

## Anna's Guide to Printing Your T1 Scan in Windows

Locate your file. I'm in uci.flywheel.io right now, in the YassaLabTest folder. I want a structural scan to print, so I'll download the nifti format of the MPAGE scan.


Acquisitions	Session	Subject	Project	Analyses	Provenance	
Brain*DownSyndrome 2018-10-11 14:20						Run Gear
<input type="checkbox"/>	Time	Description	Classification	Type		
<input type="checkbox"/>	14:26	3_Plane_Localizer				
		<input type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142610104765024...icom.zip	MR: Localizer, T2	dicom		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142610104765024...b.nii.gz	MR: Localizer, T2	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142610104765024...a.nii.gz	MR: Localizer, T2	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142610104765024...0.nii.gz	MR: Localizer, T2	nifti		
<input type="checkbox"/>	14:32	ADNI3_Accelerated_MPRAGE				
		<input type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142714507651027...icom.zip	MR: Structural, T1	dicom		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142714507651027...0.nii.gz	MR: Structural, T1	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011142714507651027...qa.html	N/A: Structural, T1	qa		
<input type="checkbox"/>	14:37	3_Plane_Localizer				
		<input type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143706446966047...icom.zip	MR: Localizer, T2	dicom		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143706446966047...b.nii.gz	MR: Localizer, T2	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143706446966047...a.nii.gz	MR: Localizer, T2	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143706446966047...0.nii.gz	MR: Localizer, T2	nifti		
<input type="checkbox"/>	14:37	PhoenixZIPReport				
		<input type="radio"/> 1.3.12.2.1107.5.2.43.166039.3000001810042017041360...icom.zip	SR: Non-Image	dicom		
<input type="checkbox"/>	14:43	ADNI3_Accelerated_MPRAGE				
		<input type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143752507230055...icom.zip	MR: Structural, T1	dicom		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143752507230055...0.nii.gz	MR: Structural, T1	nifti		
		<input checked="" type="radio"/> 1.3.12.2.1107.5.2.43.166039.20181011143752507230055...qa.html	N/A: Structural, T1	qa		

It's saved as a .nii.gz , which means it's compressed. Doesn't matter. I recommend renaming it wherever you end up saying it as a file name with no spaces or special characters.

### 1. Install VirtualBox

I'm working in Windows, so I can't download FreeSurfer onto my computer without using a virtual machine.

Go here to install: <https://www.virtualbox.org/wiki/Downloads>



## VirtualBox

**Download VirtualBox**

Here you will find links to VirtualBox binaries and its source code.

**VirtualBox binaries**

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 5.1 packages, see VirtualBox 5.1 builds. Consider upgrading.

**VirtualBox 5.2.18 platform packages**

- ☒ Windows hosts
- ☒ macOS hosts
- ☒ Linux distributions
- ☒ Solaris hosts

The binaries are released under the terms of the GPL version 2.


See the [changelog](#) for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. The SHA256 checksums should be favored as the MD5 algorithm must be treated as insecure!

- SHA256 checksums, MD5 checksums

2. Get the FreeSurfer image here: <ftp://surfer.nmr.mgh.harvard.edu/pub/dist/freesurfer/5.3.0/> (big, 9GB file)

Index of <ftp://surfer.nmr.mgh.harvard.edu/pub/dist/freesurfer/5.3.0/>

 [Up to higher level directory](#)

Name	Size	Last Modified
<a href="#">File: Freeview_v53_lion.dmg</a>	41527 KB	7/18/2013 12:00:00 AM
<a href="#">File: Freeview_v53_snowleopard.dmg</a>	40884 KB	7/18/2013 12:00:00 AM
<a href="#">File: freesurfer-Darwin-lion-stable-pub-v5.3.0.dmg</a>	3576918 KB	5/15/2013 12:00:00 AM
<a href="#">File: freesurfer-Darwin-lion-stable-pub-v5.3.0.tar.gz</a>	3576023 KB	10/23/2013 12:00:00 AM
<a href="#">File: freesurfer-Darwin-snowleopard-i686-stable-pub-v5.3.0.dmg</a>	3314942 KB	5/14/2013 12:00:00 AM
<a href="#">File: freesurfer-Darwin-snowleopard-i686-stable-pub-v5.3.0.tar.gz</a>	3314014 KB	10/23/2013 12:00:00 AM
<a href="#">File: freesurfer-Linux-centos4-stable-pub-v5.3.0.tar.gz</a>	3965837 KB	5/14/2013 12:00:00 AM
<a href="#">File: freesurfer-Linux-centos4_x86_64-stable-pub-v5.3.0.tar.gz</a>	4166807 KB	5/14/2013 12:00:00 AM
<a href="#">File: freesurfer-Linux-centos6_x86_64-stable-pub-v5.3.0.tar.gz</a>	4337181 KB	5/14/2013 12:00:00 AM
<a href="#">File: freesurfer-Virtualbox-linux-x86-stable-pub-v5.3-full.vdi.gz</a>	9486218 KB	8/15/2013 12:00:00 AM

Unzip the file when it's done and put it somewhere memorable (I'm sticking it on my desktop)

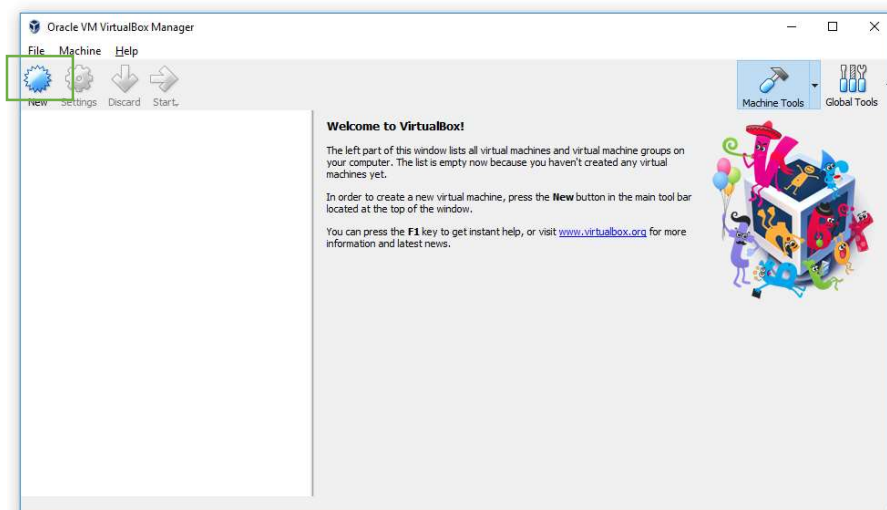
I had to install new archive software to extract it. jZip is my go-to:

<http://www.jzip.com/>

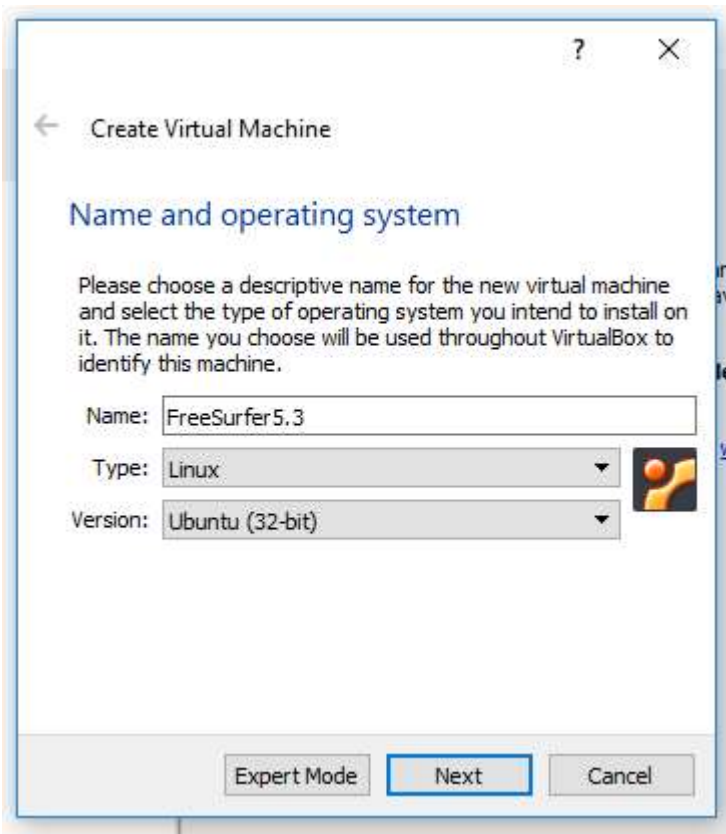
Just right click the file → jZip → Extract to... Desktop

3. I'll walk you through the Virtual Image FreeSurfer installation instructions found here: <http://freesurfer.net/fswiki/Installation/FreeSurferVirtualImage>

First, open VirtualBox. Click "New"



4. Create your VM according to these settings:



Click Next. It's asking how much RAM to allocate to the VM. To find out how much RAM I have at my disposal, I've gone into Start → Settings → System → About:

## Device specifications

Device name	Mifune
Processor	Intel(R) Core(TM) i7-4558U CPU @ 2.80GHz 2.80 GHz
Installed RAM	8.00 GB
Device ID	FBCC1093-2ED2-428B-87B0-C57CF7BF2F1E
Product ID	00326-10000-00000-AA121
System type	64-bit operating system, x64-based processor
Pen and touch	Touch support with 10 touch points

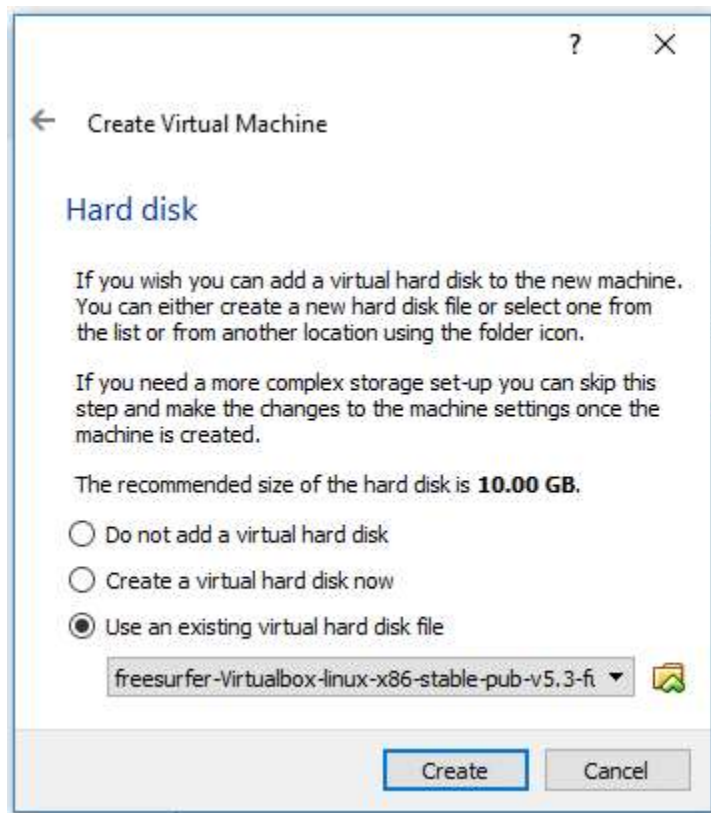
Rename this PC

My computer, Mifune, has 8GB of RAM. I get an error if I try to dedicate half for processing my scan, so I'll crank it up to 3000 MB.

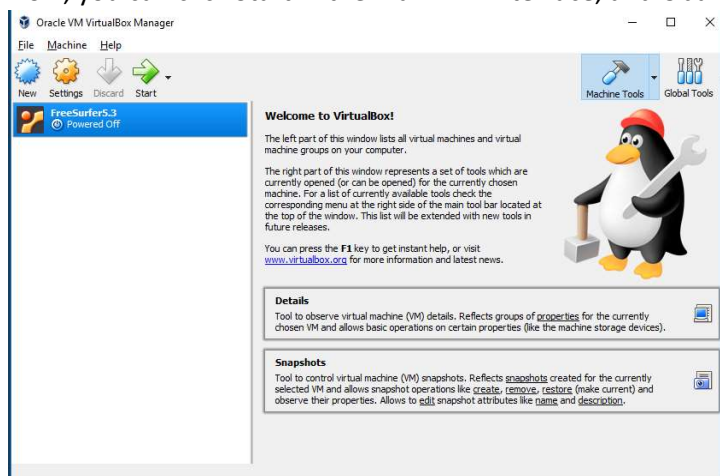
5. Click "Use an existing virtual hard disk file" and navigate to where you saved your FreeSurfer image. Click Create.



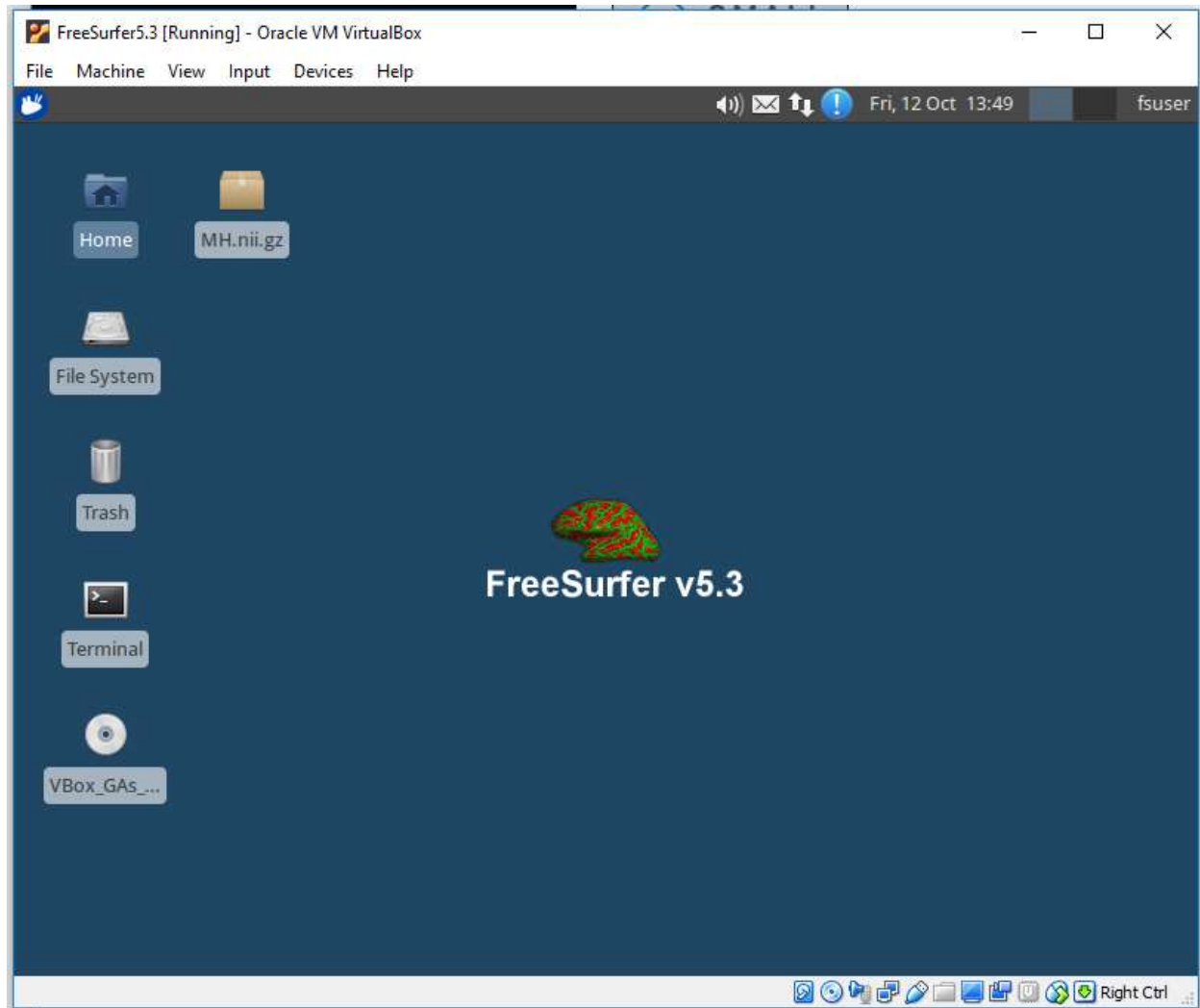
Captain Mifune, for the record. Remember the guy in the mech suit?



6. Now, you can click Start in the main VM interface, and Ubuntu will boot up!

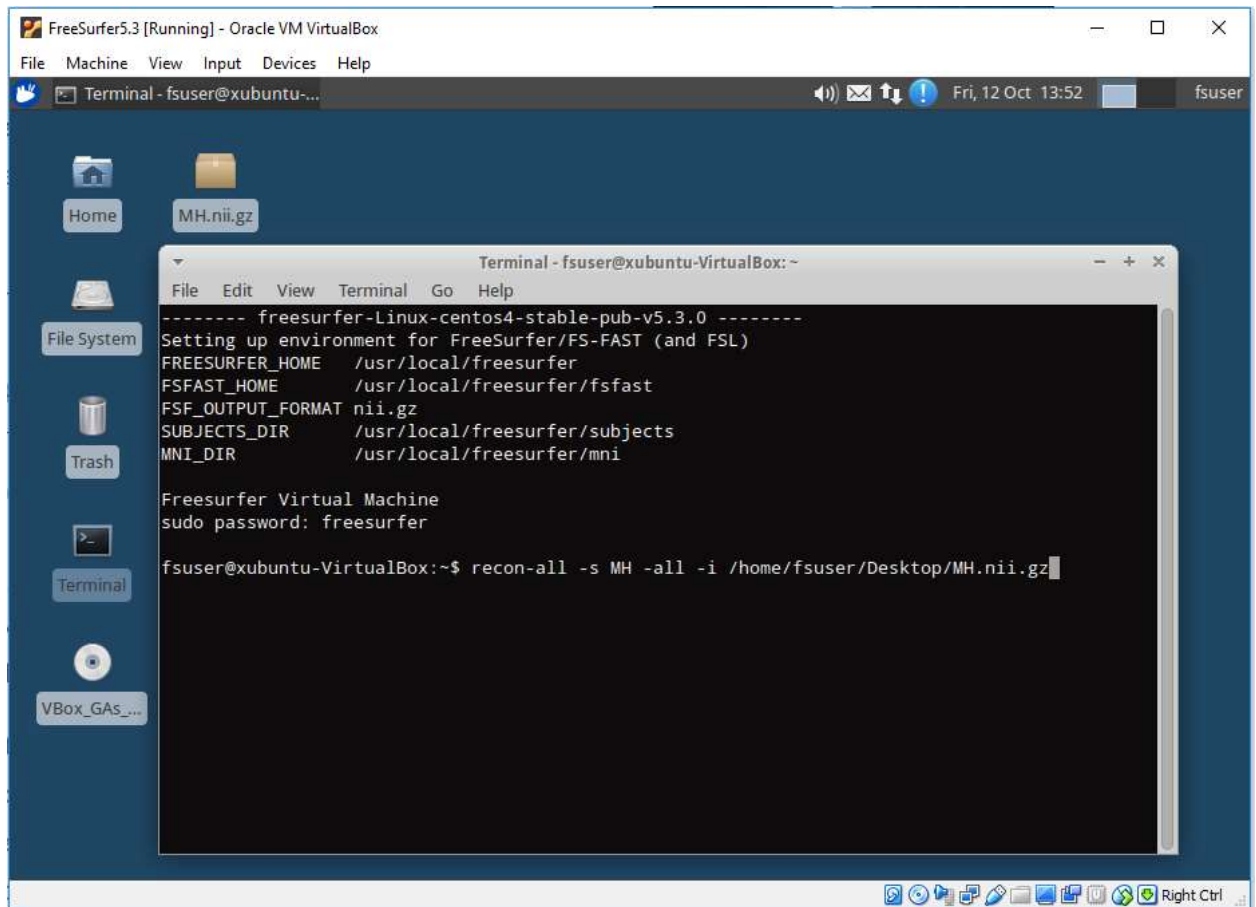


7. You can actually log into ZION from the VM by going into network and logging in as usual. Find your .nii.gz MPAGE file and stick it on your VM desktop. Otherwise, it's possible to set up Dropbox in your file system, which I would recommend if you're doing this from somewhere other than the lab.



8. **This part is the over-night bit.** We need to run recon-all on the file. Recon-all stands for reconstruct all, so what this script does is skull-strip your MRI file and spit out a bunch of differentiated brain segments.

To initiate it, open the terminal. My scan file is called MH (initials of the person receiving it, so anywhere that says MH, sub in your file name).



Hit enter.

And now we wait.

The next morning, it should say something like, "<filename> finished without error."

#### 9. Doing everything else:

You have rh.pial and lh.pial now. Those correspond to the cortices of your right and left hemispheres. You just have to convert them to .stl files now. You can do that in FreeSurfer, too. Just type:

```
mris_convert /usr/local/freesurfer/subjects/MH/surf/rh.pial rh.stl
```

```
mris_convert /usr/local/freesurfer/subjects/MH/surf/lh.pial lh.stl
```

substituting wherever your .pial files are saved and the filenames.

Then, with the .stl files, you have to combine both hemispheres into one. I'd suggest using meshlab:

<http://www.meshlab.net/>

Import both rh.stl and lh.stl. It'll ask if you want to "unify duplicated vertices." Check yes and hit OK.

It'll give you two pretty halves of your brain! Go to filters > mesh layer > flatten visible layers. Now it's one object and not two imported files.

To print it, we have to make it smoother and reduce the polygon count. Go to Filters > Remeshing, Simplification, and Reconstruction > Quadric Edge Collapse Decimation (I think they mean 'quadratic??')

You don't need to change anything, just press apply.

Then, Filters > Smoothing, Fairing, and Deformation > Laplacian Smooth

The default is 3 steps, which is good.

That's all you need to do. Unfortunately, 100% scale doesn't fit in the campus printers (or so I thought...), so we've been doing 75% for the big brains and I made 60% ones for my friends as gifts (they turned out a little larger than fist-sized).

I suggest saving your full-sized brain mesh before you scale it down, so you have a copy of it (you can't undo in Meshlab :/ )

So file > export mesh as

and save it as .stl

Then to scale it down, Filters > Normals, Curvatures, and Orientation > Transform: Scale, Normalize

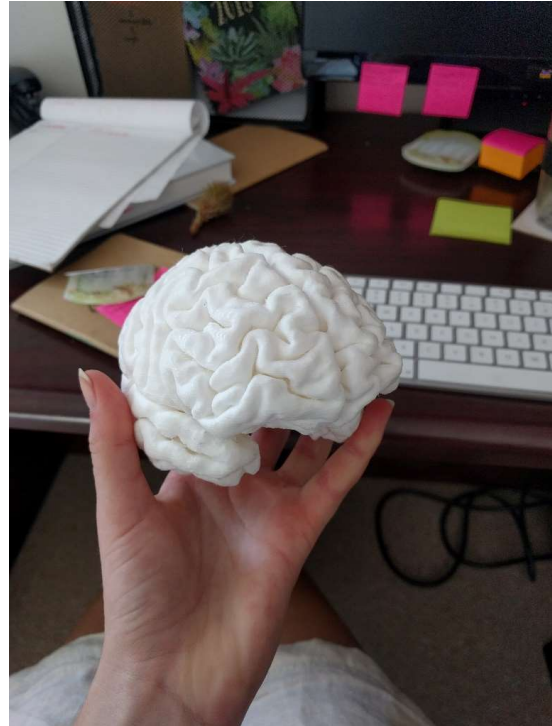
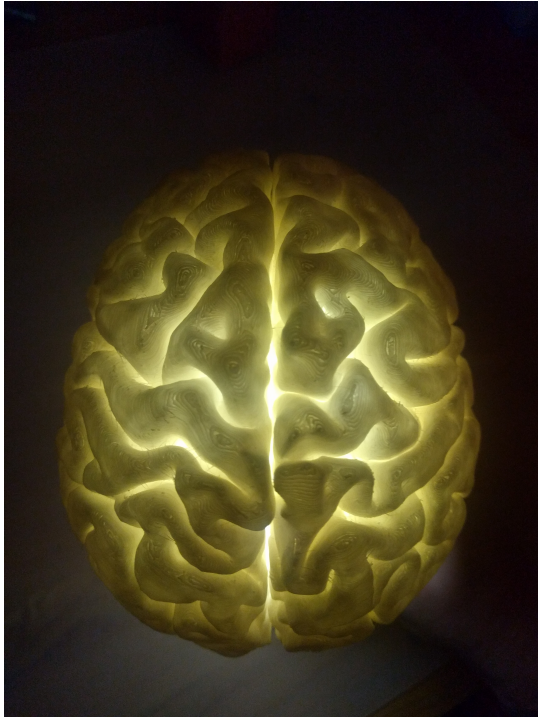
and type 0.75 in one of the fields; the other axes will adjust accordingly.

10. When you have the printable file, you stick it on a flash drive (preferably as the only file on there) and bring it to the Science Library Multimedia Resource center with your ID card.
11. Choose your filament color. See Anna's printed brain for white (opaque. Looks cool when you shine a flashlight through because the light shines through the sulci) and Natalie's for "natural" (translucent clear with a gossamer sheen).

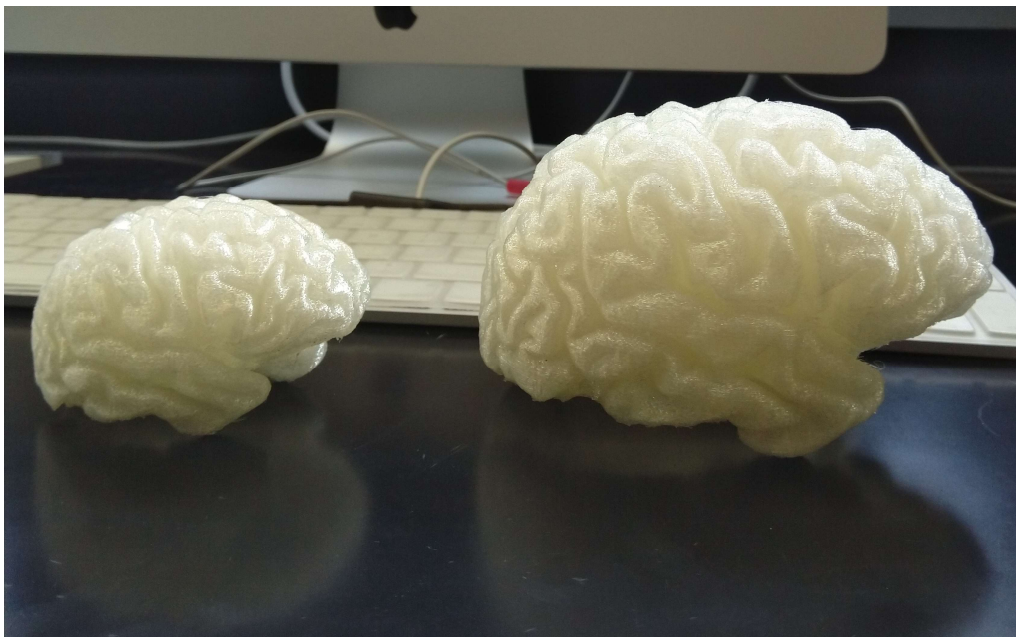


Filament Examples:

White 75%:

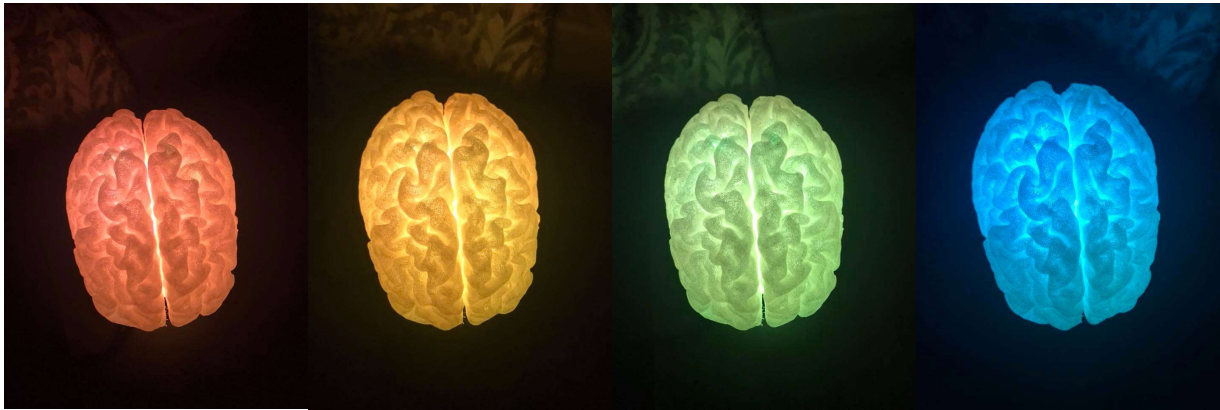


Natural 50% and 75%:





Natural + LED base



Dark Blue 60%:

