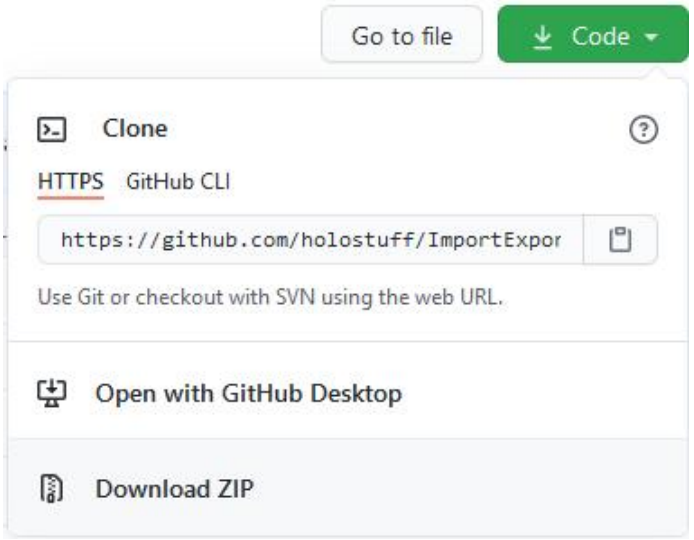
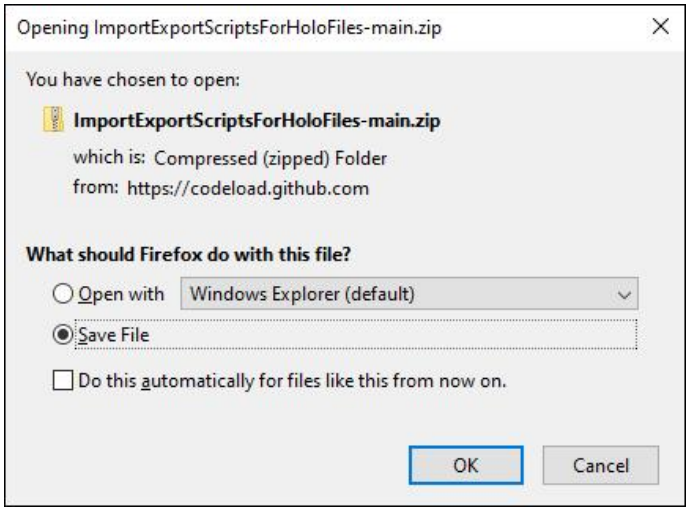
How to install and use HOLO (.holo) file readers and writers for Python, ImageJ and Matlab

Download the collection of scripts and programs from github.com/holostuff by clicking on “Download ZIP” at the “ImportExportScriptsForHoloFiles” folder from the [holostuff github repository](#).



Save the zip file that contains a collection of scripts and programs to read and write .holo files under ImageJ, Python, and Matlab.



Read [HOLO file specifications](#) if you want to learn more about the .holo structure.

Python scripts

In the Python folder there are some Python scripts but here we will introduce only the holo.py script.
Import holo.py in a Python file using “import holo”. You can read and write HOLO files.

holo.FileReader(‘filepath’)

header, data, footer = holo.FileReader('*filepath*').get_all()

Read an existing .holo file, ‘*filepath*’, and return the ‘header’, ‘data’ and ‘footer’ in bytes from the file.

data = holo.FileReader('*filepath*').get_all_frames()

Read an existing .holo file, ‘*filepath*’, and return the ‘data’ part in bytes from the file.

holo.FileWriter(‘filepath’)

holo.FileWriter('*filepath*', (*width, height, bytes_px, num_frames*), *data*).write()

Write a .holo file, ‘*filepath*’ is the writing name file, *width*, *height*, *bytes_px* and *num_frames* are the characteristics of the writing .holo file and *data* is the value array (2D or 3D).

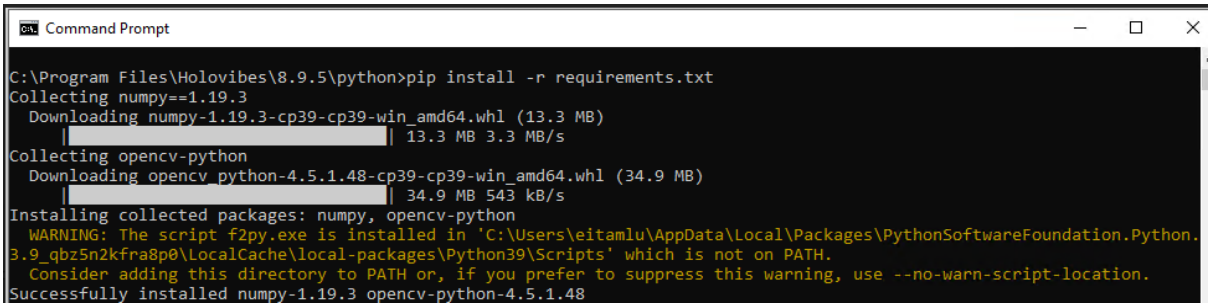
```
import holo

holo.FileWriter('test.holo', (2048,2048,1,4), data).write()
```

Convert .holo files to movies or raw data (optional)

In the “python” folder inside the Holovibes installation folder (C:\Program Files\Holovibes\9.0\python\), the “convert_holo.py” script can be used to convert .holo files from and to different file formats. For that, have python 3 installed, and install dependencies with “pip install -r requirements.txt” (the file requirements.txt can be found in the “python” folder of Holovibes). In the windows search tab, type “Windows PowerShell” or “Command prompt” and run it.

In the PowerShell or the Command Prompt, type : “pip install -r requirements.txt”.



You must provide file extensions to get the expected conversion. The supported file types and extensions are :

From	To	Command input output
.holo	.avi	python3 convert_holo.py input.holo output.avi
.holo	.mp4	python3 convert_holo.py input.holo output.mp4
.holo	.mkv	python3 convert_holo.py input.holo output.mkv
.holo	.raw	python3 convert_holo.py input.holo output.raw
.raw	.holo	python3 convert_holo.py input.raw output.holo

Default video fps is 20. However, the video fps can be specified with the option --fps.

Example: **python3 convert_holo.py “input.holo” “output.mp4” --fps 60** (the output video fps will be 60 fps).

Sometimes people don’t have writing access to the directory “C:\Program Files\Holovibes\9.0\python\”, in that case, an error message may be obtained while trying to use the script “convert_holo.py” : “PermissionError: [Errno 13] Permission denied: 'test.raw'”. To solve this, either get admin rights or simply try to move and use the scripts somewhere else on your computer.

Matlab scripts

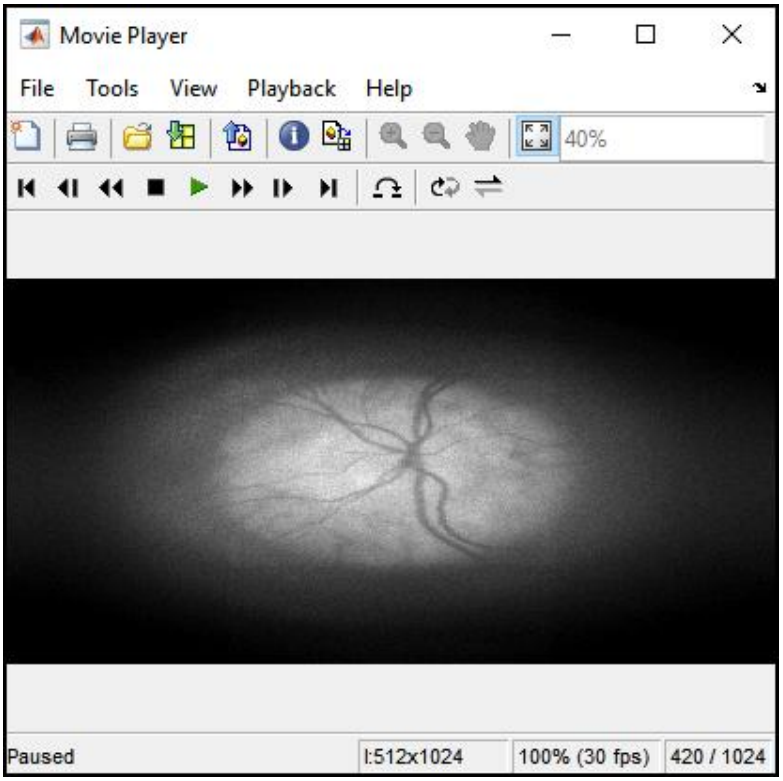
In the Matlab folder you can find two useful files : Read_Holo.m and Write_Holo.m.

Read_Holo.m

In the Read_Holo.m file you can find a function which can be used in different ways. To test this function you can download 210329_MAE0142_rendered_images.holo file.

Read_Holo()

Open the Read_Holo.m file and click on the “Run” button or write “Read_Holo” in the “Command Window”. The dialog window opens and you just need to choose the .holo file you want to watch. The “Movie Player” window opens and you can watch the image sequences.



Read_Holo(‘*filepath*’)

Give the file path to the Read_Holo function and watch the video. Write on the “Command Window” or in your program the command line : “Read_Holo(‘*filepath*’)”. The “Movie Player” will open.

Output = Read_Holo()

The dialog box will open. Choose the .holo you want to read. The data from the .holo file will be saved in a “Output” variable but the “Movie Player” window will not open.

Output = Read_Holo('*filepath*')

Choose the .holo you want to read by giving directly the "*filepath*" to the Read_Holo function. The data from the .holo file will be saved in a "Output" variable but the "Movie Player" window will not open.

Write Holo

In the Write_Holo.m file you can find a function which can be used in two different ways. The aim of this function is the writing of an array (2D or 3D) in a .holo file.

Write_Holo(Input, '*filepath*')

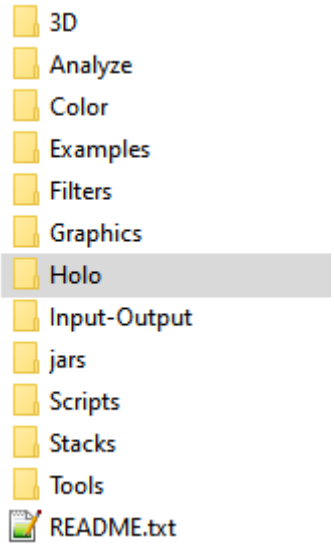
Give an "Input" array to the Write_Holo function and the '*filepath*" where the .holo file will be written.

Write_Holo(Input)

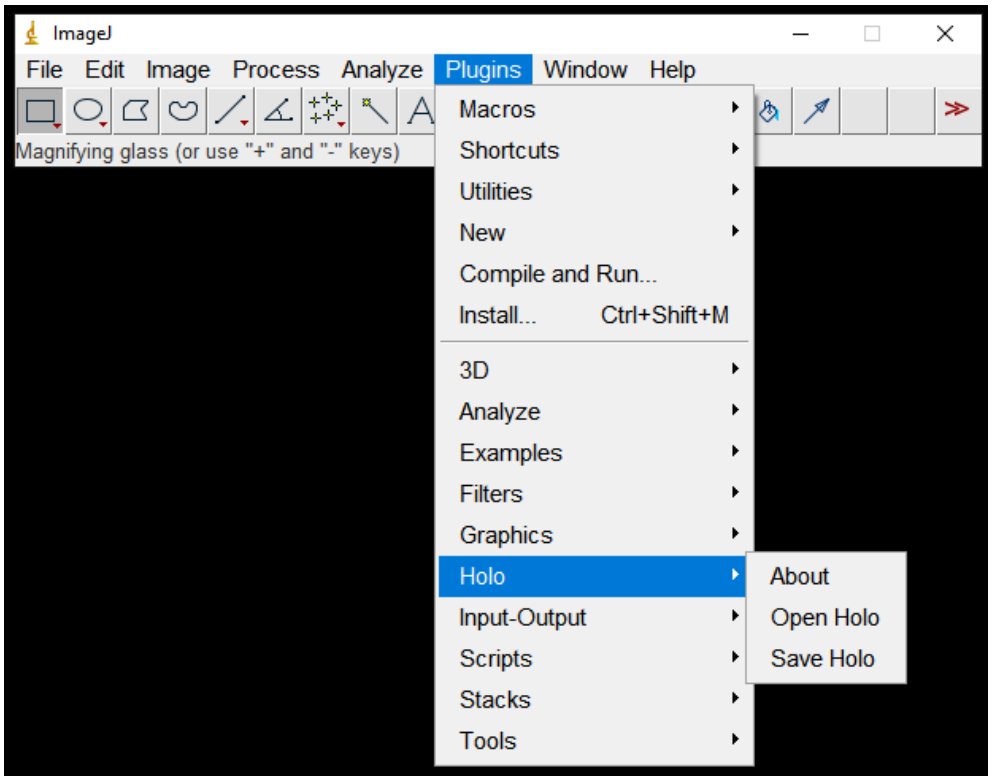
Give only the "Input" array after that the dialog window will open. Choose the location where the .holo file will be saved.

ImageJ scripts and plugins

First, download the ImageJ software (not Fiji, for which Holostuff plugins will not work out-of-the-box) and install it on your computer. Download the “Holo” folder from the holostuff github repository. This folder contains .class and .java files. The java files are the source code for the .class files. Move this folder to the “ImageJ/plugins/” folder.

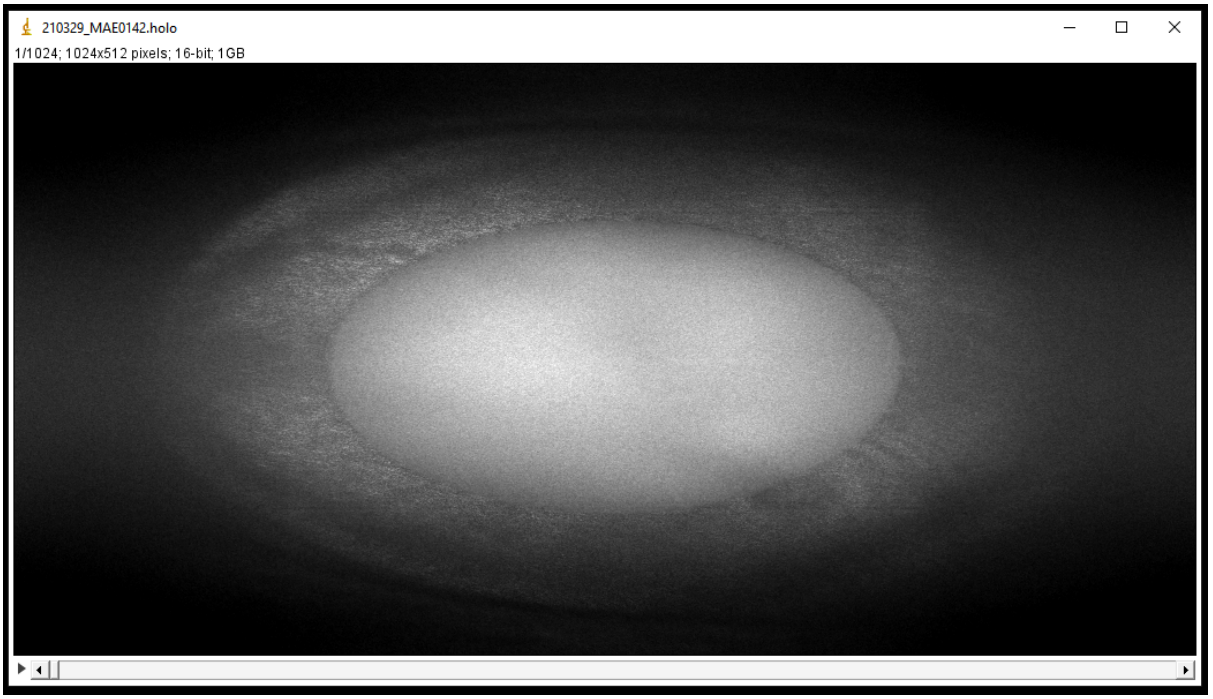


Restart ImageJ if it was open. Click on the “Plugins” menu where you will find new plugins for ImageJ gathered in the folder “Holo”.

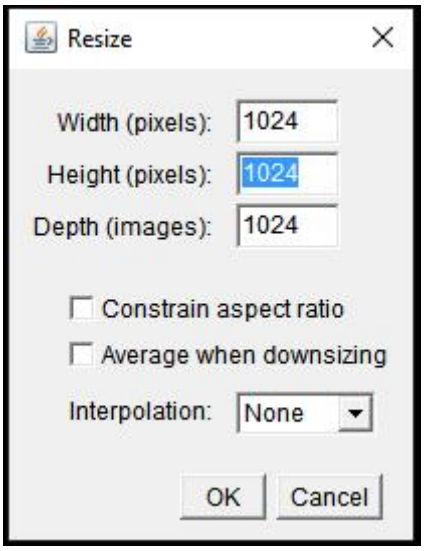


Open Holo plugin

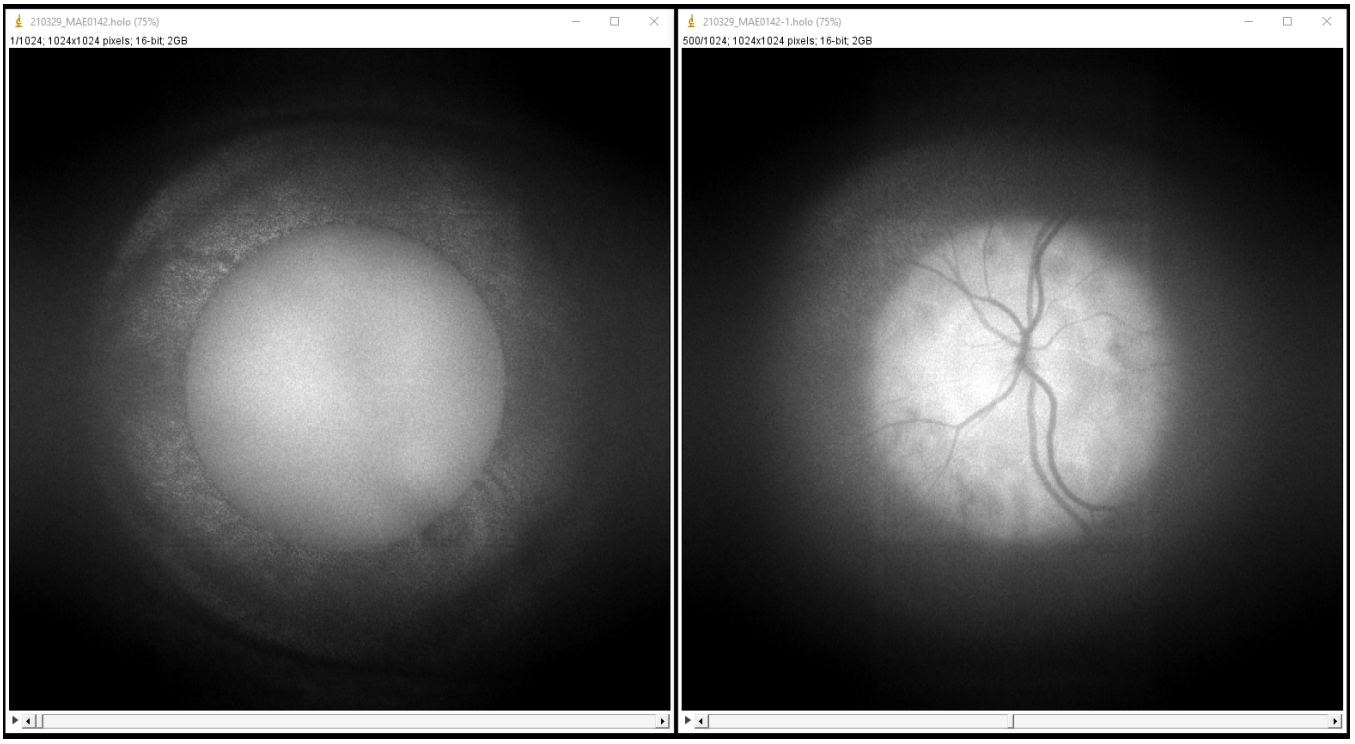
You can test the “Open Holo” plugin by downloading the file 210329_MAE0142_rendered_images.holo. Click on the “Open Holo” plugin in ImageJ and select the HOLO file that you have just downloaded. The following window displaying an eye will open. Its aspect ratio is 2:1 because the original interferograms were recorded with an anamorphic frame with the same aspect ratio, and the reconstruction was done on the same grid size..



You can resize the frame by clicking on “Image/Adjust/Size…” and setting equal width and height values.



The displayed frame should show reconstructed holographic images of the anterior and the posterior segments of a human eye.



Congratulations now you know how to open .holo files with ImageJ !

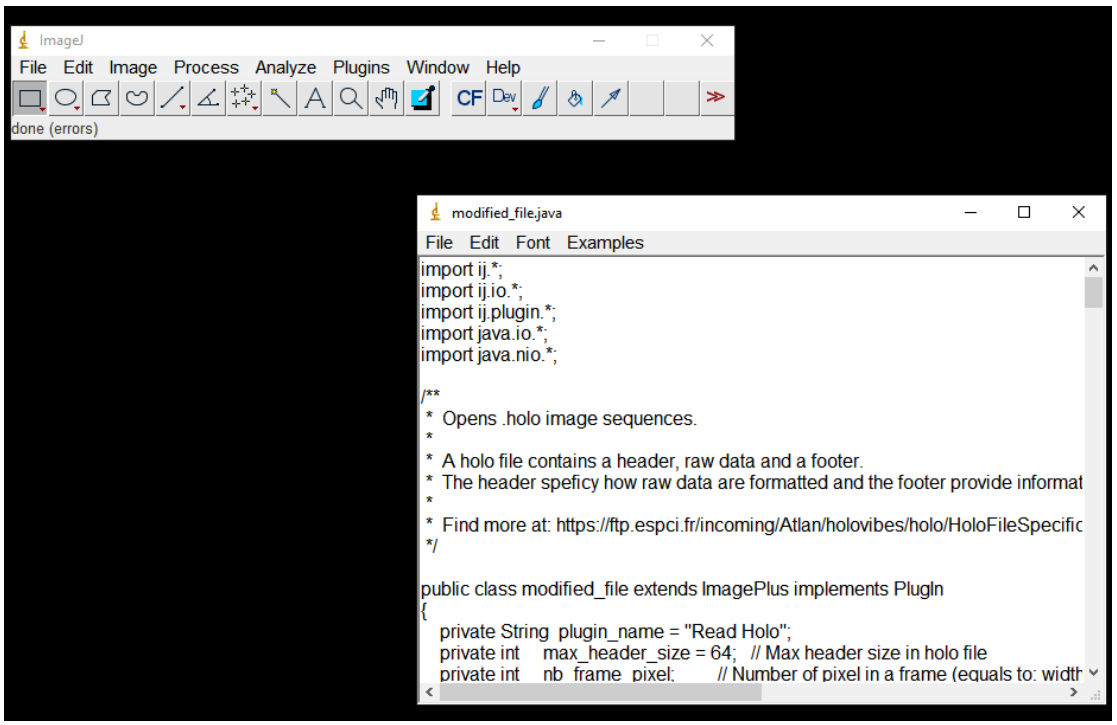
Save Holo plugin

You can also save .holo files. Click on the “Save Holo” plugin in ImageJ while a file is open in ImageJ. Choose a name for this new .holo file and save it.
To check if this new file is a .holo file you can use the “Open Holo” plugin and open it.

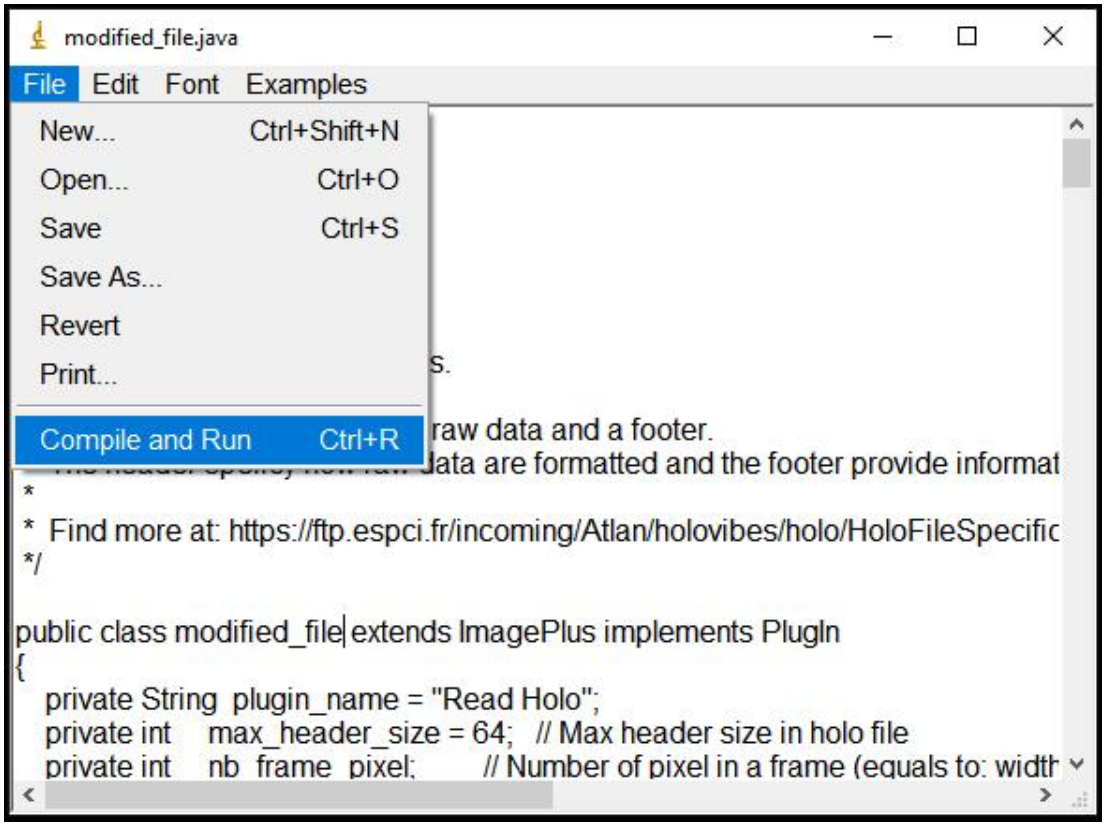
Congratulations now you know how to save .holo files with ImageJ !

Compiling .java files to .class to customize the plugins

If you want to make some modifications in these plugins you can do it !
For that, you can customize one of the .java files in the “Holo" folder with the text editor of your choice. After that, open the “modified_file.java” file with ImageJ (Ctrl + O).



Compile and Run this new file (Ctrl + R).



You can observe in the “Holo” folder a new “modified_file.class” file. This is the executable file.

Restart ImageJ if it was open. Now you can use your customized plugin with ImageJ.