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Image properties and edit tools

Channel Color Assignment

Under the File menu, choose Preferences, choose Loading

- Default Colors – Colors are always assigned as defined here.
- File Colors – Colors are loaded based on a look up table found in the image file.
- Emission Wavelength – If this parameter is reported in the image file, a color is matched to this wavelength

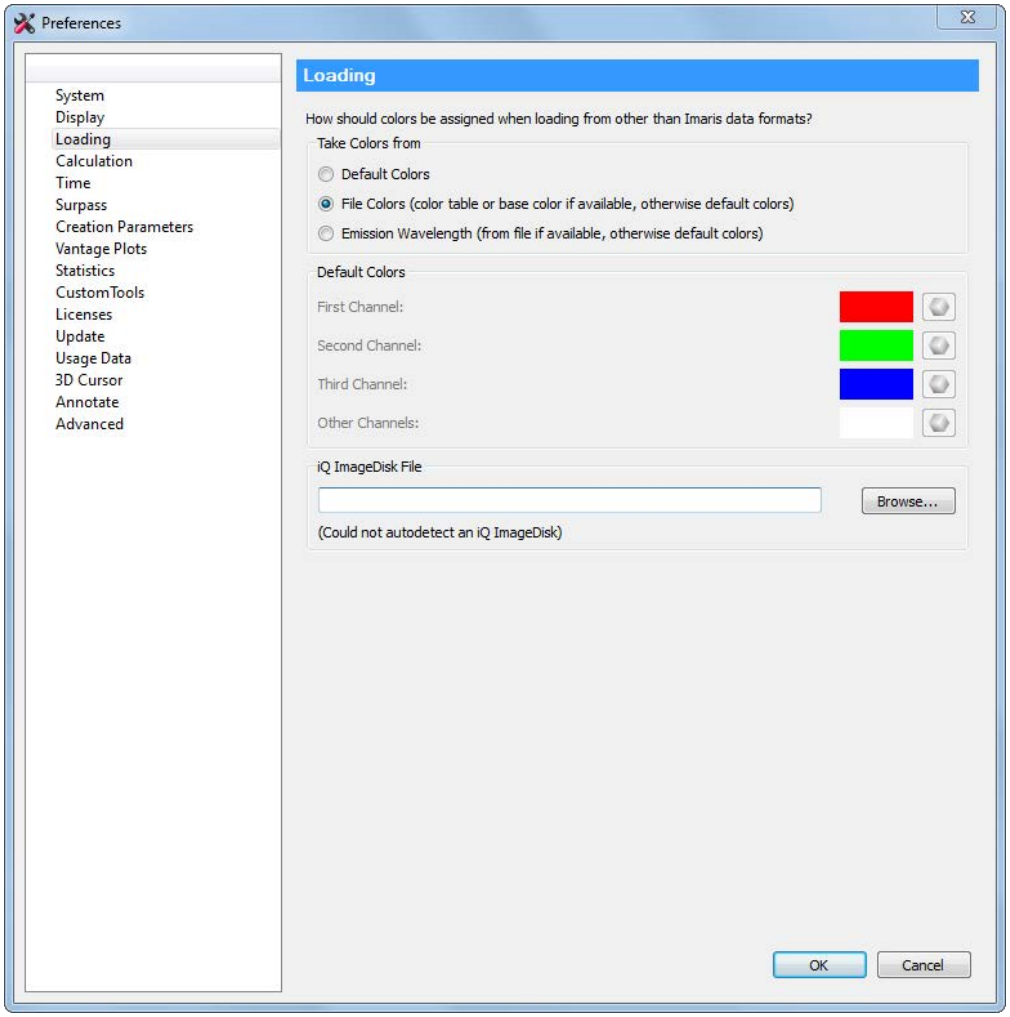

Image Properties: Geometry

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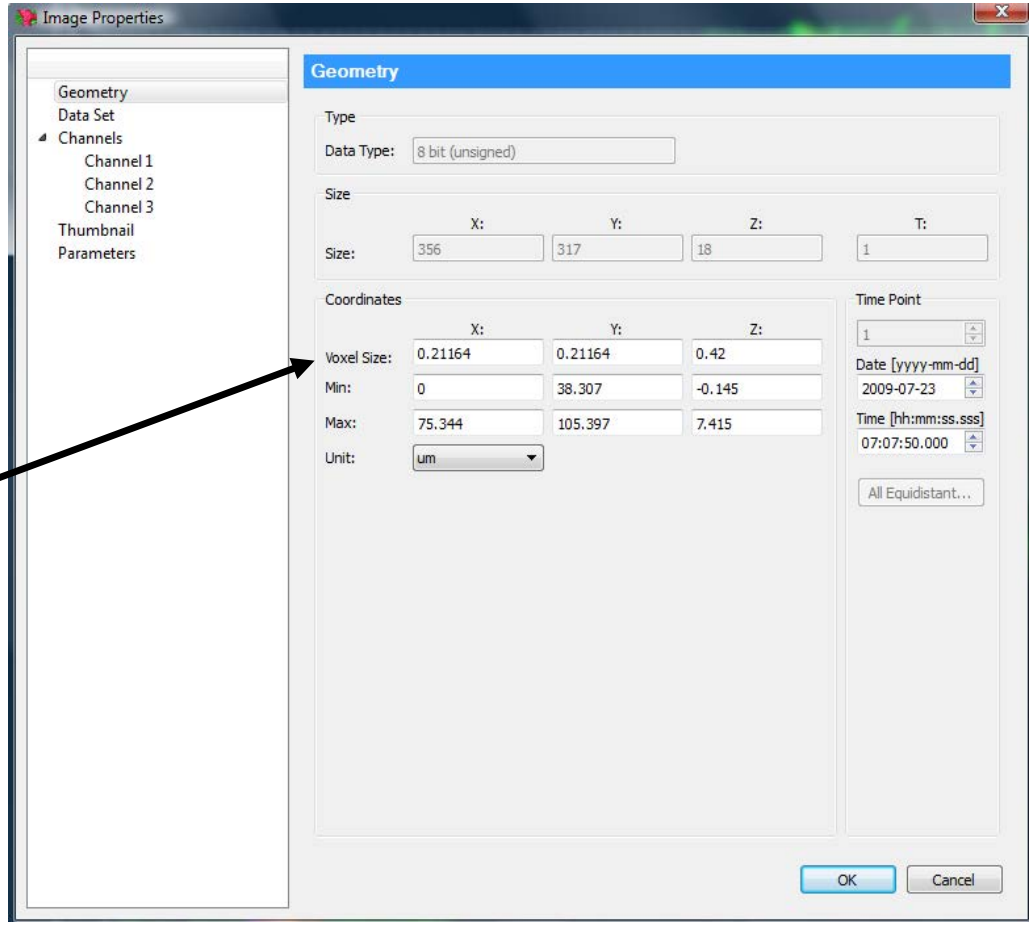
Ctrl + I

Under the Edit menu, choose Image Properties, choose Geometry

For supported file types, Imaris will load the correct voxel size and time stamps automatically

Step sizes of “1.0” should be verified, as this is the Imaris default value



- X, Y, Z Voxel Sizes
- Voxel Units
- Number of Time Points
- Time Stamps
  - “All Equidistant” to set manually
- Data Type (8 bit, 16 bit, 32 bit)

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Image Properties: Data Set

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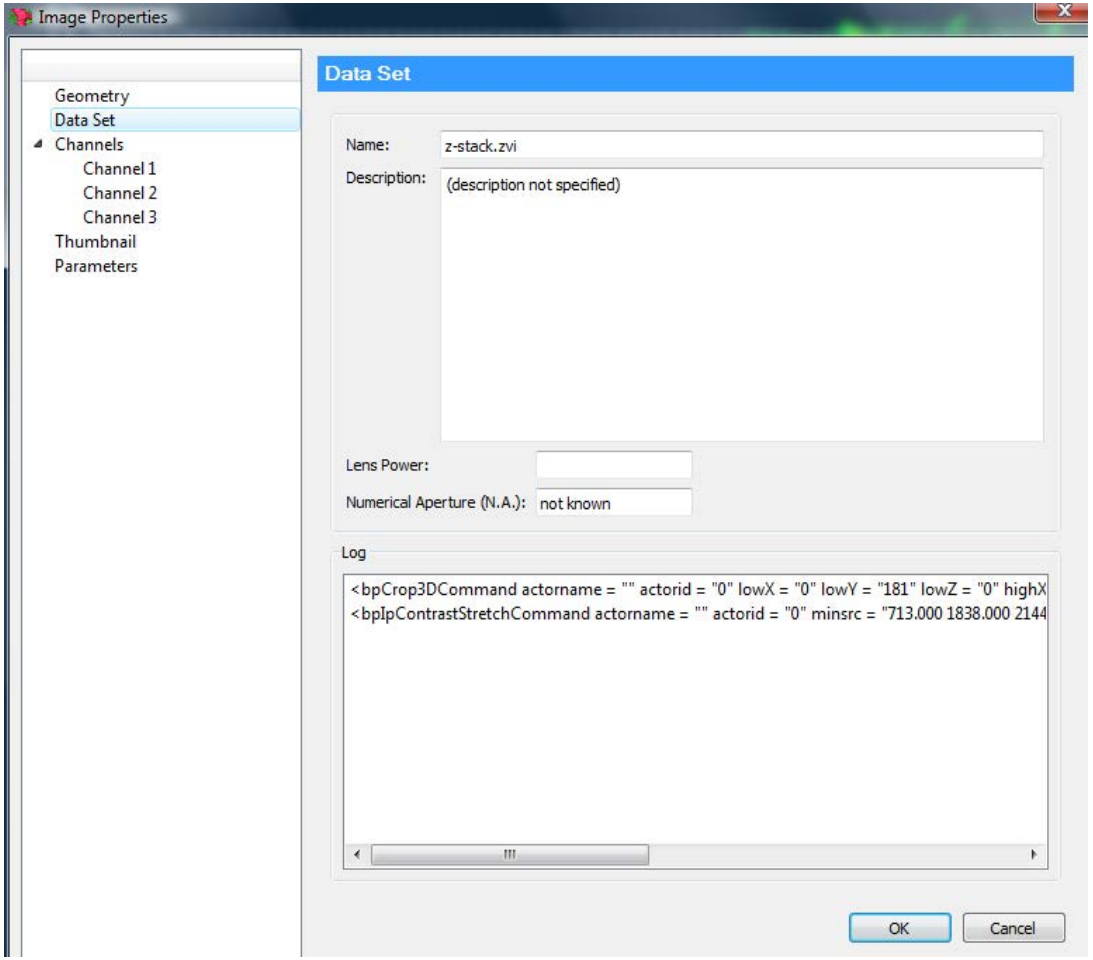
Ctrl + I

Under the Edit menu, choose Image Properties, click Data Set



All Image Types

- Numerical Aperture (N.A.)

Imaris Files Only

- Data Set Name
- Description
- Log – of Imaris Image Processing functions applied to the image

Data set name and description must be manually entered.

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Image Properties: Channel

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Ctrl + I

Under the Edit menu, choose Image Properties, click Channel X

All image files (if present)

- Channel Name
- Emission Wavelength
- Excitation Wavelength
- Pinhole Radius

Imaris Files Only

- Description of the channel

Channel description must be manually entered.

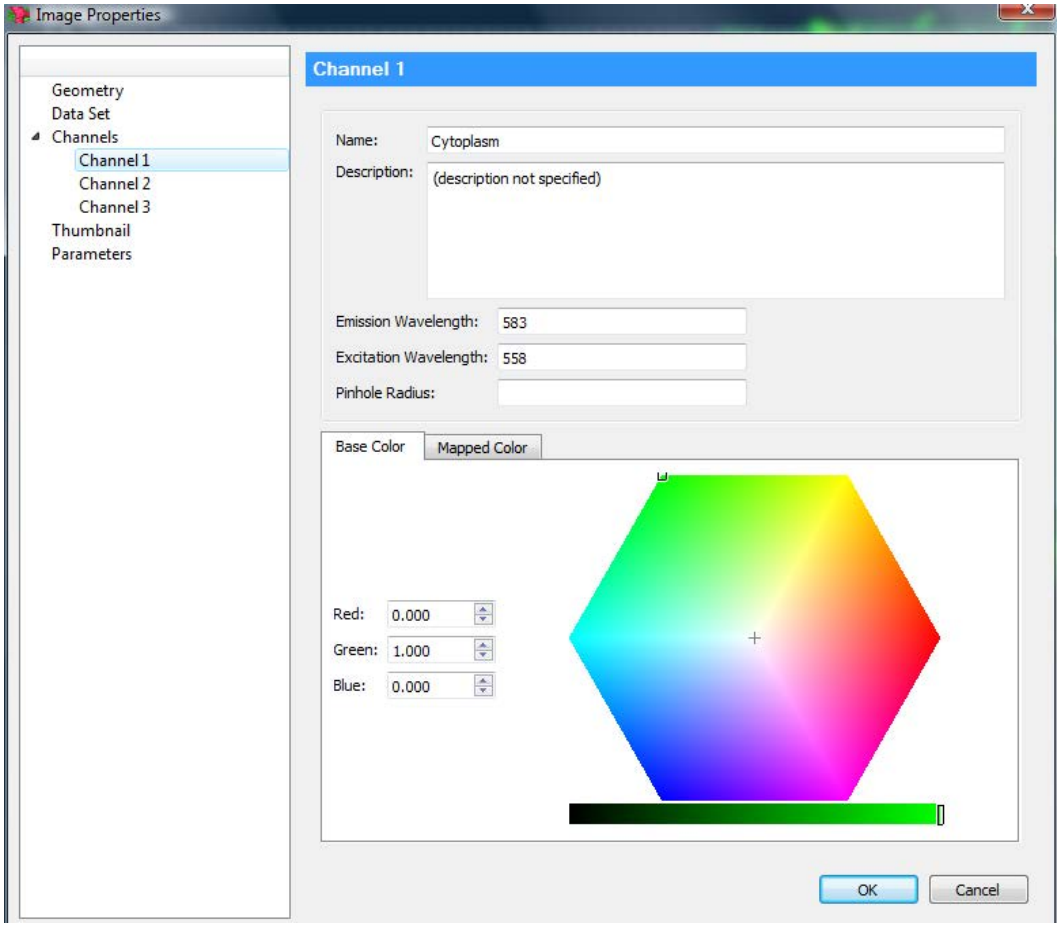

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Image Properties: Thumbnail

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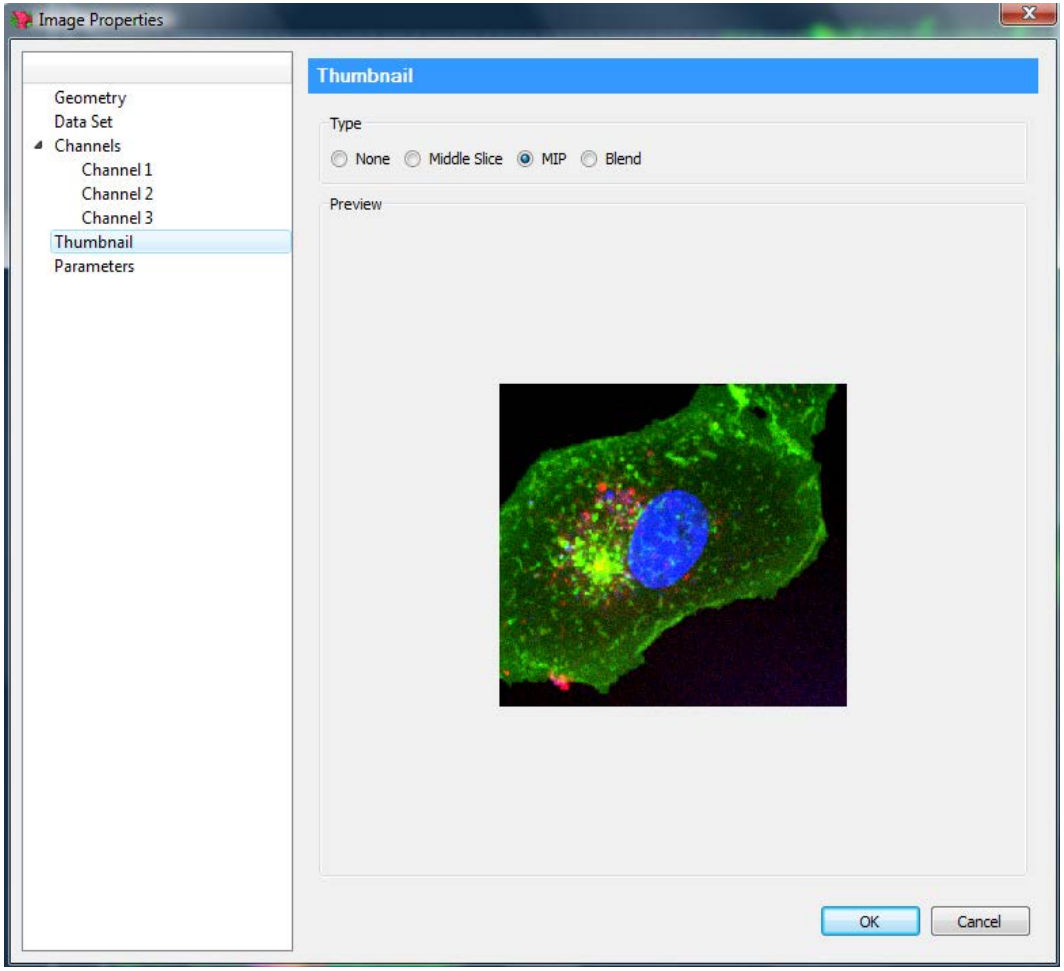
Ctrl + I

Under the Edit menu, choose Image Properties, click Thumbnail

Imaris will create a thumbnail for the Windows Explorer based on your selection here:

- None
- Middle Slice (Time Point 1)
- MIP (Maximum Intensity Projection)
- Blend (Blending Projection with lighting)



MIP and Blend options are the images produced in the Easy 3D view.

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Image Properties: Parameters

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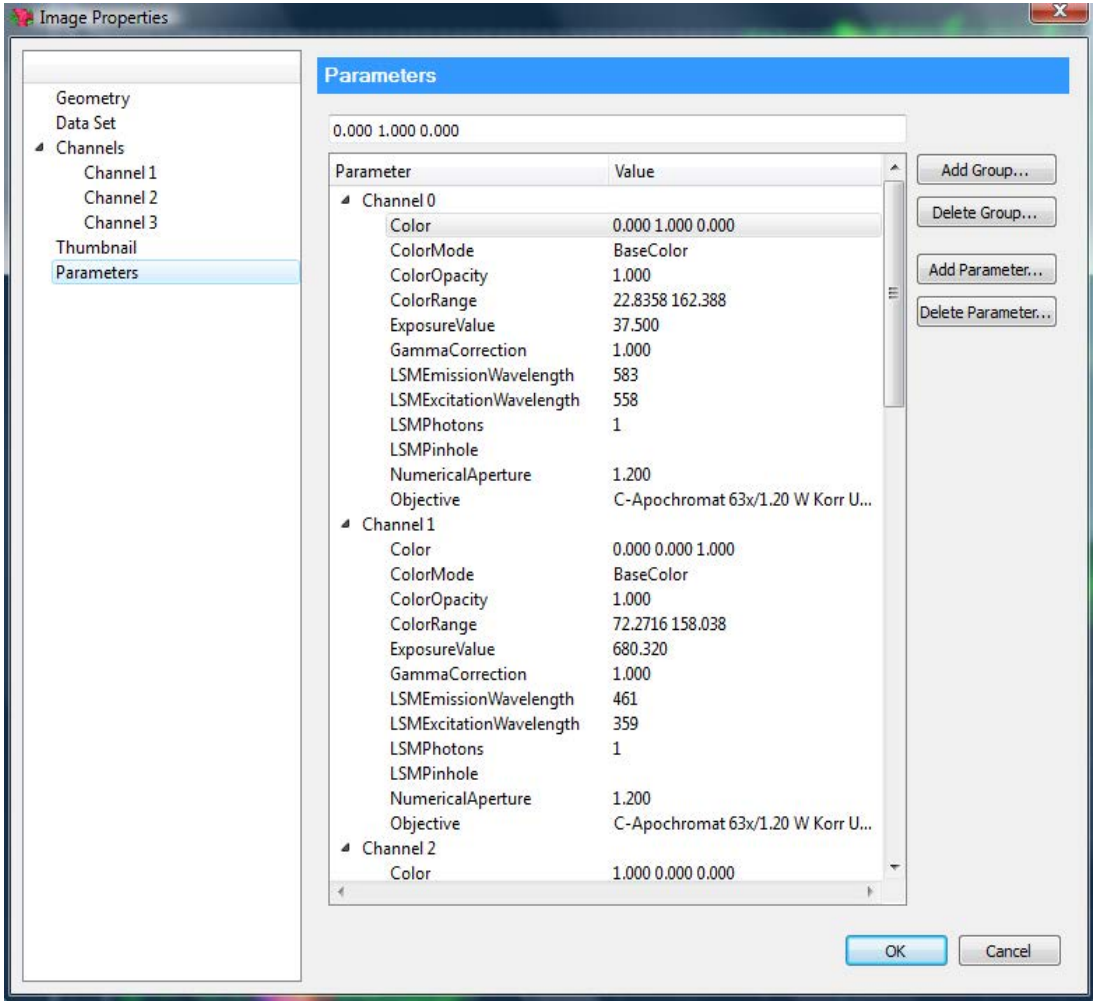
Ctrl + I Under the Edit menu, choose Image Properties, click Parameters

- Imaris searches the file header information to extract as much metadata as possible.
- Values found are placed into this table.
- The values reported depend on the file format.



Adding to or Deleting from a loaded data set

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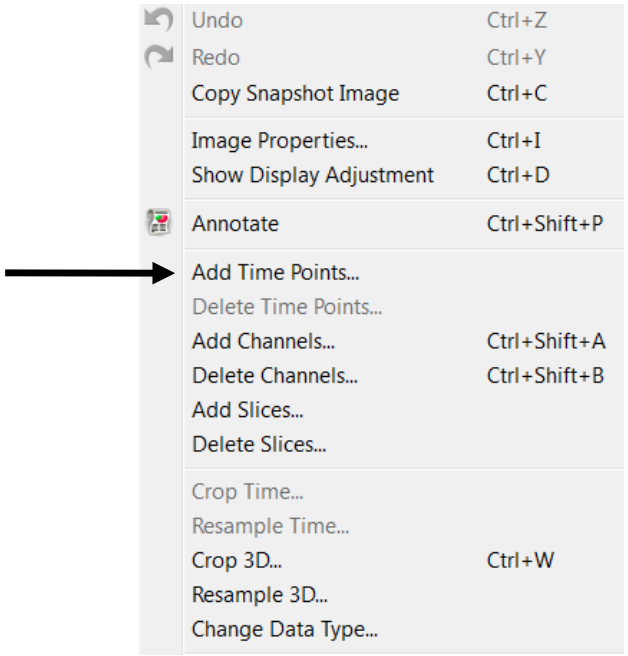
Under the Edit menu

- ***Add time points*** – adds time points to the end of an open data set (x,y,z, # of color channels and data type must be the same)
- ***Add channels*** – adds a channel to an open data set (x,y,z, t, and data type must be the same)
- ***Add slices*** – adds z layers to the end of an open data set (x,y, t and data type must be the same)
- ***Delete Time Points / Channels / Slices*** - removes the appropriate component from the open dataset



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Cropping a loaded data set

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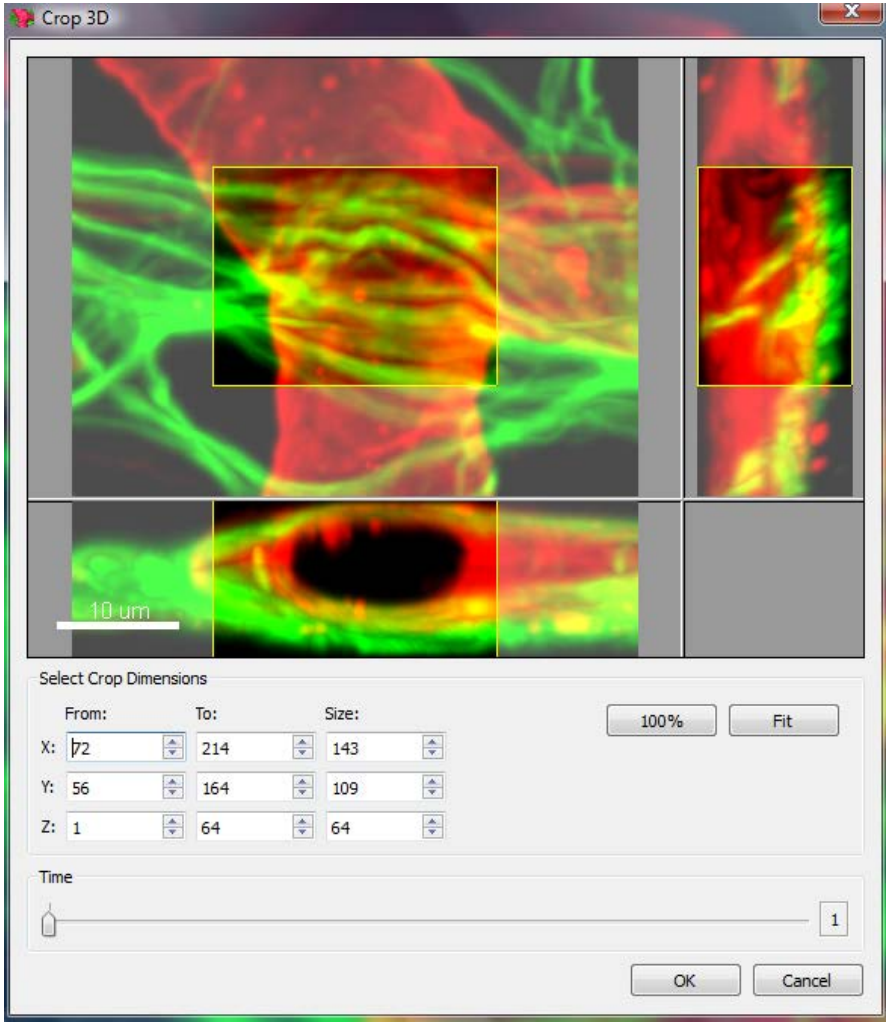
Under the Edit menu, choose Crop 3D

- See MIP image in xz, and yz view as well as xy
- Can zoom (center mouse) and pan (right mouse) in image.
- Choose selection by entering numbers or moving box in image
- Disadvantage – data is already loaded in memory… If dataset size is the problem, “Resampling Open” is more efficient



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Huge Data Capable

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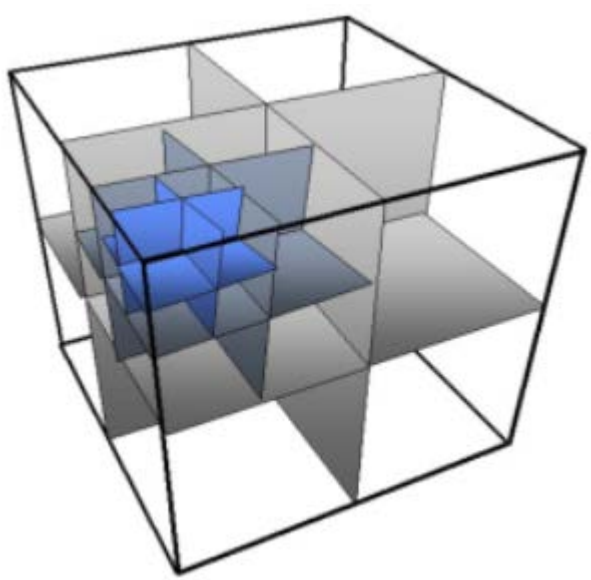
- Imaris can read and visualize at least **50 GB** (single frame!) multi-everything image.
- **Imaris 5.5** (2006) was the first version of Imaris to support "**huge images"**. This enables users to load, process, and visualize images that are far **larger than the available computer memory** (RAM).
- Imaris will speed up processing of large images by **only loading parts of the image** that are visible to the user or required by an image processing operation.
- **Imaris 6.3** (2009) introduced a technical feature which makes the zooming and panning much **faster** and **smoother** on such large images.
- Saving files in **version 8.2** is significantly faster (up to a factor of 5) than previous versions due to **multithreaded gzip compression** of image data.



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Imaris File Converter

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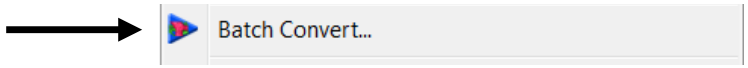
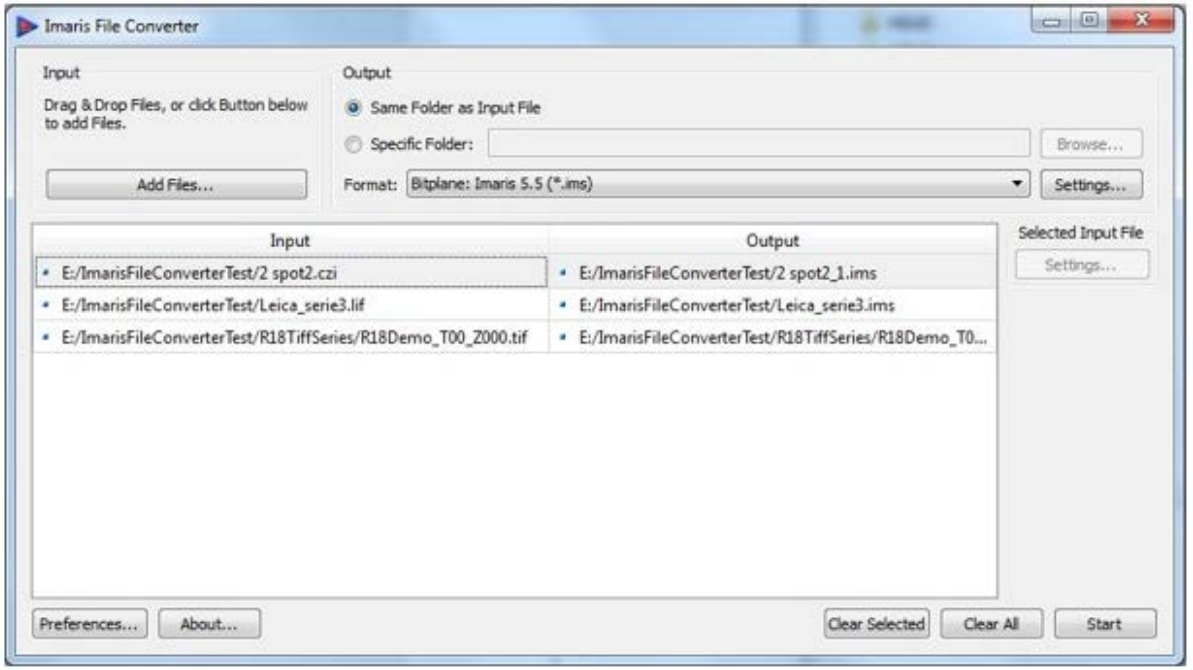
- Batch conversion of extremely large files to **Imaris 5.5 file format** allows near-instant loading into Imaris
- Runs independently of Imaris
- Does not require an Imaris license
- Import Options
  - –A. Drag and Drop
  - –B. Click Add Files
- Select the output directory
  - –A. Source
  - –B. Common Directory

Arena Tab active

File menu





OXFORD INSTRUMENTS

Bitplane made the IMS file format Open Source

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IMARIS 5.5 File Format Description (IMS)

0. Introduction

The Imaris File Format is designed to allow fast visualization of very large images. For this purpose it stores not only the original image data but also lower resolution versions of the original data. This allows the visualization software to load only low resolution data when those are sufficient. Also for the purpose of fast visualization the Imaris File Format stores the image data in contiguous 3D chunks (hdf-terminology for 3D blocks) which allows the visualization software to load only those data that are in the field of view. The multiresolution structure and the chunk-wise storage layout are the cornerstones of this high performance file format.

1. Summary

The file format is based on the standard HDF5 (Hierarchical Data Format 5) developed by The National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign. This allows the use of widely available HDF5 libraries and tools.

An Imaris 5.5 file consists of three main types of groups (or folders) for the image:

DataSet: The image itself (includes all slices, channels, and time points, resolution levels)
DataSetInfo: Image metadata information (e.g. voxel size)
Thumbnail: 2D thumbnail of the image.

An additional group may contain the Imaris Scene:

Scene or Scene8: surpass objects, annotations, etc.

In this document, the terms group, attribute and dataset refer to the concepts given in the HDF5 documentation. Whenever a path is given (/DataSet/ResolutionLevel 12) one should open the corresponding groups and subgroups.

The prior "Imaris Classic" and "Imaris3" file formats are not based on the HDF5 specifications and will not be described in this document.

2. Tools and Resources

Bitplane uses the HDF5 library from the HDF Group as a backend for reading and writing HDF5 files. A good starting point for reading about the HDF5 file format is the website of the HDF5 Group, http://www.hdfgroup.org/HDF5/. The HDF Group provides its library as open source and free of charge. It is recommended to make use of the library rather than creating your own HDF5 reader/writer.

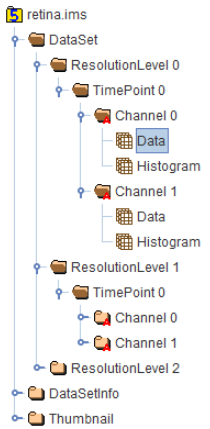
The HDF Group also provides helpful tools along with the library. Noteworthy is HDFView, a java-based HDF file inspector. It can be downloaded free of charge here.

It is highly recommended to use HDFView to look at some example IMS files in order to gain an understanding of the file format.

3. Structure

The Imaris 5.5 file structure is composed of a root "folder" and three main groups, DataSet, DataSetInfo, and Thumbnail.

The screenshot on the right of an IMS file in HDFView shows the HDF file structure. The example image has two channels and 3 resolution levels.



The DataSet folder contains the actual image data. The DataSetInfo folder contains descriptive parameters. The Thumbnail folder contains a 2D thumbnail of the image.

Full description:

http://open.bitplane.com/Default.aspx?tabid=268

4. Data

The multiresolution structure and the chunk-wise storage layout are the cornerstones of this high performance file format.

4.1 Chunk Size

For efficient data access for visualization the Imaris 5.5 file format stores image data in 3D chunks. Typical chunk sizes are 128x128x64 or 256x256x16. The optimal chunk size is determined by the geometry of the image and it is not easy to specify rules for reproducing exactly the chunk sizes that Imaris will write into the hdf-file. It is also not necessary because the hdf library is very efficient at reading data as long as the layout is not entirely different. If you want to write image files for Imaris to read, try to create 3D chunks that are of roughly 1 Megabyte size. This will produce good results for rendering in Imaris. If you need to tweak performance, please contact the Bitplane engineering team to get more detailed information.

4.2 Resolution levels

For efficient visualization the Imaris 5.5 file format stores not only the original data but also low resolution versions of the original data. The number of resolution levels in the file is determined by the following pseudocode:

```
void getMultiResolutionPyramidalSizes( const size_t[3] aDataSize,
std::vector& aResolutionSizes)
{
const float mMinVolumeSizeMB = 1.f;
aResolutionSizes.clear();
size_t[3] vNewResolution = aDataSize;

float vVolumeMB;
do {
vResolutionSizes.push_back(vNewResolution);
size_t[3] vLastResolution = vNewResolution;
size_t vLastVolume = vLastResolution[0] * vLastResolution[1] * vLastResolution[2];
for (int d = 0; d < N; ++d) {
if ((10*vLastResolution[d]) * (10*vLastResolution[d]) > vLastVolume / vLastResolution[d])
vNewResolution[d] = vLastResolution[d] / 2;
else
vNewResolution[d] = vLastResolution[d];
// make sure we don't have zero-size dimension
vNewResolution[d] = std::max((size_t)1, vNewResolution[d]);
}
vVolumeMB = vNewResolution[0] * vNewResolution[1] * vNewResolution[2]) / (1024.f * 1024.f);
} while (vVolumeMB > mMinVolumeSizeMB);
}
```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