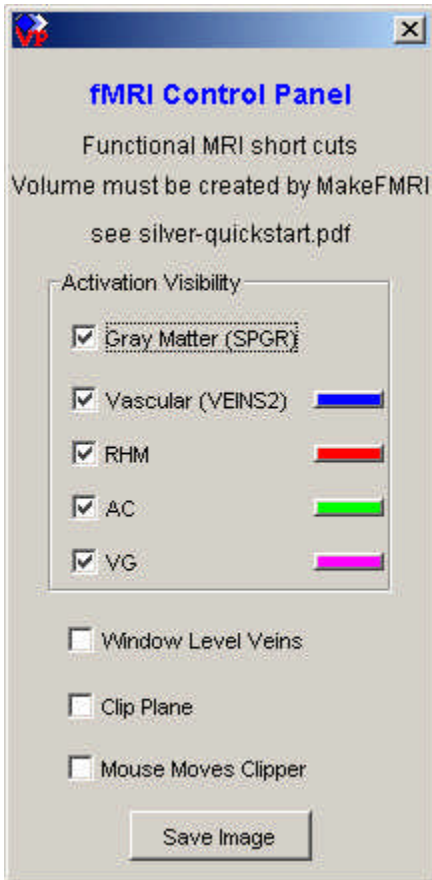


fMRI Panel – in Silver, from TeraRecon, Inc.

The fMRI Control Panel is a specialized set of functions for visualizing fMRI volumes that have been packaged with the MakeFMRIVolume utility. The eggfmri.vox file can be used to experiment with this control panel.



An fMRI data set that has been created by the MakeFMRIVolume utility will have 3 channels: gray matter, vascular and activation areas. These can be independently turned on and off by the check boxes next to each one.

Window Level Veins checkbox toggles back and forth between having the middle button change the opacity of the gray matter or the veins.

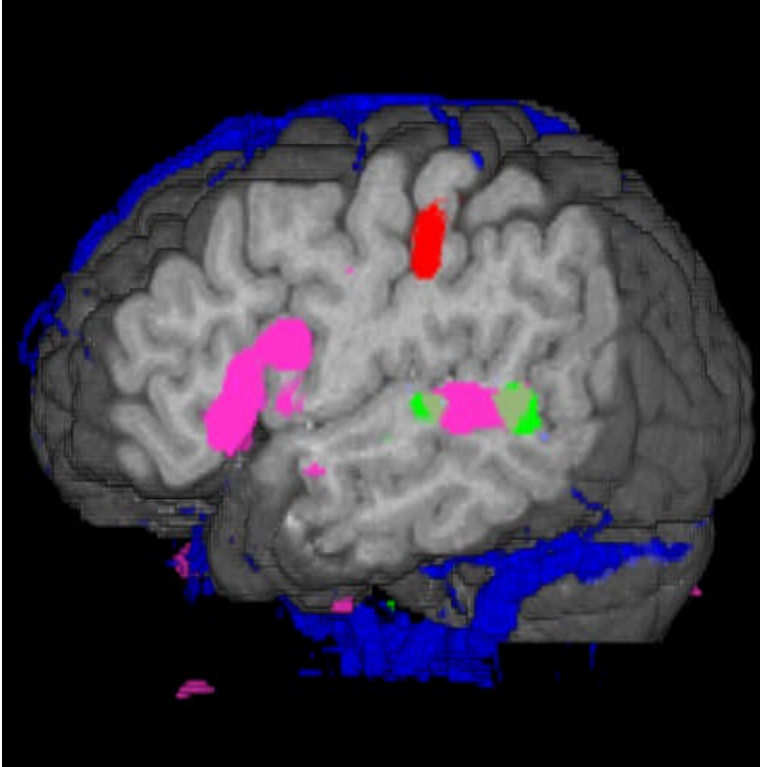
Clip Plane turns on the clipping plane half way through the volume and perpendicular to the screen. By default it turns on Mouse Moves Clipper. This make the left mouse button rotate the plane and the right mouse button push it back and forth.

There are a few configuration options that can be added to the file silver.properties (see note in the startup section):

```
silver.fmri.useRamp=0
silver.fmri.hideOverlaps=1
silver.fmri.activationColor0=0xff0000
```

Adding the above entries would give you the default values. UseRamp decreases opacity as activation strength decreases. HideOverlaps can be set to 0 to make areas of overlap explicit. ActivationColorN sets the default color for an activation area.

MakeFMRIVolume packages the gray matter, vascular and activation areas into a single .vox file. It packs the activation areas into a single channel and put information about each area into the volume title. For more information about the MakeFMRIVolume utility, send email to hardenbergh@terarecon.com.

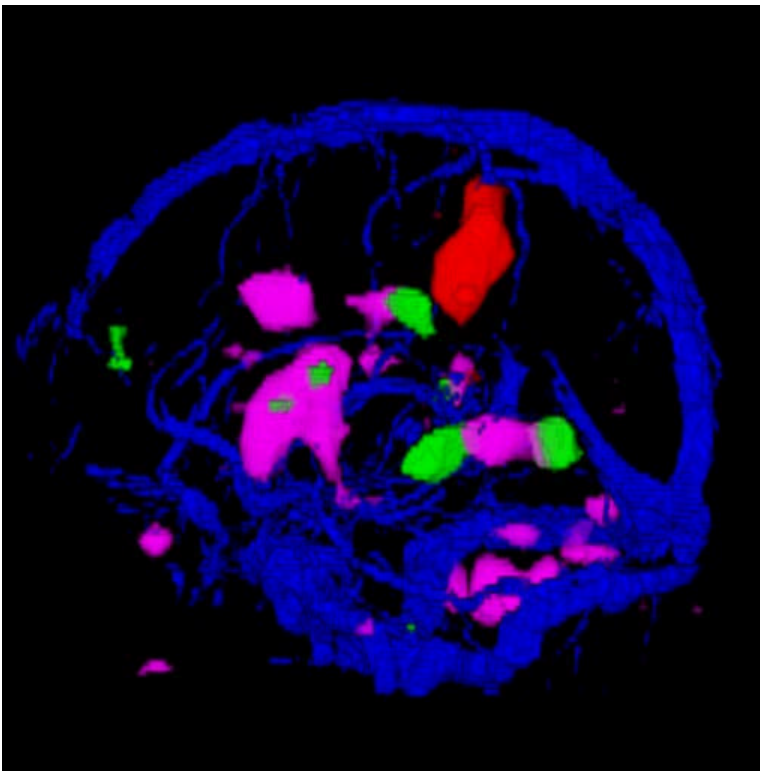


A) gray matter, vascular and activation areas displayed with a cut plane.

FMRI Visualization

In the image to the left we have all components of the fMRI dataset displayed. These are the gray matter, the vascular, and the activation areas. Each of these is a separate channel in the volume dataset.

In the VP1000, the activation channel is rendered twice, one to mask out the other data and a second time to give color to the activation areas.



B) Gray matter channel is turned off to reveal the activation areas and vasculature

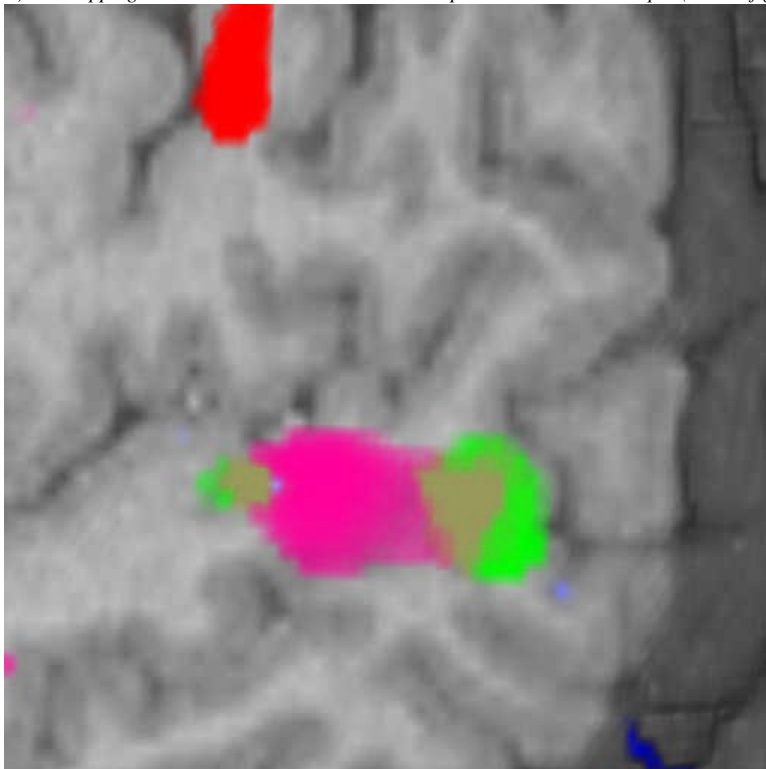
Display Options

Each of the channels and each of the activation areas can be displayed independently of the others.

Activation Areas

In order to pack the activation areas into one channel, the voxel values are shifted. By doing so, we can have up to 10 activation areas. More would be possible with a more creative UI. More on how data is packed below.

C) Overlapping Activation Areas – notice the overlap area - the brownish spot (blend of green and magenta)

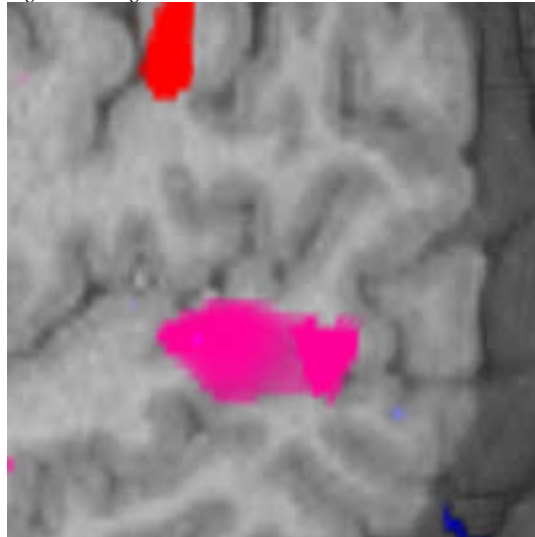
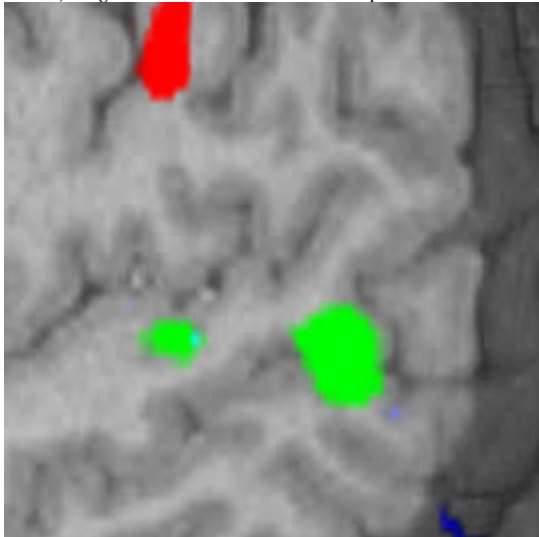


There are three activation areas: RHM, AC, and VG.

In this case the most non-zero voxel values are four (wordsmith!) and then they fall off. AC falls off in two values and RHM and VG have slightly wider ranges – 9 values. Overlapping areas are essentially made into new activation areas. The VG-AC area consists of the 768 voxels that overlap.

These are hidden by the app – blending when both areas are on, or switching to the single area’s color.

D & E) Single activation areas. The overlap area switches to either green or magenta.



RHM: [4] 2067, [5] 1182, [6] 693, [7] 439, [8] 317, [9] 61, [10] 3
 AC: [4] 2801, [5] 478, [6] 14
 VG: [4] 10570, [5] 3586, [6] 1214, [7] 288, [8] 80, [9] 23, [10] 6

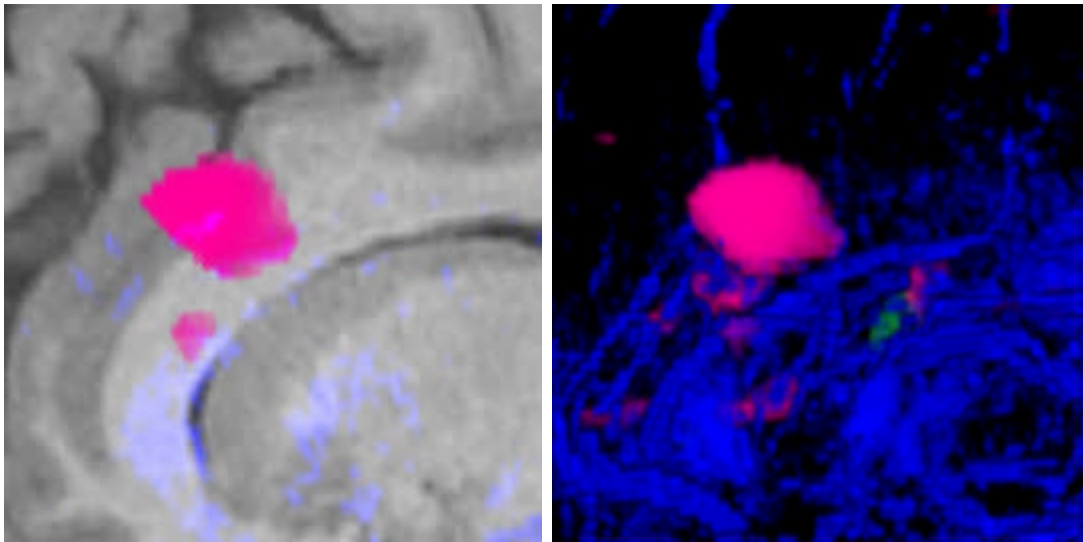
ALL: [4] 2067, [5] 1182, [6] 693, [7] 439, [8] 317, [9] 61, [10] 3, [11] 0, [12] 0, [13] 0, [14] 0, [15] 0, [16] 2216, [17] 301, [18] 8, [19] 0, [20] 0, [21] 0, [22] 0, [23] 0, [24] 10049, [25] 3391, [26] 1162, [27] 288, [28] 80, [29] 23, [30] 6, [31] 0, [32] 0, [33] 0, [34] 0, [35] 0, [36] 768

fMRI: t.vox from SPGR Vascular VEINS RHM 2 4 9 AC 14 16 5 VG 22 24 9 -VG-AC 36 36 4

The histograms for RHM, AC, and VG show the original datasets. The ALL histogram is for the Activation Area channel. The RHM values are unchanged; AC has been shifted from 4-6 to 16-18; VG from 4-10 to 24-30. Four values serve as a buffer between activation areas. The 768 voxels that are both in AC and VG have been transplanted to value 36. The results in some loss of gradation. Notice in E) that the overlap area is a brighter magenta.

B Replace A Rendering

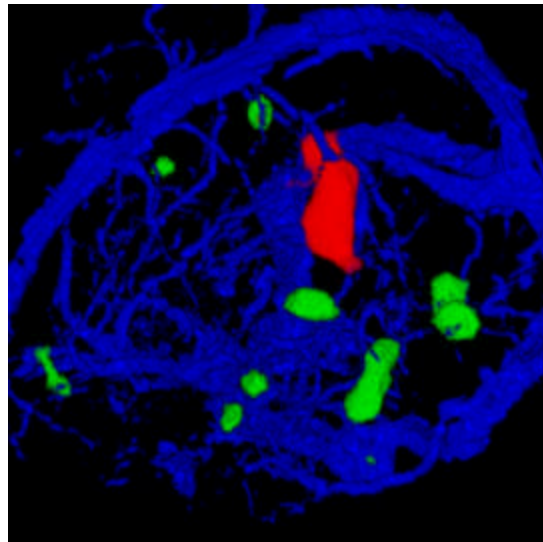
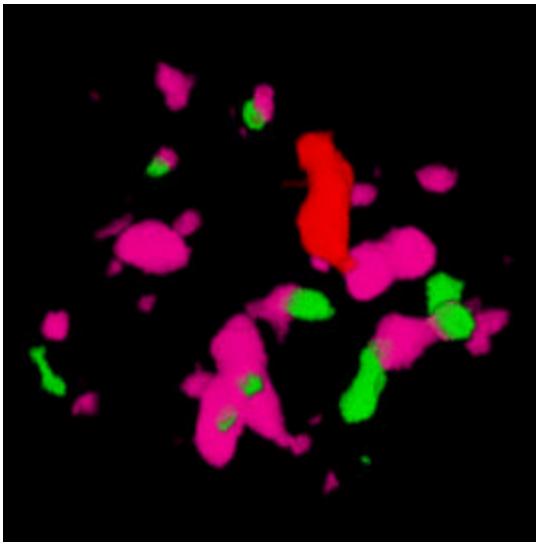
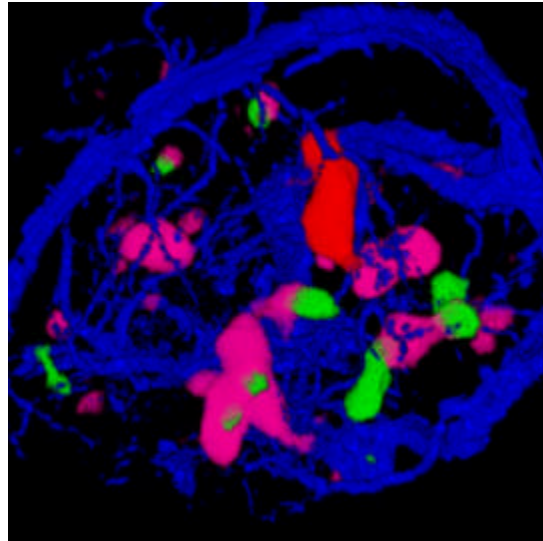
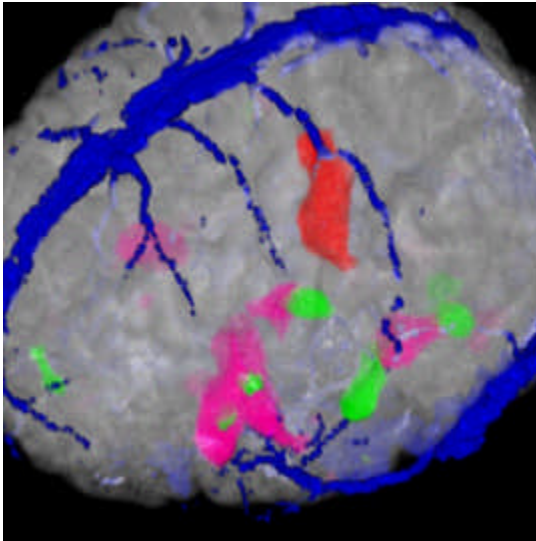
We have three channels to render. If they are combined by addition, then colors will bleed from one channel to the other. We use a masking technique called **B Replace A** to prevent the colors from bleeding. Unfortunately, with the VP1000 we are limited to four channels, so, we can only mask out the gray matter if both the gray matter and the vasculature are being displayed. Below is an example:



F & G) BReplace A technique to prevent color bleeding.

In the left image, you can see a spot of blue in the magenta. This is because the mask is only masking the gray matter. Once the gray matter is turned off, we can mask the vasculature.

A Few more images...



14-May 2004 jch