

Reconstruct: Intro for Beginners

Patrick Parker
Aug. 2017

Brief Overview of Reconstruct

Reconstruct is a program developed in the lab of Prof. Kristen Harris. Reconstruct allows users to trace and annotate images, thereby creating 3D reconstructions.

In Reconstruct, you can view and trace a series of sequential images, known as “serial sections”. The **section** is the individual image, and the **series** is the whole set of sections. The series is like a book, and the sections are the pages. Just like the pages of a book, each section is numbered. (In the Harris Lab, a series generally has around 200-250 sections.)

You can create 3D images in Reconstruct by tracing an object, paging up to the next section, tracing the object again on that section, and paging up to the next section, etc.—until you’ve traced the object on every section. Then Reconstruct can combine all your traces into a 3D image.

Reconstruct has been used to make 3D images of brain cells, blood vessels, the brain of an ant, human fetus bone, a sea lily, a fish fossil, metal alloys, tree bark, and spider genitalia. On Prof. Harris’s website, SynapseWeb, you can check out the [many uses of Reconstruct](#).

This video, [“Cruise through the Hippocampal Neuropil: Brain Cells Visualized”](#), is a cool example of what Reconstruct can do.

References:

Fiala JC (2005) Reconstruct: A free editor for serial section microscopy. J Microscopy 218:52-61. ([PDF](#))

Fiala JC, Sorra K, and Harris KM (2009) Reconstruct User Manual. ([PDF](#))

Harris KM, PI. SynapseWeb, <http://synapseweb.clm.utexas.edu/>



Installing Reconstruct and Opening a Series

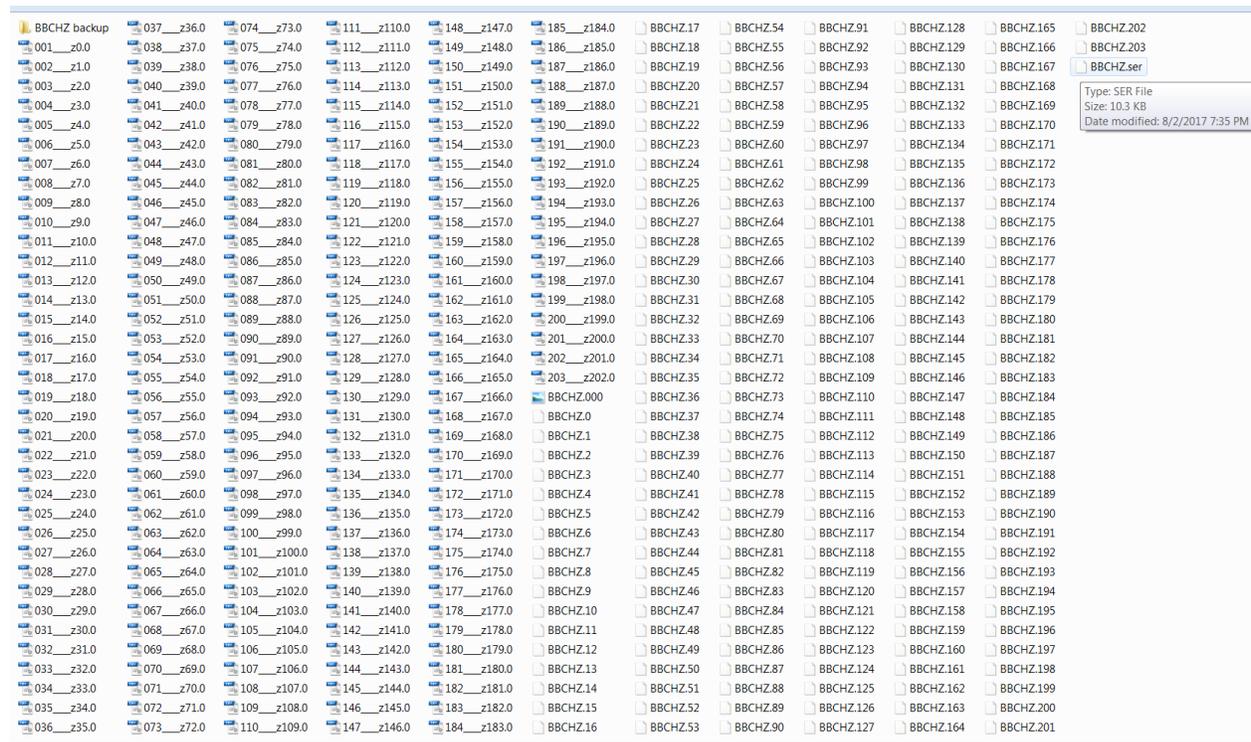
Open up a series in Reconstruct:

- Download the Reconstruct program here:
<http://synapseweb.clm.utexas.edu/software-0>
 - **If you already have a series to work on:** In the top left Menu, go to Series > Open... > select the .ser file of the series you want to open.
 - **If you don't have a series to work on:** Creating a new series is covered later in this Manual.

Notes on Reconstruct Files:

- There are 3 types of Reconstruct files: traces, images, and .ser.
- The trace files contain the Reconstruct traces for each individual section. The .ser file (.ser is short for *series*) contains traces/information which spans across many of the sections (such as Z-traces, the trace palette, settings, etc.). The image files are, of course, the images that you will be looking at and tracing.
- In order to be opened in Reconstruct, the image files, trace files, and .ser file must be *in the same folder*.
- When you open a reconstruct series, you select the .ser file to open.
- Series in the Harris Lab are named with a randomly generated 5-letter code, such as BBCHZ.

This is what the image files, trace files, and .ser file look like all in the same folder together. Note the last file in the list, the .ser file.



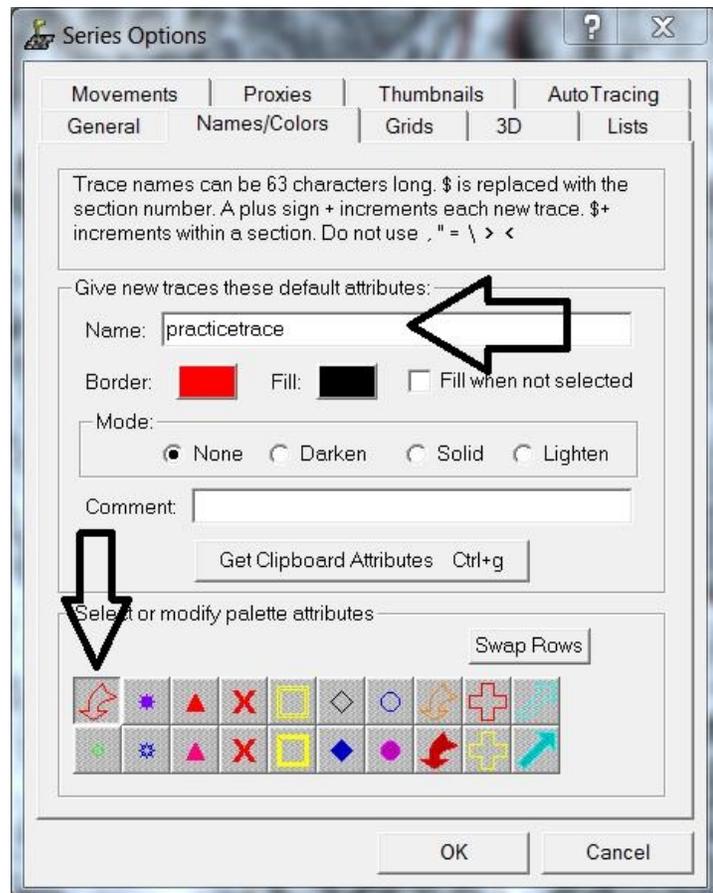
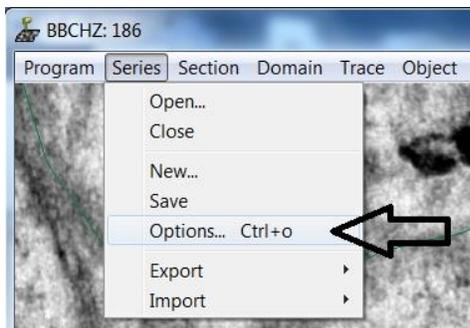
How to Make a Trace

OK, so you have a series open—what now? Let's make a trace!

How to make a trace in Reconstruct:

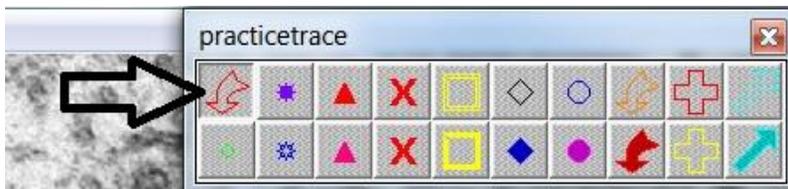
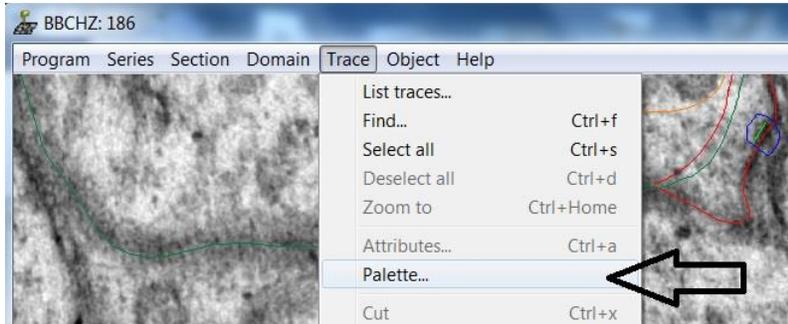
1. Choose the name and color for your trace:

- In the top left drop-down menu, open the Series Option window: go to Series > Options... (or just hit Ctrl-o).
- In the Series Option window, go to the Names/Colors tab.
- Under “Select or modify palette attributes” at the bottom, click on the first palette square. Selecting that palette square will allow you to name it or change its attributes.
- Under “Give new traces these default attributes”, next to “Name”, type in a name for your trace—maybe something like “practicetrace”.
- Click the colored square next to “Border” (i.e. the border outline color of your trace) > pick your favorite color > OK.



2. Open the Trace Palette:

- In the top left drop-down menu, select **Trace > Palette...** That opens the Trace Palette window.
- In the Trace Palette, click on your palette square to select it.



3. Choose a tracing tool:

- In the Tools Window, click on the second tool on the bottom— “Draw Freehand”—the pencil.



4. Make a trace:

- Choose an object to trace.
- Using the pencil, hold down the left mouse-button and carefully move your mouse around to trace the object.
- Release the left mouse-button when you are done with the trace.
- You are now tracing in Reconstruct!

How to move the image around: While tracing, it is helpful to move the image around or zoom in and out. In the Tools Window, click on the tool directly above the pencil— “Pan and Zoom Section”. By holding down the left button and moving the mouse around, you can move the image left, right, up, and down. By holding down the right button and moving the mouse toward or away from you, you can zoom the image in and out.

How to Make a 3D Reconstruction

OK, so you made a trace—what now? Let's make a 3D reconstruction!

1. Make traces in more sections:

- Scroll up or hit “Page Up” on the keyboard to go to the next section.
- Trace the same object that you just traced, with the same name, “practicetrace”.
- Scroll up to the next section and trace your object again.
- You can do this for a few more sections if you want. You need a minimum of two sections traced in order to make a 3D reconstruction.
- Note: All traces with the same name are grouped together as one object.

2. Make a 3D Reconstruction:

- In the top left drop-down menu, select **Object > List objects...** That opens the Object List window.
- In the Object List, find your trace named “practicetrace”. You might need to scroll down to find it in the alphabetical list.
- Click on “practicetrace” to highlight it > **Scene > Add to Scene**. (Or you can double-click on “practicetrace”, which will also add it to the scene.)
- Yay, you just made a 3D reconstruction!

