NA-MIC
National Alliance for Medical Image Computing
http://na-mic.org

Interactive Editor tutorial

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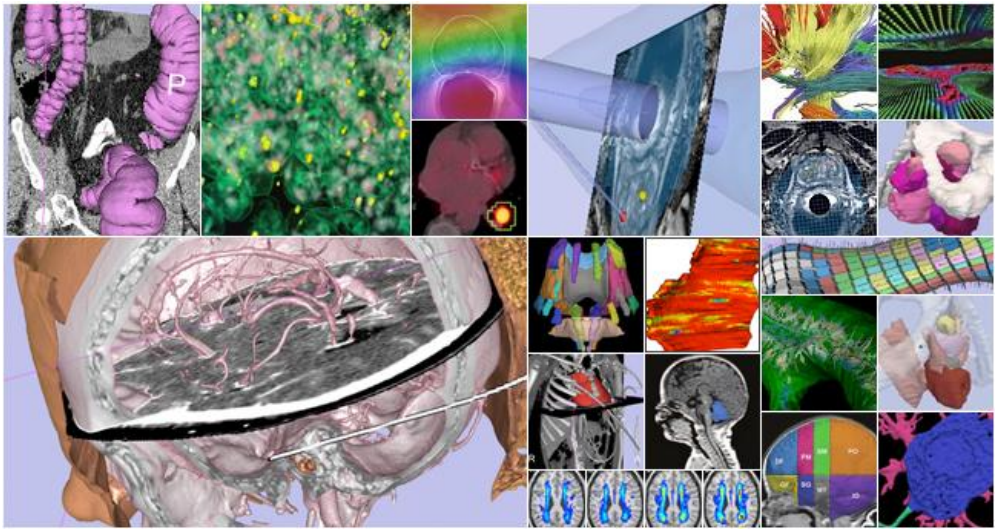
Harvard Medical School

Slicer3.6

- An end-user application for image analysis

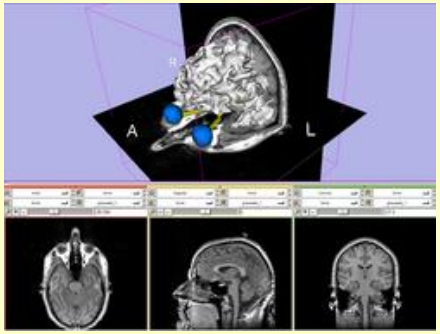
- An open-source environment for software development



- 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

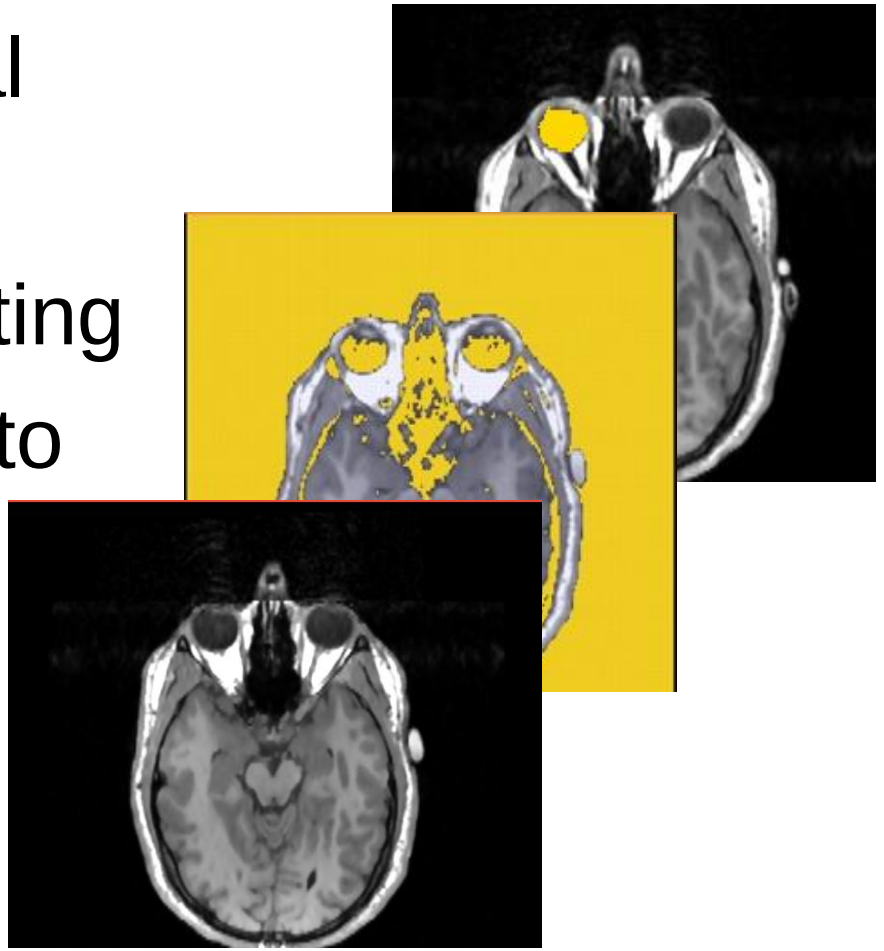
http://www.slicer.org/slicerWiki/index.php/File:EditorTutorialDataset.zip

Disclaimer

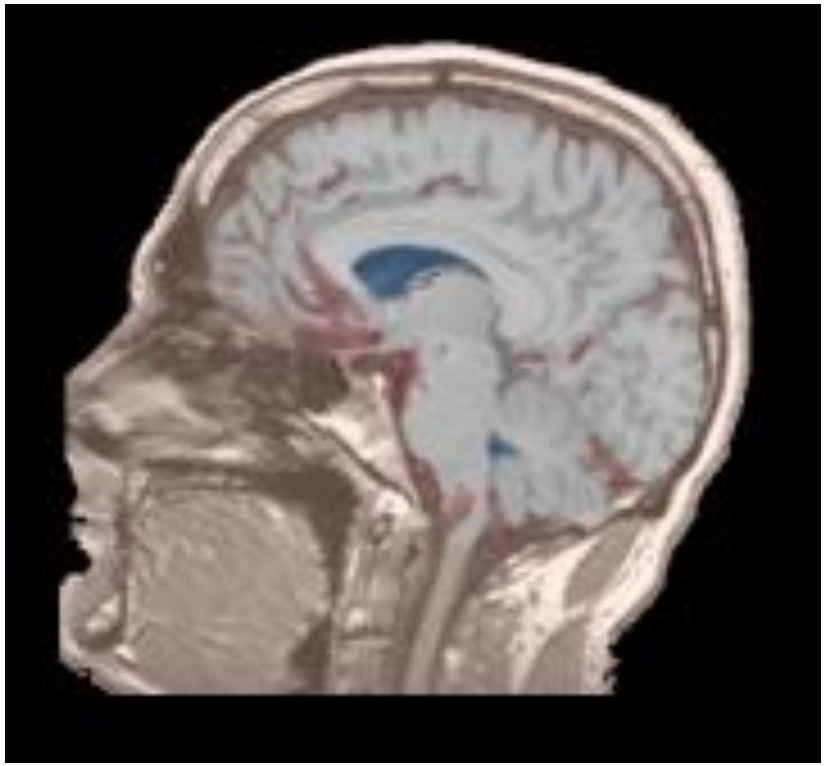
It is the responsibility of the user of 3DSlicer to comply with both the terms of the license and with the applicable laws, regulations and rules.

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.

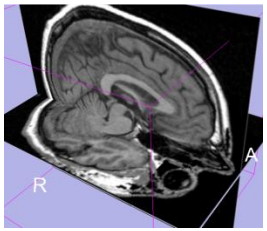


Label map



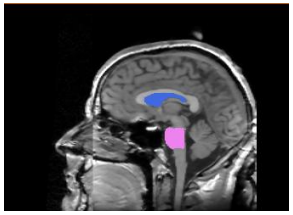
A label map has a number at each pixel representing the anatomy present at that point.

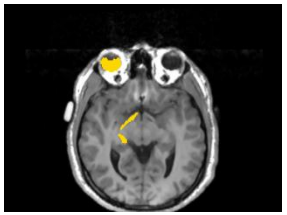
Overview



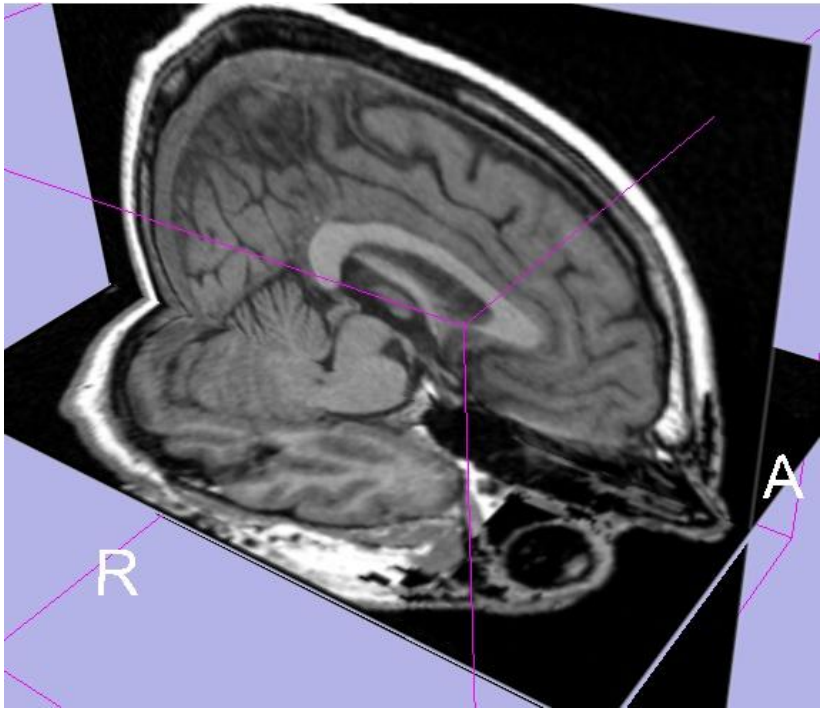
Part 1: Creating a single label map

Part 2: Editing a single label map



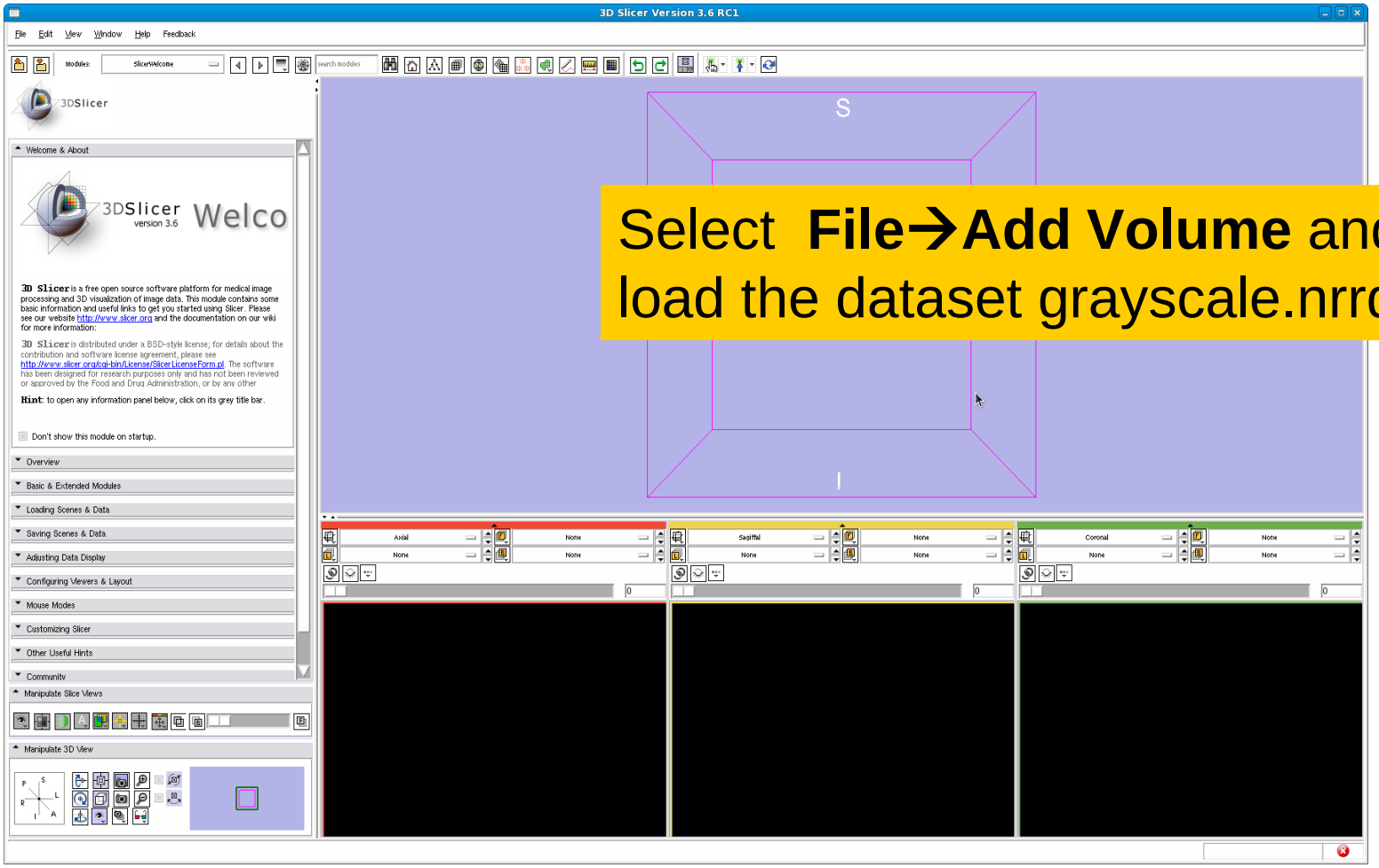


Part 3: Creating and editing a label map with multiple labels

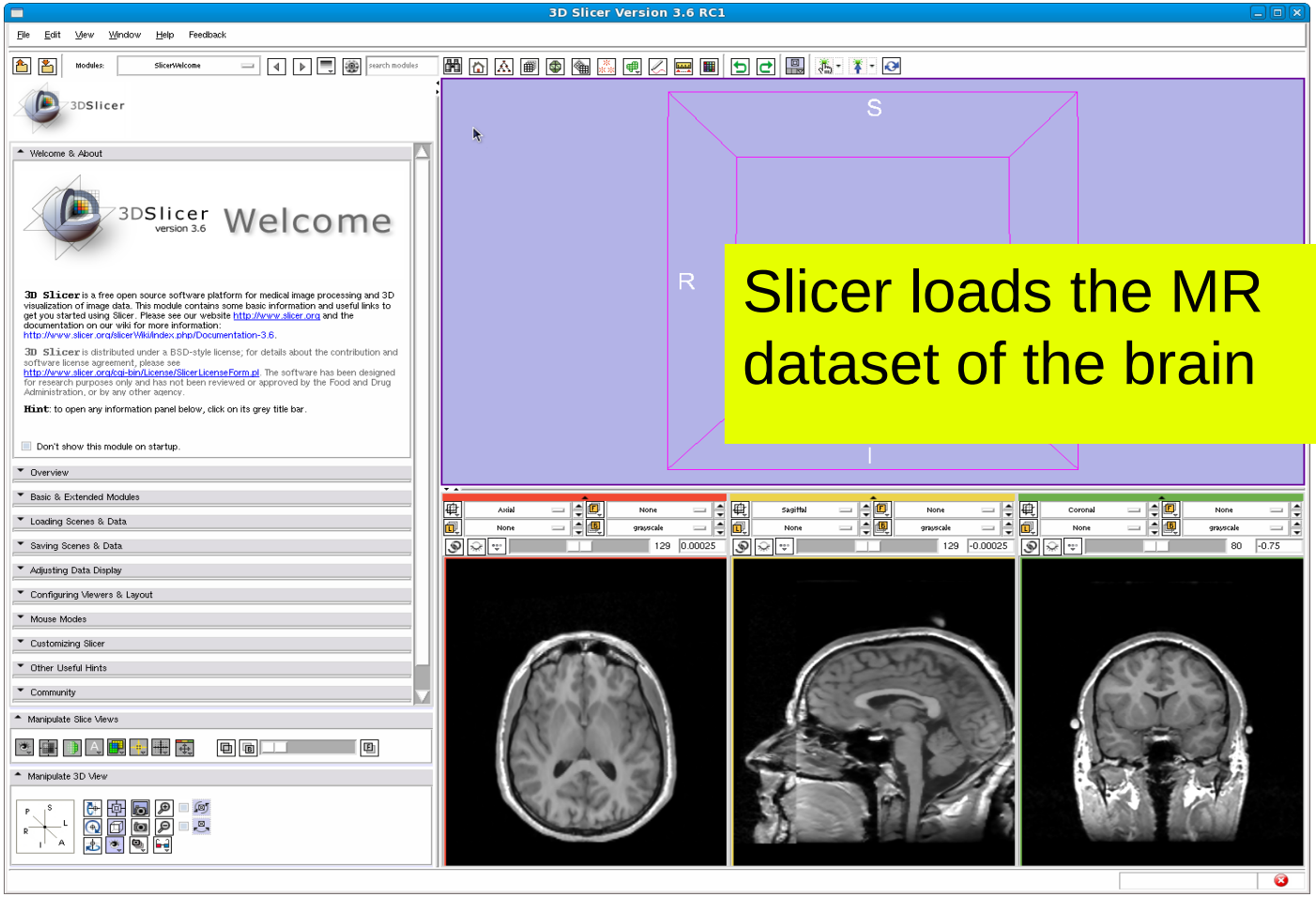


Part 1: Creating a single label map

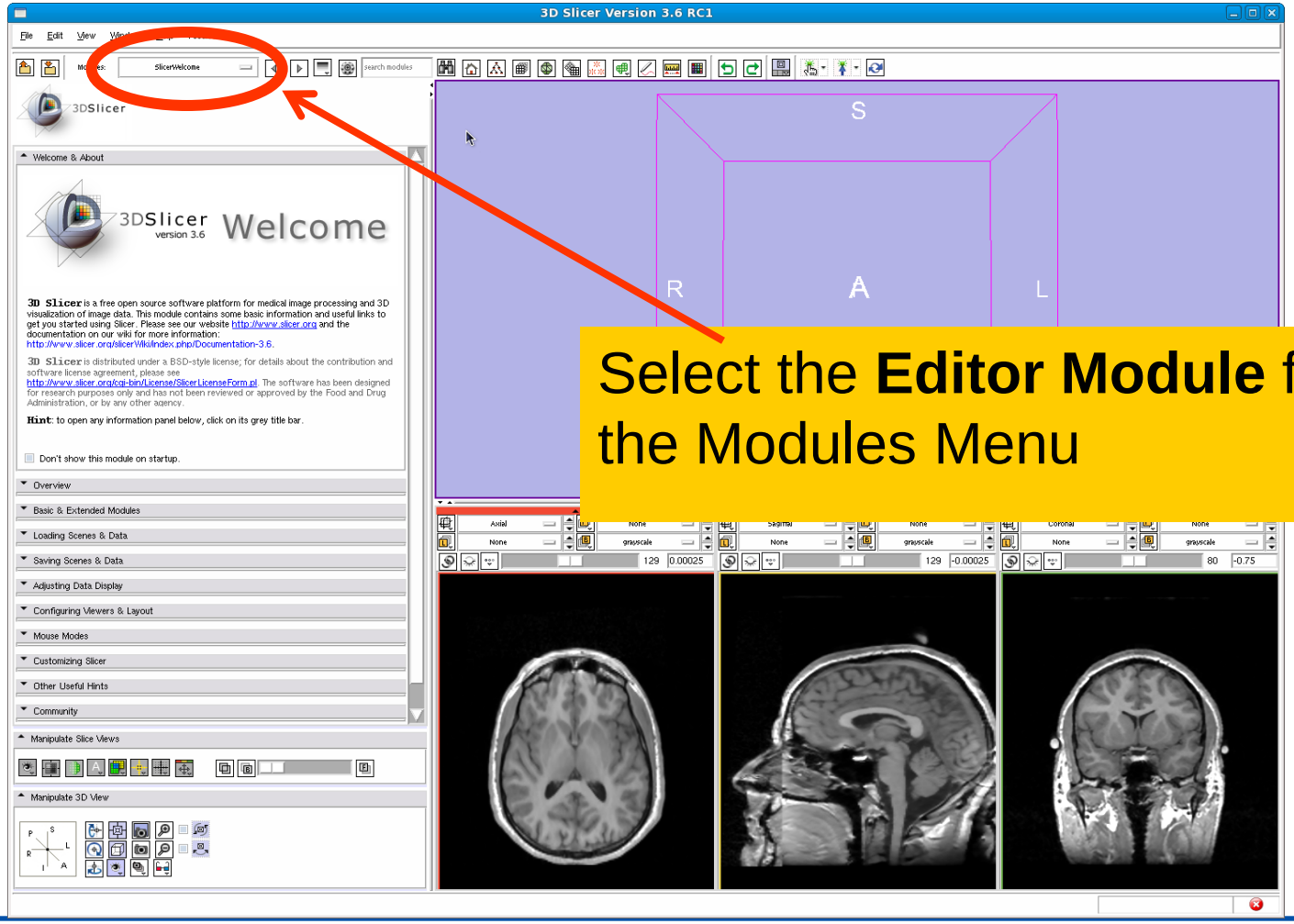
Data Loading



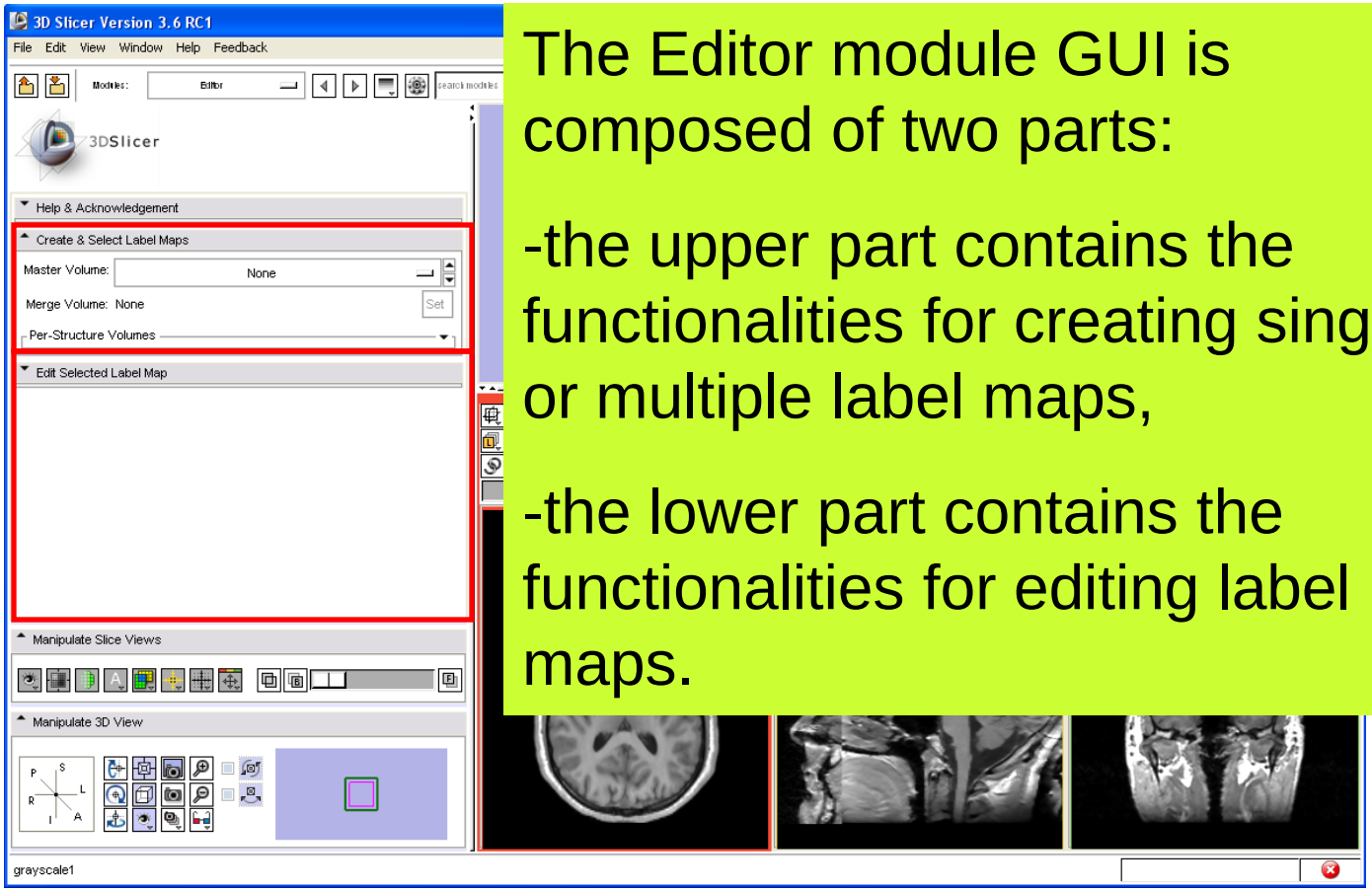
Data Loading



Data Loading



Editor Module

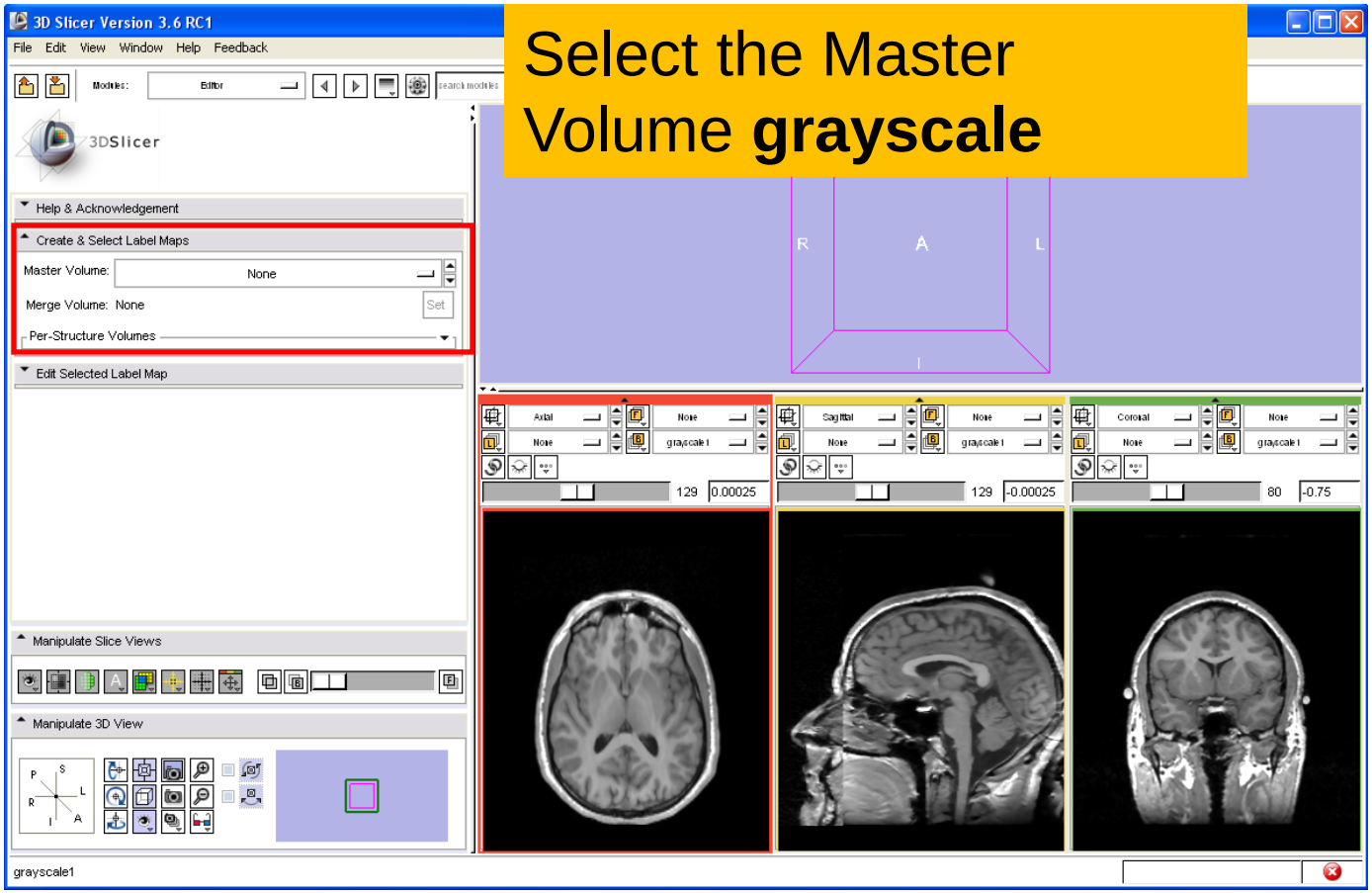


The Editor module GUI is composed of two parts:

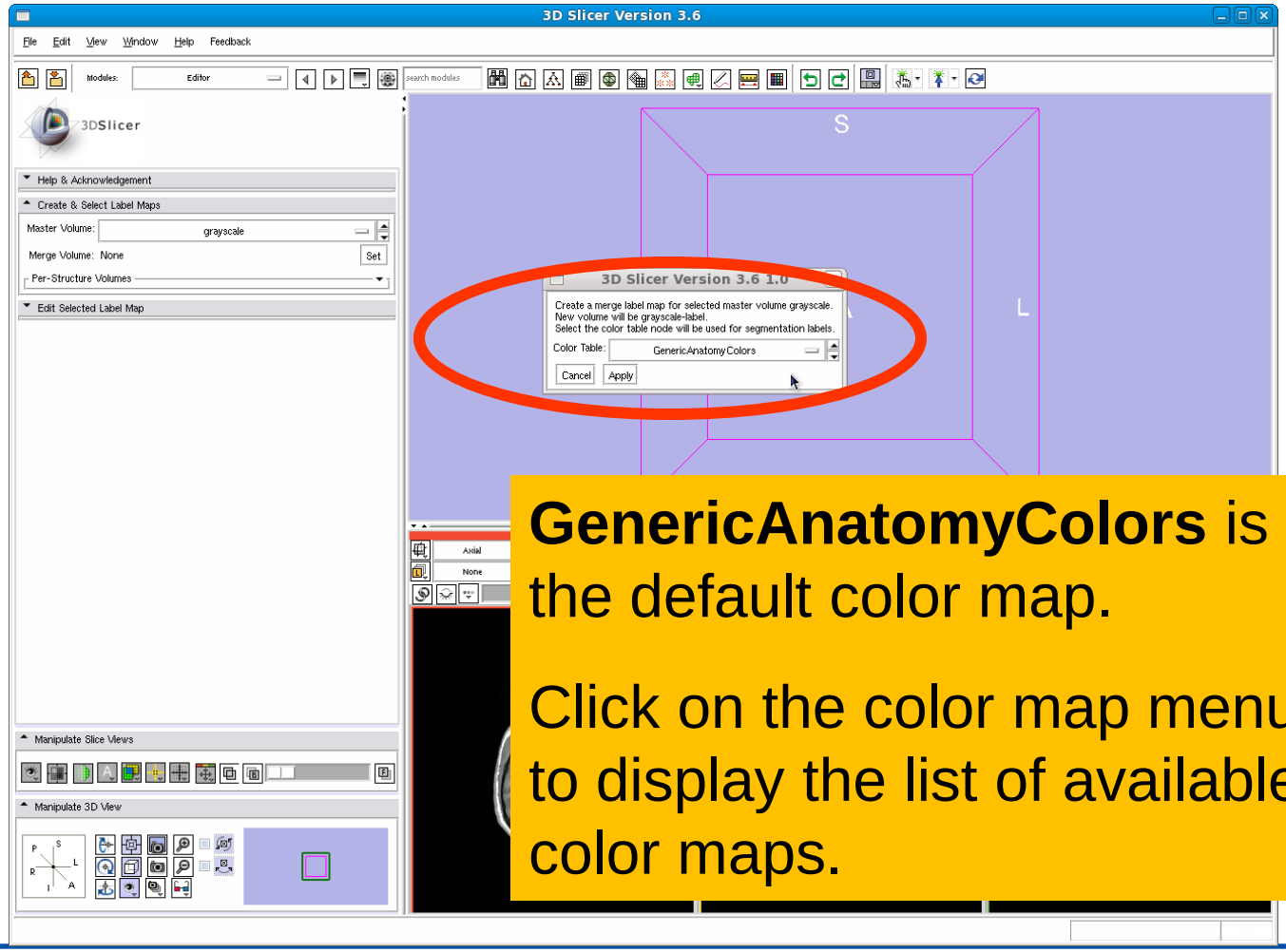
-the upper part contains the functionalities for creating single or multiple label maps,

-the lower part contains the functionalities for editing label maps.

Label Map Creation



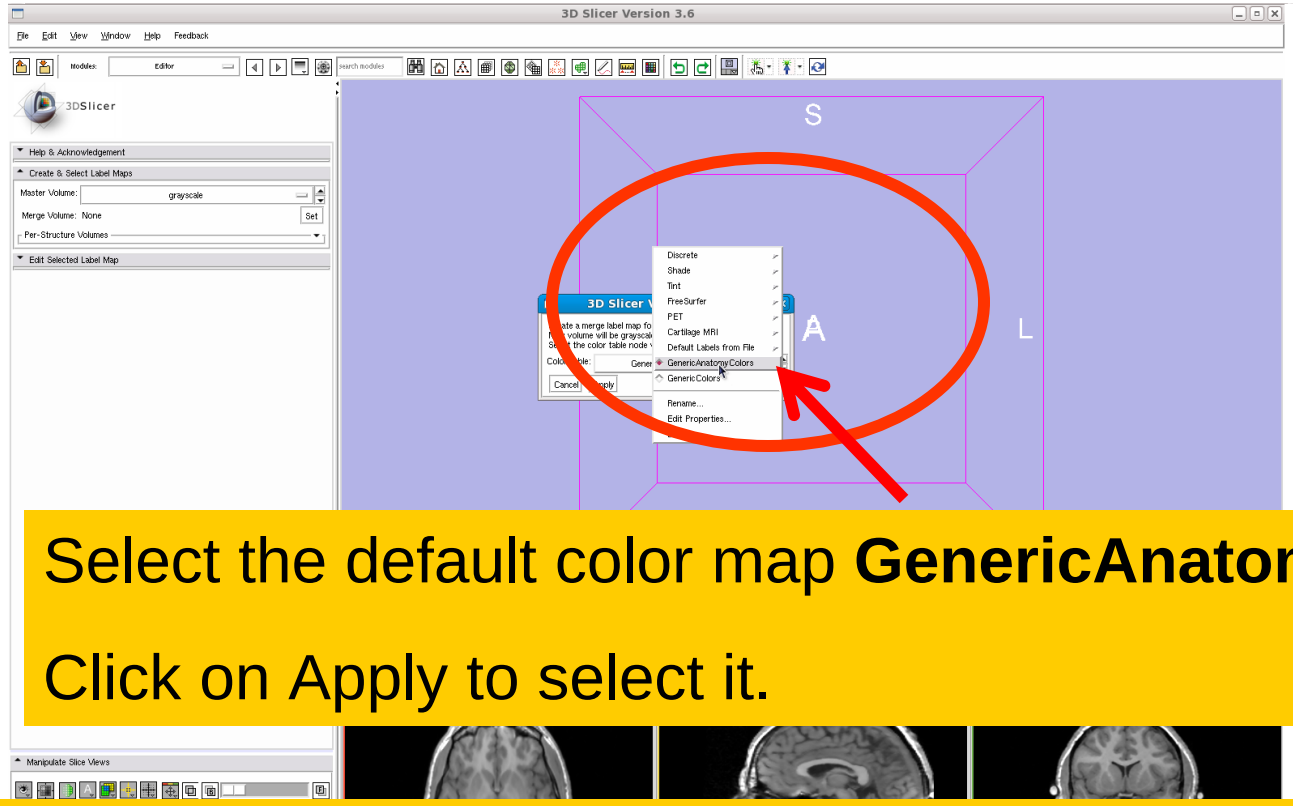
Label Map Creation



GenericAnatomyColors is the default color map.

Click on the color map menu to display the list of available color maps.

Label Map Creation

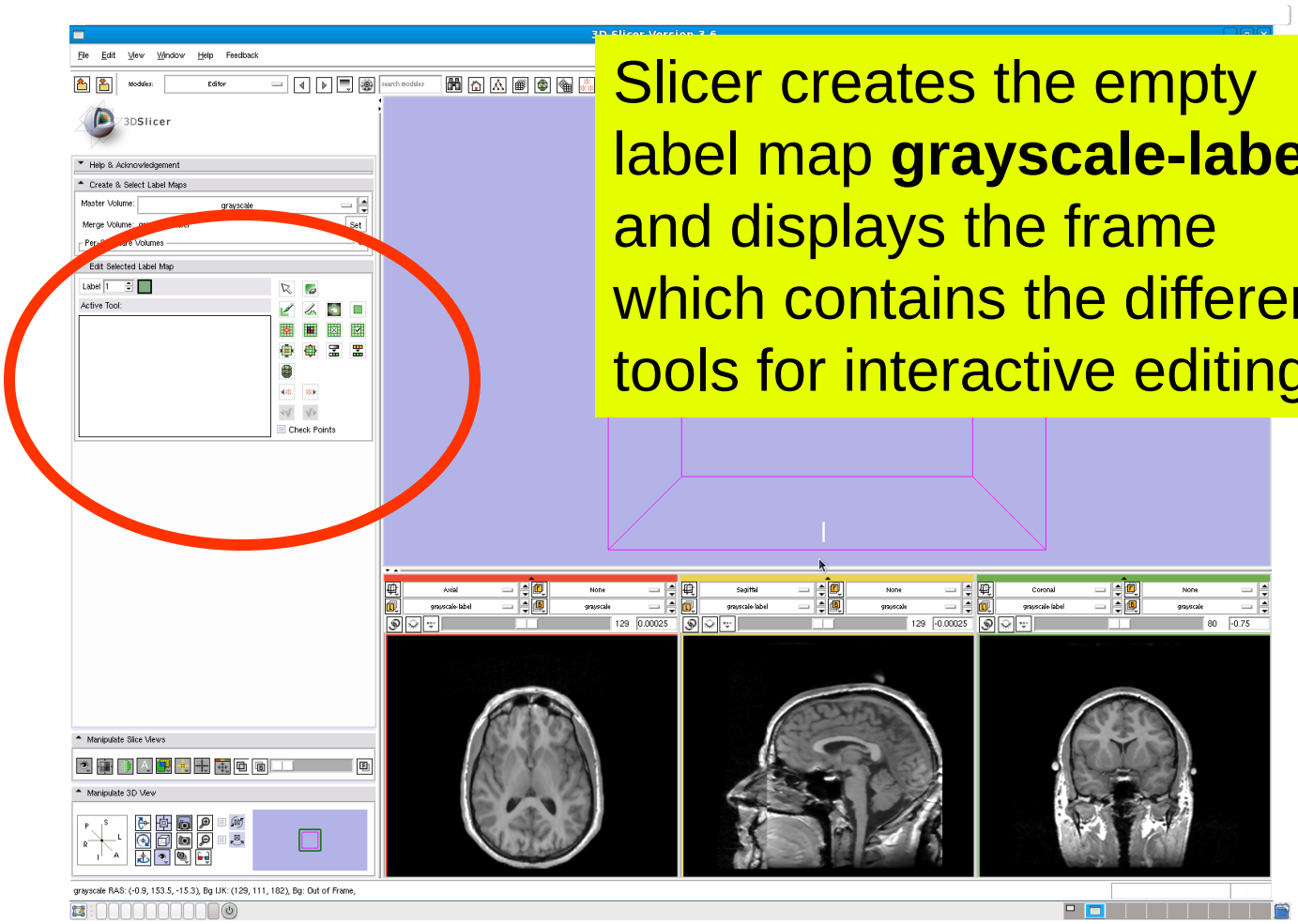


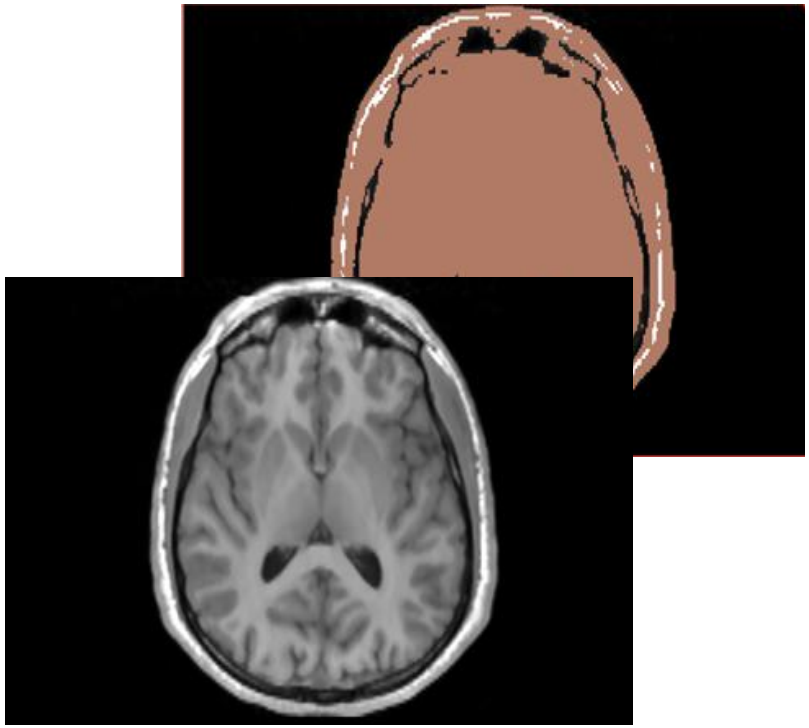
Select the default color map **GenericAnatomyColors**

Click on Apply to select it.

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

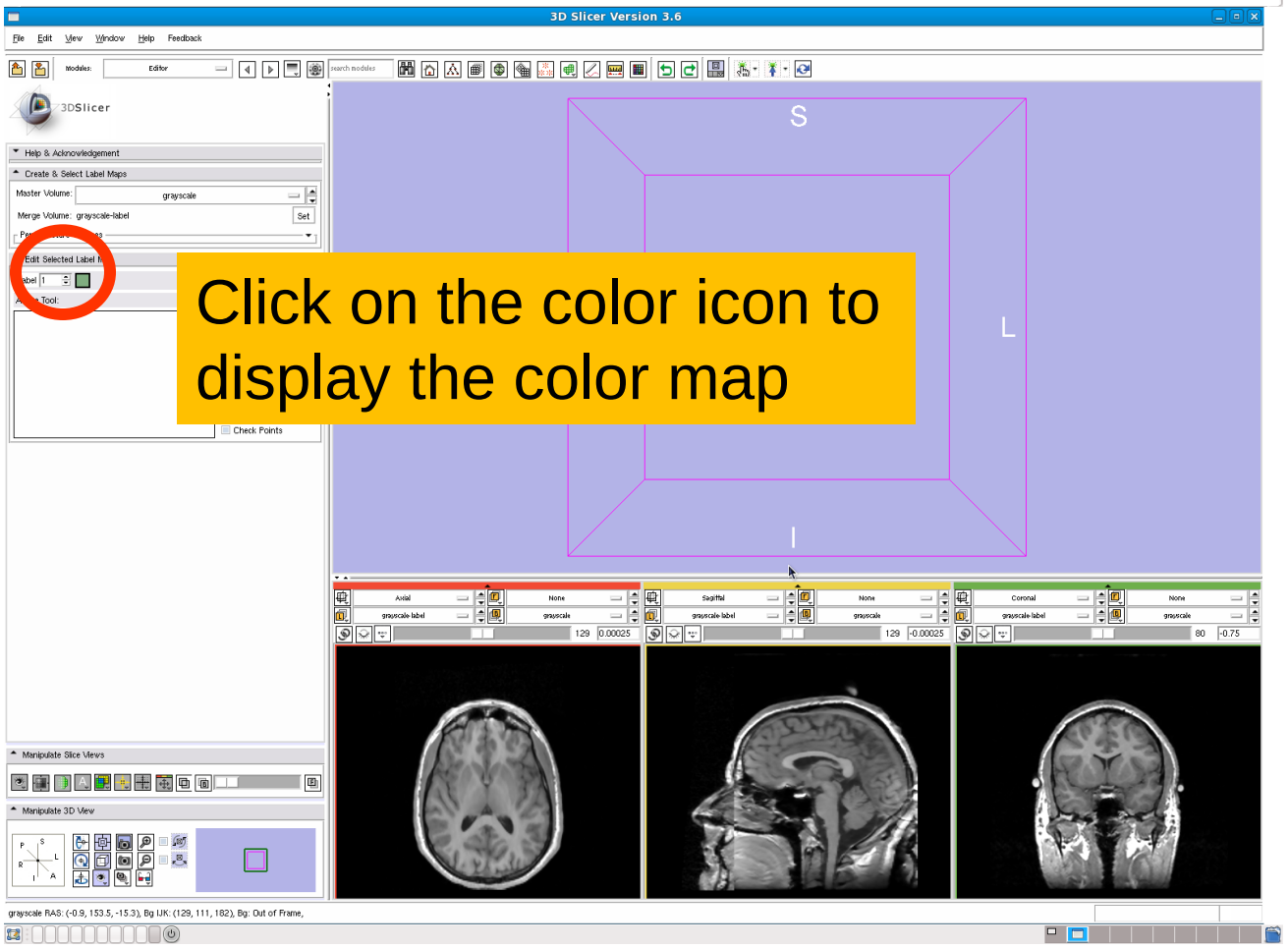
Label Map Creation



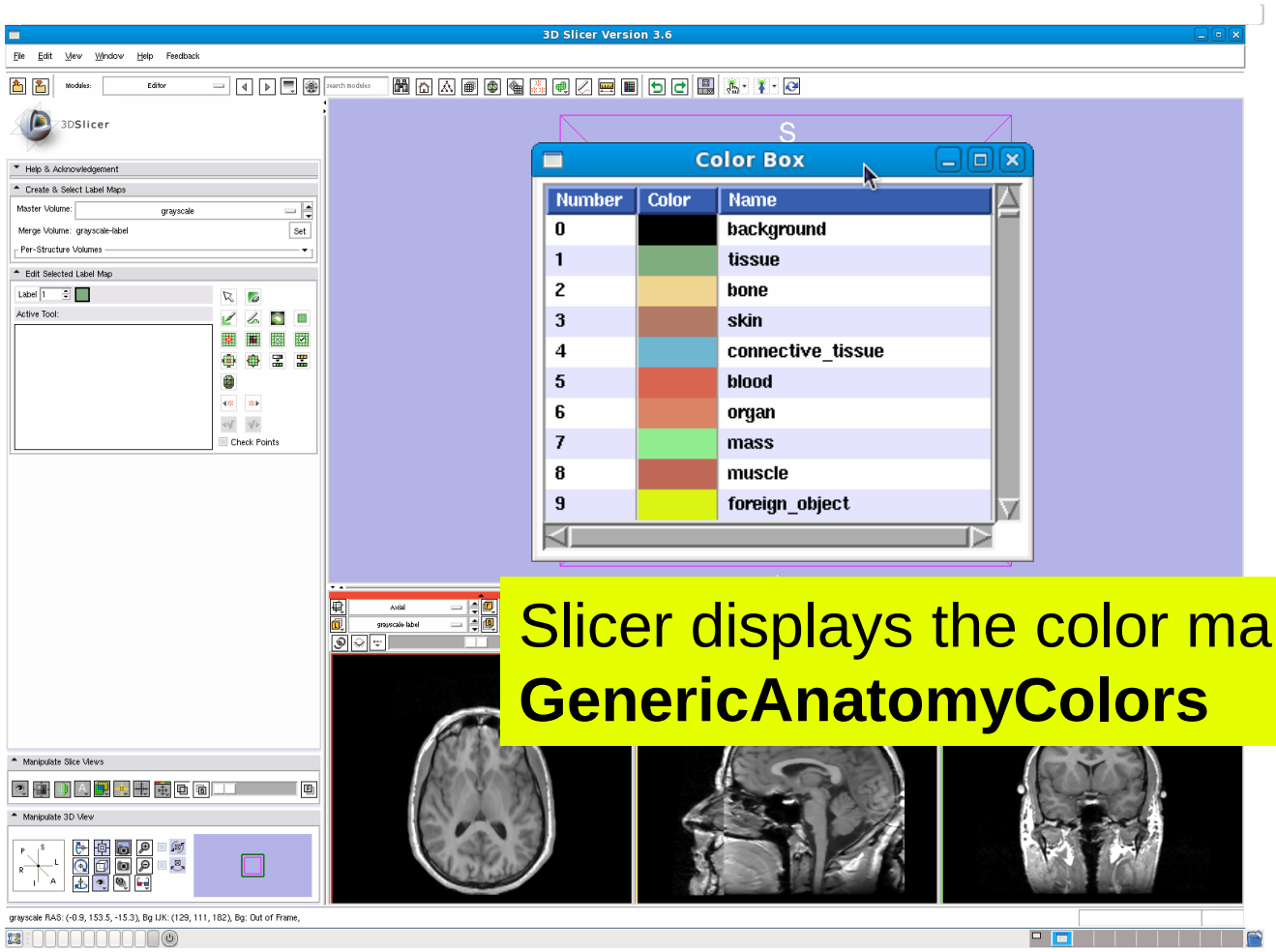


Part 2: Editing a single label map

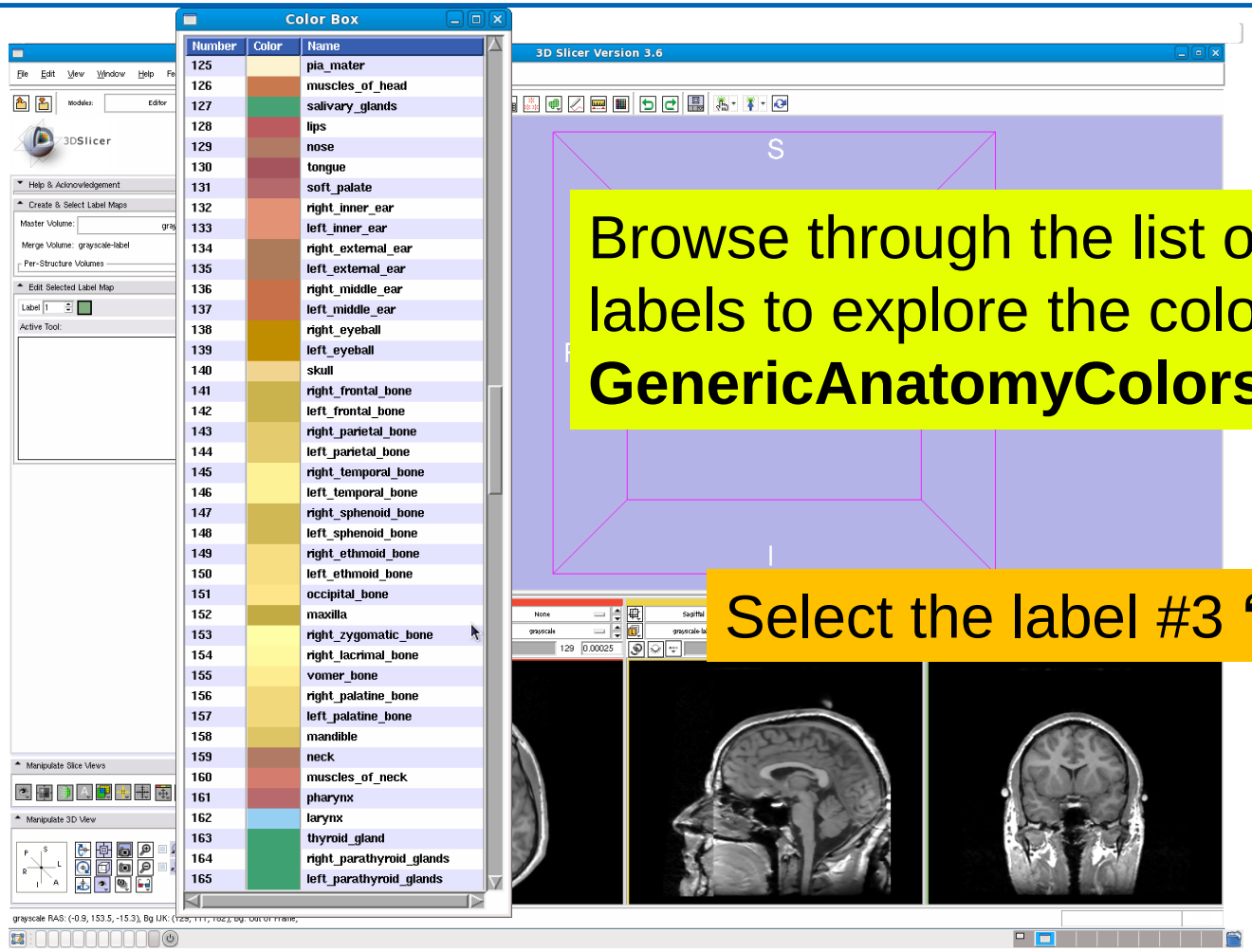
Label Map Editing



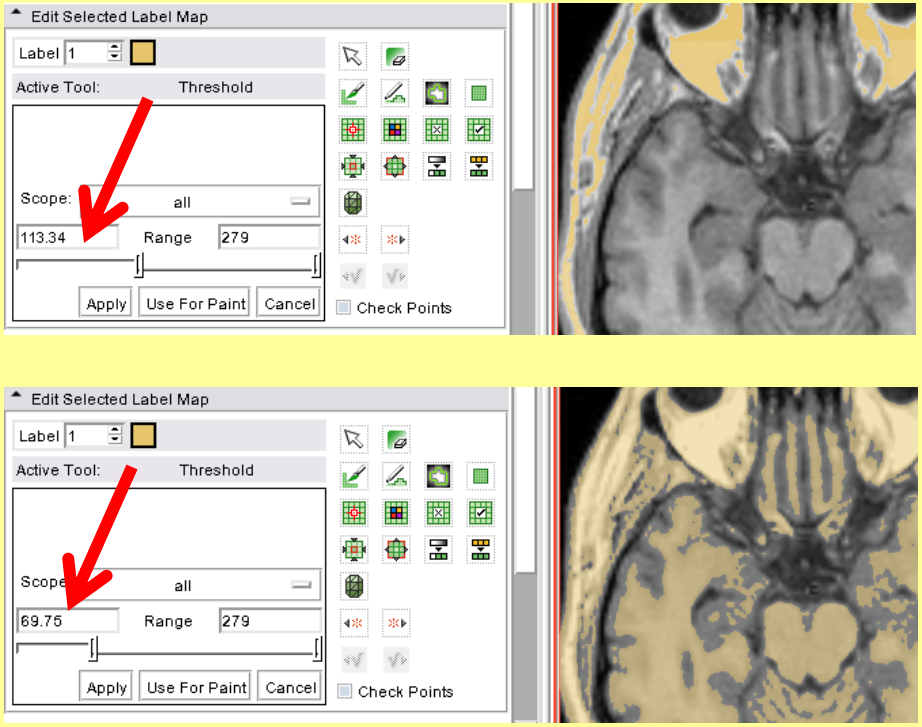
Label Map Editing



Label Map Editing

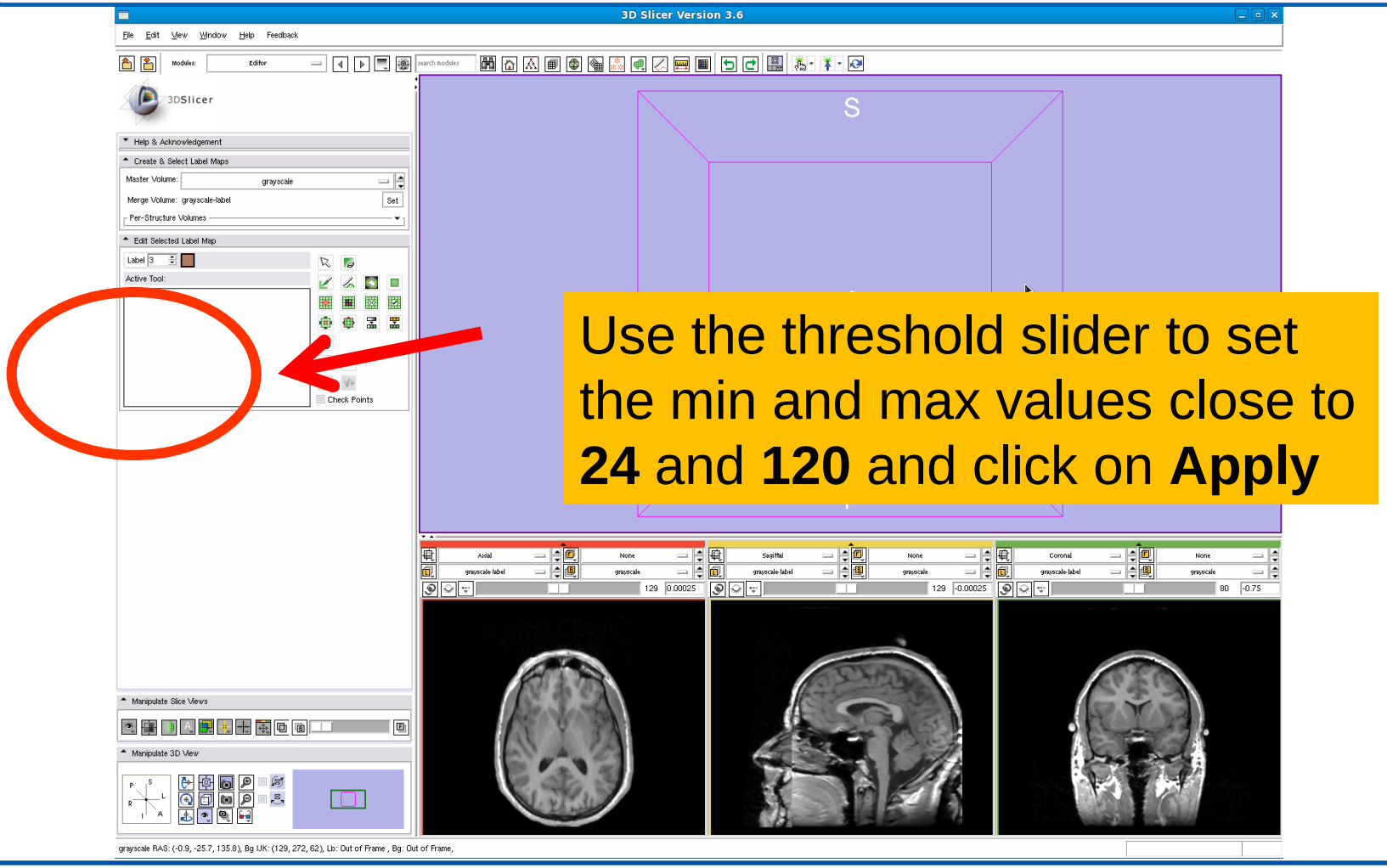


Threshold



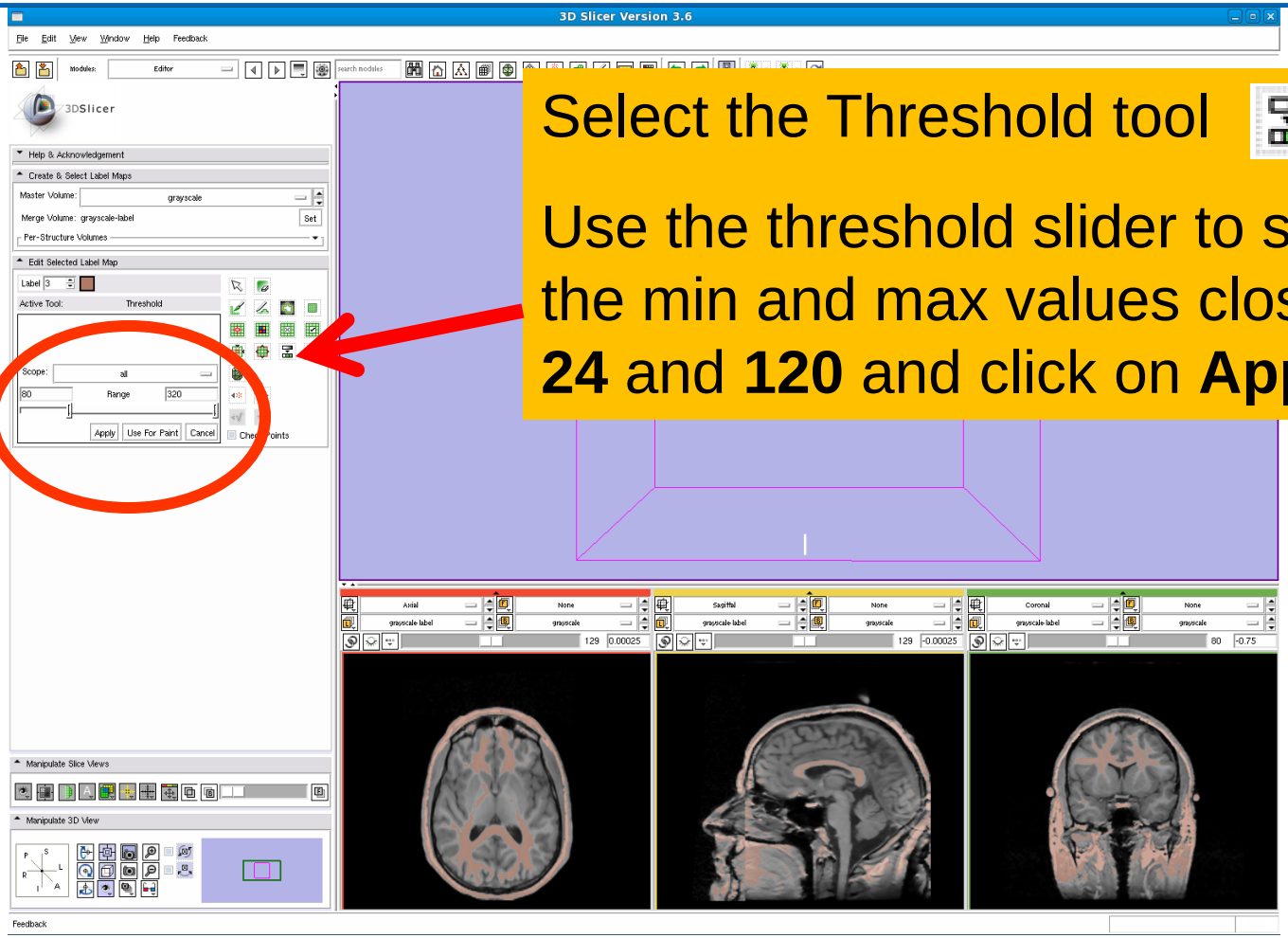
Description: The grey level volume voxels for which the intensity is within the specified range will be assigned the same label in the label map.

Threshold Effect



Use the threshold slider to set the min and max values close to **24** and **120** and click on **Apply**

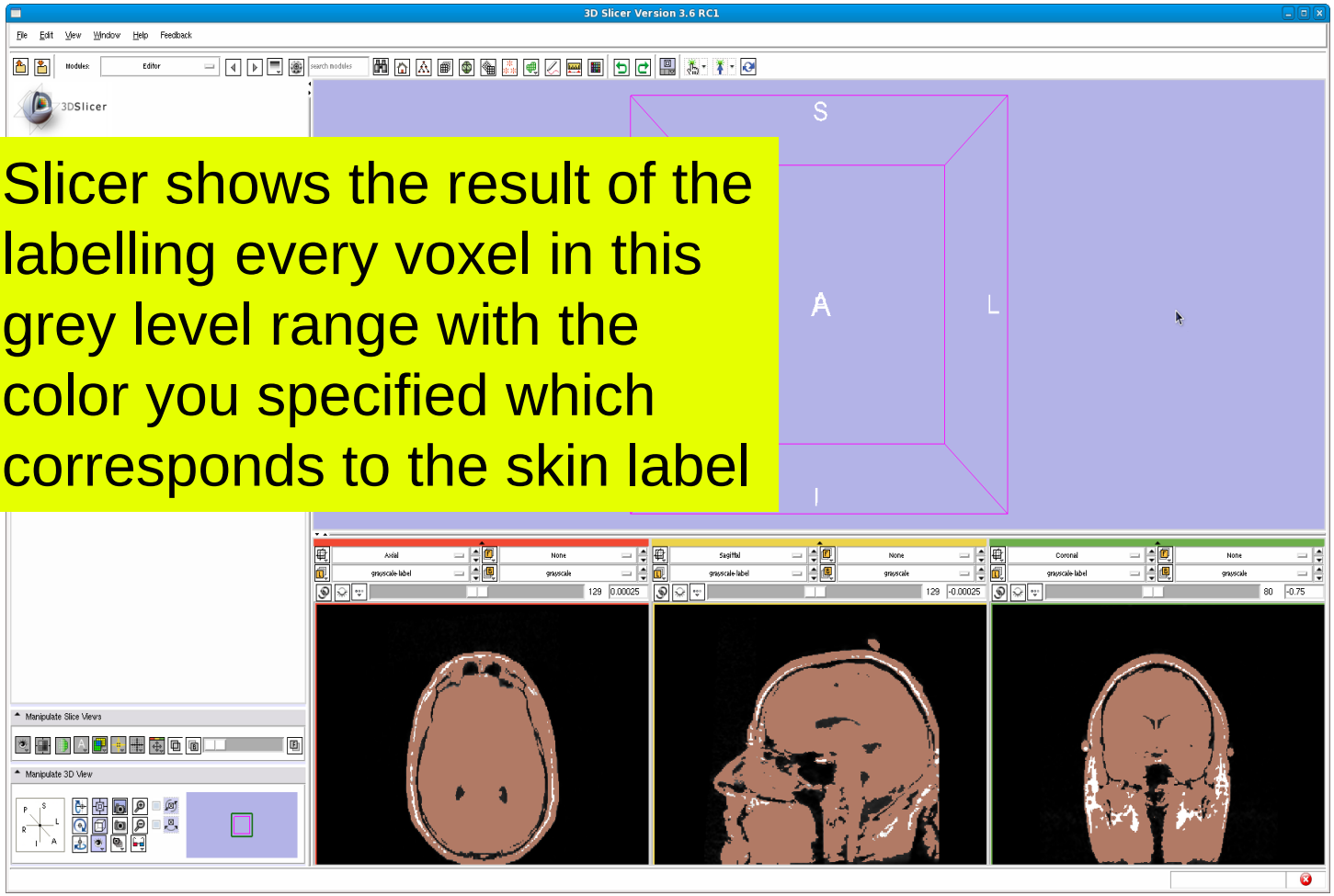
Threshold Effect



Select the Threshold tool

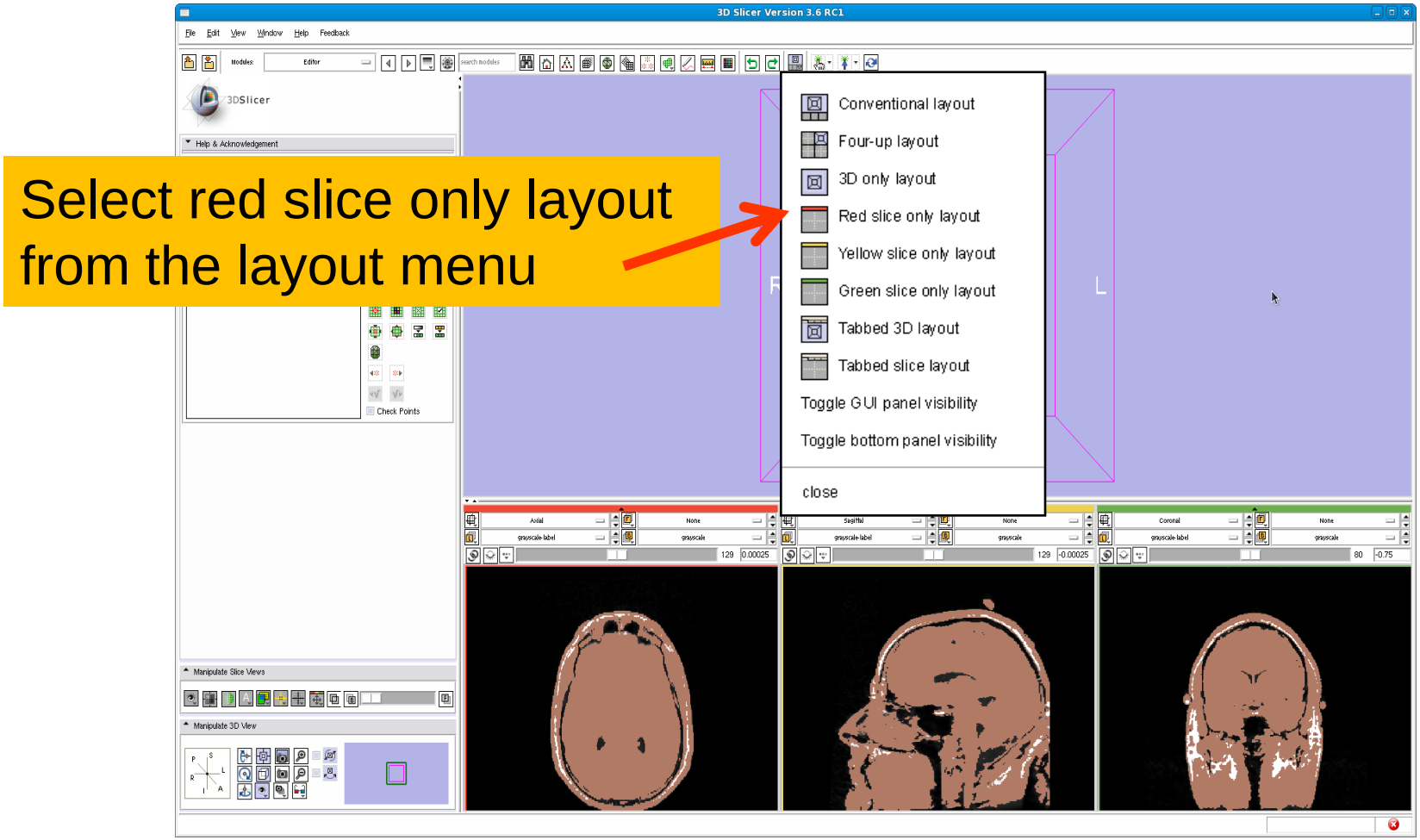
Use the threshold slider to set the min and max values close to **24** and **120** and click on **Apply**

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

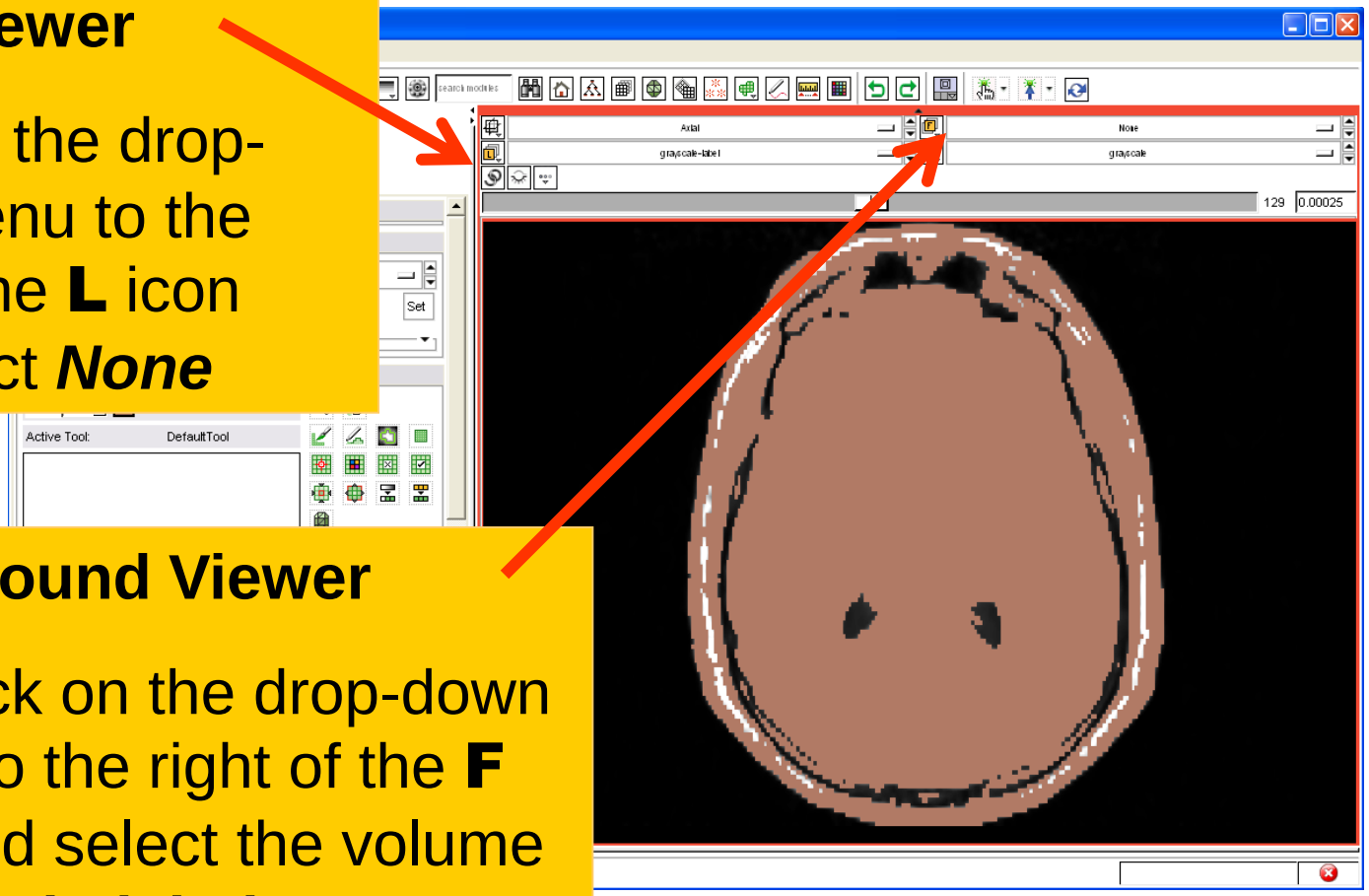
Threshold Effect



Threshold Effect

Label Viewer

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

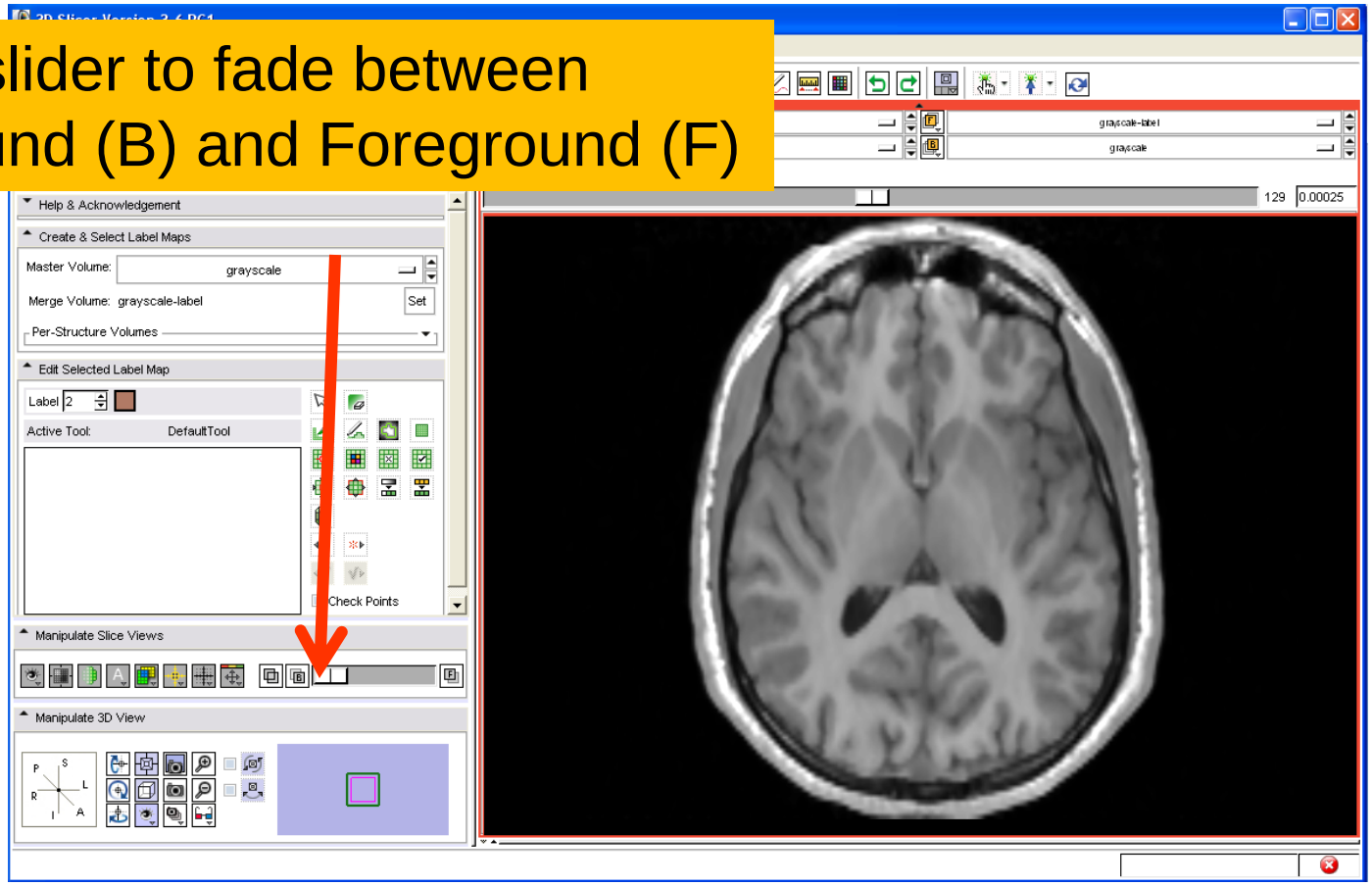


Foreground Viewer

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

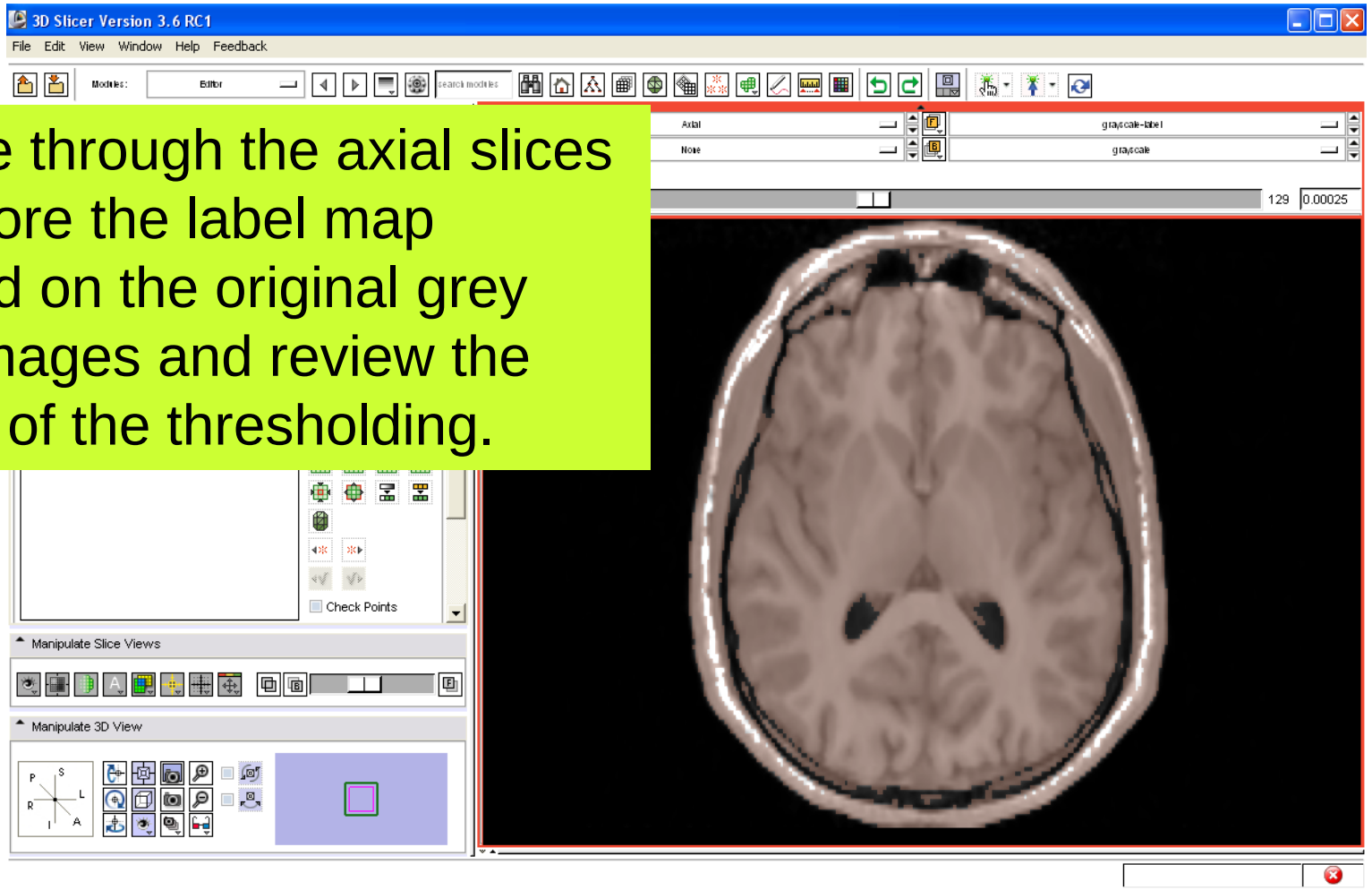
Threshold Effect

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

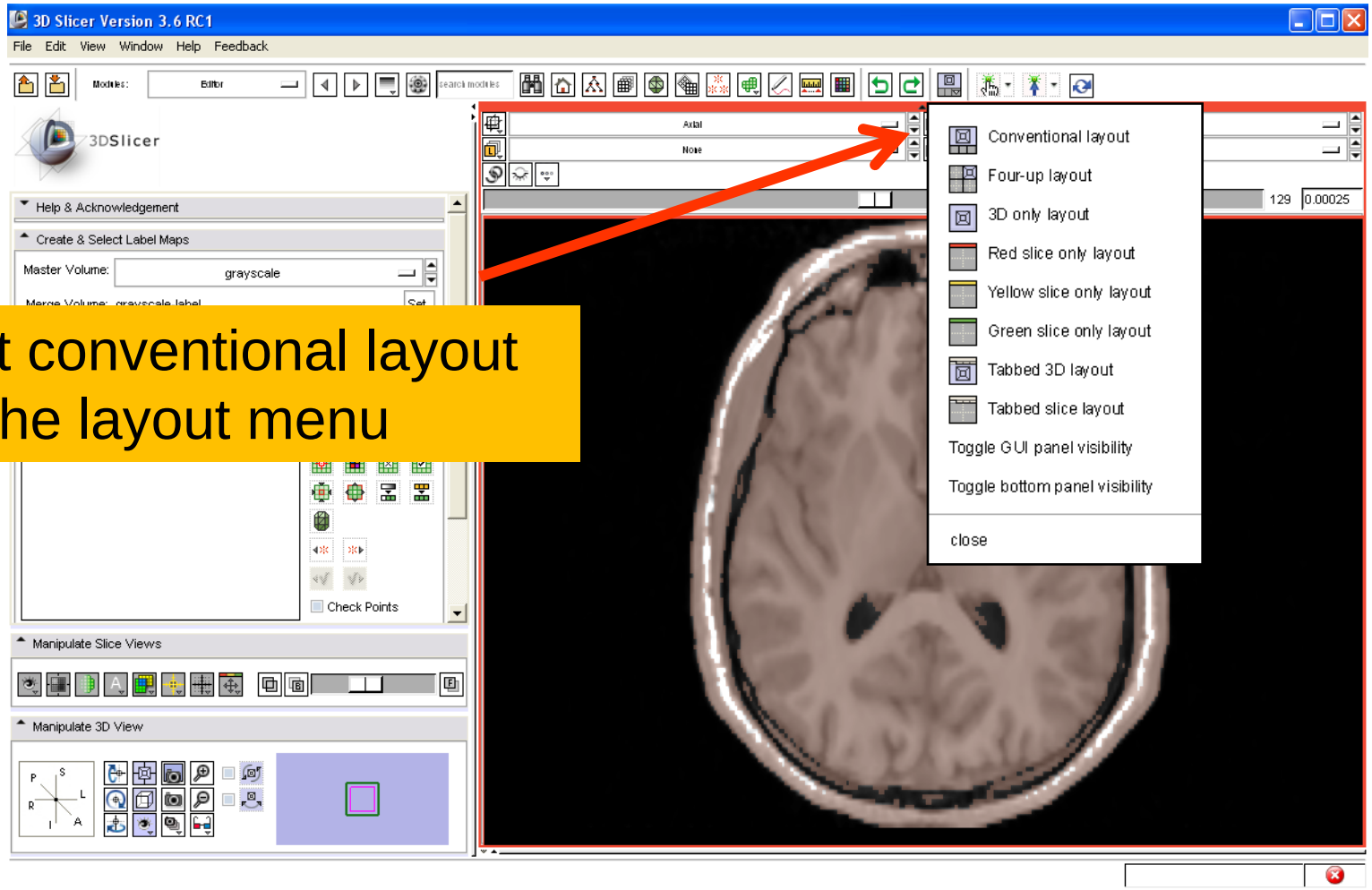


Exploring the result

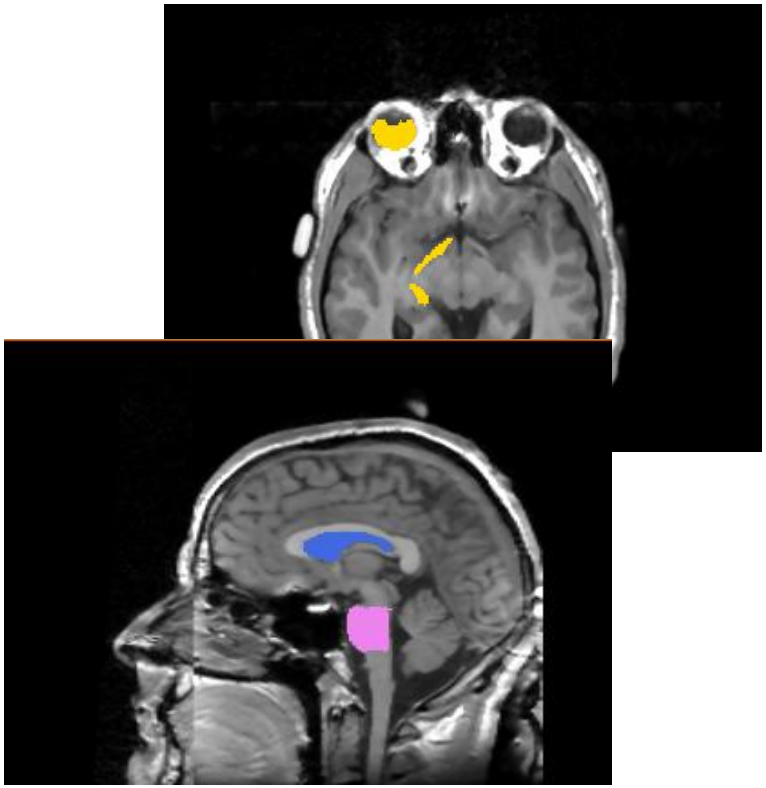
Browse through the axial slices to explore the label map overlaid on the original grey level images and review the results of the thresholding.



Threshold Effect

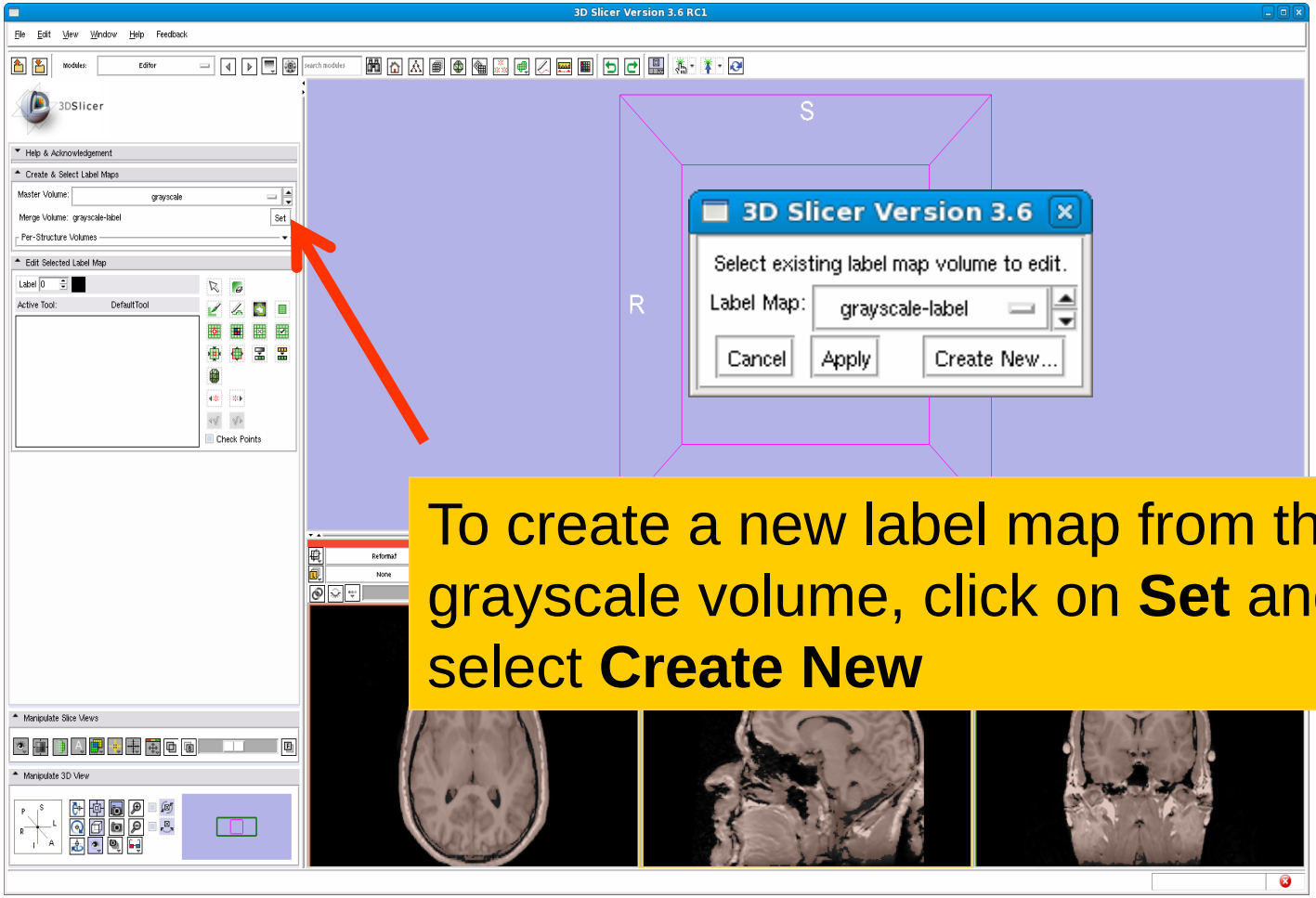


Select conventional layout from the layout menu



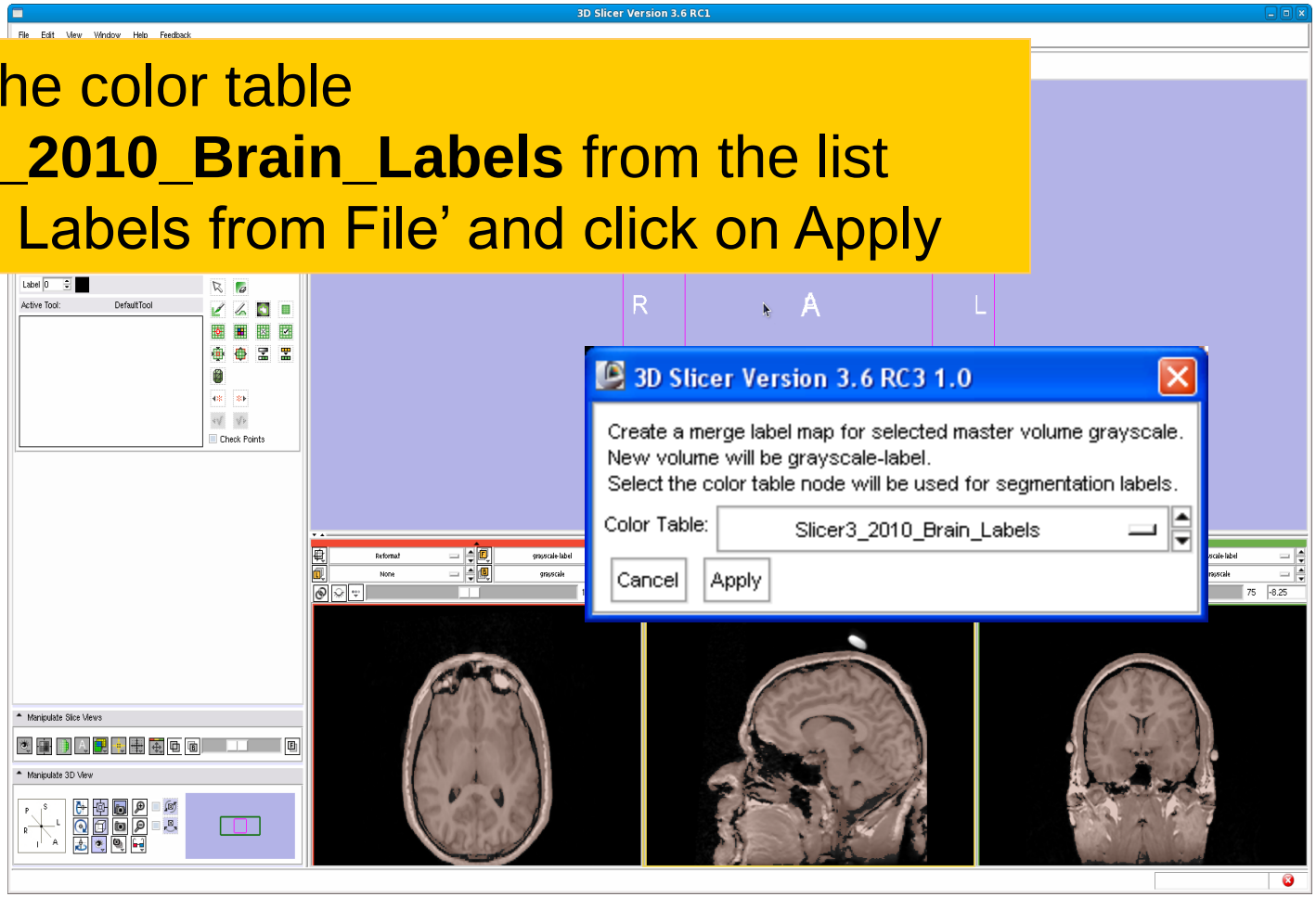
Part 3: Creating and editing a label map with multiple labels

Creating a map with multiple labels

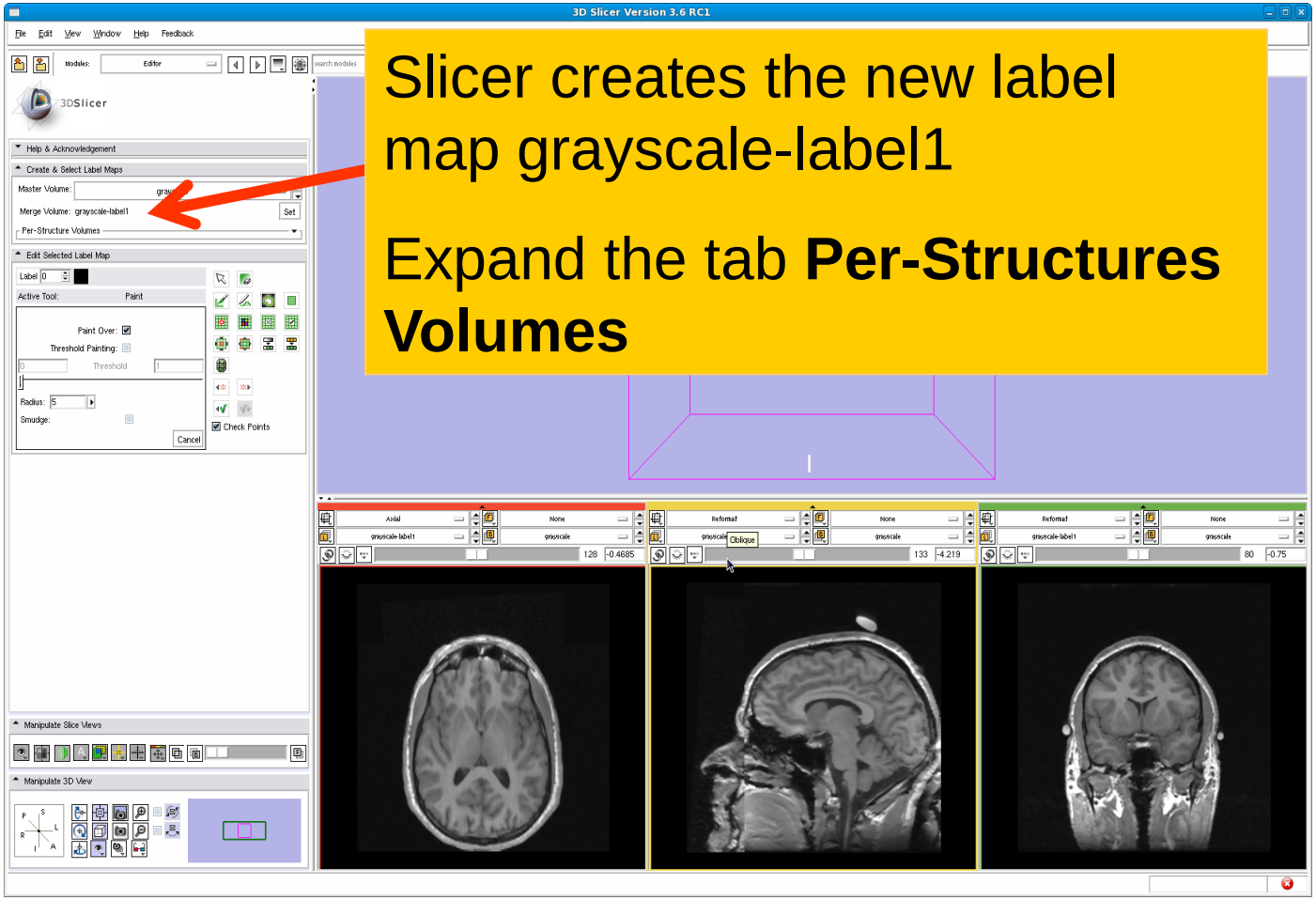


Creating a map with multiple labels

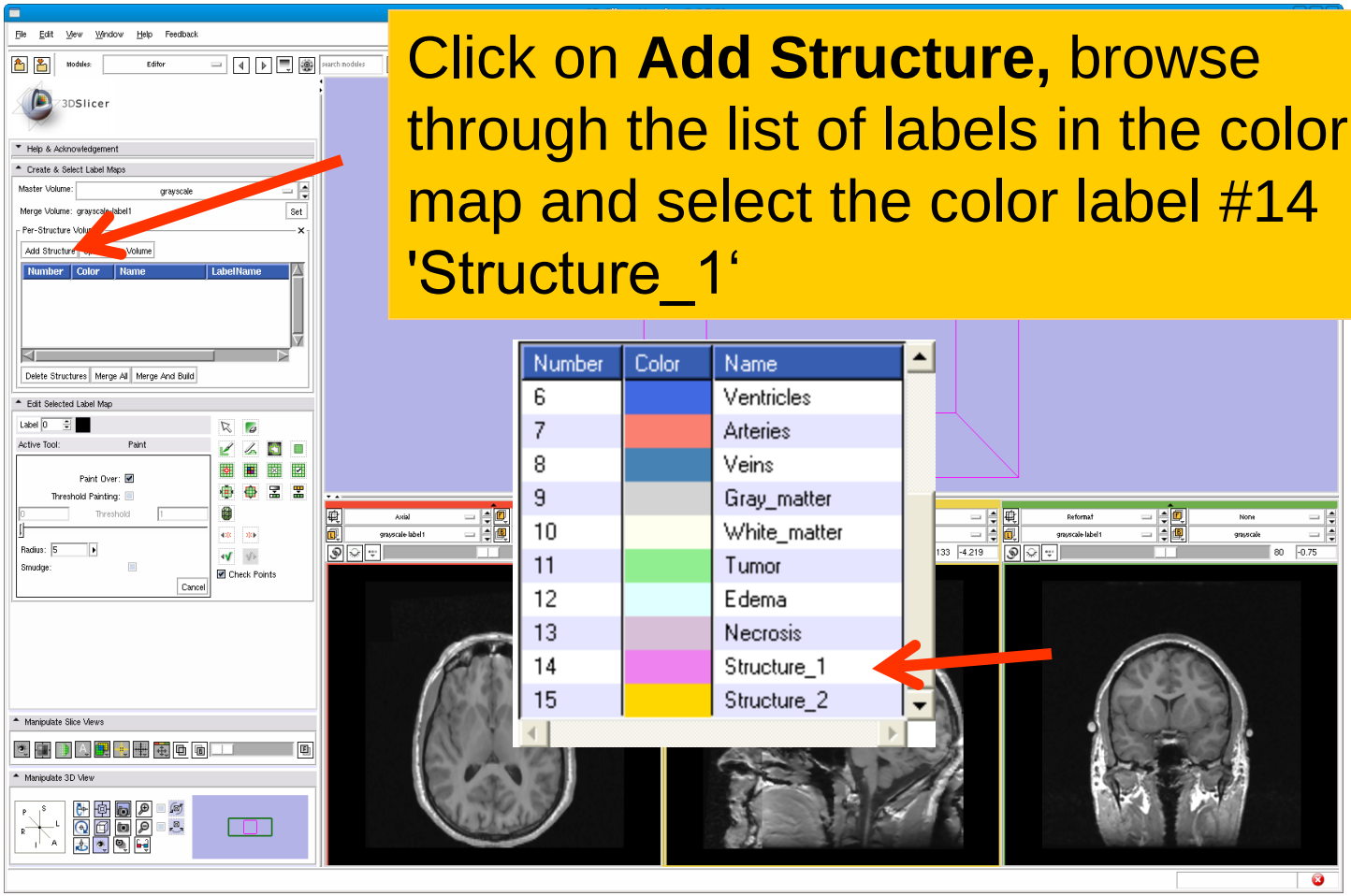
Select the color table **Slicer3_2010_Brain_Labels** from the list ‘Default Labels from File’ and click on Apply



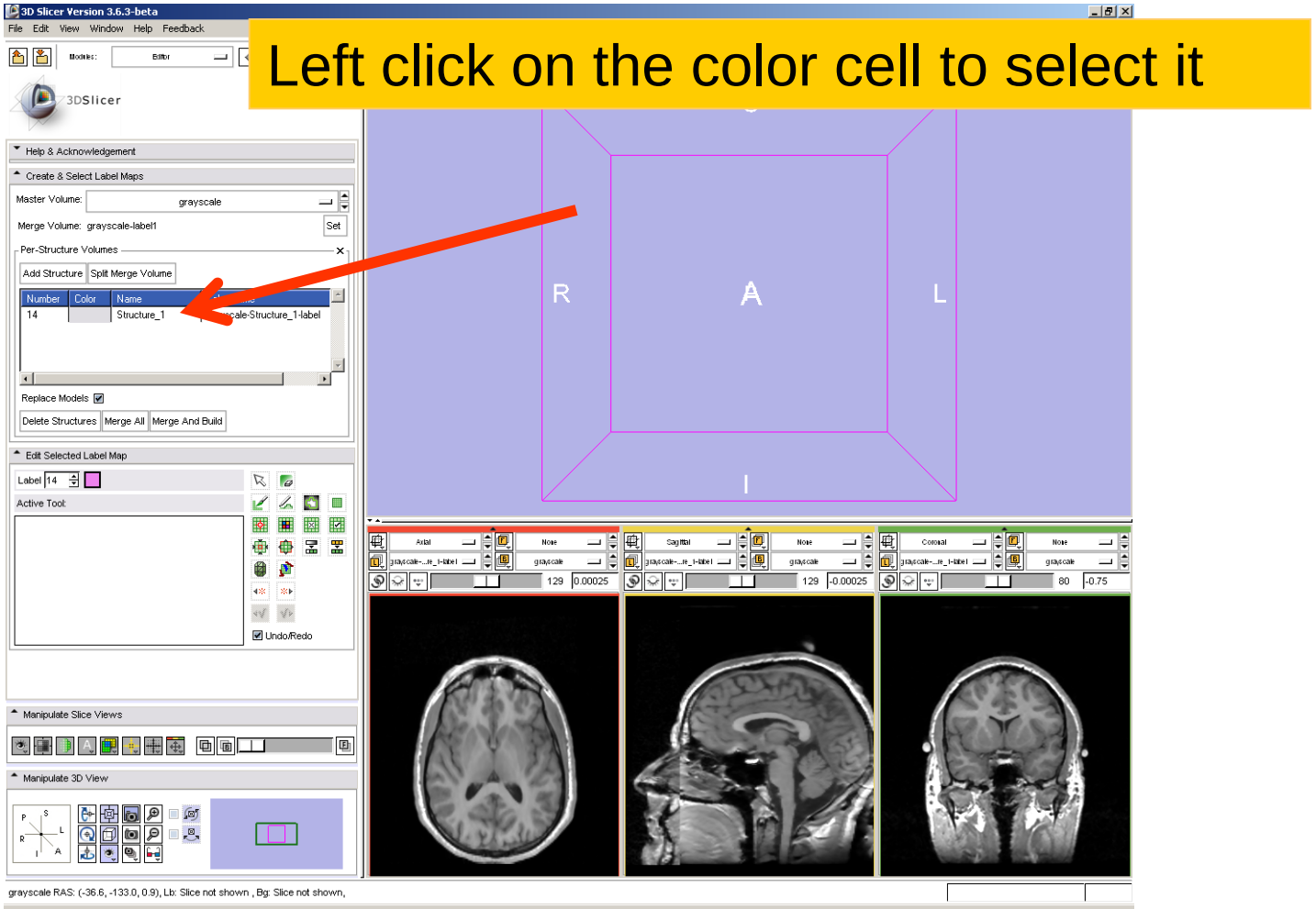
Creating a map with multiple labels



Adding a structure



Draw Tool



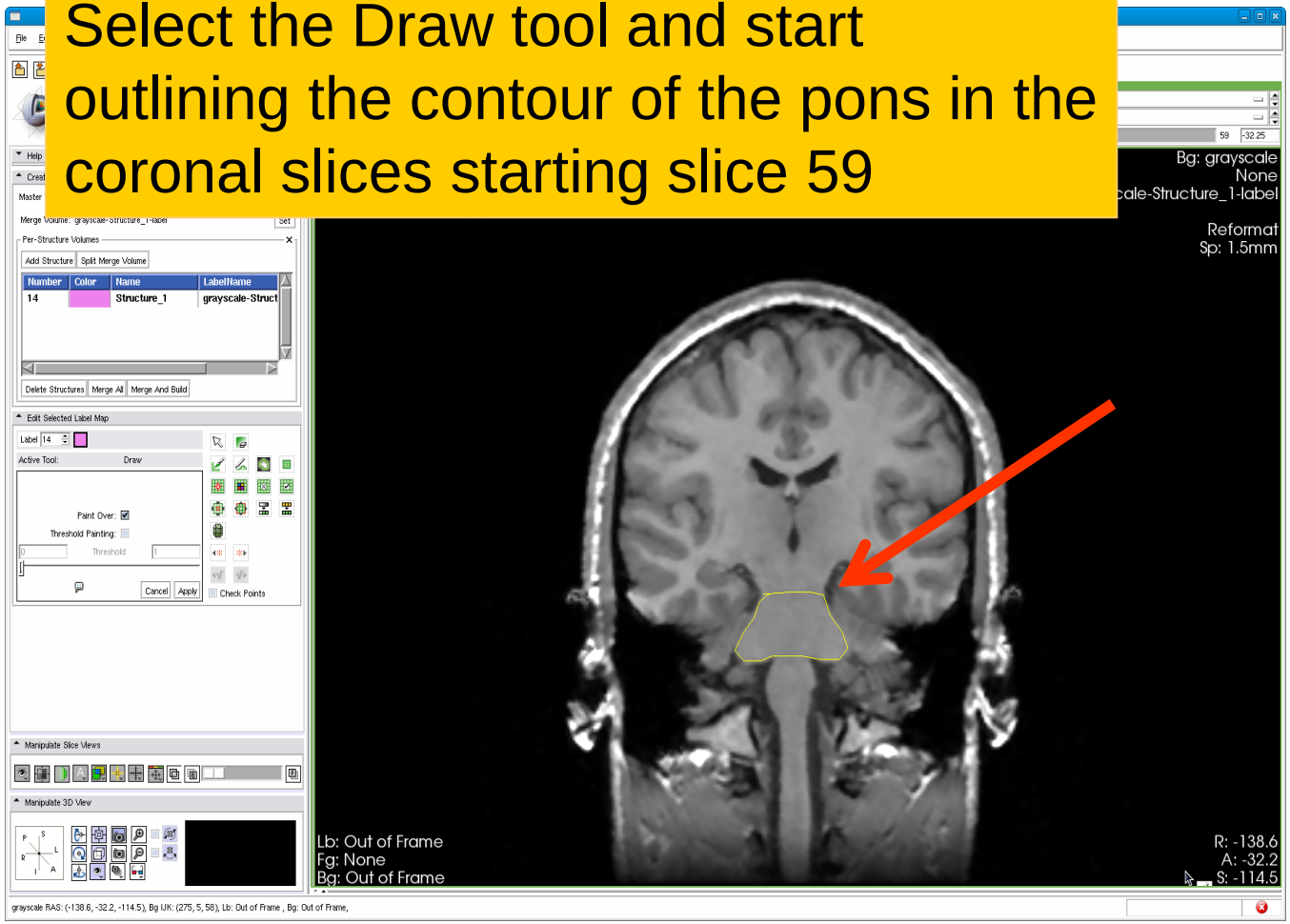
Left click on the color cell to select it

Drawing

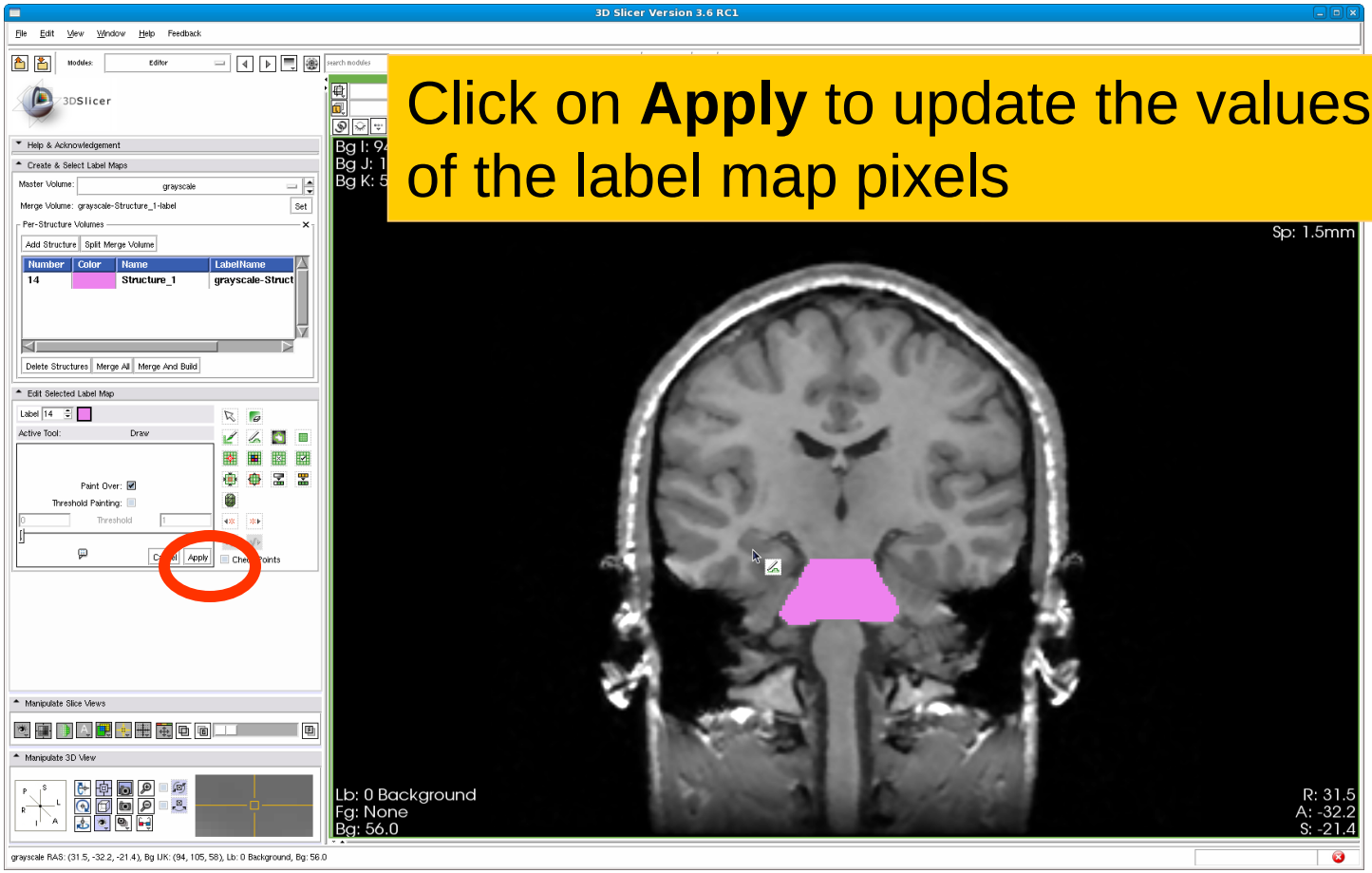
Description: The draw tool is an intuitive tool that can be used to manually outline structures in the grey level images.

Draw Tool

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

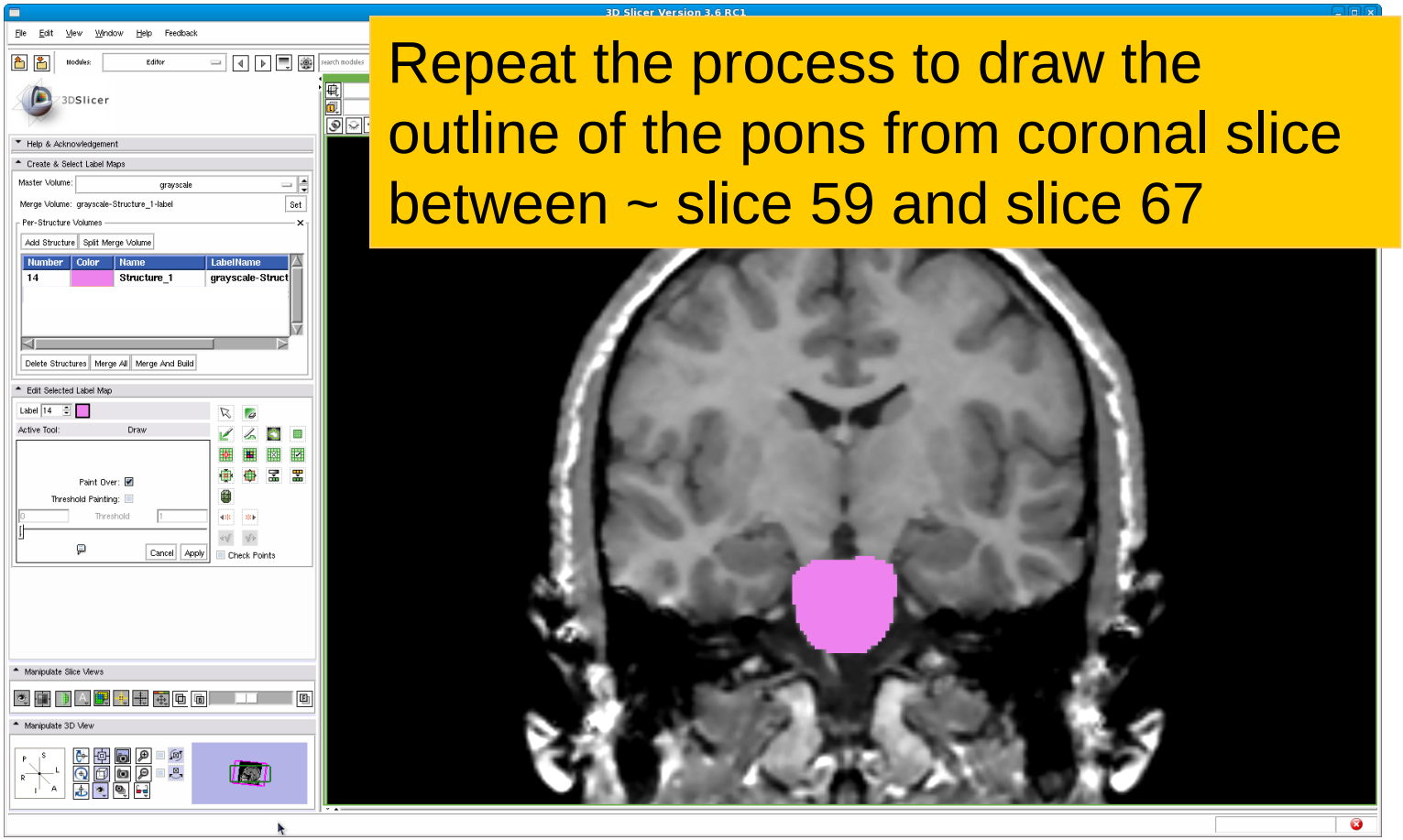


Draw Tool

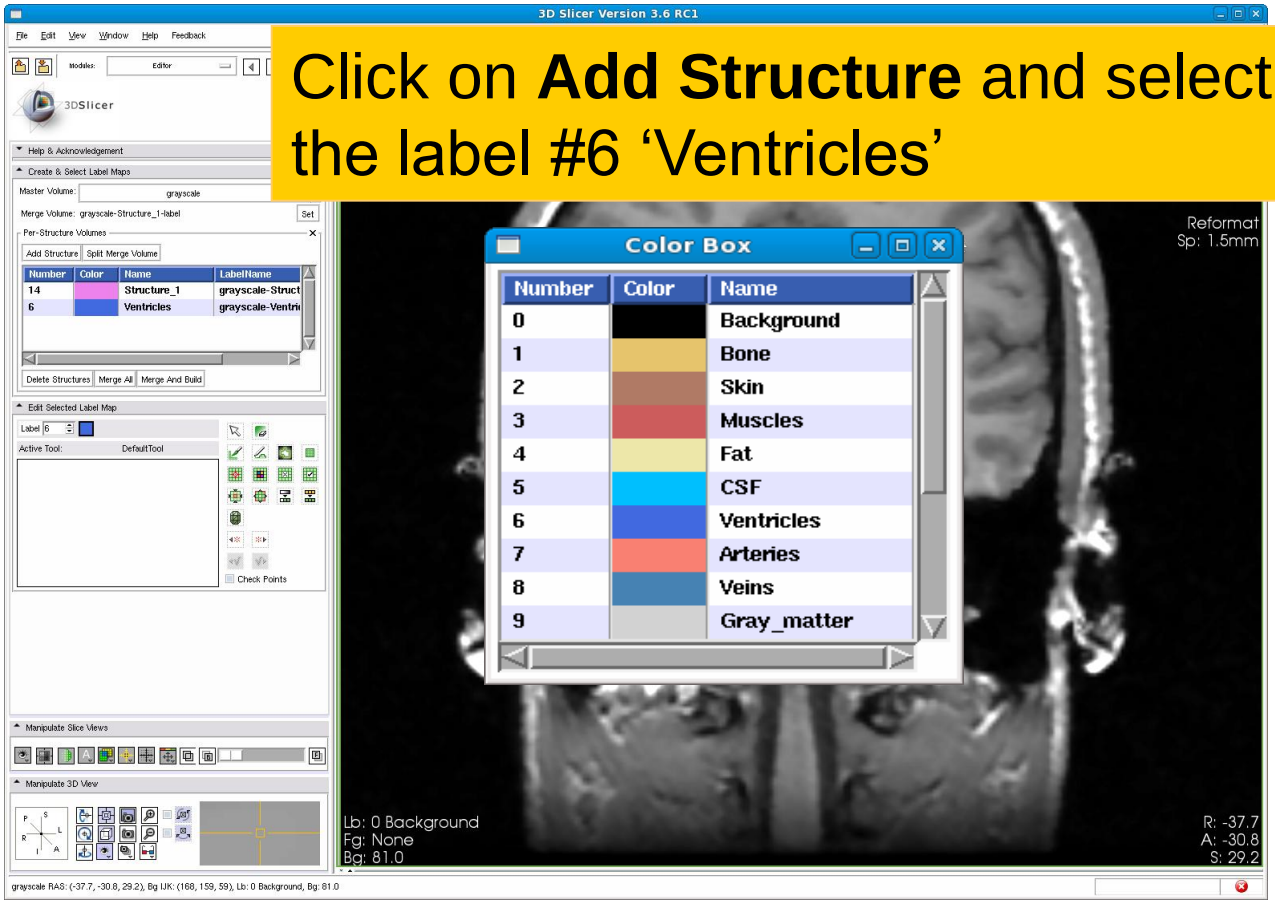


Click on **Apply** to update the values of the label map pixels

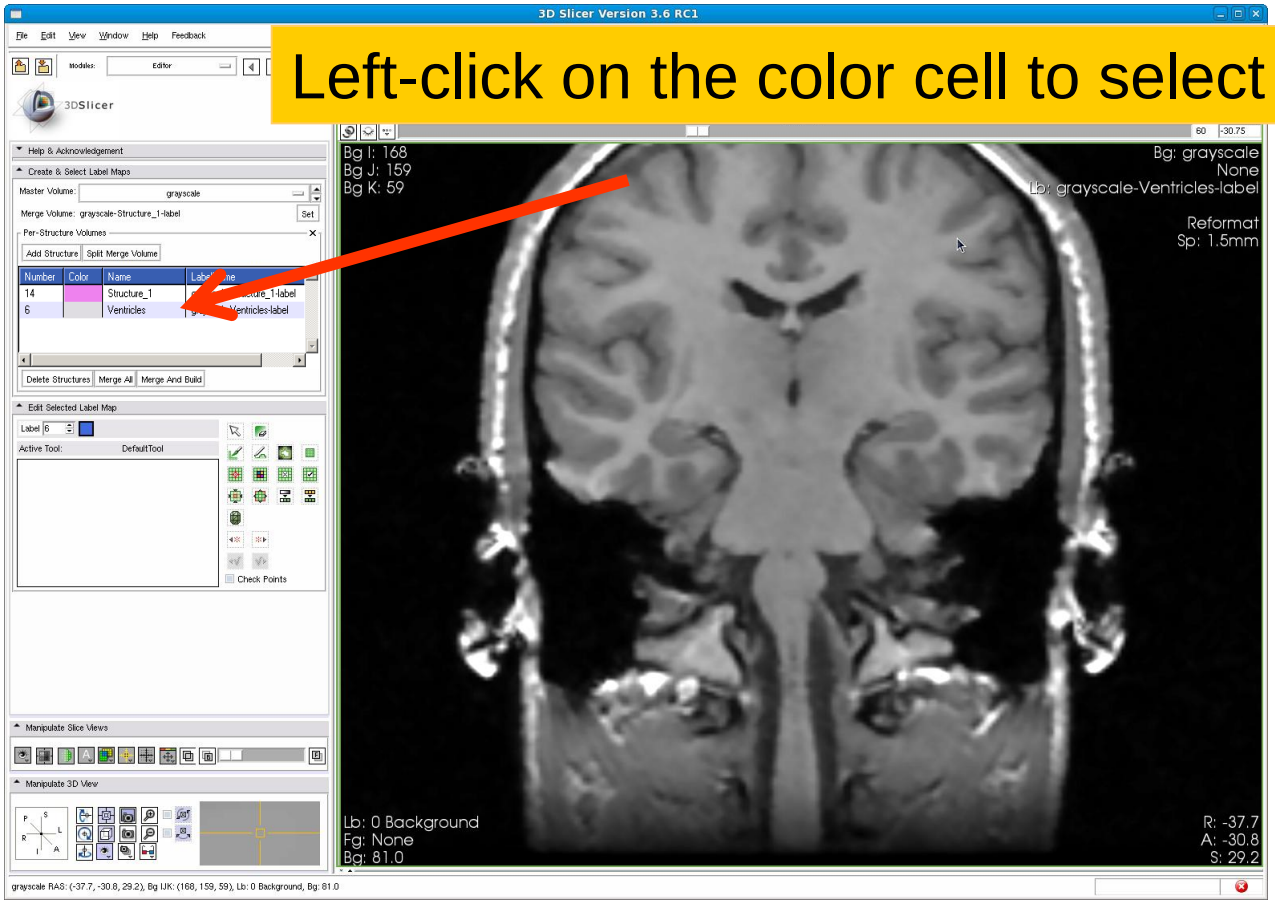
Draw Tool



Adding a second structure



Adding a second structure

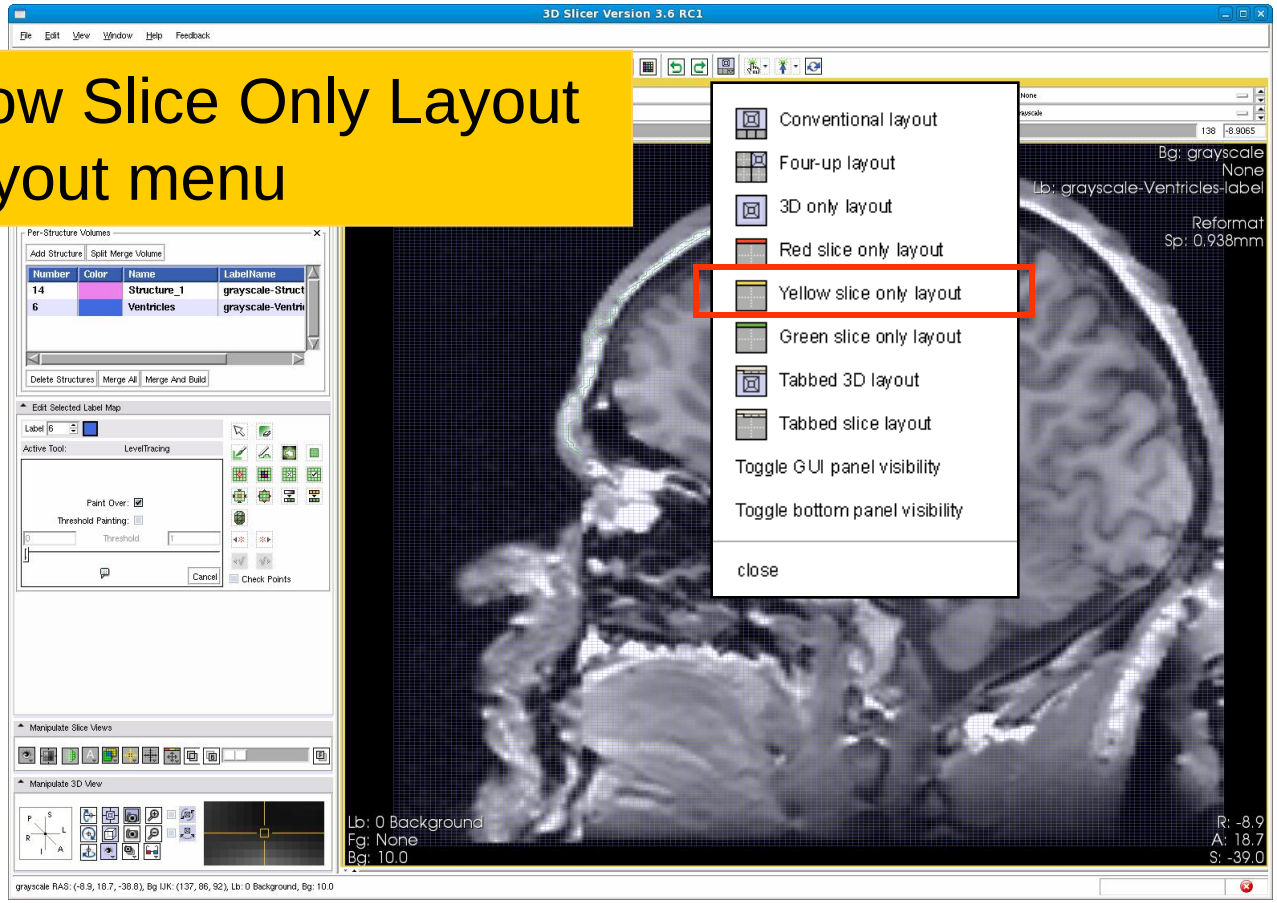


Level Tracing

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

Select Yellow Slice Only Layout from the layout menu

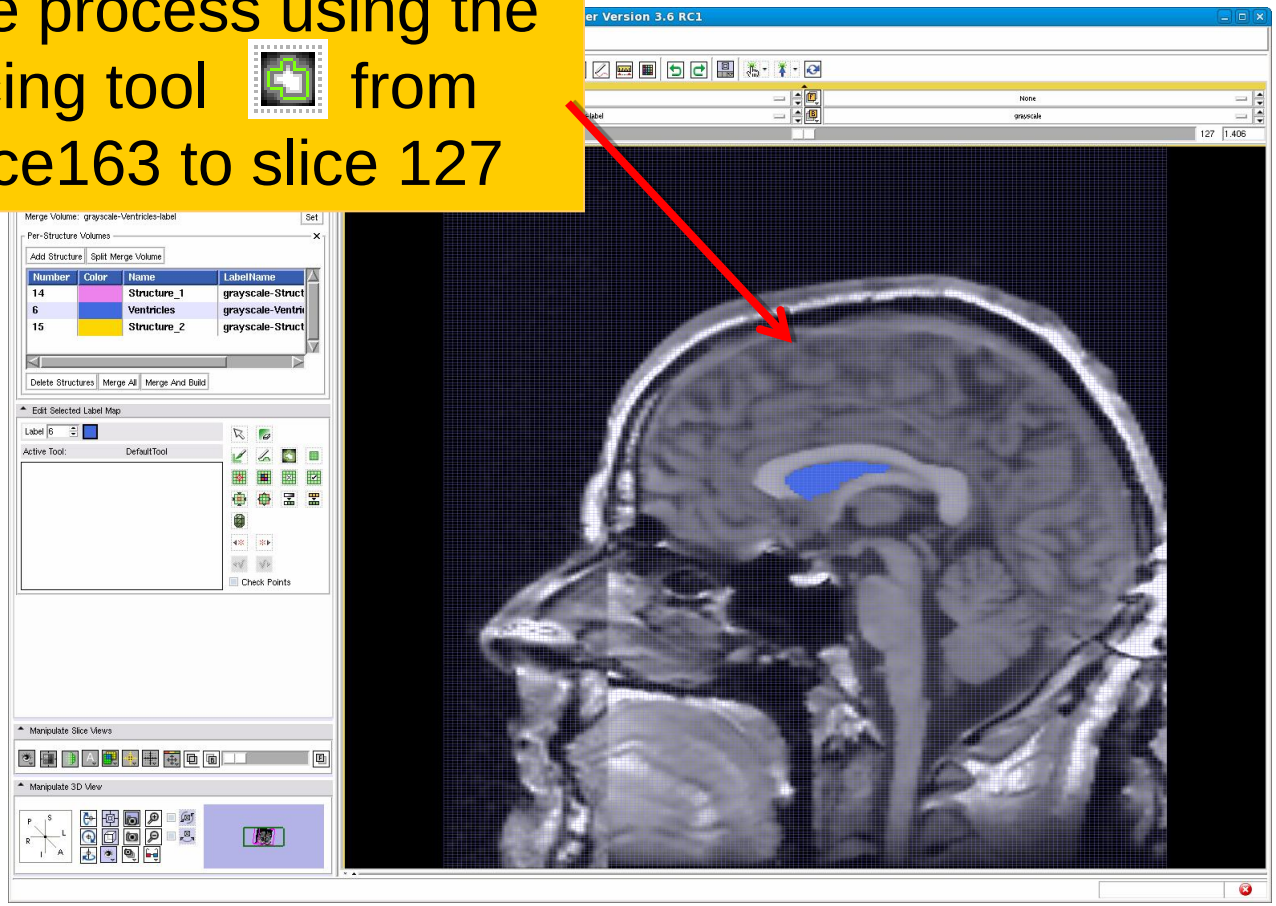


Level Tracing

Use the **Level Tracing tool**  to trace the outline of the left lateral ventricle on slice 138

Level Tracing

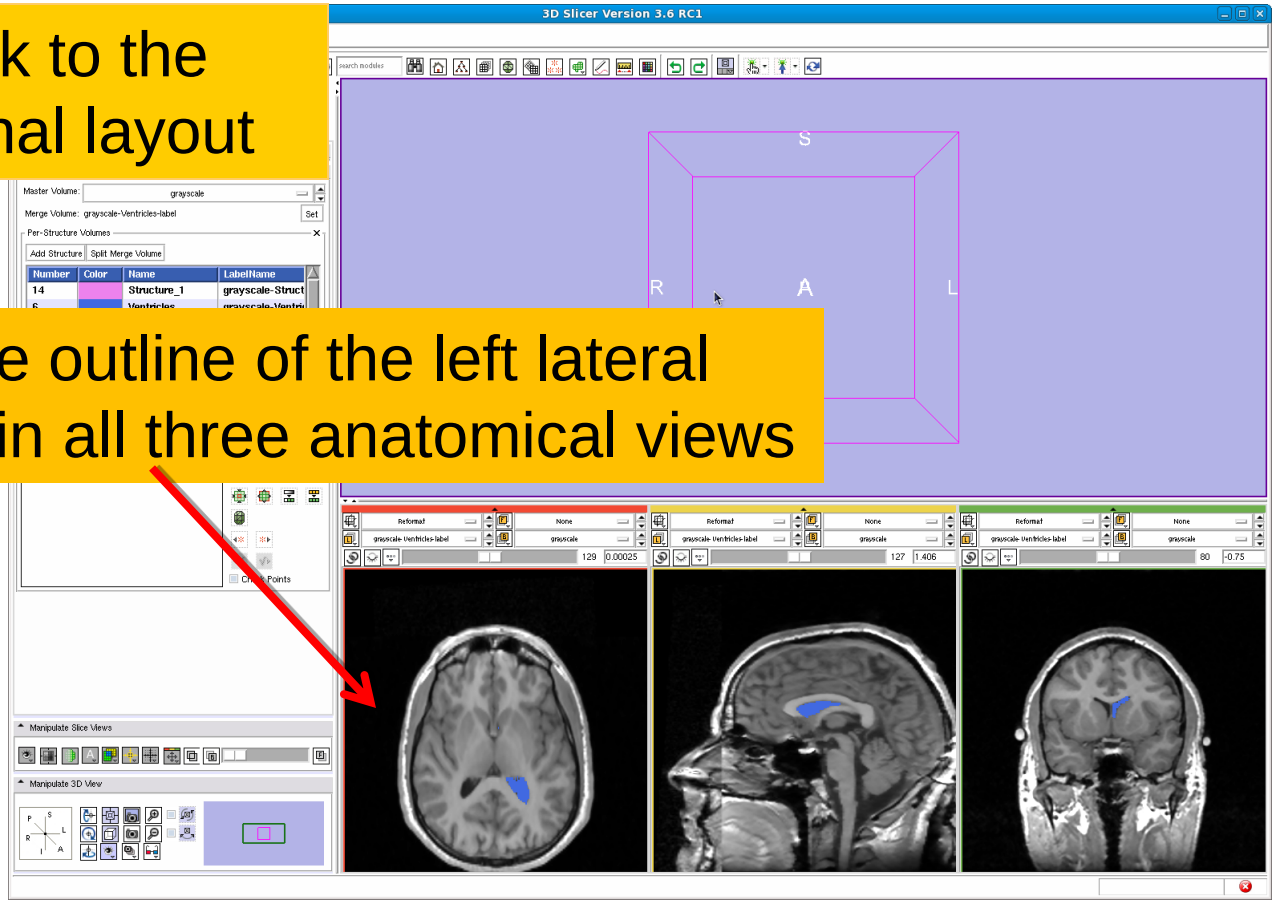
Repeat the process using the Level Tracing tool from sagittal slice163 to slice 127



Level Tracing

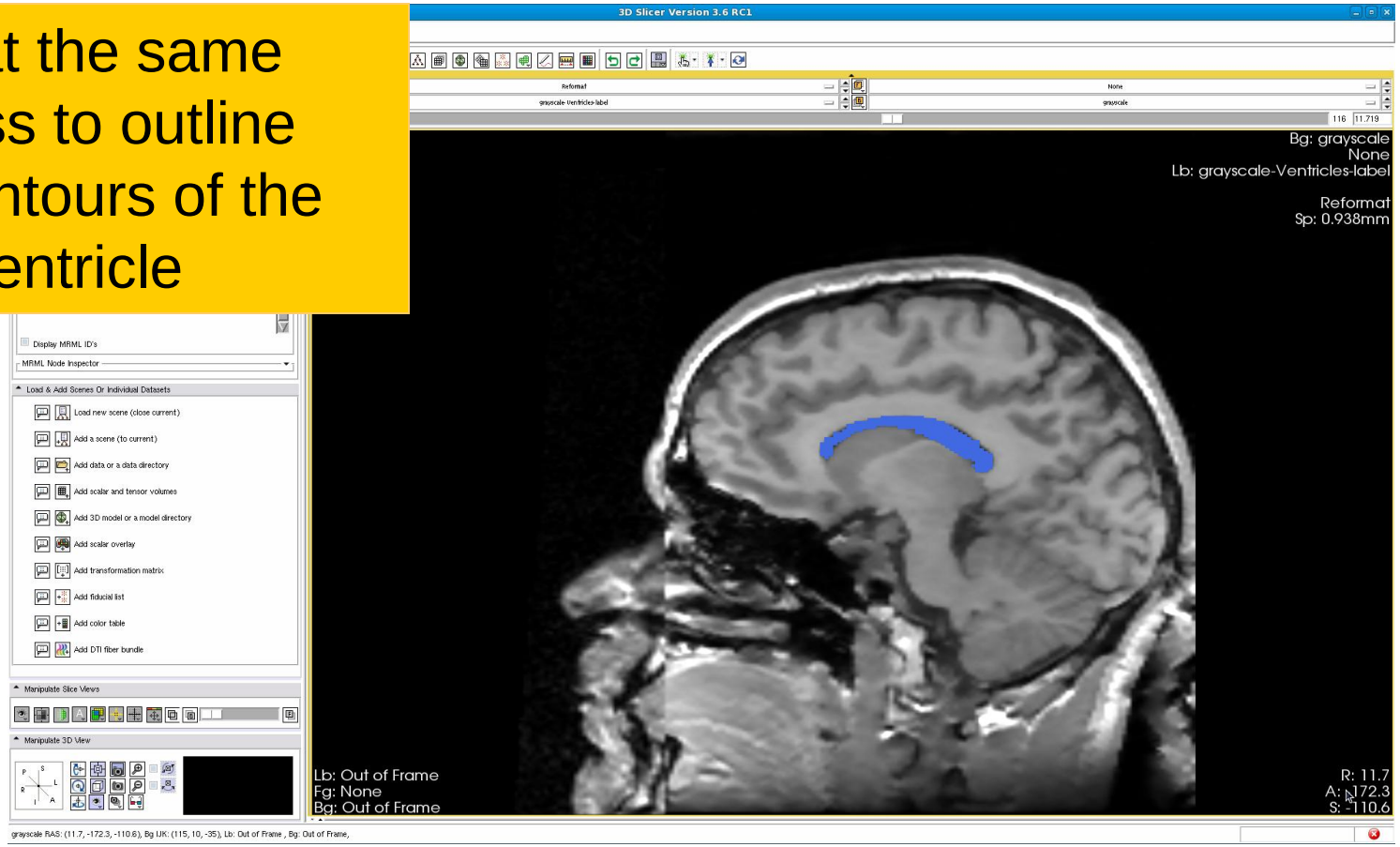
Come back to the conventional layout

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



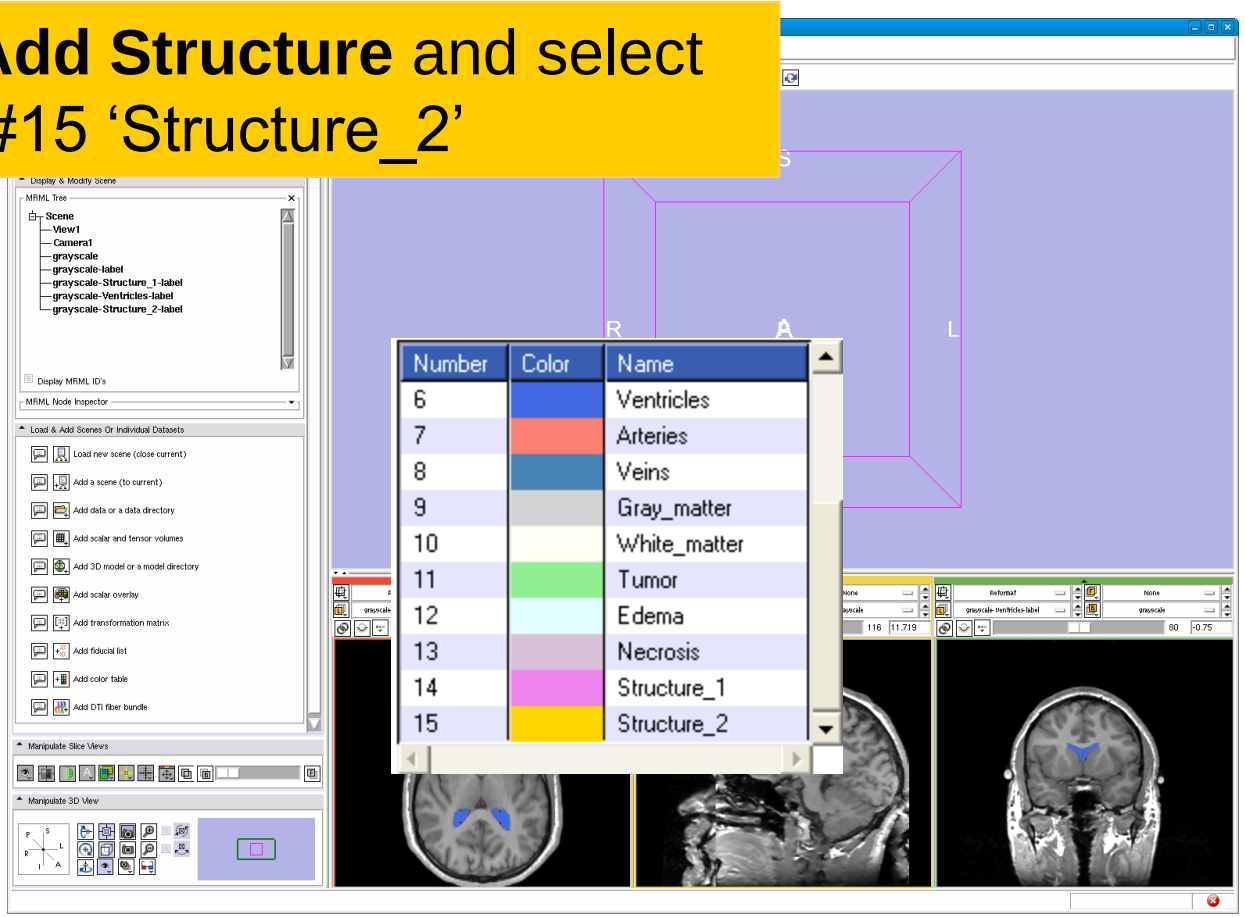
Level Tracing

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

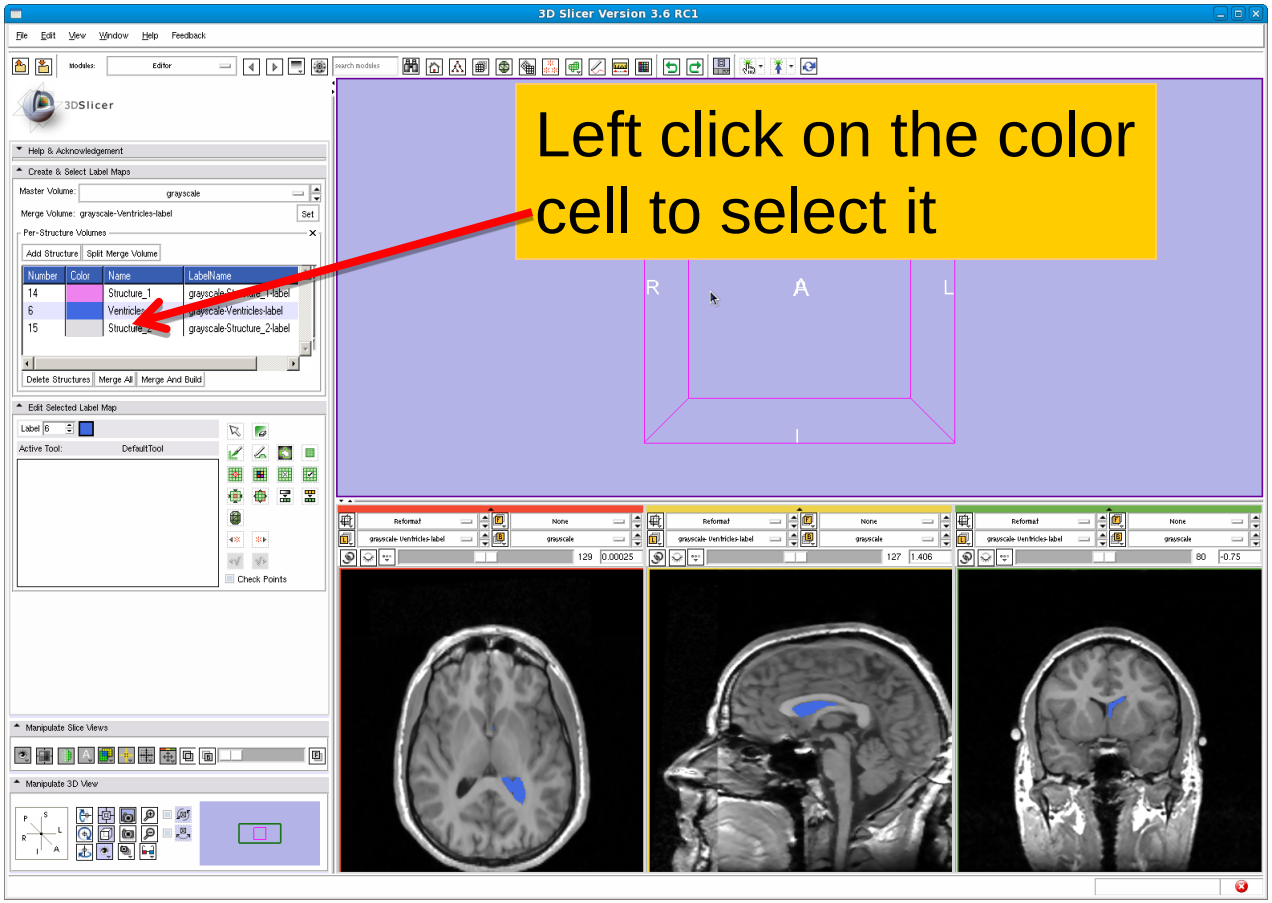


Adding a third structure

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

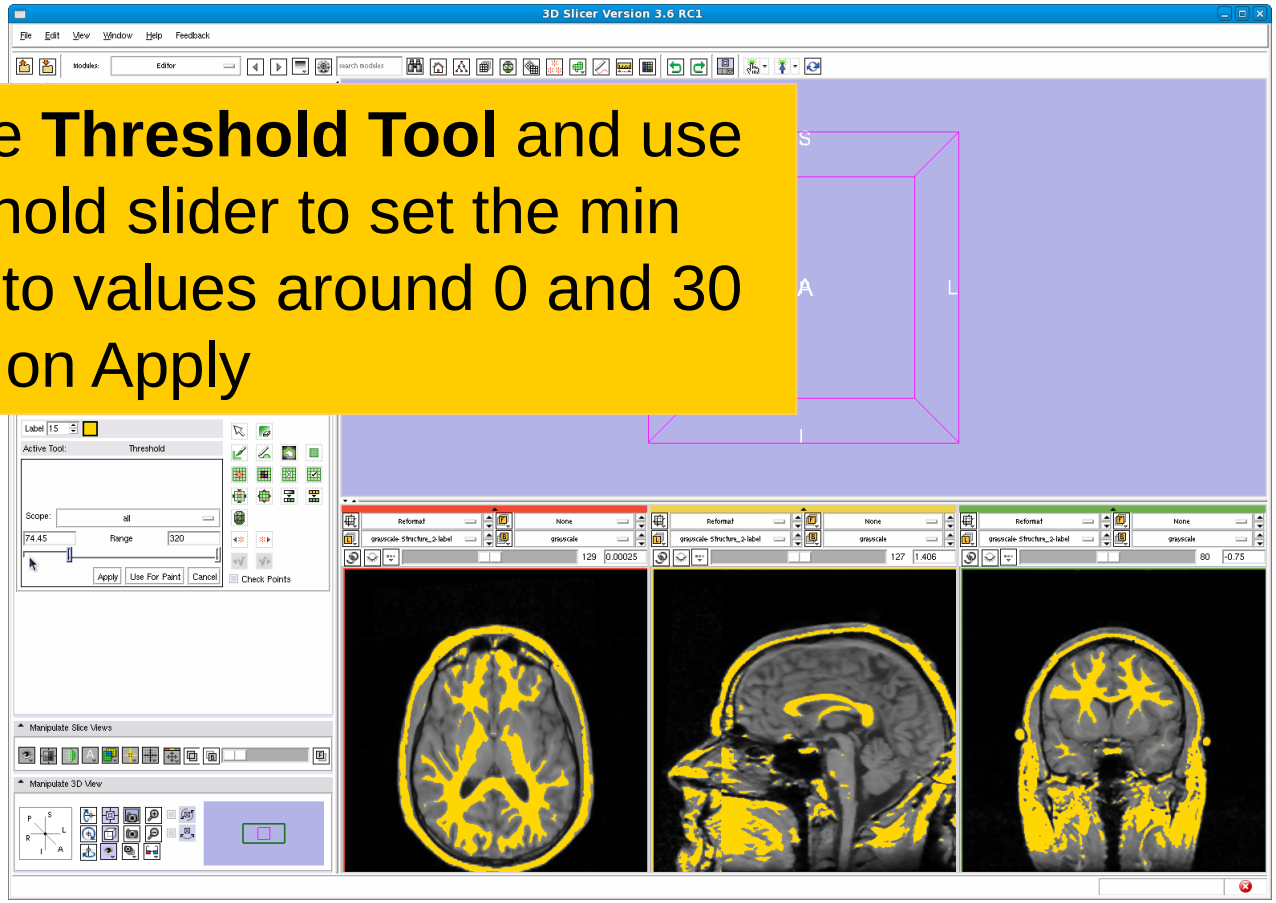


Adding a third structure

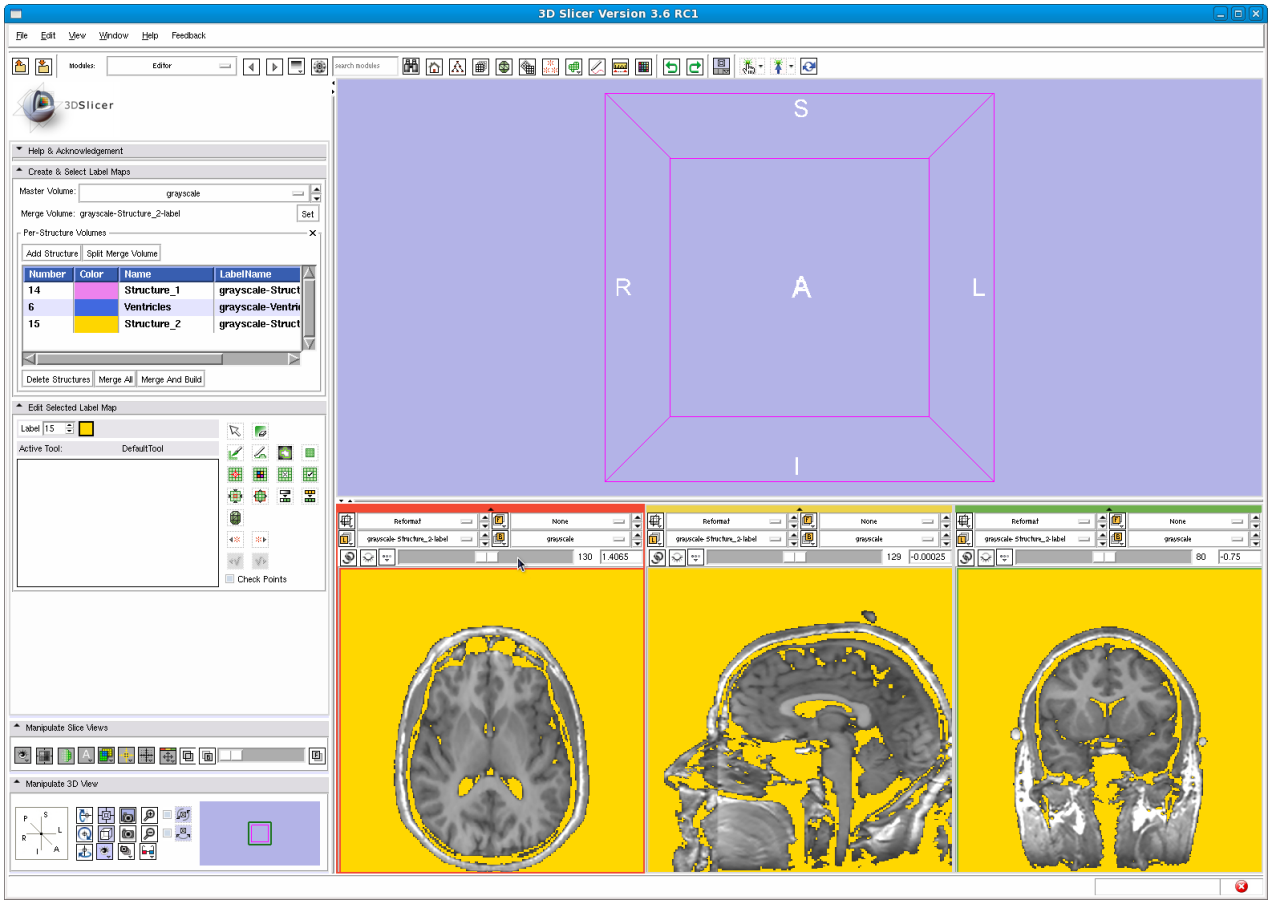


Threshold tool

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

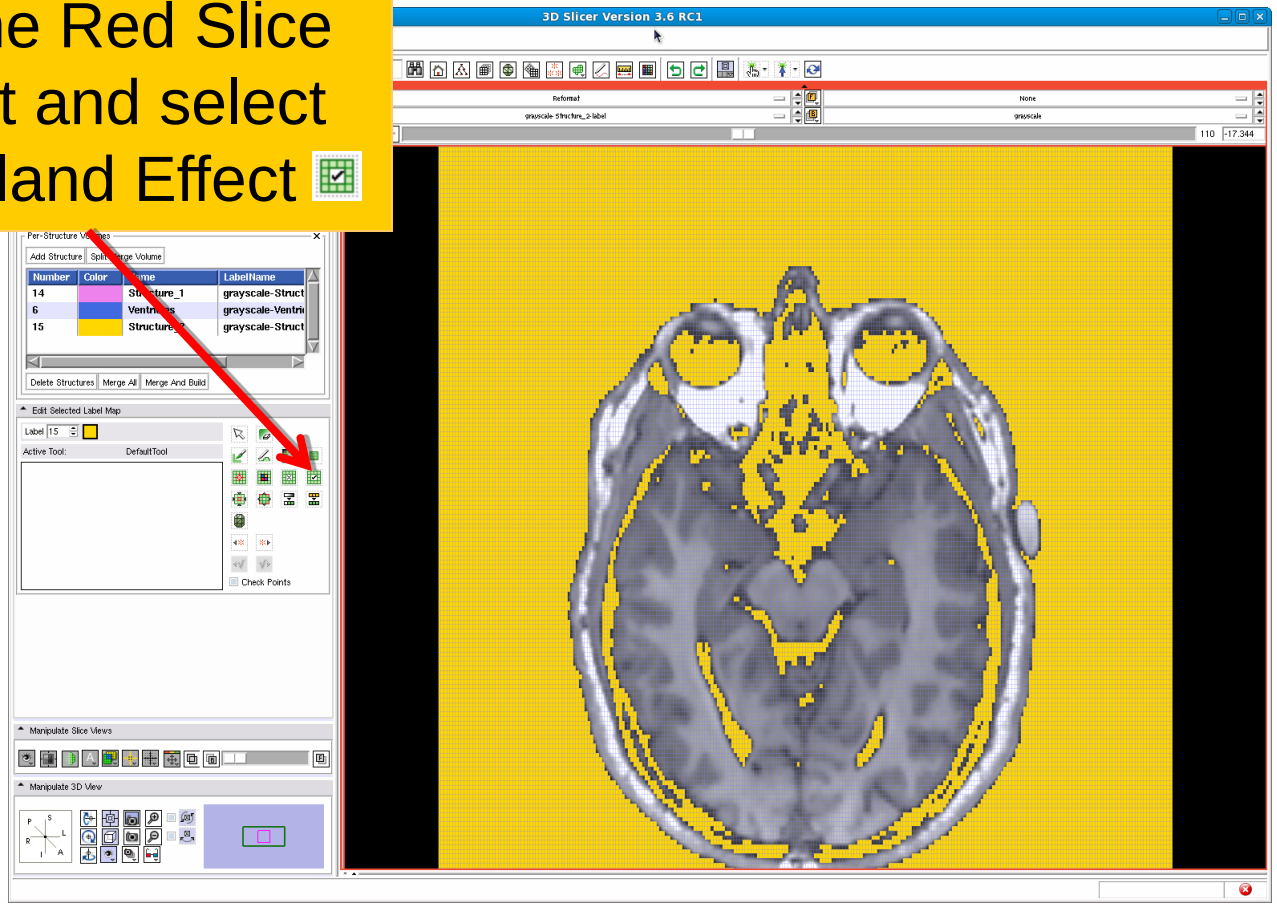


Threshold tool

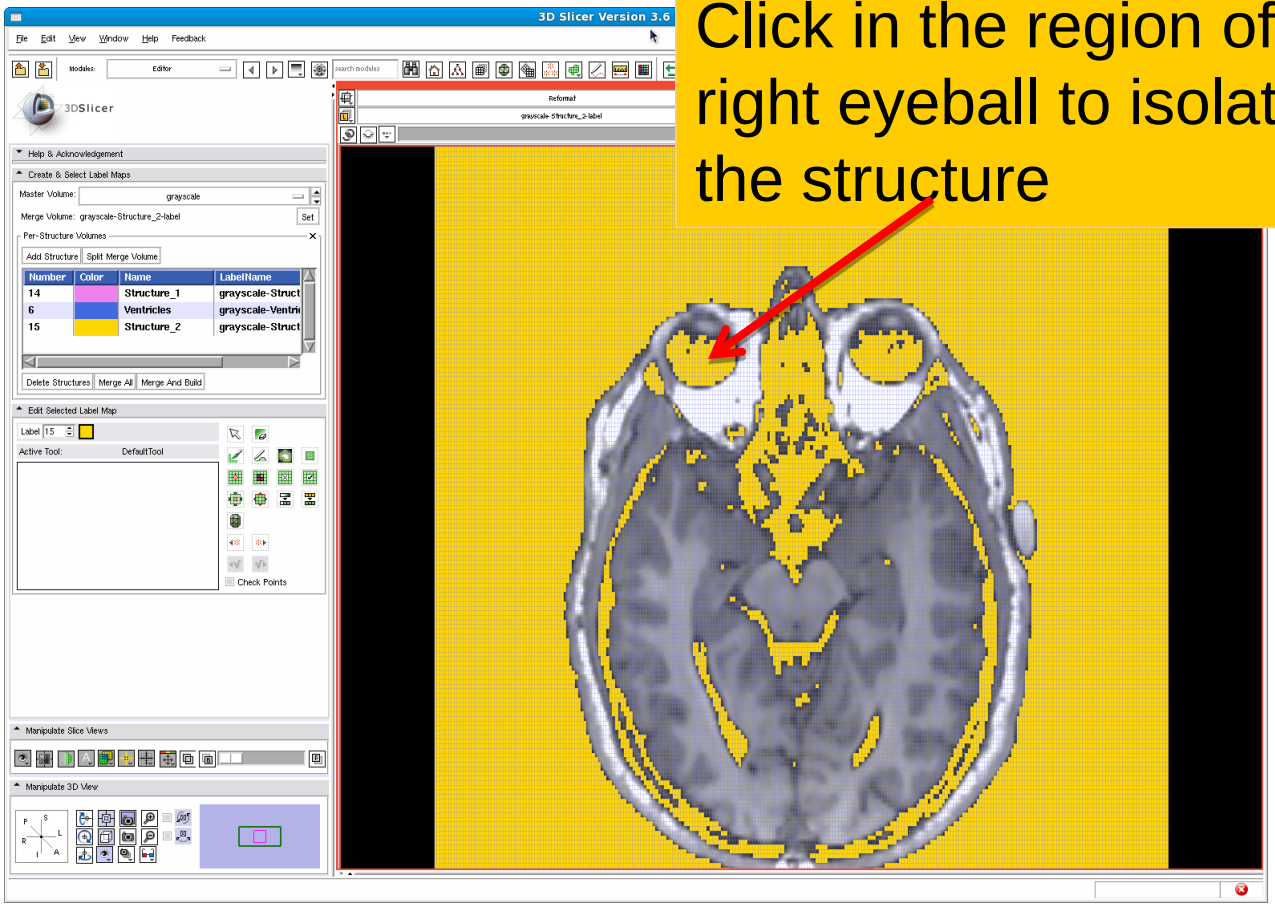


Save Island

Switch to the Red Slice Only Layout and select the Save Island Effect



Save Island



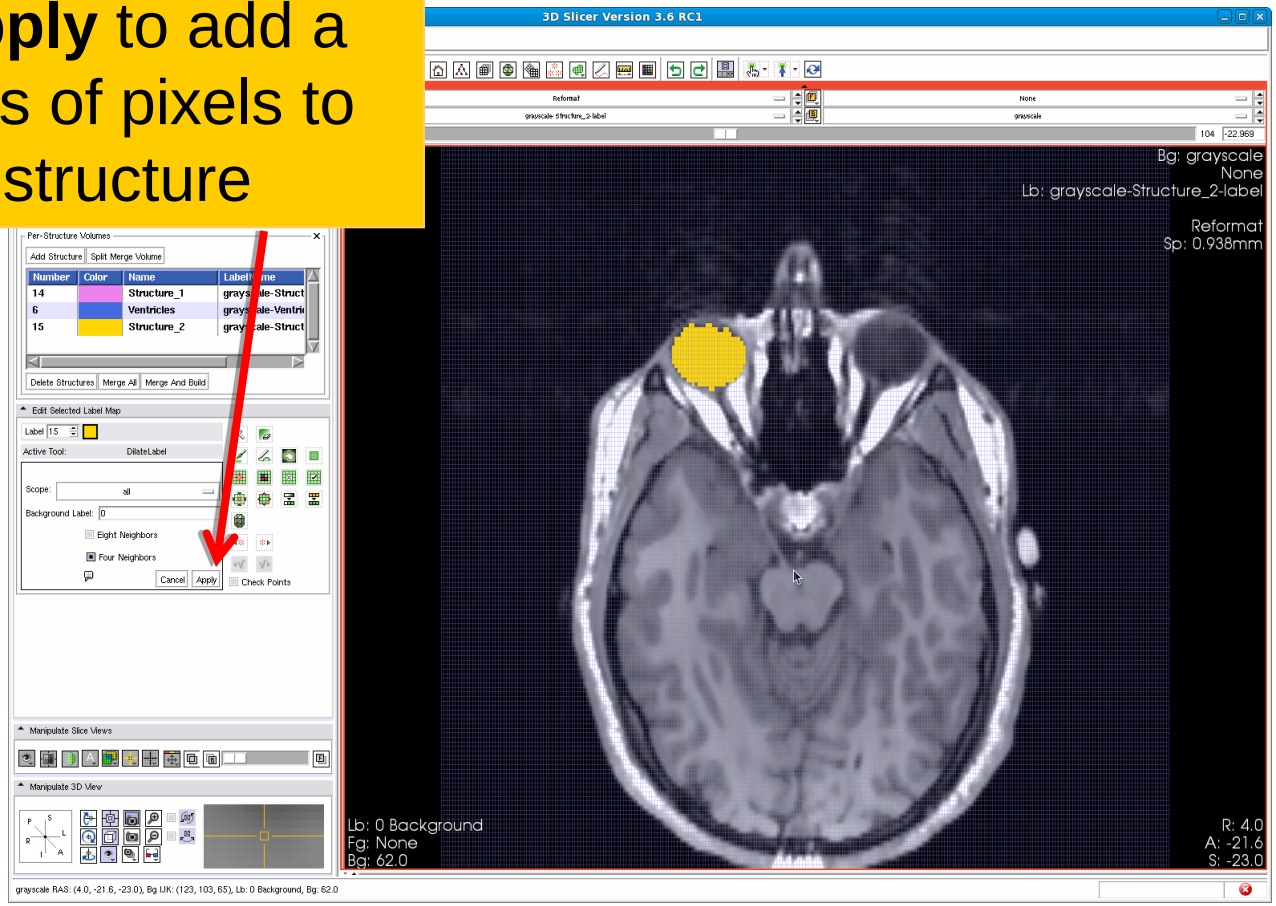
Click in the region of the right eyeball to isolate the structure

Dilate Effect

Select the Dilate Effect 

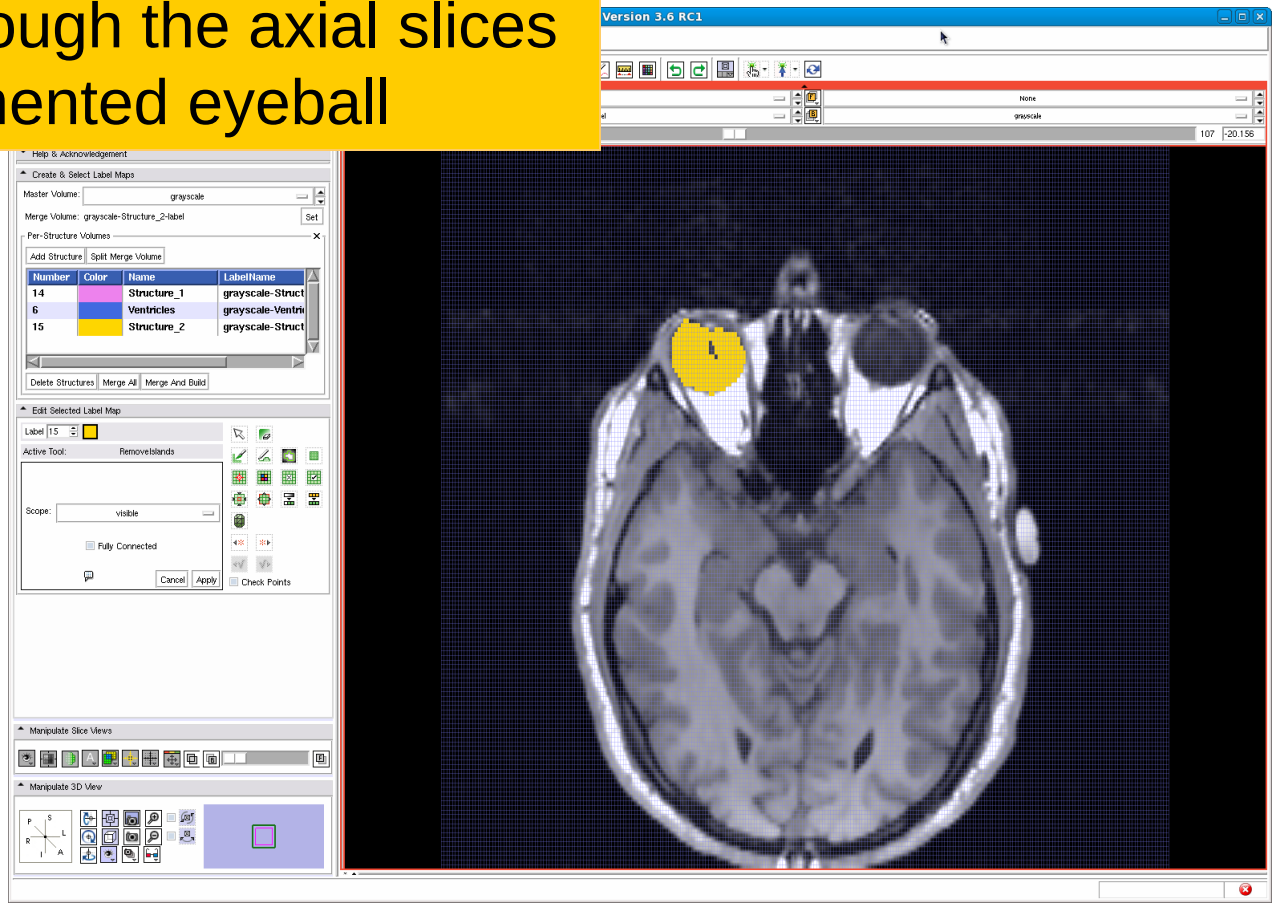
Dilate Effect

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



Dilate Effect

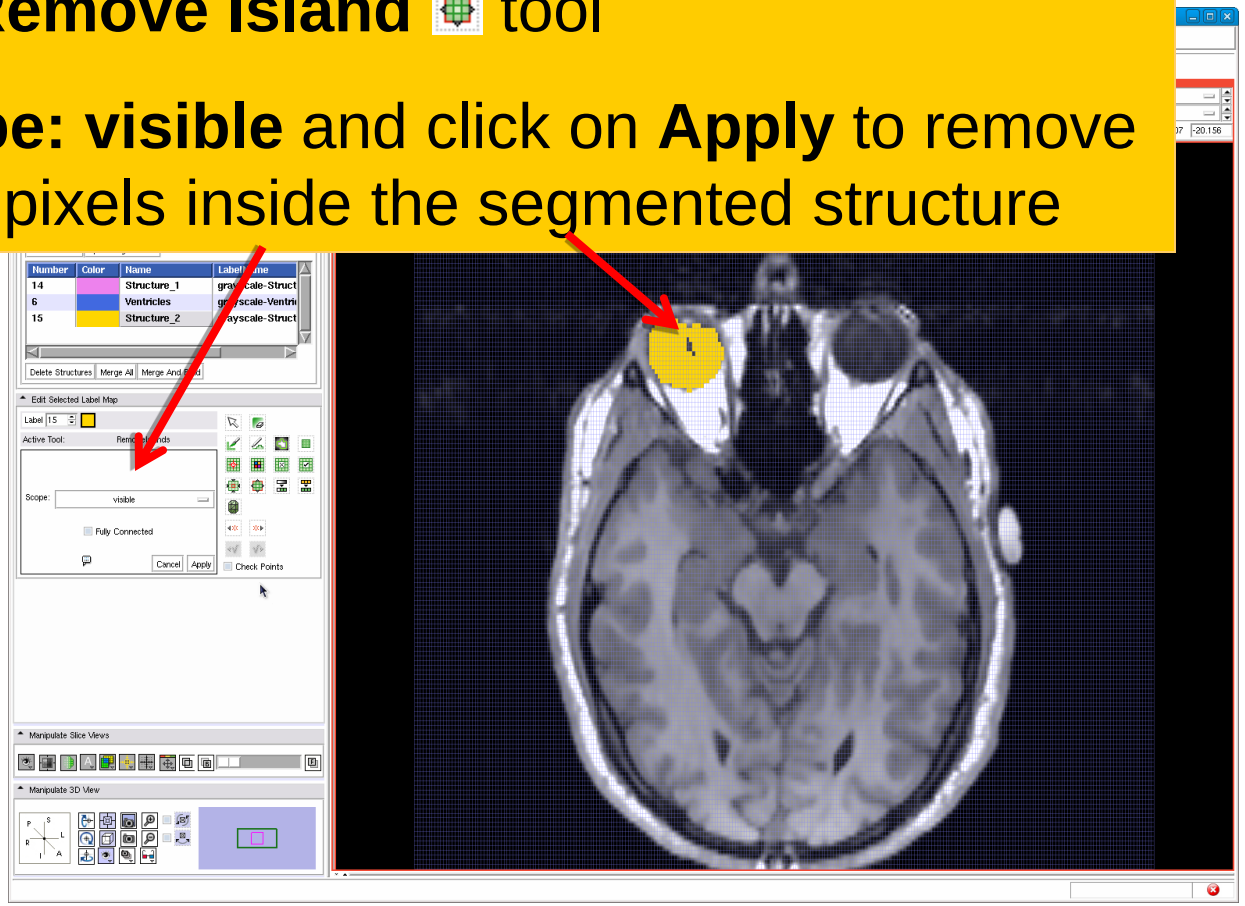
Browse through the axial slices of the segmented eyeball



Remove Island

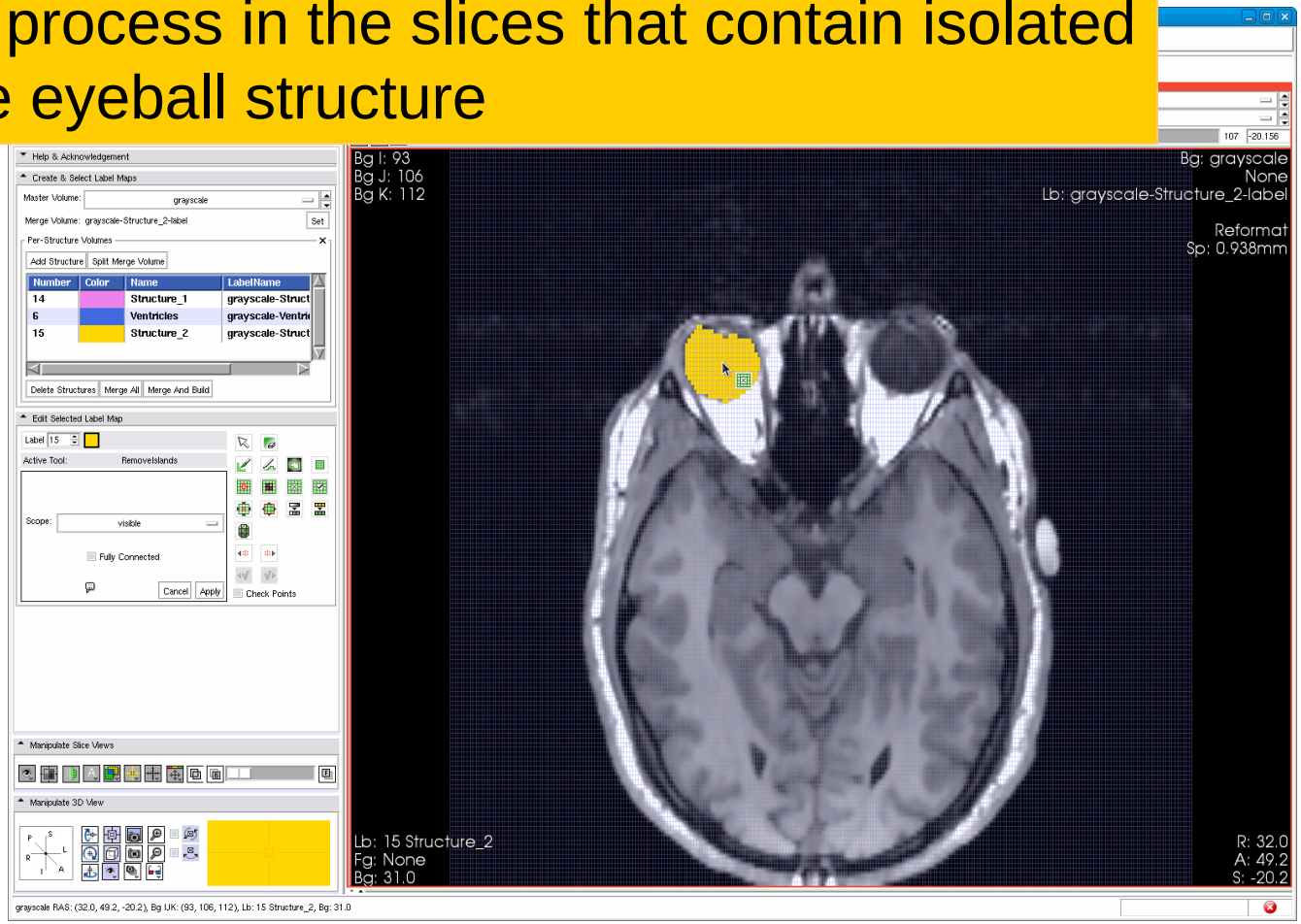
Select the **Remove Island** tool

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



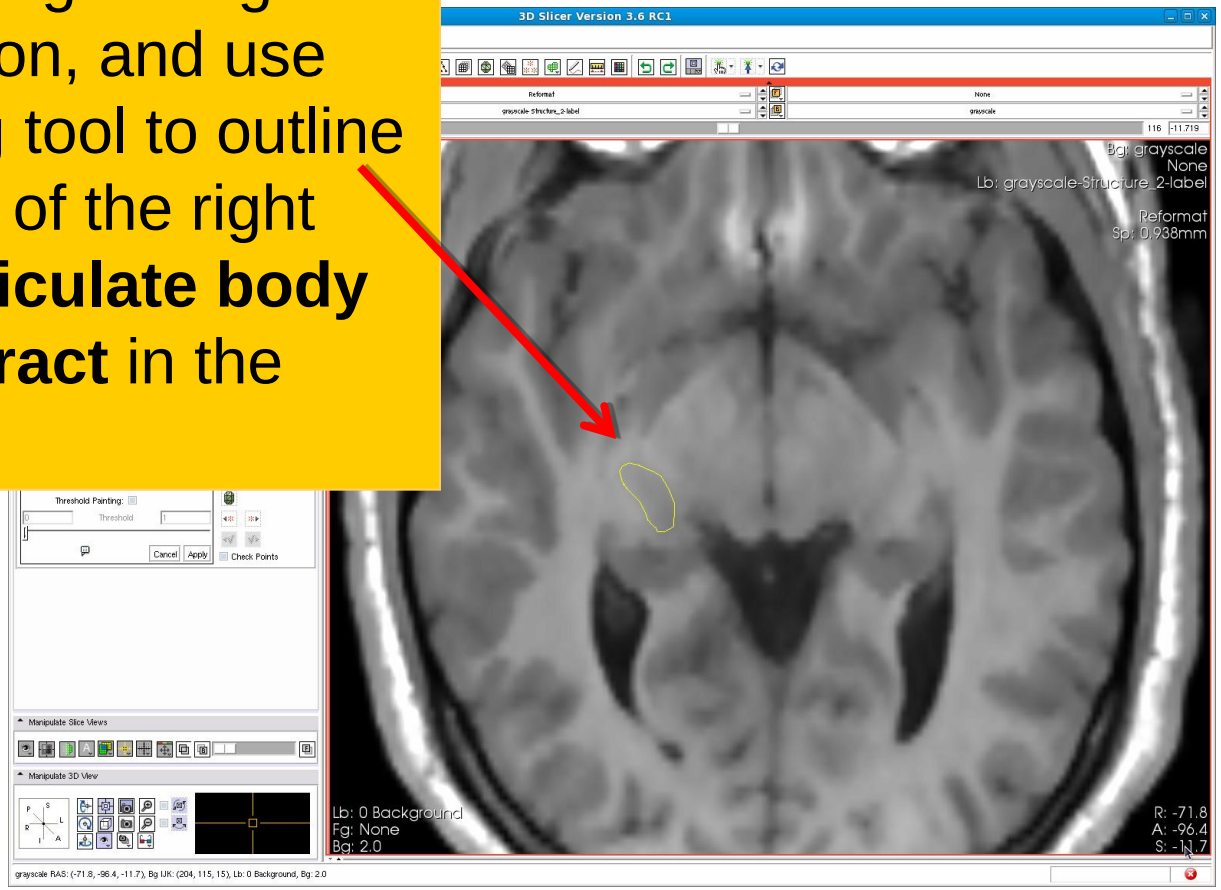
Remove Island

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



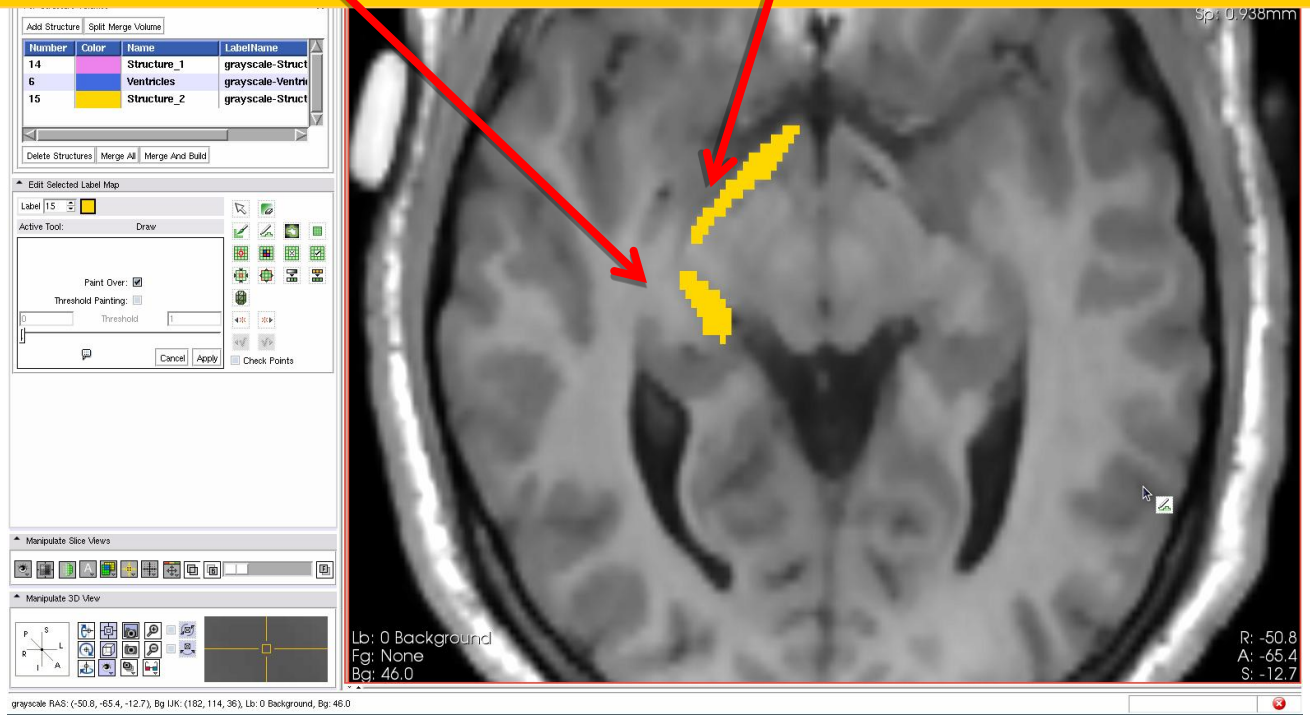
Adding more structures

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.

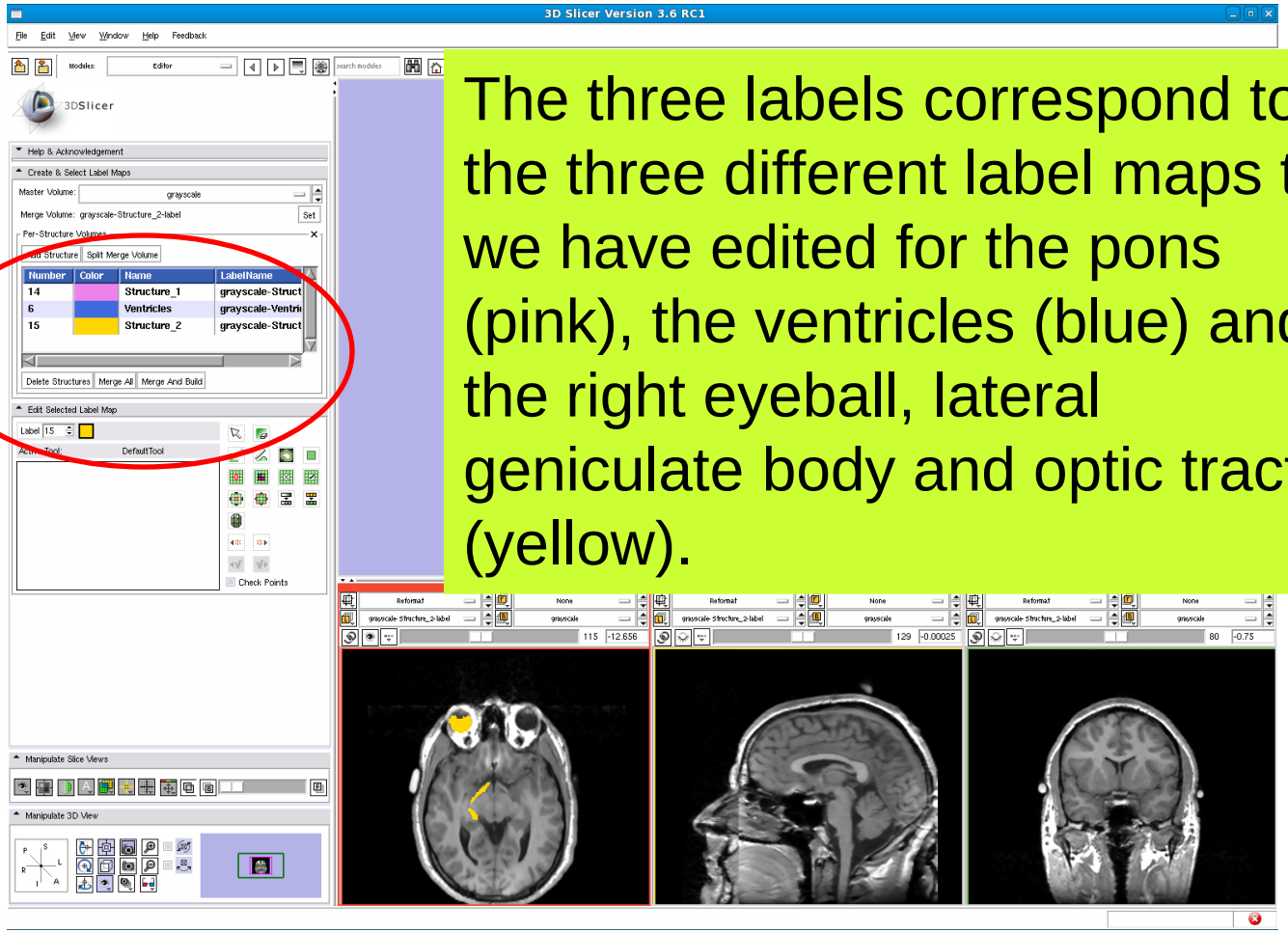


Adding more structures

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

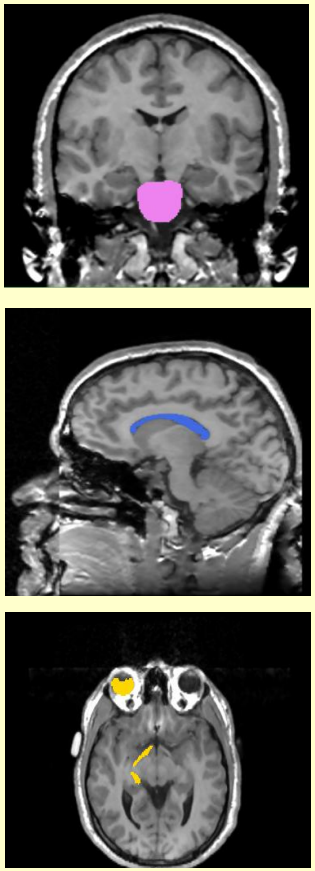


Merge And Build



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).

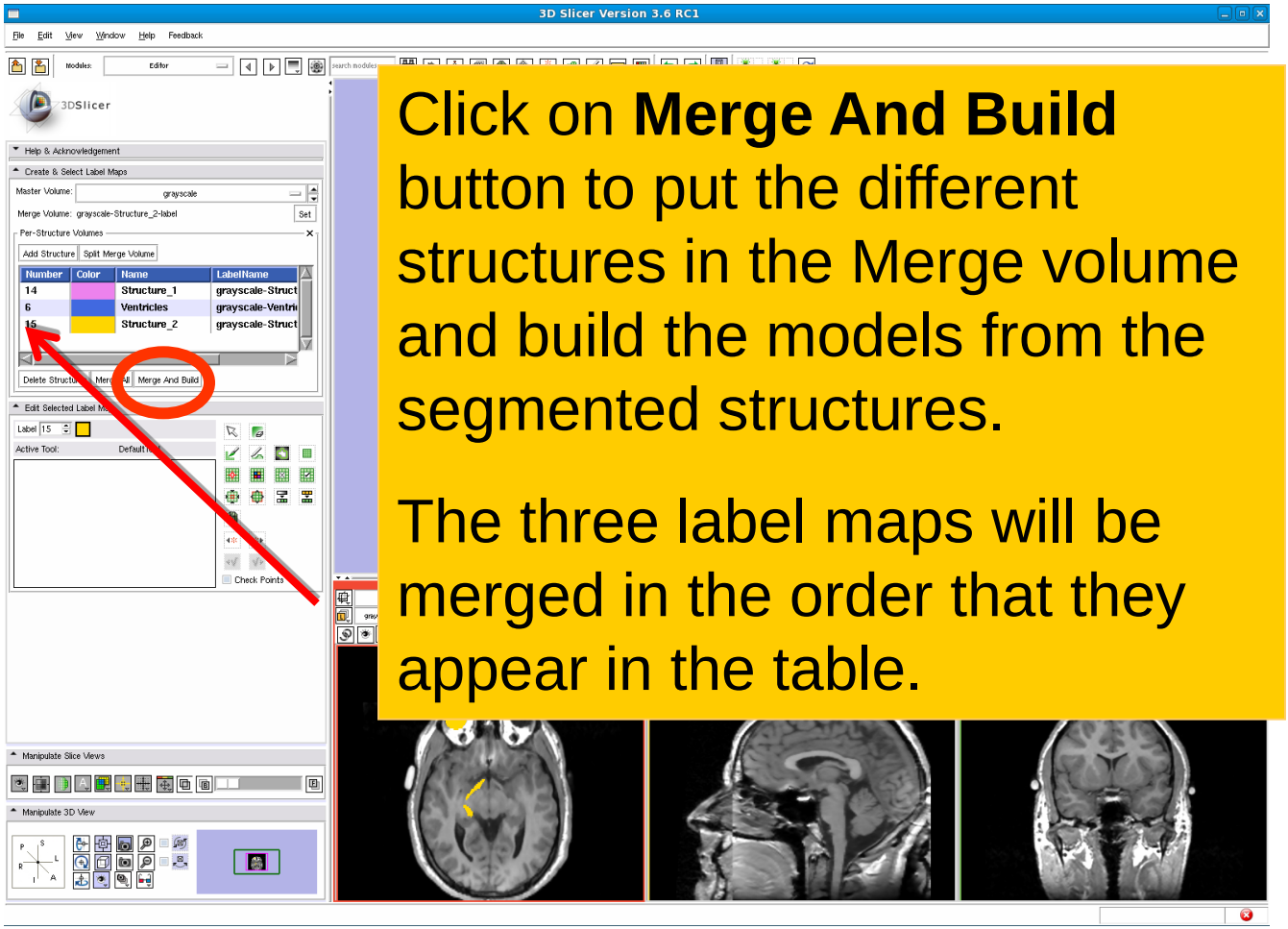
Merging label maps



Grayscale-label1

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

Merge And Build

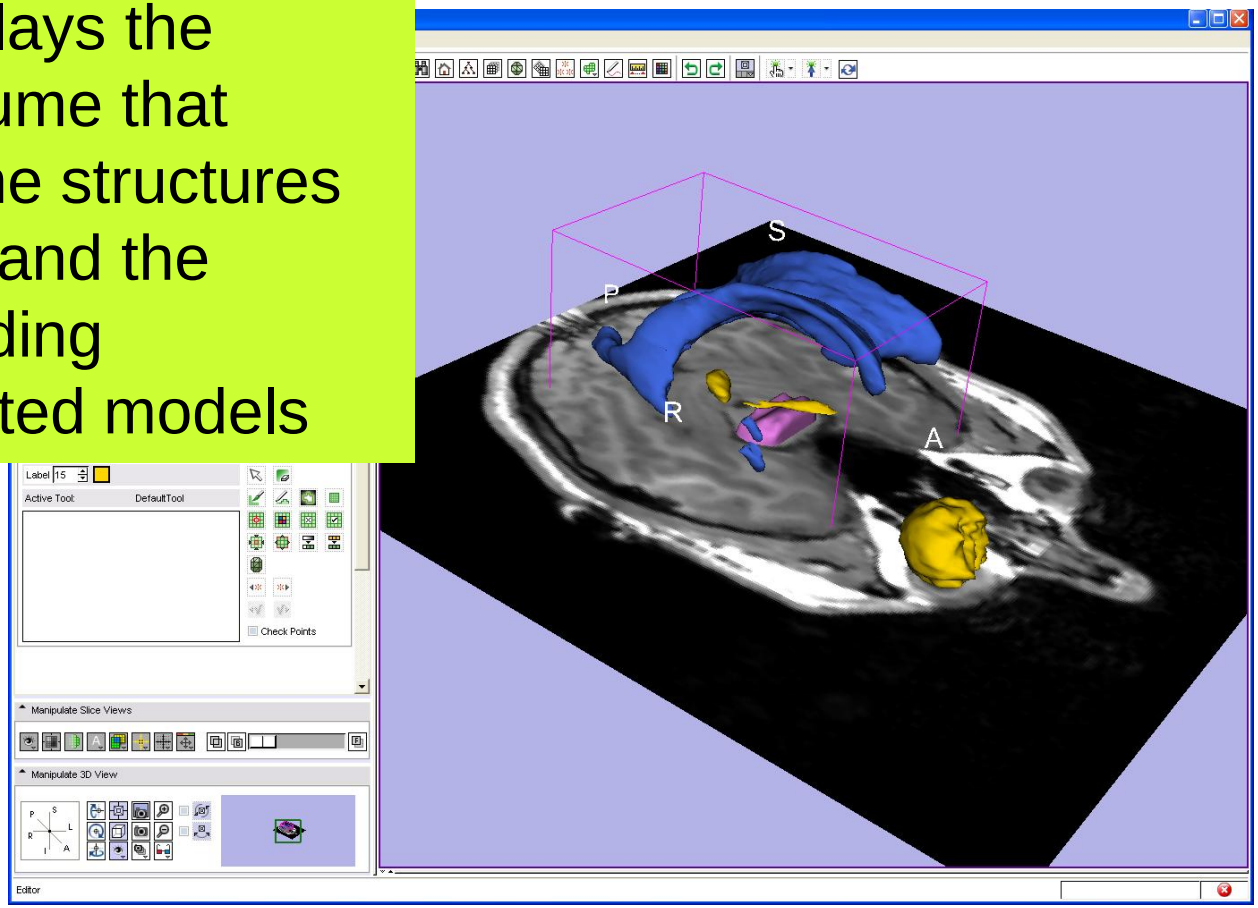


Click on **Merge And Build** button to put the different structures in the Merge volume and build the models from the segmented structures.

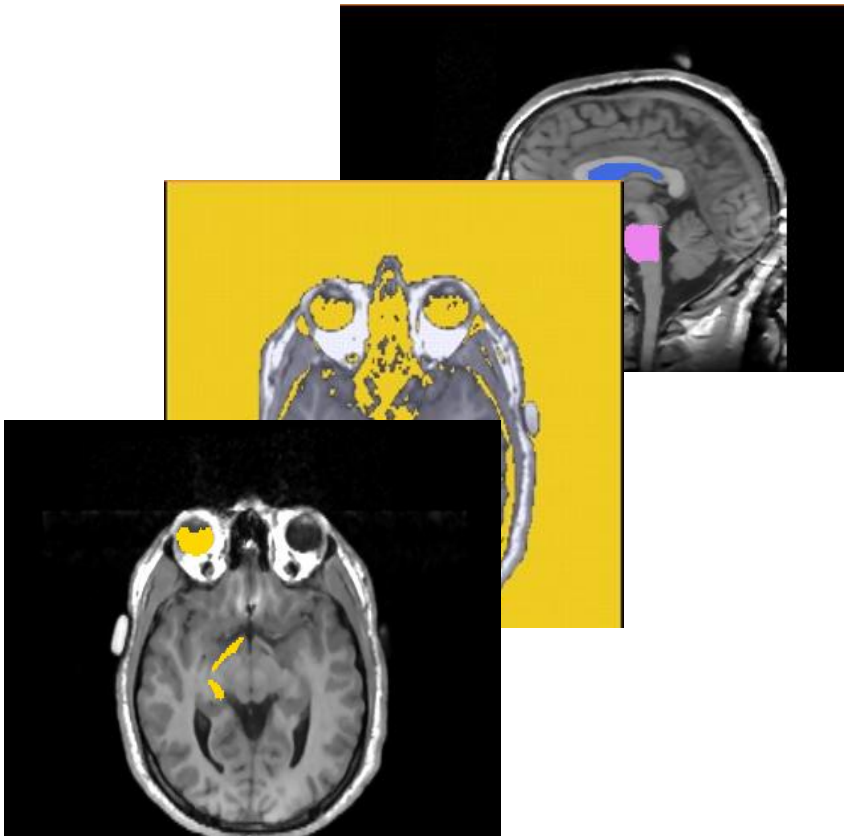
The three label maps will be merged in the order that they appear in the table.

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

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