

# Analysis of auto-fluorescence in NHP baseline *in vivo* retinal images

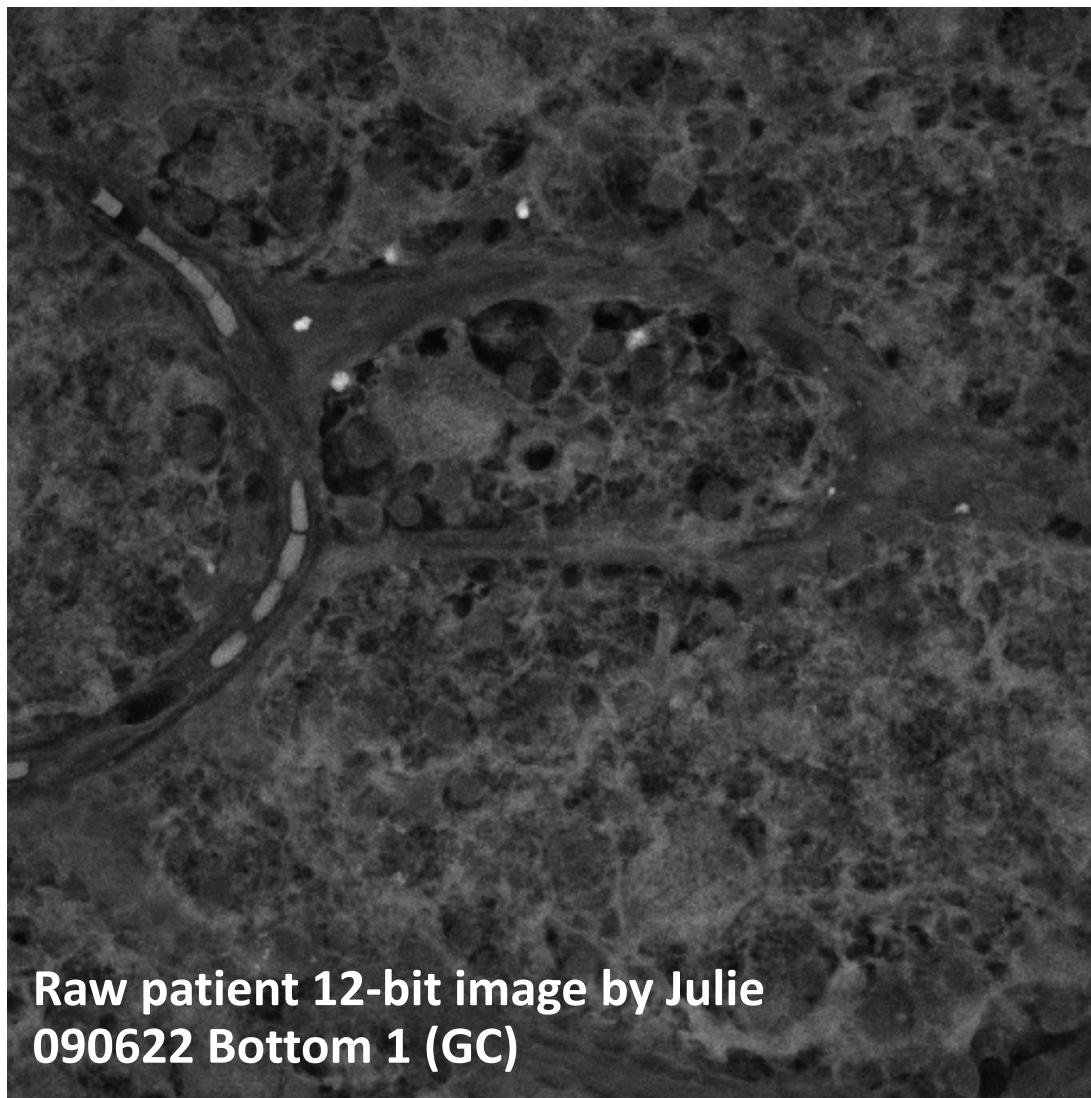
Alex Matov  
November 2022

## Summary of data & findings

- 13 NHP in vivo datasets/eye samples
- 6-8 images time-lapse images per sample, split roughly half prior to & post injection
- 15 faint auto-fluorescent blobs were detected, an average of ~1.15 per sample (max. 3 in an eye)
- Aggregates had higher contrast & were more easily detected in images acquired prior to injection
- The blobs are often circular with peak intensity ~40[A.U.], perimeter ~200um, & area ~.003mm<sup>2</sup>
- Images acquired with 8-bit camera; intensity range is 0 to 255 [A.U.]; 1 image pixel = 7um in sample

Cyno 170395 \Cyno1\_000.tif - 1  
Cyno 180424 \Cyno1\_004.tif - 0  
Cyno 191797 \Cyno1\_004.tif - 2  
Cyno 191800 \Cyno1\_004.tif - 2  
Cyno 191815 \Cyno1\_004.tif - 3  
Cyno 191817 \Cyno1\_004.tif - 1  
Cyno 191823 \Cyno1\_004.tif - 1  
Cyno 200188 \Cyno 200188\_004.tif - 0  
Cyno 200188 \Cyno2\_005.tif - 1  
Cyno 200190 \Cyno2\_003.tif - 0  
Cyno 200193 \Cyno2\_003.tif - 0  
Cyno 200217 \Cyno2\_003.tif - 2  
Cyno 200251 \Cyno2\_006.tif - 2

## Example: Glaucoma SDEB Eye #2 – SIFT features test on ex vivo data



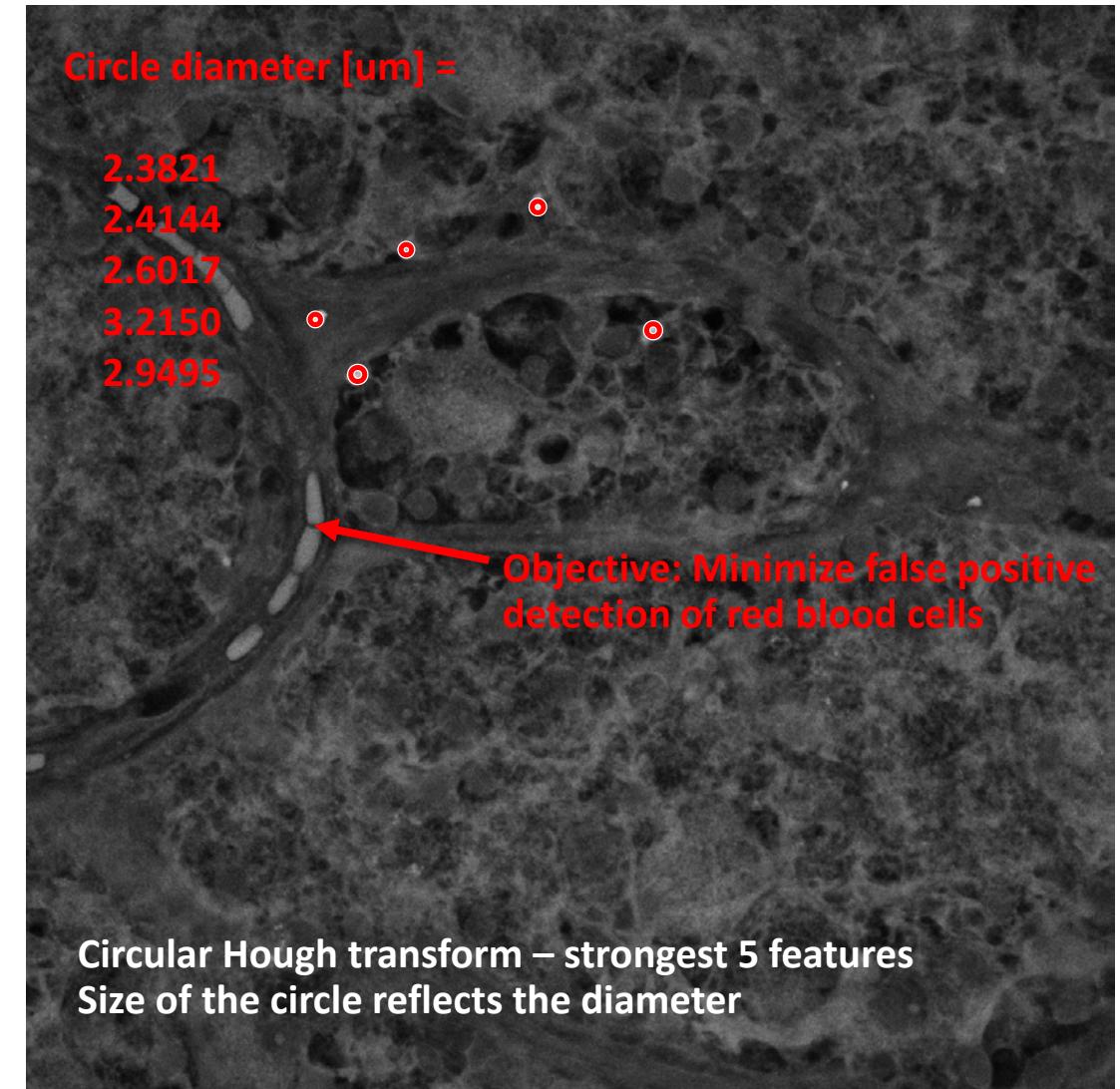
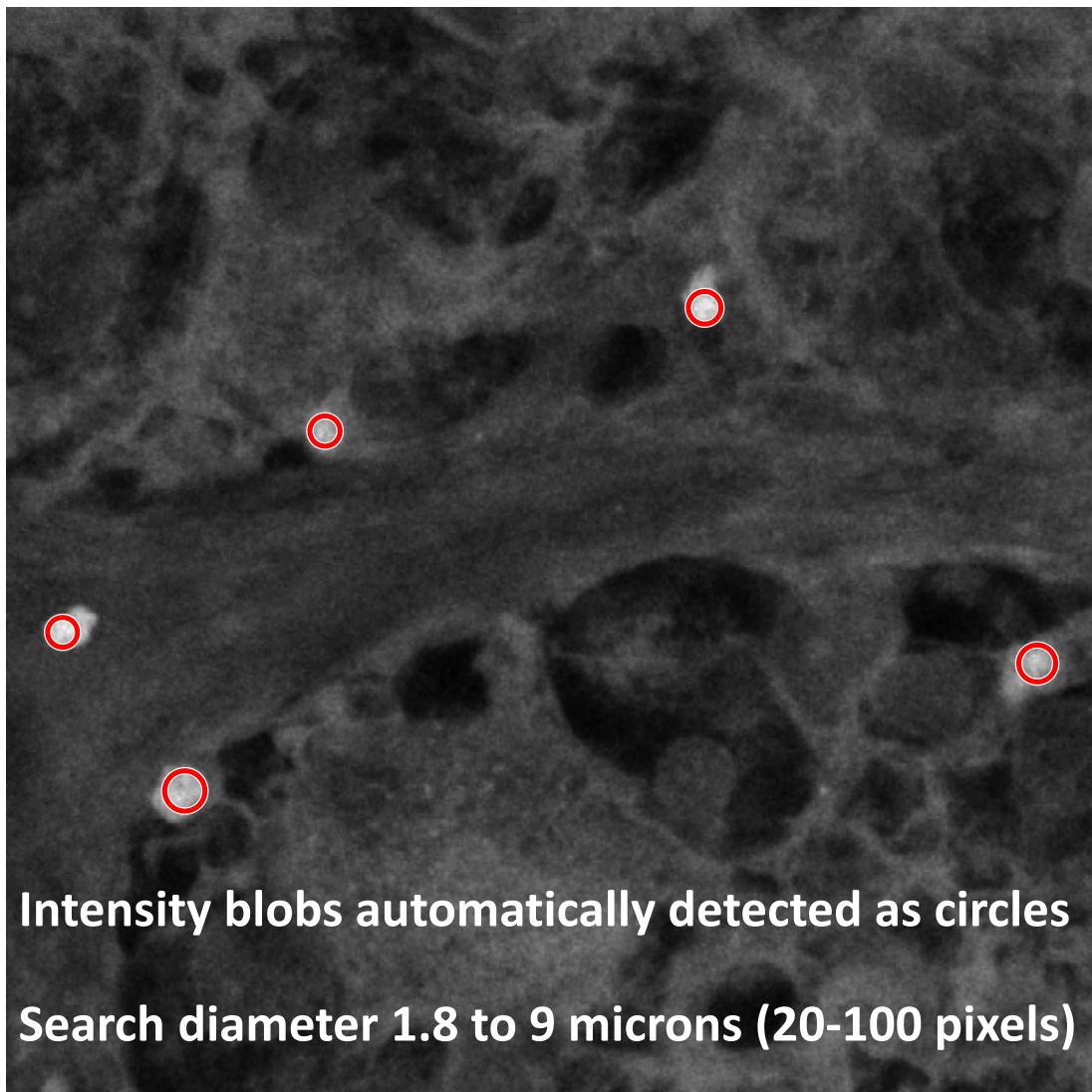
Raw patient 12-bit image by Julie  
090622 Bottom 1 (GC)



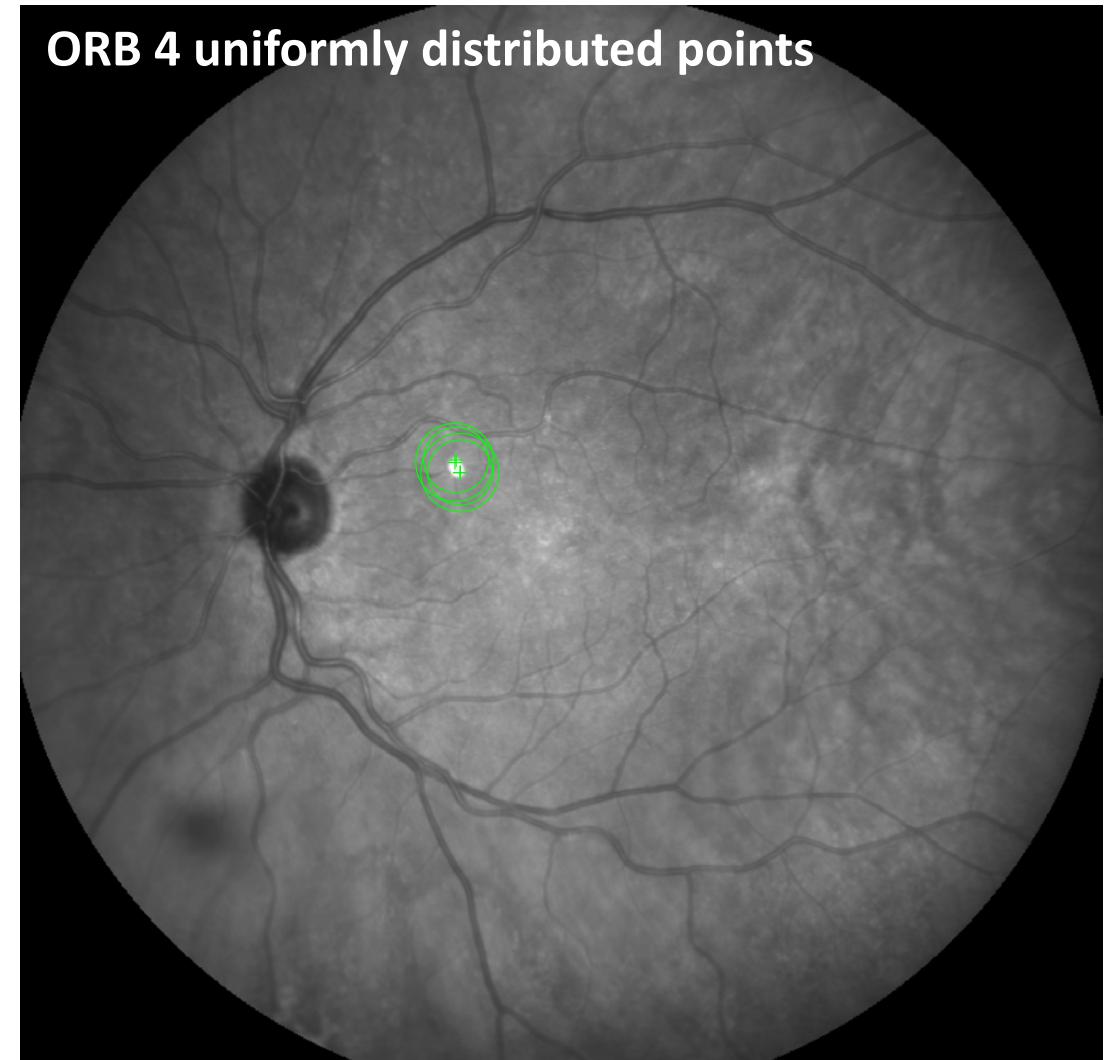
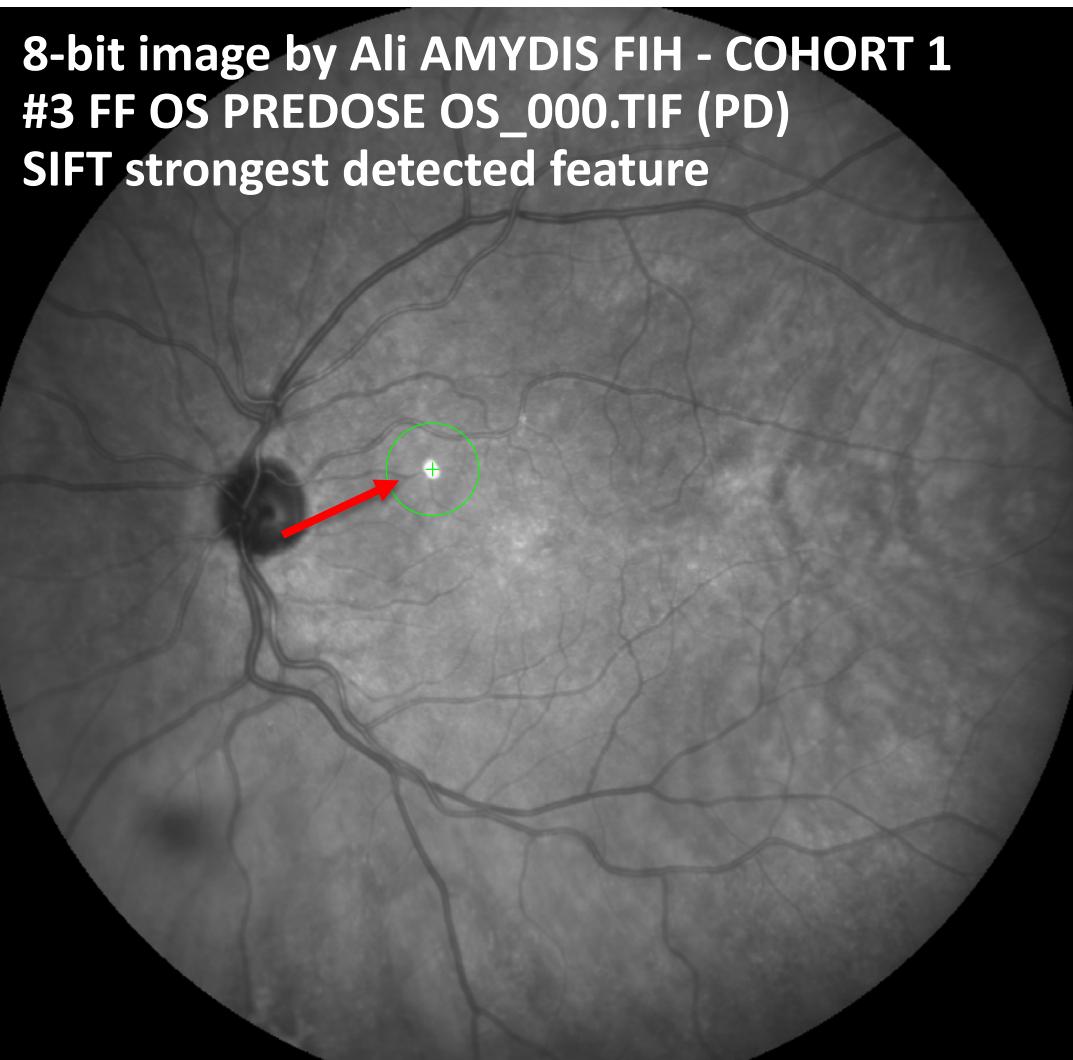
Scale-invariant feature transform – strongest 5 features  
Size of the circle reflects the scale

SIFT detects distinct features in ex vivo GC image data

## Example: Glaucoma SDEB Eye #2 – Circular Hough transform test on ex vivo data

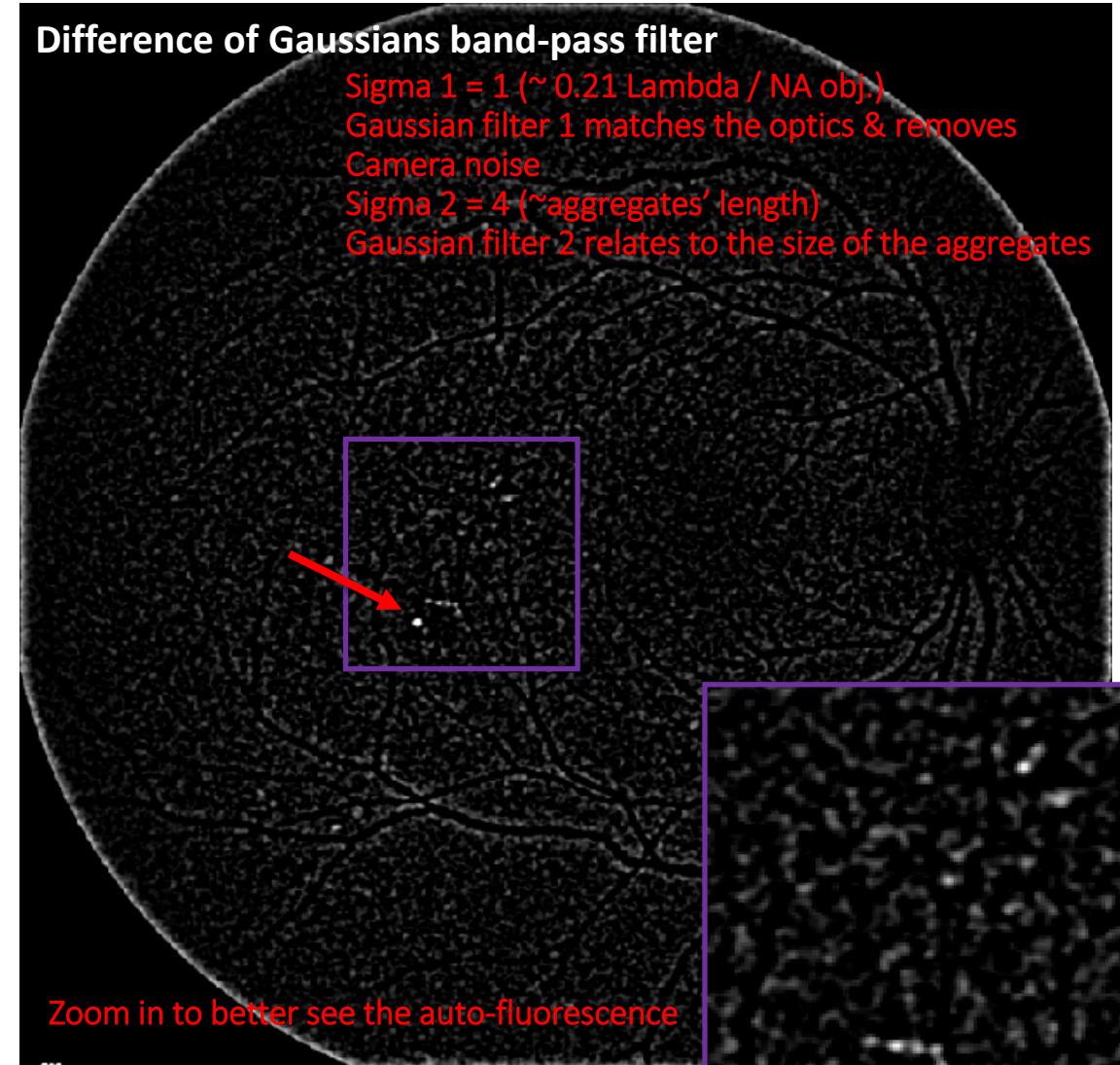
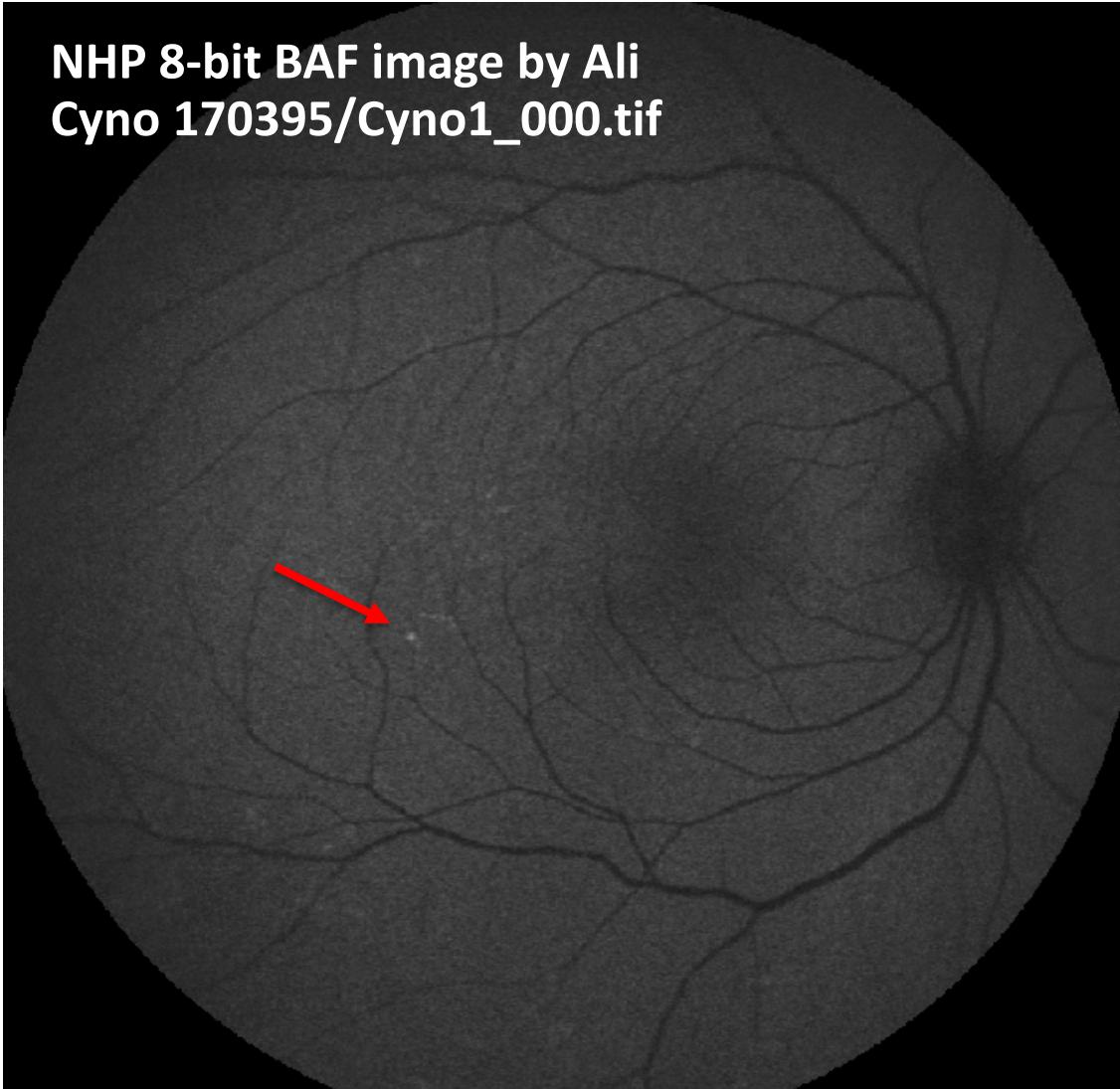


## Pre-dose (no labeling) aggregates in in vivo human PD



SIFT & ORB test on in vivo PD image data pre-injection – perhaps could be used in a classification test as positive samples

## Preliminary analysis



## Preliminary analysis

perimeter in microns (red), area in square microns (green), max. intensity in arbitrary units (yellow)

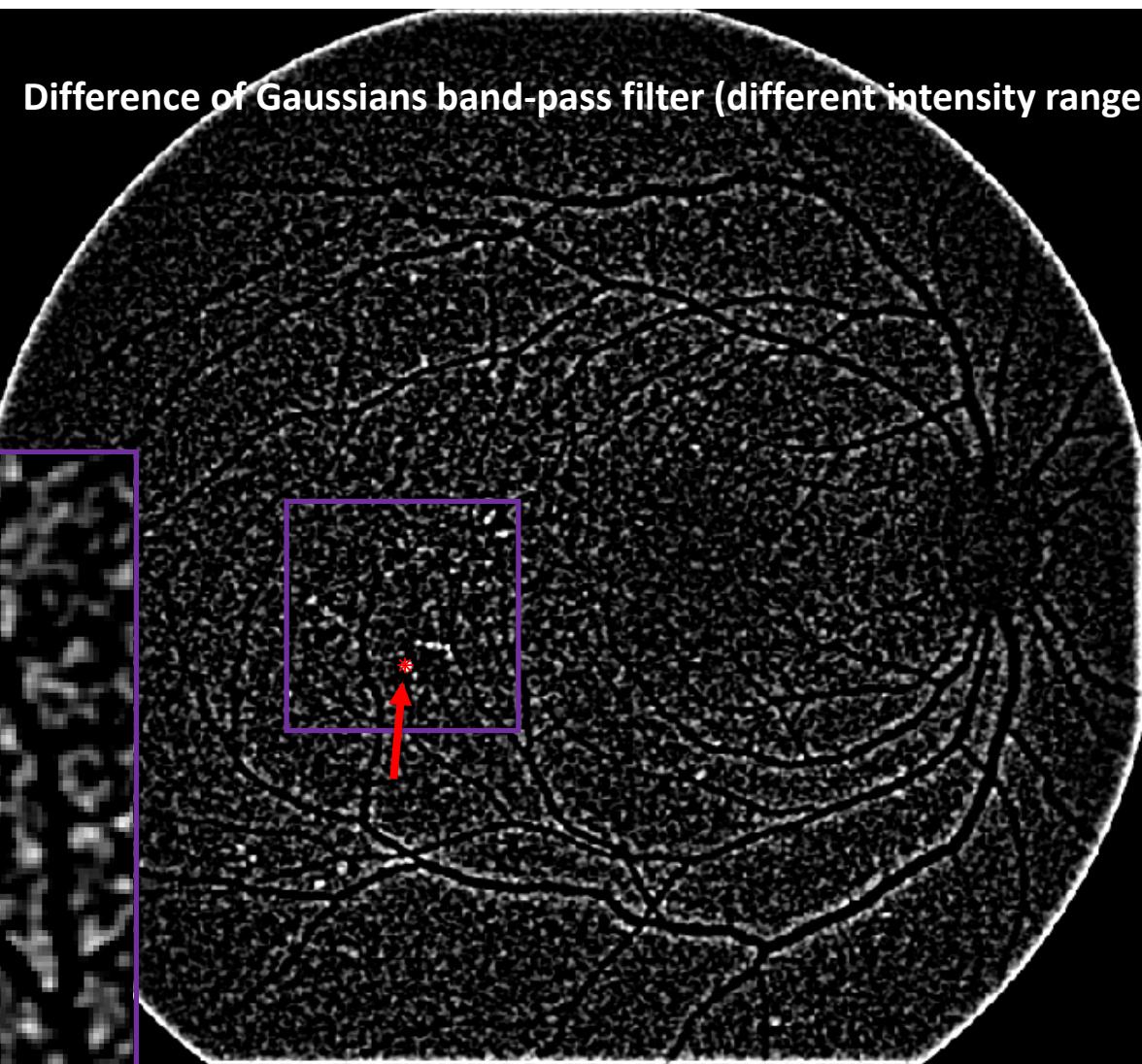
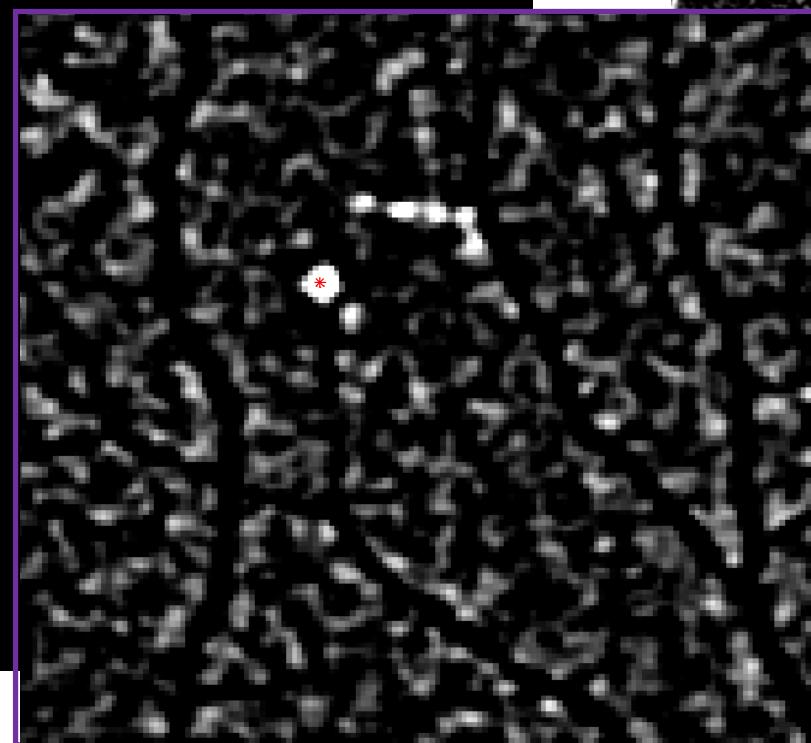
### NHP 8-bit Post-injection image by Ali

Cyno 170395/Cyno1\_000.tif – Segmentation:

- 1) Clip (set to 0) pixels <50% of max. intensity of DoG
- 2) Select blob w max. value for peak intensity

177  
2646  
41.6973

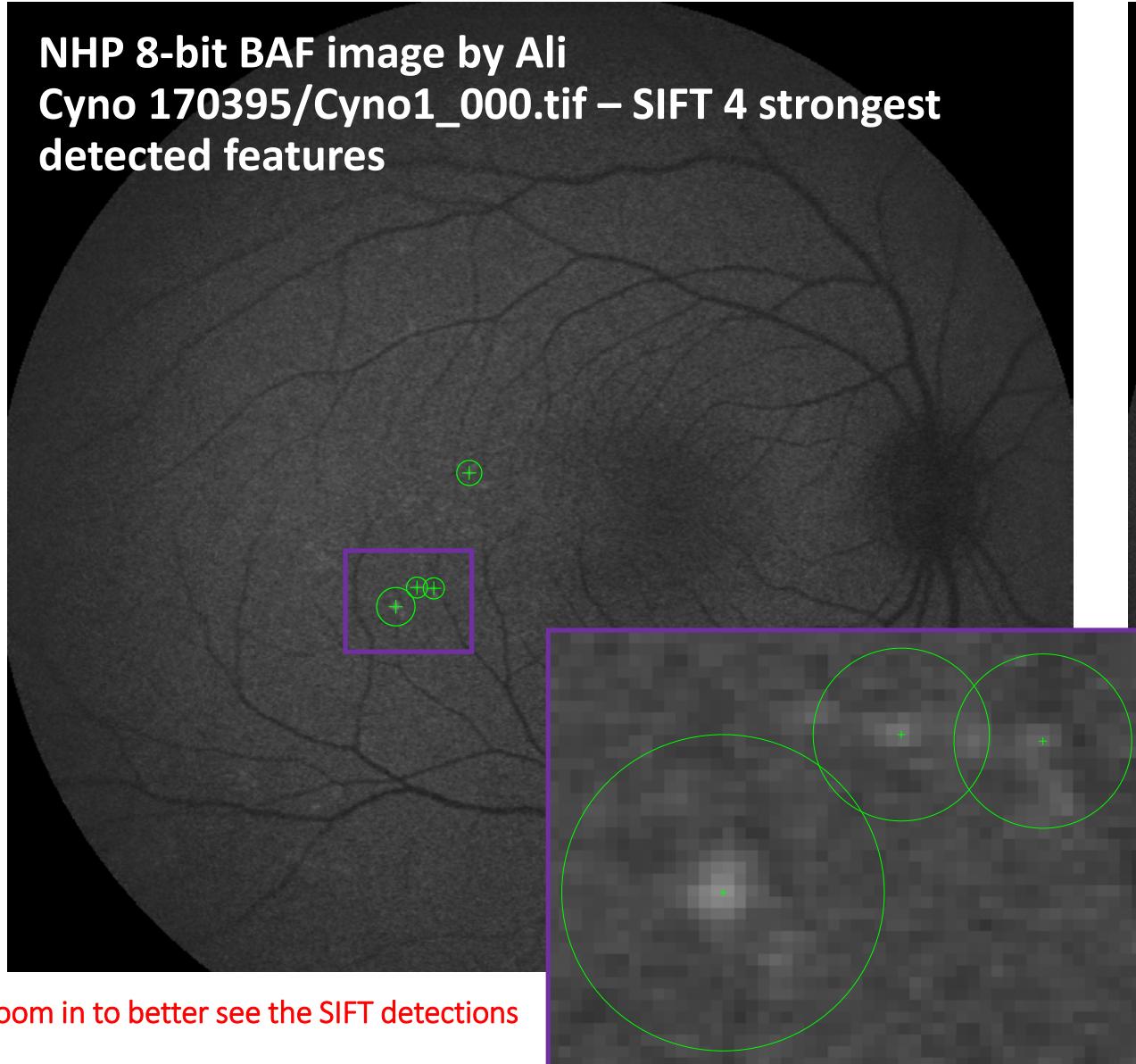
0.002646 square millimeters



Zoom in to better see the auto-fluorescence

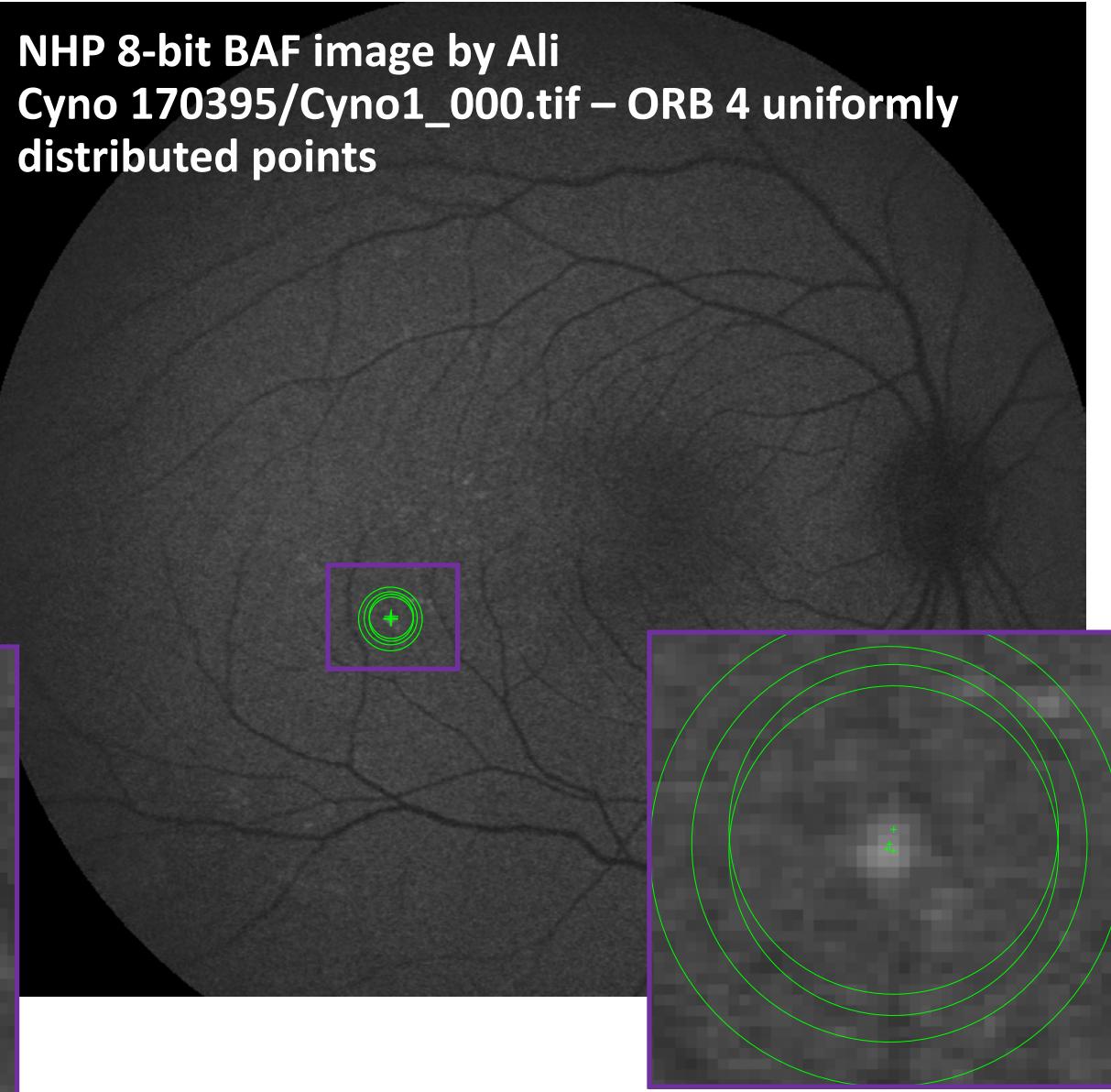
## Preliminary analysis

NHP 8-bit BAF image by Ali  
Cyno 170395/Cyno1\_000.tif – SIFT 4 strongest  
detected features

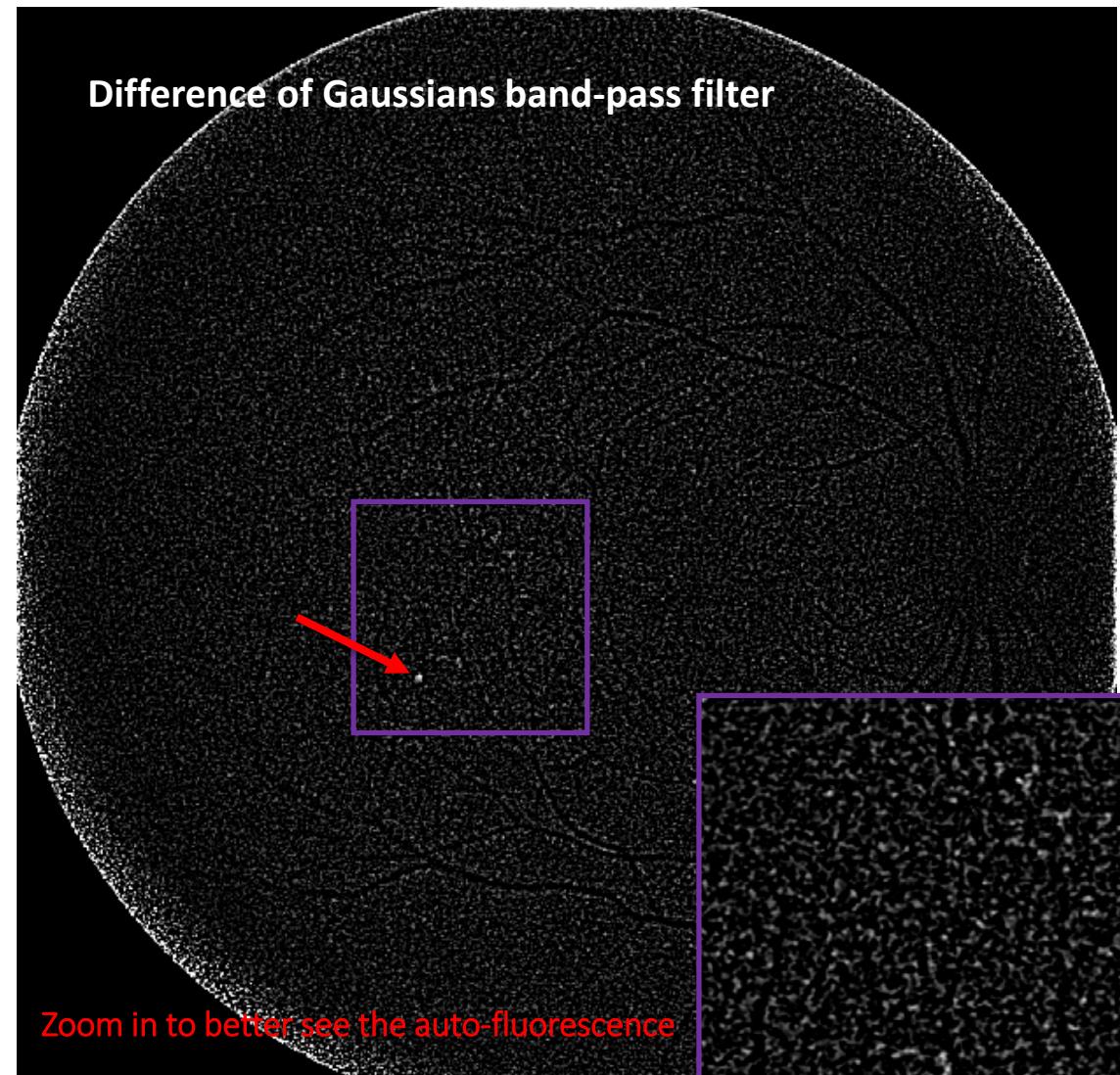
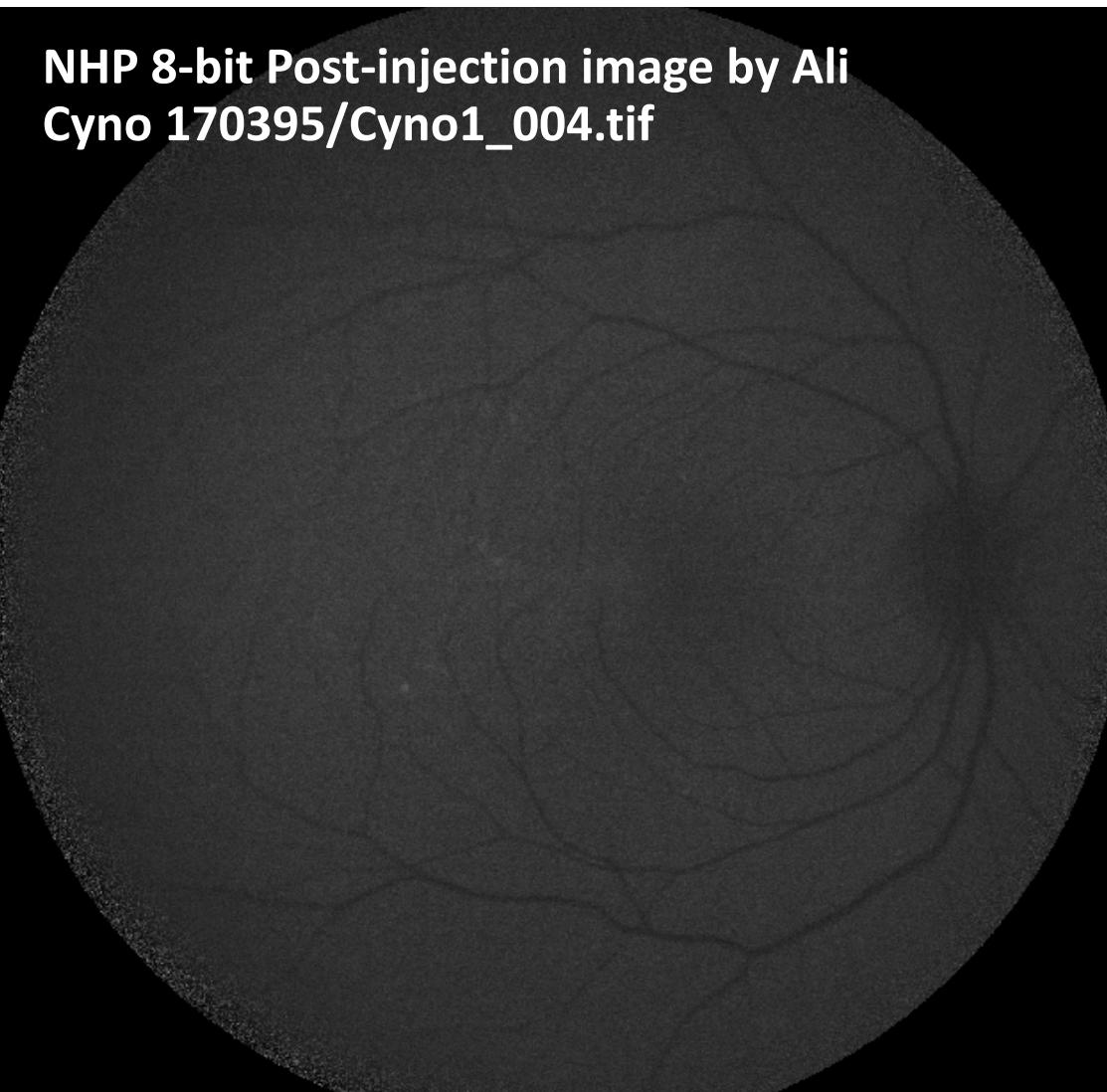


Zoom in to better see the SIFT detections

NHP 8-bit BAF image by Ali  
Cyno 170395/Cyno1\_000.tif – ORB 4 uniformly  
distributed points

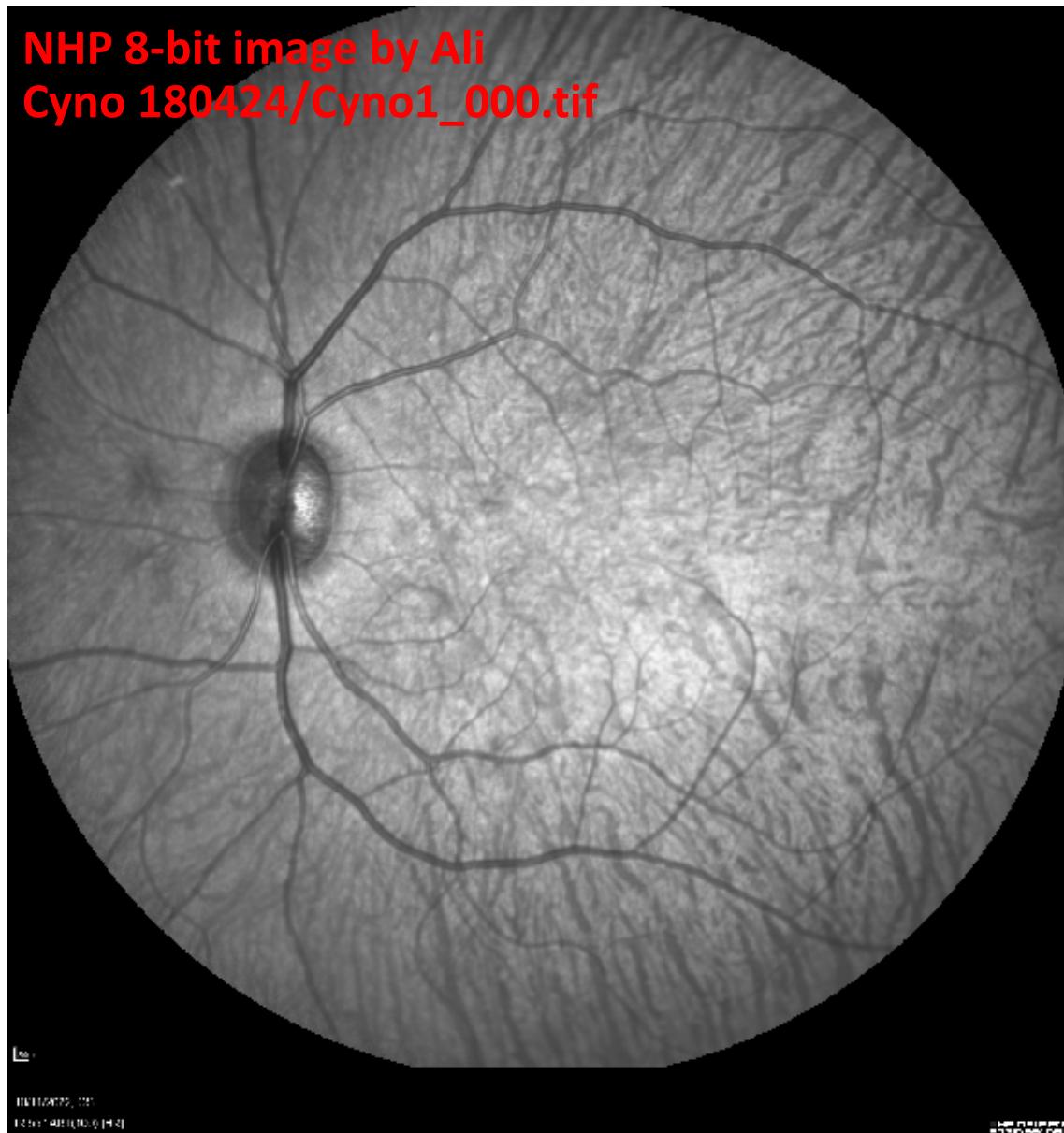


## Preliminary analysis

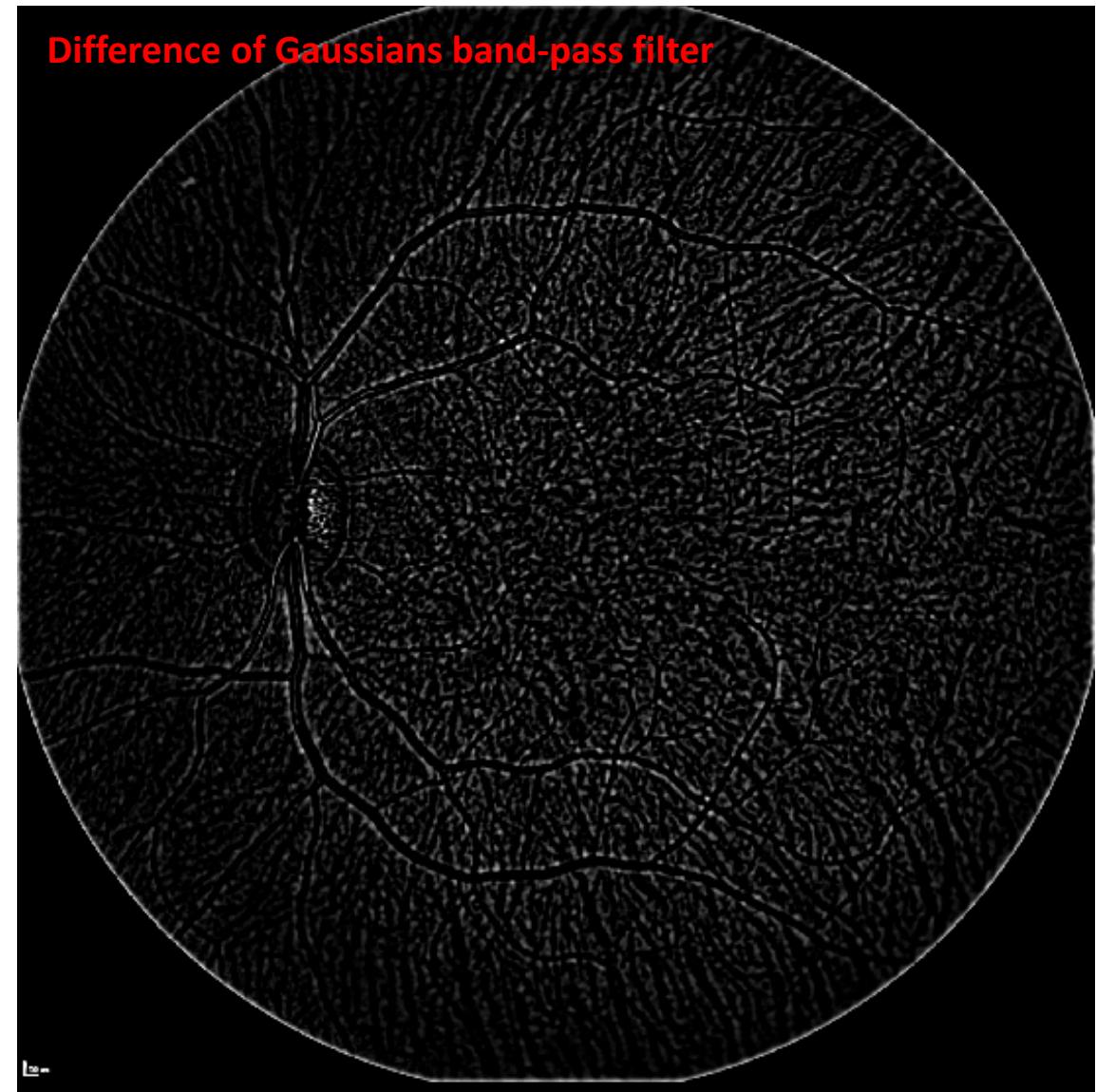


## Preliminary analysis

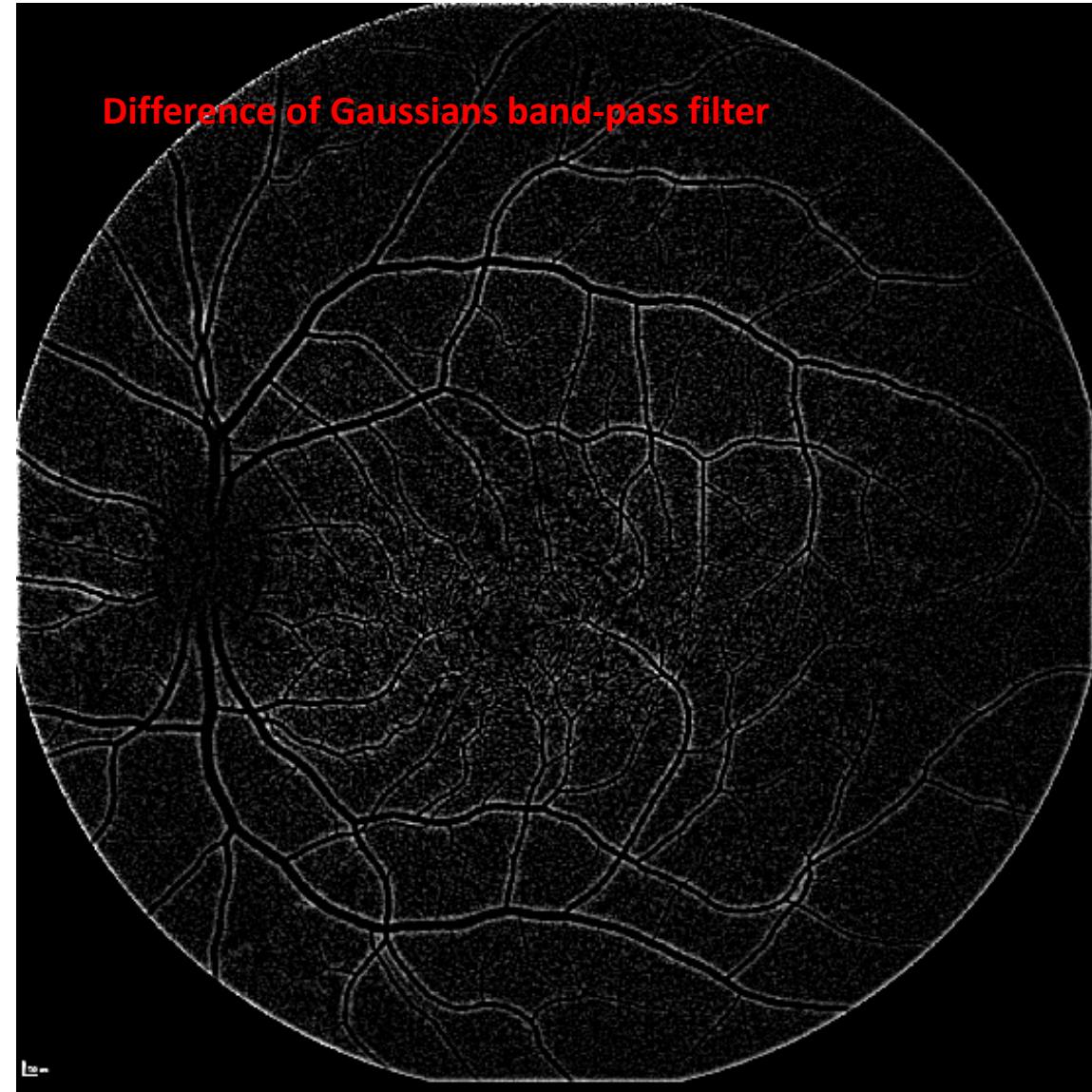
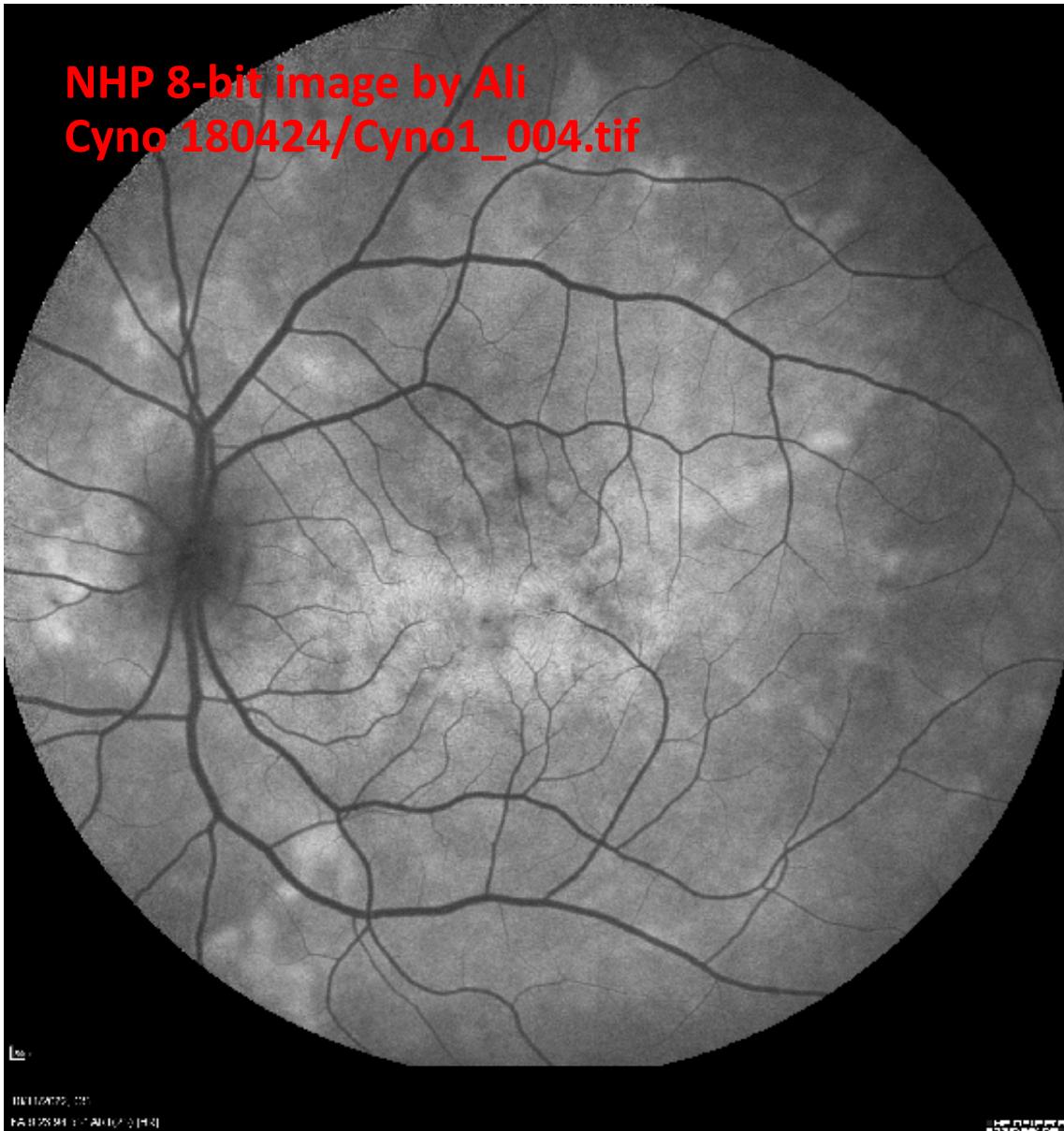
NHP 8-bit image by Ali  
Cyno 180424/Cyno1\_000.tif



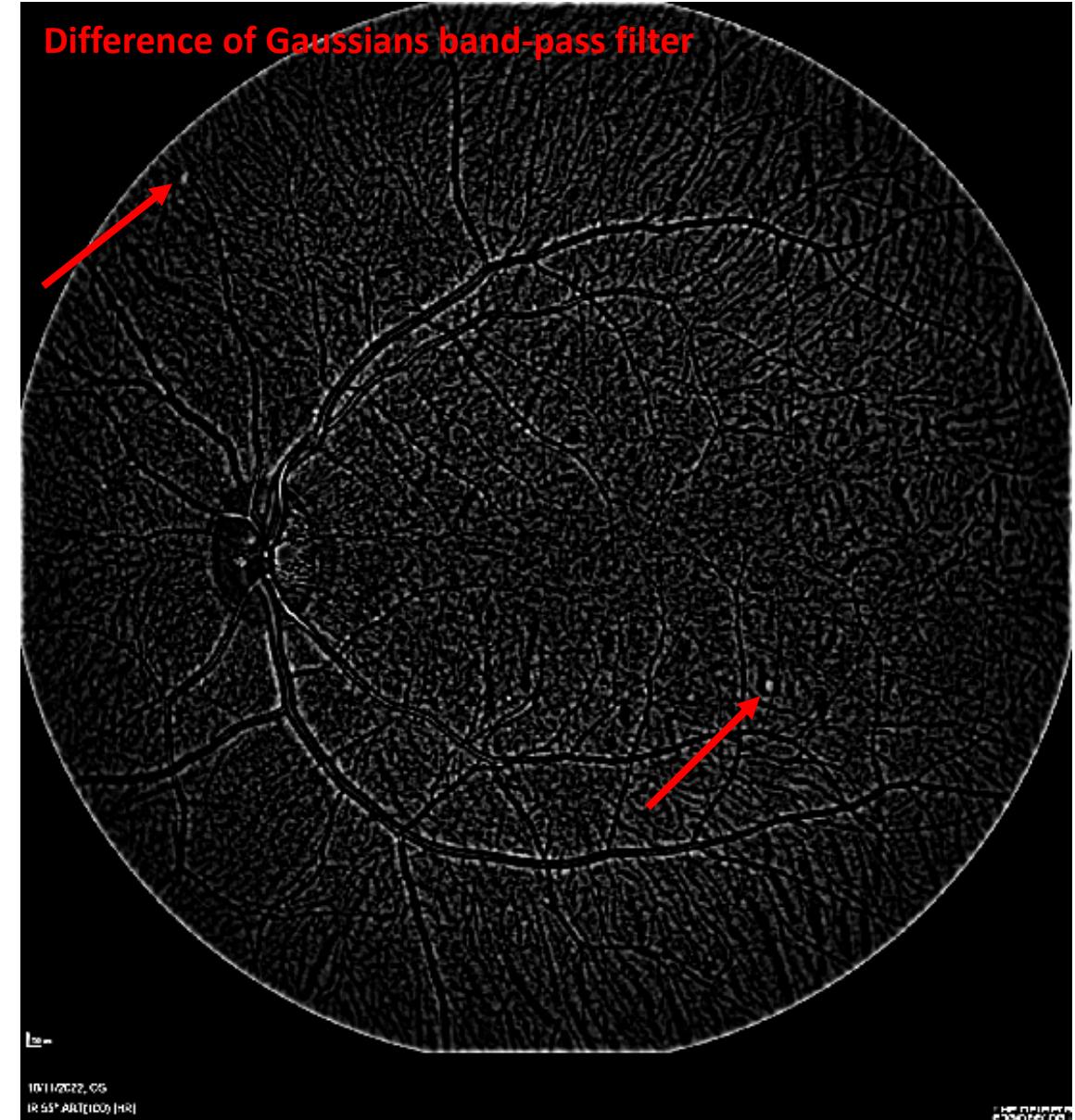
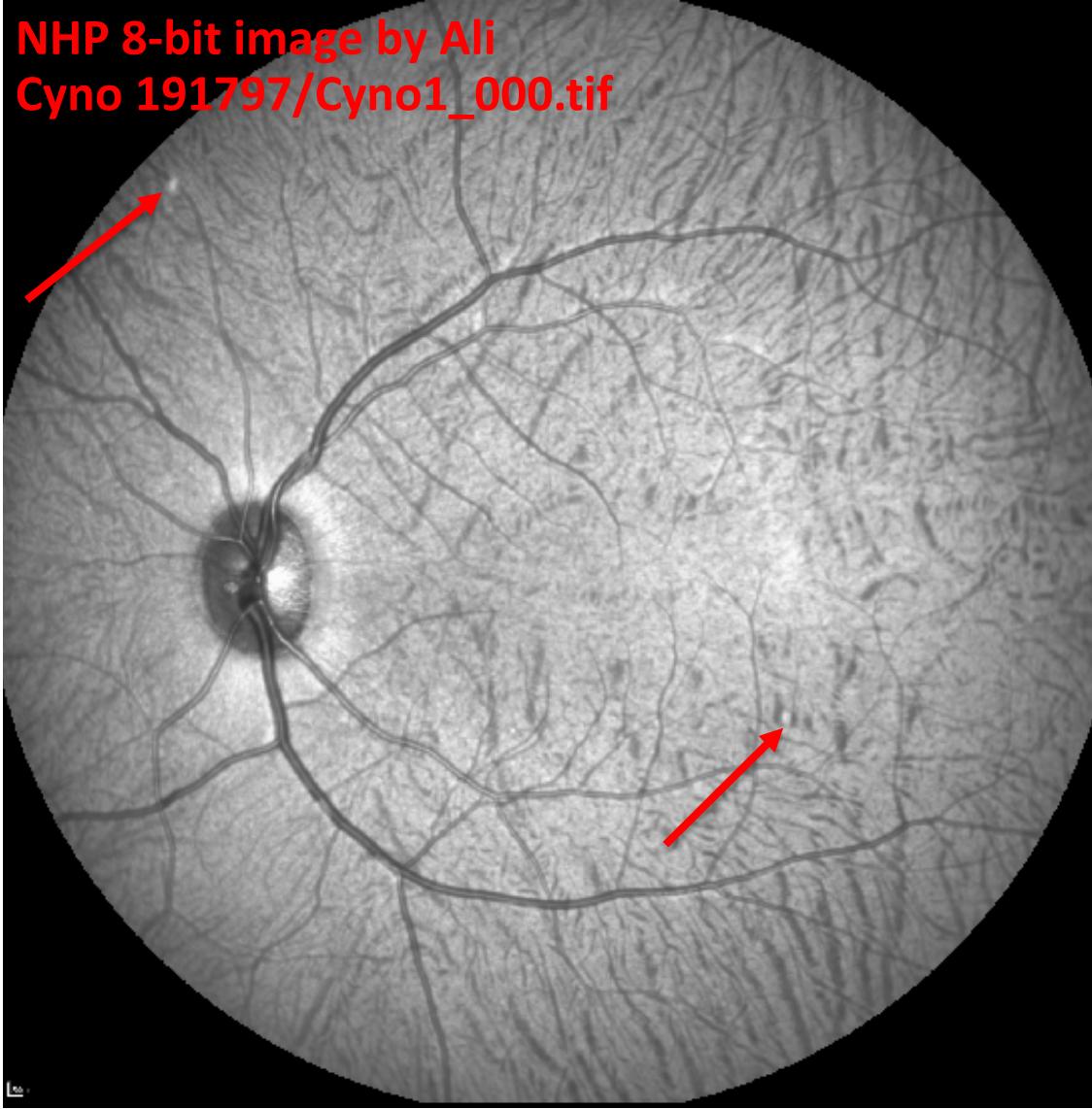
Difference of Gaussians band-pass filter



## Preliminary analysis

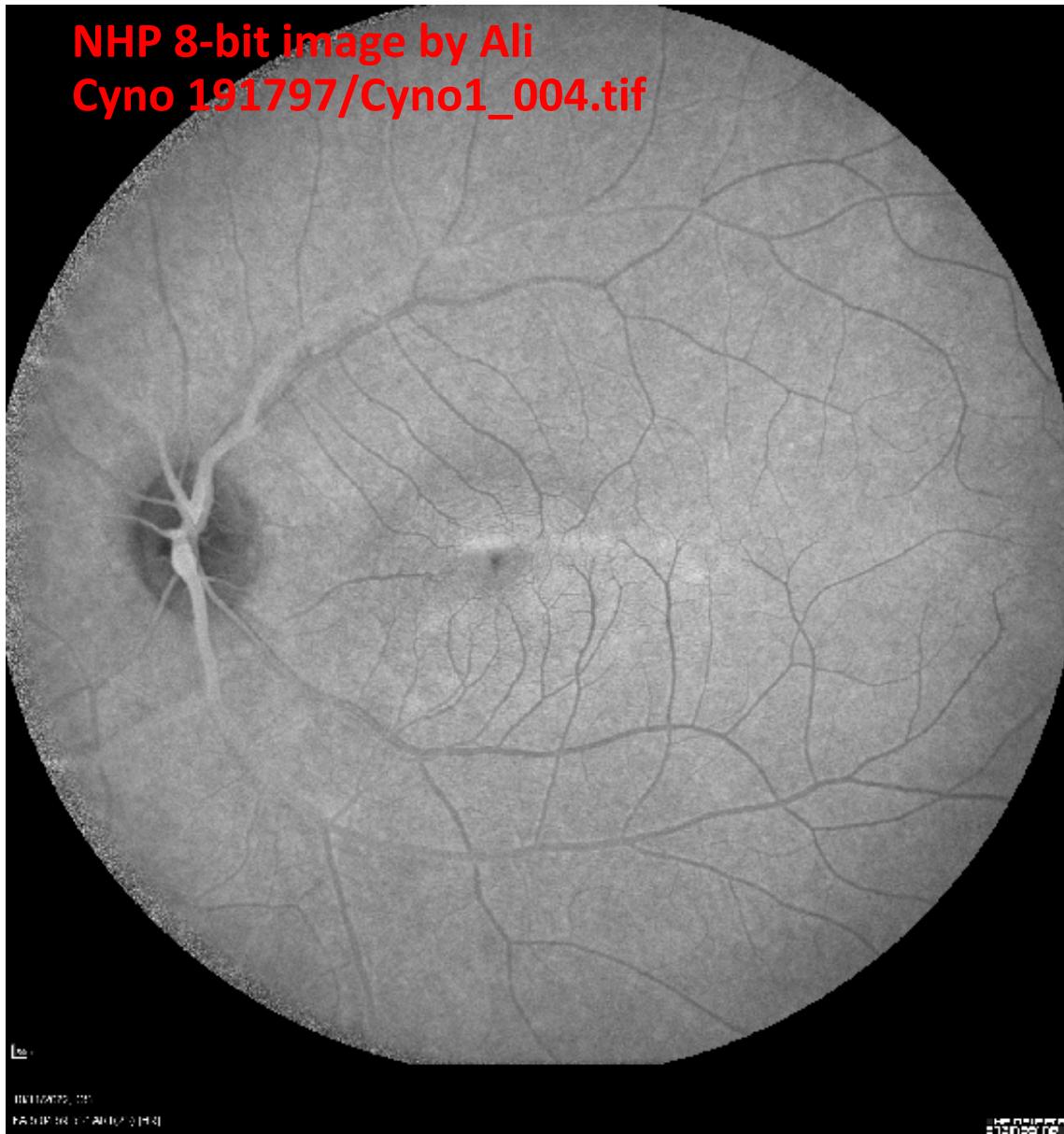


## Preliminary analysis

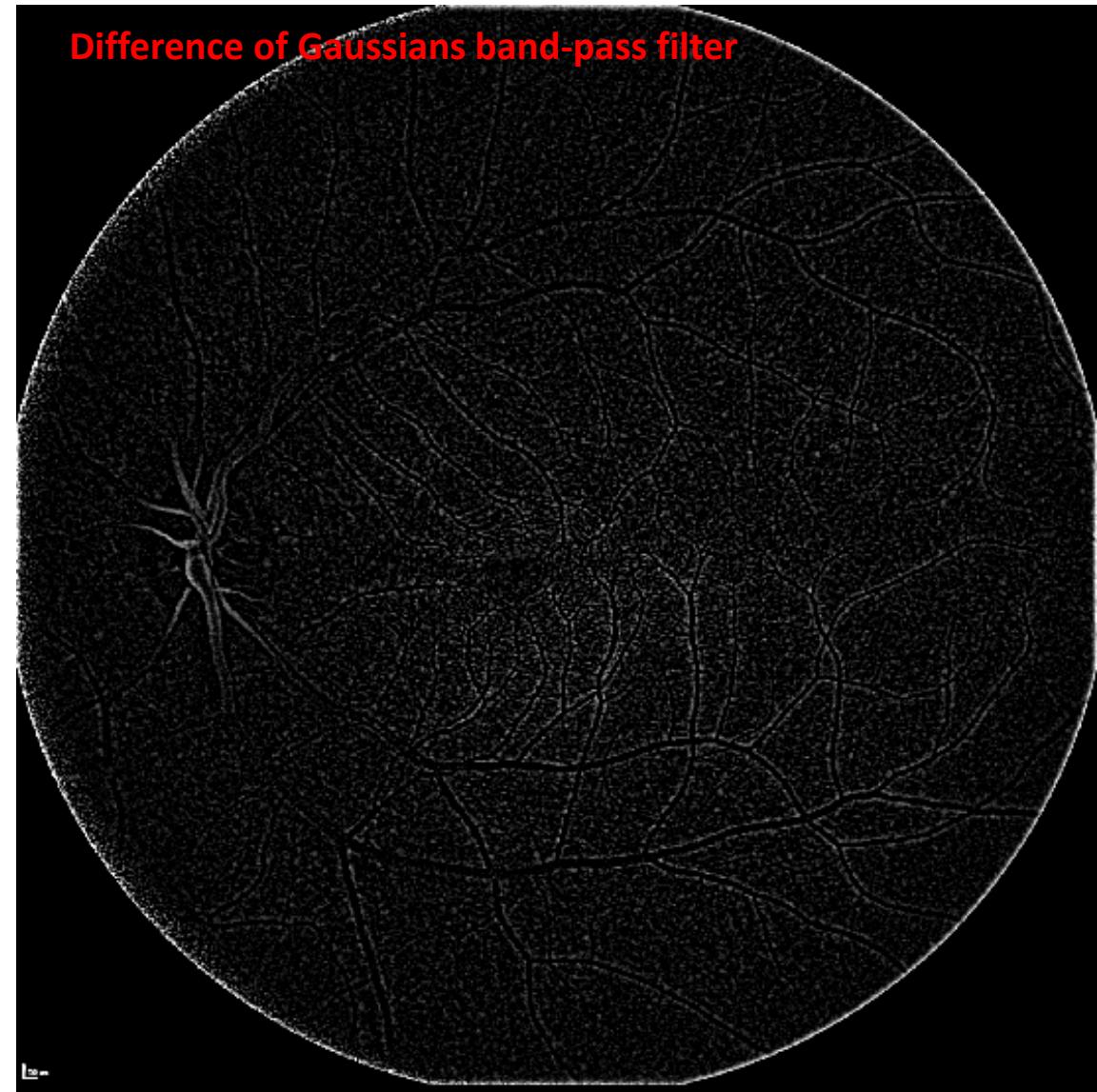


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191797/Cyno1\_004.tif

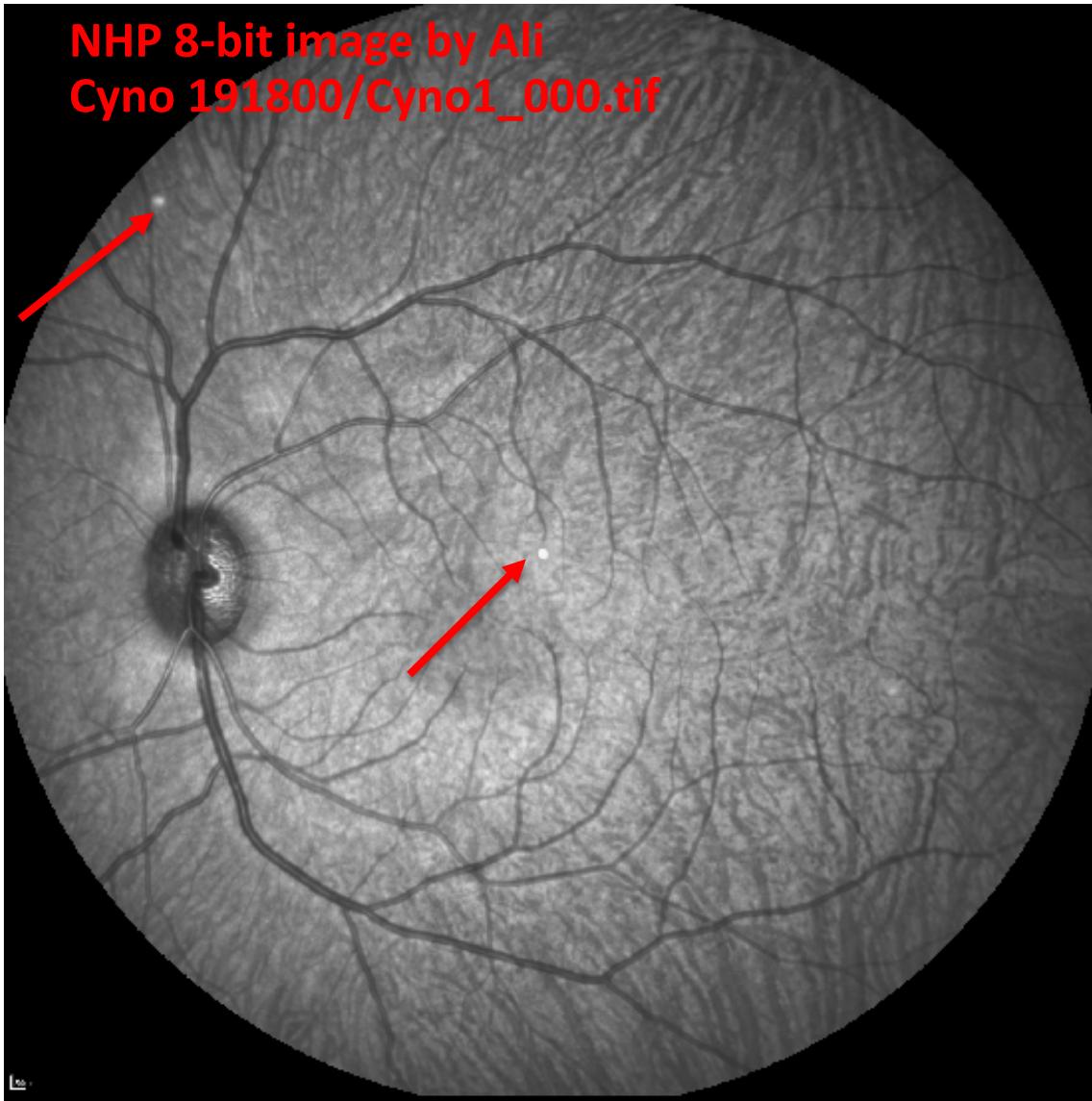


Difference of Gaussians band-pass filter

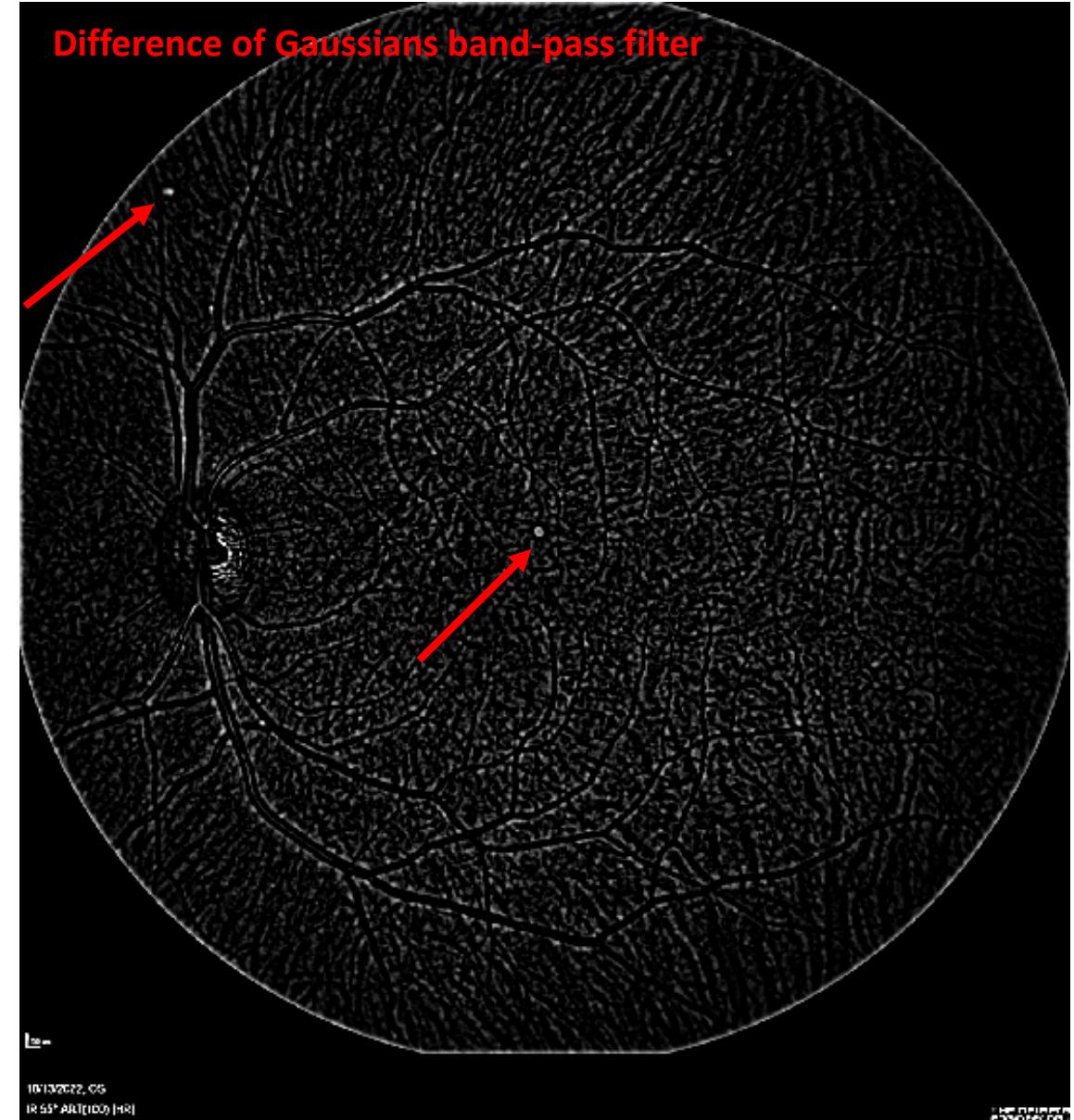


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191800/Cyno1\_000.tif

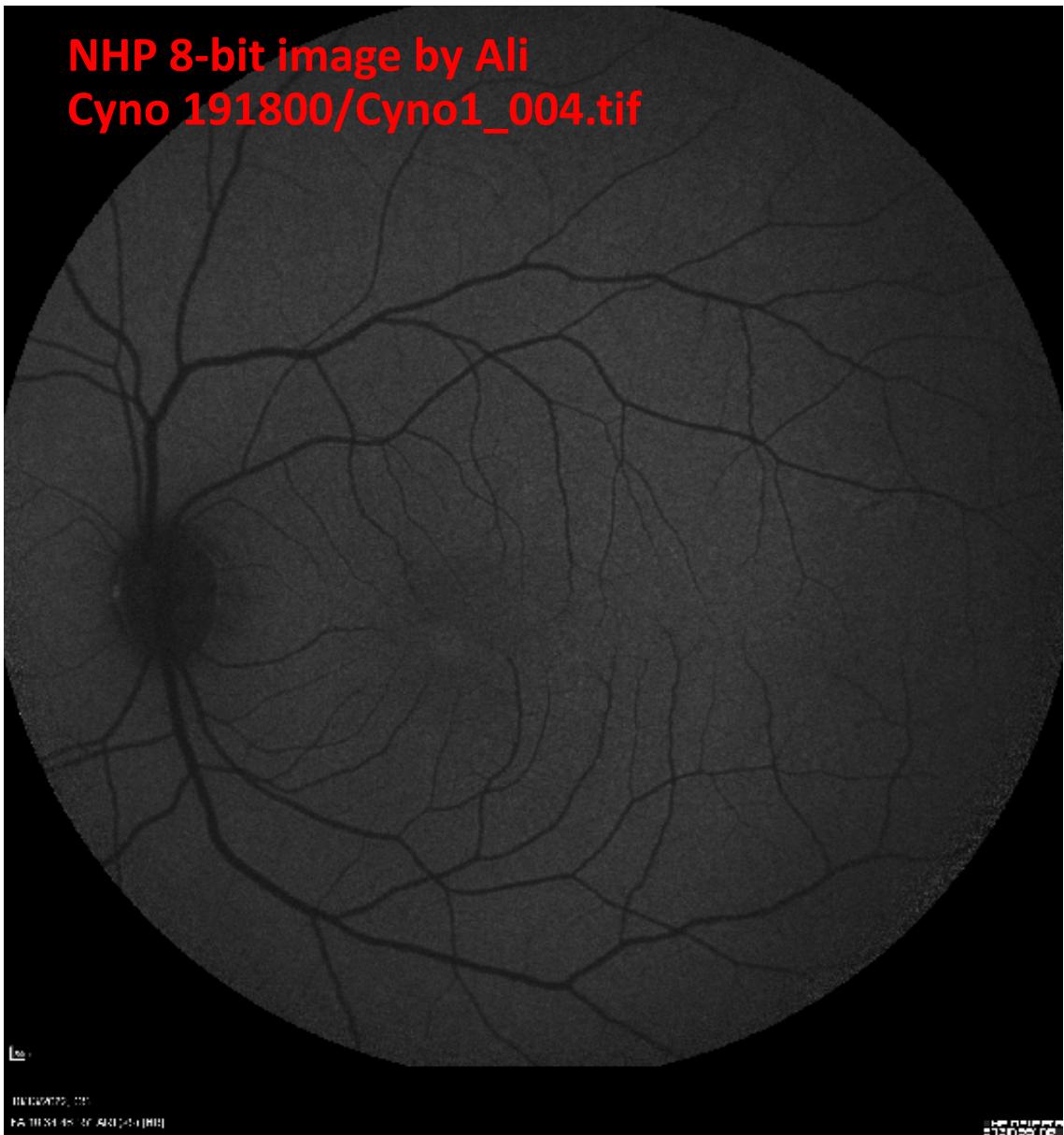


Difference of Gaussians band-pass filter

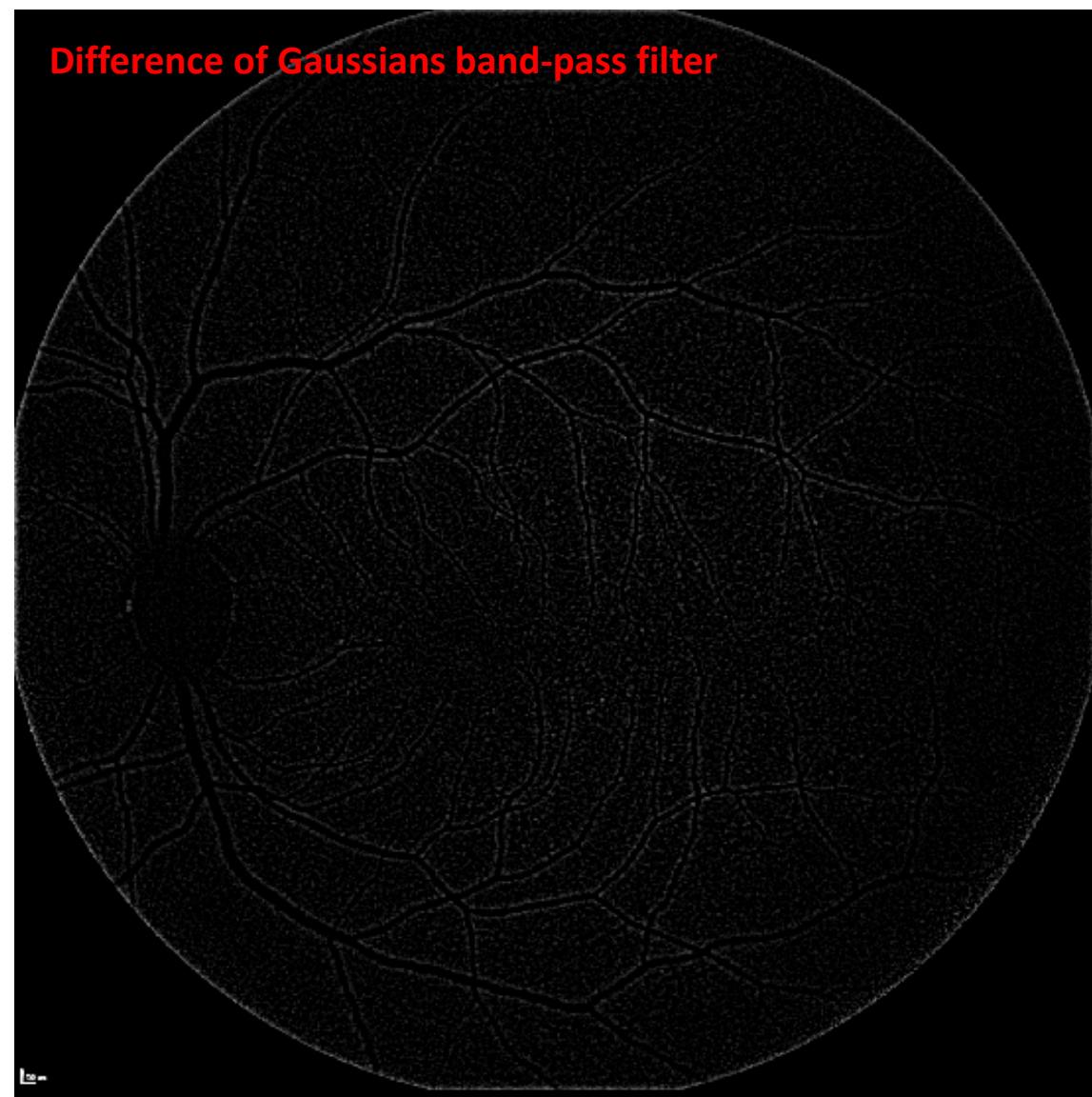


## Preliminary analysis

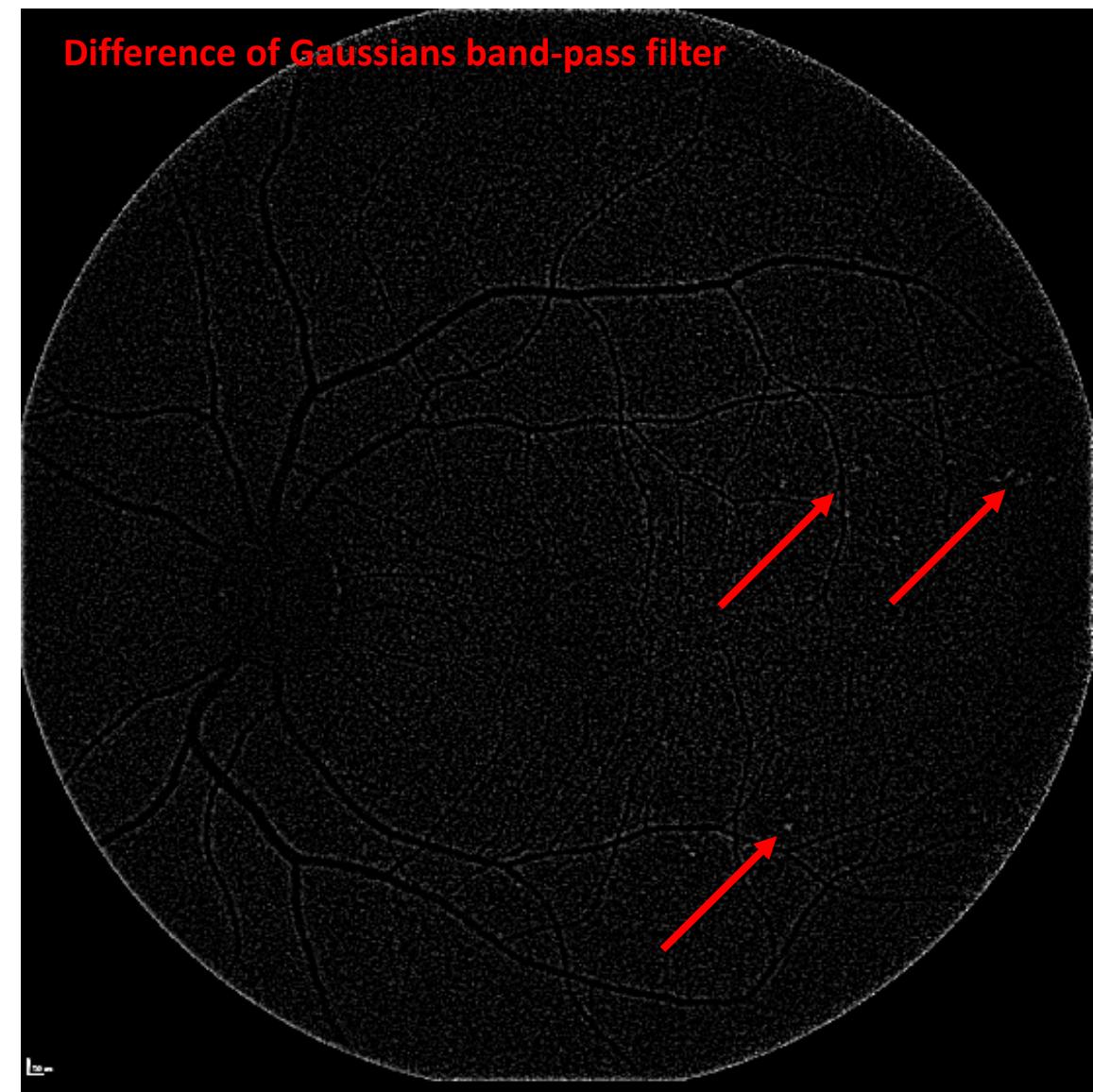
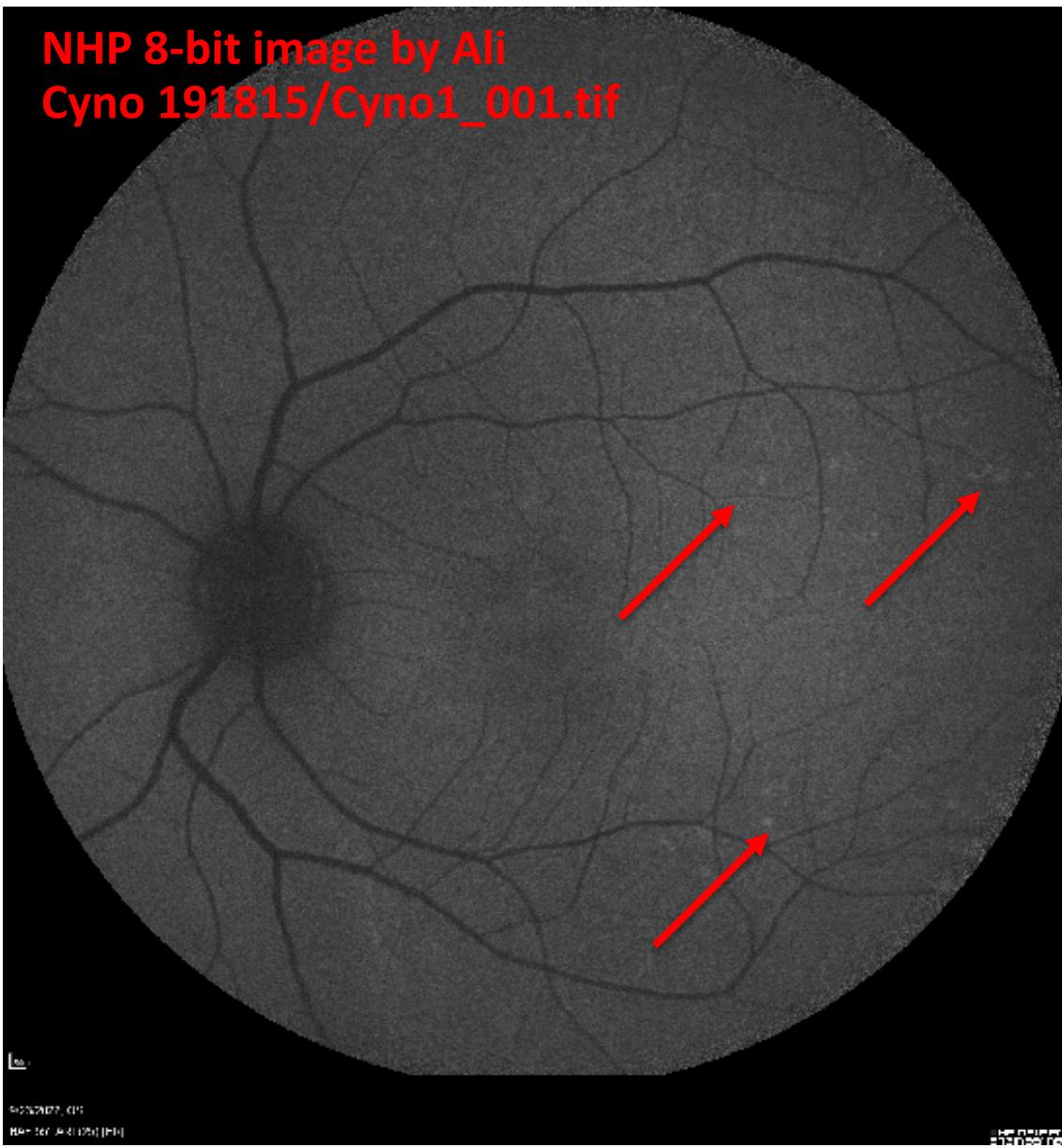
NHP 8-bit image by Ali  
Cyno 191800/Cyno1\_004.tif



Difference of Gaussians band-pass filter

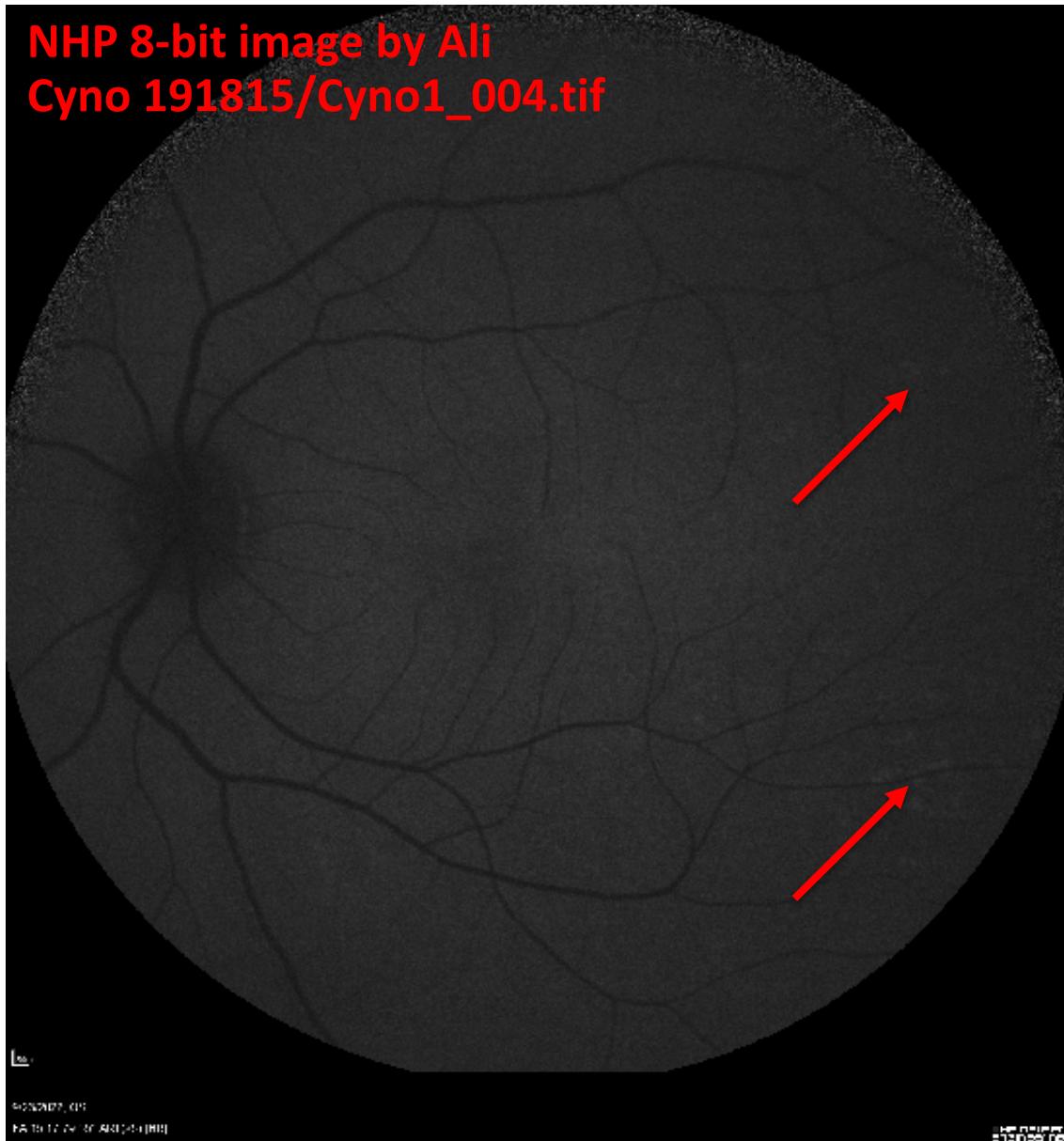


## Preliminary analysis

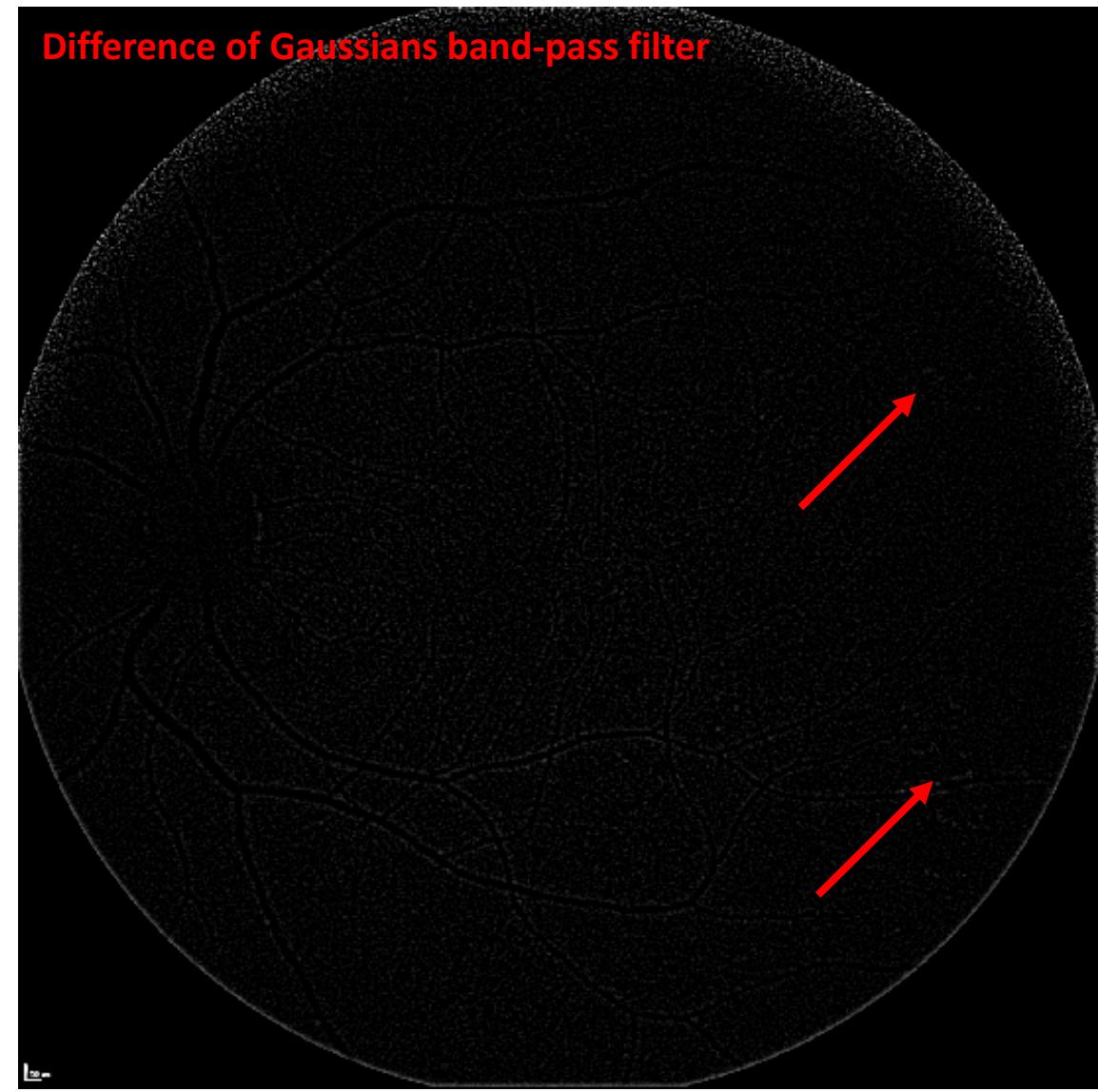


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191815/Cyno1\_004.tif

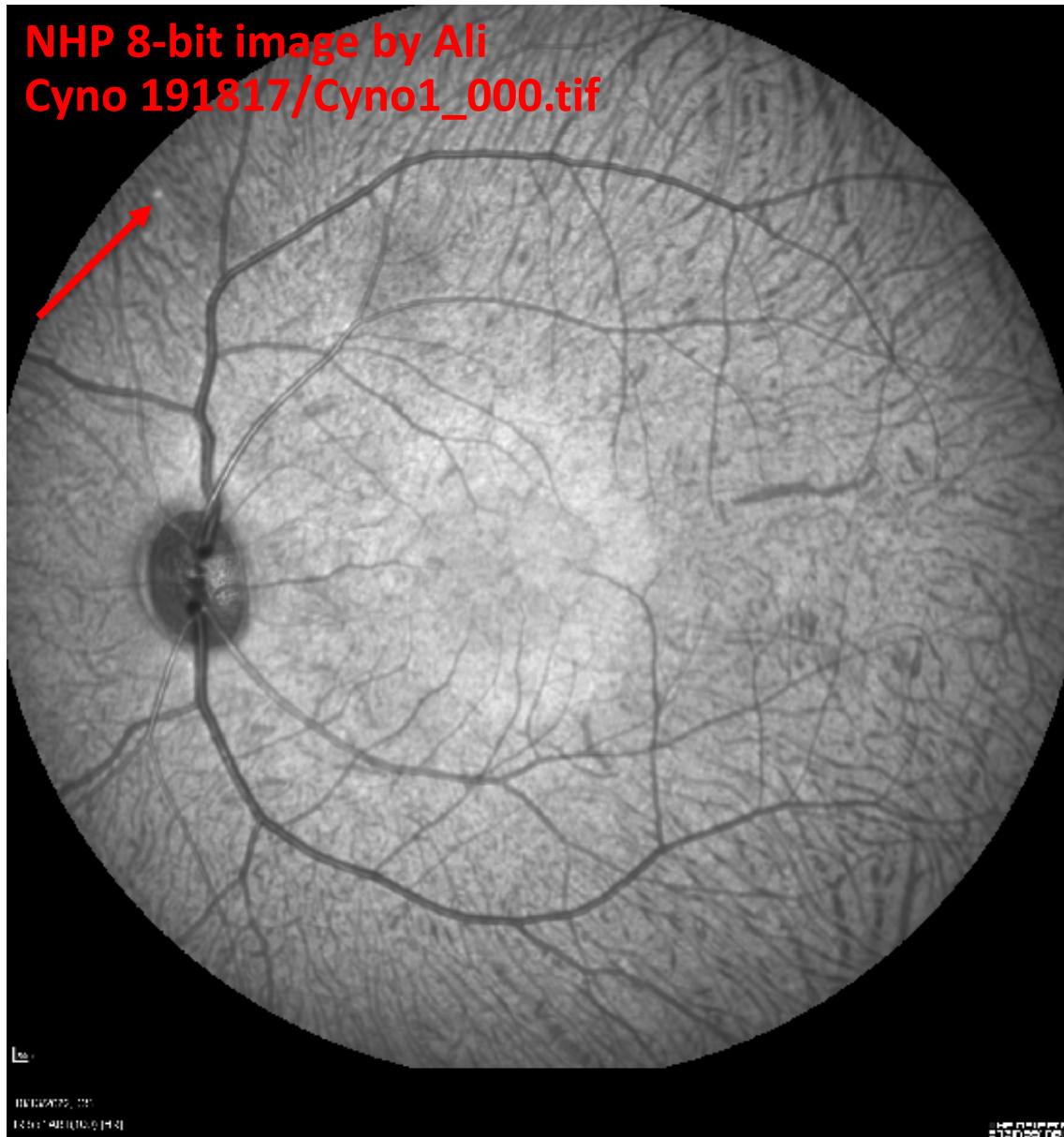


Difference of Gaussians band-pass filter

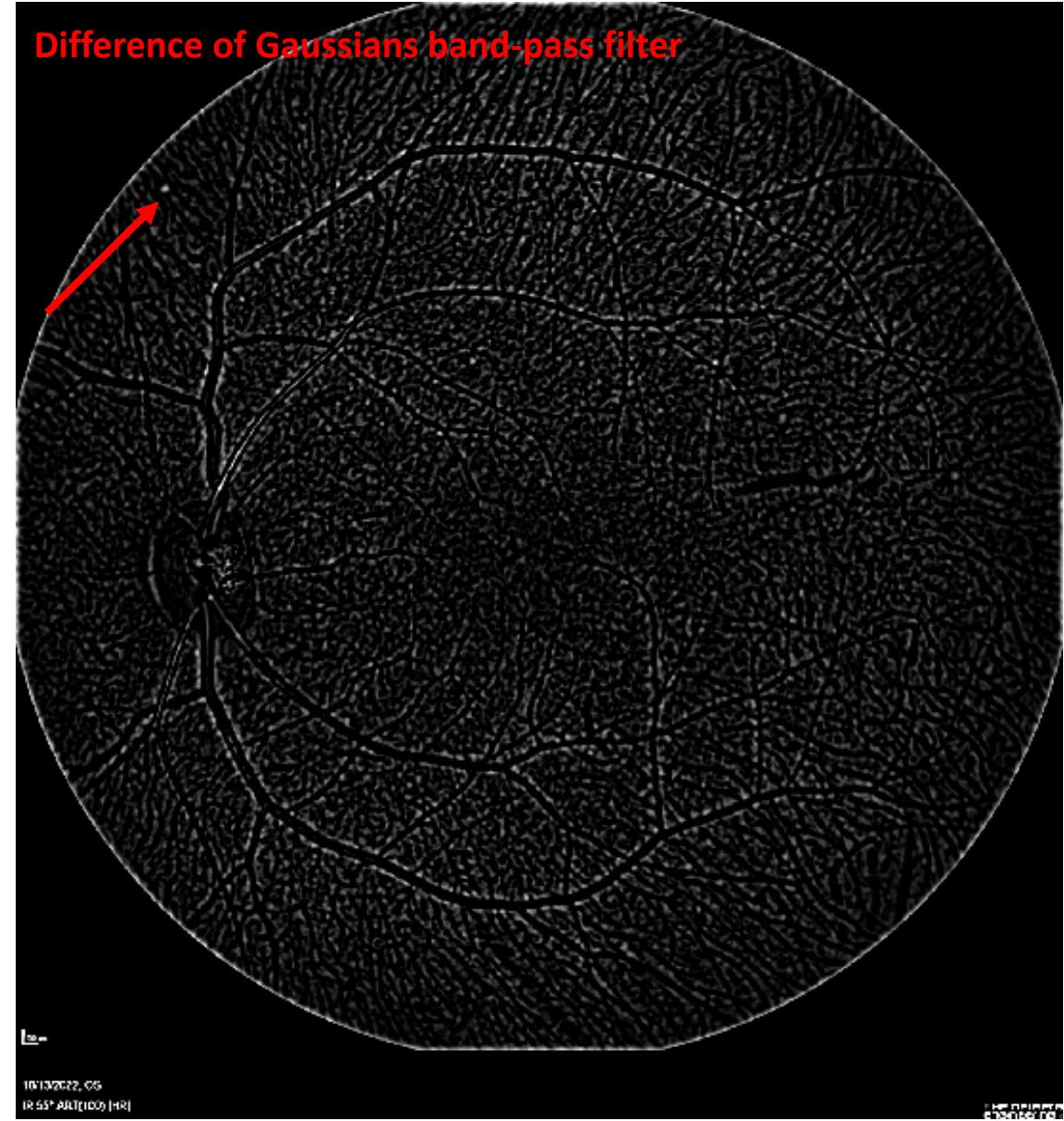


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191817/Cyno1\_000.tif

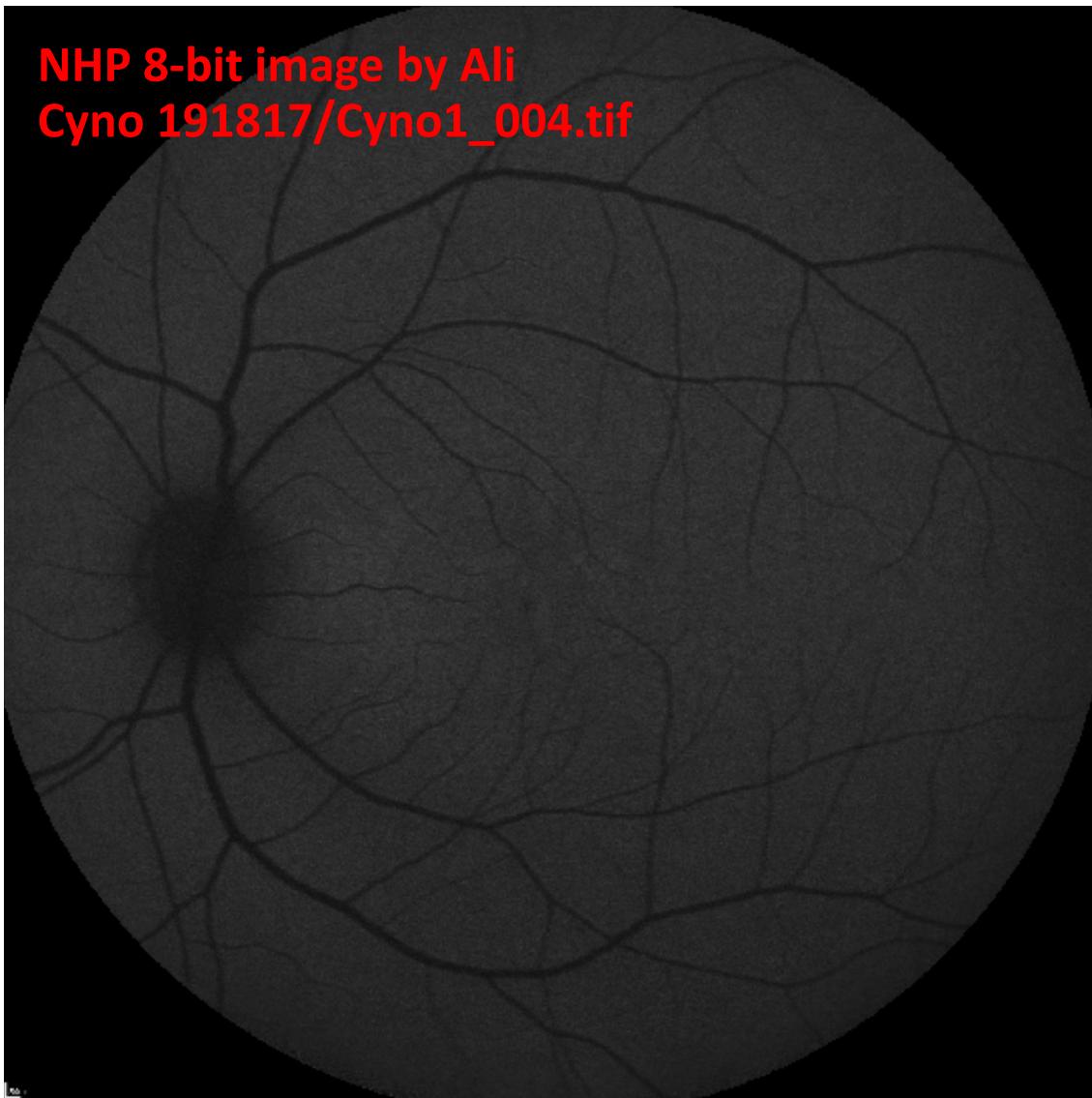


Difference of Gaussians band-pass filter

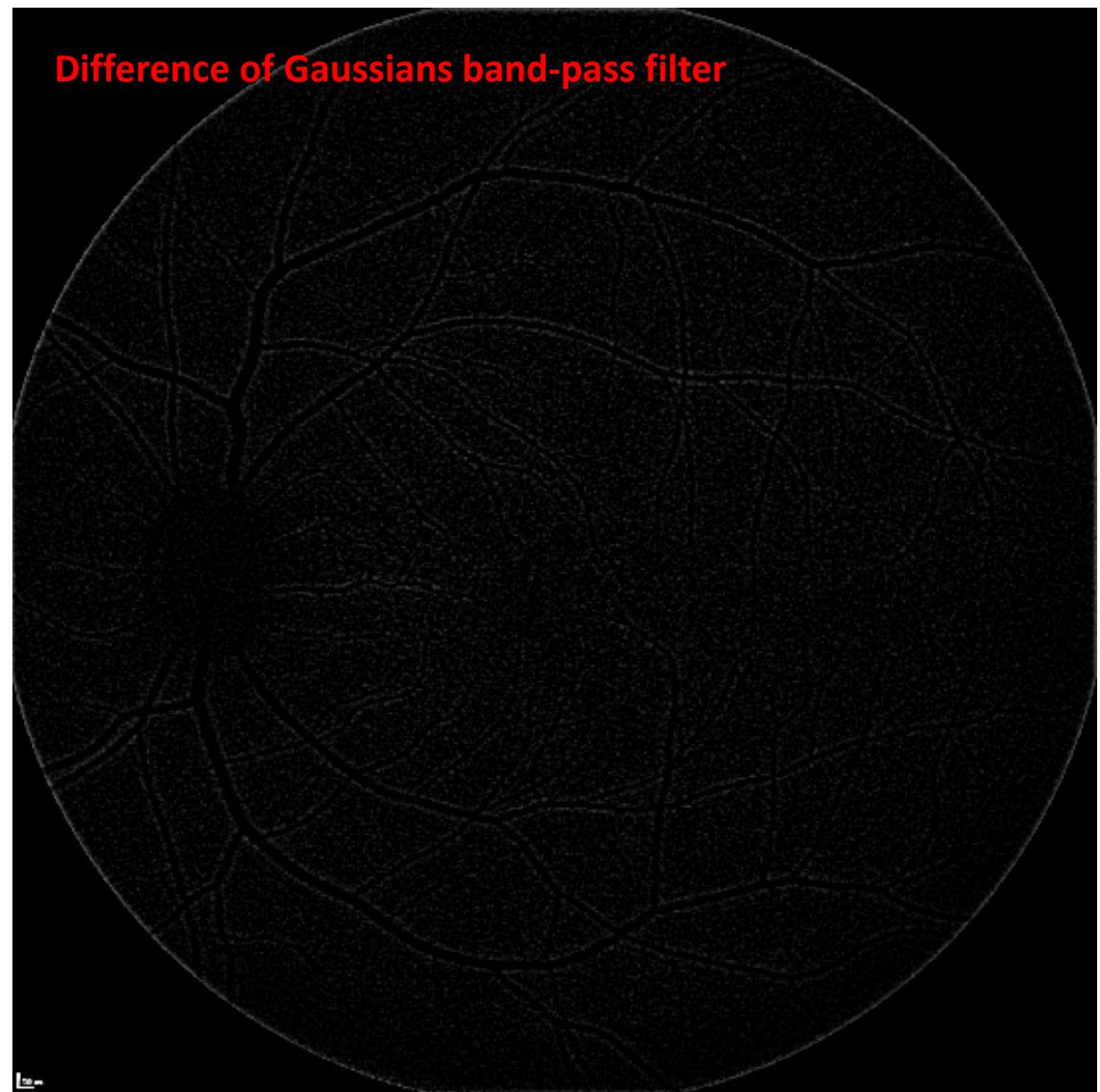


## Preliminary analysis

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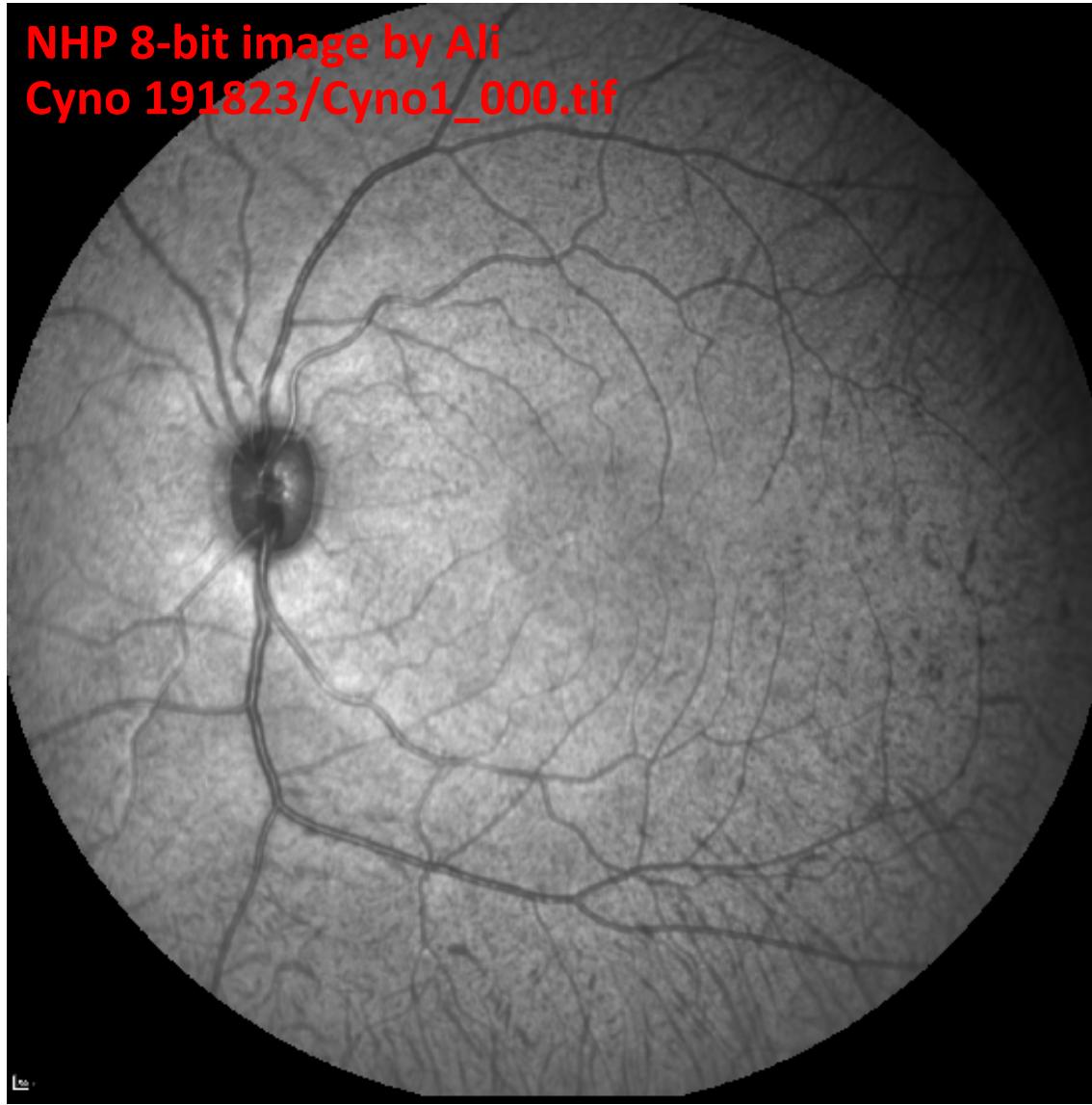


Difference of Gaussians band-pass filter

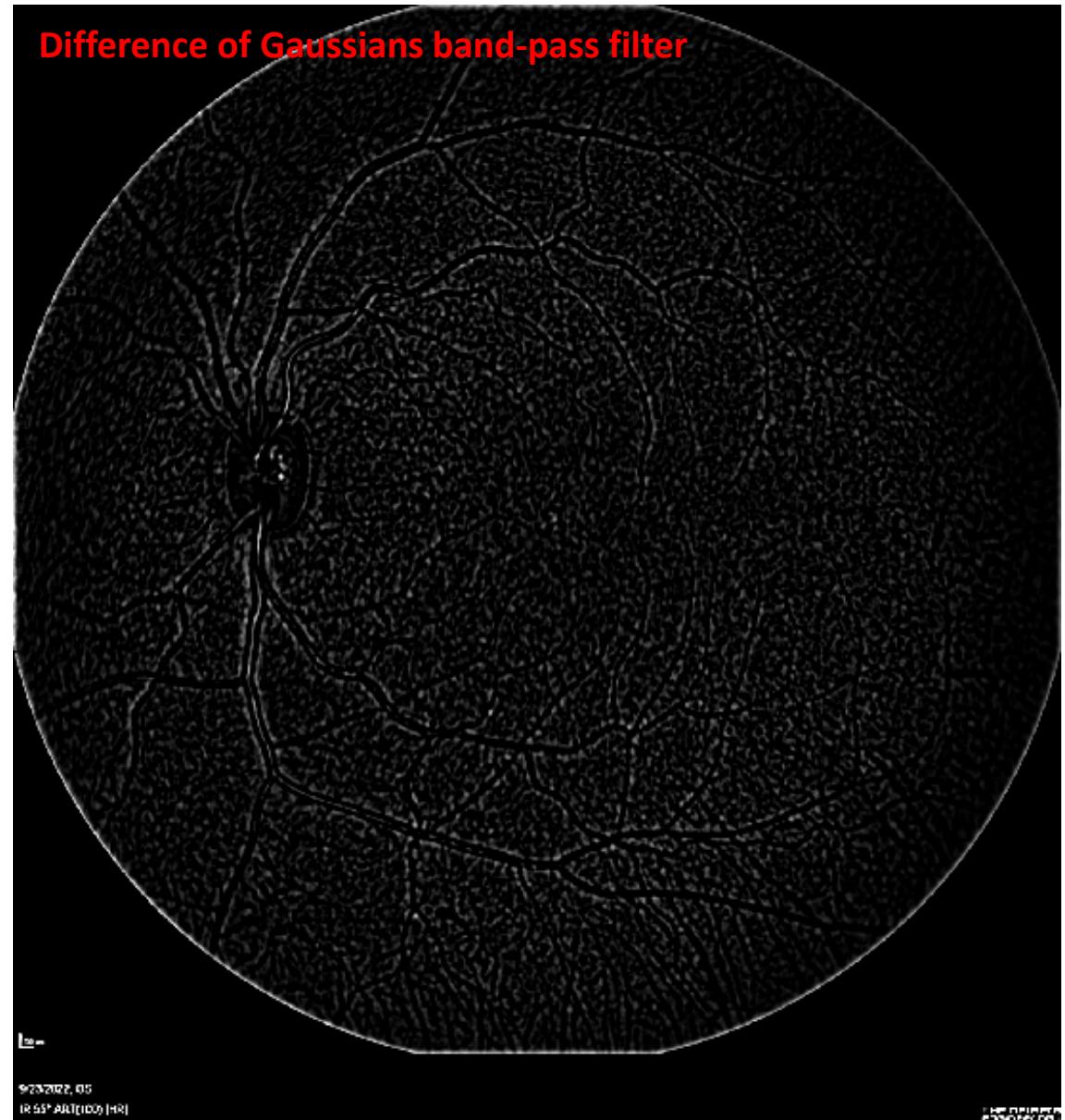


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191823/Cyno1\_000.tif

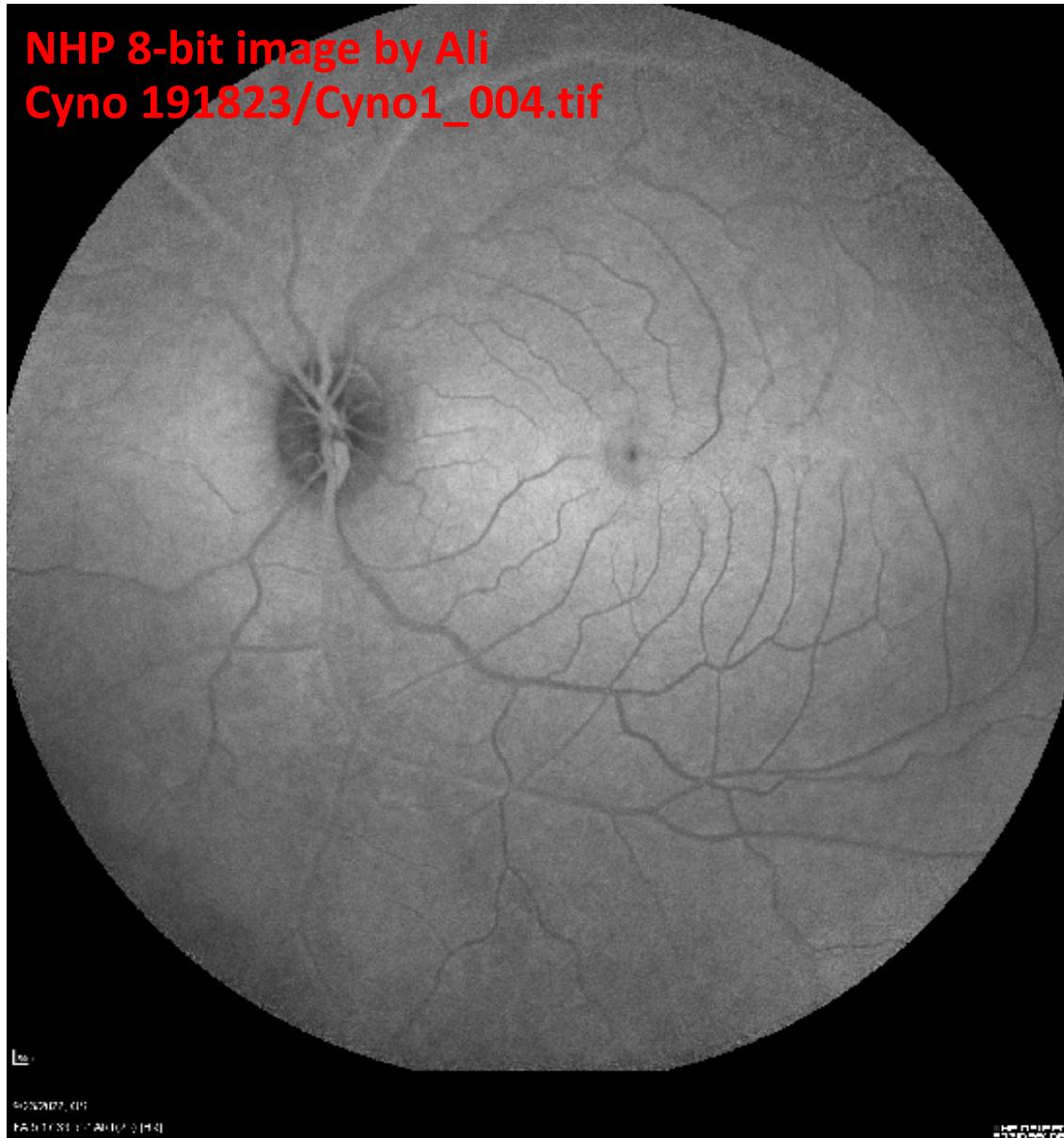


Difference of Gaussians band-pass filter

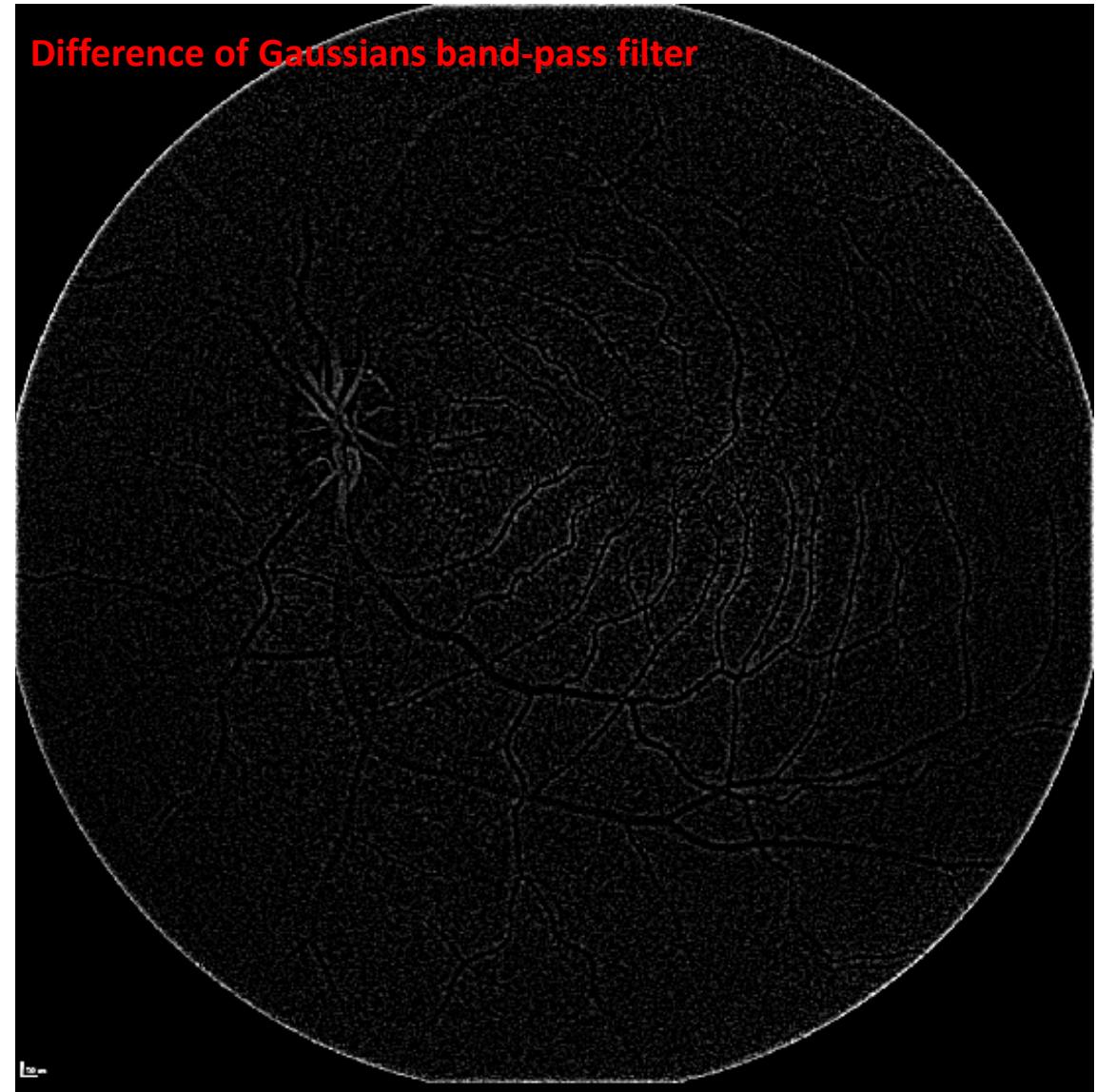


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 191823/Cyno1\_004.tif

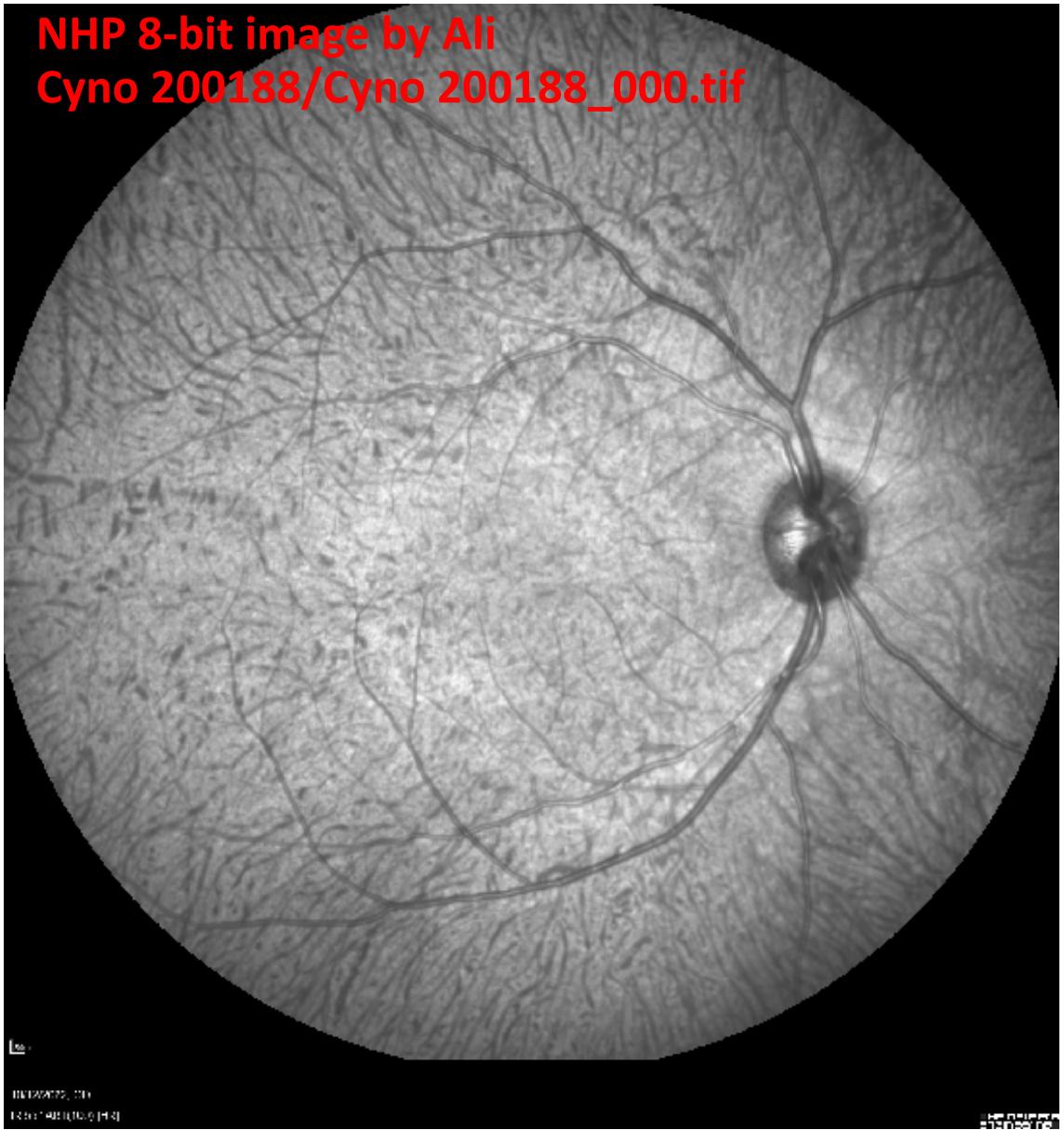


Difference of Gaussians band-pass filter

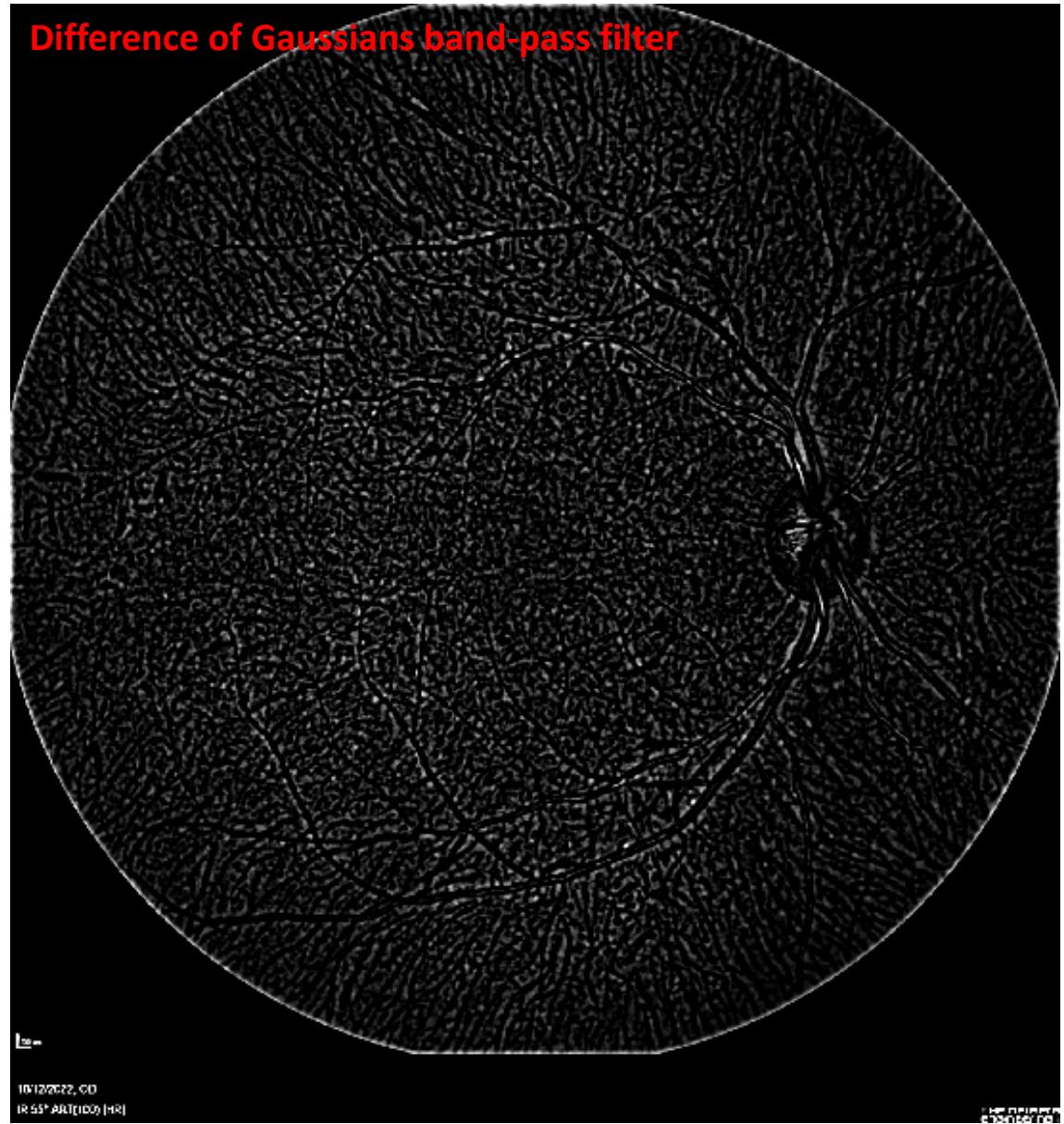


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 200188/Cyno 200188\_000.tif

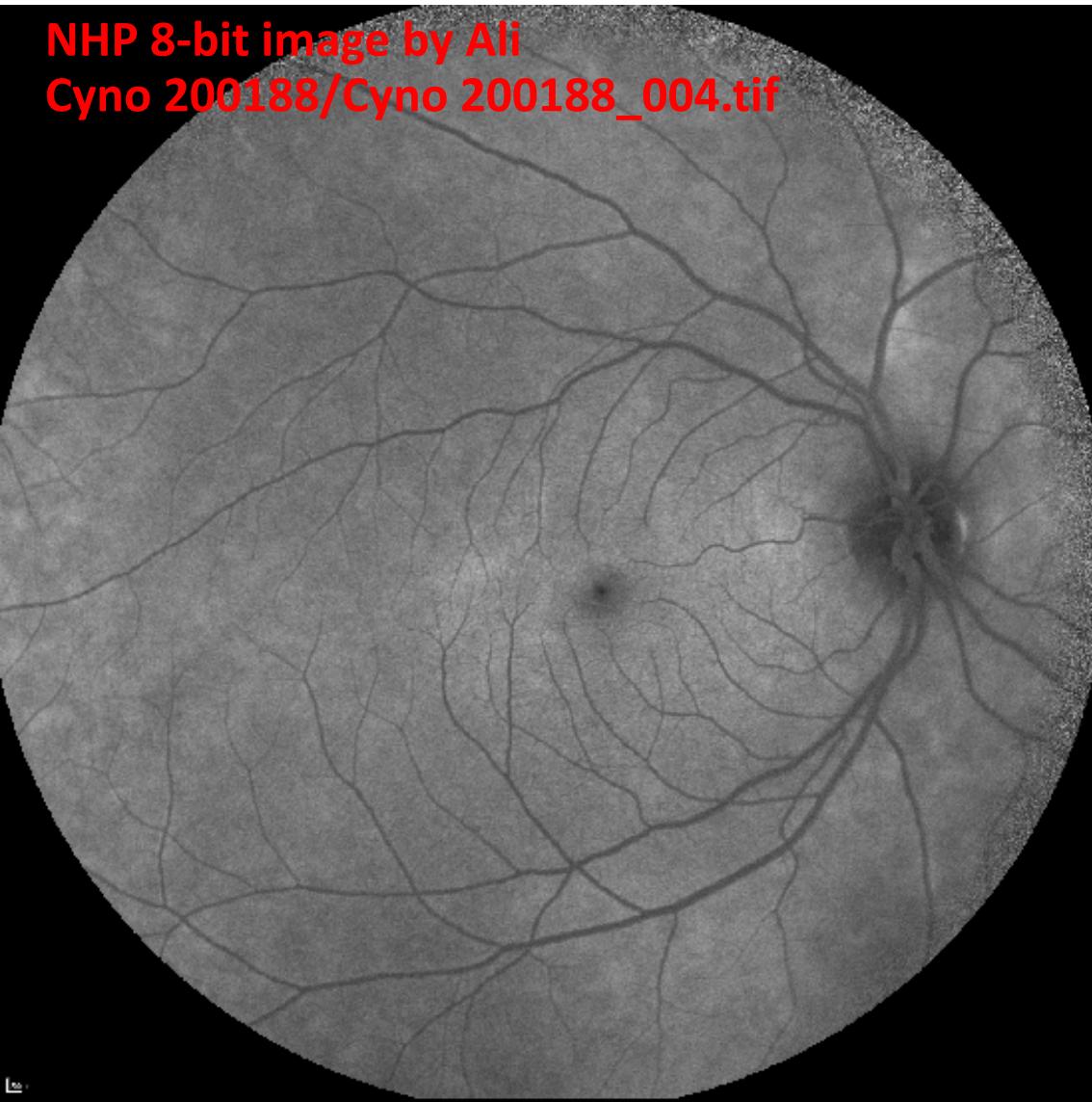


Difference of Gaussians band-pass filter

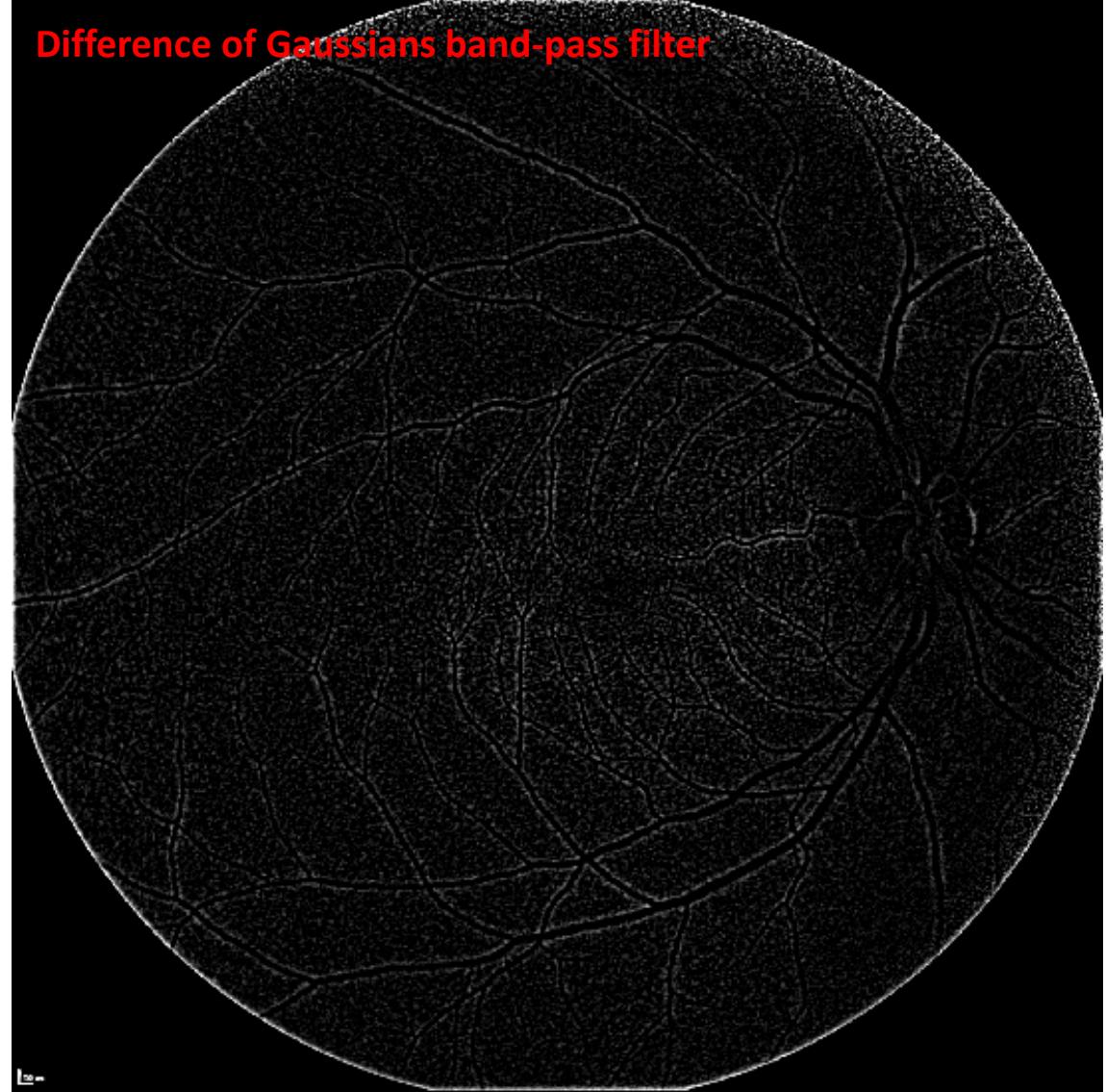


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 200188/Cyno 200188\_004.tif

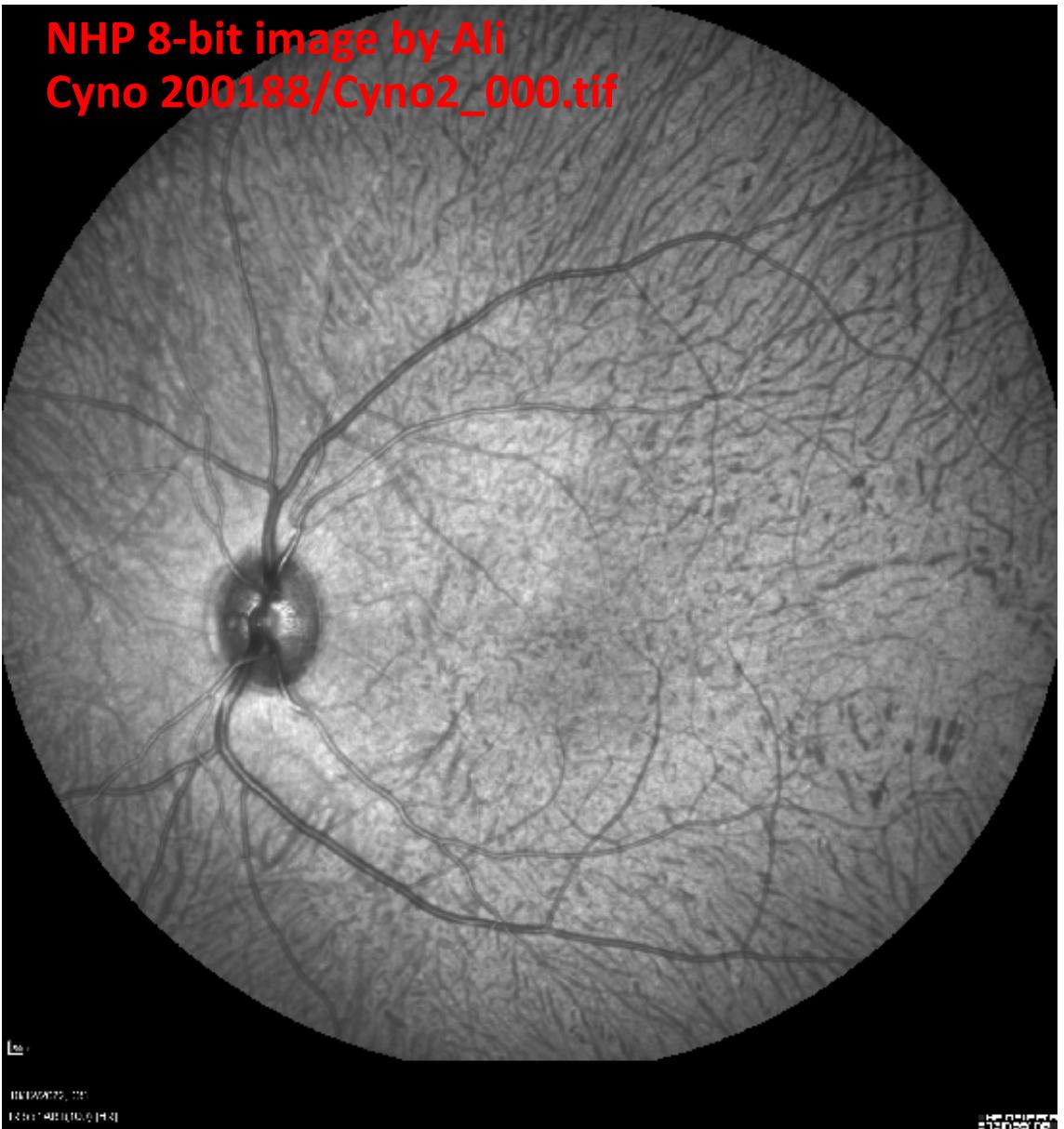


Difference of Gaussians band-pass filter

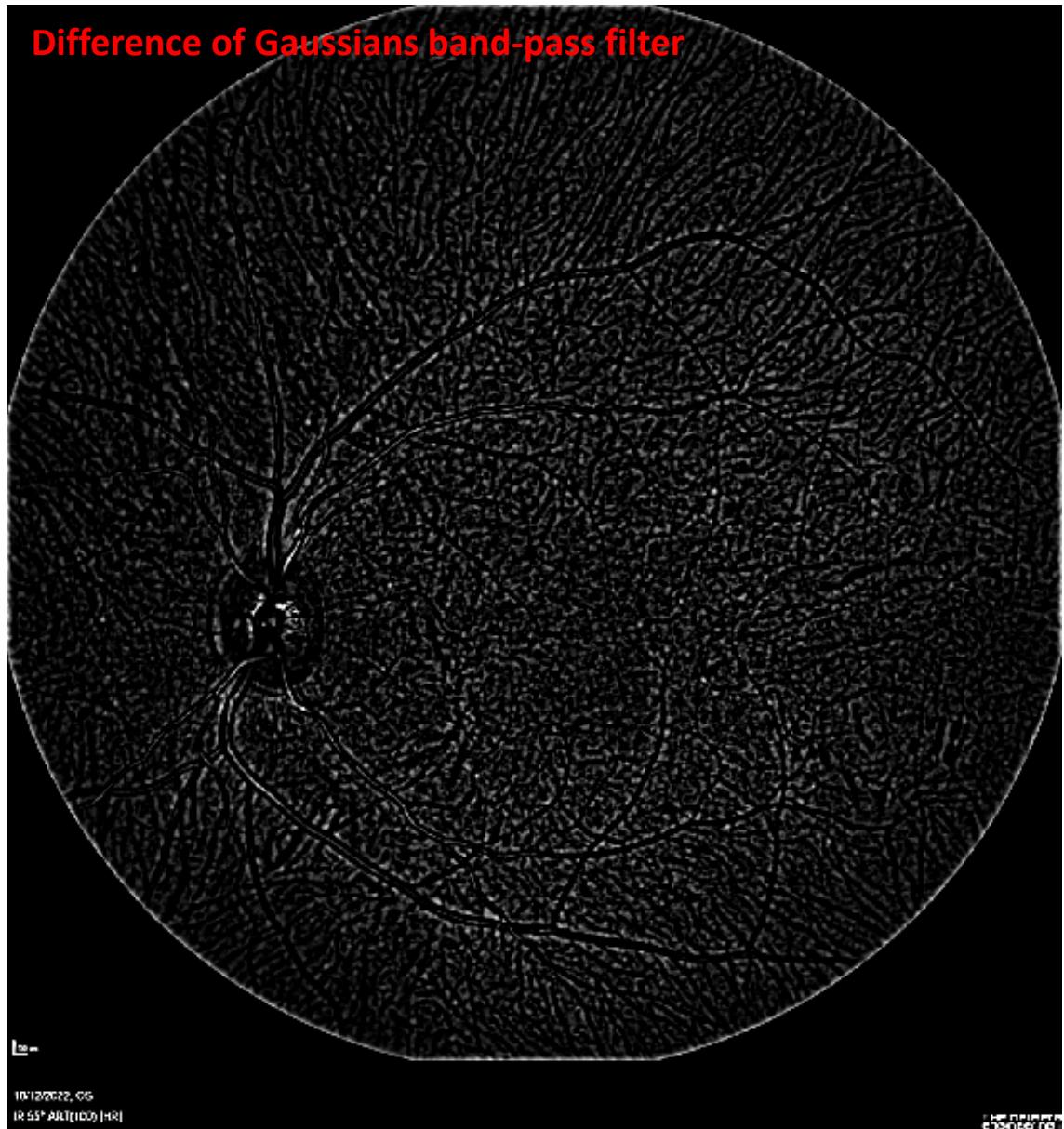


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 200188/Cyno2\_000.tif

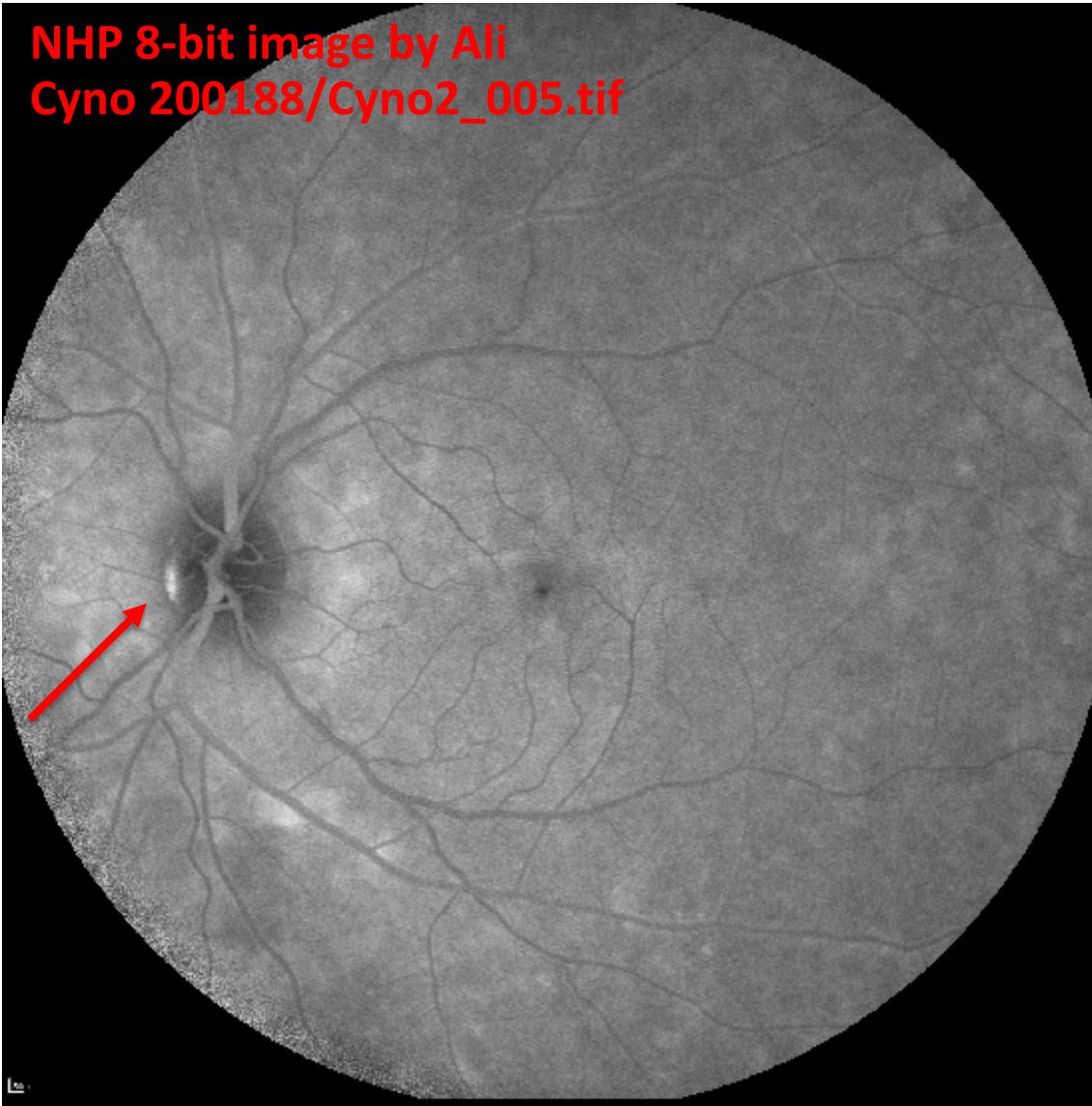


Difference of Gaussians band-pass filter

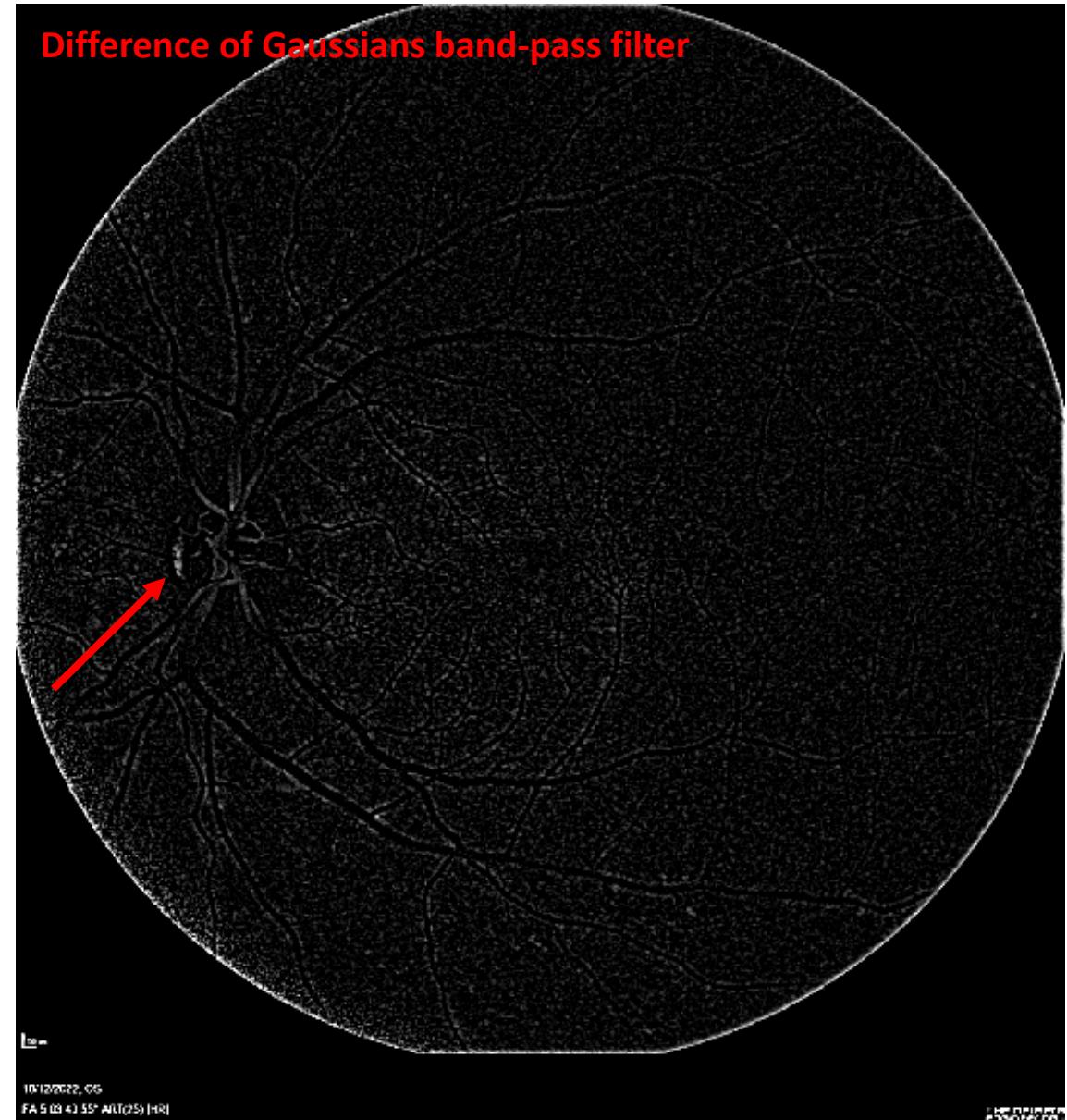


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 200188/Cyno2\_005.tif

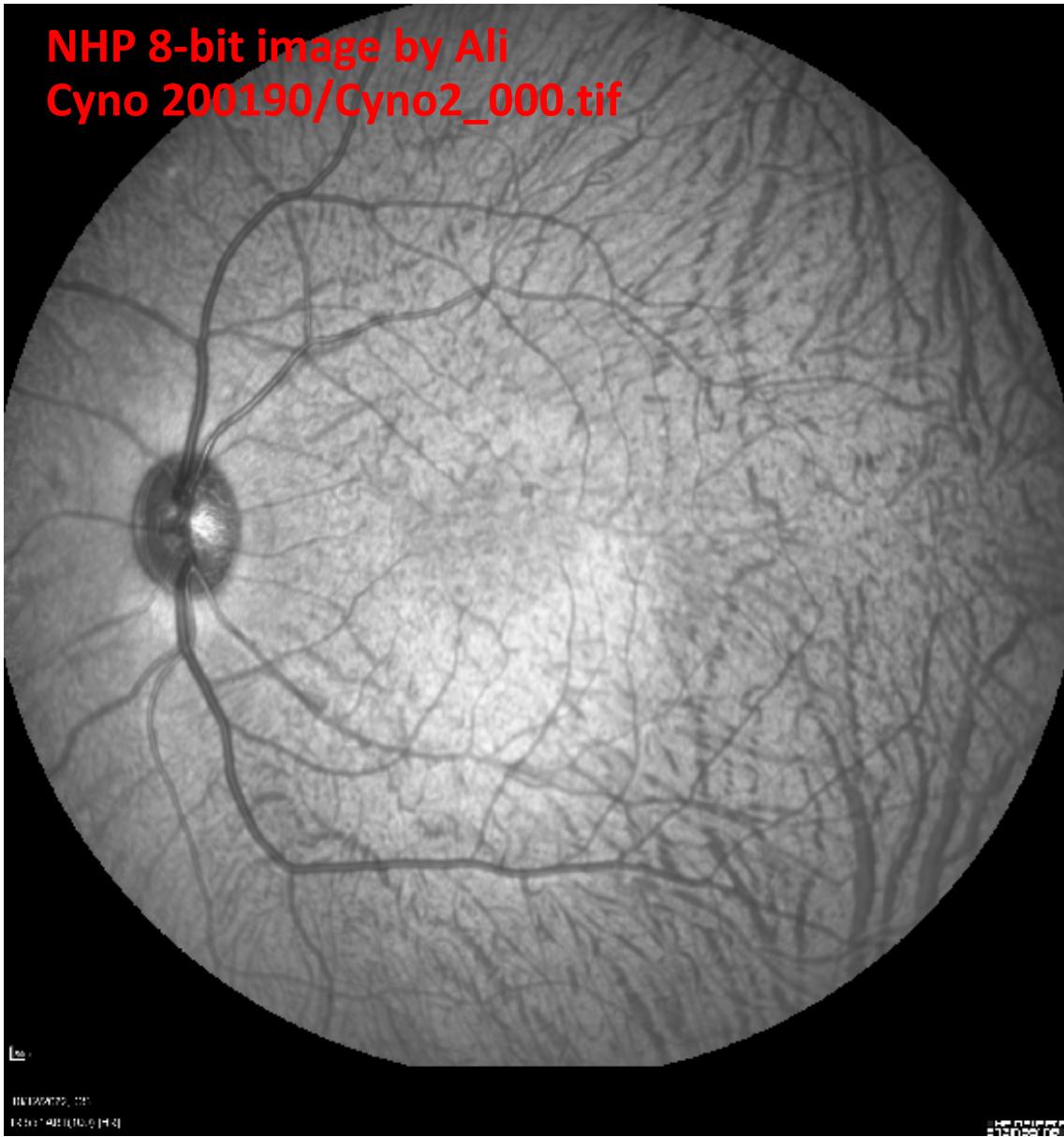


Difference of Gaussians band-pass filter

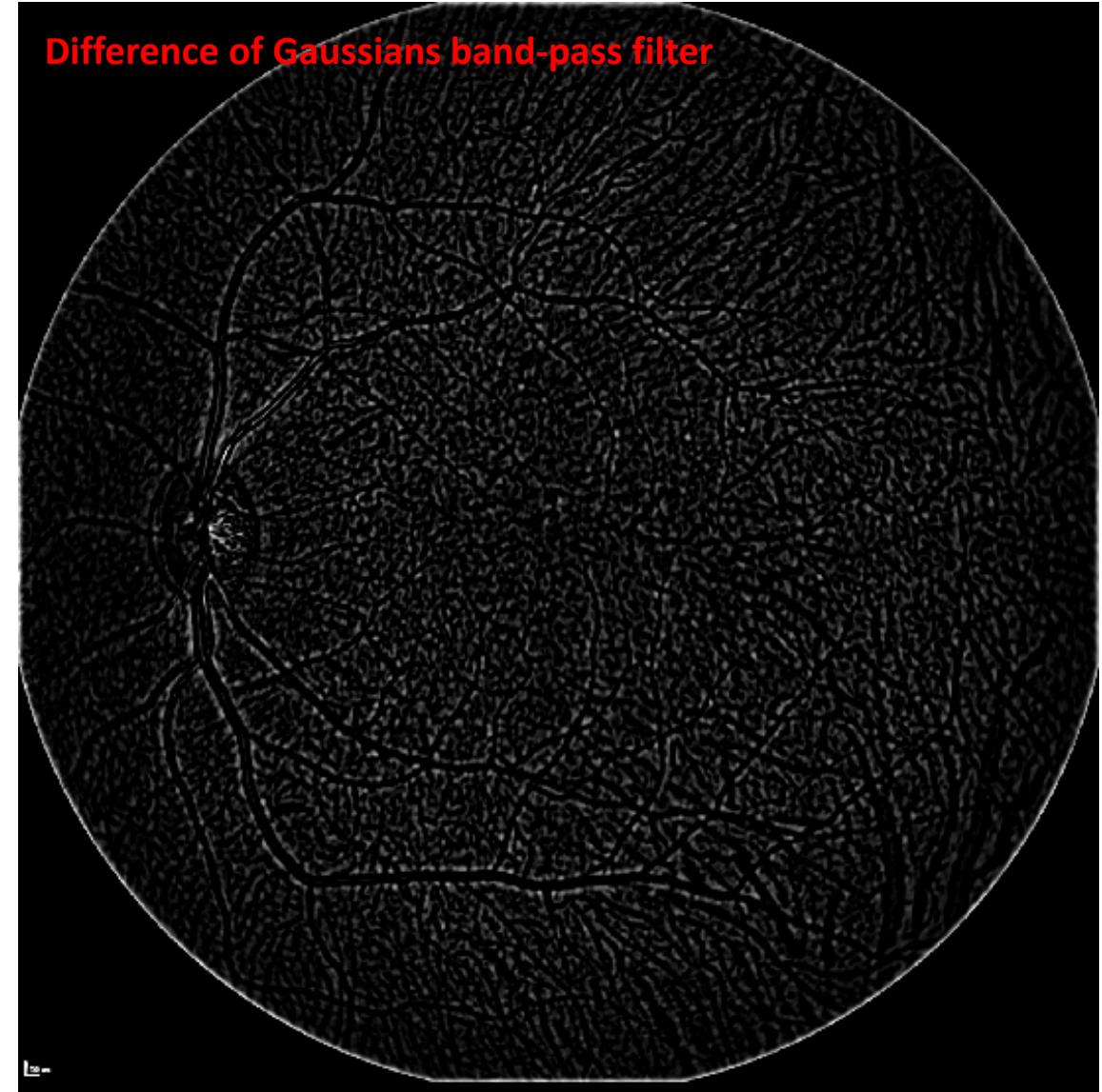


## Preliminary analysis

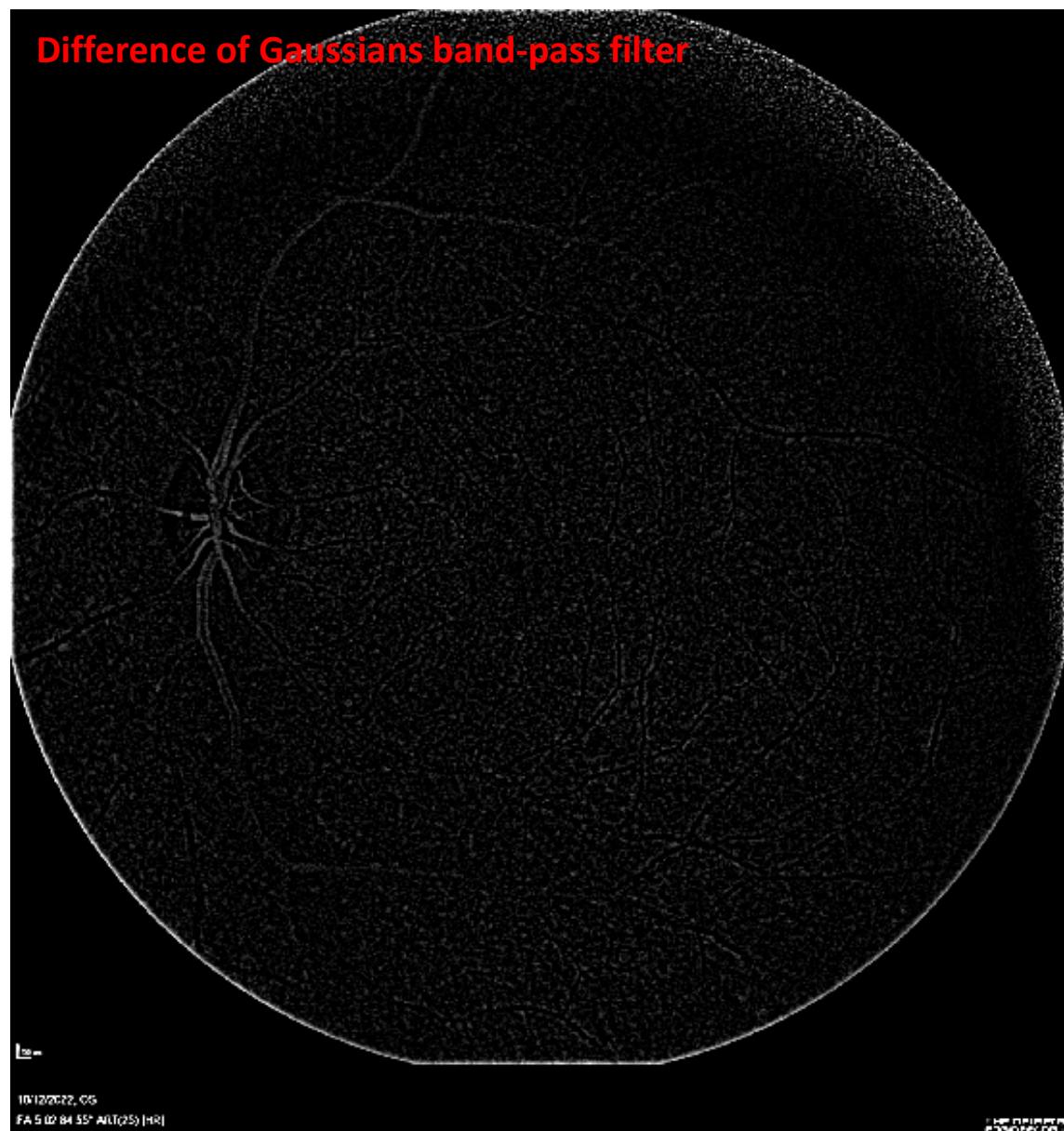
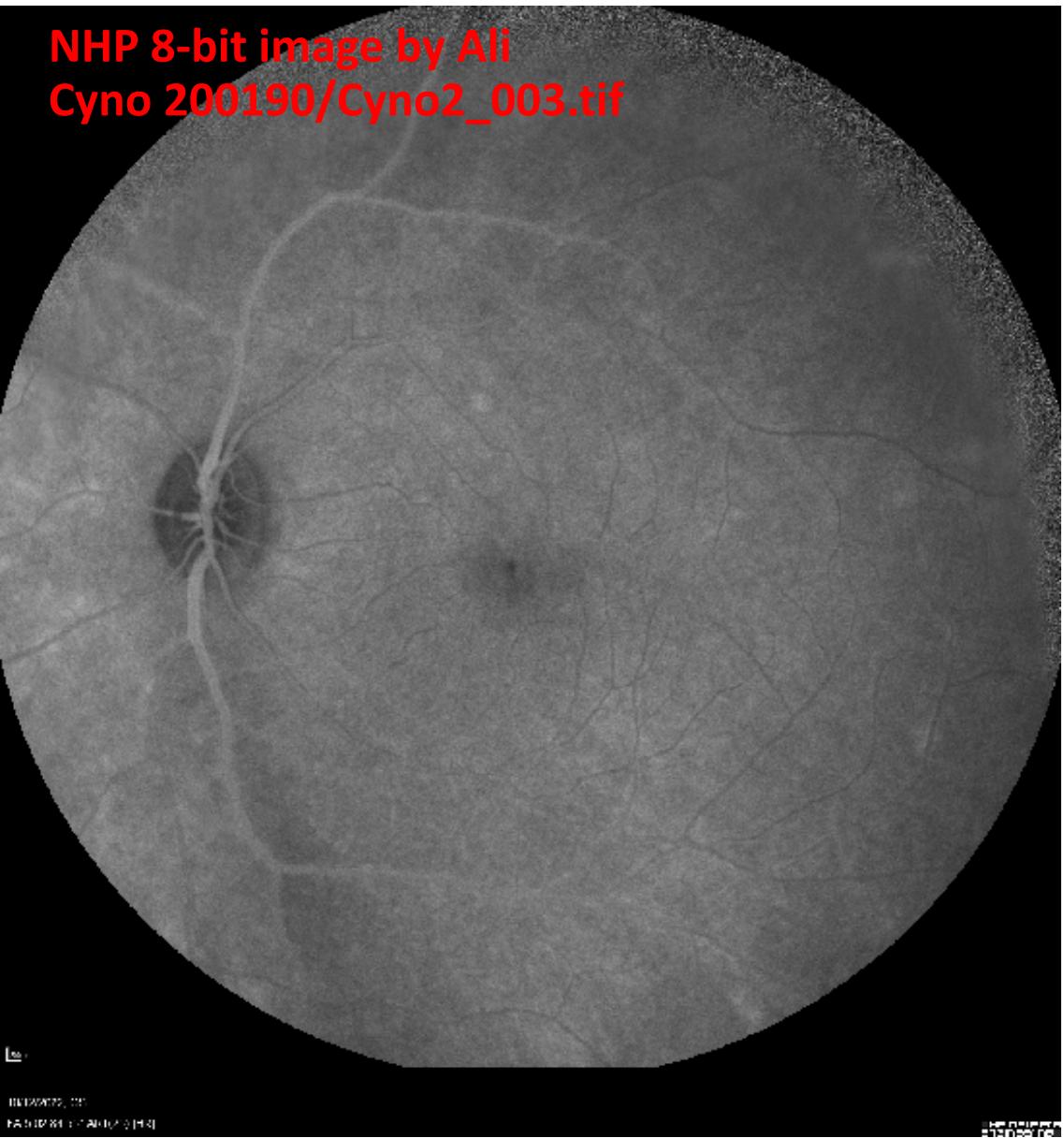
NHP 8-bit image by Ali  
Cyno 200190/Cyno2\_000.tif



Difference of Gaussians band-pass filter

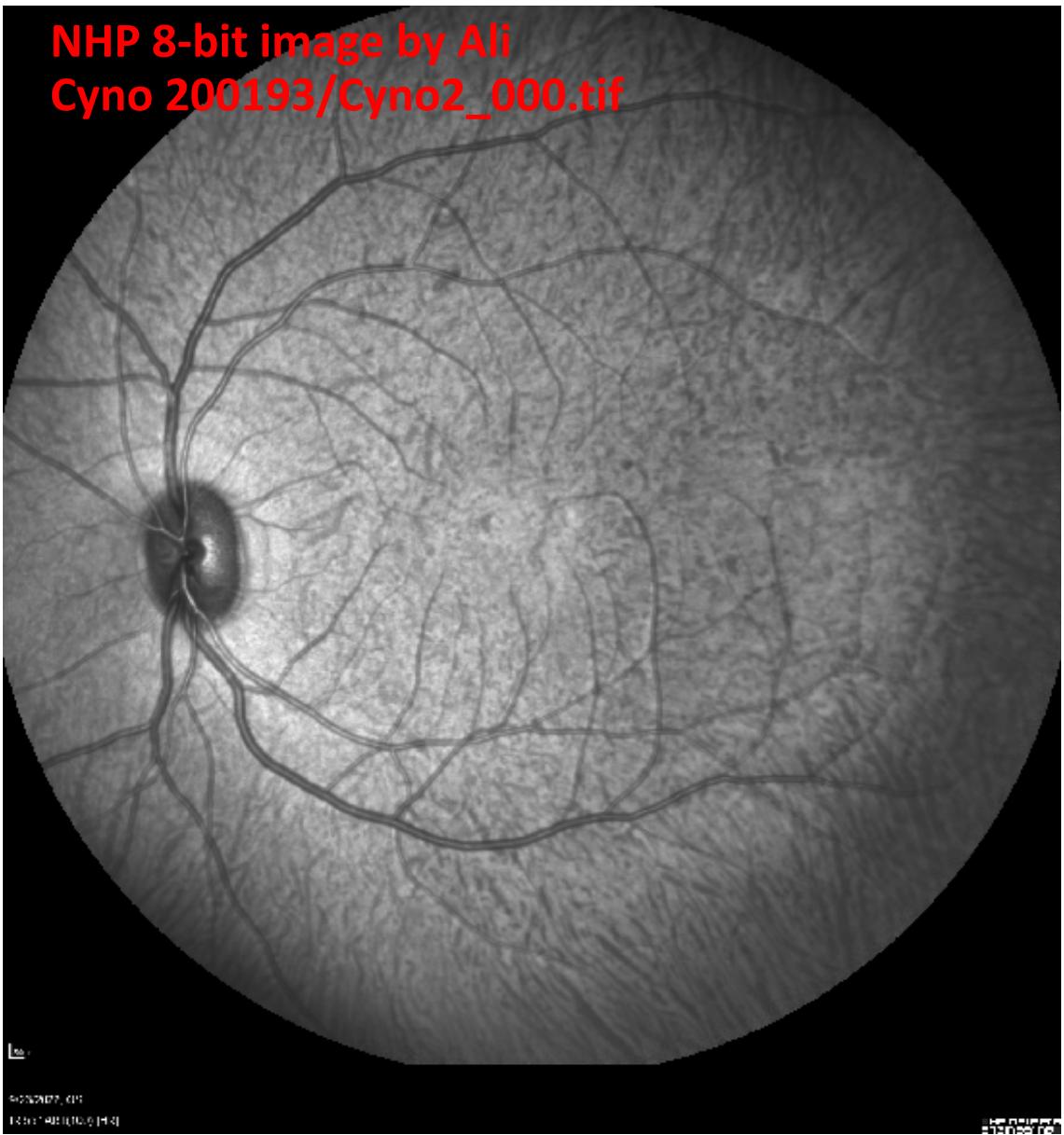


## Preliminary analysis

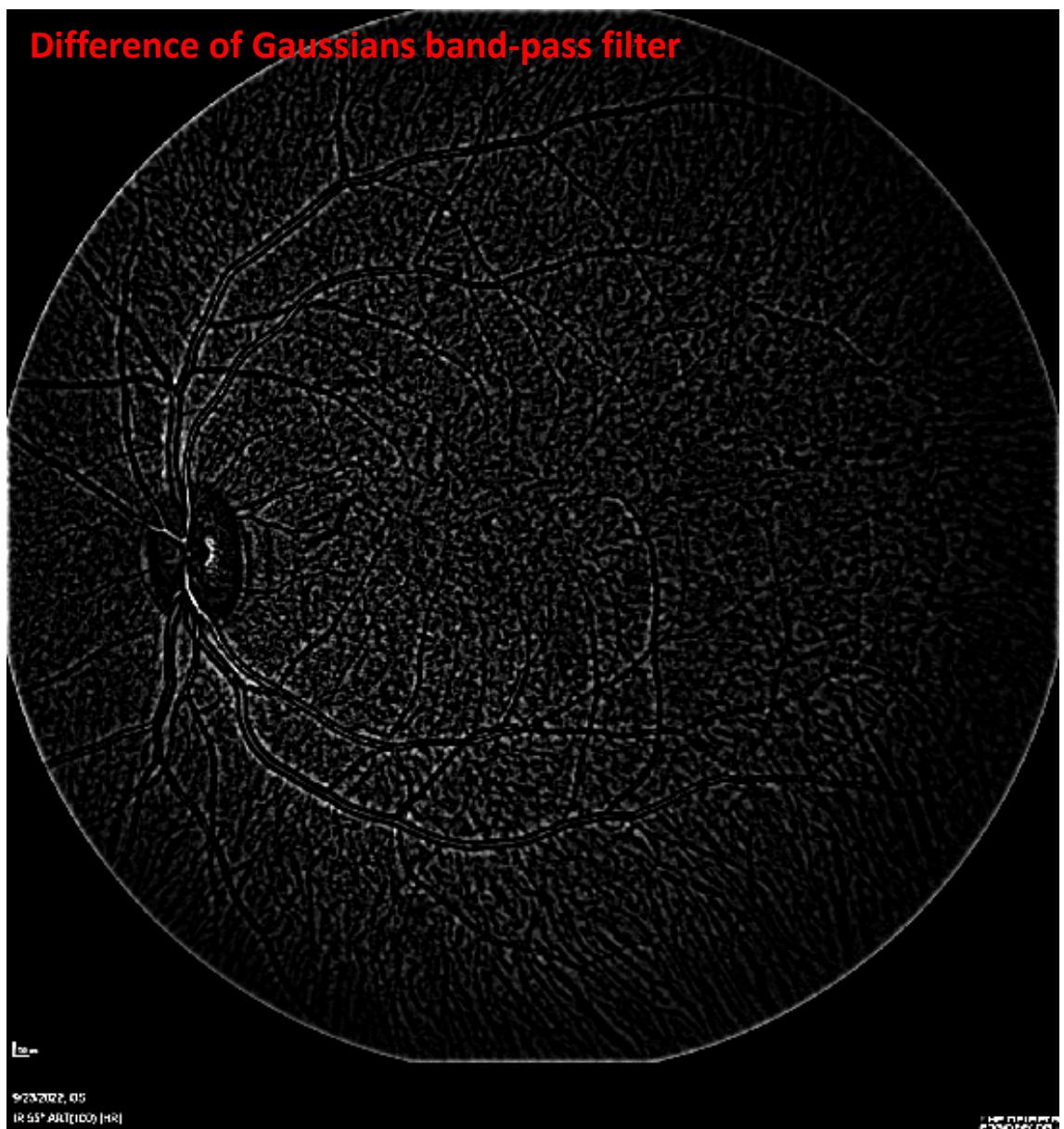


## Preliminary analysis

NHP 8-bit image by Ali  
Cyno 200193/Cyno2\_000.tif

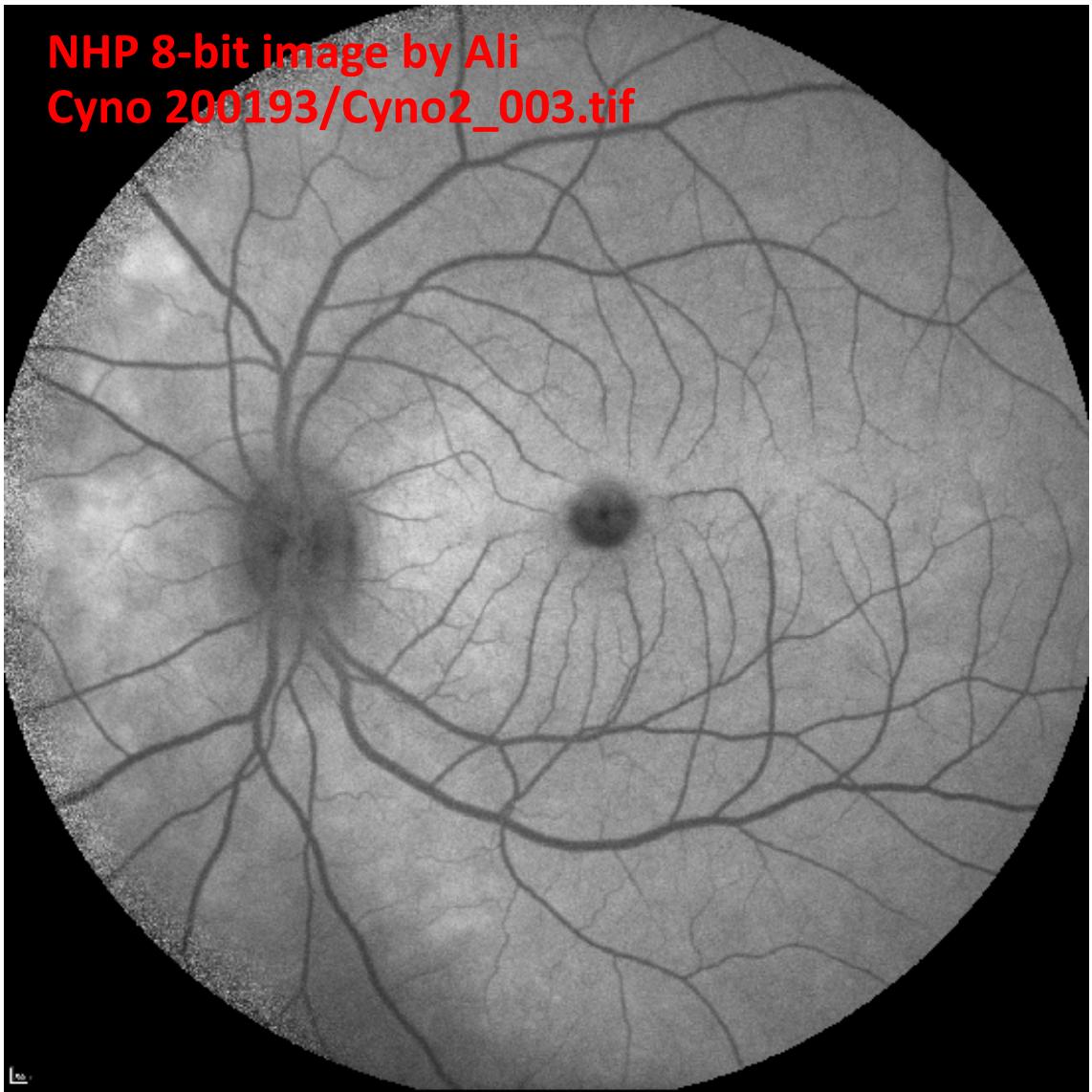


Difference of Gaussians band-pass filter

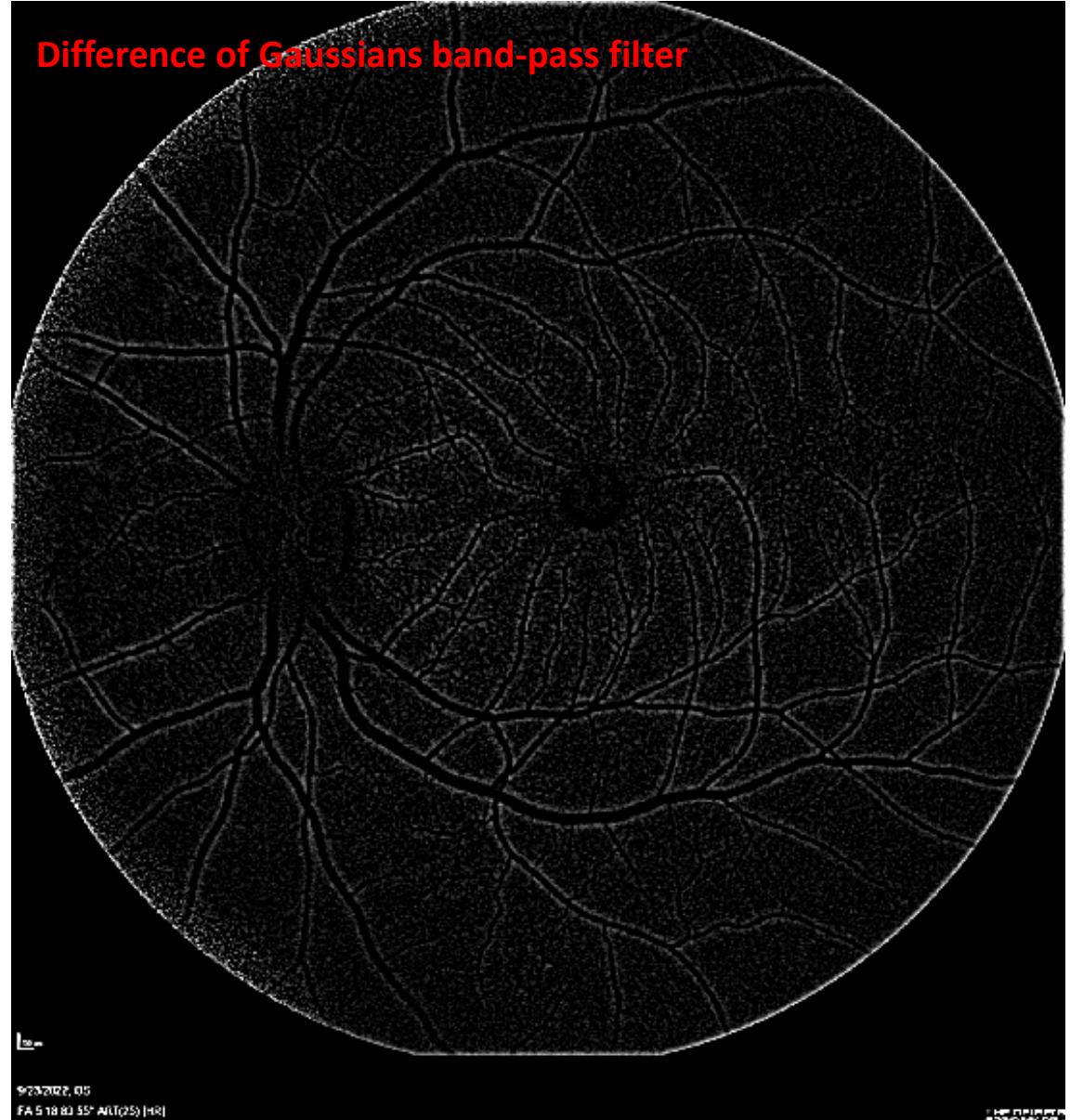


## Preliminary analysis

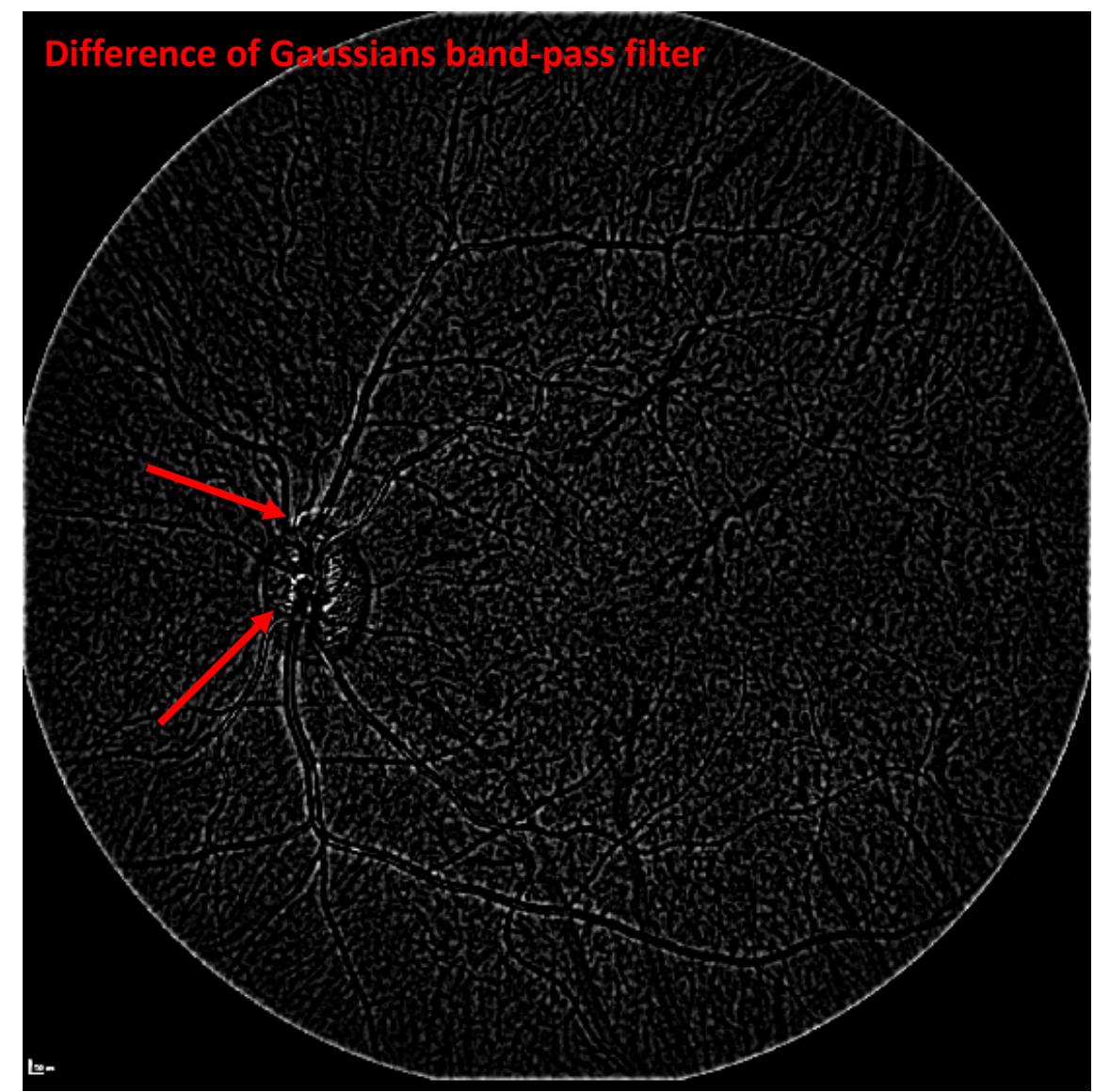
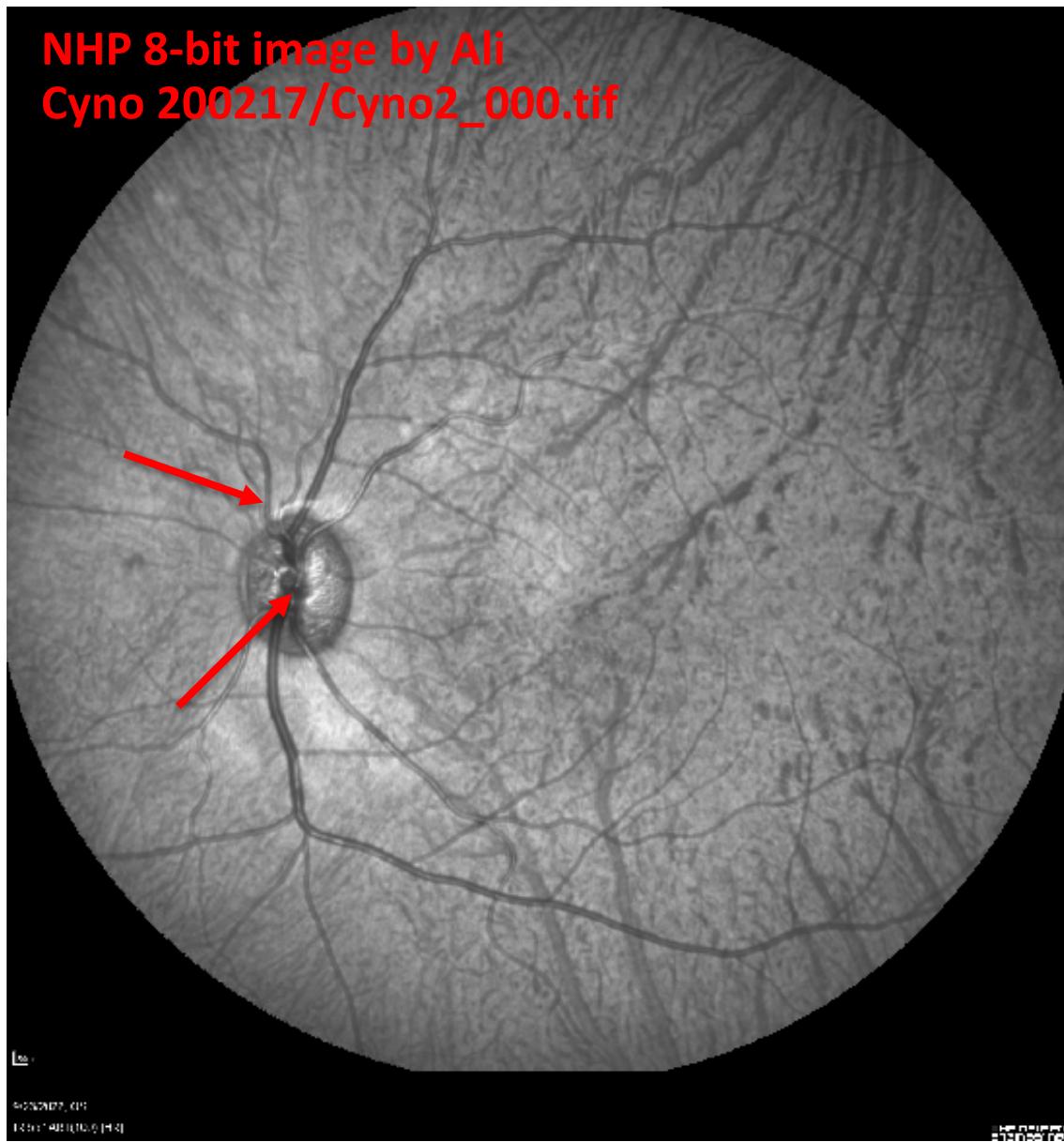
NHP 8-bit image by Ali  
Cyno 200193/Cyno2\_003.tif



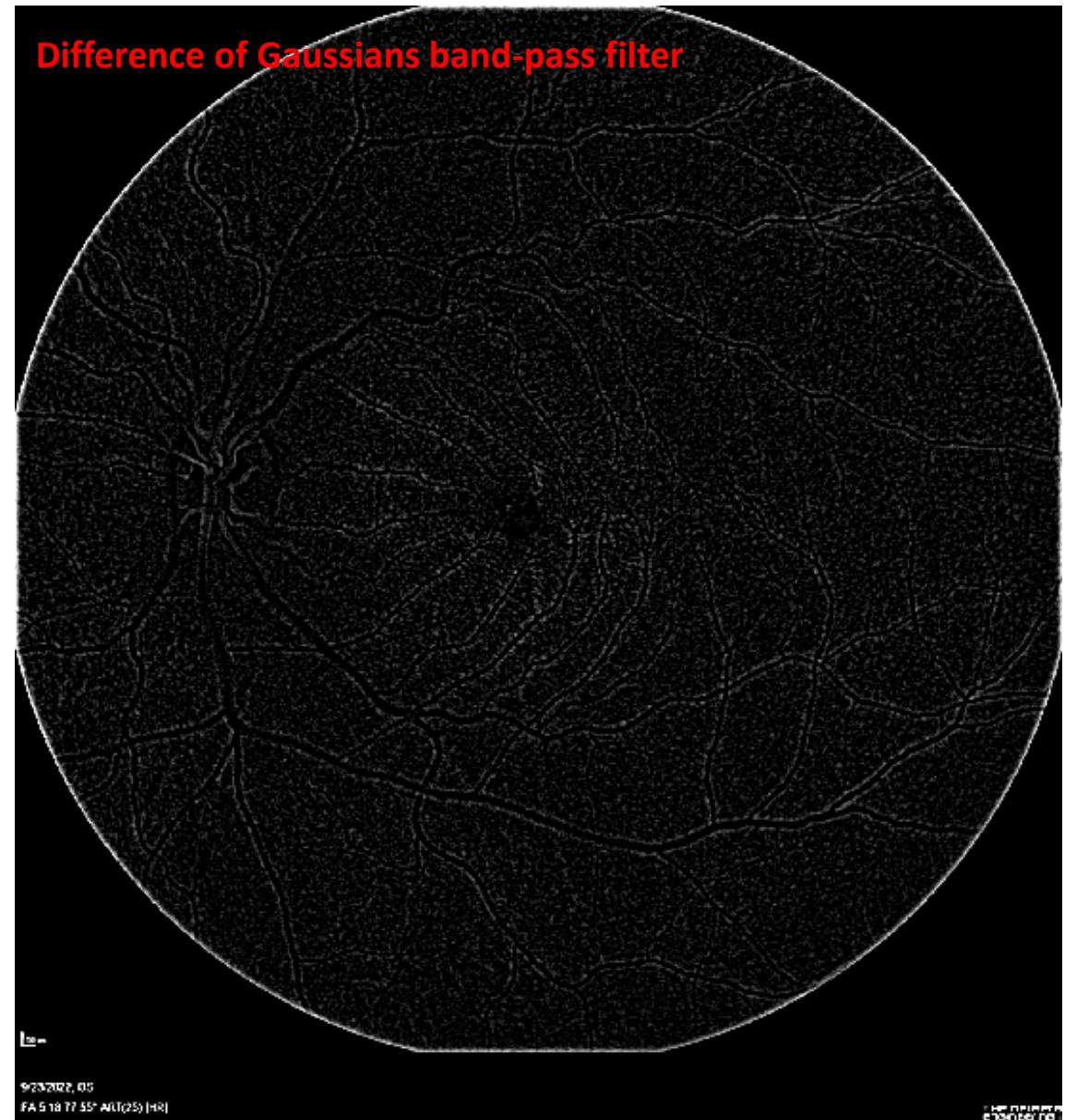
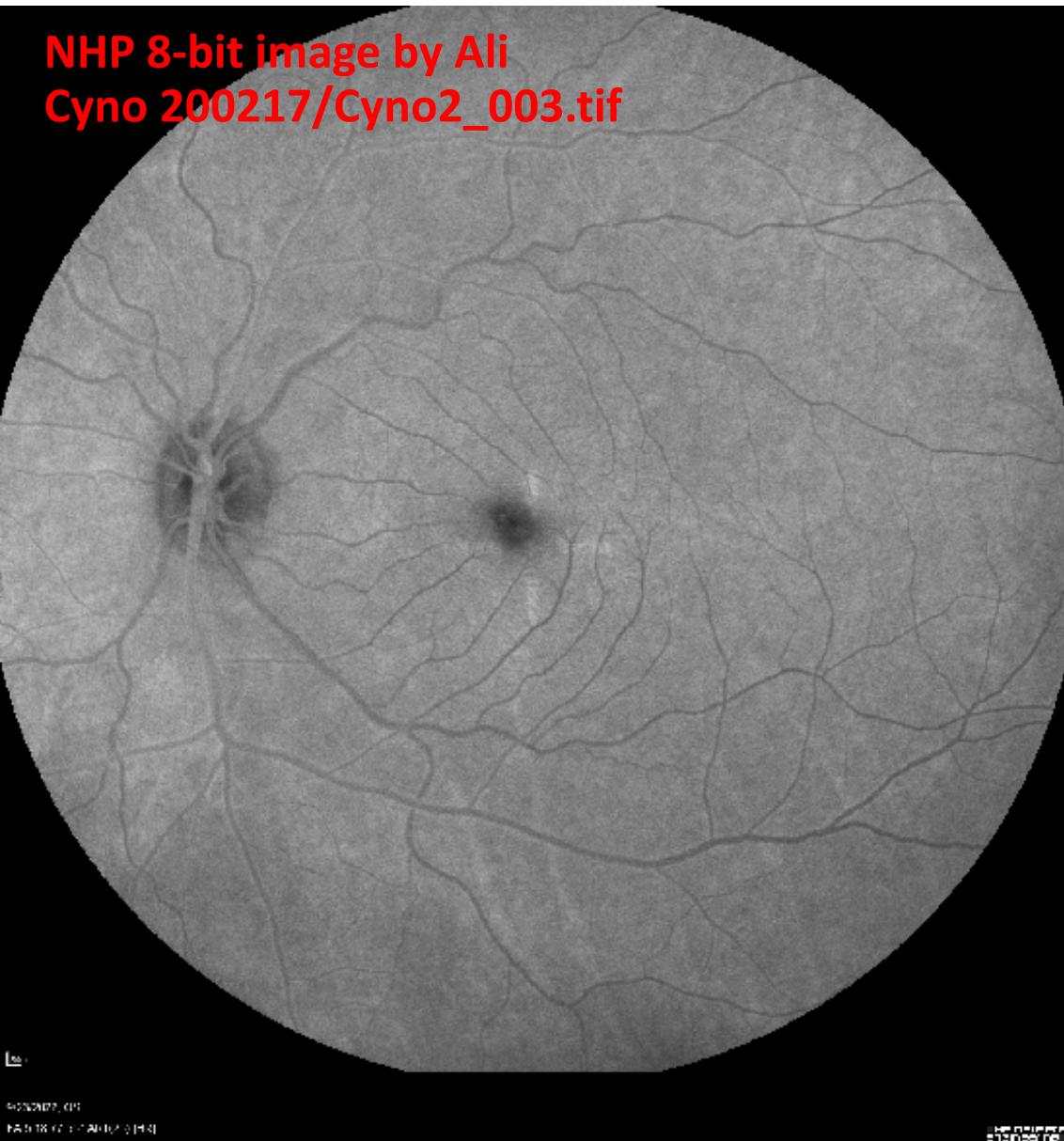
Difference of Gaussians band-pass filter



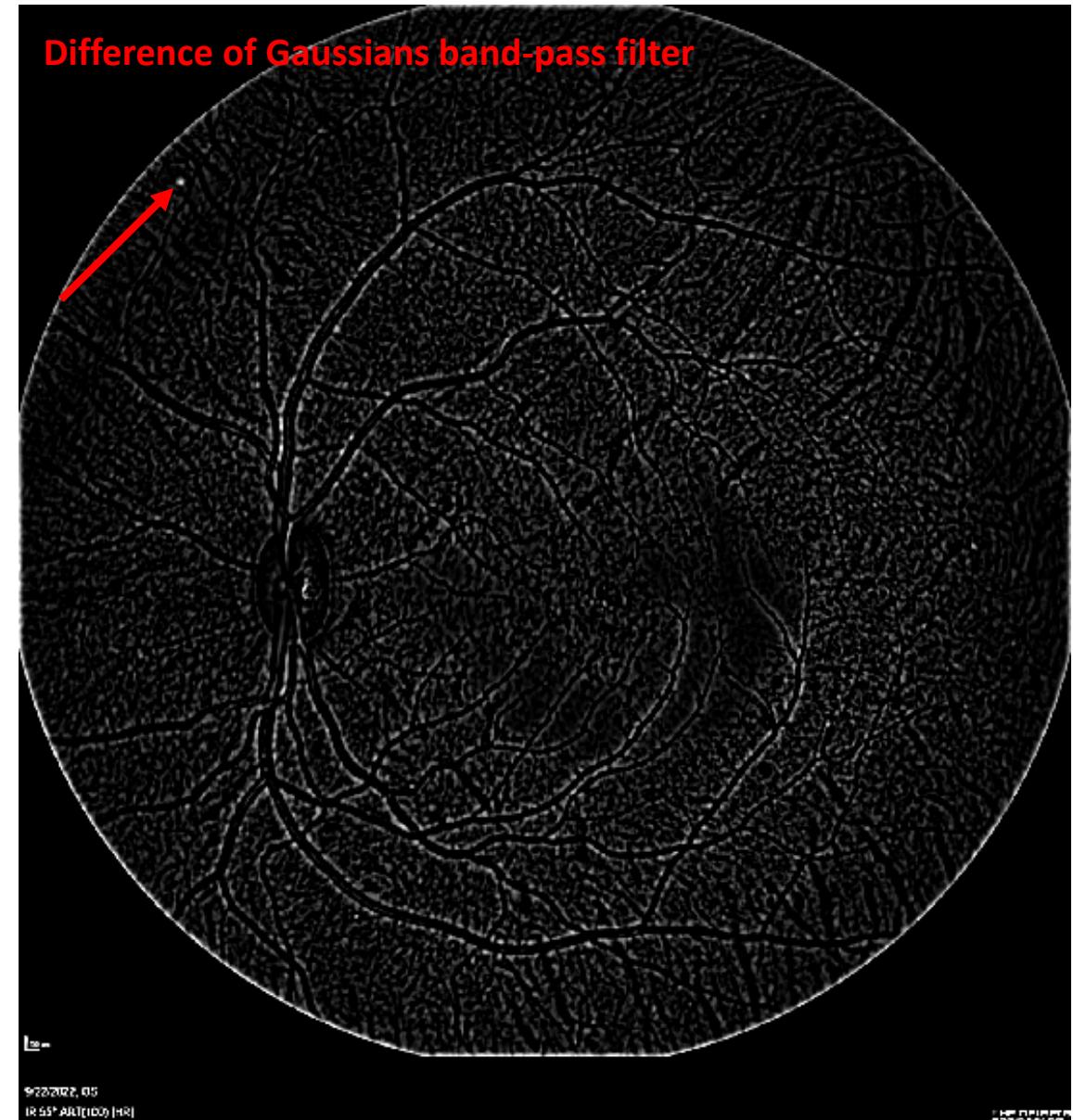
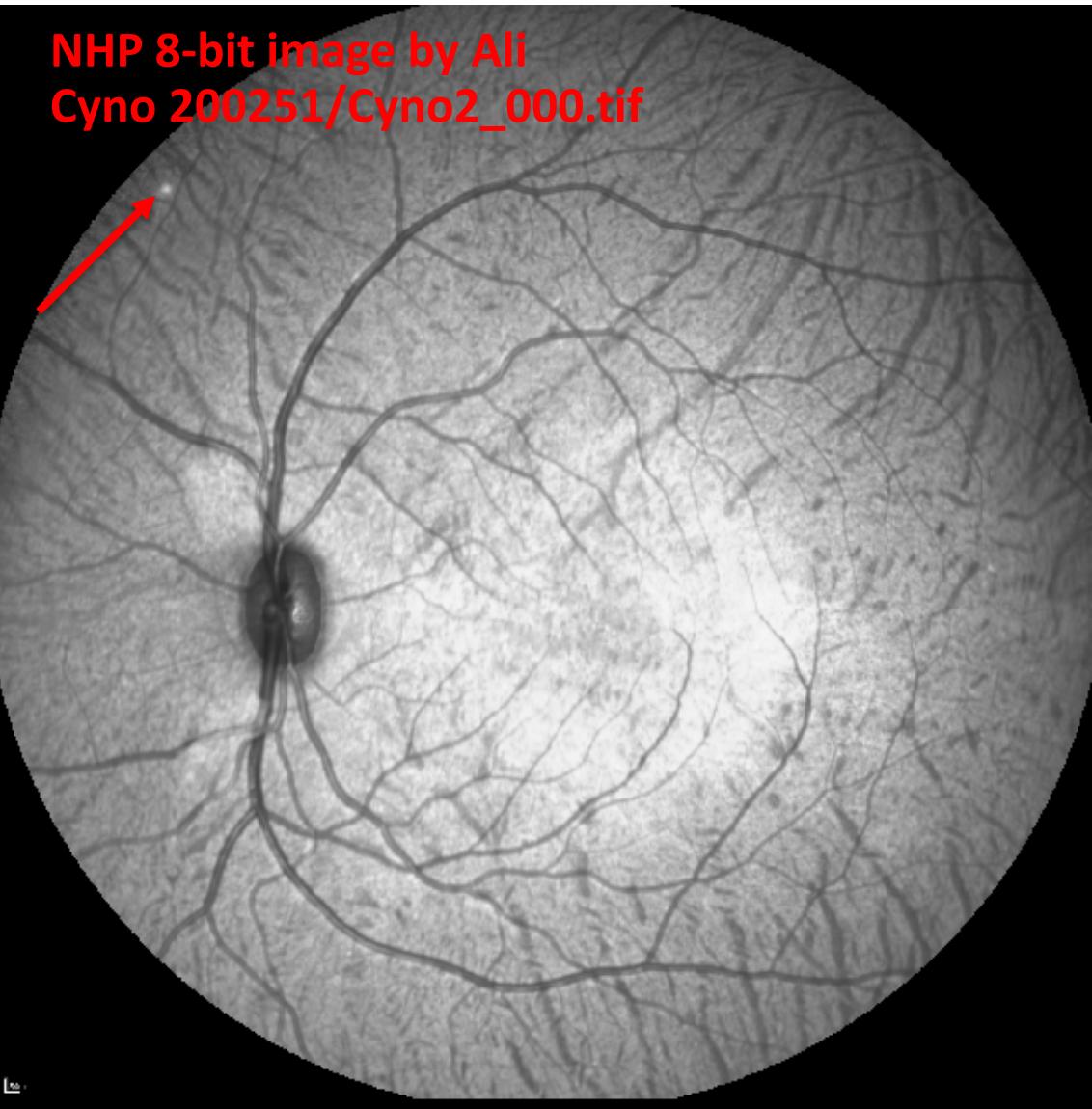
## Preliminary analysis



## Preliminary analysis



## Preliminary analysis



## Preliminary analysis

