Batch Coordinator
Quick Start Tutorials

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Table of Contents

1   Batch Coordinator

Batch Coordinator is easy to use software designed specially for effective image processing and analyses.
Batch Coordinator collects commands that you might ordinarily issue in Imaris, in order to perform an image processing and analysis, into a single batch job and executes them together. By collecting image processing and analyzing commands, Batch Coordinator provides opportunity to execute multiple operations on a large data set just with one click.

Batch Coordinator gives a great degree of customization and uniformity in a multiple data set processing, reducing time and increasing reproducibility of repetitive procedures by decreasing risk of inconsistency. By providing standardized output, both in graphical and statistical form, Batch Coordinator makes easy a comparison and assessment of multiple data sets.

1.1 Introduction

Quick Start Tutorials provides an overview of base usage of Batch Coordinator. Quick Start Tutorials is a series of examples and supporting commentaries designed to quickly acquaint new user with the structure, possibilities and the most compelling features of the Batch Coordinator.

In the Quick Start Tutorials, you will follow a series of straightforward, step-by-step instructions. Each tutorials designed to show a particular aspect of a batch processing and they are designed to be followed sequentially. A reasonable knowledge of Imaris is assumed. The tutorials are cross-referenced by hyperlinks highlighted in blue underlined font. The Table of Contents and the Index provide further support for navigation in the tutorials. At any time during the tutorial, you can access Reference Manual for additional information and an in-depth explanation of specific features of Imaris.

Each tutorial is a hands-on seminar, therefore open Imaris and Batch Coordinator on the left hand side of the screen and adjust the online Tutorial on the right hand side of the screen and practice step-by-step. If you prefer to use a printout, a copy of this document is also provided in PDF format.
When you finish the tutorial, you'll have a greater understanding of how to implement Imaris Batch Coordinator in your research and be ready benefiting from of user friendly, fast, and powerful Batch Coordinator in processing microscopic images.
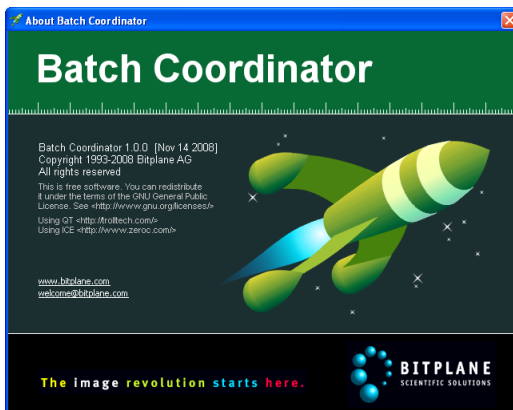
1 - Batch Coordinator

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www.bitplane.com or contact support@bitplane.com.

1.2 Batch Processing

Batch image processing allows users to create, manage, and execute routinely repeated tasks quickly and efficiently. It automates repetitive tasks of a multiple image processing and analysis and save you a lot of time. Batch processing ensure consistency and accuracy by carrying out in exactly the same way analysis and processing for every single image within a large dataset.
The Batch processing has four stages:
1. Creating a command sequence in Imaris and submitting the commands with the adjusted parameter values to Batch Coordinator.
2. Selecting images for processing and analysis.
3. Running Bach Coordinator and executing the complete command sequence on the selected input images.
4. Reviewing the results.

Commands

Commands could be defined as a set of the actions requested to be performed on the input files. Information and specifications that the command uses to perform its action are called **parameters**. There are a variety of available commands, like the most used ones: Flip, Rotate, Crop, Resample, Gaussian filter, Threshold Adjustment; and some complex commands like Spots and Surface creation.
Batch job consist of the **command sequence** applied to the selected **input files** as a singe command unit, and the resulting **output**, collected in a newly created batch file.

1.3 Starting the Batch Coordinator

It is advisable to start the Batch Coordinator either before or concurrently with the Imaris.
Double-click on the Batch Coordinator icon.

Batch Coordinator

Double-click on the Imaris icon.

Imaris

PC: Double-click on the Imaris and Batch Coordinator shortcuts on the desktop of your computer to open the programs.
Mac: In the folder Applications double-click on Imaris and Batch Coordinatorto open the programs.

1.4 Main Screen

The main screen in Batch Coordinator provides the facility to build, submit and process batch jobs. The main screen is divided into two areas and has two Toolbar buttons sections.
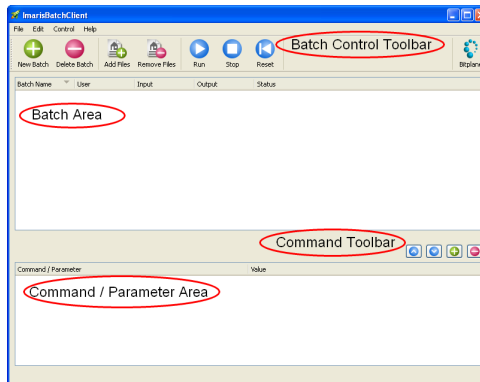
Batch Area

In Batch Area the hierarchical structure provides information on existing and completed Batch jobs such as the names of Batch, input and output files, user name and the status information.

Batch Control Toolbar

Batch Control toolbar provides the user shortcuts for accessing the main program features. Contains seven buttons named New Batch, Delete Batch, Add Files, Remove Files, Run, Stop, Reset.

Command Parameter Area

In the Command Parameter Area information about the command sequence as well as commands parameter specific Values are displayed.
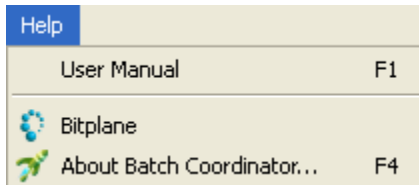
Command Toolbar

The Commands toolbars let you create or delete commands or edit command sequence arrangement.

1.5 User Manual

The User Manual provides a description of all menu entries, display modes, functions and parameters. To open the online User Manual click on the menu **Help** and select **User Manual**.

The Imaris Batch Coordinator Reference Manual displays.

Imaris Batch

Contents | Search

- ⊞ Introduction
- ⊞ Getting Started
- • Main Screen
- ⊞ Batch Creation
- ⊞ Menu File
- ⊞ Menu Edit
- ⊞ Menu Control
- ⊞ Menu Help
- ⊞ Batch Area
- ⊞ Batch Control Toolbars
- ⊞ Command/Parameter Area
- • Command/Parameter Toolbars
- • Spots and Surfaces
- • Output Statistics File

2   Smoothing and Rotating Images

In this tutorial you will learn the Batch Coordinator basic working steps. This tutorial will provide a step-by-step guide how to create the command sequence ⌐11⌐, select the input files ⌐14⌐ and execute a batch job ⌐26⌐. The tutorial describes the principles of command sequence ⌐11⌐ design and covers the output file name ⌐14⌐ creation rules. As an example, we will create the command sequence containing **Rotate** and **Gaussian filter** commands and select the Retina, Pyramidalcell and R18Demo images as the input files. In the last part of this tutorial you will find a short description how to review the output files ⌐17⌐.

2.1 Starting the Batch Coordinator

Start the Batch Coordinator either before or concurrently with the Imaris.
Double-click on the Batch Coordinator icon.

 Batch Coordinator

Double-click on the Imaris icon.

 Imaris

PC: Double-click on the Imaris and Batch Coordinator shortcuts on the desktop of your computer to open the programs.
Mac: In the folder Applications double-click on Imaris and Batch Coordinatorto open the programs.

2.2 Open image

In Imaris in the menu **File** select **Open**. Select the file **Retina** and Open File window will appear. Click on **Add to Batch button.** In Batch Coordinator a new batch is automatically created   with **Batch Name-Open** and **User Name.**

Batch Name	▼	User	Input	Output	Status
└── Open		Bitplane			

Switch back to Imaris. Open the demo image Retina in the **Surpass** view.
PC:\ProgramFiles\Bitplane\Imaris\images\Retina.ims
Mac:/Applications/Imaris.app/Contents/SharedSupport/images/Retina .ims
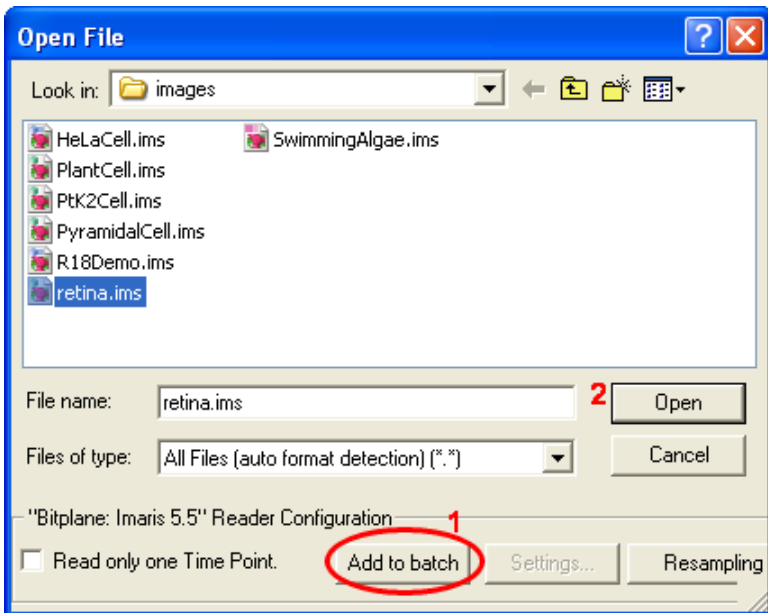
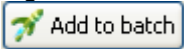A Retina image is displayed in Imaris Main screen.
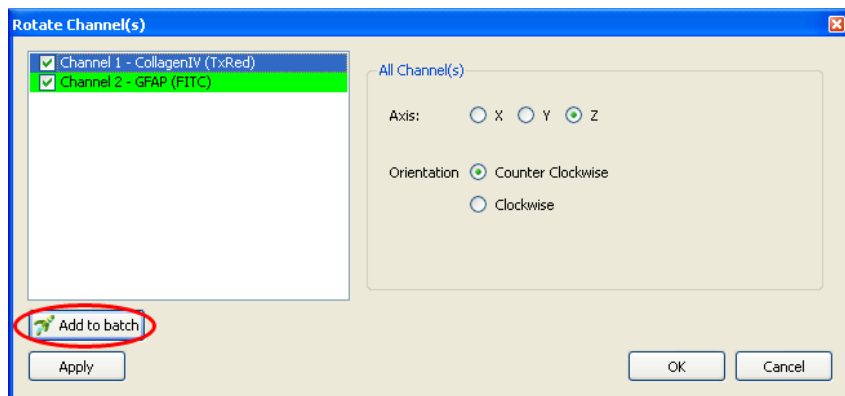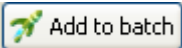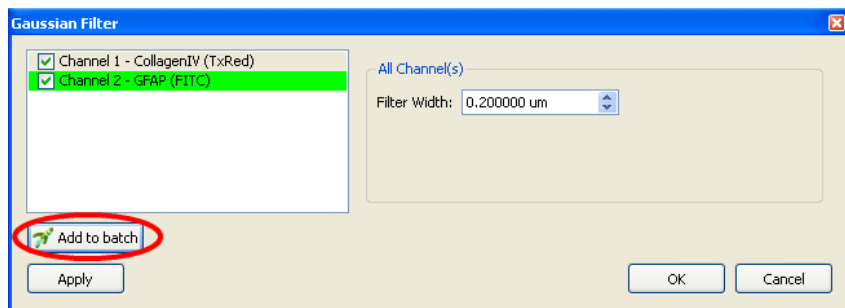
2.3 Create Command Sequence

The following example shows how to submit commands **Rotate** and **Gaussian filter** into Batch Coordinator.

In the menu **Image Processing** select the command **Rotate**. A Rotate Channels window will appear. Select the rotation orientation **Counter-clockwise** of **both channels** along the **Z axis**.

Click on the **Add to batch** button submits the command **Rotate** into Batch Coordinator.
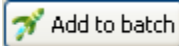

In the menu **Image Processing** select the command **Gaussian filter**. In Gaussian filter window select **both channels** and enter **0.2um** as a Filter Width value. Click on the **Add to batch** button submits the command **Gaussian filter** into Batch Coordinator.
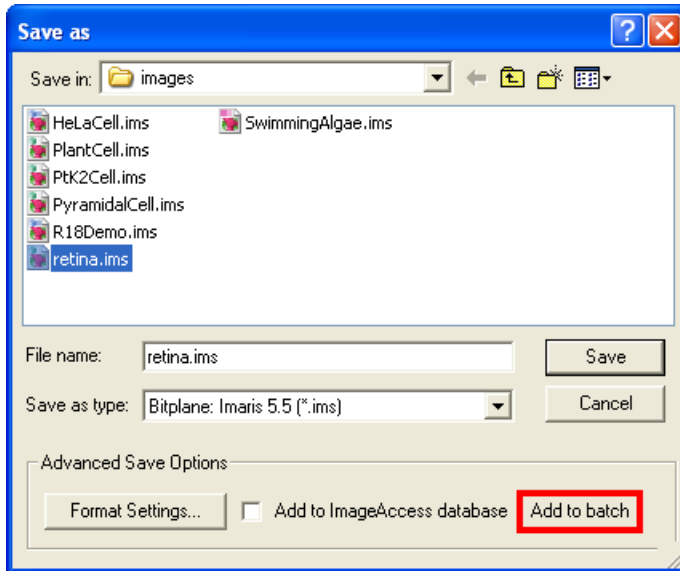
The last step in creating the command sequence in Imaris is selecting the commands **Save as** ![Save as icon]. Click on the **Add to batch** button ![Add to batch] and the command **Save** is added in the command sequence in Batch Coordinator.

Selecting and submitting commands could be repeated for any commands that you would like to execute in Batch Coordinator.

See also: Spots Creation-Command Sequence 21

2.4 Command Sequence in Batch Coordinator

Switch to Batch Coordinator . In the batch area a new batch is created with automatically created **User Name** and **Batch Name-Rotate.** A Batch Name always match the name of the first submitted command in Imaris, so the new Batch is named **Rotate**. The user name is automatically created using log in system information.

Batch Name	User	Input	Output	Status
Rotate	Bitplane			

In the Command/Parameter area the **command sequence** is displayed. The command sequence containing following commands: Open, Rotate, Gaussian Filter and Save. The commands in the command sequence are listed in the same order as they were submitted by Imaris.

| Command / Parameter	Value
⊞ Open	
⊞ Rotate	
⊞ Gaussian Filter	
⊞ Save	

To demonstrate the principle of submitting the parameter values from Imaris to Batch Coordinator click on the (+) symbol next to the command **Gaussian filter**. An expanded command line shows all parameter values. The value for parameter **Sigma** is set to be **0.2** as set by Imaris for Filter Width in Gaussian filter window. The value for Parameters **Channel** is set to **on on** (filter be applied to the both channels).

Command / Parameter	Value
⊞ Open	
⊞ Rotate	
⊟ Gaussian Filter	
Sigma	0.200
Channels	on on
⊞ Save	

See also: Smoothing and Rotating Images-Create Command Sequence

2.5 Input Files

The next step in image Batch processing is selecting all files that will be processed with the created command sequence. Click on the Add files Button [Add Files] and Choose input files window appears.
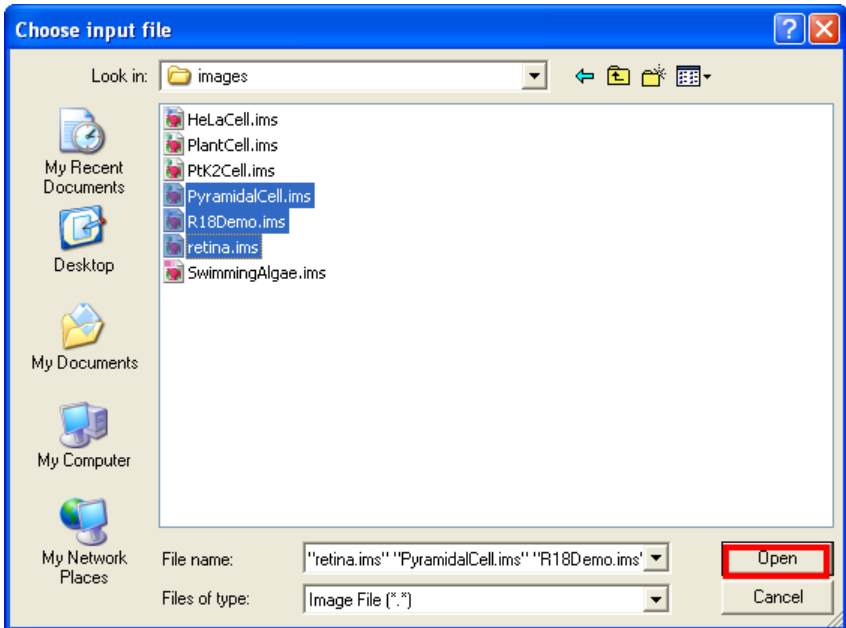
Select the **PyramidalCell**, **R18Demo** and **retina** files for Batch execution and click **Open**. All selected files will be added to the Input file list in the Batch area.

2.6 Output Files

After selecting the input files the **Output files names** will be **generated** automatically and added to the Output file list.
All output files will be placed in the same directory as the input file, in the **new folder**, called **batch output**.
The output file names are assigned by using a default-naming rule comprised of the following: **input file name** with suffixes **batch name**, **command name**, **date stamp** and **file number**.
The output file inherit the **input file** name followed by:

- **batch name** - the name of the first command in the command sequence
- **command name** - the name of the command that generates and saves the output files
- **date stamp** - output file creation date in the format **yyyy-mm-dd**
- **file number** - number of the output files being created (consecutive integer numbers).

Batch Name	▼	User	Input		Output		Status
⊟ Rotate		Bitplane					
⋯			PyramidalCell.ims	☑	PyramidalCell-Rotate-Save-2008-11-11-1.ims	☑	Waiting
⋯			retina.ims	☑	retina-Rotate-Save-2008-11-11-1.ims	☑	Waiting
⋯			R18Demo.ims	☑	R18Demo-Rotate-Save-2008-11-11-1.ims	☑	Waiting

Please note: The output file type and format depends on the commands specified to be executed in Batch job.

All files with extension **IMS** are generated by the command **Save**, regardless of preceding commands in the command sequence. The file name of these output files contain **Save** as the **command name**.
All files with extension **IMX** and **XLS** are generated either by the commands **Spots** or **Surfaces**, regardless of preceding commands in the command sequence. The file name of these output files contain **Spots** or **Surfaces** as the **command name**.

See also: Smoothing and Rotating Images-Create Command Sequence 13, Spots Creation-Multiple Output Files 25

2.7 Running Batch Coordinator

Starting Batch Job

To initialize a Batch job click on the icon Run ▶ . By Running Batch Coordinator, the complete command sequence is executed on all input files and the results are collected and stored in the output file list. In status line massage **Queued** for all file waiting to be executed.

Batch Name ▽	User	Input	Output	Status
⊟ Rotate	Bitplane			
		PyramidalCell.ims ☑	PyramidalCell-Rotate-Save-2008-11-11-1.ims ☑	▮▮▮▮▮▮ 50%
		retina.ims ☑	retina-Rotate-Save-2008-11-11-1.ims ☑	▮▮▮▮▮▮ 45%
		R18Demo.ims ☑	R18Demo-Rotate-Save-2008-11-11-1.ims ☑	Queued

Completed batch job are marked **Finished** and remain in the batch display.

Batch Name ▽	User	Input	Output	Status
⊟ Rotate	Bitplane			
		PyramidalCell.ims ☑	PyramidalCell-Rotate-Save-2008-11-11-1.ims ☑	Finished
		retina.ims ☑	retina-Rotate-Save-2008-11-11-1.ims ☑	Finished
		R18Demo.ims ☑	R18Demo-Rotate-Save-2008-11-11-1.ims ☑	Finished

See also: Spots Creation-Running Batch Coordinator 26
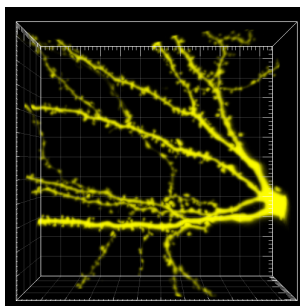
2.8 Reviewing Batch Results

To verify and confirm the Batch processing results, click on the quick open icon next to the output file name, **retina-Rotate-Save-yyyy-mm-dd-1.ims**. Imaris will be launched, displaying Retina image after the batch processing.
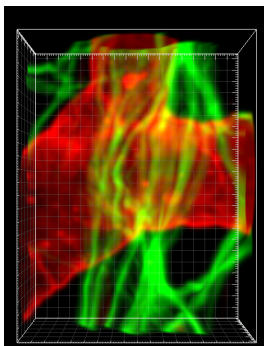
The resulting files can be also open in Imaris. Start Imaris and in the menu File select **Open.** From the **batch output** folder select the **PyramidallCel-Rotate-Save-yyyy-mm-dd-1.ims** file. The Pyramidal cell image is displayed after the batch processing.

Please close Imaris and Batch Coordinator before you start with the next tutorial.

See also: Spots Creation-<u>Reviewing Batch Results</u> 27

3   Spots Creation

Creating **Spots** and **Surfaces** with Batch Coordinator have many similarities to the other Batch commands, but there are some distinct differences that need to be taken into account when creating Batch job containing commands **Spots** or **Surfaces**.

In this tutorial you get familiar with the command **Spots** in Batch Coordinator. First you will learn how to create the command sequence 21 containing the command **Spots** and than how to submit it to Batch Coordinator. The unique features of the command Spots will be explainedIn the chapter Spots in Batch Coordinator 23 . After selecting input files 24 , the explanation of the specific multiple output files 25 will be given. Finally, the statistical and image results 27 of the Batch Spots creation will be demonstrated.

The same method used for the submitting the command **Spots** can be applied for the command **Surfaces**. The system of multiple output files display explained for the command Spots is identical for the command Surfaces.

3.1 Starting the Batch Coordinator

Start the Batch Coordinator either before or concurrently with the Imaris.
Double-click on the Batch Coordinator icon.

 Batch Coordinator

Double-click on the Imaris icon.

 Imaris

PC: Double-click on the Imaris and Batch Coordinator shortcuts on the desktop of your computer to open the programs.
Mac: In the folder Applications double-click on Imaris and Batch Coordinatorto open the programs.

3.2 Open a Dataset

In Imaris in the menu **File** select **Open**. Select the file **SwimmingAlgae** and Open File window will appear. Click on **Add to Batch button**. In Batch Coordinator a new batch is automatically created with **Batch Name-Open** and **User Name.**

Batch Name	▼	User	Input	Output	Status
└─ Open		Bitplane			

Switch back to Imaris.Open the demo image SwimmingAlgy cell in the **Surpass** view.
PC:\ProgramFiles\Bitplane\Imaris\images\SwimmingAlgae.ims
Mac:/Applications/Imaris.app/Contents/SharedSupport/images/
SwimmingAlgae.ims
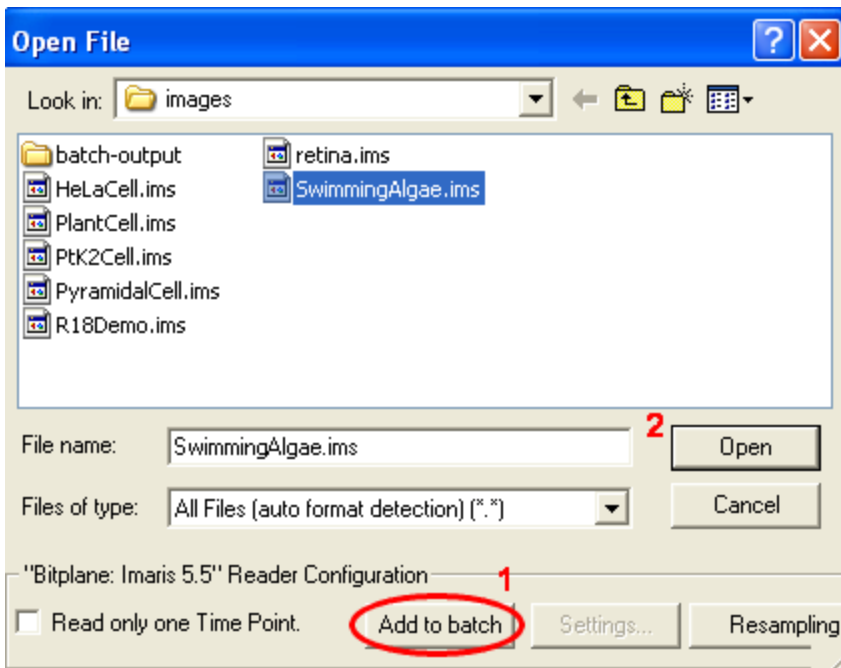
A SwimmingAlgae image is displayed in Imaris Main screen.

3.3 Command Sequence

Using the Spots **Creation Wizard** the command sequence containing the command Spots is created. In the Creation Wizard all the parameters for Spots creations are adjusted, and all adjustments are instantly viewed.

In the **Objects** toolbar of the Surpass view click on the icon 🔆 to add new Spots.

Creation Wizard - 1/3 Algorithm

Leave the boxes **Segment only a Region of Interest** and **Different Spot Sizes (Region Growing)** un-checked and click on Next 🔵.
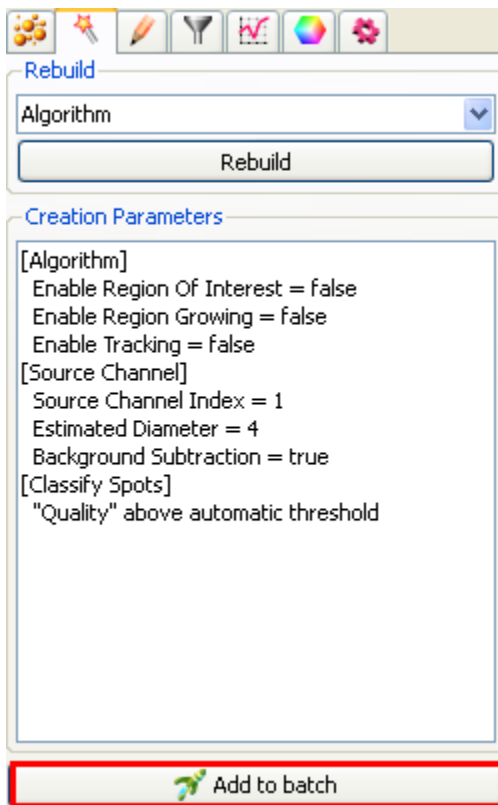
Creation Wizard - 2/3 Source Channel

Select as **Source Channel** the **Channel 1 - (name not specified)** and set the **Estimated Diameter** to **5.000 um** and click on Next 🔵.

Creation Wizard - 3/3 Classify Spots

Select as **Filter Type: Quality**, select **Automatic** and click on 🔵 (Next).You see at the same time the gray Spots and the Volume rendered green channel. Click on 🔵 (Finish). The Creation Wizard is completed.

Tab Creation

After completing the Spots Creation Wizard select the **Tab Creation** 🪄 . The parameters with values are once more displayed. Select the **Add to batch** button and the command **Spots** is submitted to Batch Coordinator with all adjusted parameters values.

Rebuild

Algorithm

Rebuild

Creation Parameters

```
[Algorithm]
  Enable Region Of Interest = false
  Enable Region Growing = false
  Enable Tracking = false
[Source Channel]
  Source Channel Index = 1
  Estimated Diameter = 4
  Background Subtraction = true
[Classify Spots]
  "Quality" above automatic threshold
```

Add to batch

See also: Imaris Quick Start Tutorial for step by step Spots Creation Wizard.

3.4 Spots in Batch Coordinator

After selecting Add to Batch button in Imaris switch to Batch
Coordinator 📑 .
In the Batch Area following view is displayed with automatically created
Batch Name-**Spots**.

Batch Name	User	Input	Output	Status
⊞ Spots	Bitplane			

Like other commands, the command **Spots** is submitted and listed in
the Command/Parameter area.
In contrast to other commands, the command **Spots** automatically
collects and **saves** output files. As a consequence it is not necessary to
include command Save in command sequence.

Command / Parameter	Value
⊞ Open	
⊞ Spots	

The command Spots is creating the multiple output files ⌐25⌐ from a
single input file.

See also: Spots Creation- Multiple Output Files ⌐25⌐, Smoothing and
Rotating Images- Output Files ⌐15⌐

3.5 Input Files

The next step is selecting the files that will be processed. To Add files for Batch processing click on the Add Files Button. Choose input files winnow appears.
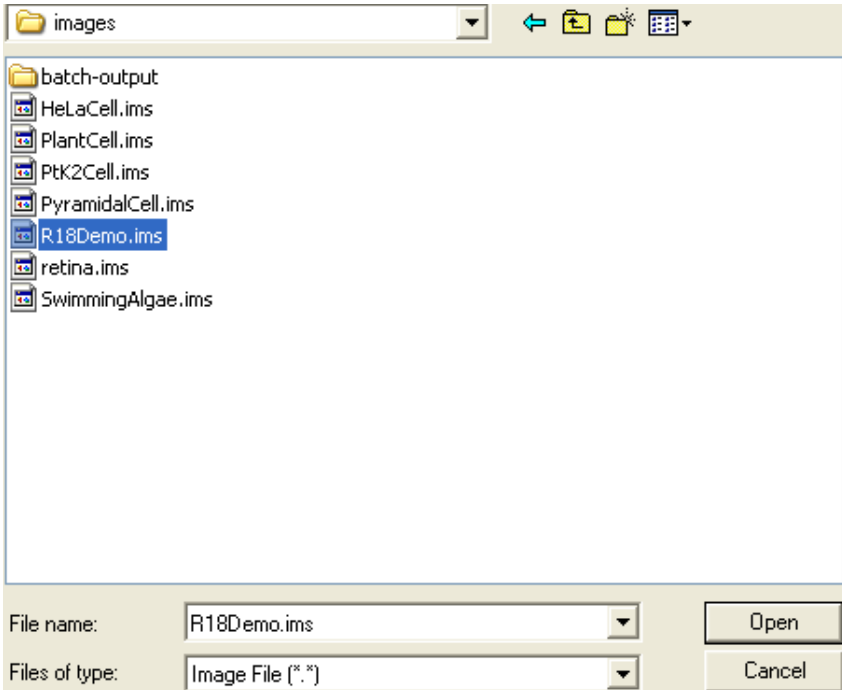
Select the file **R18Demo** for Batch processing and click **Open**. The selected file is added to the Input file list.

3.6 Multiple Output Files

The command Spots is creating multiple output files from a single input file.

Two generated output files are: **Imaris scene** with, extension **IMX**, and **Statistical file**, with extension **XLS**.

Excel files (**XLS)** are organized in spreadsheets, one for each individual statistical variable.

The output file name of files with extension **IMX** and **XLS** is containing **Spots** as the **command name**.

See also: Multiple Statistics File-<u>Statistical File Output</u> 30

3.7 Running Batch Coordinator

Starting Batch Job

To initialize a Batch job click on the icon **Run** . By Running Batch Coordinator, the complete command sequence is executed on the input files and the results are collected and stored in the output file list. The Status line displays and reports the full status messages with percentage of complied batch job.

When all commands from command sequence are executed the batch job is completed. Completed batch job are marked **Finished** and remain in the batch display.

See also: Smoothing and Rotating Images- Running Batch Coordinator
16

3.8 Reviewing the Results

The batch result includes the scene output file (IMX) and statistical file output (XLS) of the job.
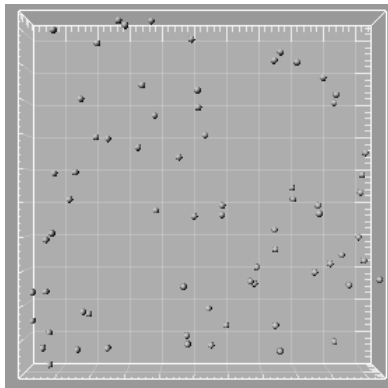
Scene output file

To verify and confirm the scene output file double click on the quick open icon [image] next to file **R18Demo-Spots-Spots-yyyy-mm-dd-1.imx**.

Batch Nar	User	Input	Output	Status
⊟ Spots	Bitplane			
		R18Demo.ims [image]	R18Demo-Spots-Spots-2008-11-21-1.imx [image] R18Demo-Spots-Spots-2008-11-21-2.xls [image]	Finished
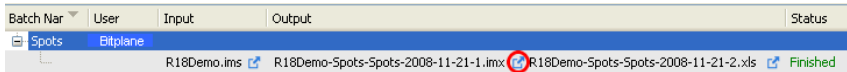
After click on the quick open icon, **Imaris** in a new window will open.
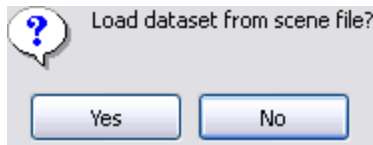
Click on **Yes** to load the Scene. The R18Demo displays in the viewing area with the corresponding Surpass Tree properties.

Statistical output file

To open the statistical file click on the quick open icon [image] next to the output file **R18Demo-Spots-Spots-yyyy-mm-dd-2.xls**.

Statistical file is open in Excel. The statistical parameters obtainable in Imaris are presented in separated tabs listed at the bottom on the page.

	A	B	C	D	E	F	G	H	
1	**Position X**	**Position Y**	**Position Z**	**Unit**	**Categ▶**	**Collecti▶**	**Time**	**ID**	
2	0.41	27.15	2.69	um	Spot	Position	1	0	
3	0.41	44.58	2.69	um	Spot	Position	1	1	
4	6.66	10.59	2.69	um	Spot	Position	1	2	
5	9.66	77.00	6.56	um	Spot	Position	1	3	
6	10.76	20.19	2.69	um	Spot	Position	1	4	
7	12.32	80.75	2.69	um	Spot	Position	1	5	
8	13.95	48.46	24.23	um	Spot	Position	1	6	
9	13.73	117.35	2.69	um	Spot	Position	1	7	
10	16.08	6.24	24.23	um	Spot	Position	1	8	
11	17.80	199.82	22.59	um	Spot	Position	1	9	
12	26.99	101.60	21.12	um	Spot	Position	1	10	
13	27.96	9.77	3.08	um	Spot	Position	1	11	
14	31.04	117.32	24.23	um	Spot	Position	1	12	
15	32.16	161.17	14.07	um	Spot	Position	1	13	
16	33.88	35.36	15.97	um	Spot	Position	1	14	
17	35.24	31.81	3.84	um	Spot	Position	1	15	
18	41.65	138.38	16.15	um	Spot	Position	1	16	
19	43.60	191.75	24.23	um	Spot	Position	1	17	
20	46.88	138.26	5.28	um	Spot	Position	1	18	

▶ ▶| Number of Voxels Category_Spot / Overall \ **Position** / Time Index Category_Spot

See also: Smoothing and Rotating Images- Reviewing Batch Results
17

4   Multiple Statistics File

In Batch Coordinator all files with the **XLS** extension are used to save a statistical data. The statistical files are generated either by the commands **Spots** or **Surfaces**.

This tutorial describes the statistical files and provides an example of managing 30 and merging 31 them. The chapter Statistical File Output 30 contains information about the statistical output files and gives guidance on modifying parameter values. In the last chapter of this tutorial you will learn how to export the statistical results in a new **CSV format** with command Command Merge Csv Statistics [Post] 31.

XLS Statistical File Output

After executing Batch job all statistical files will be in the **batch output** folder. For each individual input file, one new **XLS file** is created in the batch output folder. Therefore, a Batch job, containing in the command sequence the commands Spots or Surfaces, applied to the multiple input files, generate as a result **multiple statistical files**.

Batch Coordinator provides **merger** option of combining multiple statistical files and creating the statistical output summaries. The command **Merge Csv Statistics** [**Post**] will combine datasets with the common statistical variable and incorporate them in one file containing the specific variable of all input files.

4.1 Statistical File Output

Merger of the multiple statistical files is possible by changing the type of statistical output files from **Excel (XLS)** to **comma-separated values (CSV)** files.

The merge command will fuse together from all CSV statistical folders all CSV files with matching statistical variables (area, volume, intensity).

The following steps are used to **change the statistical file output** and **combine** image related XLS files into a statistical variable clustered CSV files.

The command **Merge Csv Statistics [Post]** will combine datasets with the **common statistical variable** and incorporate them in one file containing the specific variable of all input files.

Statisticswriter

Expand the command **Spots** by clicking on the **(+)** symbol. The parameter list is displayed. The type of statistical output files is defined in parameter **Statisticswriter** and value is set to be **bpStatisticswriterExceXls**.

Command / Parameter	Value		
⊞ Open			
⊟ Spots			
Scenefile	R18Demo-Spots-Spots-2008-11-11-1-1.imx	📁	⬀
Statisticsfile	R18Demo-Spots-Spots-2008-11-11-1-1.xls	📁	⬀
Statisticswriter	bpStatisticsWriterExcelXls		

The value of **Statisticswriter** have to be changed. In the **Batch area** select the **Batch** containing the command sequence with the commands **Spots**.

Double clicking on the bpStatisticswriterExceXls value. The field, highlighted it in blue, will be open. Enter **bpStatisticsWriterCsv** as a new value for the **Statisticswriter** parameter.

Please note: The parameter values are case sensitive.

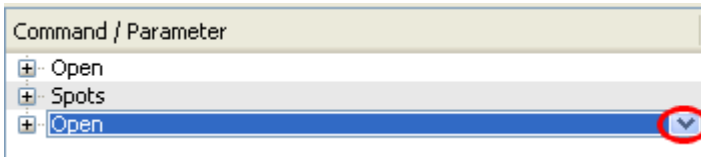| Command / Parameter	Value
⊞ Open	
⊟ Spots	
Scenefile	(Please select a job to edit filenames)
Statisticsfile	(Please select a job to edit filenames)
Statisticswriter	bpStatisticsWriterCsv

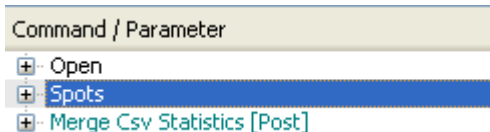# 4.2 Command Merge Csv Statistics [Post]

To merge the CSV Output files of all jobs within a Batch, the new command must be inserted into the command sequence. In the Command/Parameter Toolbar click on the **Add command** button

and the new command **Open** is added into the command sequence.
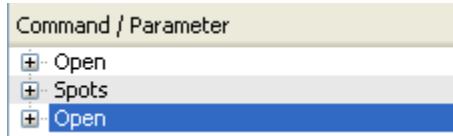
Double click on the added command line and an arrow appears indicating a drop down window.

From the list of the commands select the command **Merge Csv Statistics [Post]**.

Expand the command **Merge Csv Statistics [Post]** by clicking on the (+) symbol. Two parameters are available, InputFiles and OutputFiles. The value for Input files is automatically generated from the individual CSV statistical files. A value for the merged **Output** folder name must be created.

Select the **OutputFile** parameter and the entire row will be highlighted in blue. Click on the open file icon and a new window will be open.

Specify the **folder** name and directory for merged Statistical CSV file and save it.

The **new merged folder name** will be **generated** by appending _ **Statistics** to the entered name, defined by the **OutputFile** value. The command merge will identify and retrieve **all files** that share a **common statistical variable** and **merged** them in **one file**. The names of new merged files will correspond to names of statistical variables. The resulting merged **folder** will have the same number of files as the number of calculated statistical variables.

Index

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