

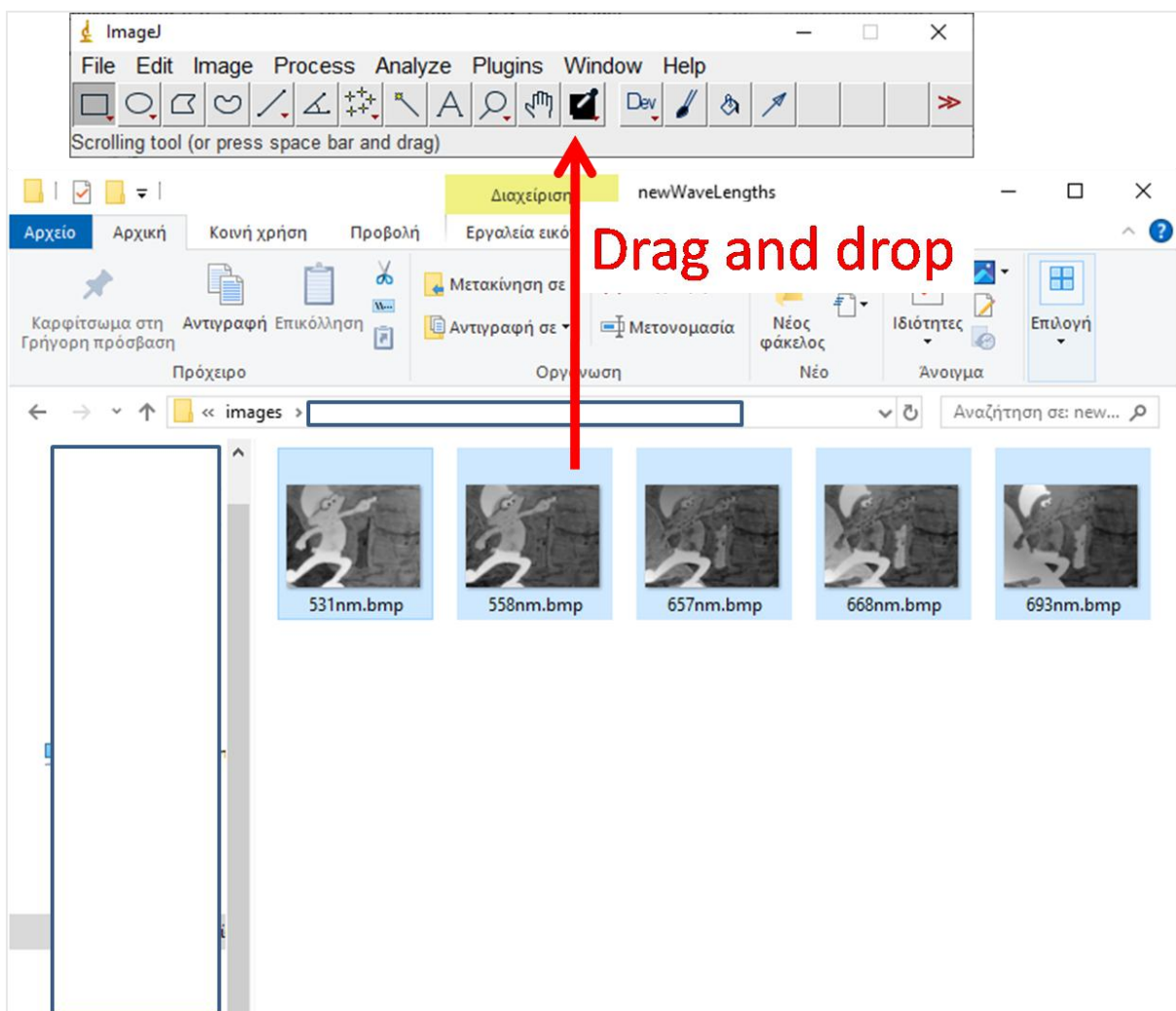
Graph of Intensity

Following these steps, you can construct a graph of the average value of the intensity per wavelength for specific areas of the painting. Bear in mind that you need the normalized images in order to follow these steps.

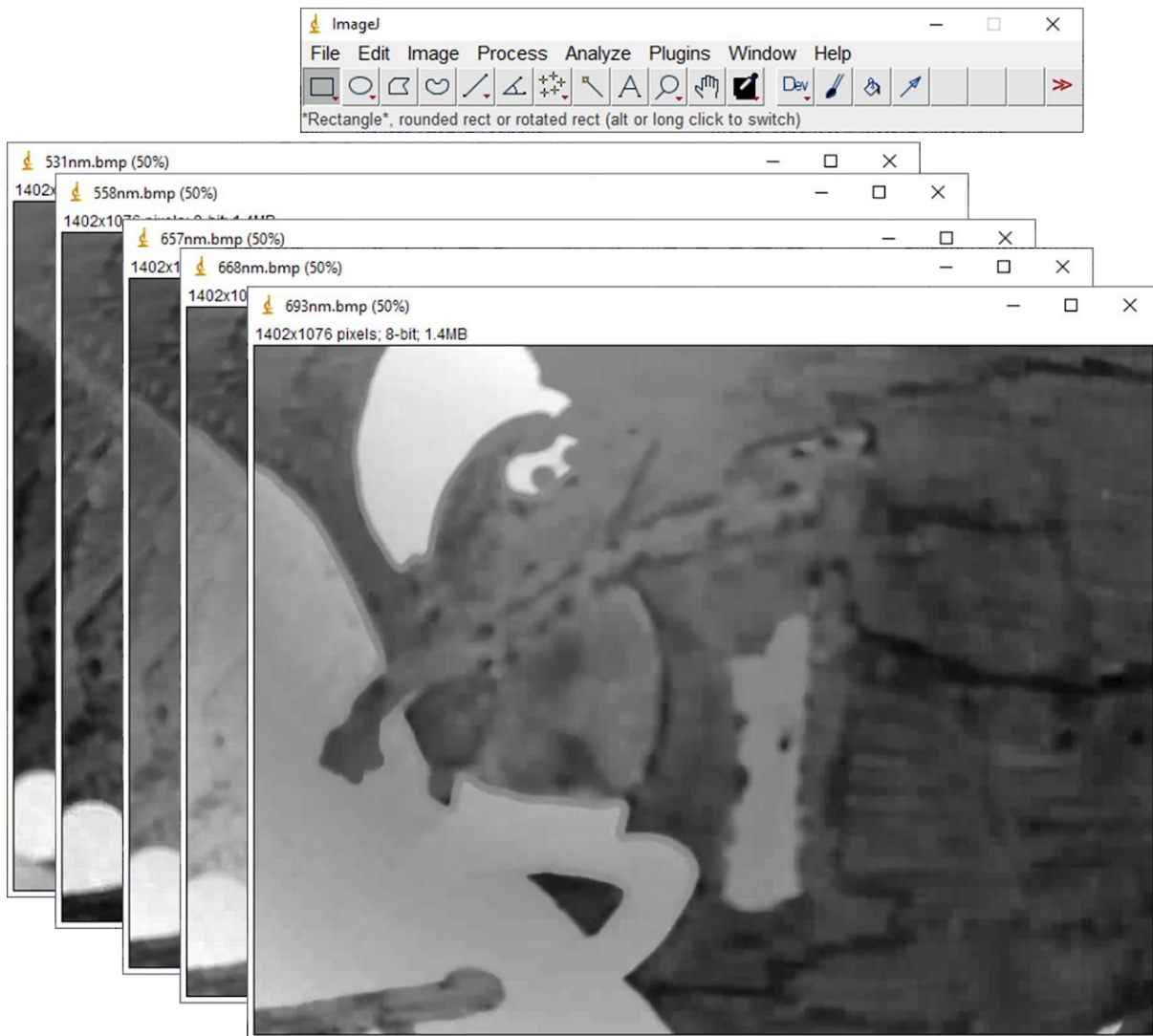
Step 1

Drag and drop the normalized images to *ImageJ*.

You will get something like that.



Note: The images should be from the smallest wavelength (bottom) to the largest wavelength (top windows). If the images are not in that order, you can change their order by clicking on them one by one.

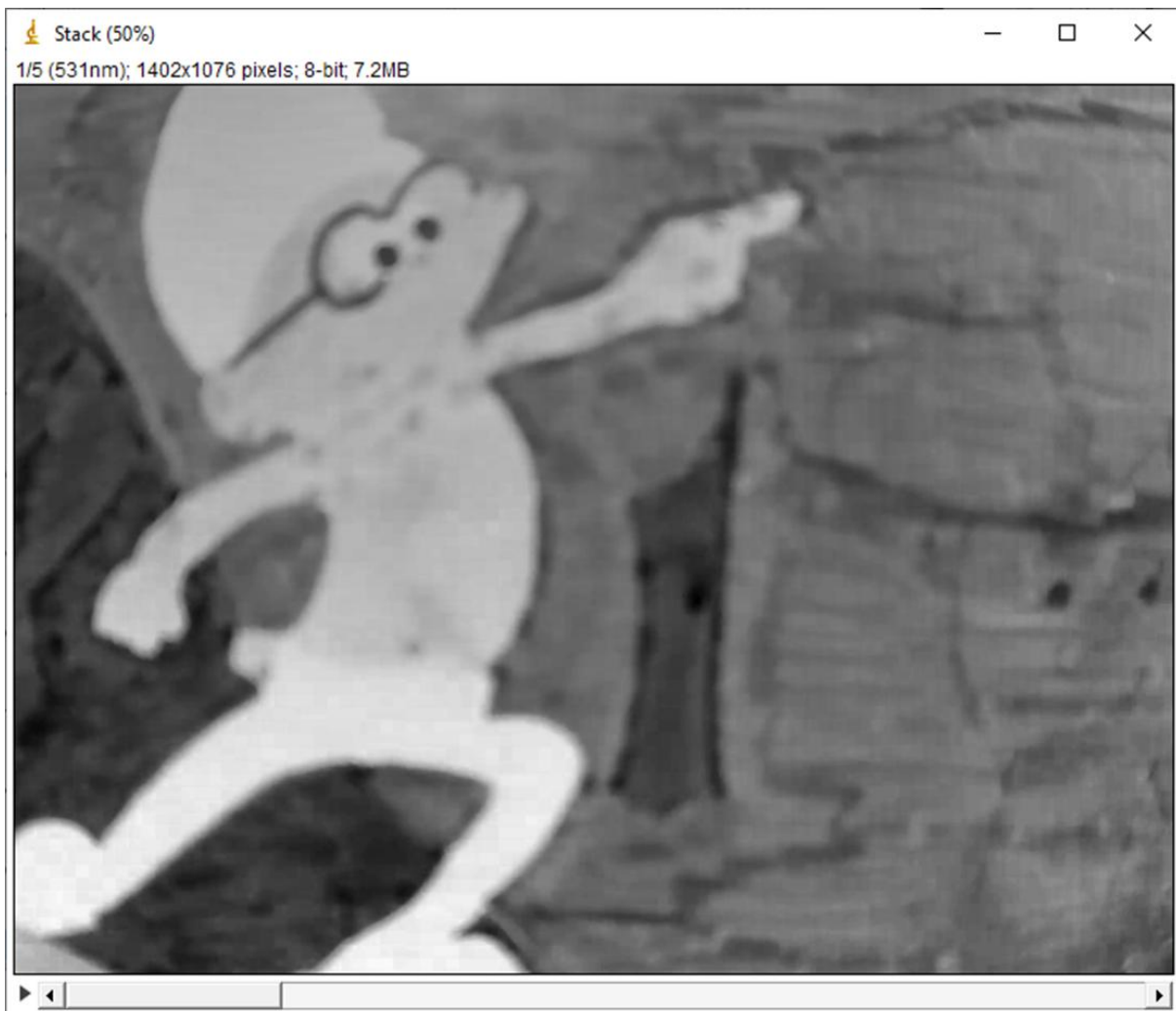
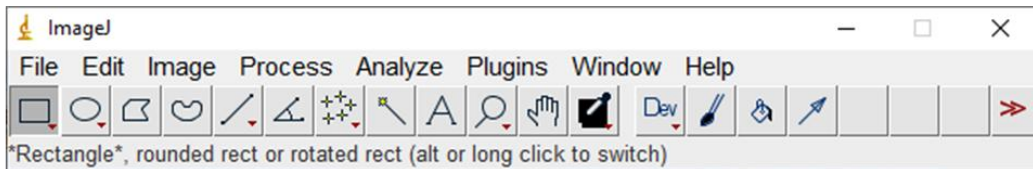
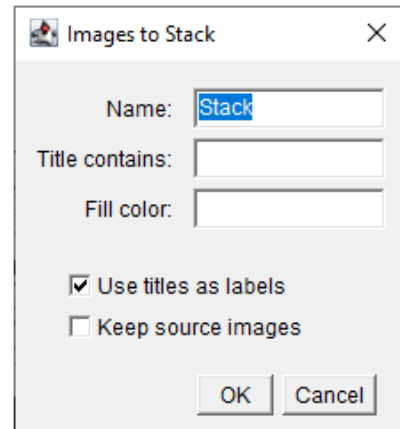


Step 2

To combine all these images into one "stack", go to:
Image → *Stacks* → *Images to Stack*

A small window will pop up. Choose a name and click *OK*.

You will get something like that. All images are now in one window. You can see all images by moving the horizontal bar at the bottom of the window.

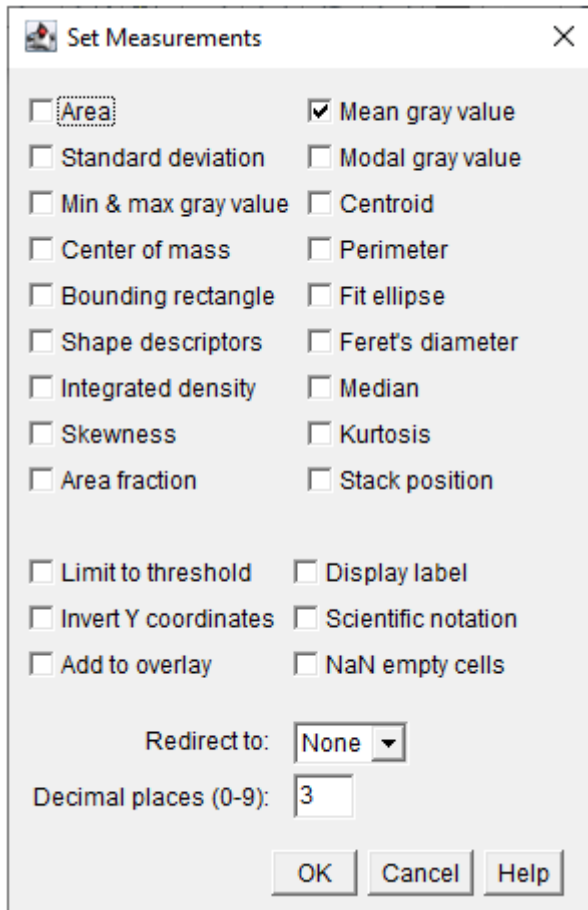


Step 3

Now we will choose the type of calculations that we want to get. So go:

Analyze → *Set Measurements*

A new window will pop up. Choose only the option "*Mean gray value*" and click *OK*.



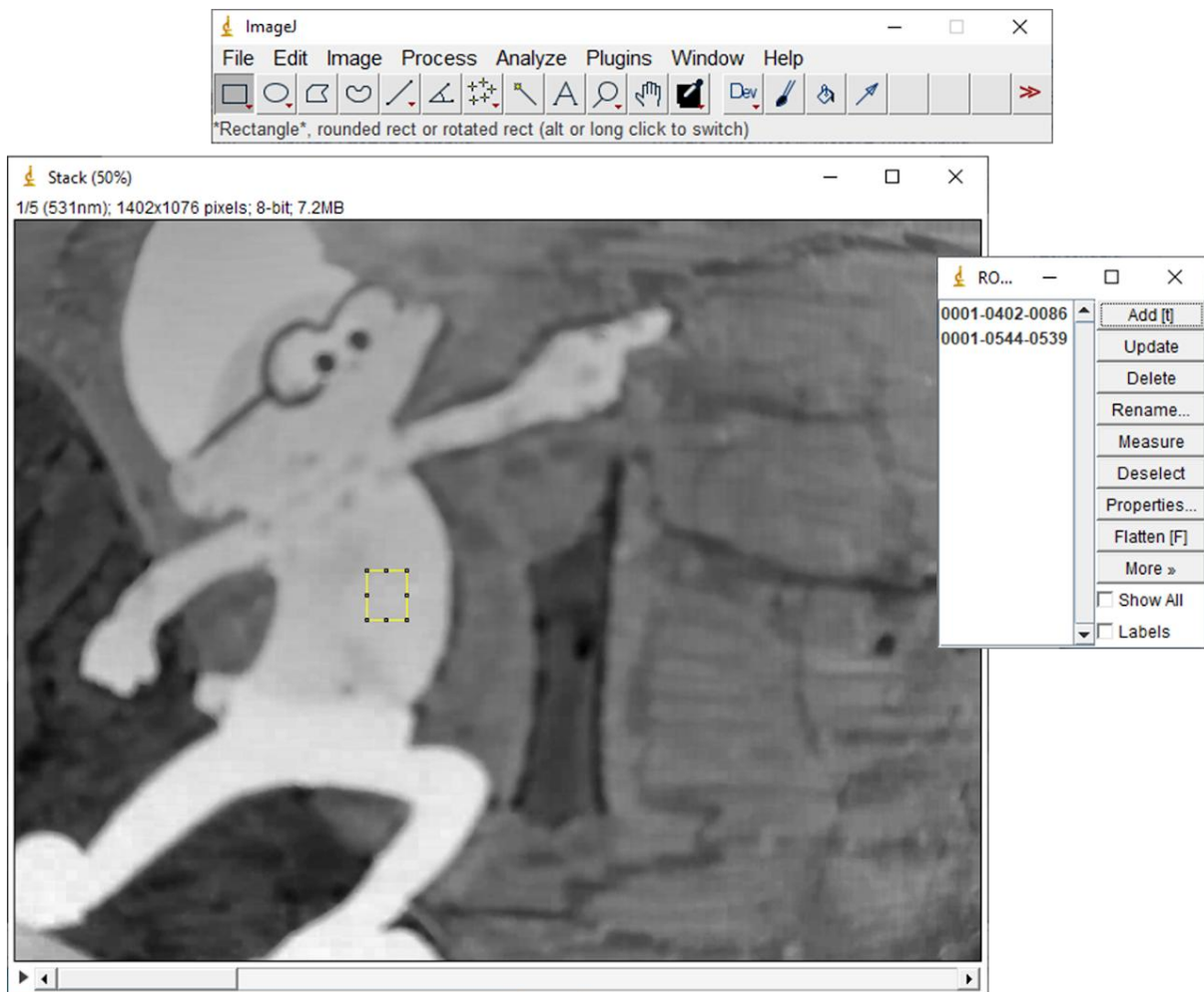
Shedding „light“ on a Picasso!

Step 4

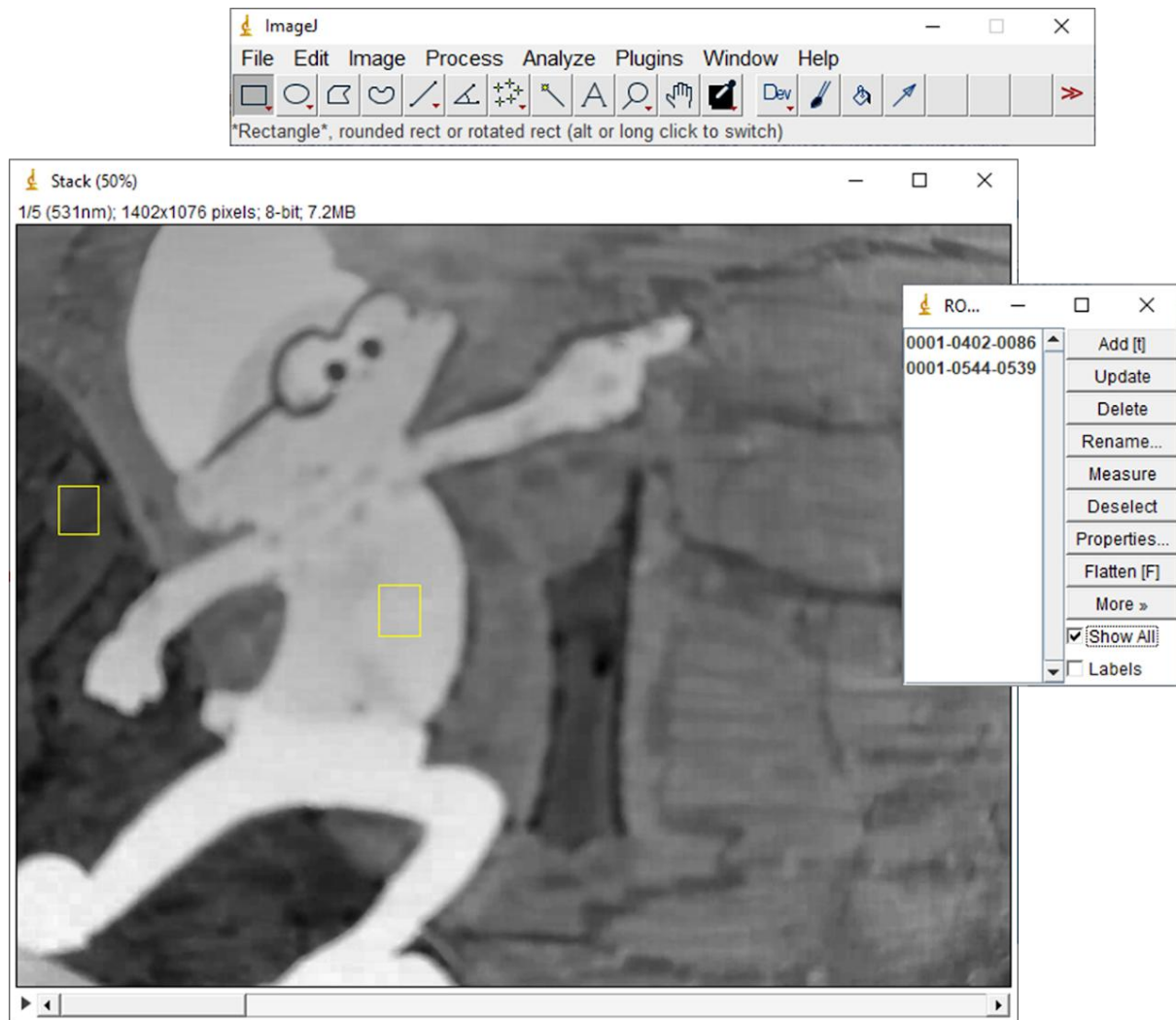
Now we will choose the areas that we want to analyze.

Select again: *Analyze* → *Tools* → *ROI Manager*

In the small window that will pop up, select an area on the image (with the rectangle) and click "Add".



You can add as many areas as you want. You can see all areas together by selecting the "Show All" option on that window. You can delete an area by selecting it and clicking the "Delete" button.

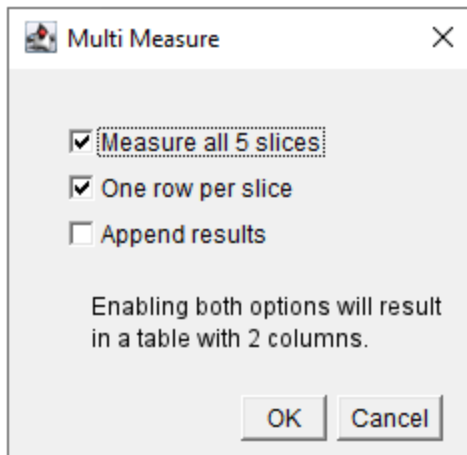


Shedding „light“ on a Picasso!

Step 5

Select: *Measure* → *Multimeasure*

In the new window, select "*Measure all xxx slices*" and click *OK*.



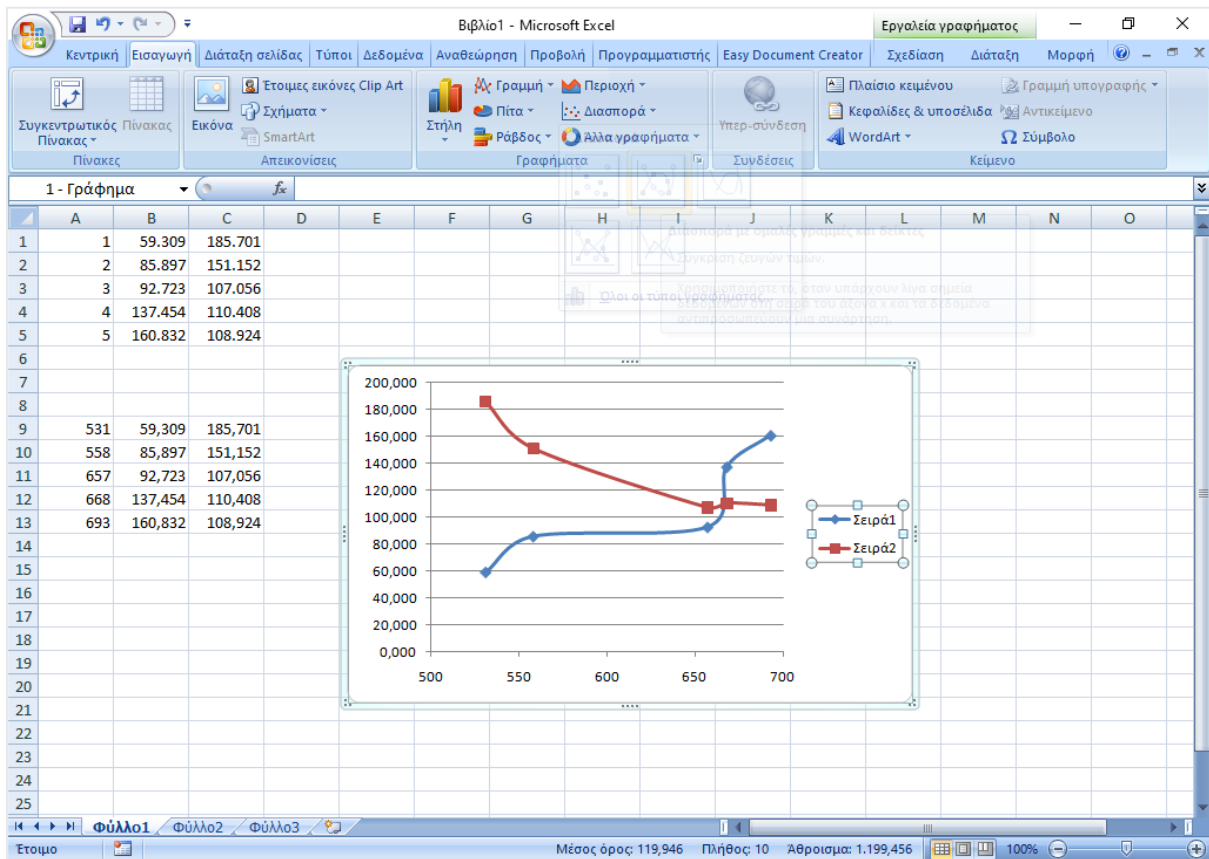
A new window with the results will pop up. The first column is the number of the image, while the other columns are for the areas that you selected.

	Mean1	Mean2
1	59.309	185.701
2	85.897	151.152
3	92.723	107.056
4	137.454	110.408
5	160.832	108.924

Step 6

Now you can use the data to draw a graph.

Here, we pasted the data to excel. We changed the numbers 1 to 5 with the wavelength and then we drew the graph for the data. You might have to change the dots to commas.



You find further information on [the project page](#) by the authors.

The project “Shedding “light” on a Picasso!” by Kalliopi Giannakoudaki and Georgios Chatzisavvas introduces students to multispectral imaging. [Go to the Science on Stage teaching material.](#)



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