Analyze 10.0

New Features & Enhancements

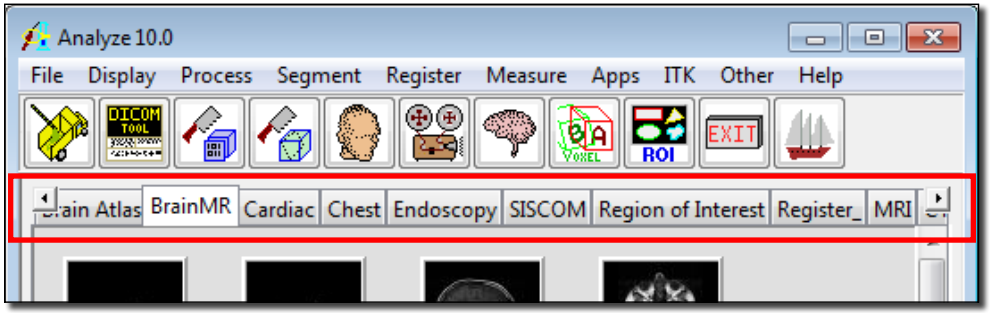
Introduction

Welcome to the Analyze 10.0 New Features and Enhancements document. This document will provide an overview of all new features and enhancements available in Analyze 10.0.

Table of Contents

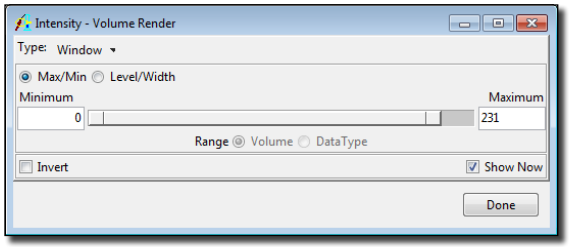
Analyze Workspace

- Right-click ‘unappend’ option for 4D multi-volumes and RGB volumes.
- Ability to scroll left and right through Workspace tabs.



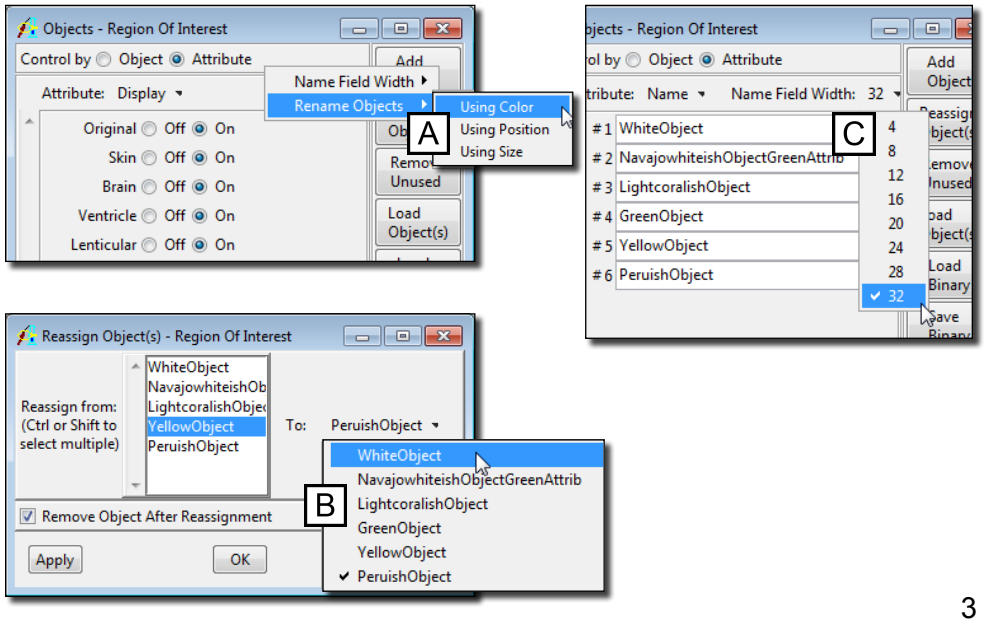
Intensity Windowing

- Shortcut key to invoke Intensities window within any Analyze module – <Ctrl+F9>



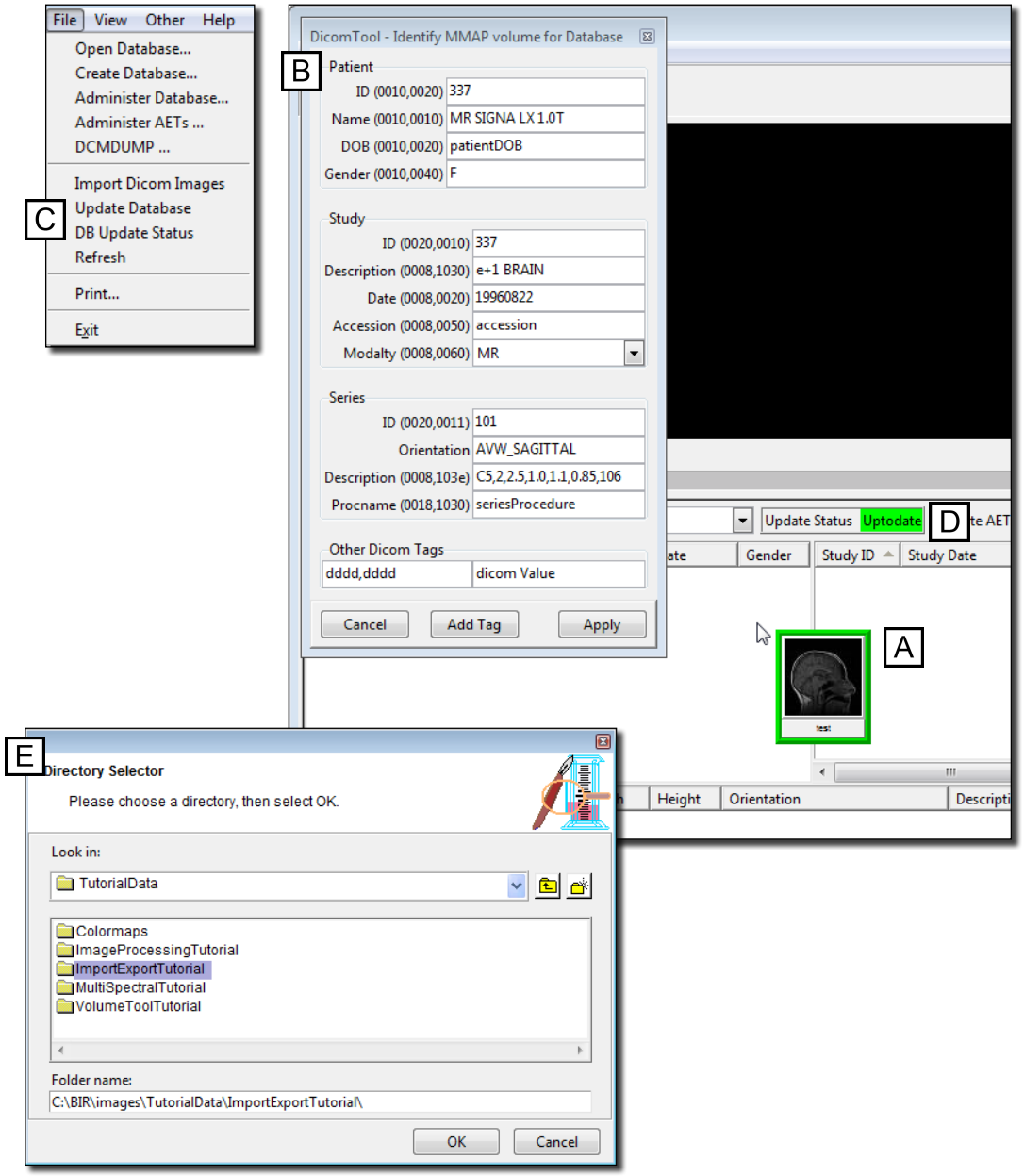
Object Maps

- Automatic object naming option allows you to name all objects using their color, position, or size [**A**].
- Enhanced ‘Reassign Object’ option allows you to reassign multiple objects to a single object. Also includes option to delete reassigned objects [**B**].
- Object name field width control from 4 to 32 characters [**C**].



DICOM Tool

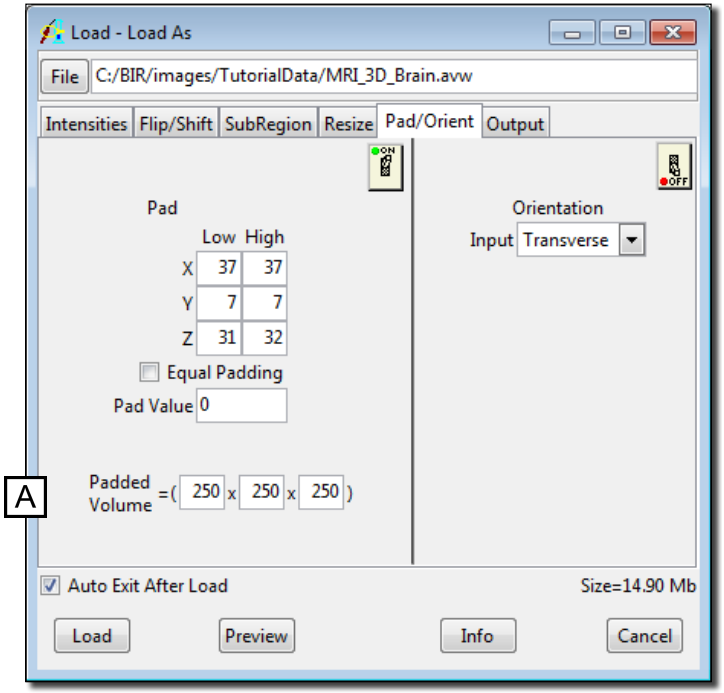
- New “drag-and-drop” support: Add images to a DICOM Tool database by draging and dropping a volume from the Analyze Workspace into the DICOM Tool [**A**]. A new StudyUID and SeriesUID will automatically be created for the added images. In addition, you can also:
  - Add and edit critical DICOM header elements from an interactive menu [**B**].
  - Send images directly to a remote DICOM server.
- Image database operations added to the File menu: Import Dicom Images, Update Database, DB Update Status, Refresh [**C**].
- PowerBar added with buttons for: Import Dicom Images and Update Database [**D**].
- New directory selection tool for instant creation of new directories on disk [**E**].
- Custom ‘Volume Naming’ options can now be set as defaults. The selected method for naming loaded volumes is stored and recalled with subsequent uses of DICOM Tool.



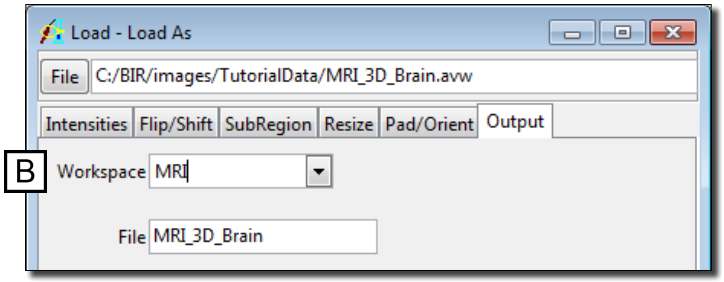
Load/Load As

- New option in the ‘Pad/Orient’ tab for viewing and controlling the end size of a padded volume [**A**].
- New ‘Output’ tab allows the name and destination Workspace of a volume to be specified [**B**].
- Ability to select multiple volume files and load them directly into the Workspace as a 4D multi-volume.
- Ability to apply selected processing options to multiple volumes. Load multiple volumes with the same set of processing options – i.e. subregioning, rescaling, intensity changes, etc.

A

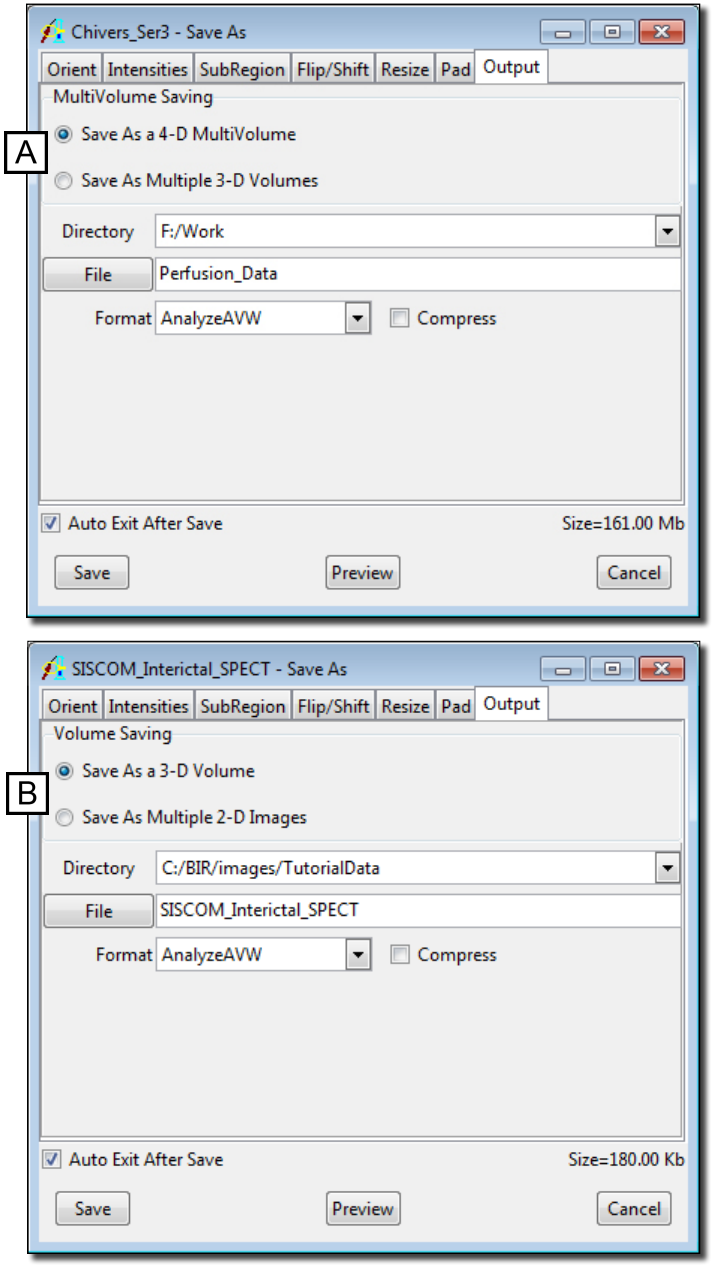


B



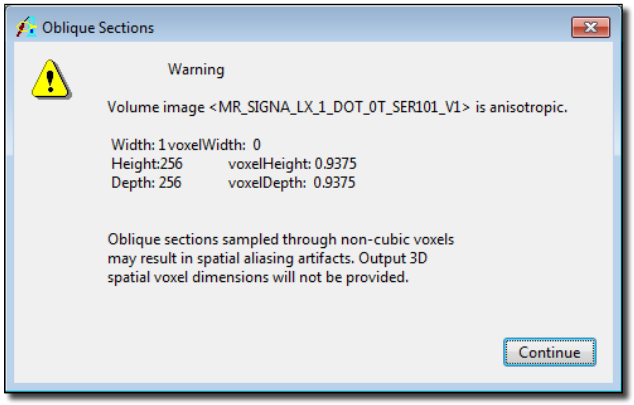
Save As

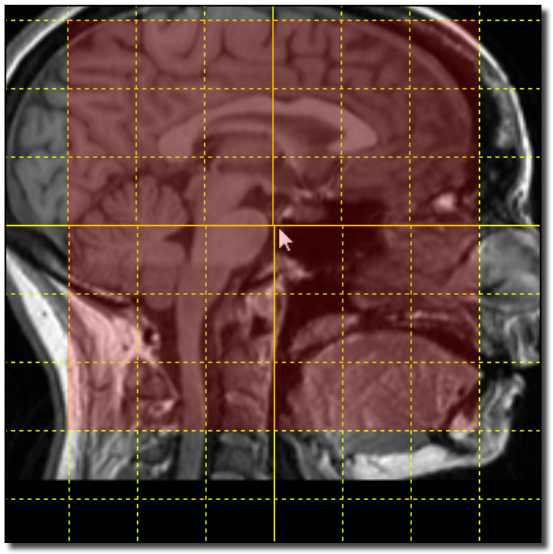
- New ‘Output’ tab supports changes in dimensionality of volumes upon saving.
  - 4D multi-volumes can be split and saved as separate 3D volumes [**A**].
  - 3D volumes can be split and saved as individual 2D image files [**B**].
  - When saving 2D image files creation of volume file wrapper is now optional.
  - Available ‘Output’ formats are automatically restricted to those that support the selected dimensionality.
- Common file format extensions are automatically appended to output files – i.e., .jpg, .tif, .avi. etc



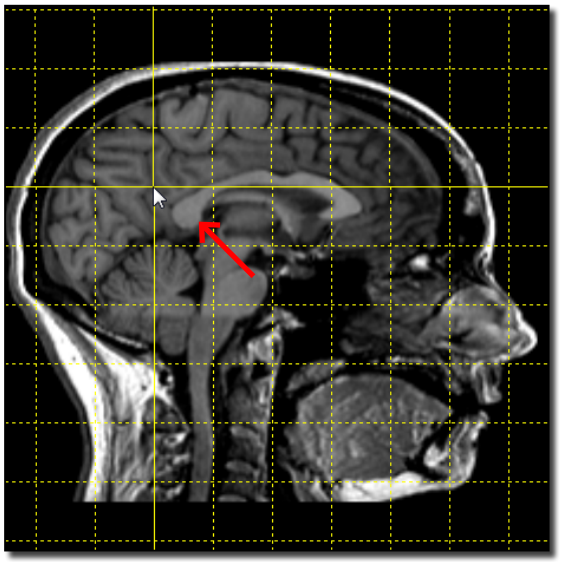
Oblique Sections

- New ‘Grid Align’ tool added to Generate menu which displays a grid on the current oblique image and allows for interactive translate and yaw transformations of the oblique.
- Warning message displayed when anisotropic (non-cubic) volume images are loaded. This warning cautions the user that spatial aliasing can occur from resampling non-cubic voxels and that the resulting volume will be output without voxel dimensions.





Click to select anywhere near the center of the grid axis.

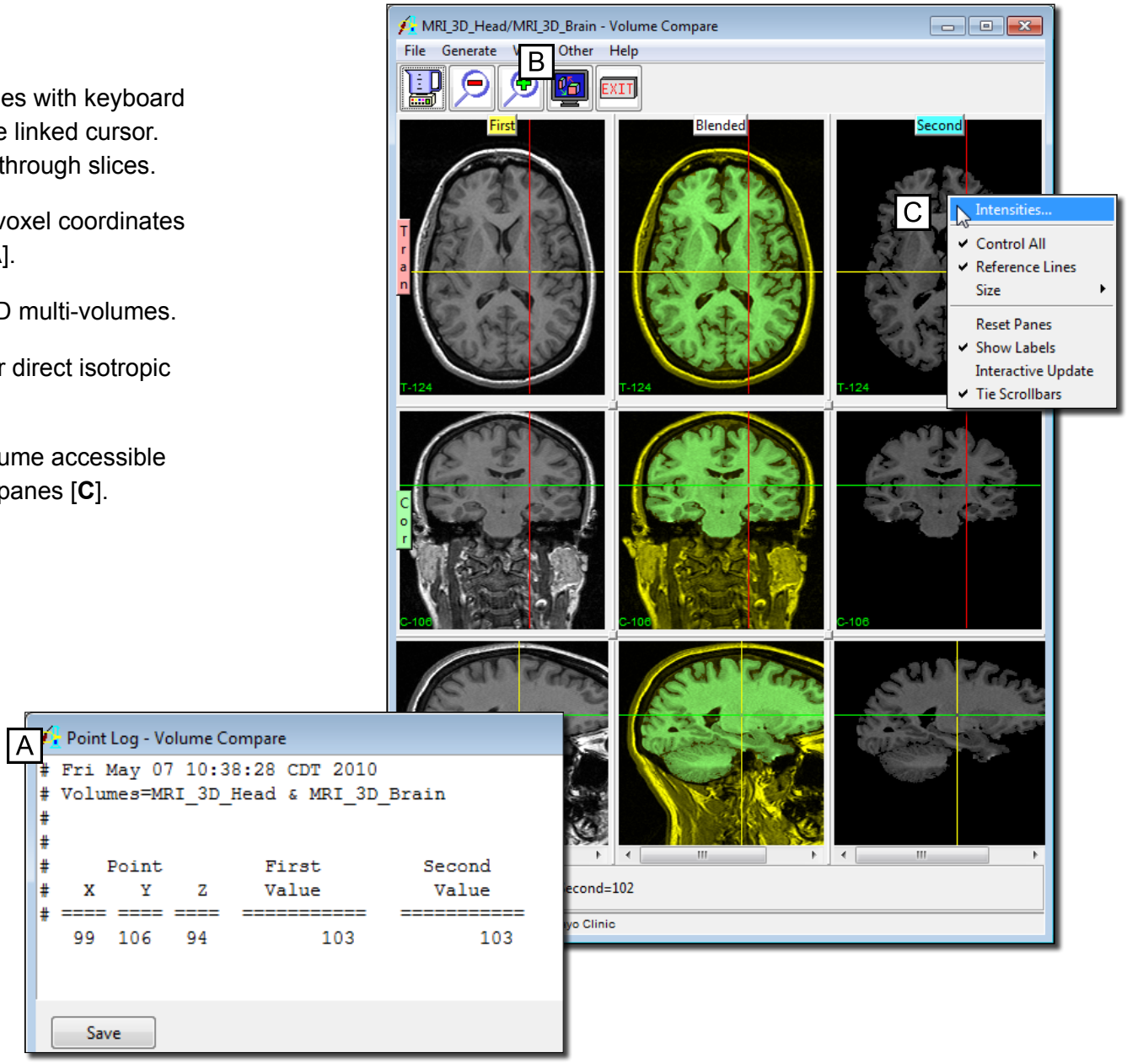


While holding the mouse button down, move the grid to a new location.

Release the mouse button. The image will be translated with the selected region as the new center point.

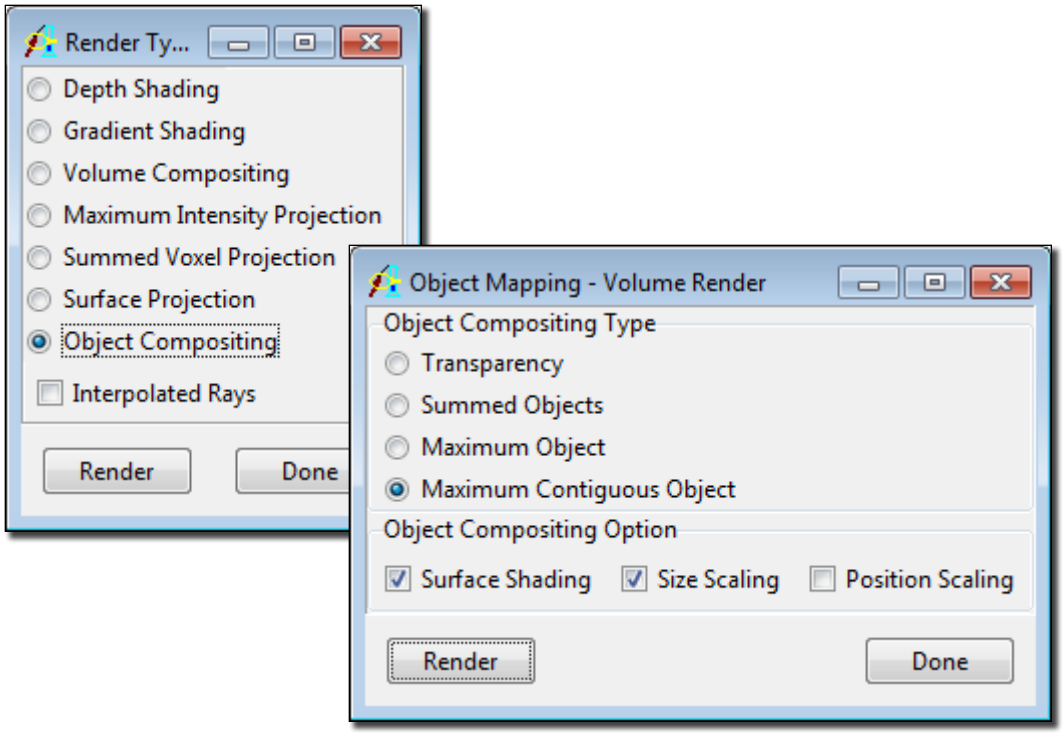
Volume Compare

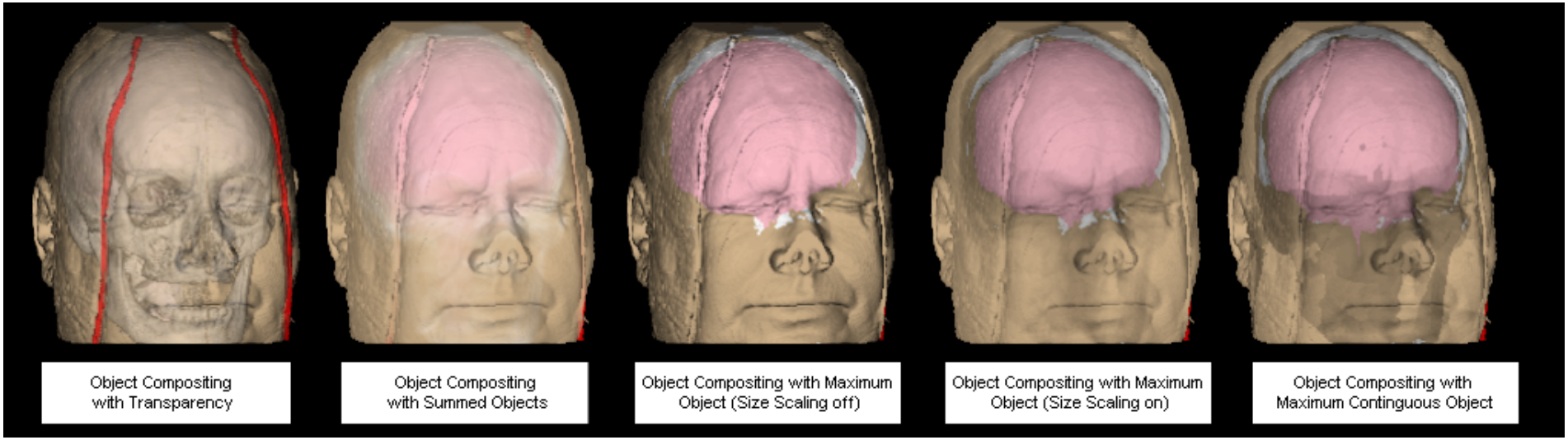
- Improved control of the displayed images with keyboard keys. Arrow keys allow you to move the linked cursor. Page Up/Down keys allow you to step through slices.
- Double-click of left mouse button logs voxel coordinates and voxel values from both volumes [**A**].
- Support for direct comparison of two 4D multi-volumes.
- 'Toggle Cubic' option added to allow for direct isotropic image display [**B**].
- Intensities window for First/Second volume accessible from right-click menu in image display panes [**C**].



Volume Render

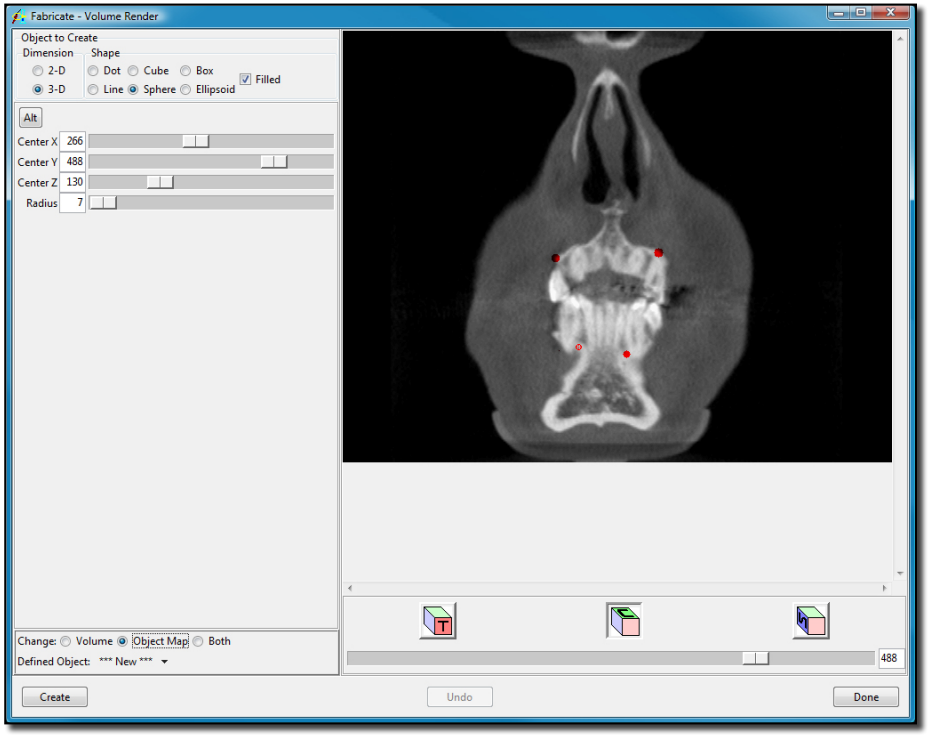
- New ‘Object Compositing’ Render Type that provides new methods for rendering objects, including:
  - Transparency: Standard object-based transparency using object opacities.
  - Summed Objects: Object color contributions are summed along the ray.
  - Maximum Object: Object with maximum number of voxels along a ray is rendered.
  - Maximum Contiguous: Object with maximum contiguous voxels along ray is rendered.

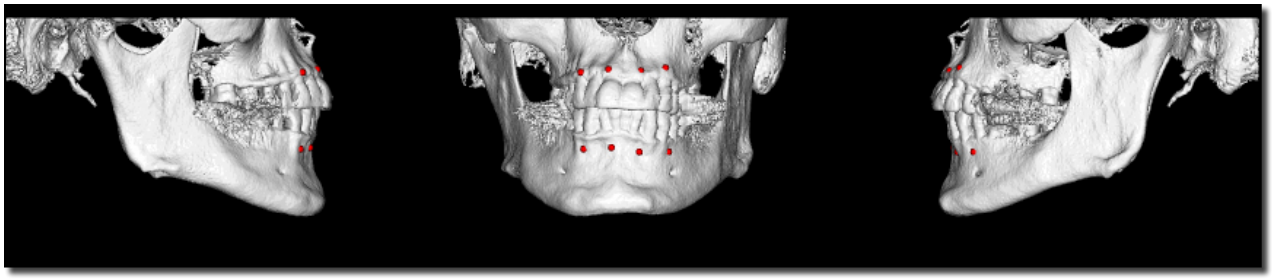


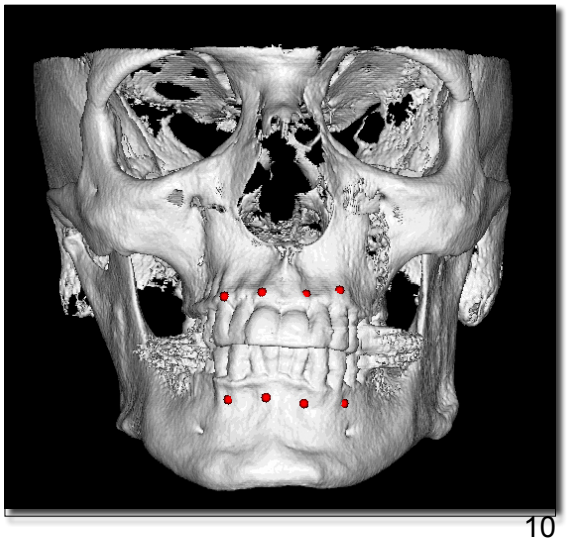


Volume Render

- New ‘Fabricate’ tool allows for introduction of 2D and 3D shape-based landmarks in the volume and/or object map.
  - 2D Shapes: Dot, Square, Rectangle, Line, Circle, and Oval.
  - 3D Shapes: Dot, Cube, Box, Line, Sphere, and Ellipsoid.
  - Options provided to control size and location of selected shape in the volume.
  - Shape location can be set interactively on 2D orthogonal slices or in the ‘Ortho Sections’ tool.
  - Shape location and associated object name can be specified through a point log file on disk.
  - 3D Line shape allows you to select line endpoints on different 2D slices or on the same slice.

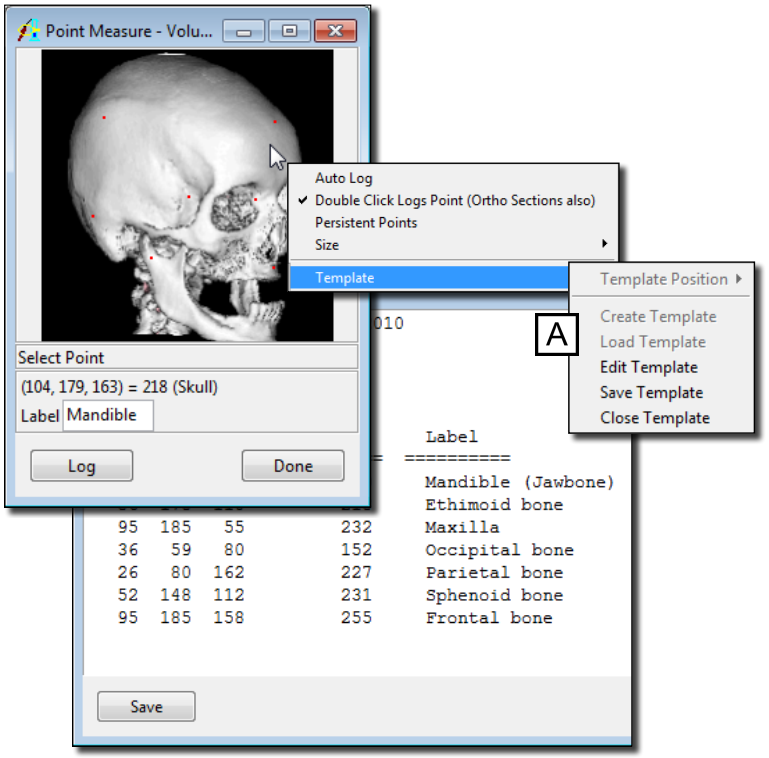


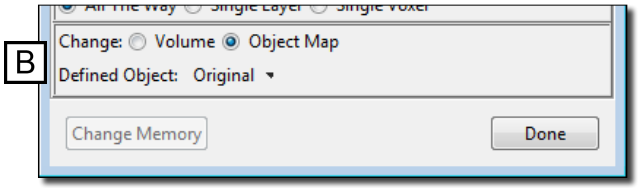




Volume Render

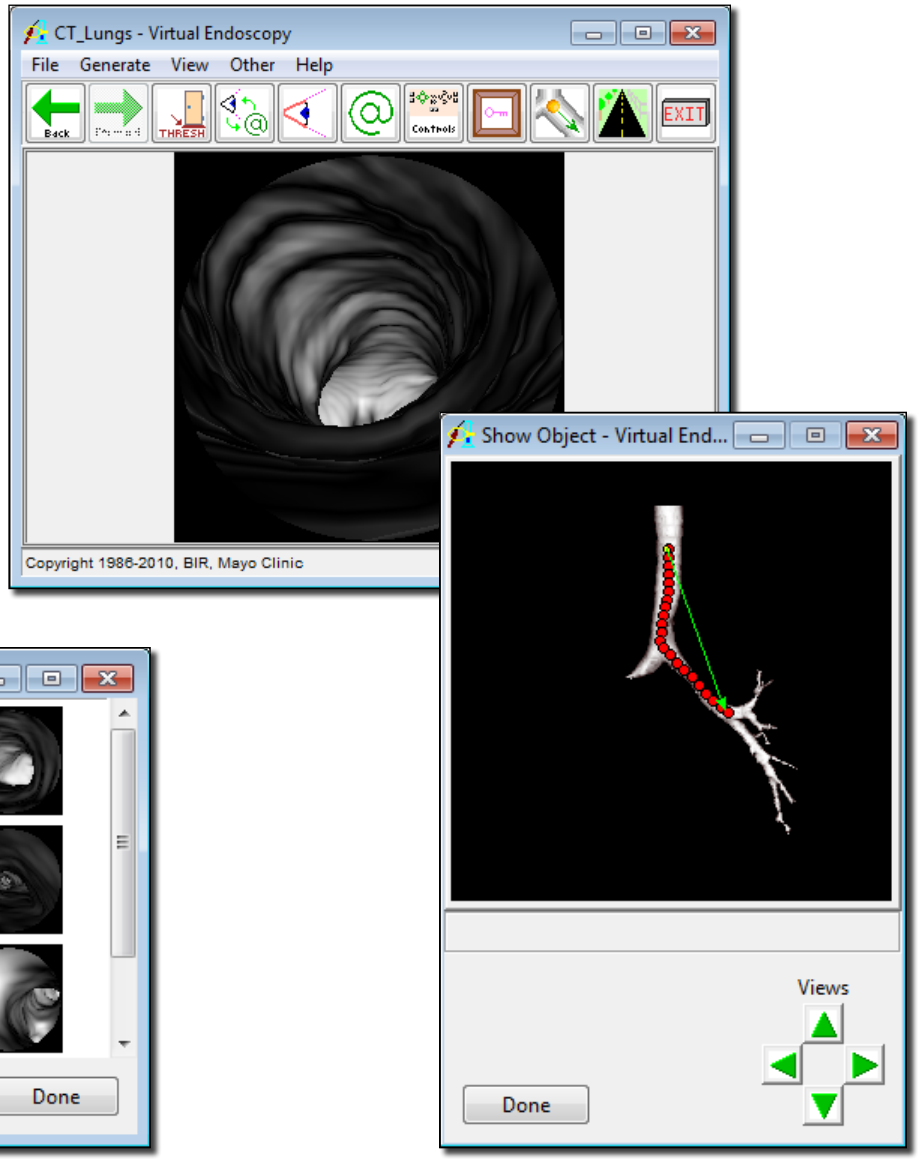
- ‘Point Measure’ tool provides support for creating, editing, saving and loading point selection templates [**A**].
- Keyboard controls in ‘Ortho Sections’ tool:
  - Arrow keys allow you to move the linked cursor.
  - Page Up/Down keys allow you to step through slices.
  - Enter key logs voxel coordinates and value in Point Measure log file.
- ‘Toggle Preview’ button available on PowerBar. 
- All Manipulate tools remember the last selected ‘Change’ method throughout the session.
- All Manipulate tools automatically set the ‘Change’ method to Object Map if an object map has been loaded [**B**].





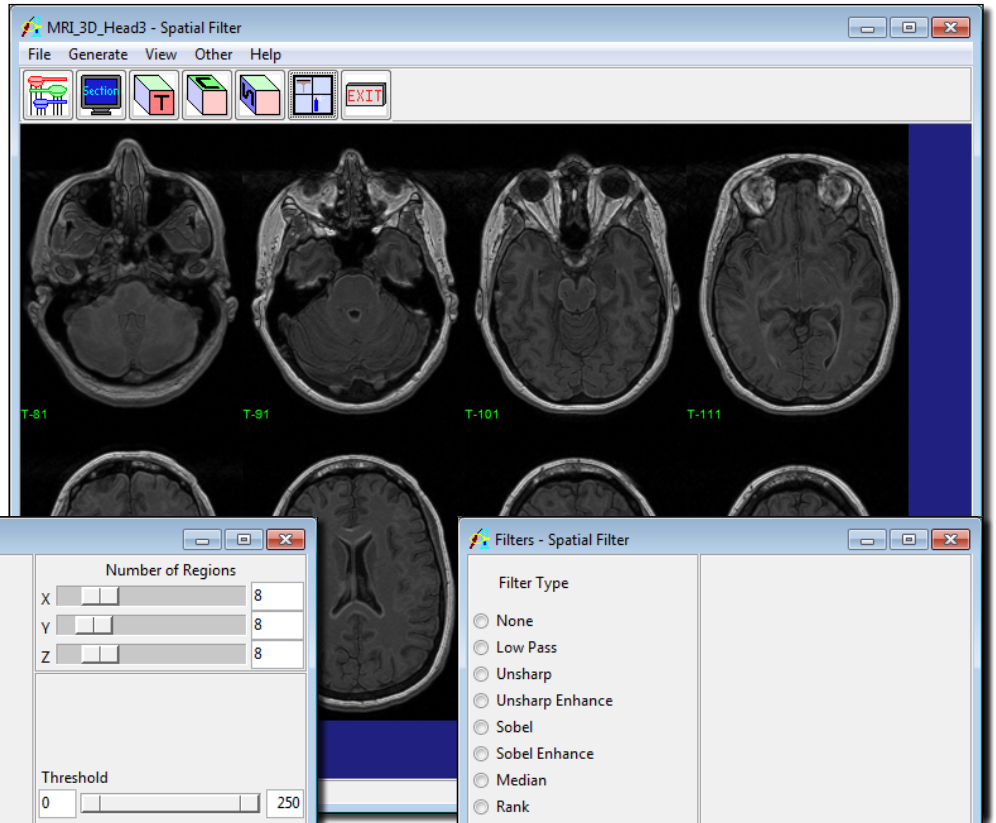
Virtual Endoscopy

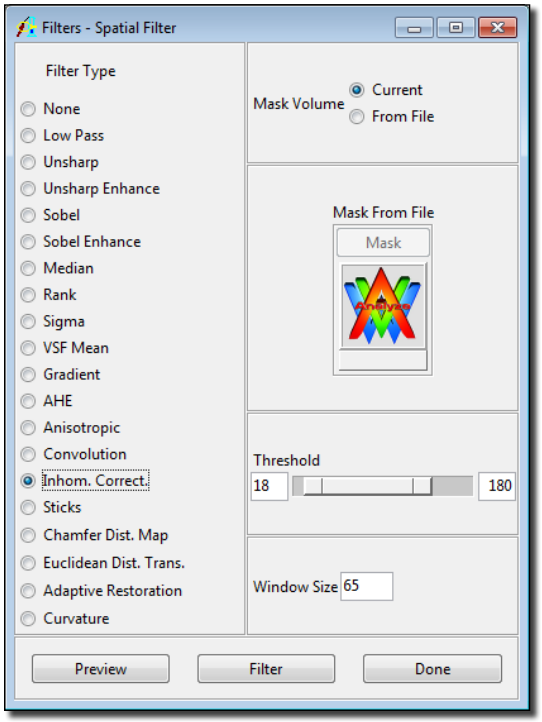
- New ‘Generate Center Line’ option finds the centerline of the endoscopic structure from the current Eye point to the current Look At point.
  - Keyframes are automatically generated and displayed in the Sequence Edit window once the centerline is determined, allowing an endoscopic sequence to be generated along the centerline.
  - The centerline can be viewed in the Show Object window.

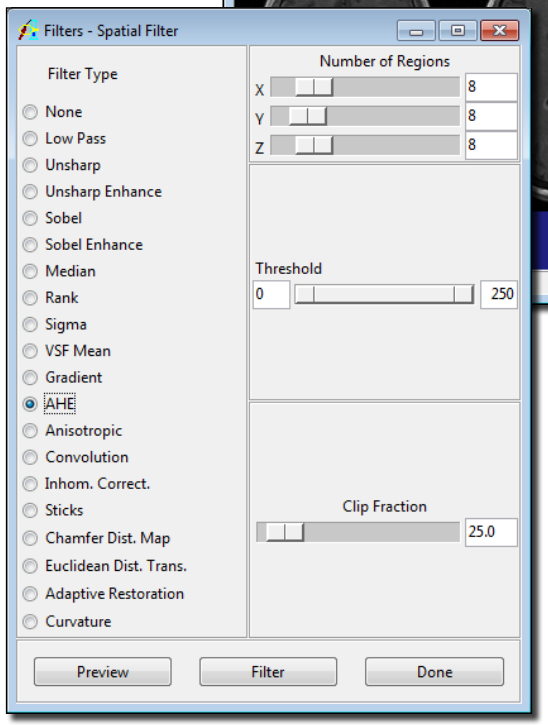


Spatial Filters

- Preview slice-by-slice option. Ability to review filtered preview slice-by-slice, rather than the automatic rapid display.
- ‘Show Thresholding’ option added to AHE, Inhomogeneity Correction, and Curvature filters. When selected, this option converts images to binary display, allowing for interactive determination of threshold range.







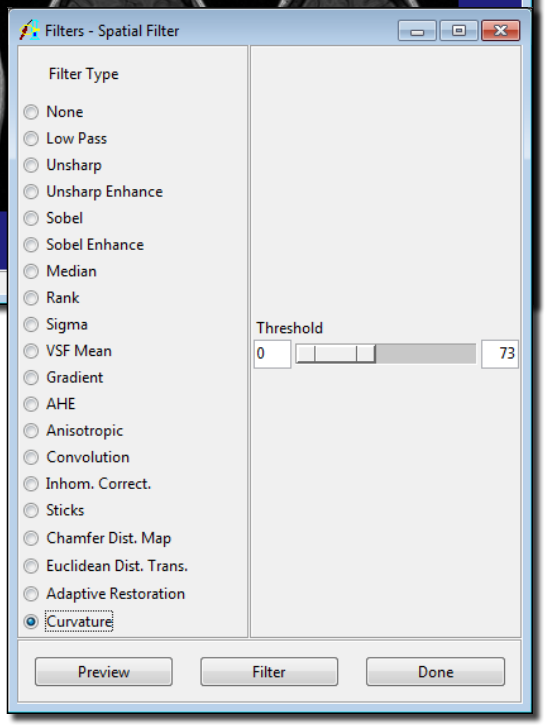
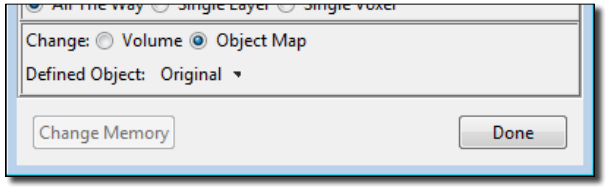


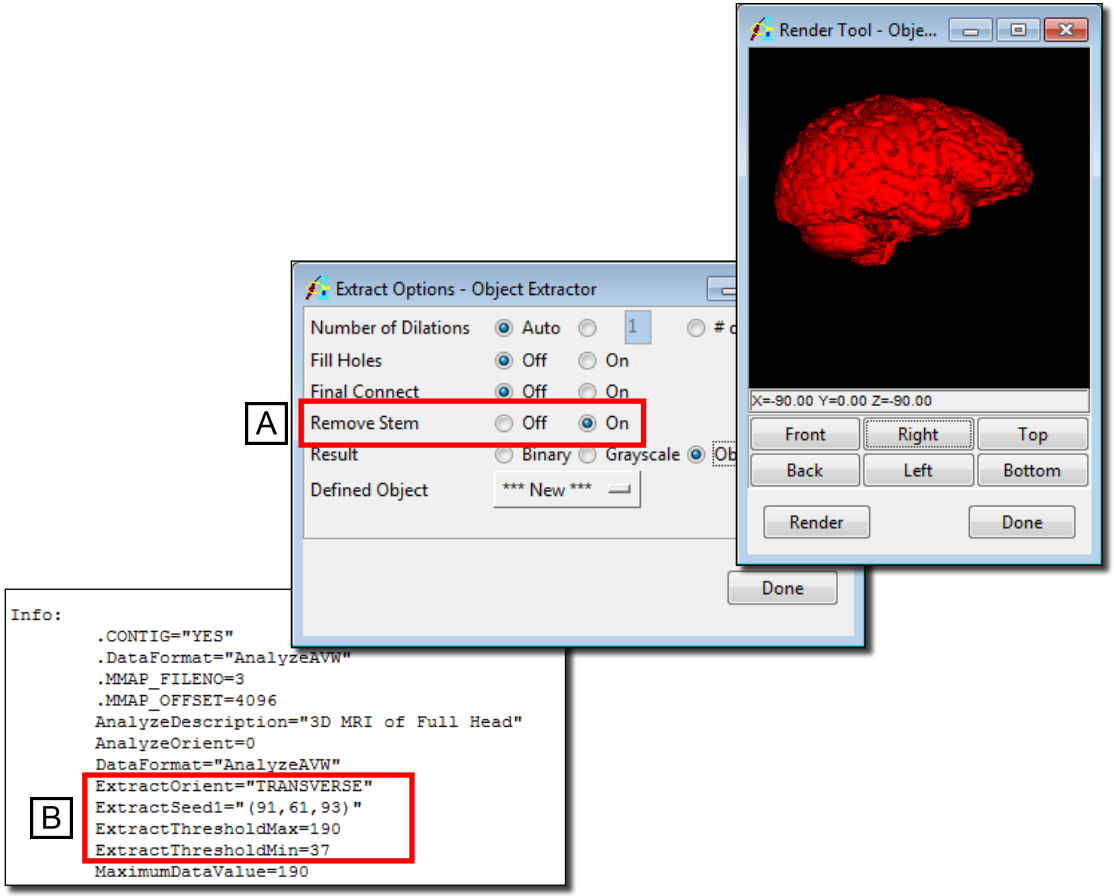
Image Edit

- Module automatically sets the ‘Change’ method to Object Map if an object map has been loaded.



Object Extractor

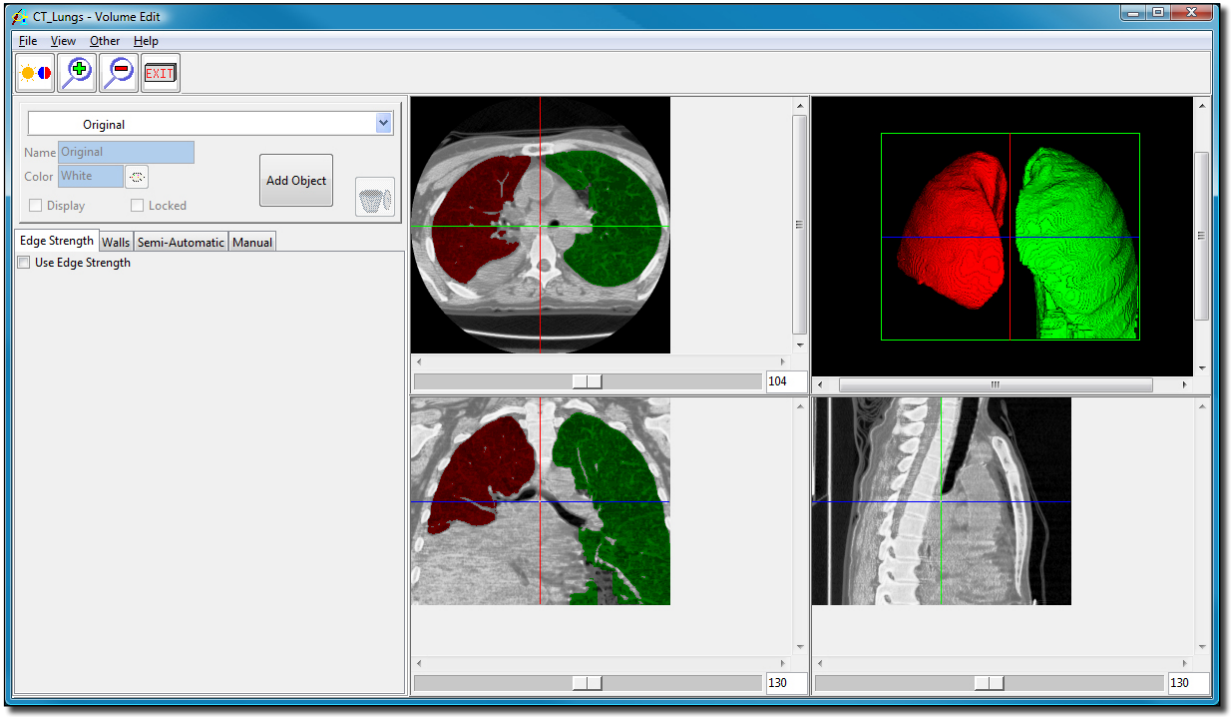
- New ‘Remove Stem’ option applies closed-space dilation to remove the brainstem during brain segmentation from MRI head volume images [**A**].
- Extraction parameters stored in header information of output volume image, allowing for replication of the same extraction process at a later time [**B**].
- Extractions done to produce both grayscale and binary output volumes will automatically append ‘_bin’ to the binary volume output to avoid name conflicts with grayscale volume.



Volume Edit

The new Volume Edit module provides an intuitive interface with interactive tools for manual and semi-automated segmentation of structures in 3D.

- The main segmentation window provides direct viewing of transverse, coronal, and sagittal images with an interactive linked cursor for structure selection and definition.
- A 3D rendering panel provides a current rendering of the segmented structures and allows for interactive 3D volume segmentation using tools such as oblique cutting and 3D tracing.
- Segmentation tools that apply to the entire 3D volume include:
  - Edge strength determination based on gradients.
  - 3D wall definition for control of region growing operations.
  - Morphologic object extraction, object separator.
  - Oblique cutting plane definition and manual trace/cut.
  - Boundary nudge tools for manual region definition.

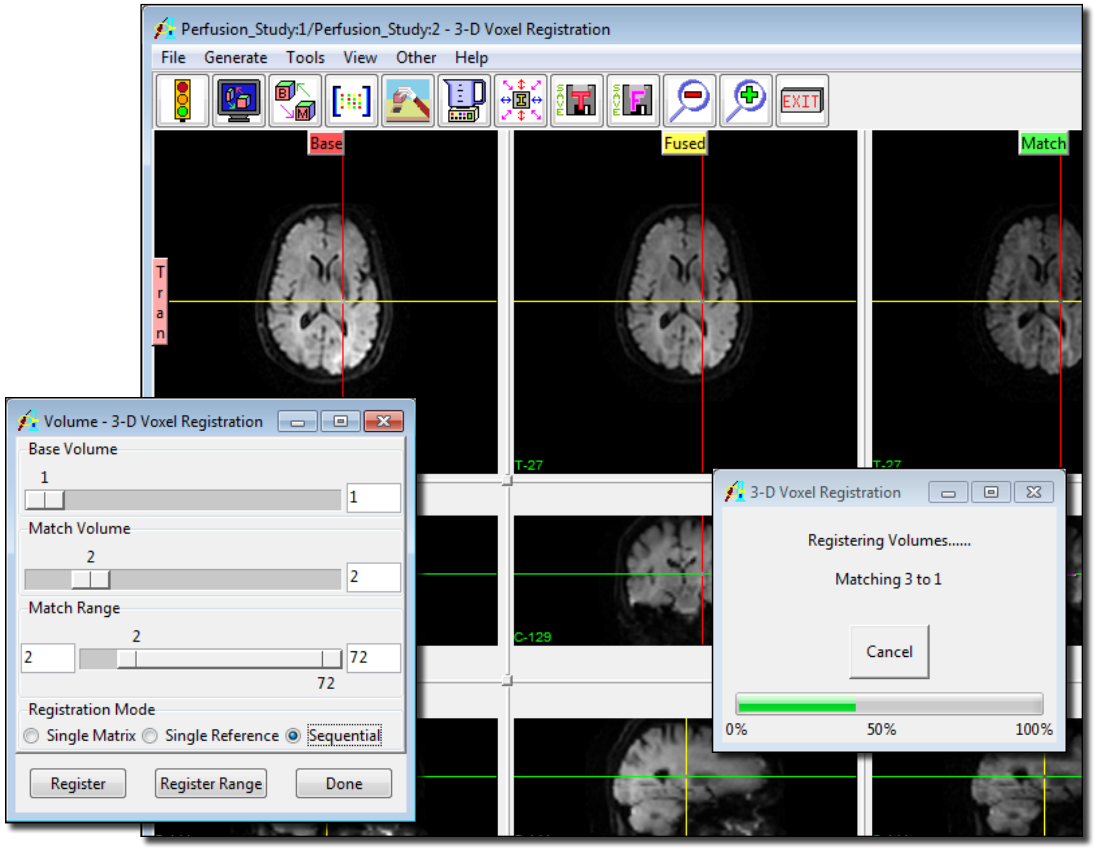


2D Rigid/Non-Rigid and 3D Non-Rigid Registration

- ‘Show Thresholding’ option will allow for interactive determination of threshold parameters by converting images to binary display in the Cursor Link Tool.
- ‘Reset Matrix/Matrices’ option added to allow all transformations to be reset.

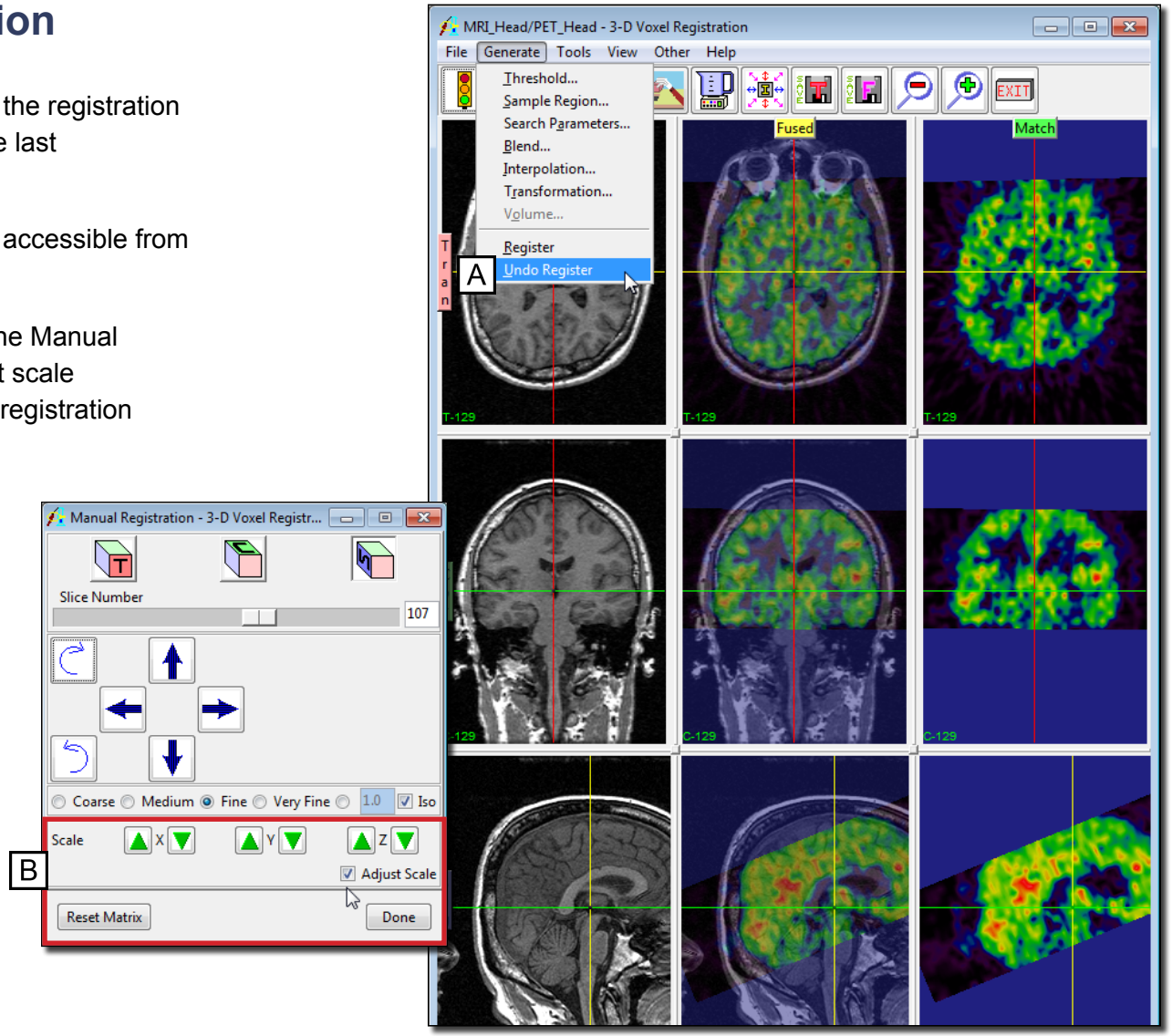
3D Surface/Voxel Registration

- New 4D multi-volume registration controls for registration of 4D volume data.
  - Single Reference mode allows all volumes to be registered to a chosen reference volume.
  - Sequential mode registers neighboring volumes, keeping track of individual registration transforms between sequential volumes and concatenating these transforms when an output multi-volume is generated.
- Improved control of the displayed images with keyboard keys. Arrow keys allow you to move the linked cursor. Page Up/Down keys allow you to step through slices.



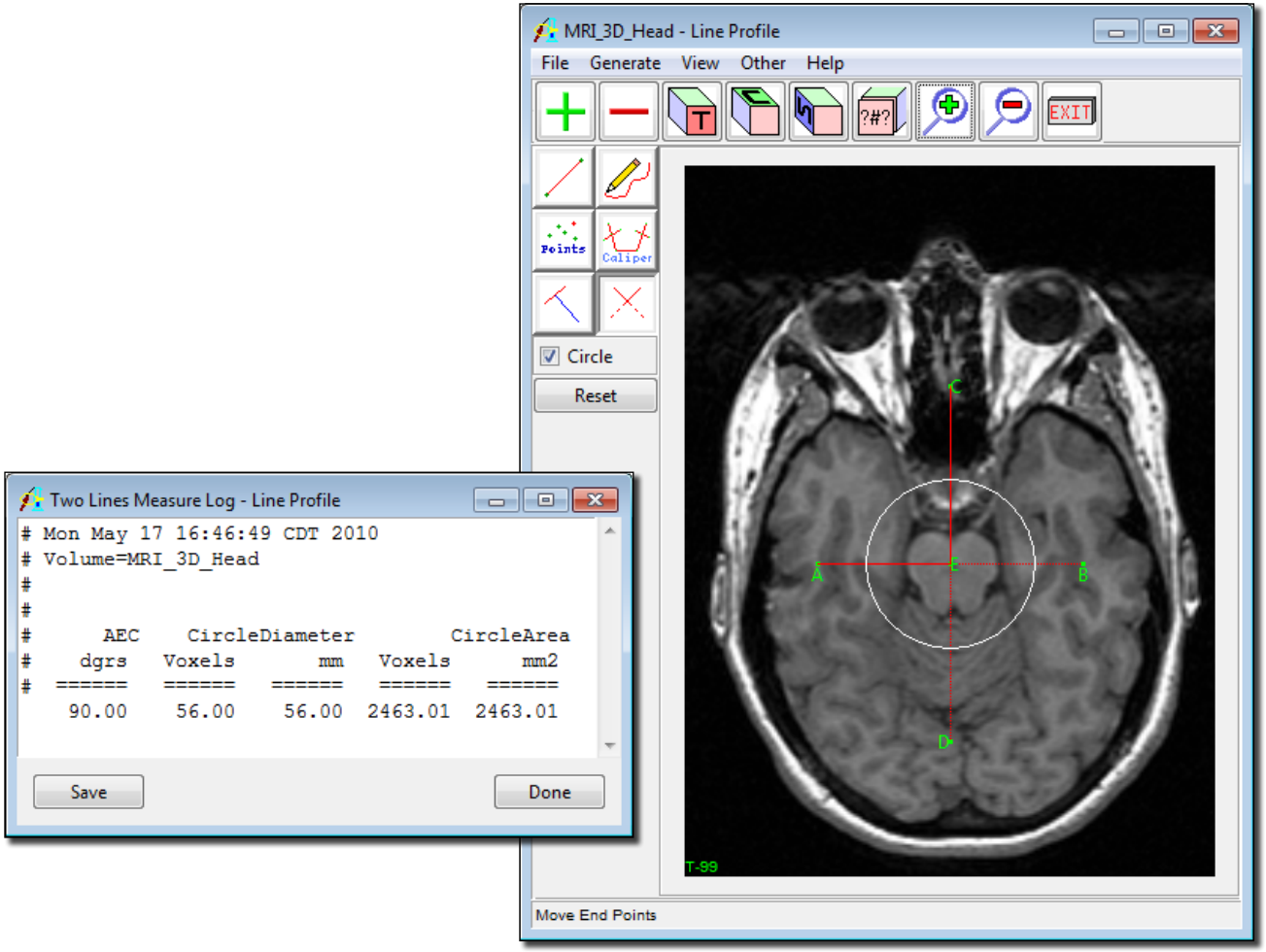
3D Surface/Voxel Registration

- New ‘Undo Register’ option [**A**] that resets the registration transformation to the matrix just prior to the last registration attempt.
- Intensities window for Base/Match volume accessible from right-click menu in image display panes.
- New ‘Adjust Scale’ option [**B**] provided in the Manual tool to turn on the ability to manually adjust scale along the axes represented by the current registration transformation.



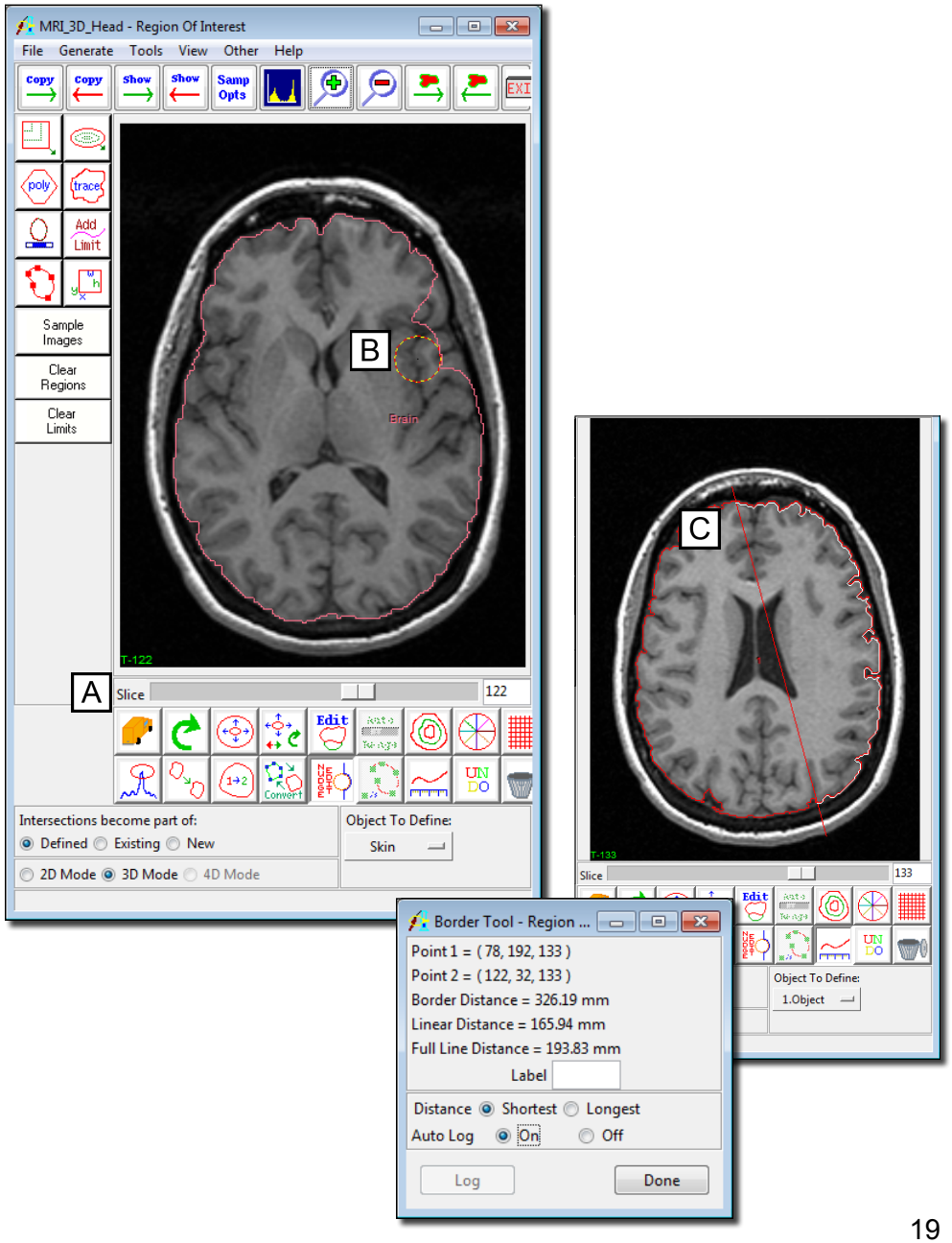
Line Profile

- ‘Circle’ option added to the Two Lines measuring tool. A circle centered on the intersection of the two lines can be manipulated in size. Measurements of circle diameter and area are reported.



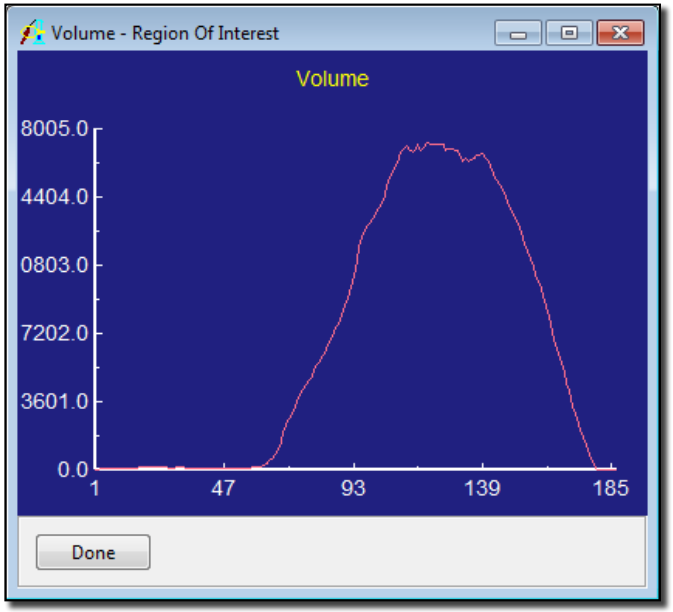
Region of Interest

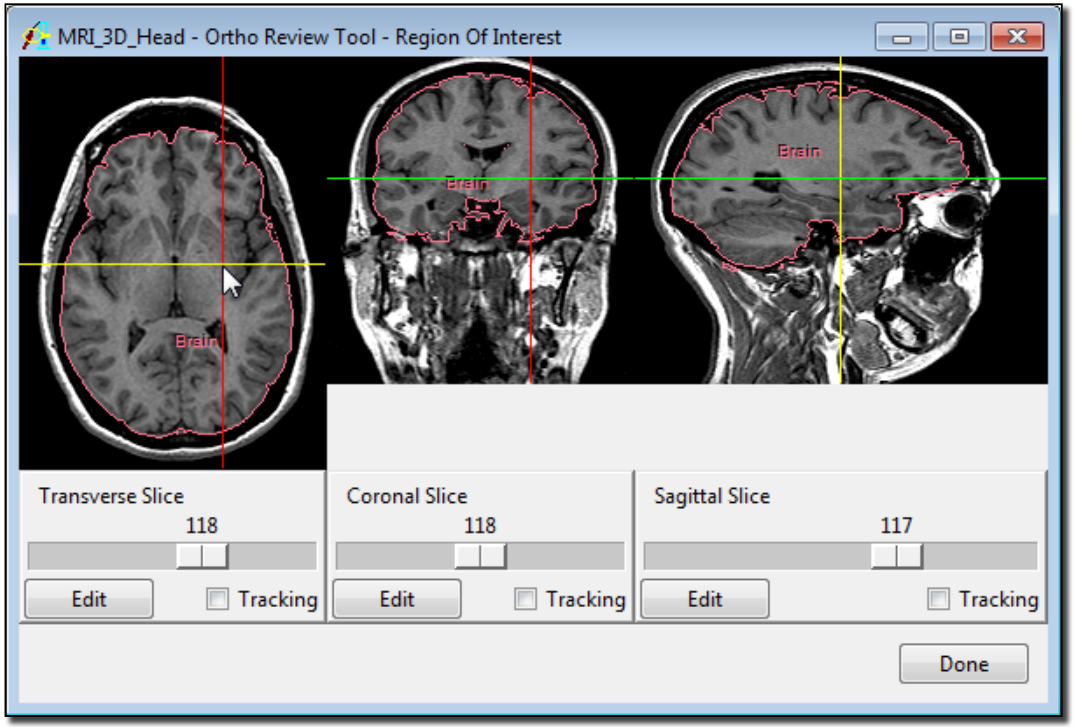
- Slice control slider always visible below image in main ROI window [**A**].
- New ‘Nudge Edit’ tool for region modification [**B**]. Allows region boundaries to be moved, or “nudged”, using a circular region. Circle size can be controlled with the middle mouse button.
- ‘Border Length’ tool enhanced to include total linear distance on defined line. Border points are also now selected only at crossover points between the border and the defined line [**C**].
- New ‘Redo’ button allows for a single ‘redo’ operation.
- Sample ‘All Slices’ option now samples all slices in all volumes if a 4D multi-volume is loaded.



Region of Interest

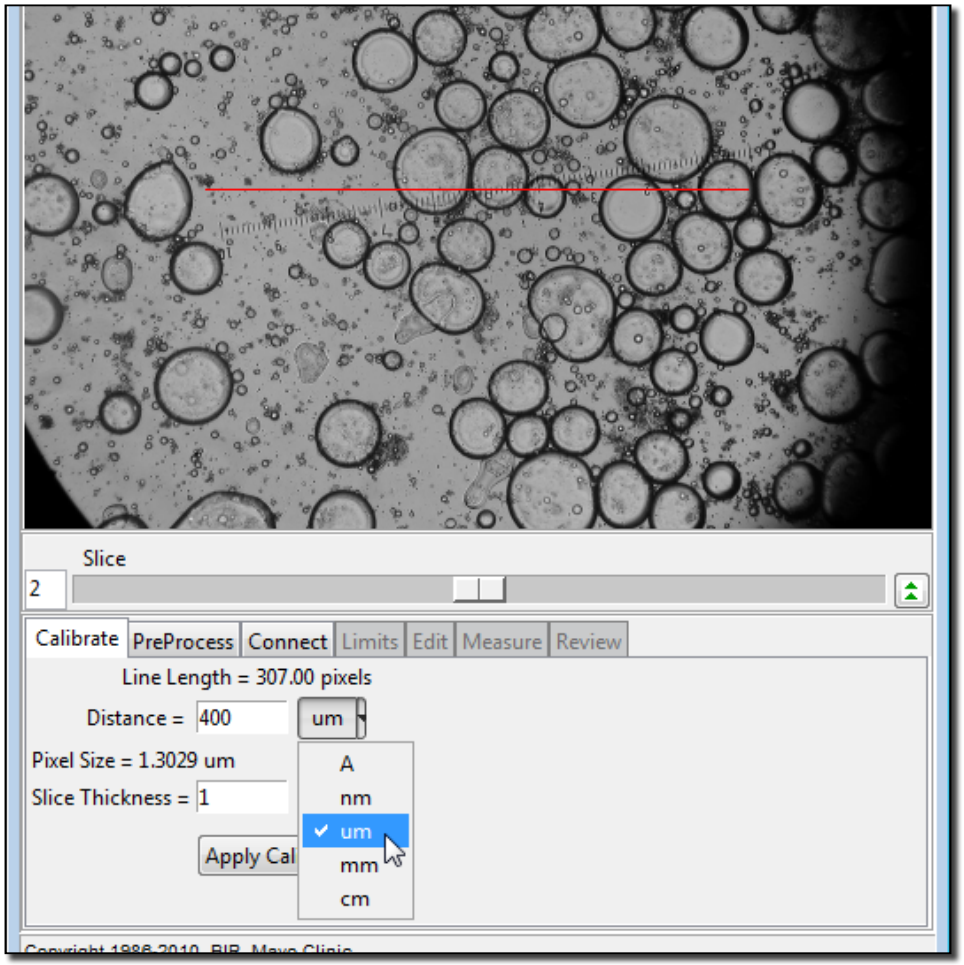
- New option to output a screenshot of a plot to the Analyze Workspace, allowing it to be saved to disk as a .jpg or .tif file.
- 'Ortho Review' tool enhancements:
  - 'Linked Cursor' is automatically enabled after clicking on any one of the displayed images.
  - 'Linked Cursor' reference lines automatically update in position if displayed slice is changed using 'Slice' slider bars.





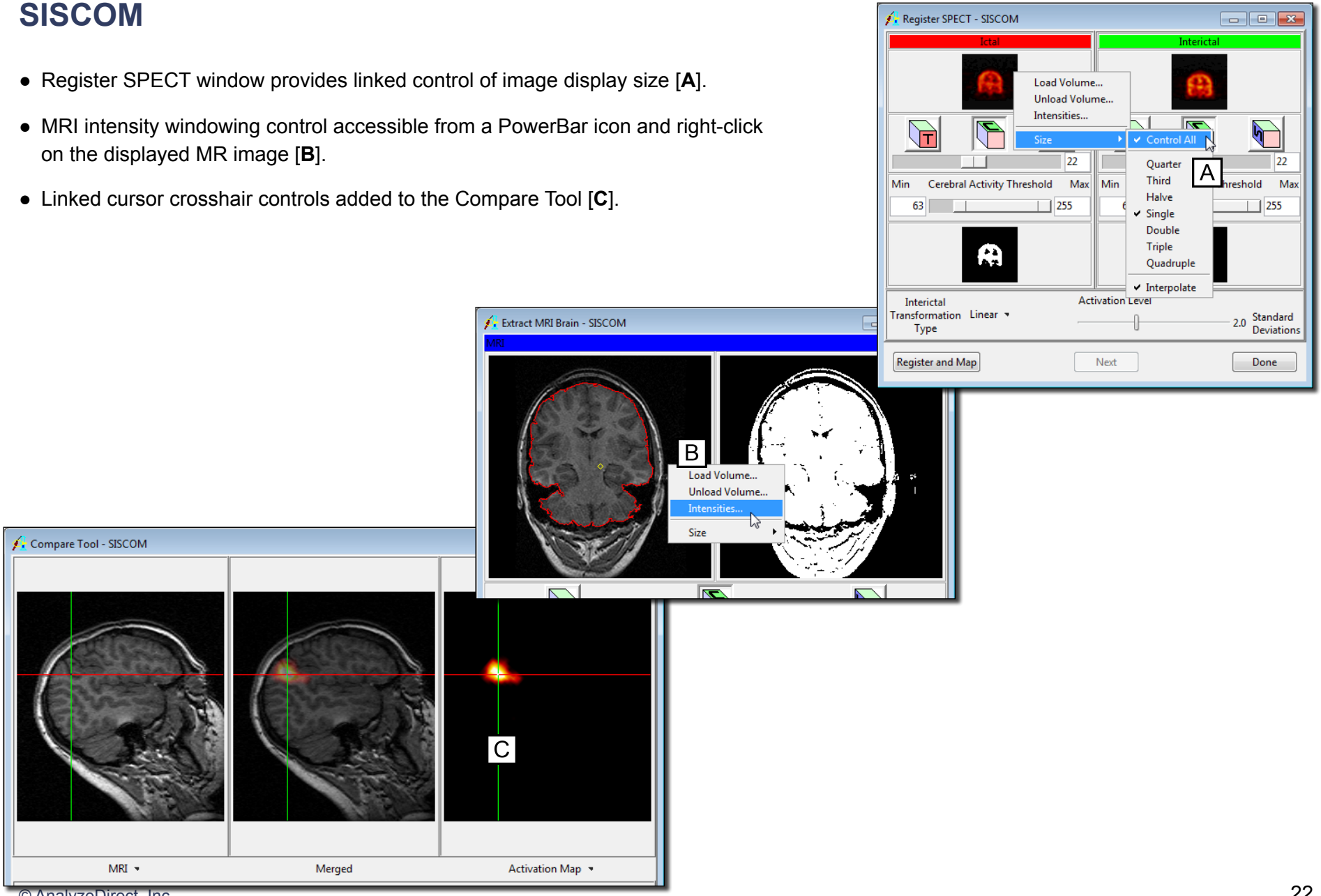
Object Counter

- New ‘Calibrate’ tab added to allow specification of a line on the image which corresponds to a specific measurable distance, such as with a ruler or structure of known size. This then establishes the correct pixel size in the image for all measurements. Slice thickness can also be entered for 3D data.



SISCOM

- Register SPECT window provides linked control of image display size [**A**].
- MRI intensity windowing control accessible from a PowerBar icon and right-click on the displayed MR image [**B**].
- Linked cursor crosshair controls added to the Compare Tool [**C**].



DTI

- New ‘Auto Save’ option for creating a screen shot or movie of displayed fibers.