



## **Reindeer Graphics™ Focus Extender**

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## Introduction

Focus Extender is a plug-in designed to take a stack of images and blend them, keeping the most in-focus regions of each image in the stack. If you are trying to threshold features, or perform any measurements on a subject that cannot be in-focus in a single frame, this plug-in will be invaluable to your work. Focus Extender is most applicable to bright-field, fluorescence, and confocal microscopy, though there is no limit on the type of images you can combine with the plug-in.

## Installation

Focus Extender must be placed in the plug-ins folder for the current version of Adobe Photoshop. Typically, you can find this folder at

[C:\Program Files\Adobe\Photoshop\Plug-ins](#) (Windows)  
[/Applications/Adobe Photoshop/Plug-ins](#) (Macintosh)

To install Focus Extender, simply drag the Focus Extender plug-in (called “FocusExtender” on the Mac and “FocusExtender.8BF” on the PC) to the appropriate Plug-ins folder. If you have multiple versions of Photoshop on your computer, be sure to place Focus Extender into the plug-ins folder for every version you wish to use.

## FAQ

Q.) Focus Extender does not show up in the Filters menu after I install it.

A.) Make sure that the plug-in is in the Plug-ins folder for the copy of Photoshop that is currently running. If not, move it there and restart Photoshop.

Q.) The image is coming out blurred and ringed. How do I prevent this from occurring?

A.) This happens if the image is not completely aligned. Use a layer, or a tool such as the Optipix Layer Modes plug-in to align your images before blending them. This can also happen if your images are at slightly different magnifications.

Q.) The images I’m trying to blend cannot be aligned, but I didn’t move the sample! What’s happening?

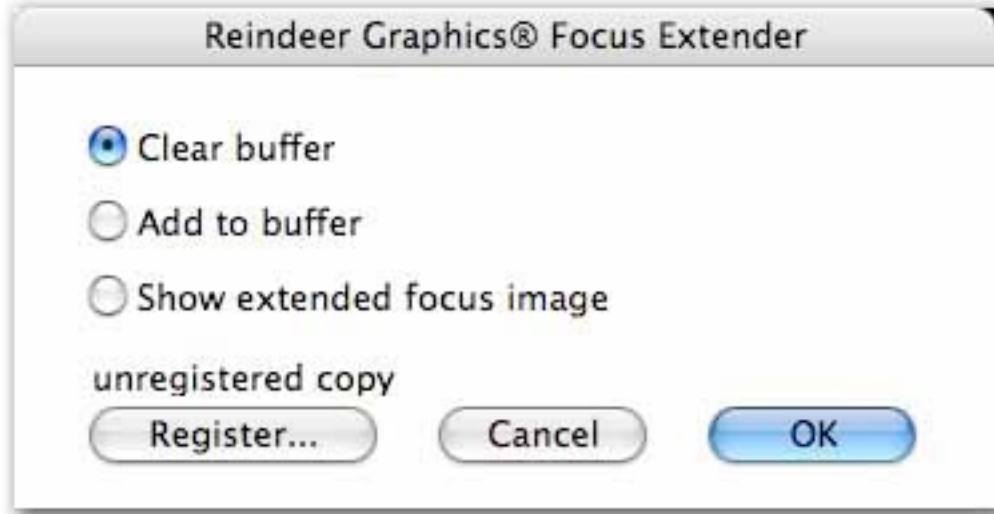
A.) If you adjust the focus knob, instead of moving the sample up and down, you are changing the effective magnification of the image. This will make it impossible to get good results with Focus Extender.

Q.) I had a demo of Focus Extender and the time on it has expired. How do I unlock the software?

A.) By purchasing a serial number. Click on the Register... button in the Focus Extender dialog, and contact us with the “A” number shown in the upper right hand corner. We can generate a serial number for you on the phone or via email. The contact information can be found at the end of this document and on the Register dialog.

## Registering Focus Extender

The first time you run Focus Extender, you should enter your serial number. (Note: if you are using the demo version, you will not have a serial number.) The Focus Extender dialog will look like this:



To enter your serial number, click on the Register... button in the lower left hand corner. A dialog will come up asking for your serial number. Enter your serial number in the field provided and click OK. The software will be registered, and the Register... button will deactivate.

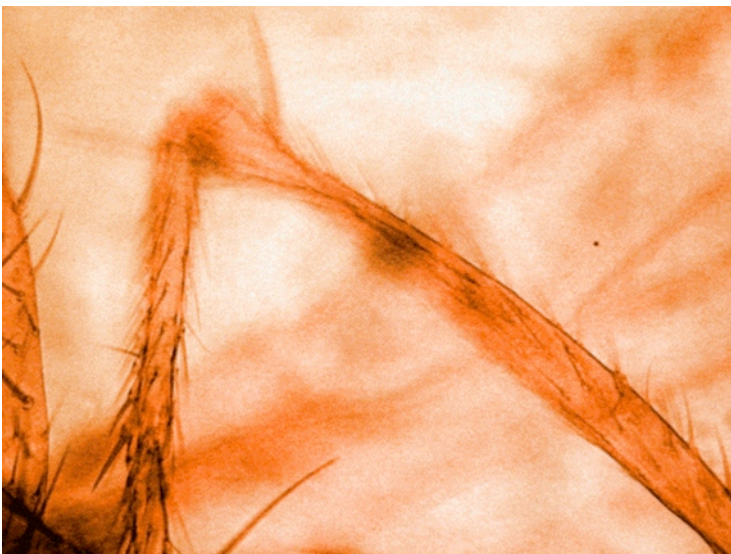
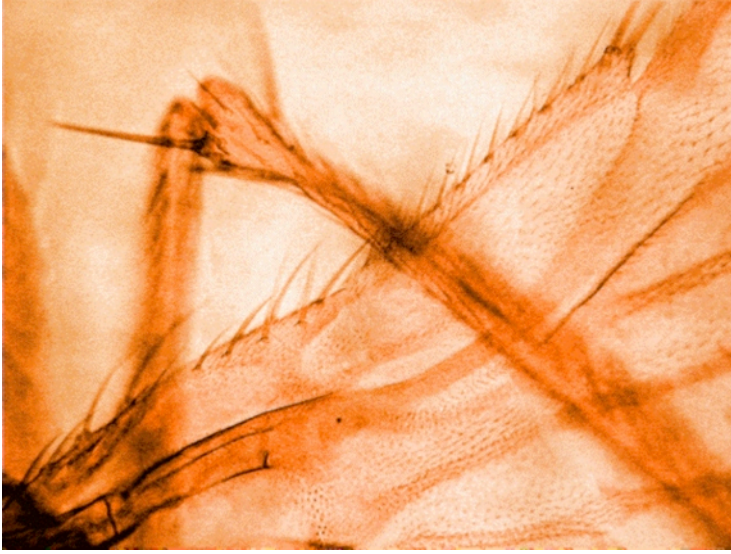
## Using Focus Extender

To combine a stack of images into a single extended depth of field composite, you must add each image to the image buffer in Focus Extender, then select Show extended focus image. It is usually a good idea to clear the buffer before beginning to add images, in case there are already images stored there of which you are unaware. The outline of the procedure is as follows:

1. Select Filter > Focus > Focus Extender. Choose “Clear buffer,” and click OK.
2. Bring the first image you wish to blend to the foreground. Select Filter > Focus > Focus Extender and choose “Add to buffer.”
3. Repeat Step #2 for as many images as you have.
4. Select Filter > Focus > Focus Extender and choose “Show extended focus image.” The current image will be replaced by the extended focus composite.

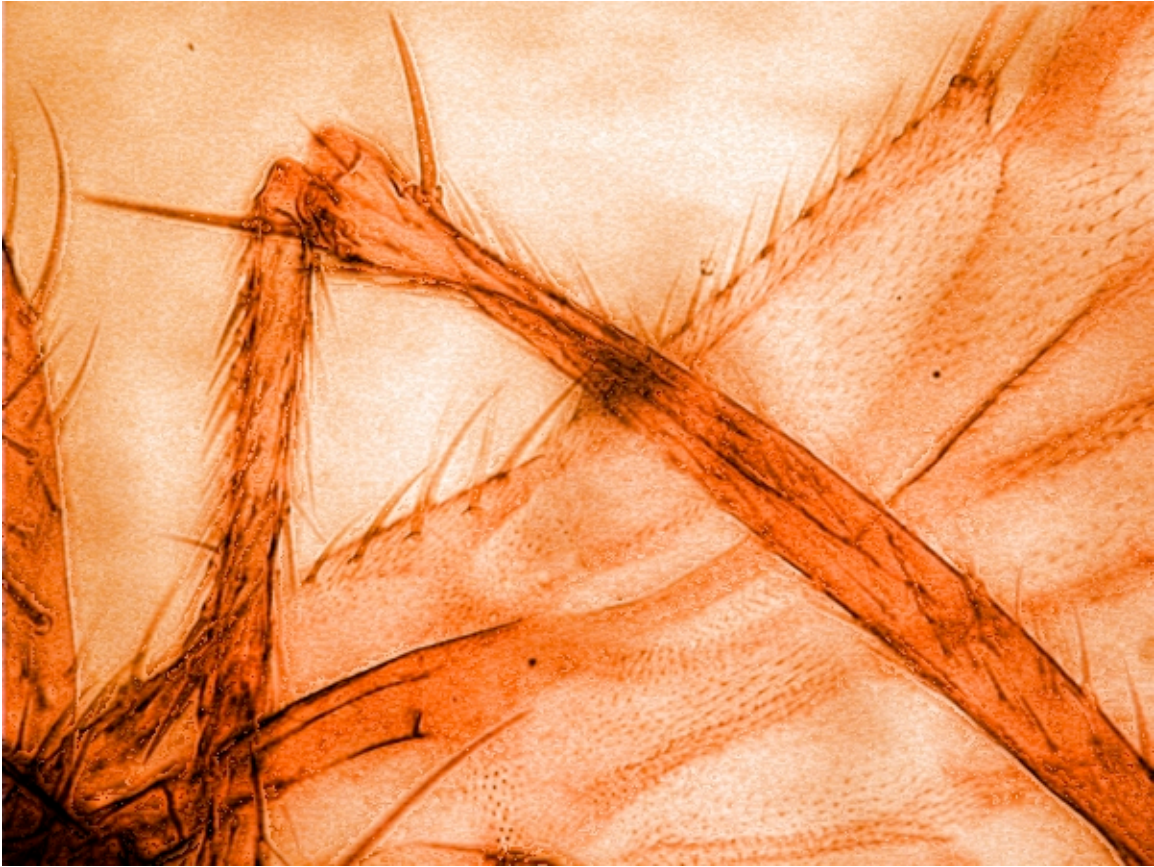
The image buffer is capable of storing up to 30,000 images at 16 bits per channel.

The following series of images gives an example of how Focus Extender can be used. These are transmission light micrographs of a fruit fly, each with a limited depth of field.





After following the steps above, you get an extended depth of field image that looks like this:



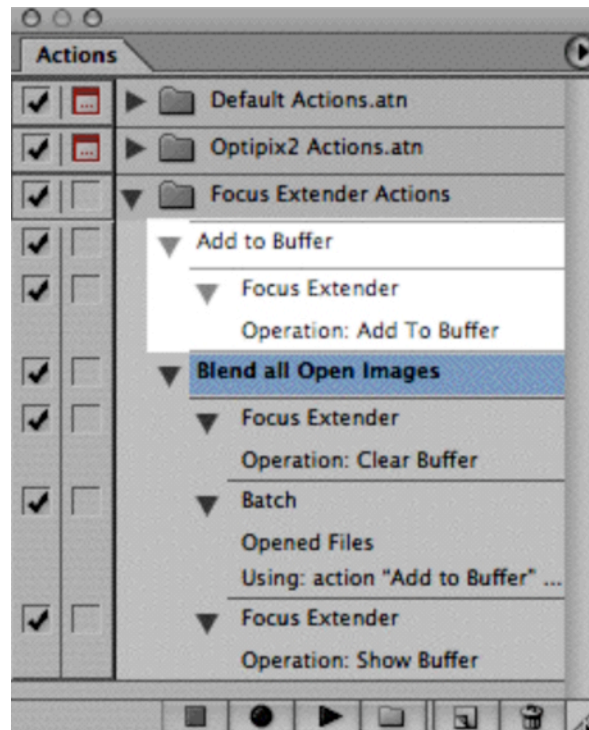
Note that the leg in the field of view is now sharp everywhere in the image.

### **Focus Extender in Photoshop Actions**

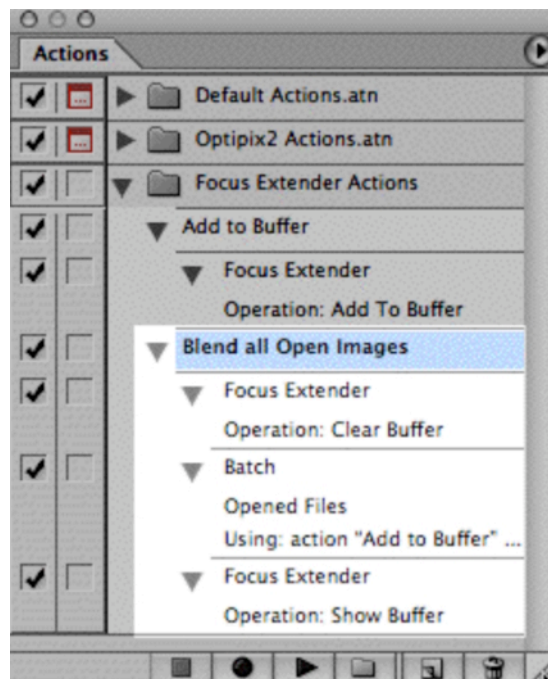
The interface of Focus Extender is designed to integrate well with Photoshop's Actions engine. It is thus easy to write actions that make the use of Focus Extender trivially simple. Examples of this are included in the Focus Extender package.

We'll explain them here.

The first action we include is a simple one that simply adds the current image to the Focus Extender buffer:

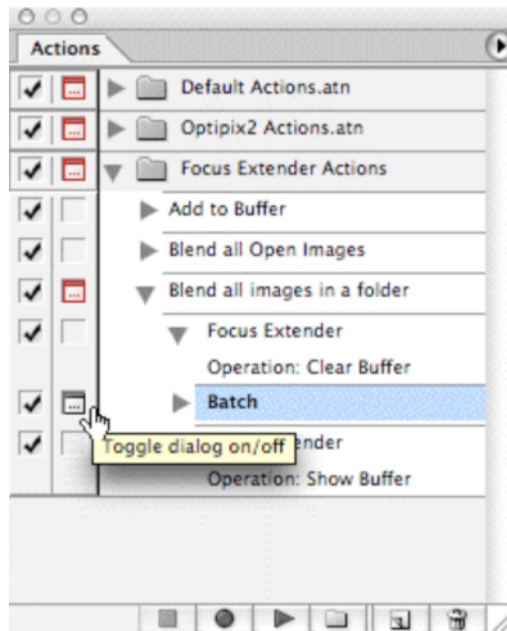


This simple action will become the core of the other actions. The first action we'll talk about is an action that clears the buffer, adds every open image to the buffer, then puts the result in the current image.



This action takes advantage of Photoshop's very useful "Batch Processing" mode, which can be found under the File > Automate > Batch... menu. This tool allows you to quickly apply a single action to a large group of images.

One capability of the Batch mode is to apply an action to a user-selected folder of images. One of the actions included with Focus Extender takes advantage of this. The action looks like this:



Note that we've checked the "Toggle dialog" setting on the action step corresponding to the Batch step. This will let us select a folder each time the action is run. The Batch dialog looks like this:

**Batch**

**Play**

Set: Focus Extender Actions

Action: Add to Buffer

OK  
Cancel

Source: Folder

Choose... Mnemosyne:Library:User Pictures:Images:

☐ Override Action "Open" Commands

☐ Include All Subfolders

☒ Suppress File Open Options Dialogs

☒ Suppress Color Profile Warnings

Destination: None

Choose...

☐ Override Action "Save As" Commands

**File Naming**

Example: MyFile.gif

Document Name + extension +

+  +

+

Starting serial#: 1

Compatibility: ☐ Windows ☒ Mac OS ☐ Unix

Errors: Stop For Errors

Save As...

When the dialog comes up, you will want to make sure the appropriate action is selected, in this case, Add to Buffer. Then, you will want to choose the folder that contains the images you wish to blend. The two boxes that are checked will suppress any subsequent dialogs that might come up (and if you are working with scientific images, you typically do not want to color manage the image anyway.)

Using these examples, you should be able to construct actions that will be useful for your applications. Photoshop's online help contains an excellent primer on building and using actions, and there are many resources available online as well.



**Contact information**

Please direct all inquiries to:

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