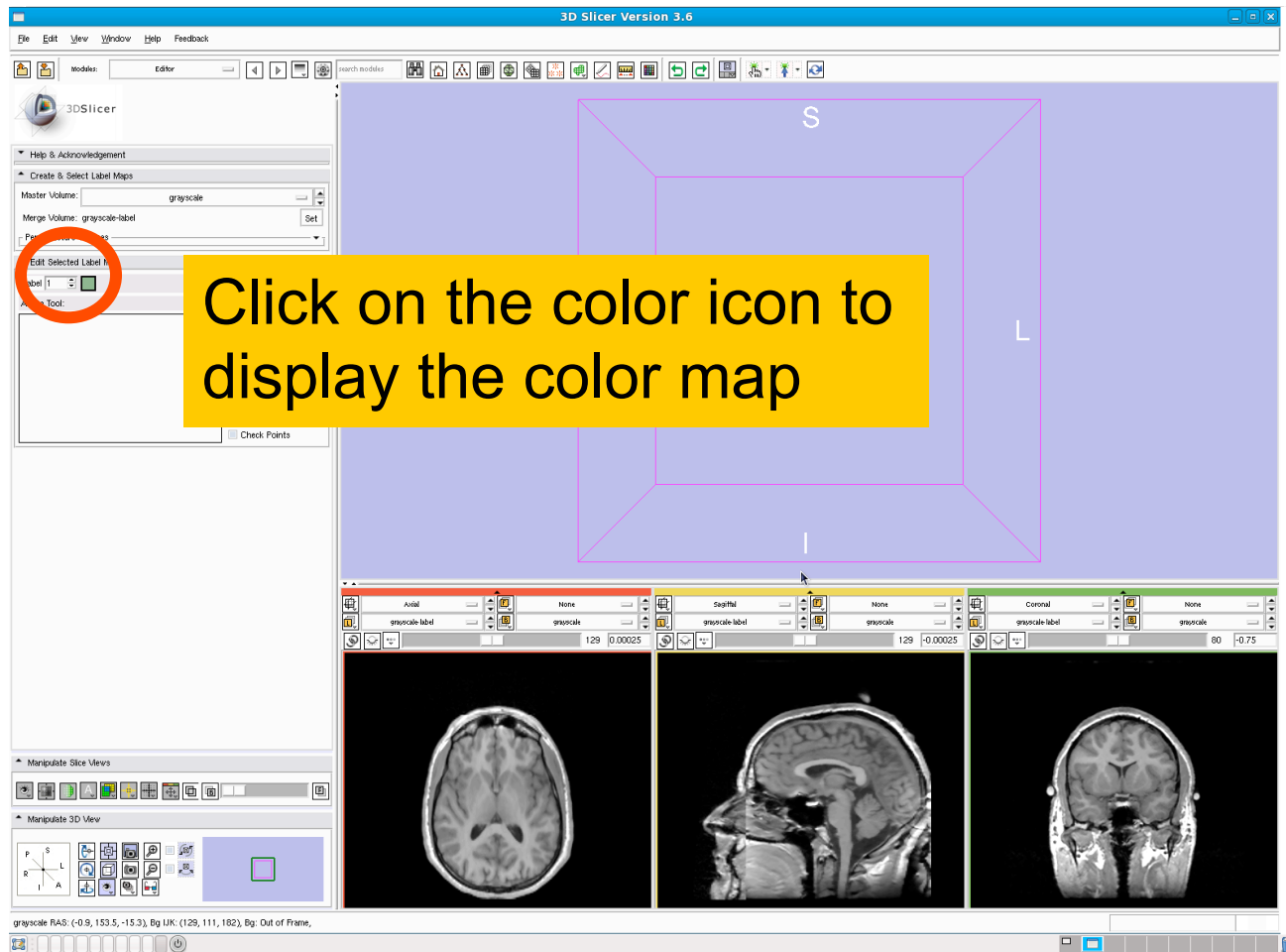




Part 2: Editing a single label map

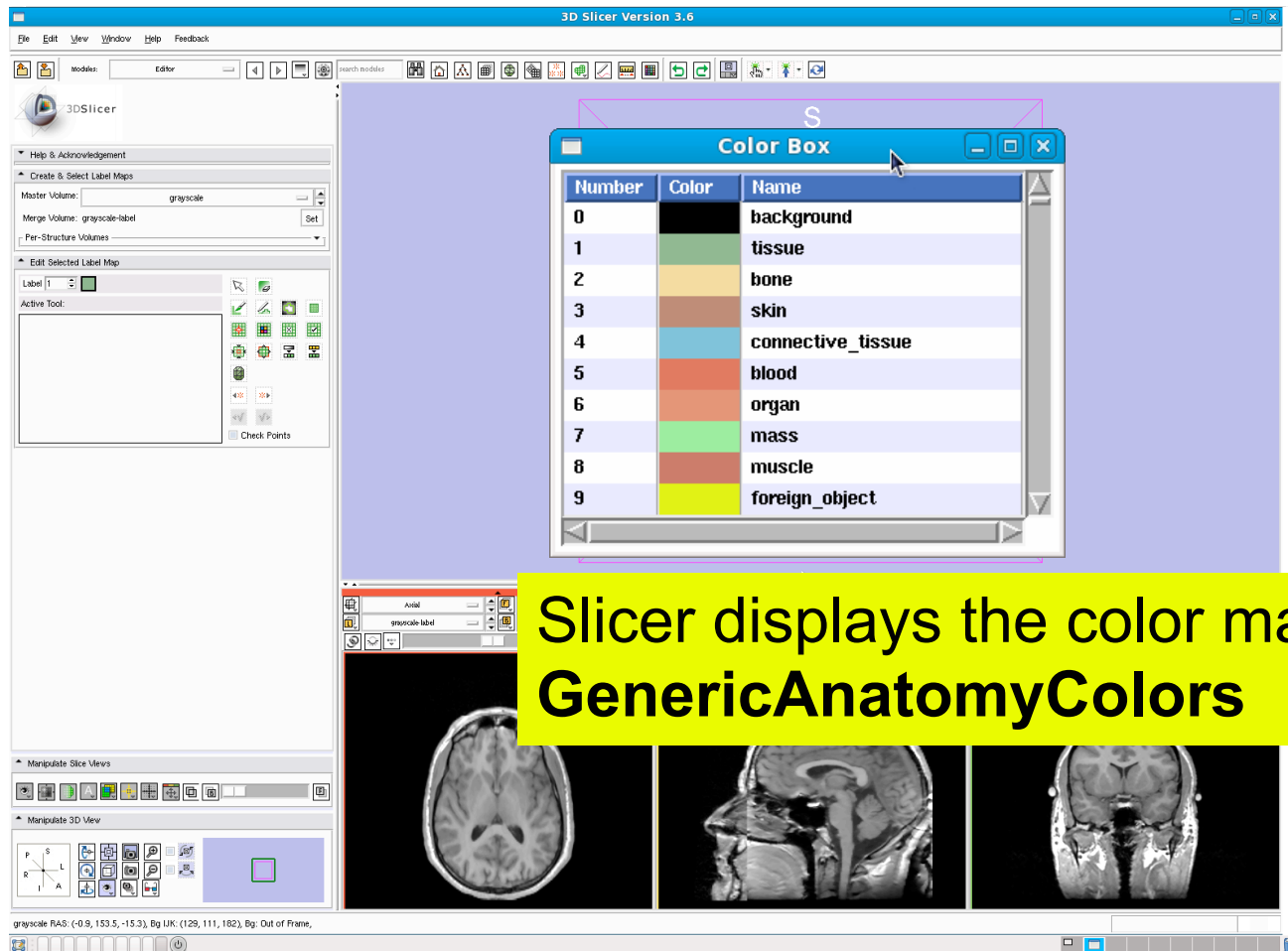


Label Map Editing





Label Map Editing





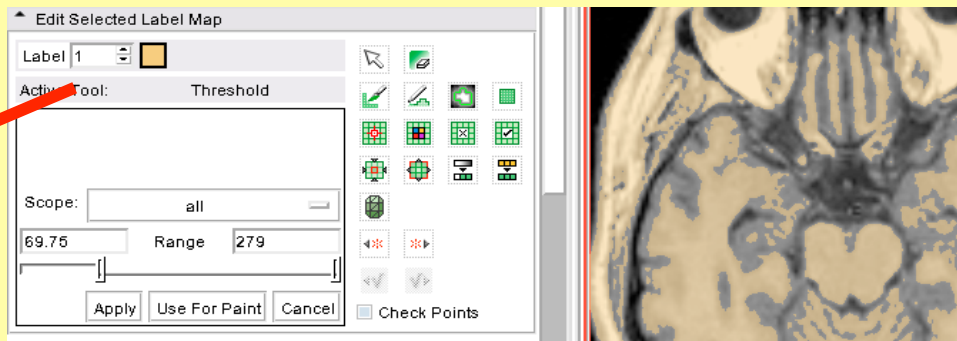
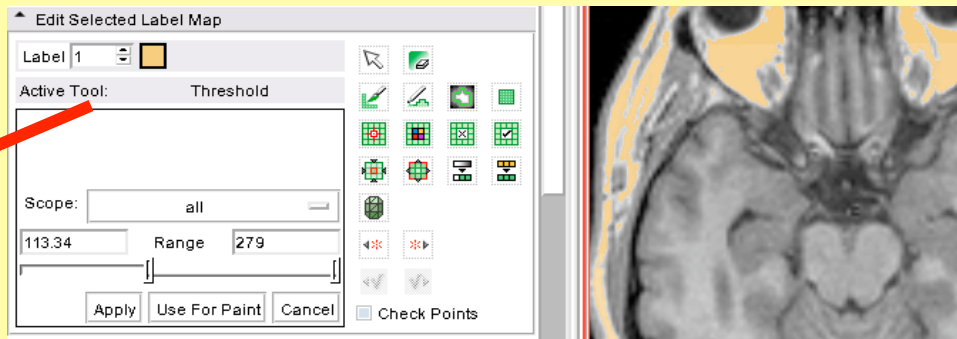
Browse through the list of 307 labels to explore the color map
GenericAnatomyColors

Select the label #3 'Skin'



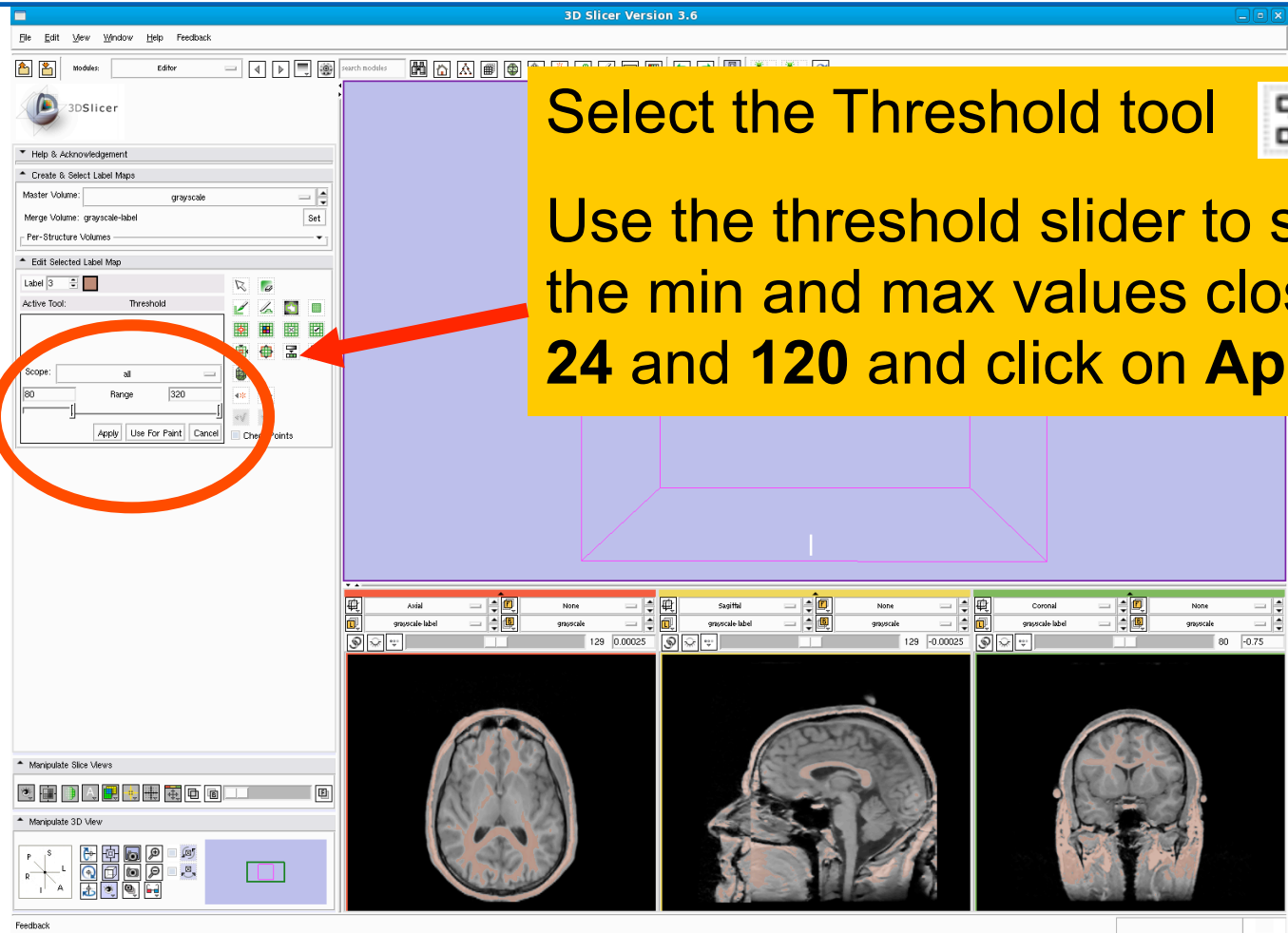
Threshold

Description: The grey level volume voxels for which the intensity is within the specified range will be assigned the same label in the label map.





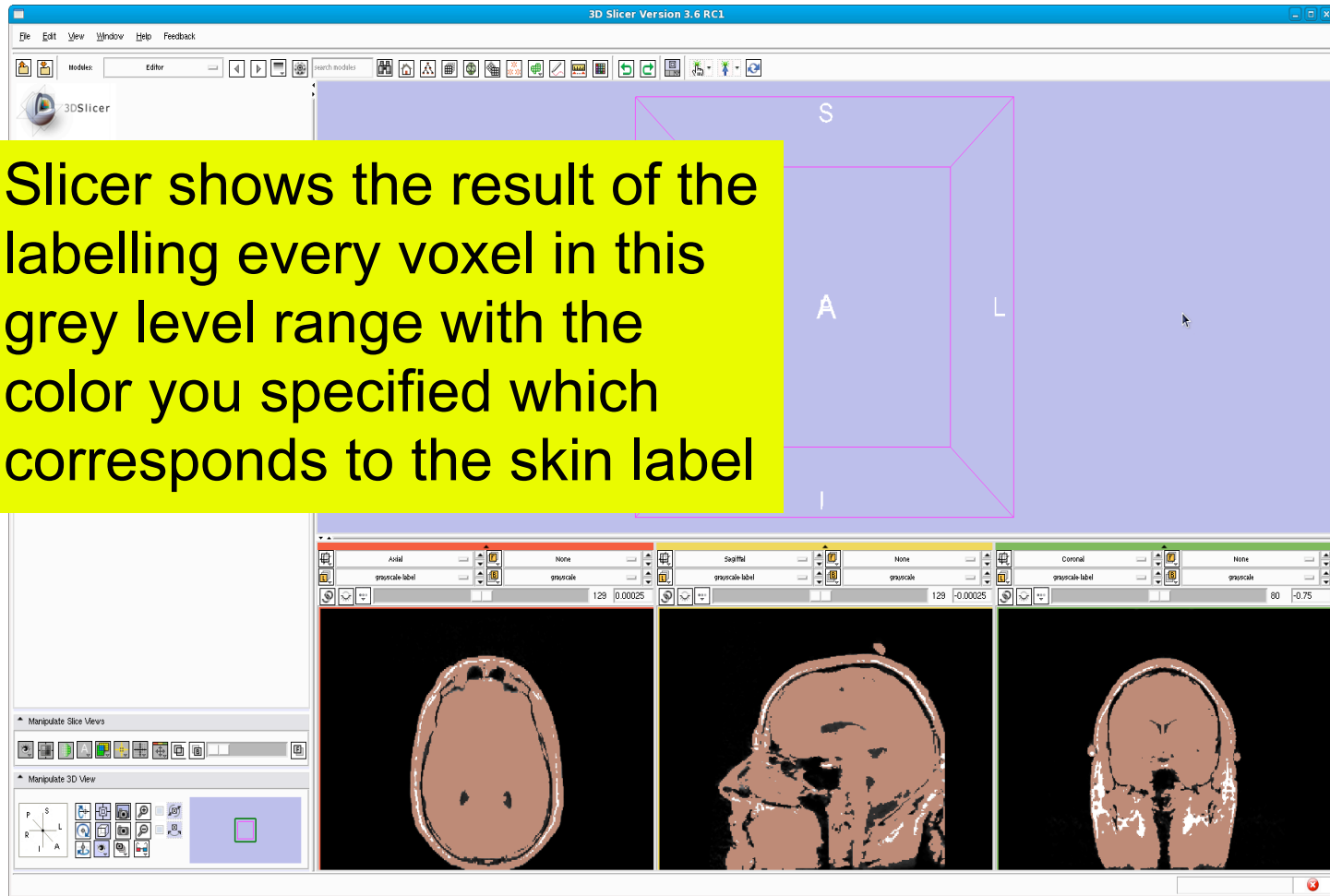
Threshold Effect





Threshold Effect

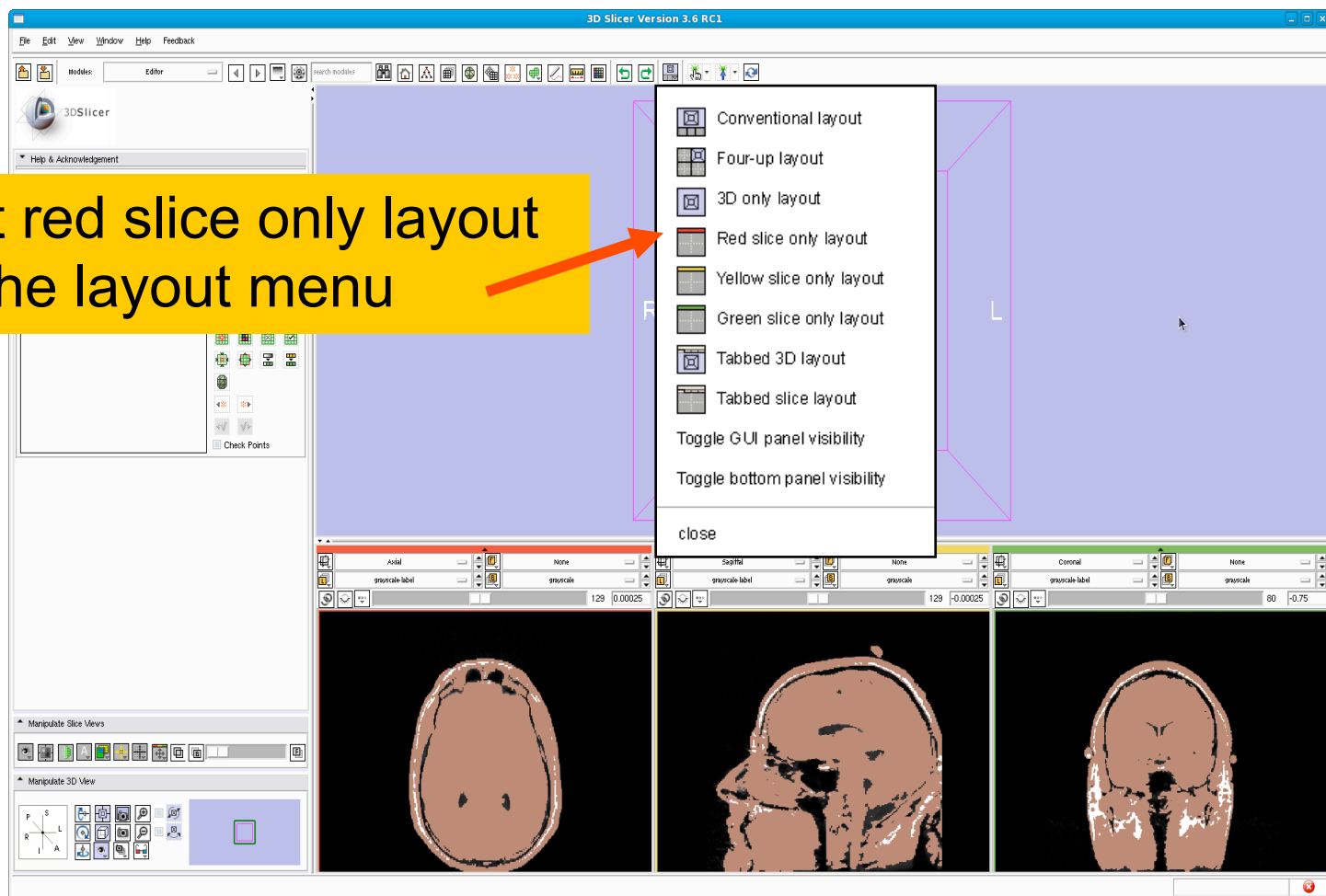
Slicer shows the result of the labelling every voxel in this grey level range with the color you specified which corresponds to the skin label





Threshold Effect

Select red slice only layout
from the layout menu





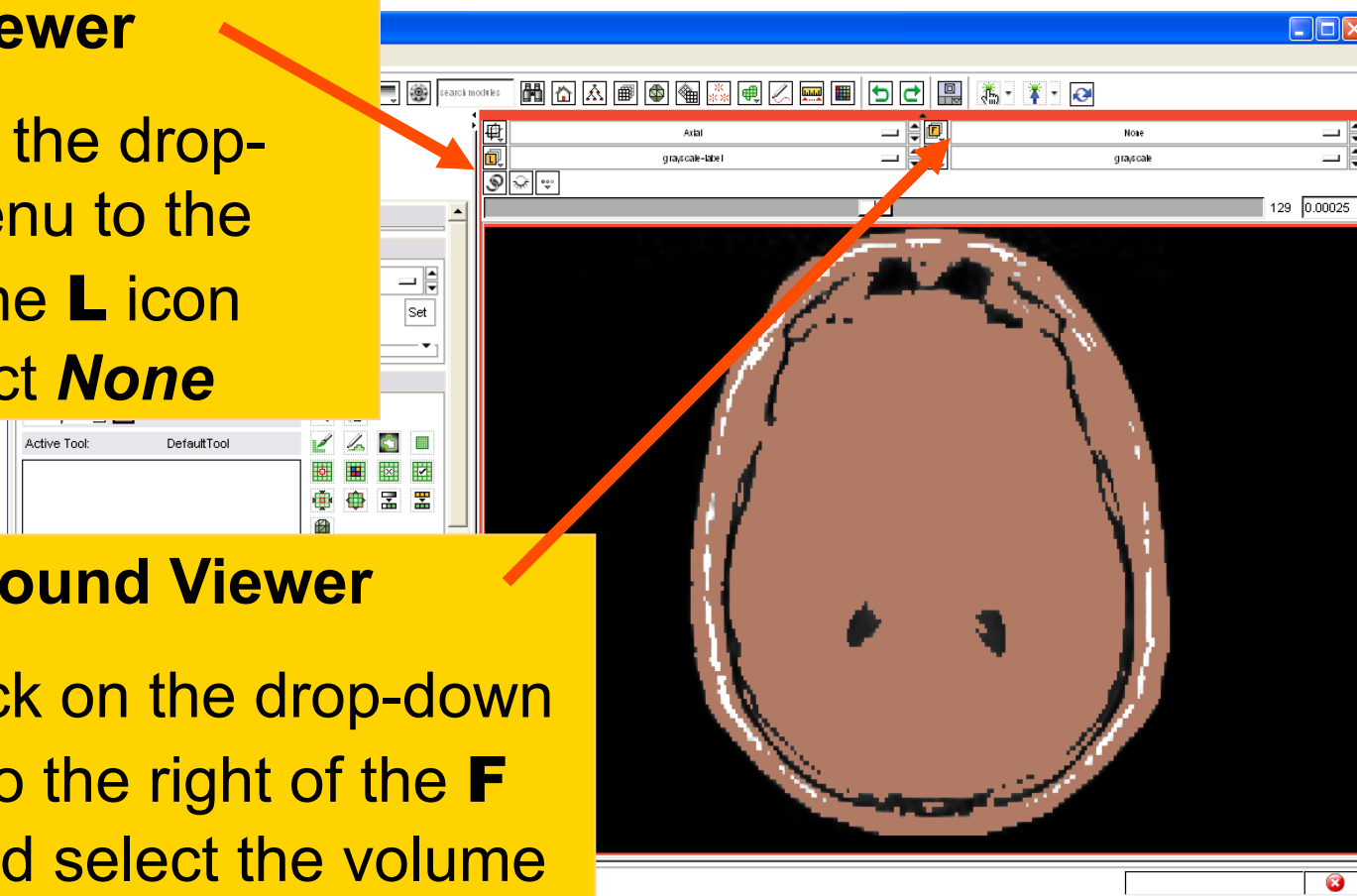
Threshold Effect

Label Viewer

Left click the drop-down menu to the right of the **L** icon and select **None**

Foreground Viewer

Left click on the drop-down menu to the right of the **F** icon and select the volume **grayscale-label**

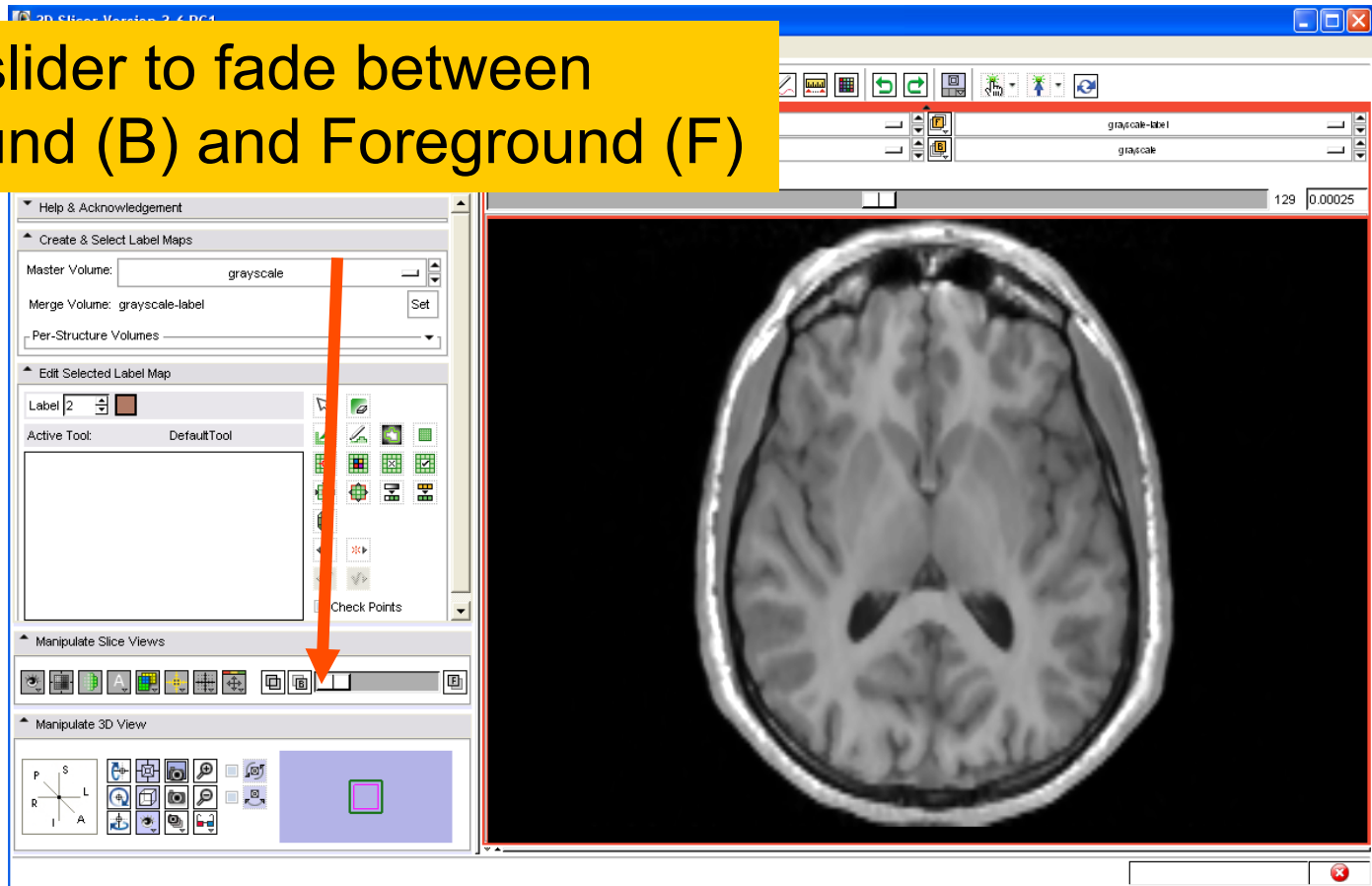


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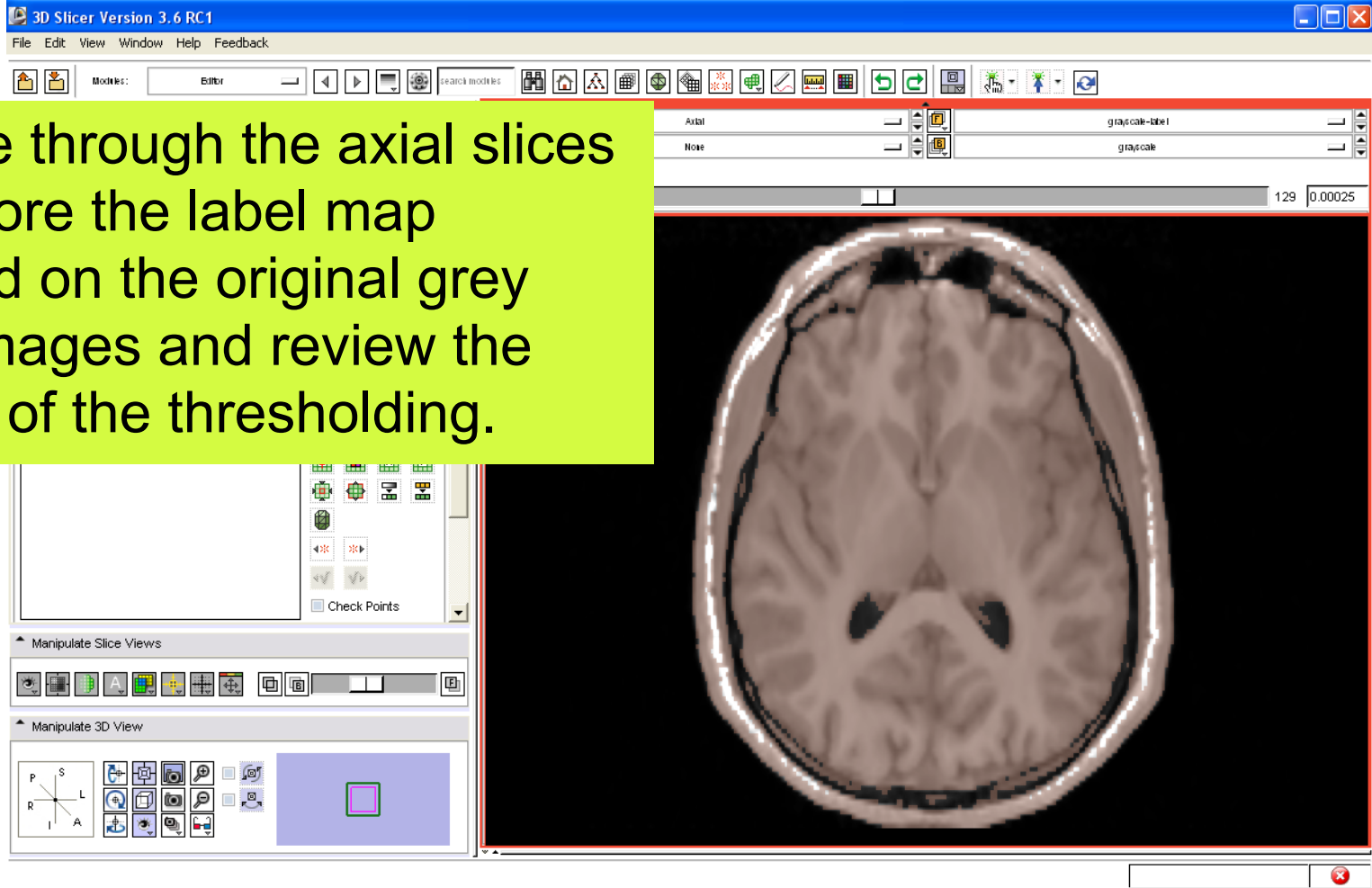
Threshold Effect

Use the slider to fade between Background (B) and Foreground (F)





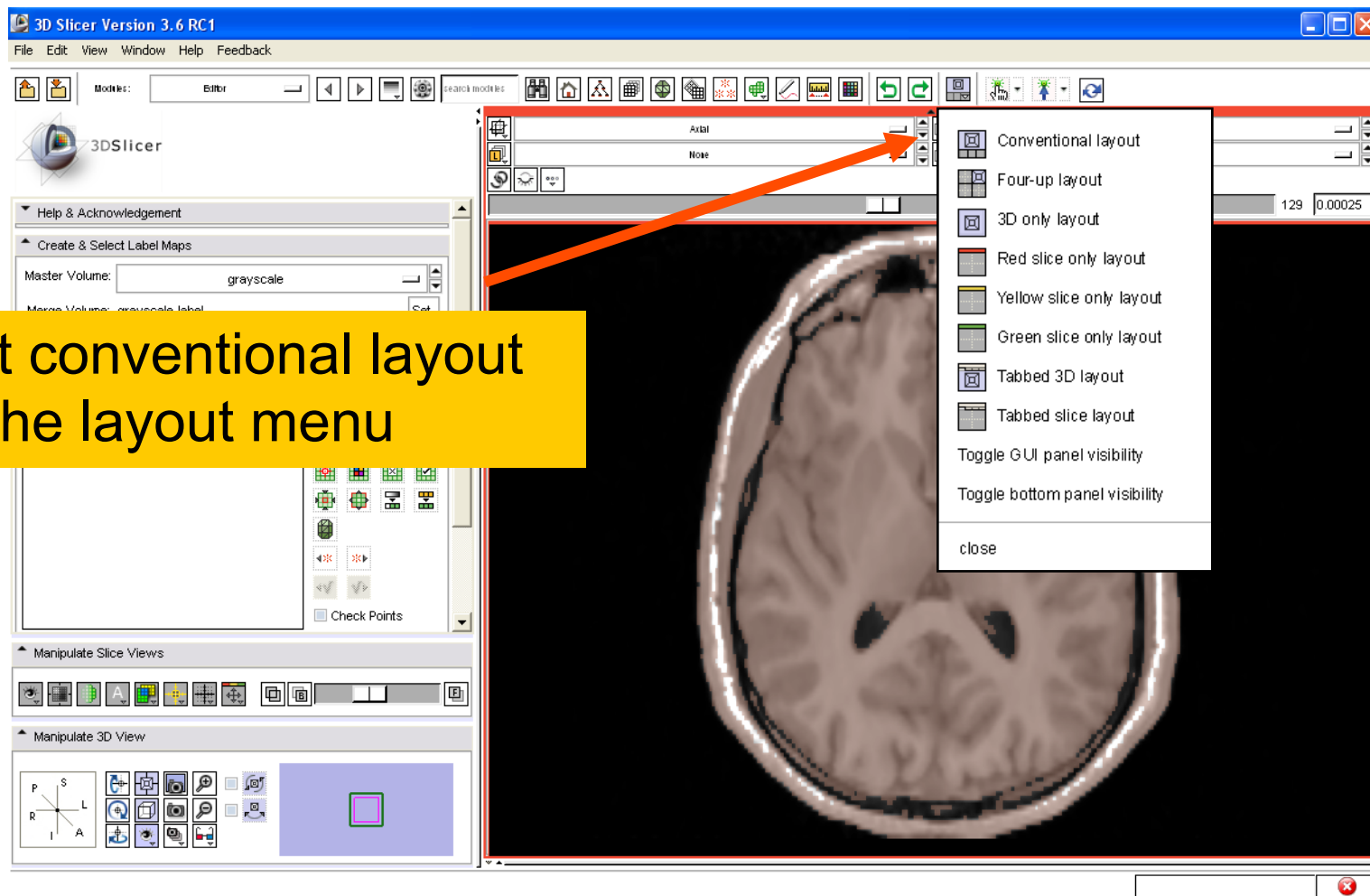
Exploring the result



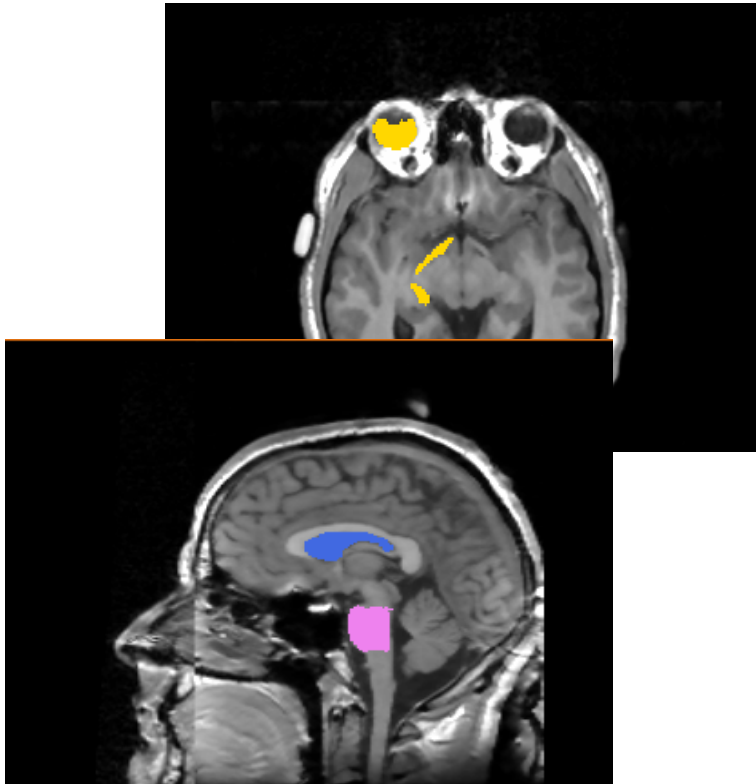
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Threshold Effect



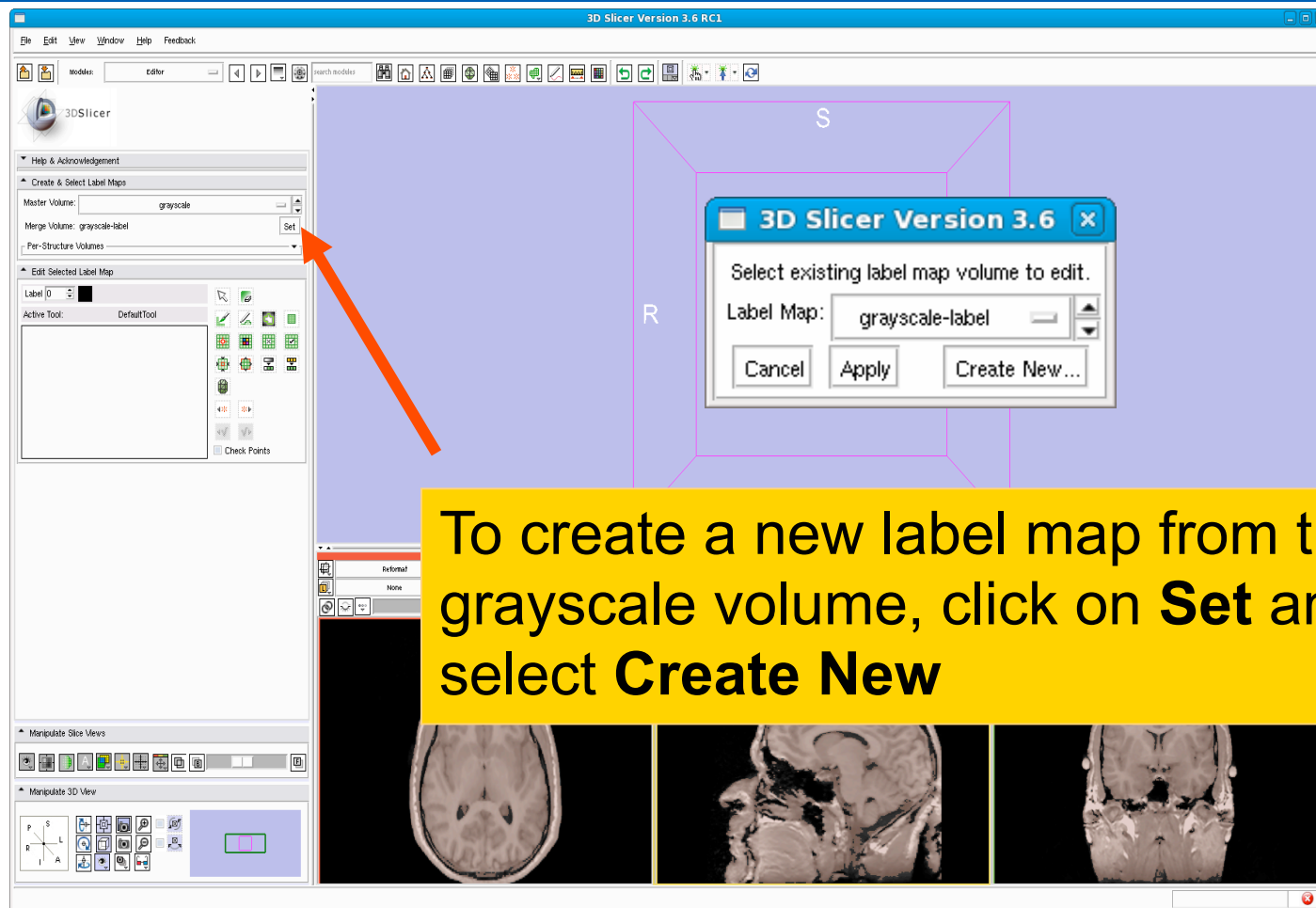
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Part 3: Creating and editing a label map with multiple labels



Creating a map with multiple labels

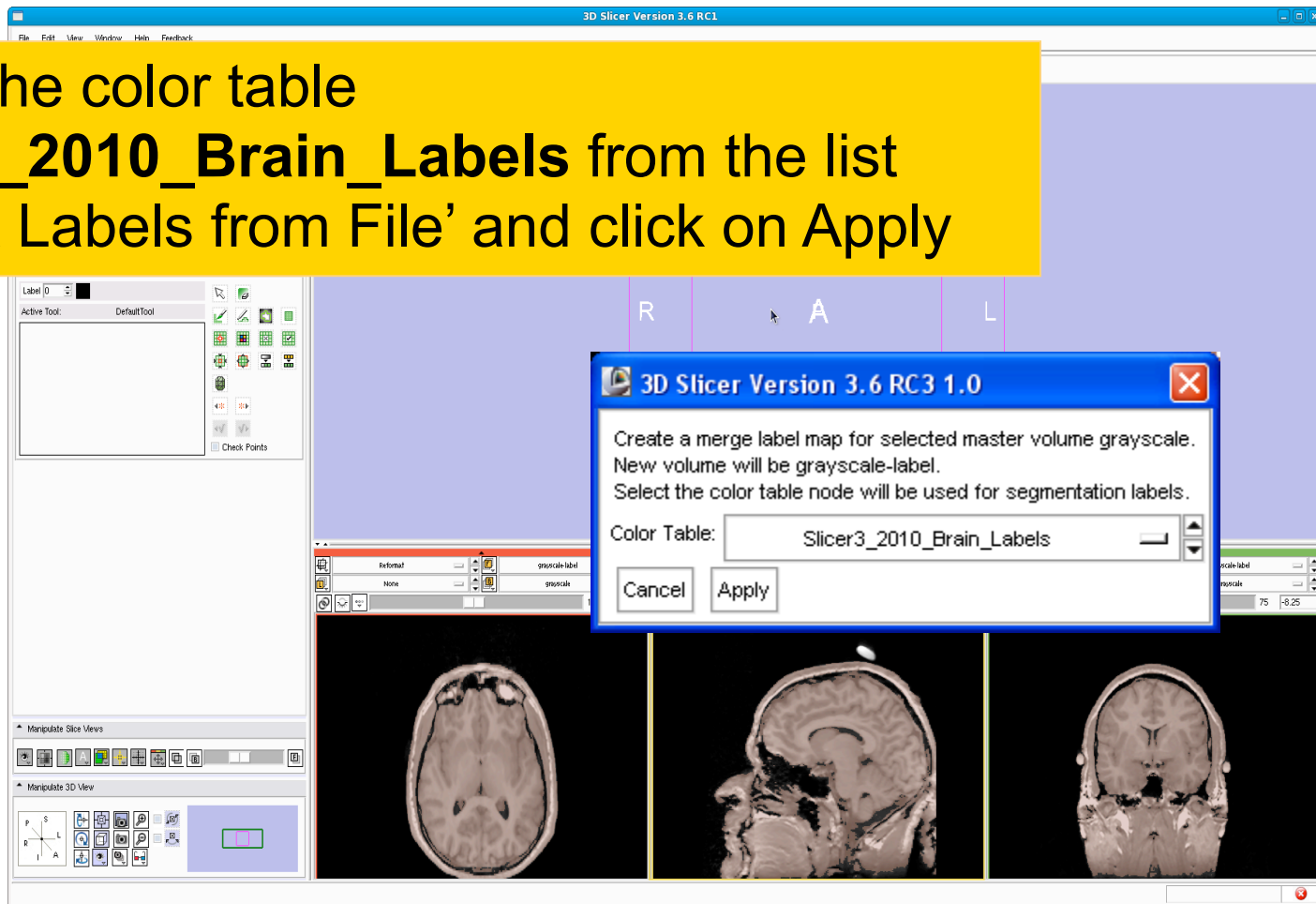




Creating a map with multiple labels

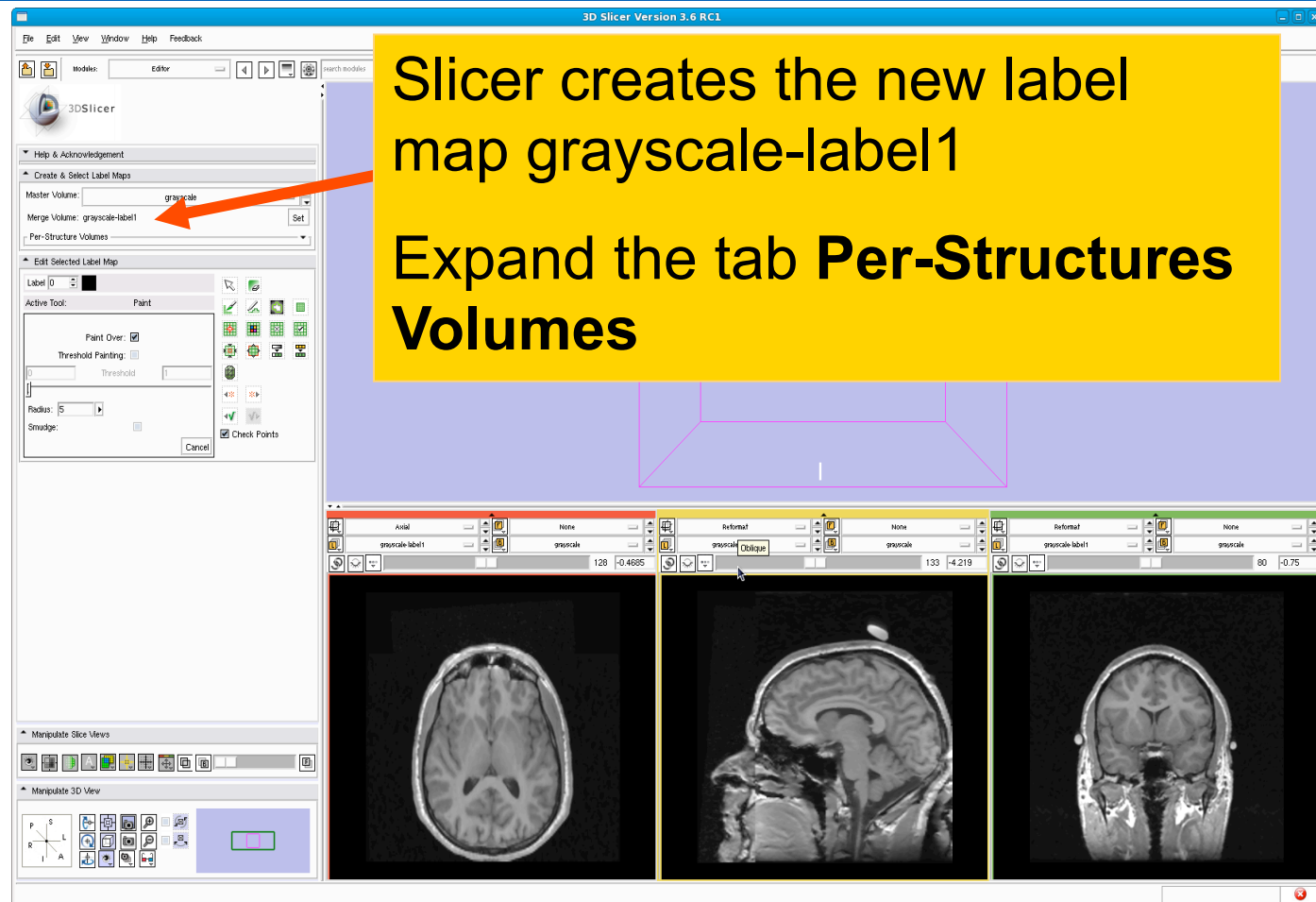
Select the color table

Slicer3_2010_Brain_Labels from the list
'Default Labels from File' and click on Apply





Creating a map with multiple labels





Adding a structure

Click on **Add Structure**, browse through the list of labels in the color map and select the color label #14 'Structure_1'

Number	Color	Name
6	Blue	Ventricles
7	Red	Arteries
8	Dark Blue	Veins
9	Gray	Gray_matter
10	White	White_matter
11	Green	Tumor
12	Cyan	Edema
13	Purple	Necrosis
14	Magenta	Structure_1
15	Yellow	Structure_2



Drawing

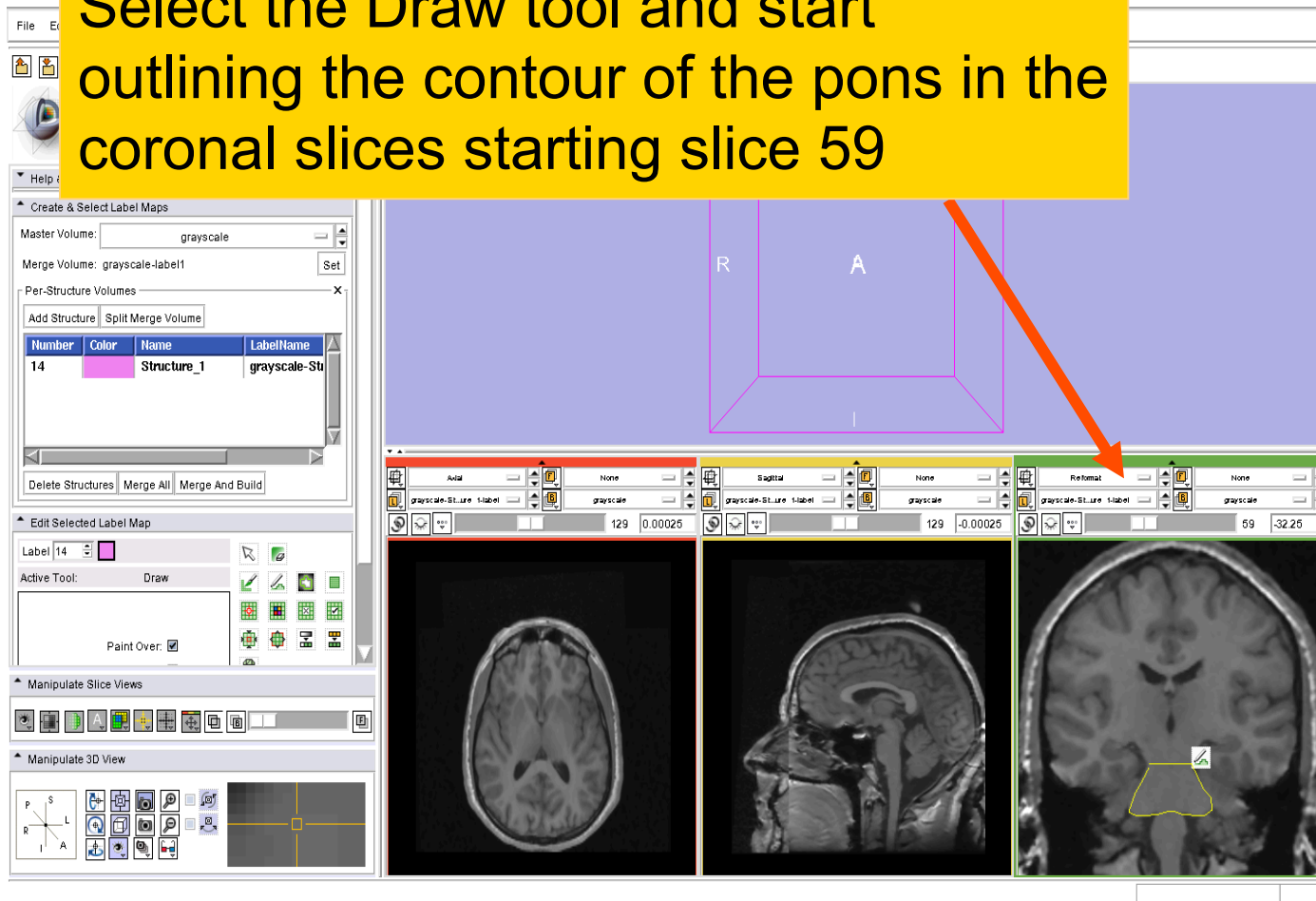


Description: The draw tool is an intuitive tool that can be used to manually outline structures in the grey level images.



Draw Tool

Select the Draw tool and start outlining the contour of the pons in the coronal slices starting slice 59





Draw Tool

File Edit View Window Help Feedback

Modules: Editor

3DSlicer

Per-Structure Volumes

Number	Color	Name	LabelName
14		Structure_1	grayscale-Stu

Delete Structures Merge All Merge And Build

Edit Selected Label Map

Label 14

Active Tool: Draw

Paint Over: ☒

Threshold Painting: ☐

Threshold 1

Cancel Apply Check Points

Manipulate Slice Views

Manipulate 3D View

Click on **Apply** to update the values of the label map pixels

R A L

I

Reformat None None

grayscale-ST_Lure 1-label grayscale

129 0.00025

Sagittal

Reformat None None

grayscale-ST_Lure 1-label grayscale

129 -0.00025

Reformat None None

grayscale-ST_Lure 1-label grayscale

60 -30.75

grayscale RAS: (-2.8, 125.1, 204.9), Lb: Slice not shown, Bg: Slice not shown.



Draw Tool

Repeat the process to draw the outline of the pons from coronal slice between ~ slice 59 and slice 67



Adding a second structure

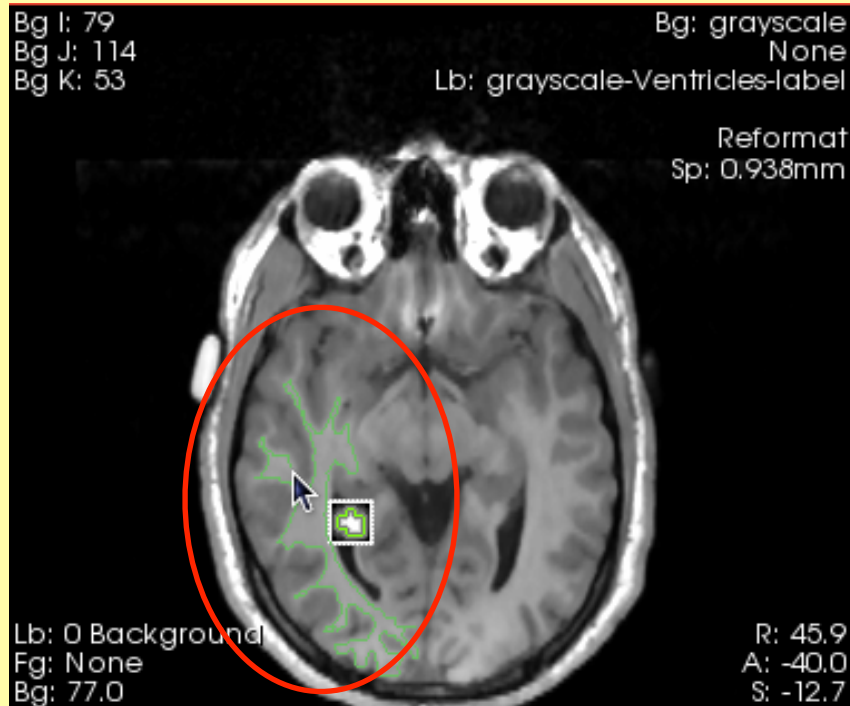
Click on **Add Structure** and select the label #6 'Ventricles'

Number	Color	Name
0	Black	Background
1	Yellow	Bone
2	Brown	Skin
3	Red	Muscles
4	Orange	Fat
5	Blue	CSF
6	Green	Ventricles
7	Light Blue	Arteries
8	Dark Blue	Veins
9	Gray	Gray_matter

grayscale RAS: (77.3, -27.8, 126.7), Lb: Slice not shown, Bg: Slice not shown.



Level Tracing



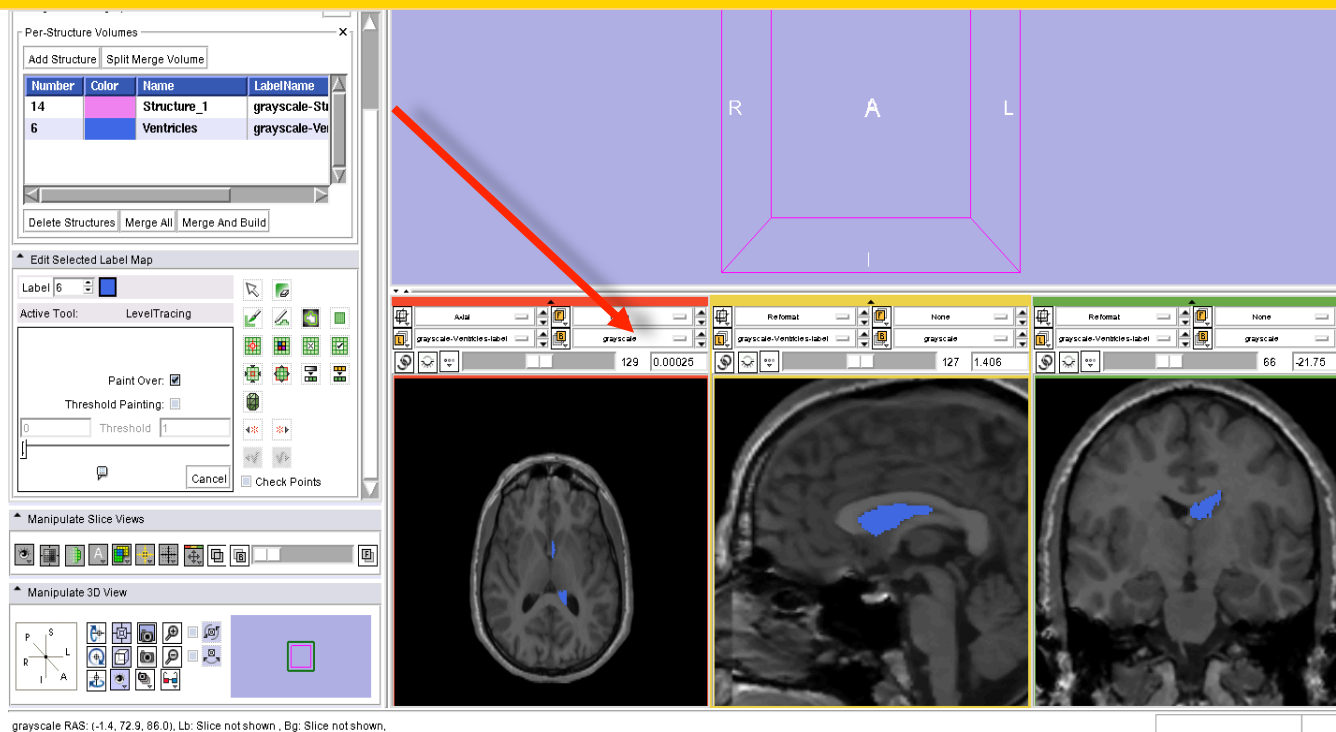
Description: By moving the mouse in the grey level images, you'll define in the label map volume an outline where the pixels all have the same value as the current background pixel.





Level Tracing

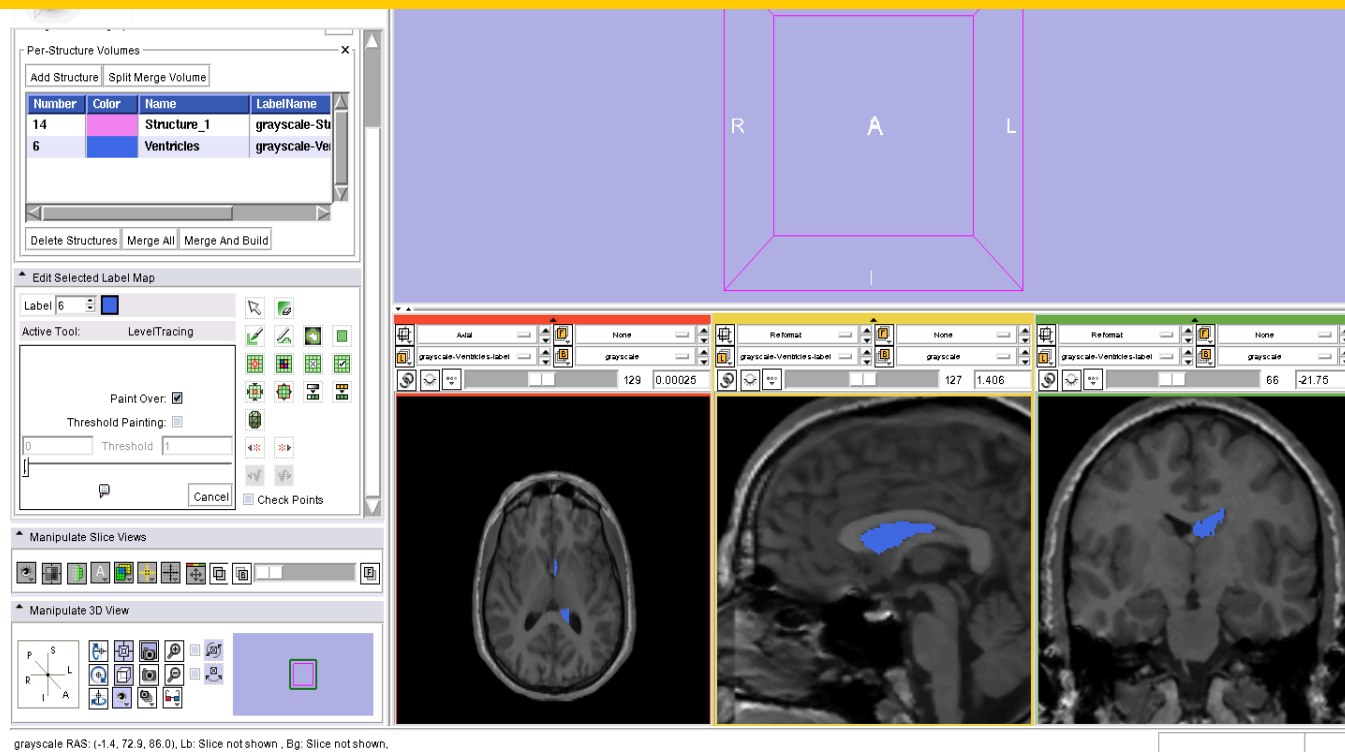
Repeat the process using the Level Tracing tool  from sagittal slice 163 to slice 127





Level Tracing

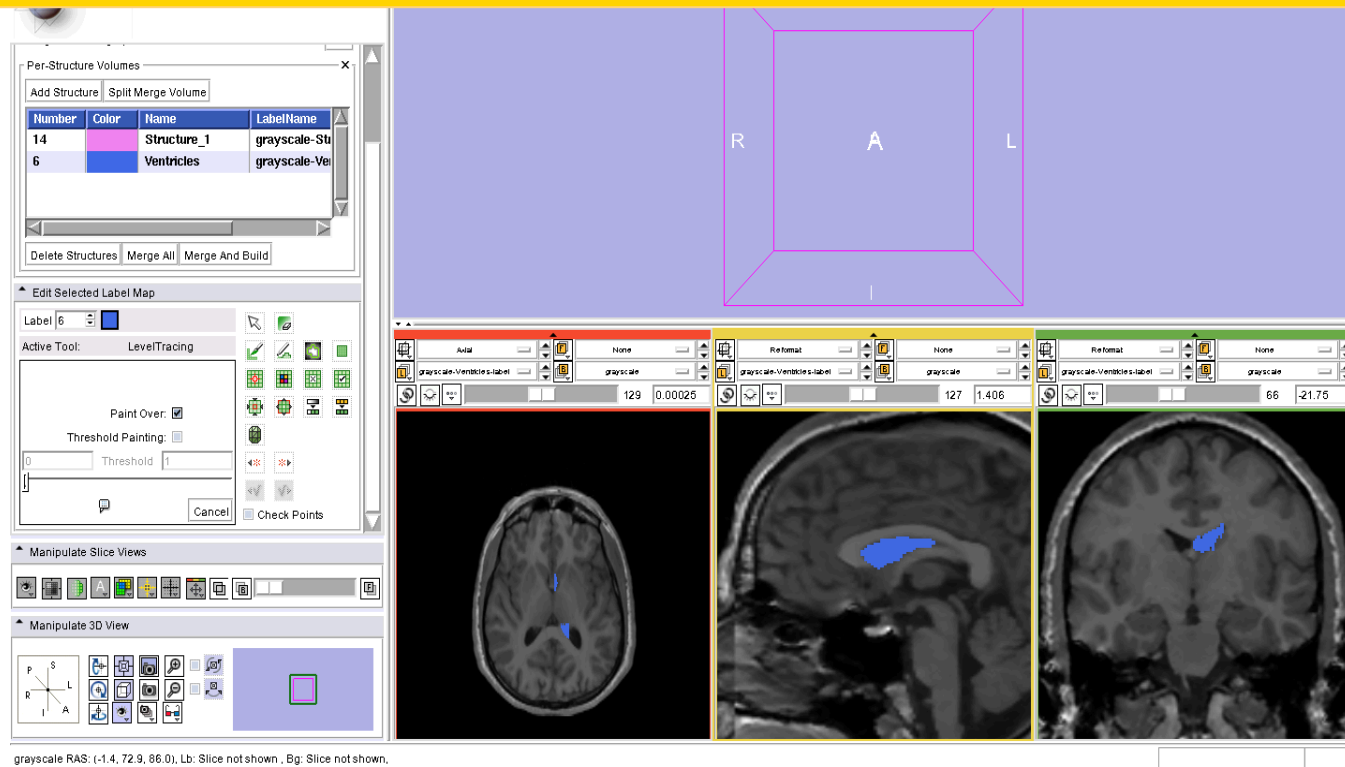
Explore the outline of the left lateral ventricles in all three anatomical views





Level Tracing

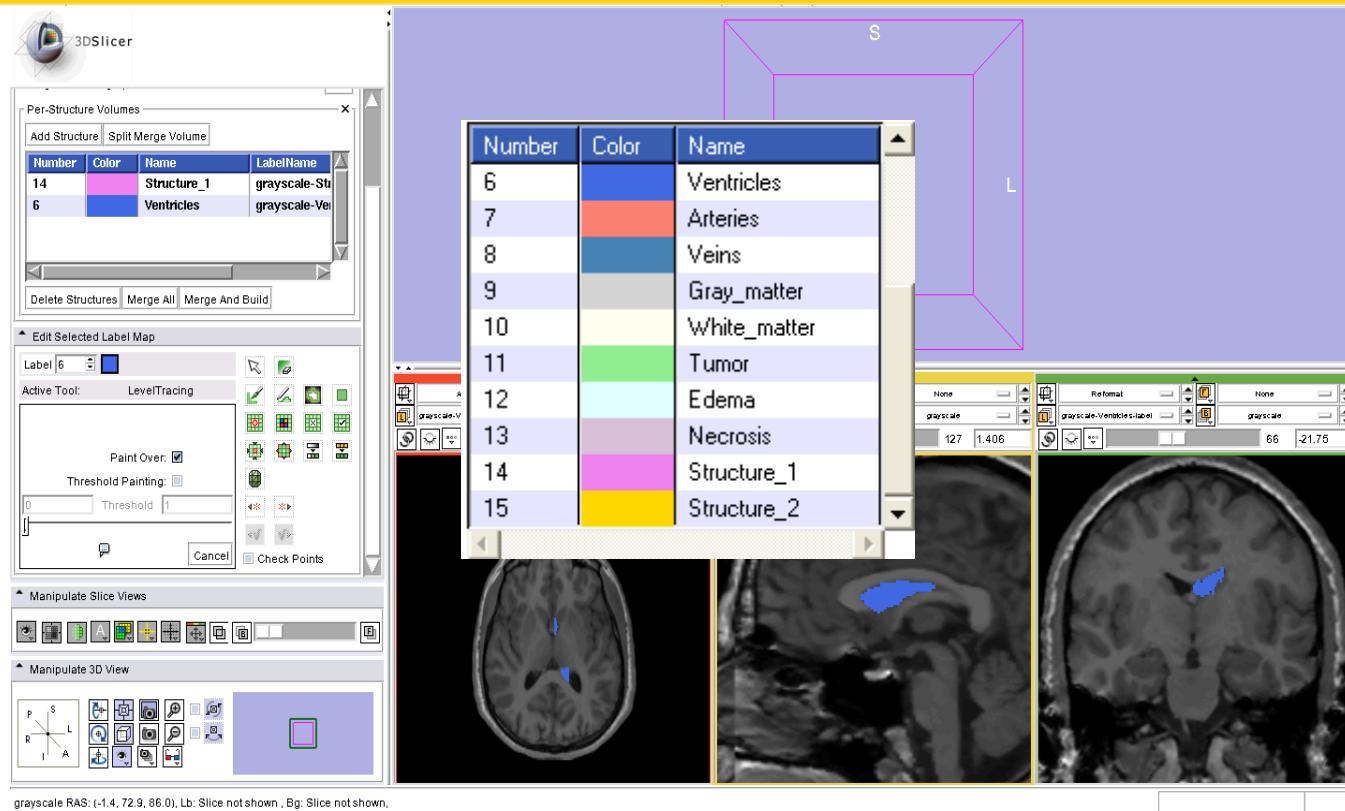
Repeat the same process to outline the contours of the right ventricle





Adding a third structure

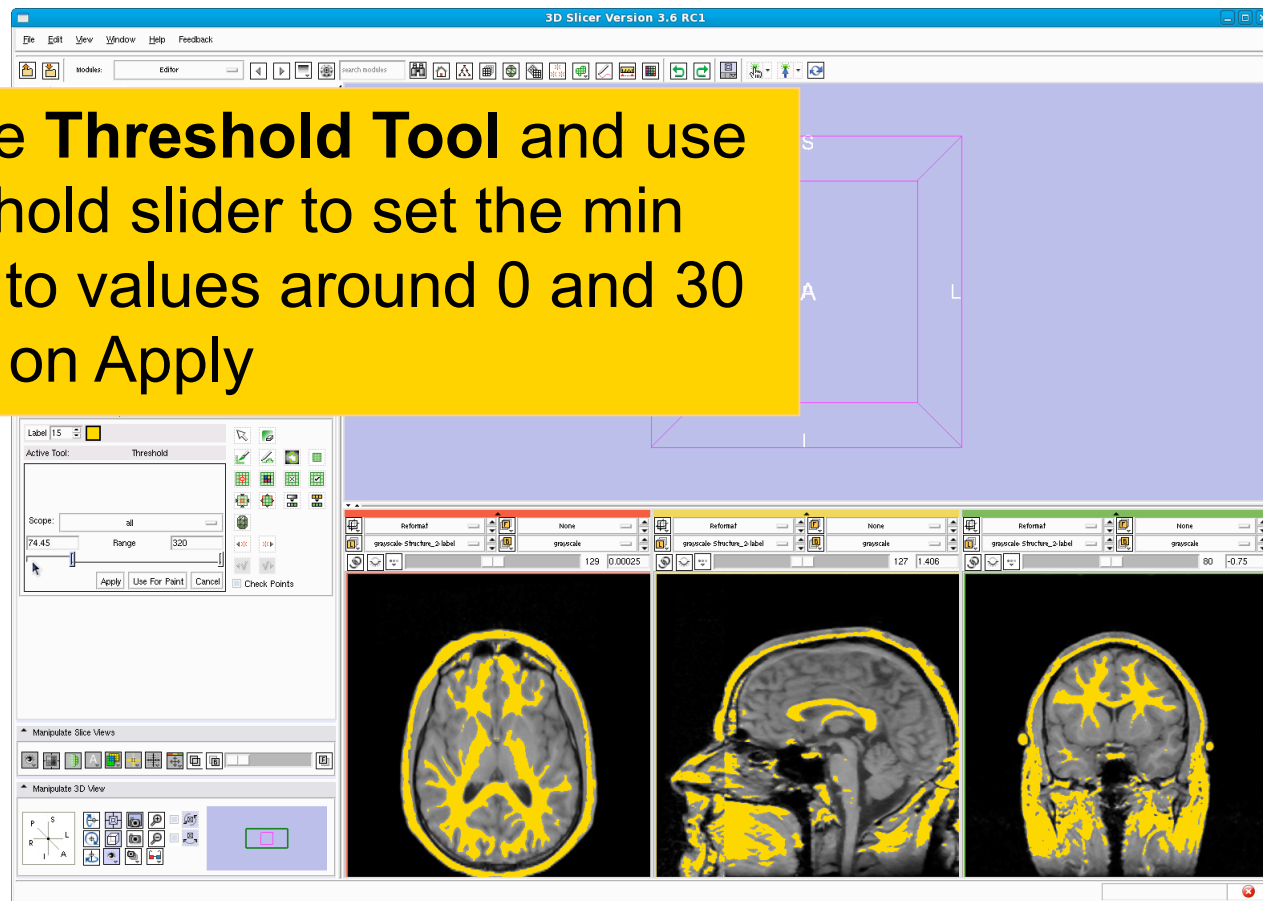
Click on **Add Structure** and select the label #15 'Structure_2'





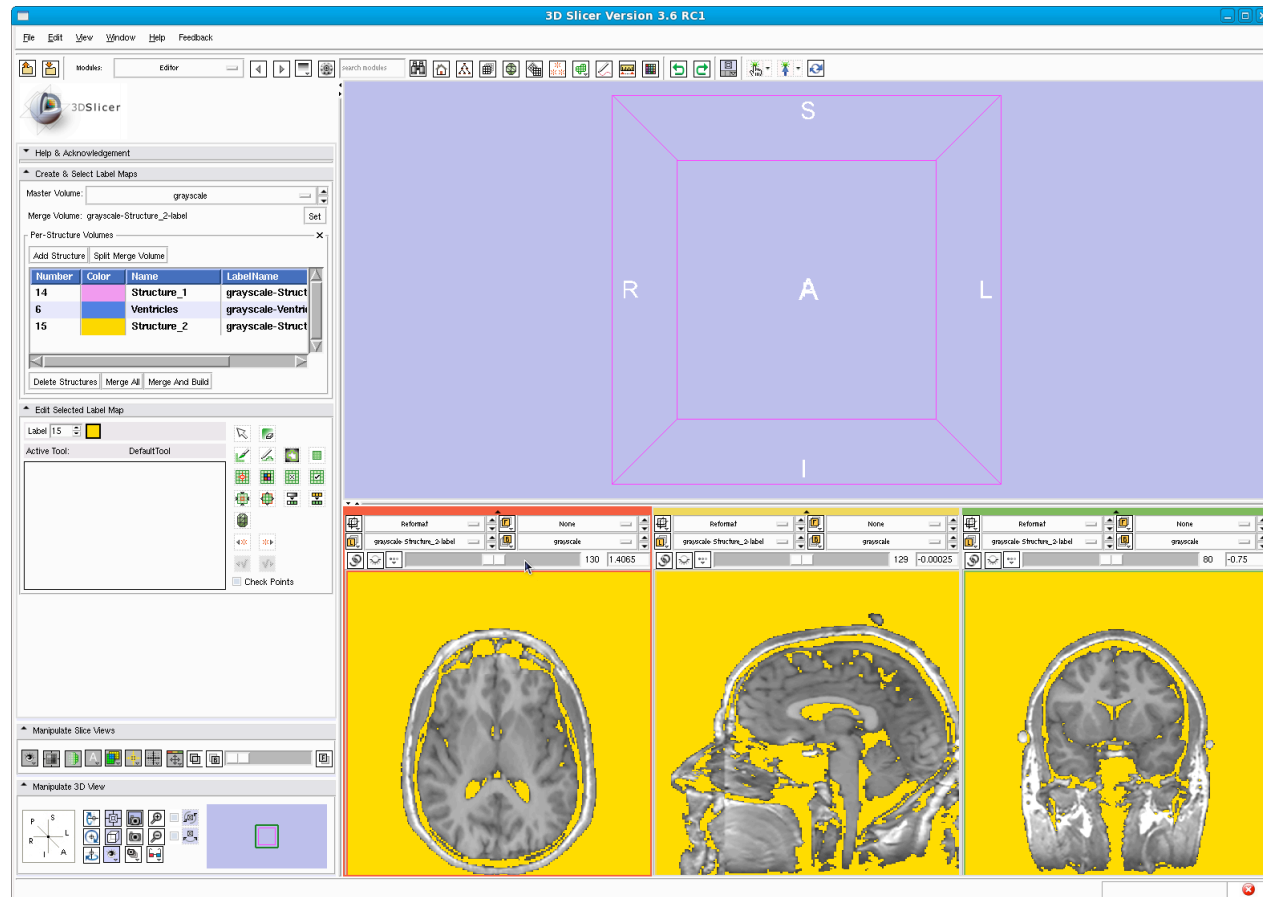
Threshold tool

Select the **Threshold Tool** and use the threshold slider to set the min and max to values around 0 and 30 and click on Apply





Threshold tool

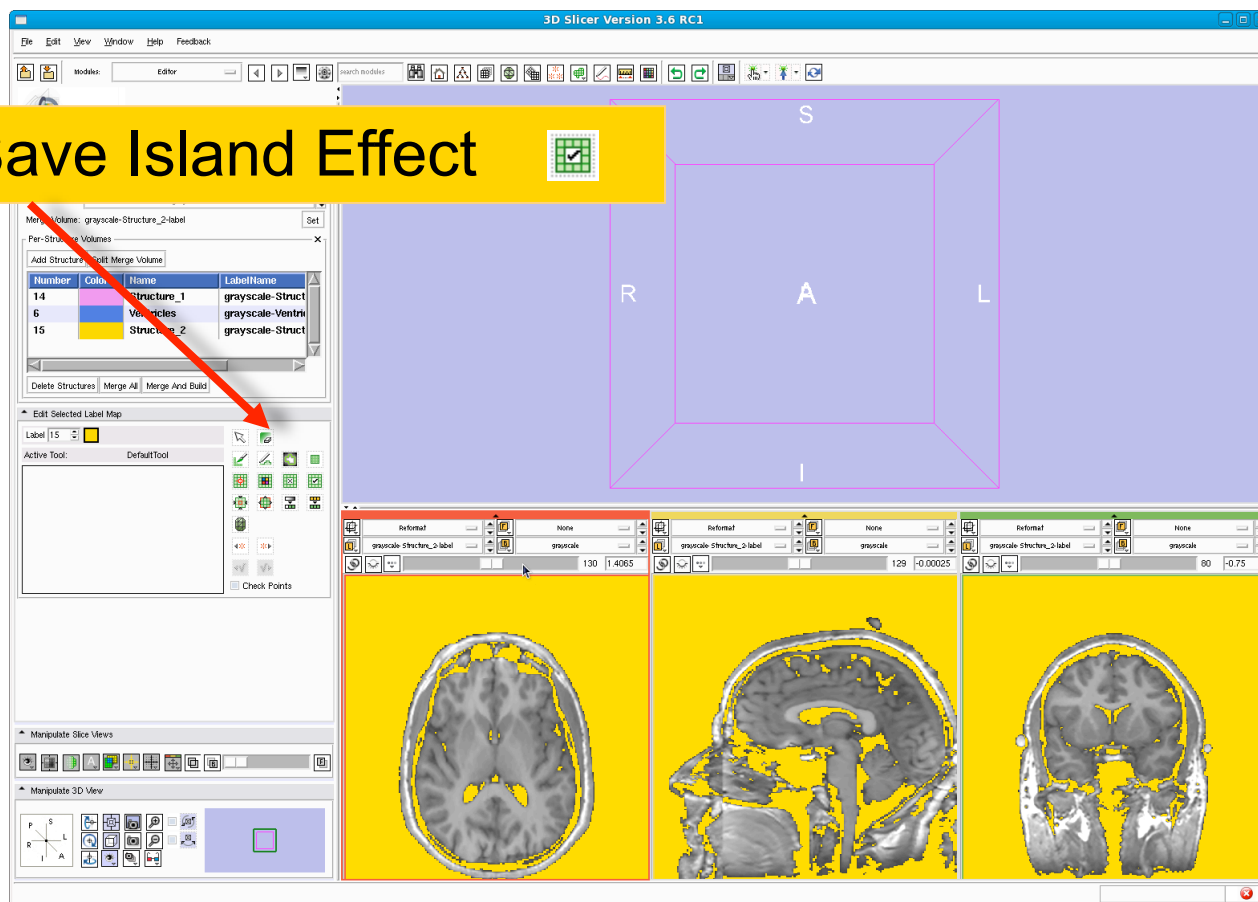


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Save Island

Select the Save Island Effect

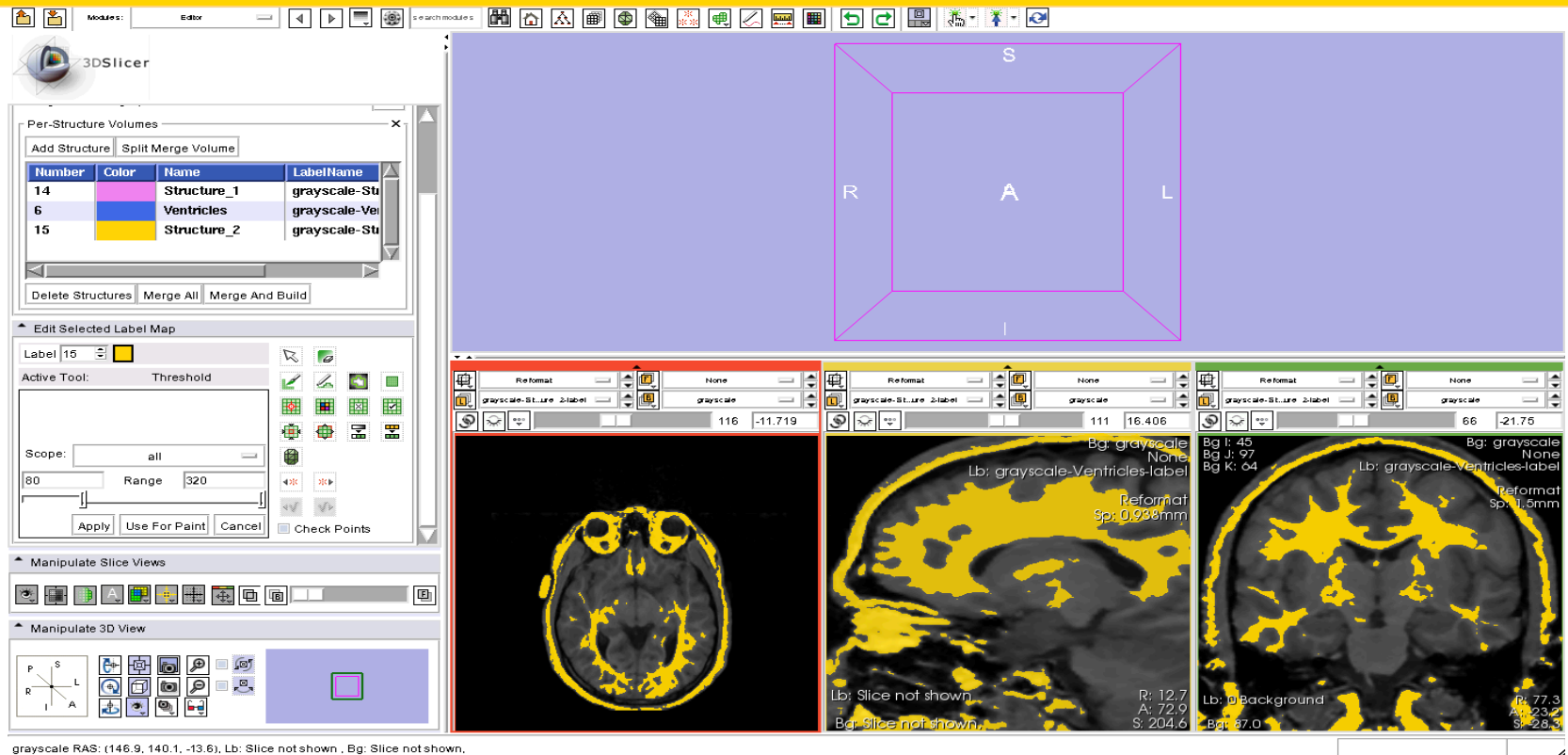


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Save Island

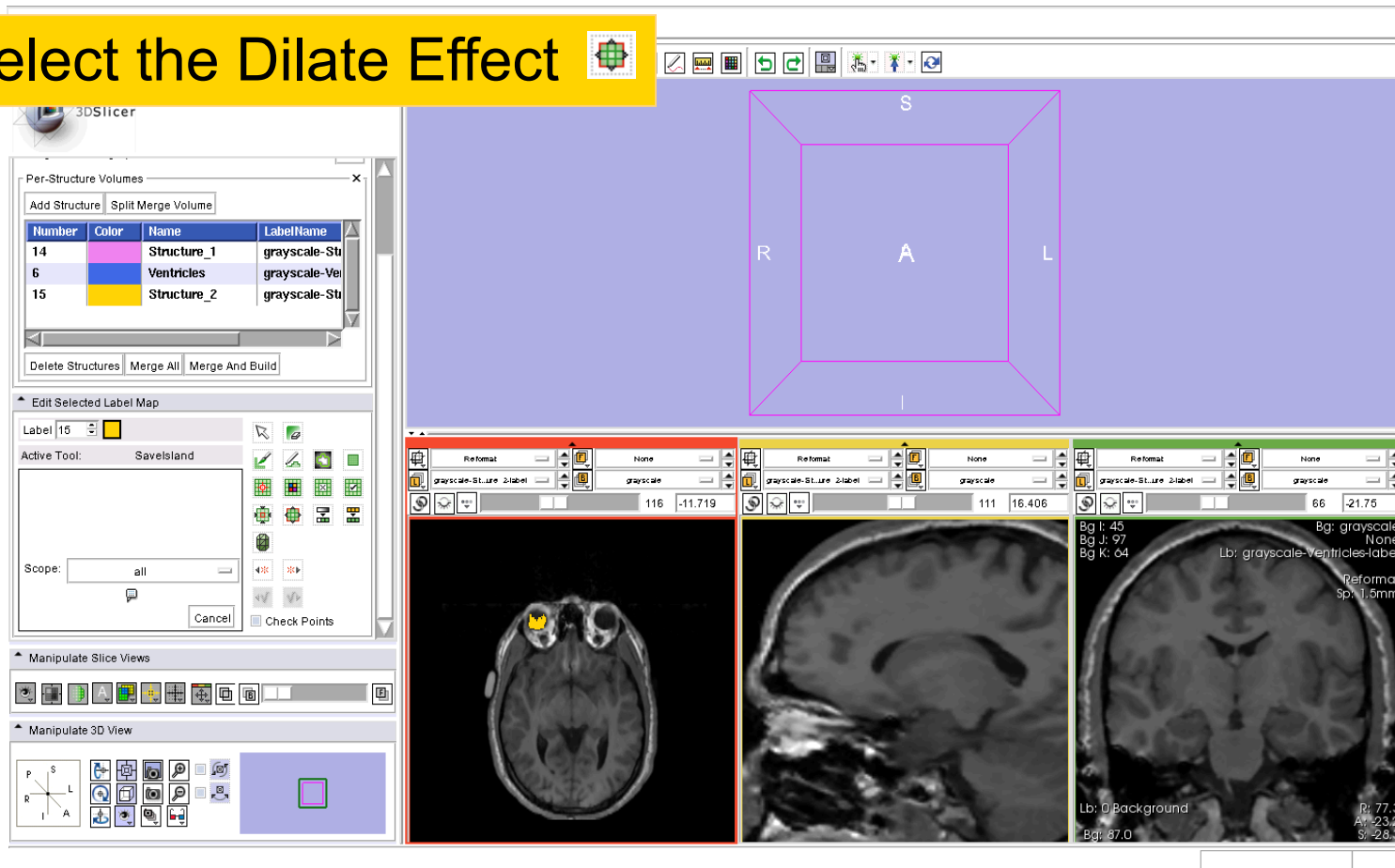
Click in the region of the right eyeball to isolate the structure





Dilate Effect

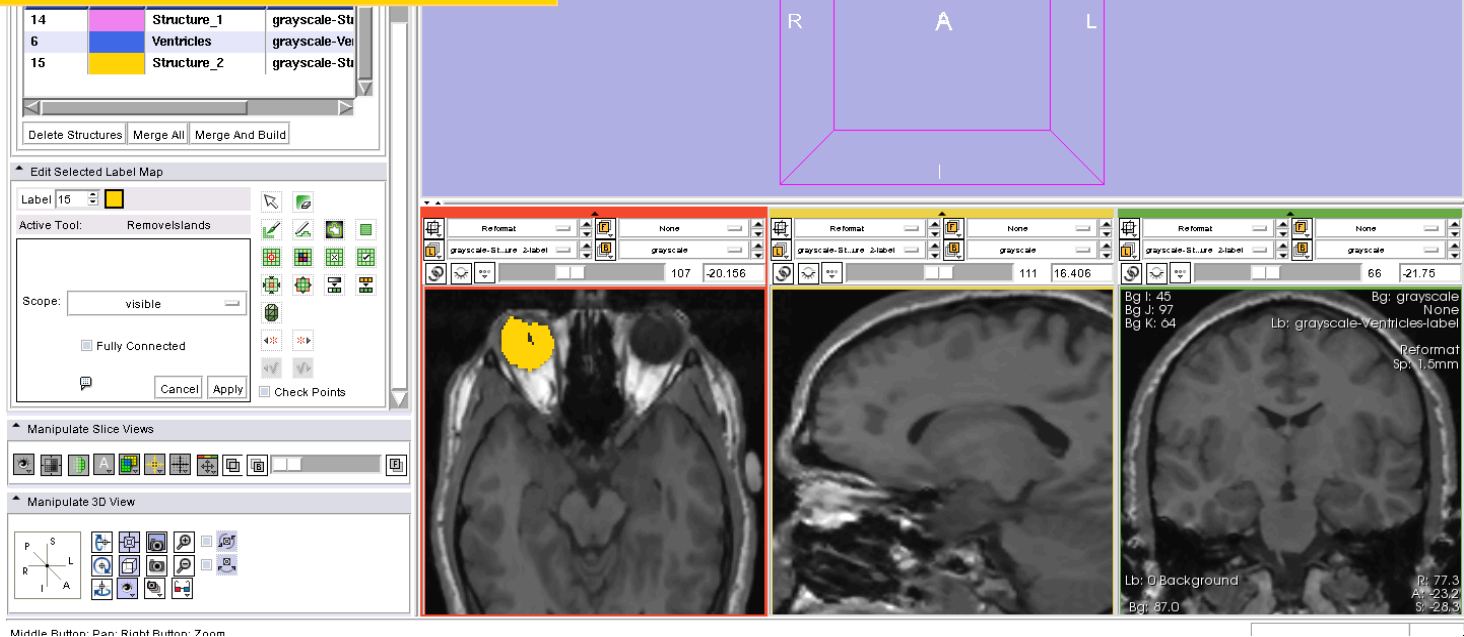
Select the Dilate Effect





Dilate Effect

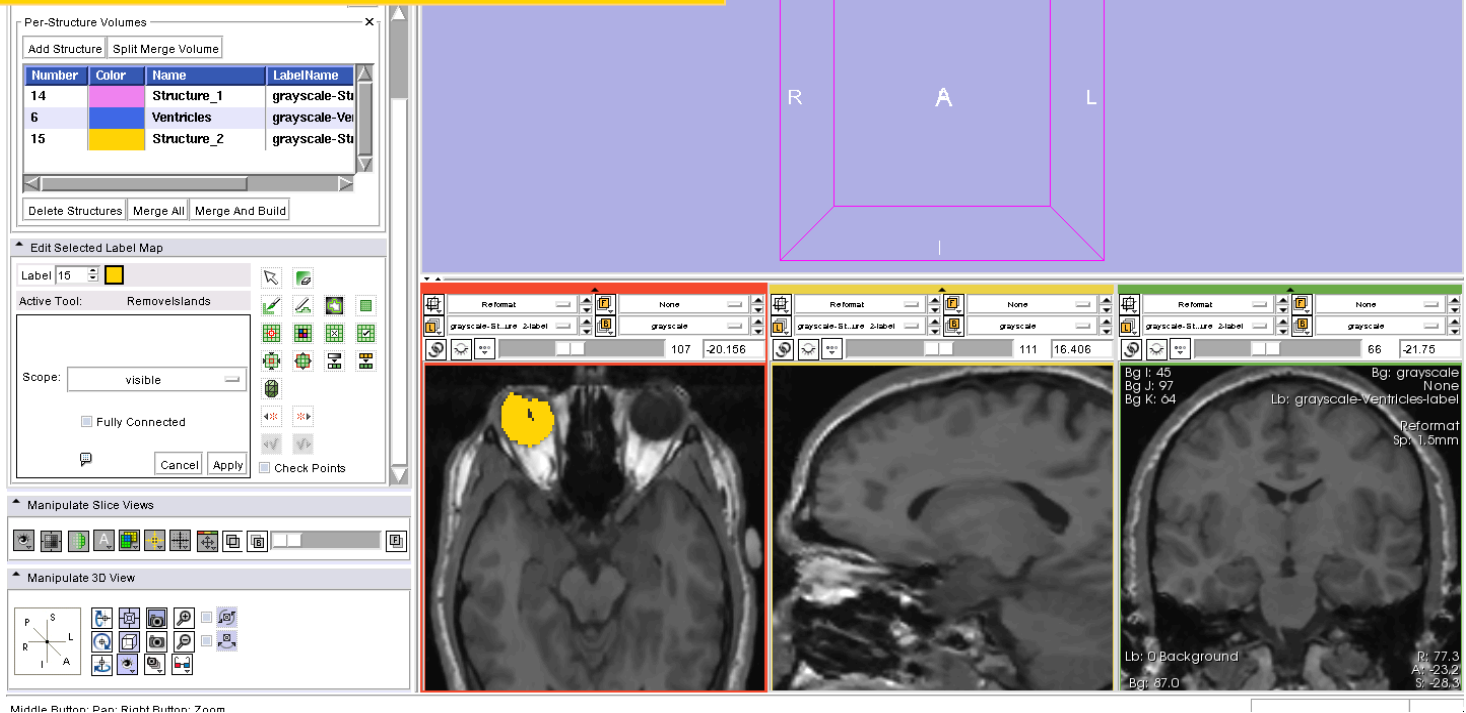
Click on **Apply** to add a single layers of pixels to the eyeball structure





Dilate Effect

Browse through the axial slices of the segmented eyeball

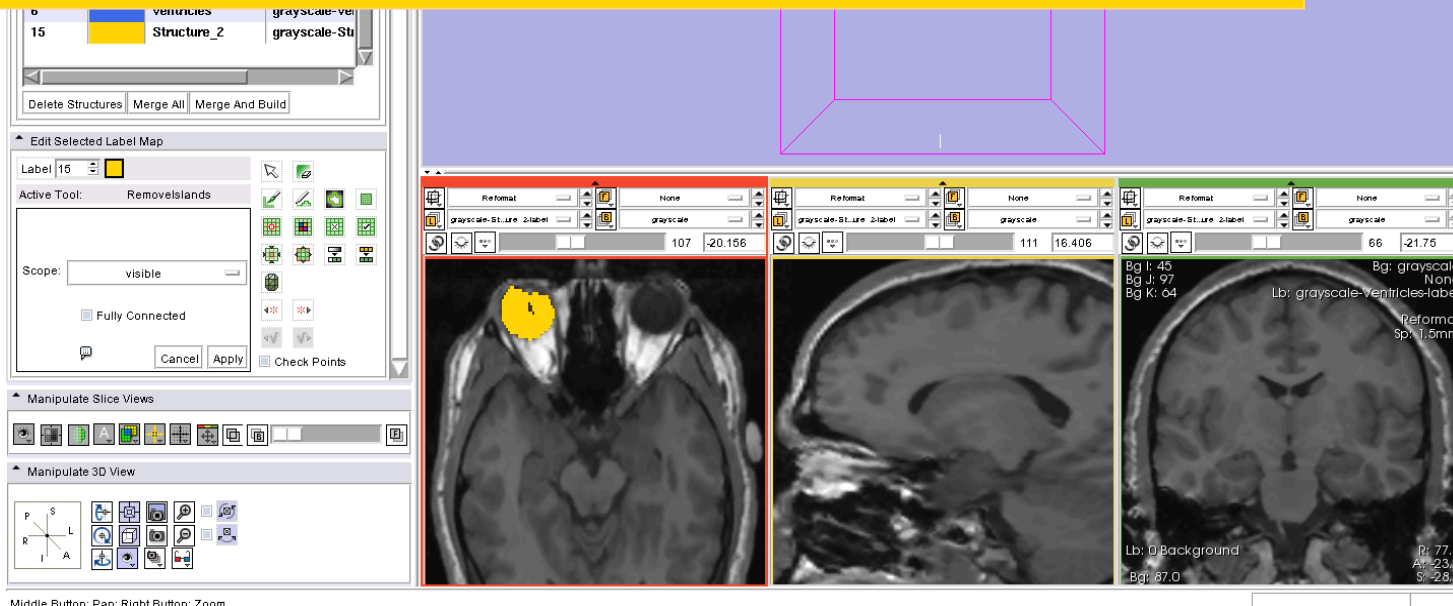




Remove Island

Select the **Remove Island**  tool

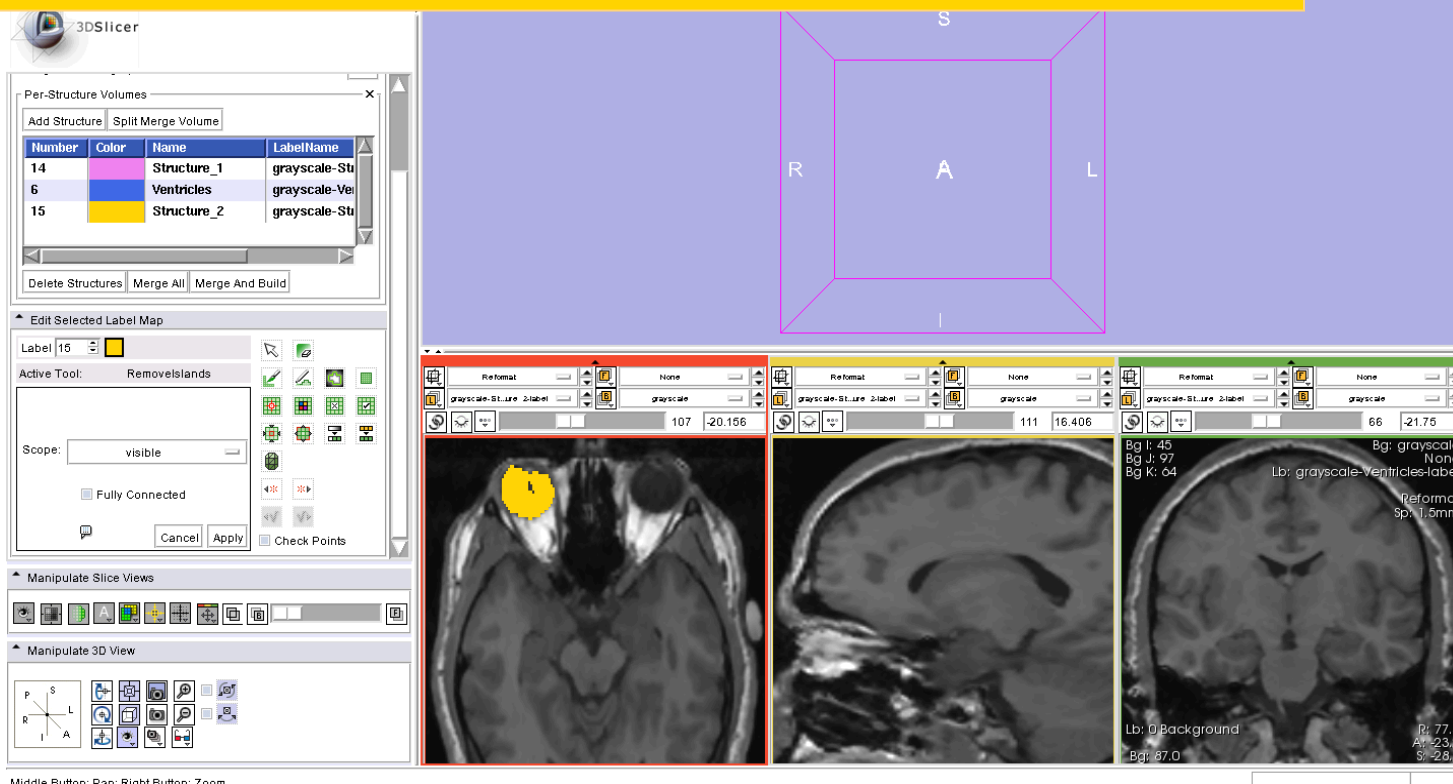
Select **Scope: visible** and click on **Apply** to remove the isolated pixels inside the segmented structure





Remove Island

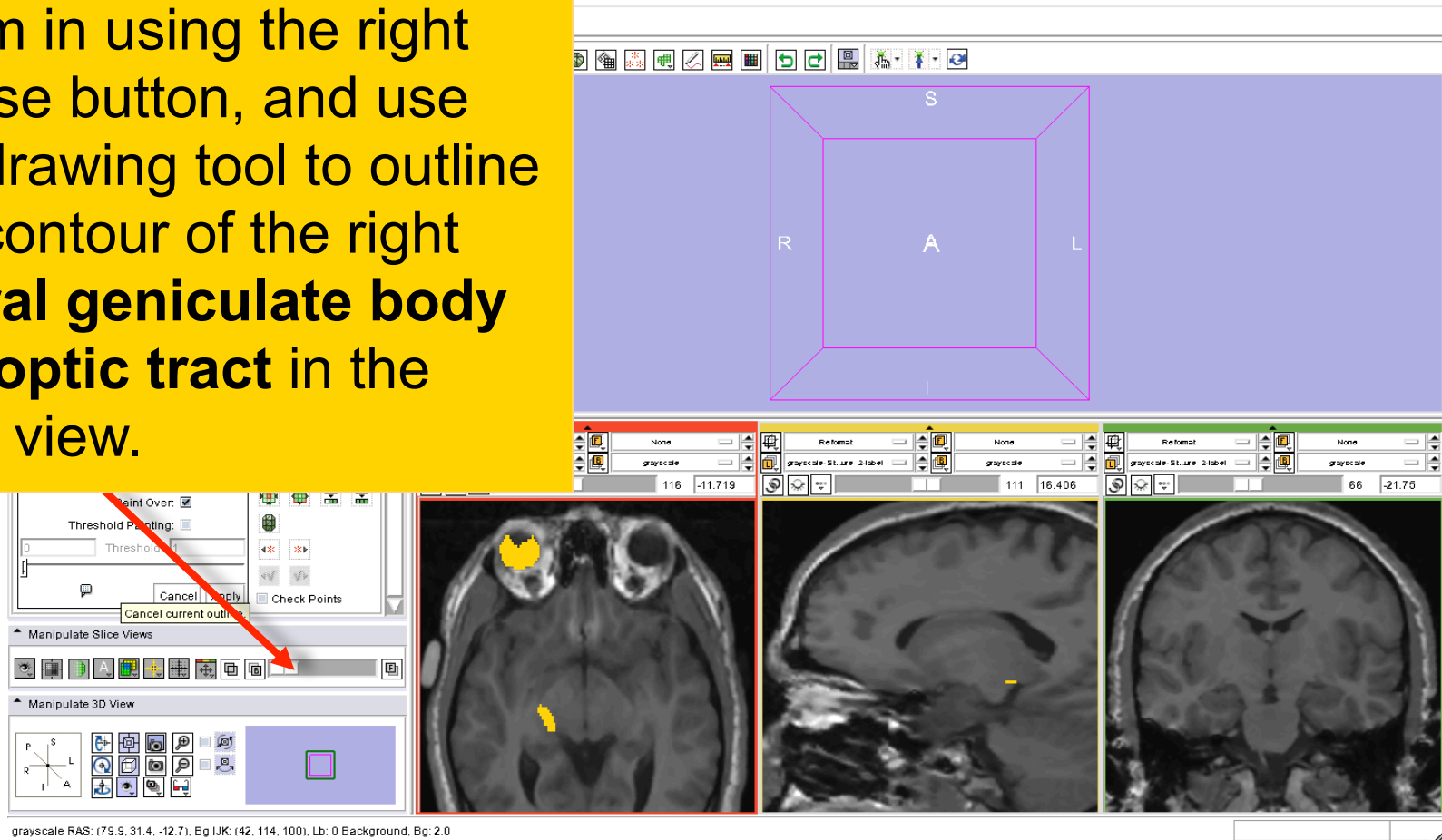
Repeat the process in the slices that contain isolated pixels in the eyeball structure





Adding more structures

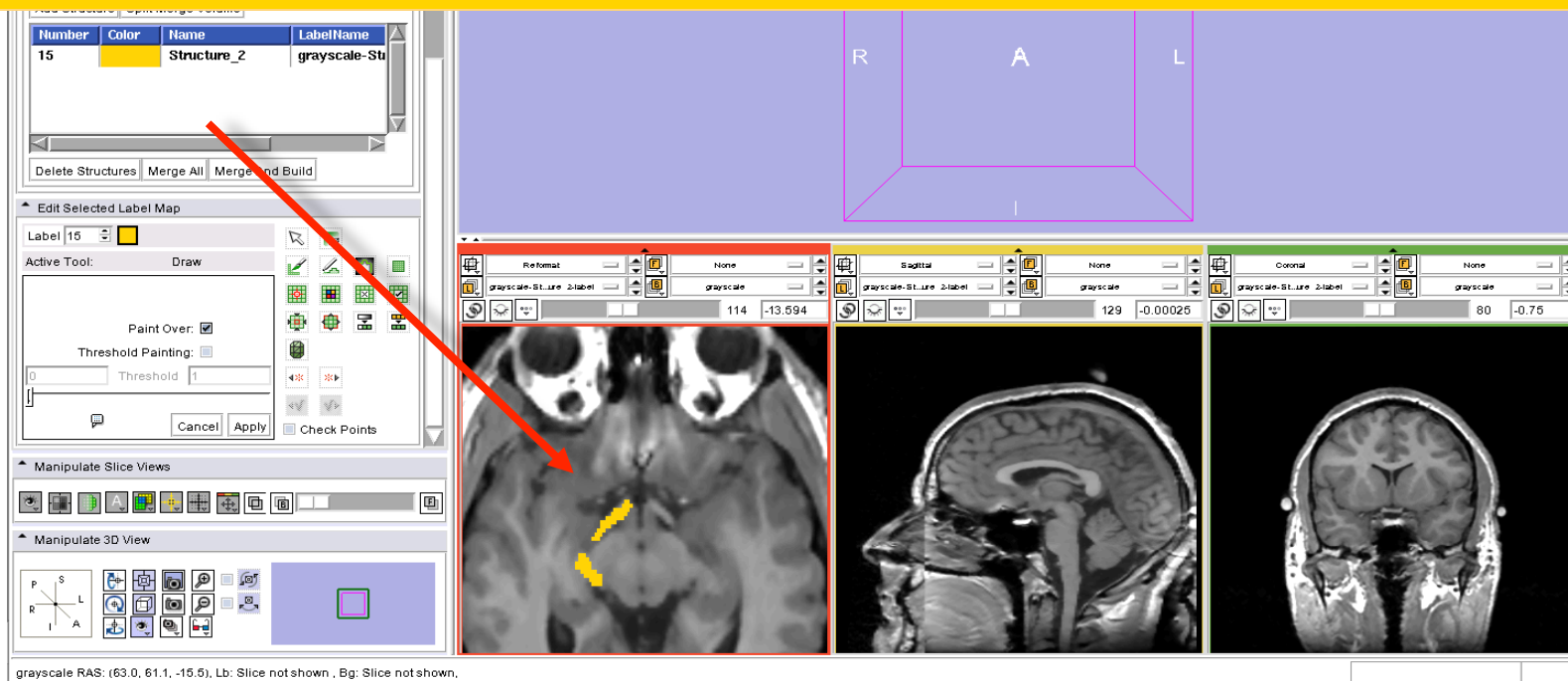
Zoom in using the right mouse button, and use the drawing tool to outline the contour of the right lateral geniculate body and optic tract in the axial view.





Adding more structures

Repeat the process to outline the contour of the right **lateral geniculate body** and **optic tract** from slice 113 to slice 118





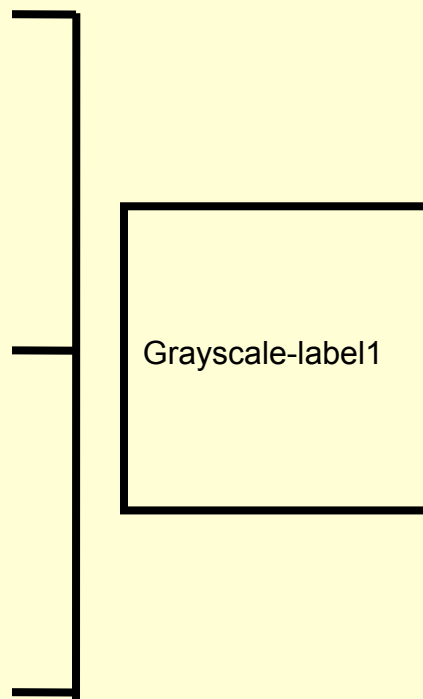
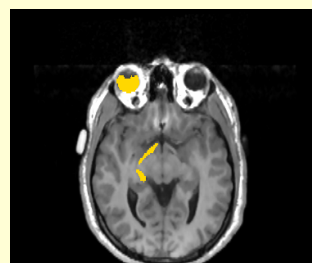
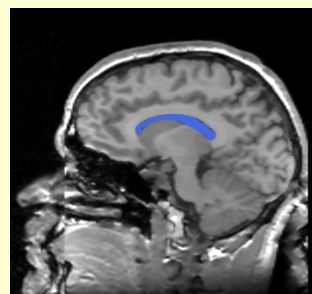
Merge And Build

The three labels correspond to the three different label maps that we have edited for the pons (pink), the ventricles (blue) and the right eyeball, lateral geniculate body and optic tract (yellow).

Number	Color	Name	LabelName
14	Pink	Structure_1	grayscale-Struct
6	Blue	Ventricles	grayscale-Ventri
15	Yellow	Structure_2	grayscale-Struct



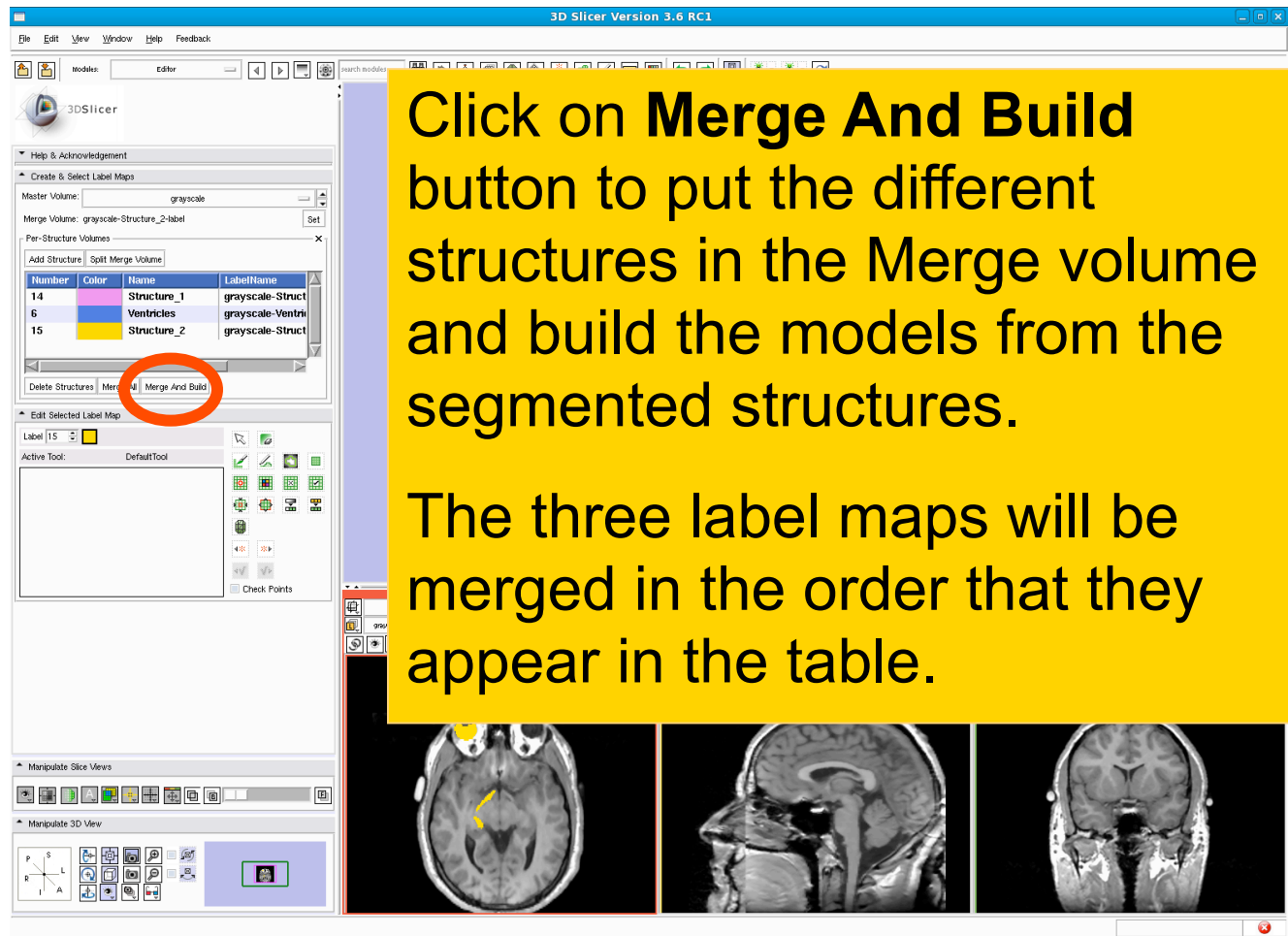
Merging label maps



The Merge tool will merge the label maps of the anatomical structures that we have edited into a single label map



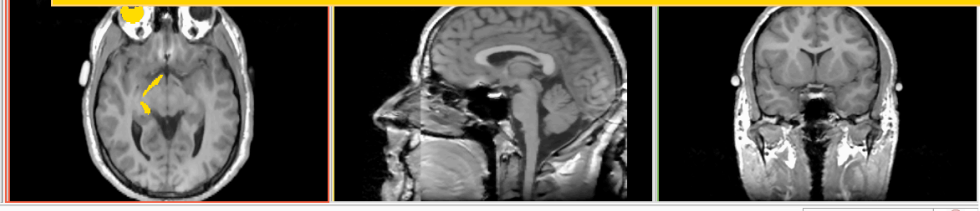
Merge And Build



Click on Merge And Build button to put the different structures in the Merge volume and build the models from the segmented structures.

The three label maps will be merged in the order that they appear in the table.

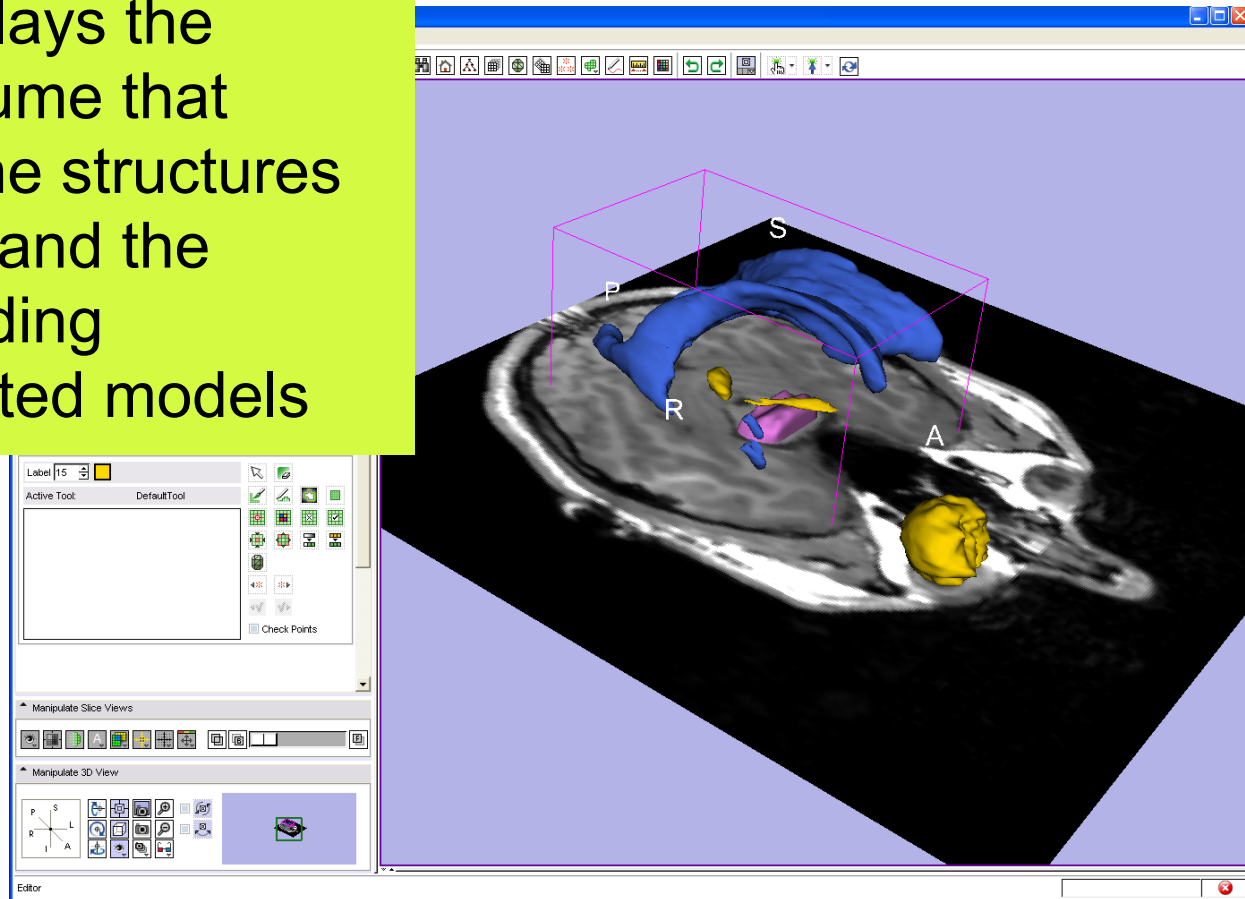
Number	Color	Name	LabelName
14		Structure_1	grayscale-Struct
6		Ventricles	grayscale-Ventri
15		Structure_2	grayscale-Struct





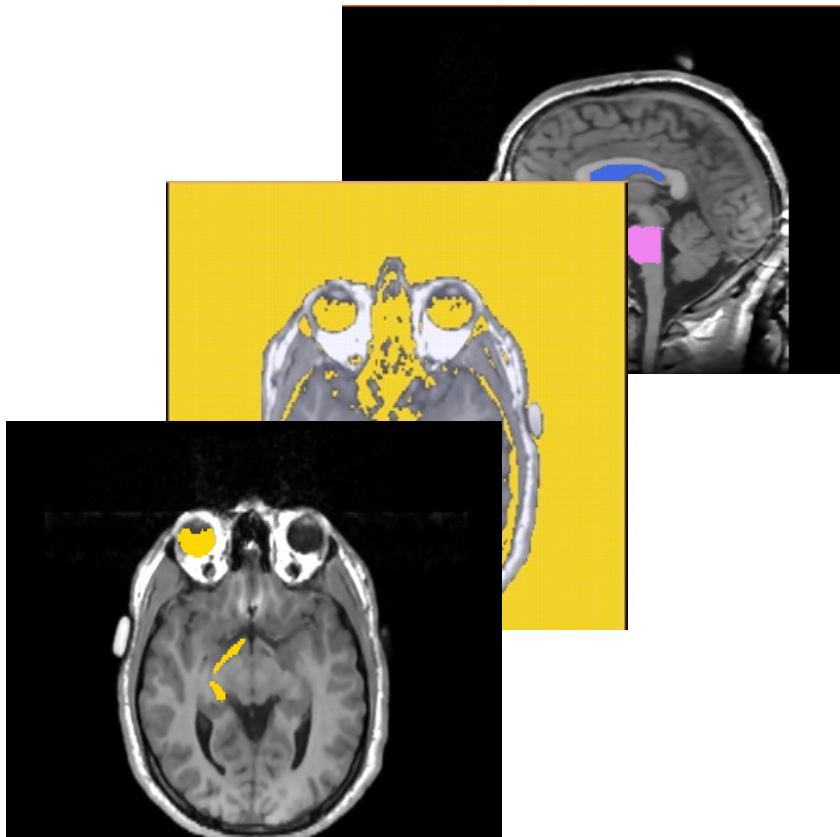
Merge And Build

Slicer displays the merge volume that contains the structures of interest and the corresponding reconstructed models





Conclusion



This tutorial guided you through the tools for interactive editing of label maps created from scalar images using the Editor module of Slicer3.6.

www.slicer.org



Acknowledgments



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