Using RTIBuilder and RTIViewer

This is a step by step guide to using the freeware RTIBuilder and RTIViewer.

RTI – Reflectance Transformation Imaging

RTI is a method for capturing and viewing surfaces in high detail in computer software. The surfaces are produced using a series of photographs taken from a fixed position of a subject being lit from multiple angles. Once the surface structure has been captured and constructed by the software it can be enhanced and relit from any direction allowing otherwise scarcely observable details to stand out.

For the following tutorial we are mainly relying on software made available by the CHI's webpage (Cultural Heritage Imaging: http://culturalheritageimaging.org/).

For an in-depth explanation of how the method works you can read and view video examples here:

http://culturalheritageimaging.org/Technologies/RTI/

For this tutorial we are providing you with a sequence of photos. For those of you who want to try capturing your own photos you will find a very comprehensive guide on the CHI webpage: http://culturalheritageimaging.org/What_We_Offer/Downloads/RTI_Hlt_Capture_Guide_v2_0.pdf)

Step by step guide

The following steps explain how to produce RTI from an already available set of photos. In addition to this written guide you can view Tutorial_video_RTIBuilder_and_RTIViewer.

(Before continuing make sure to download and install CHI's RTIBuilder and RTIViewer – see the step by step guide *Tutorial_installing_RTIBuilder_and_RTIViewer*).

File and folder preparation:

The software RTIBuilder requires a specific folder and subfolder directory to be able to process photos. It does not allow for spaces within folder names. For instance, in Windows versions before Windows 10 the **Desktop** is placed within **Documents and Settings** and will therefore not work. Also, avoid Danish letters. We suggest the following:

1. Create the following folder and subfolder (on a place on your hard drive without any spaces or danish letters in its folder structure):

   ➢ feltkursus2021\
       rti-master\

2. Download the dataset we have made available and place it within rti-master\ producing the following structure:
   ➢ feltkursus2021\
       rti-master\
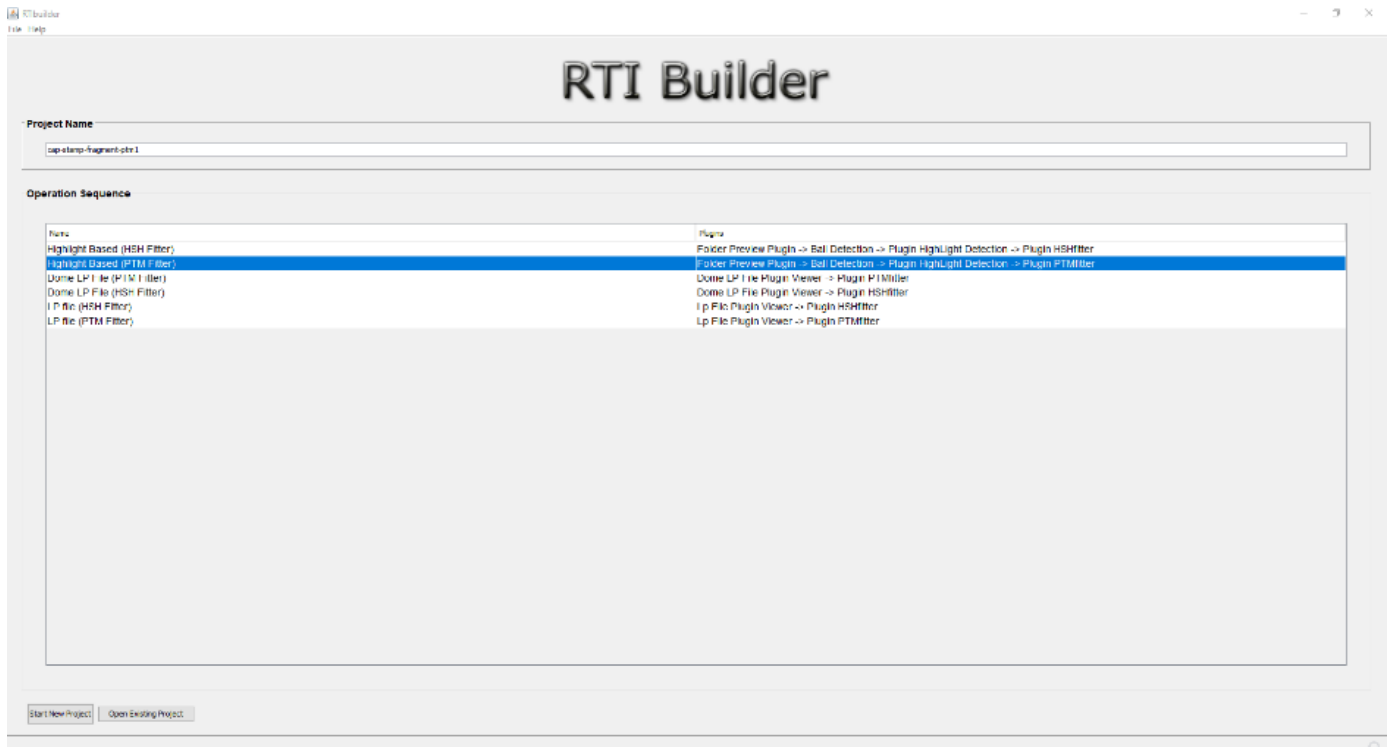   cap-stamp-fragment-dataset\
   jpeg-exports\
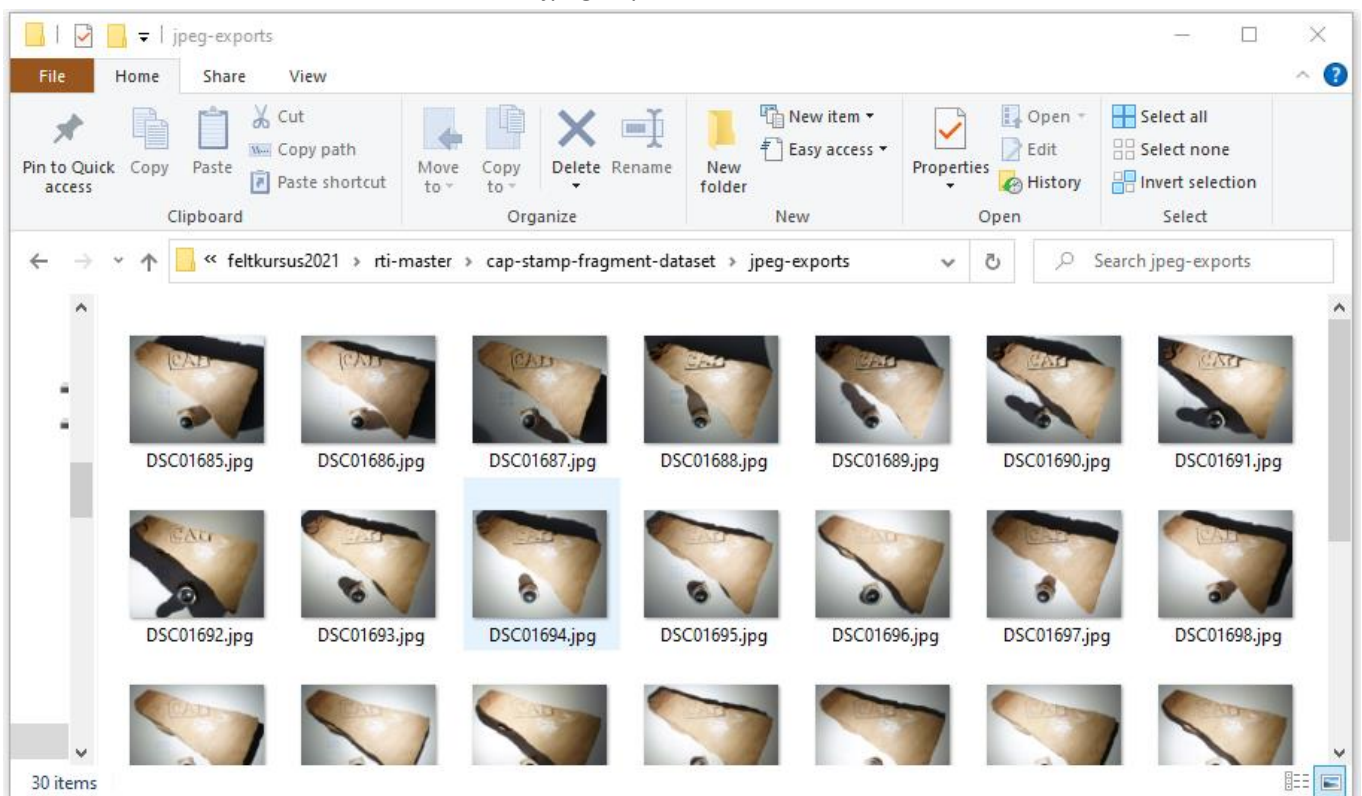
About the photo sequence

Our dataset consists of 30 images of a fragment of a ceramic with a CAP stamp. The images were initially captured in RAW file format to retain as much image information as possible, but for the RTI process they have been converted to JPEG.

In RTIBuilder

1. After opening RTIBuilder you will:
    a. Enter a **Project Name** (make sure not to use spaces in name).
    b. Choose the desired **Operation Sequence**. In our casese **Highlight Based (PTM Fitter)**. (Alternatively, you can use **Highlight Based (HSH Fitter)**, but PTM – Polynomial Texture Map – will at the end of the process give you the most viewing options)
   c. Press **Start New Project**.

2. In the next window press **Open Folder** and locate the place on drive where your project is stored. Select the folder containing your project in our case **cap-stamp-fragment-dataset** (not **jpeg-exports**, the folder actually containing the photos!). This loads in your photos. Then press **Next**.
   (Additionally, you can fill in your name as Author of the project in the **Project Properties** panel)
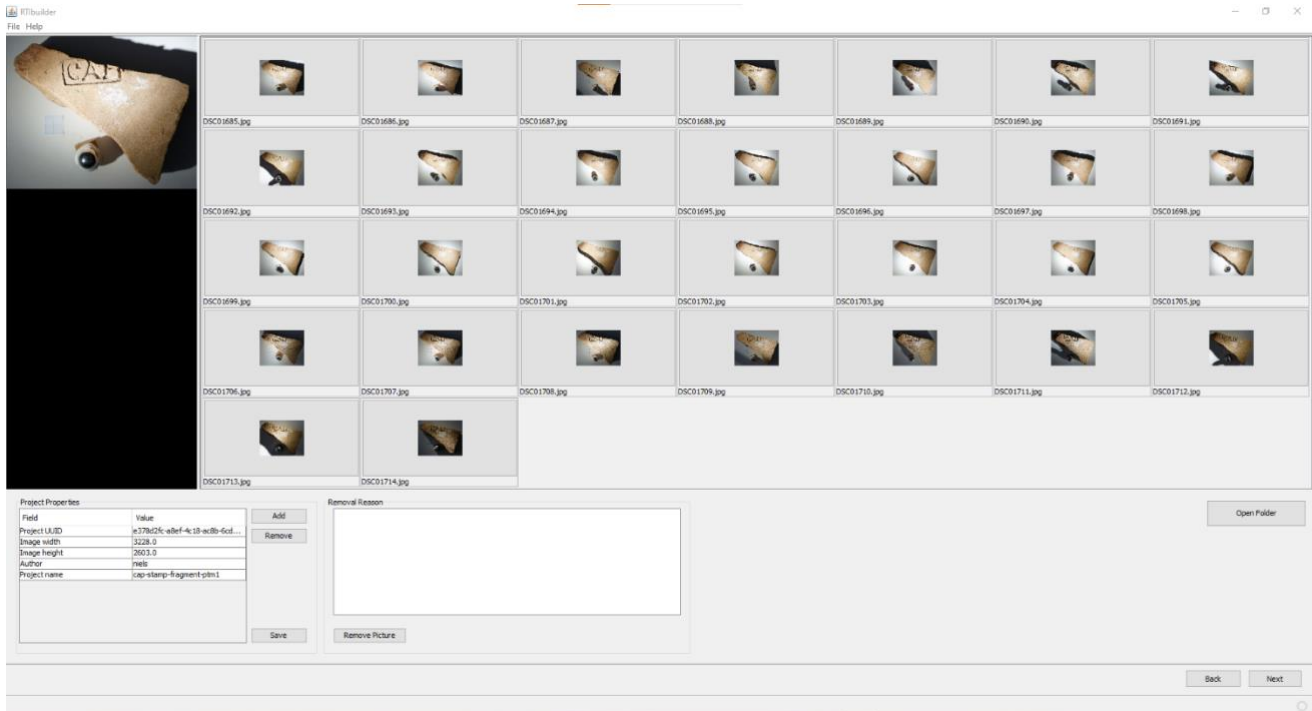
3. Next, we will help RTIBuilder locate the reflective sphere within the photos.
    a. Left clicking drag a rectangle that covers the sphere within the larger photo being previewed the left.
    b. Press **Add Area** in the **Pre-selected areas** panel. Afterwards you can adjust the rectangle if needed by pulling the corners.
    c. In the **Process Configuration** panel you can choose between **Black** or **Red** (sphere). For this project leave it on **Black**.
   d. Press **Detect Spheres**.
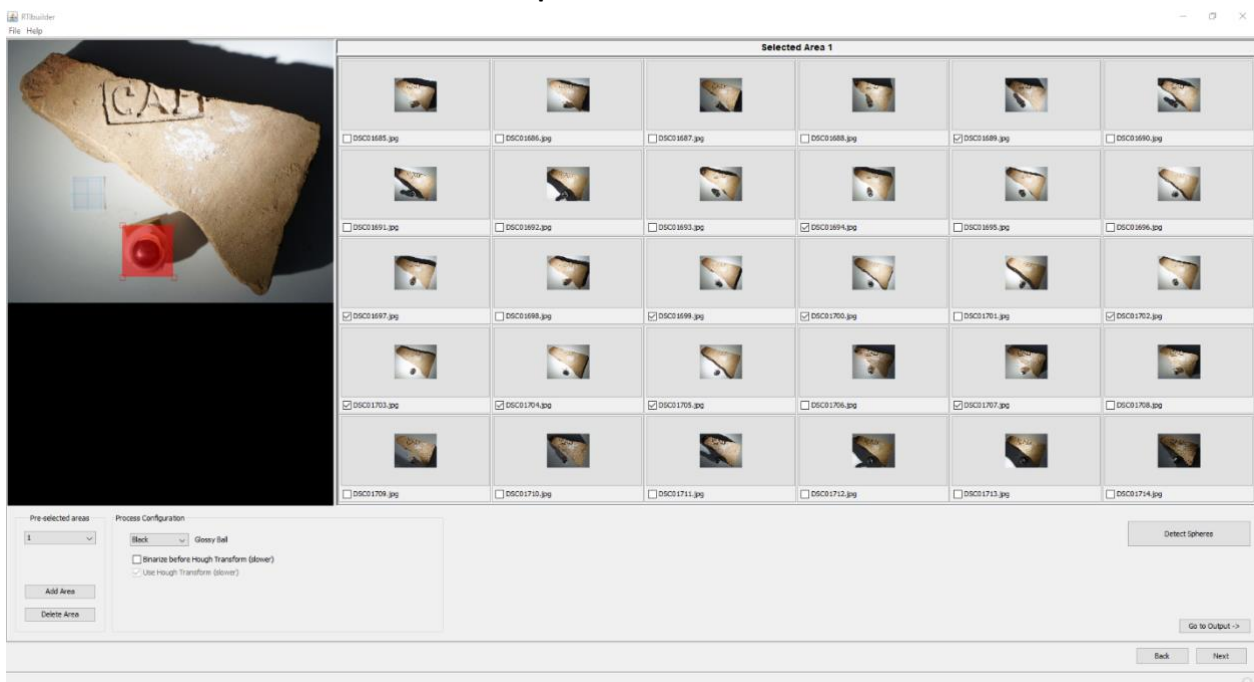
4. Once the sphere has been detected you will (probably) need to adjust the results slightly. On the left below the thumbnails of your photos there will now appear to additional images – **Edge** and **Median**. On left a larger version of Edge will be shown with a circle and center marked out.
   a. In the **Image Scale** panel you can adjust the scale to fit the image within the frame.
   b. Next (if needed), enlarger or shrink the red circle by pulling the small square on the circle and recenter the circle by clicking and dragging the small square on the center cross.
   c. Press the **Set New Center** button below the photo thumbnails.
   d. Press **Next**.
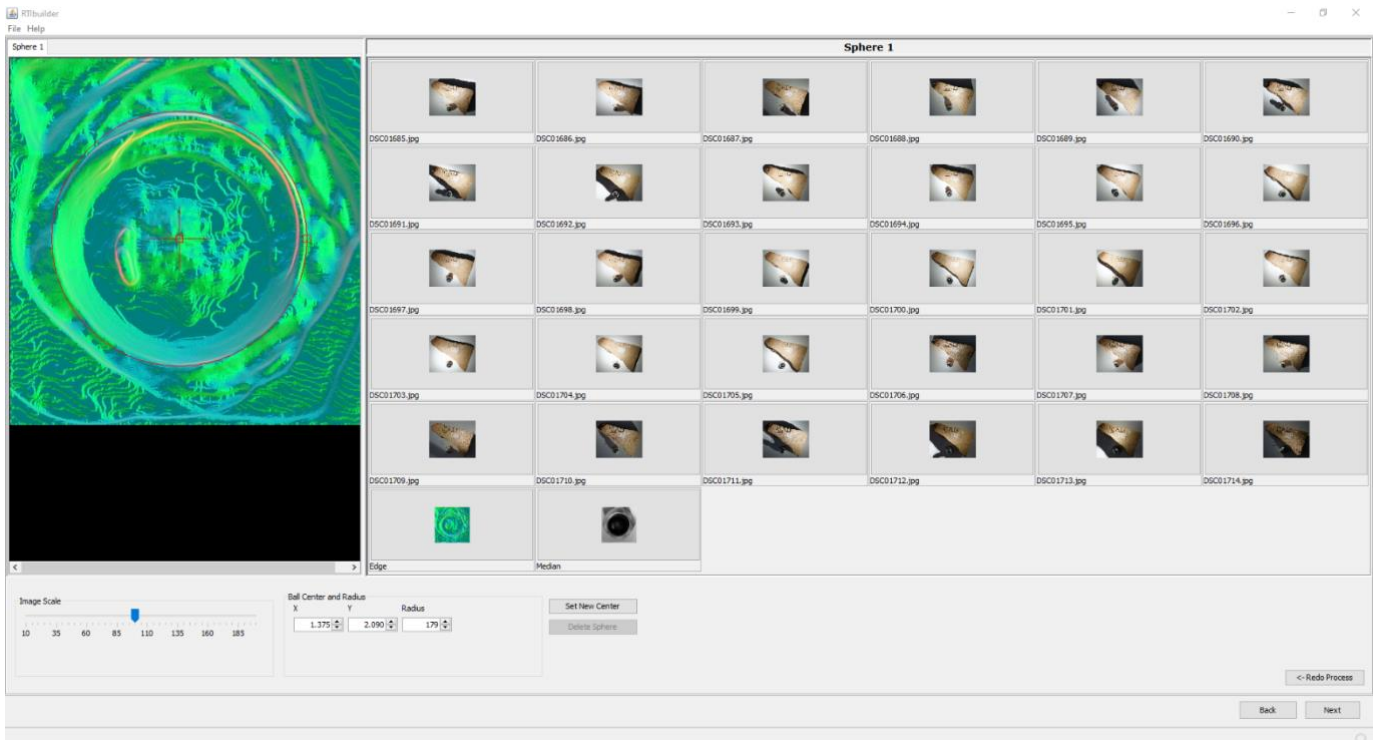
5. In the following step RTIBUilder detects highlight on the sphere within each of the photos – calculating from which direction light is being cast on our objects surface.
   a. Press **Highlight detection**.
   b. After executing the command, a thumbnail of a **Blend** image will appear beneath your photos. This image shows the sphere with all the highlights from the photos.
   c. Press **Next**.
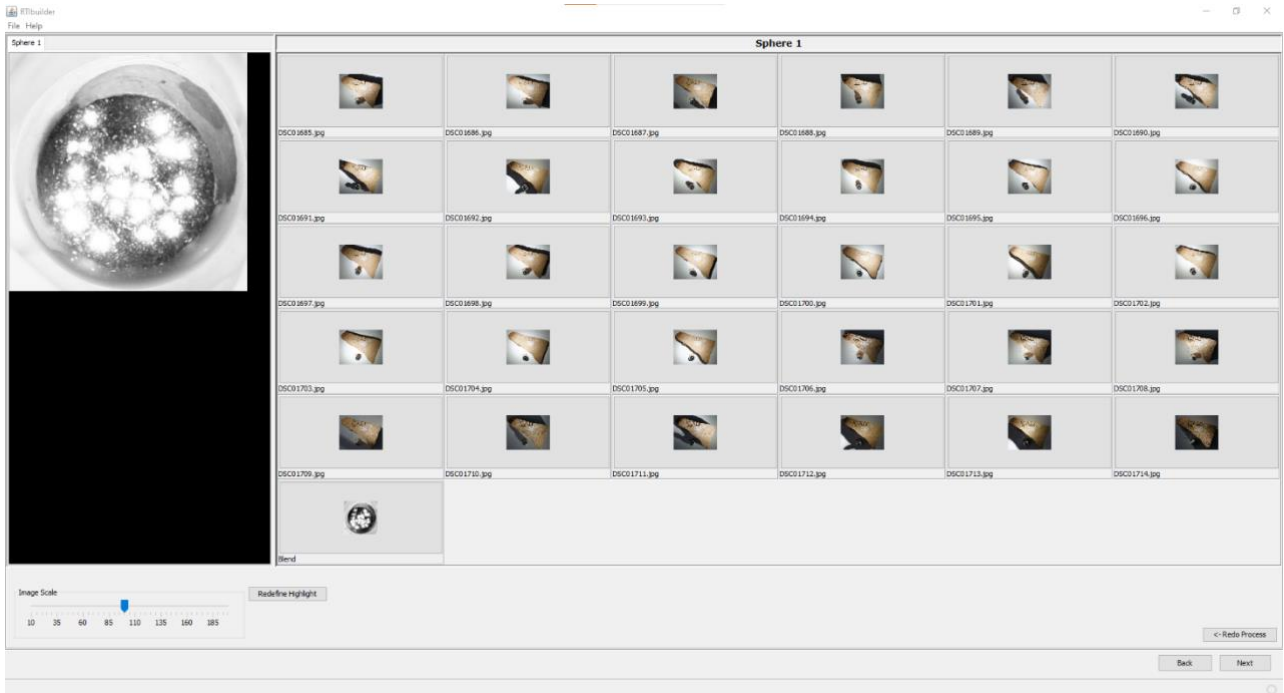
6. The last RTIBuilder step will execute and output the final file for viewing.

   a. You can choose to crop the final output by ticking the box **Use Crop** in the **Crop Properties** panel and dragging a rectangle over the image.

   b. To the right of the image at the top make sure that the **PTMFitter Location** is pointing at the right location by pressing **Find** and navigating to and opening PTMfitter.exe within your folder directory. If you have followed the steps in the RTIBuilder installation tutorial correctly this should be within feltkursus2021\rti-master\RTIbuilder_v2_0_2\Fitters.

   c. Change the **Output File Name** if you want, but otherwise leave the rest as it is.

   d. Press **Execute**. (On the right you can see the process running – the duration of the process will depend on your computer hardware). At the end it should give you the **Message – Fitting Completed**.
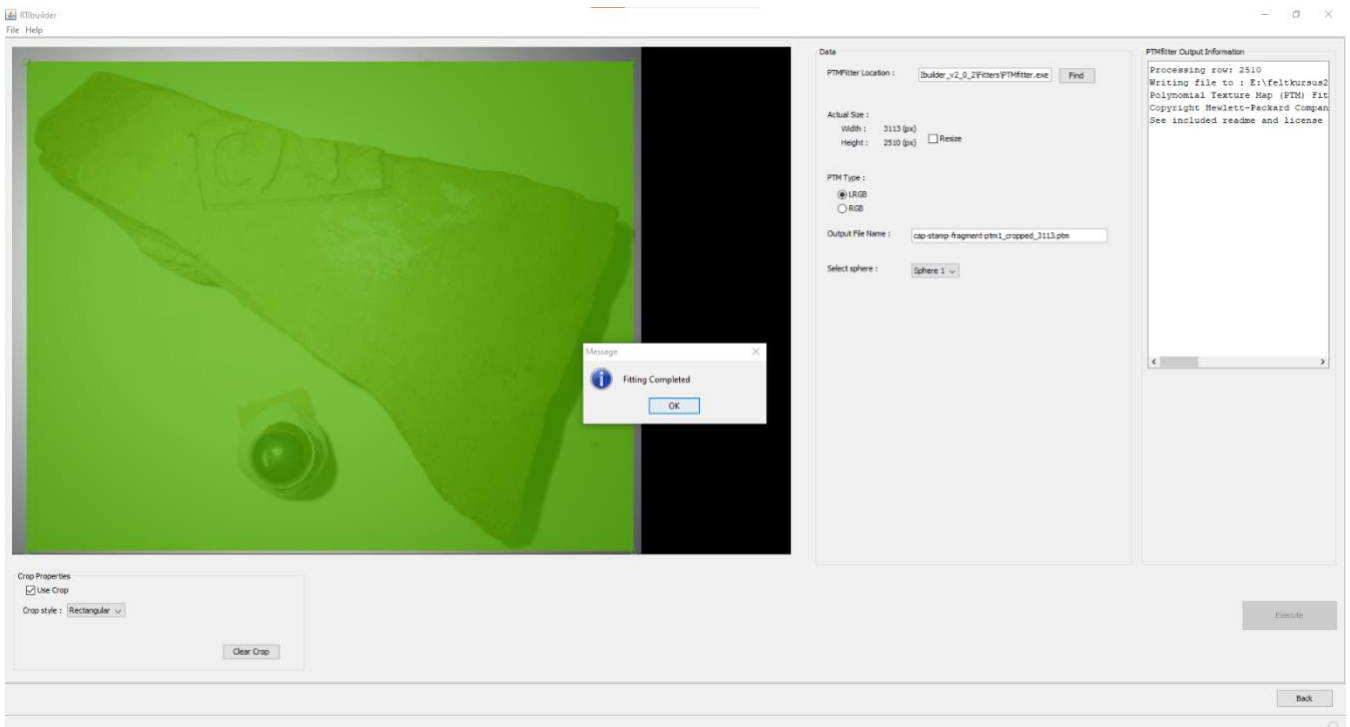
The RTIBuilder steps and process has now run its course and you can view the result in RTIViewer.

In RTIViewer

1. Navigate to your finished RTI file. Within your **cap-stamp-fragment-dataset** folder RTIBuilder has created a number of subfolders and files. Open the **finished-files** folder and open the file in RTIViewer by double clicking on it. (Alternatively, open RTIViewer and open the file by clicking on the top icon to the right of the main viewer panel)
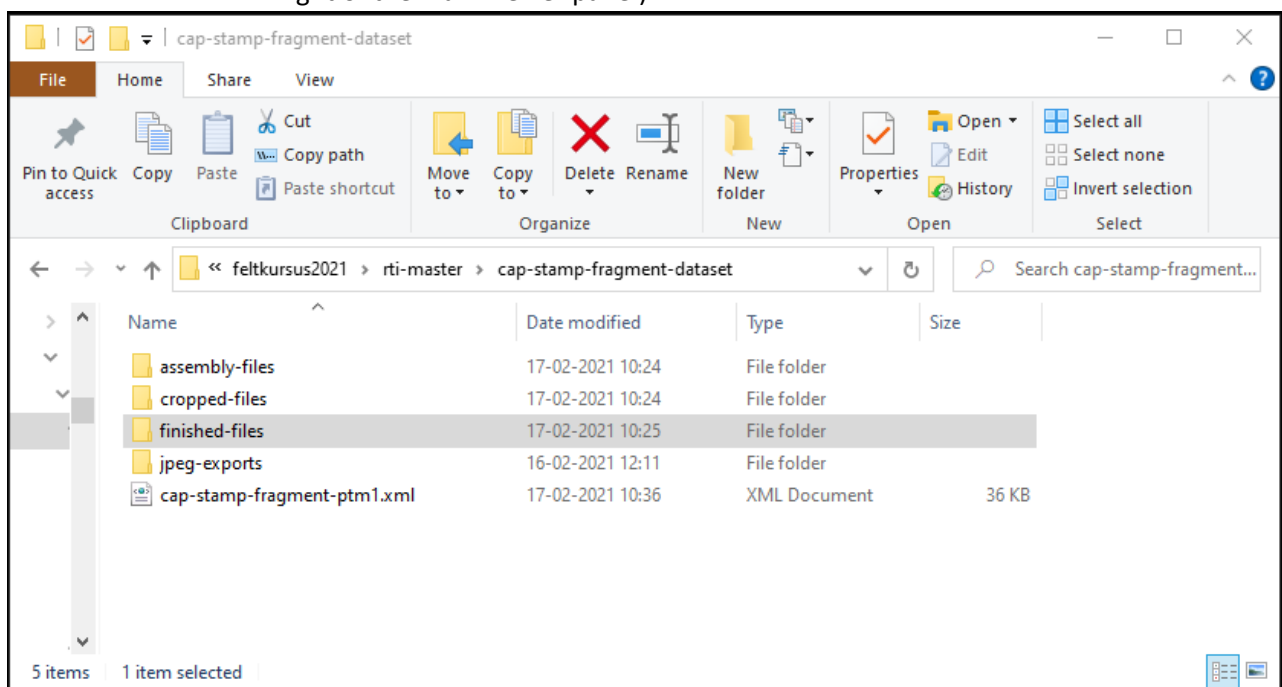
2. Once opened you can manipulate the direction of the light by moving the highlight on the green sphere at the top right of the viewing panel.
3. In the **Rendering mode** panel you can switch between different options. For this particular project either **Specular Enhancement** or **Luminance Unsharp Masking** will give you the most pronounced contrasts.
4. Shining the light on the surface (almost) from the side will let surface imperfections and fabrication marks stand out. In this case you will also find what seems to be a partial fingerprint to the left of the stamps lower left corner.

Congratulations you are now very close to the person, who made this object in antiquity!