NIS-Elements: HDR Imaging

Dynamic Range is a measure of the ratio between the minimum and maximum values in a set of intensities and is limited by the camera used. Typically images are captured within the camera's range, however sometimes the light reaching the camera will be greater than this range. This results in a loss of detail and information as some areas will be saturated and appear white, while other areas may be dark. High Dynamic Range (HDR) Imaging is a technique that corrects this problem by expanding the dynamic range of an image through software for color, brightfield and fluorescence modalities. The HDR module in NIS-Elements uses a series of images, either captured or loaded, to compare the quality of each pixel position relative to pixels in the same position in the other images of the series. The pixels with the highest quality are used to create the resulting HDR image that has a dynamic range greater than the range of the camera.

This document covers how to:
- Capture an HDR Image
- Create an HDR Image from a sequence
- Capture a Reflection Free Image
- Create an HDR Image from an ND file

Capturing an HDR Image

NIS-Elements can capture and automatically create an HDR image using a few simple settings. The high and low exposure points are entered in to NIS-Elements points and the modules determines the appropriate number of steps to produce a quality HDR image. The low exposure point will produce an image that is mostly black but will still contain some detail. Conversely, the high exposure point will be mostly white (if using a color camera) but will still show detail.
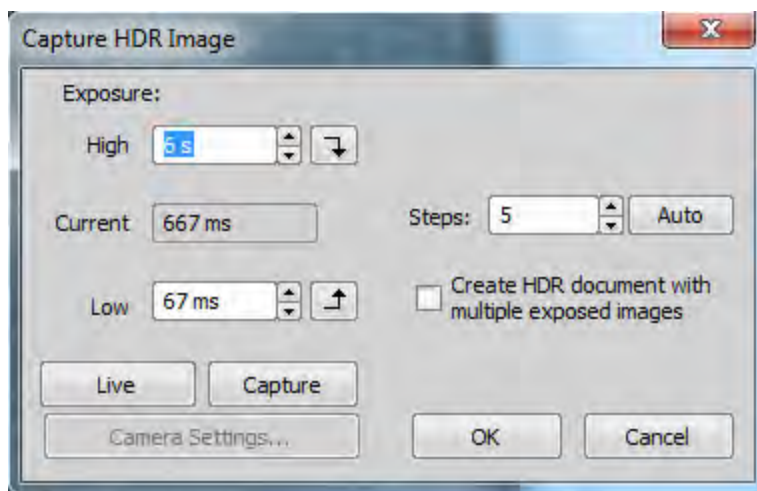
1) Focus the system on the sample.

2) Open the 'Applications' Menu and select 'Capture HDR Image…'
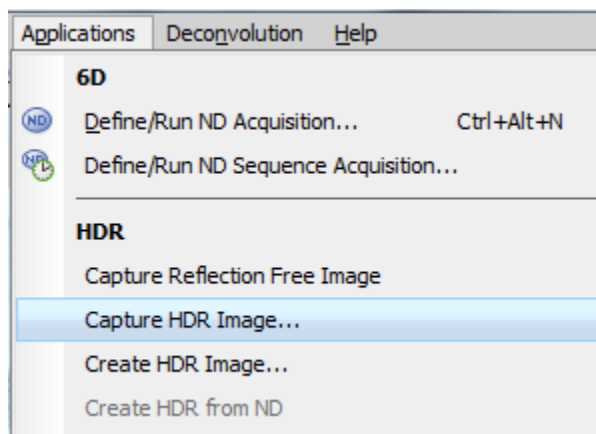
3) The 'Capture HDR Image' window will open

4) Click the 'Live' button to display the sample in real time. ⬛ Live
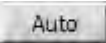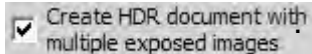
5) Select a High exposure point that produces an image that is mostly white but still contains detail. This is done by adjusting the value in the text field next to "High   High | 950 ms | ⬍ and then clicking the arrow button ⬇ to set the live exposure setting to the value entered. Repeat adjusting and viewing until a satisfactory high exposure setting has been reached.
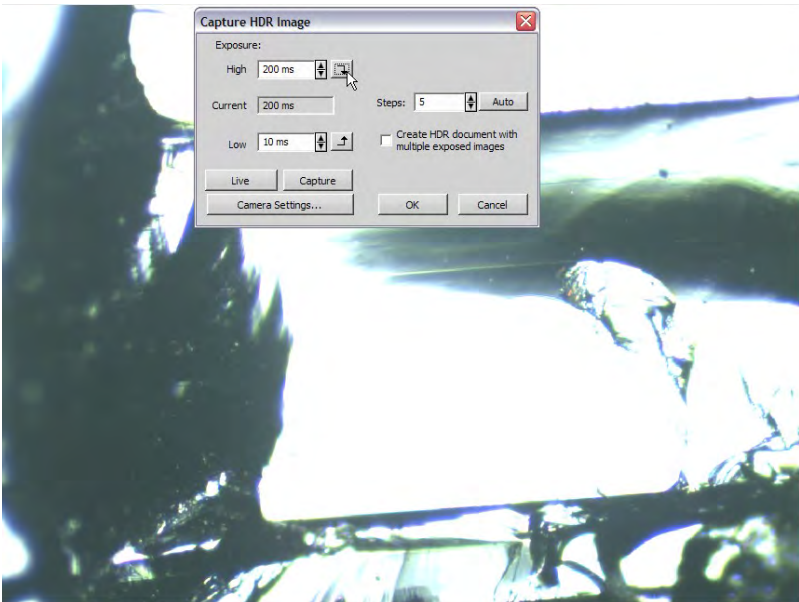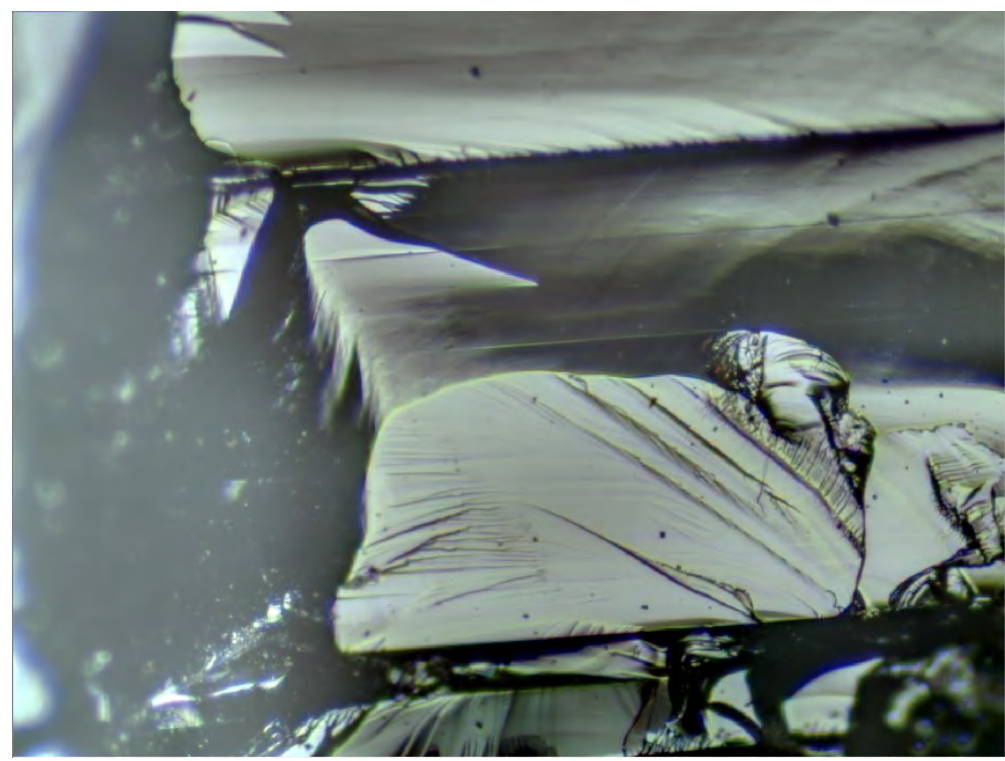

6) Repeat this process for the Low exposure setting so that the live image looks dark but contains detail using the "Low" input field Low | 10 ms | ⬍ and corresponding arrow button ⬆ .
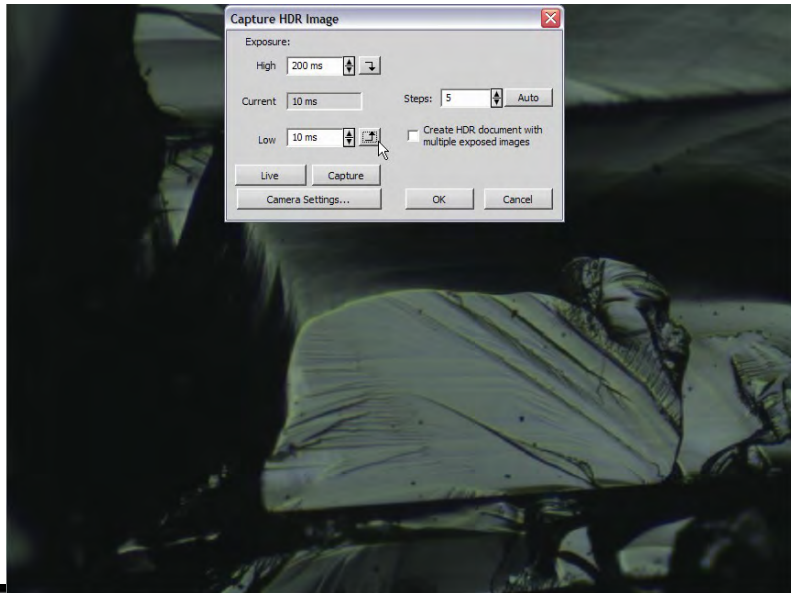
7) The number of captures that will be used to create the HDR image can be automatically calculated by NIS-Elements or entered manually. Either enter a number in the "Steps" field `Steps: 5` or click the 'Auto' button `Auto` .

8) If you would like to save the captured images used to create the HDR image click the checkbox below the 'Steps' area `☑ Create HDR document with multiple exposed images` .

9) Click the 'OK' button `OK` and NIS-Elements will create the HDR image.

10) If the checkbox was clicked in Step 8, the captured images will be included in the HDR document as separate channels titled with the exposure setting.

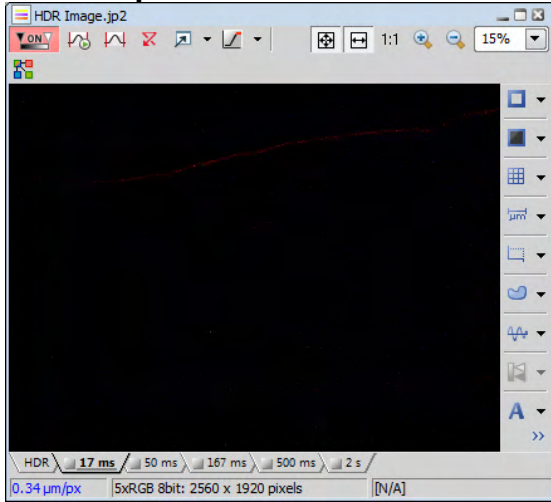`HDR \ 10 ms / 20 ms \ 40 ms \ 100 ms \ 200 ms /`

Fluorescent biological samples are included as examples as well. Individual exposure times are shown when creating an HDR document with multiple exposed images.
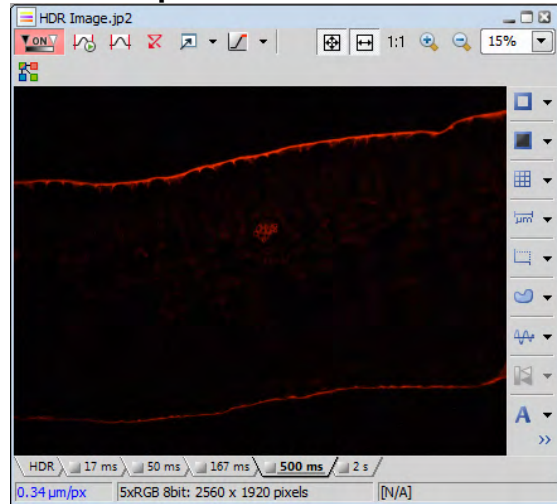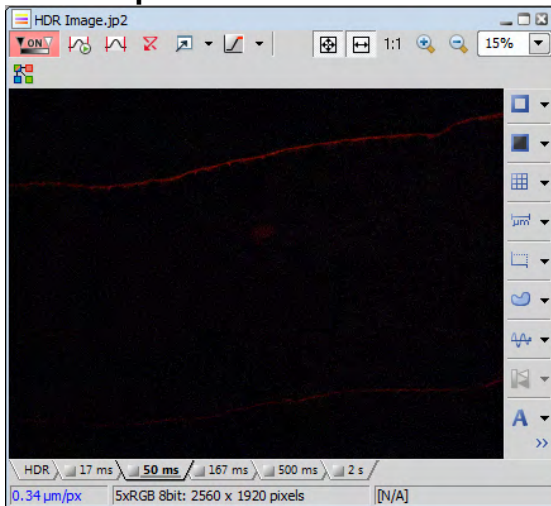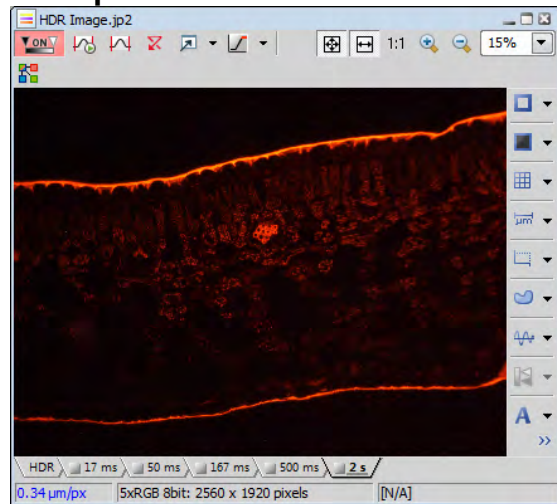
17ms Exposure:

500ms Exposure:

50ms Exposure:

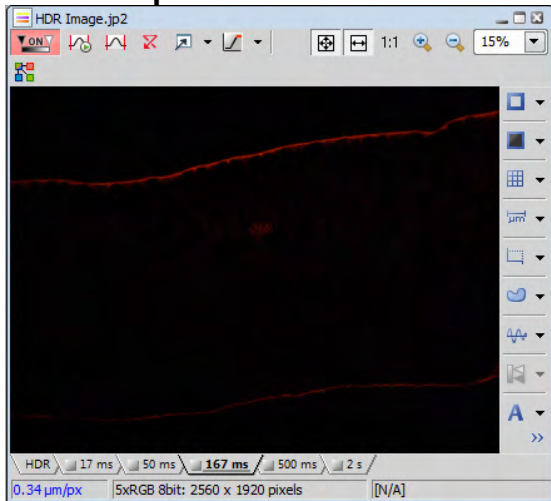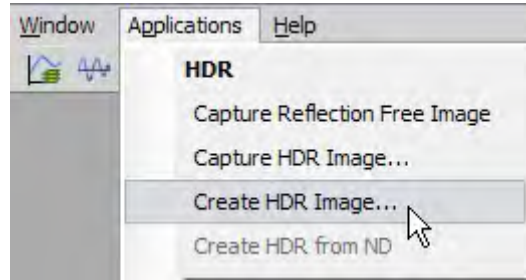**2s Exposure:**

167ms Exposure:

Creating an HDR Image from a Sequence

NIS-Elements can create an HDR image using multiple files which were previously captured and saved. In this example, seven captures of varying exposure will be used.
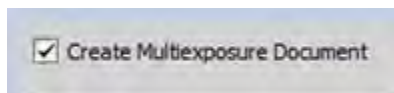
1) Open the 'Applications' menu and select 'Create HDR Image…'

2) The "Select HDR source files" window will open. Open the folder containing the images you would like to use.
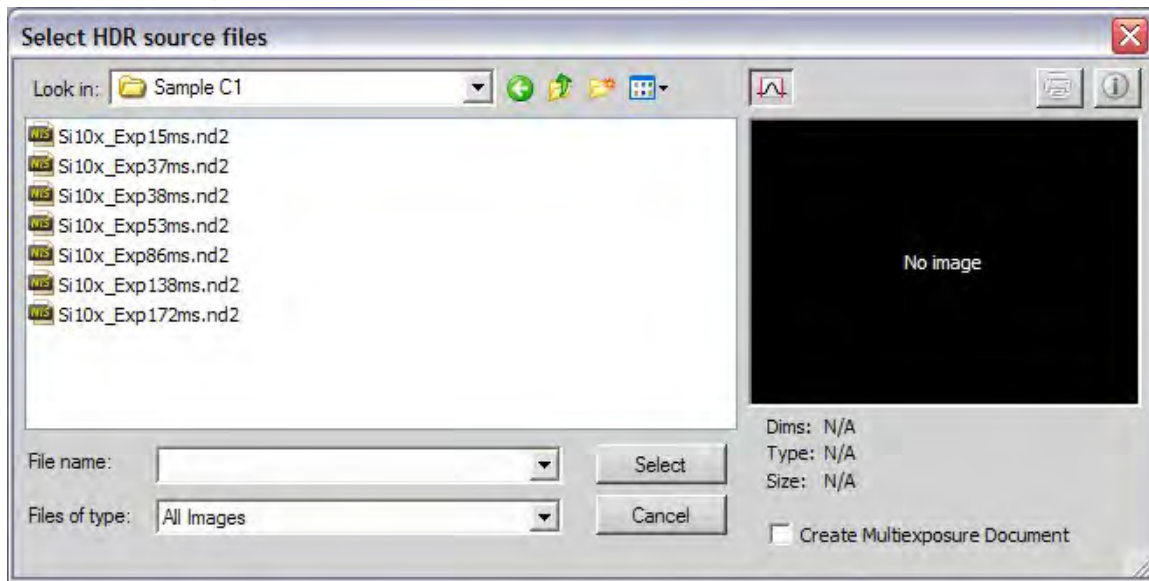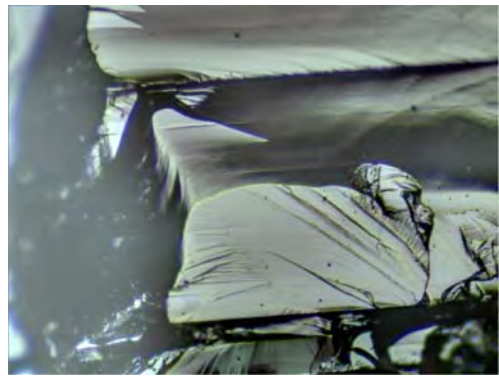

Note: The same option is available here to save the captured images used to create the HDR image.

3) Select the files that contain the appropriate captures. **Note:** Hold the Control key while clicking on the filenames to select multiple files.
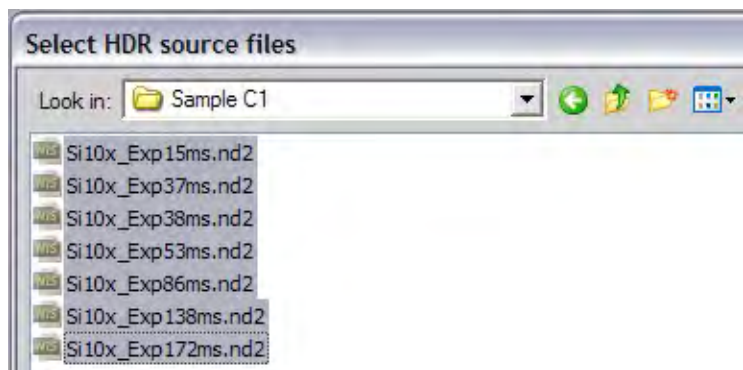
4) Click the 'Select' button and NIS-Elements will create the HDR image.

Capturing a Reflection Free Image

NIS-Elements can eliminate oversaturated areas caused by reflections in an image. This is useful when working with polished or highly reflective samples. Previously obtaining a quality image would require reducing the amount of light reaching the sample to eliminate bright spots but would result in a dark image. NIS-Elements can capture a Reflection Free Image in one step without changing the setting on the scope. When using the 'Capture Reflection Free Image' feature, this will automatically run the Capture HDR Image function. This eliminates the need to setup the 'Capture HDR Image' settings.
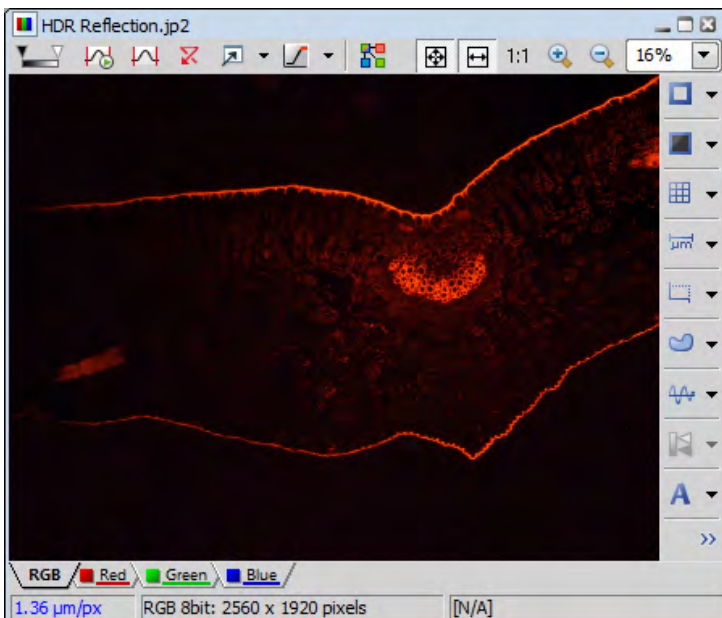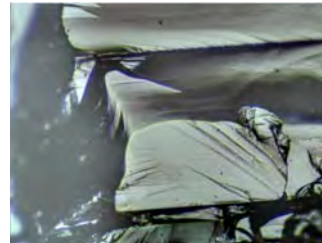
1) Focus the system on the sample.

2) Open the 'Applications' menu and select 'Capture Reflection Free Image'.
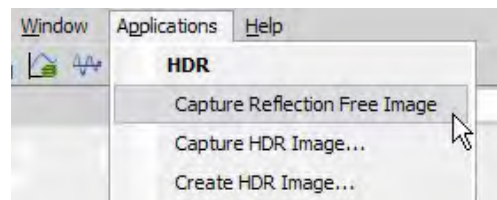
3) NIS-Elements will create the Reflection Free Image.

Here is an example using a fluoresencent biological sample:

Creating an HDR Image from an ND File

This feature will create an HDR image from a previously captured ND sequence which contains a suitable number of captured images of varying intensity.
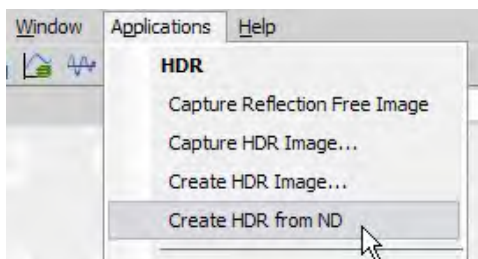
1) Open the desired ND sequence for converting into an HDR image . Select what type of ND: (Z series, Time, Multipoint or Wavelength).
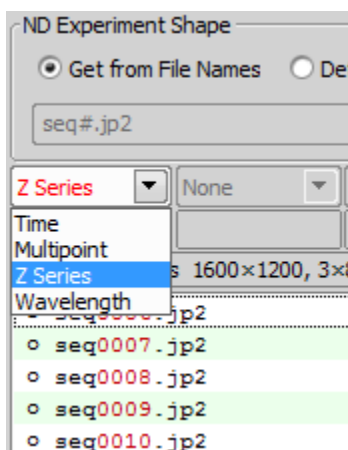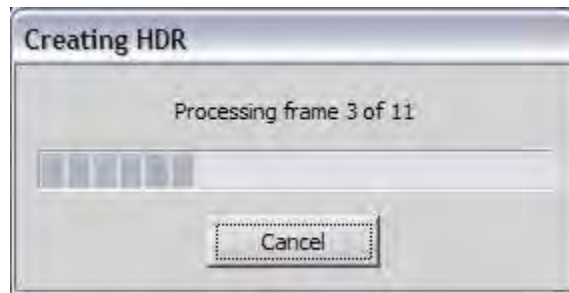

In this example an ND sequence of 11 images with increasing exposure is used.
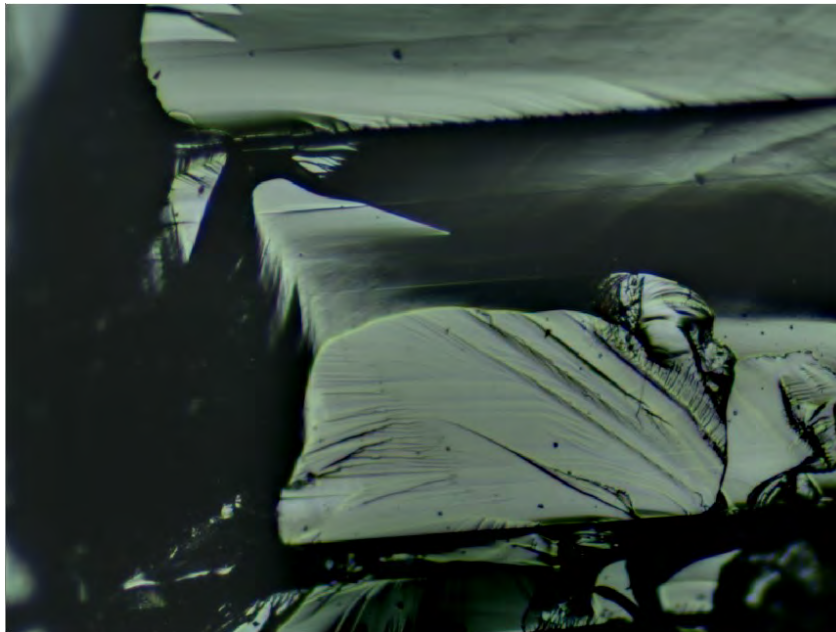

1st Image - Low Exposure

Last Image - High Exposure
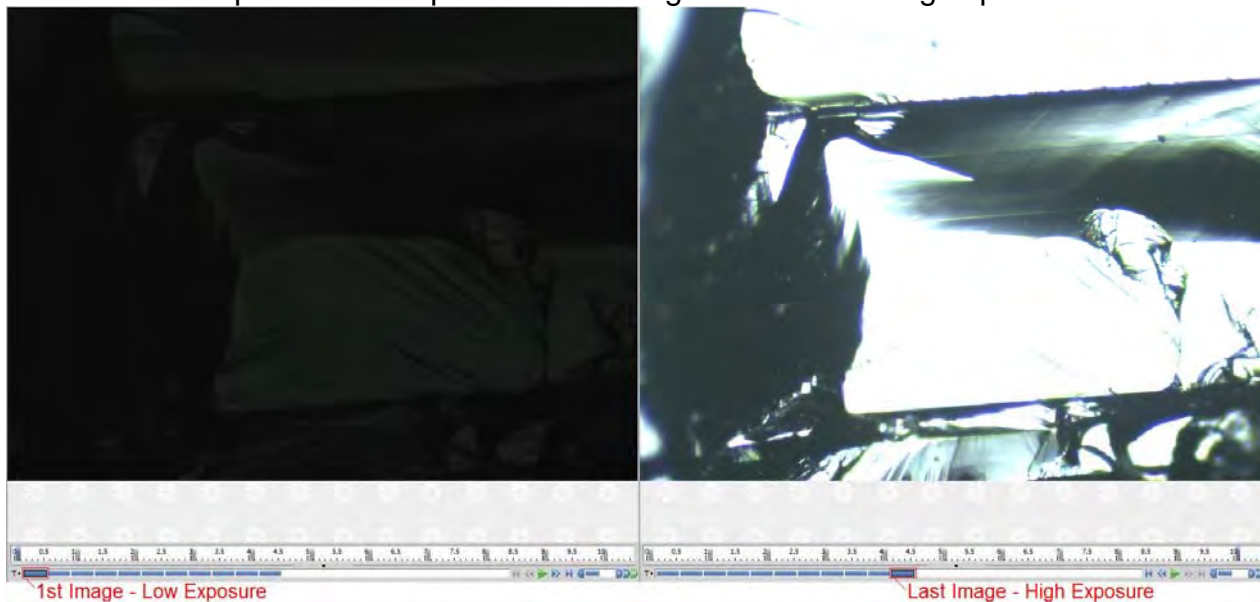
2) Open the 'Applications' menu and select 'Create HDR from ND'.

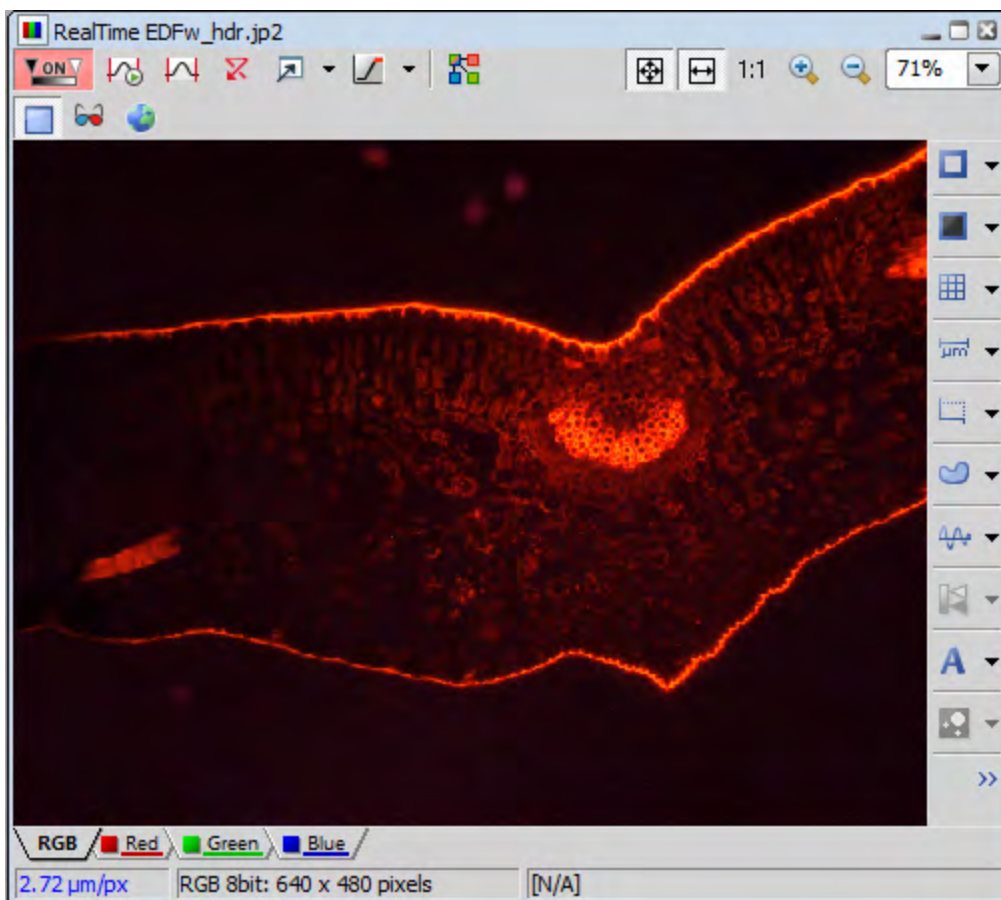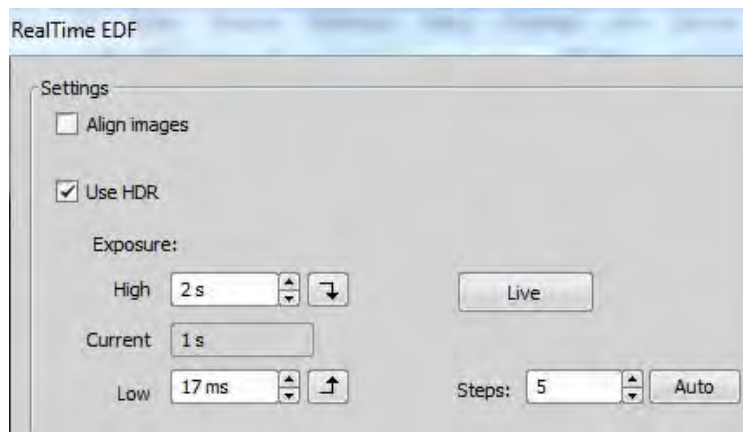3) NIS-Elements will process each frame of the ND sequence.

4) After processing each frame, NIS-Elements will display the HDR image.

Using HDR with EDF

When setting up Real Time EDF (Extended Depth of Focus) you can include HDR in this function.

Note: The NIS-Elements HDR Module # MQS42790 is an optional add-on modules for the Basic Research (Br) and Documentation (D) packages. It is included in the Confocal (C) and the Advanced Research (Ar) packages..