Light Microscopy Image Process

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Image Acquisition

Zebrafish

Macaque

Z-Axis
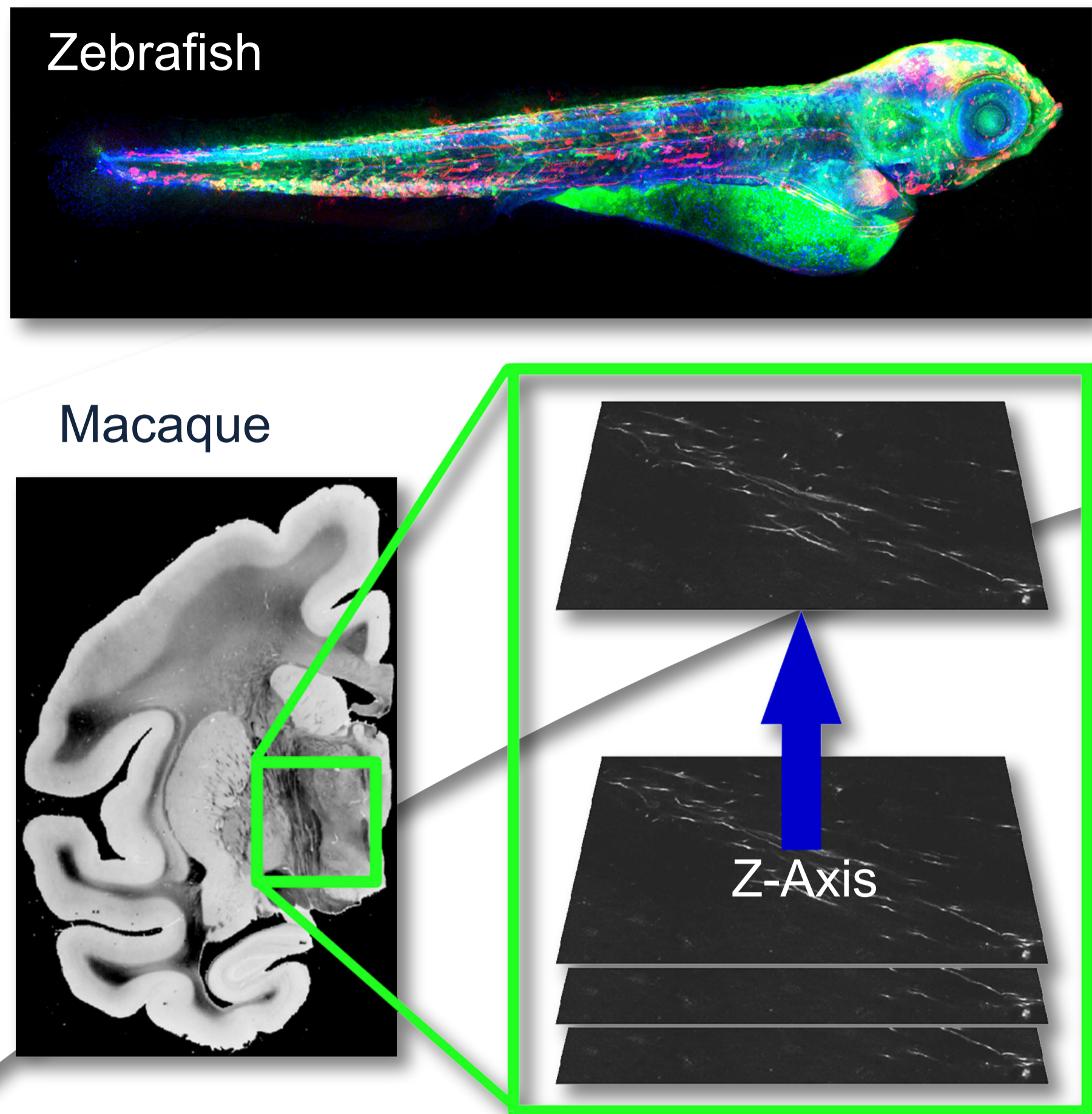
-Data sets we have explored include zebrafish volumes and macaque monkey serial sections
-Images are acquired using fluoresence confocal microscopy techniques

Preprocessing

Deconvolution
-Correct for blurring from the imperfect optical systems
Contrast Adjustment
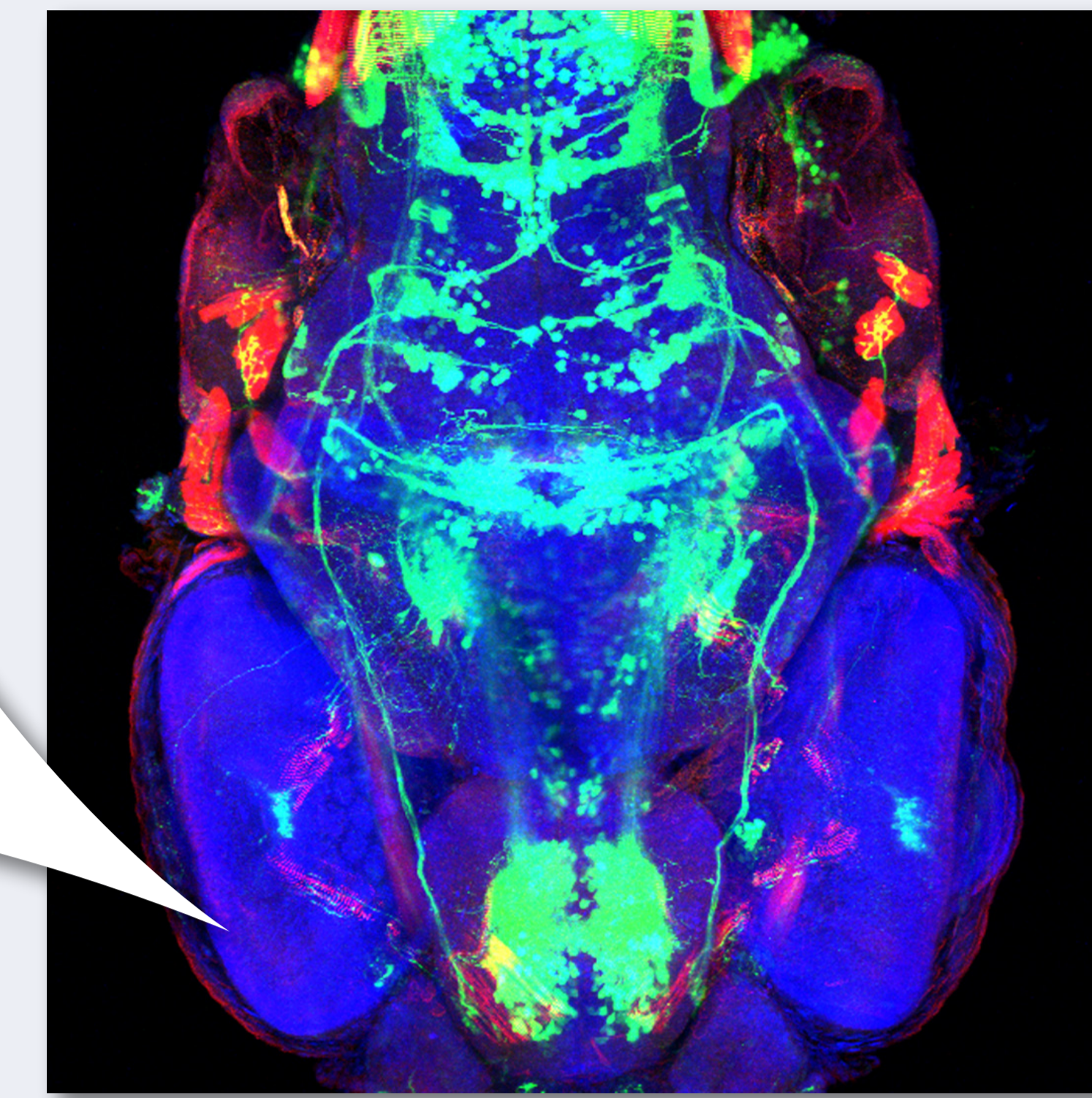-Make light and dark regions more distinguishable
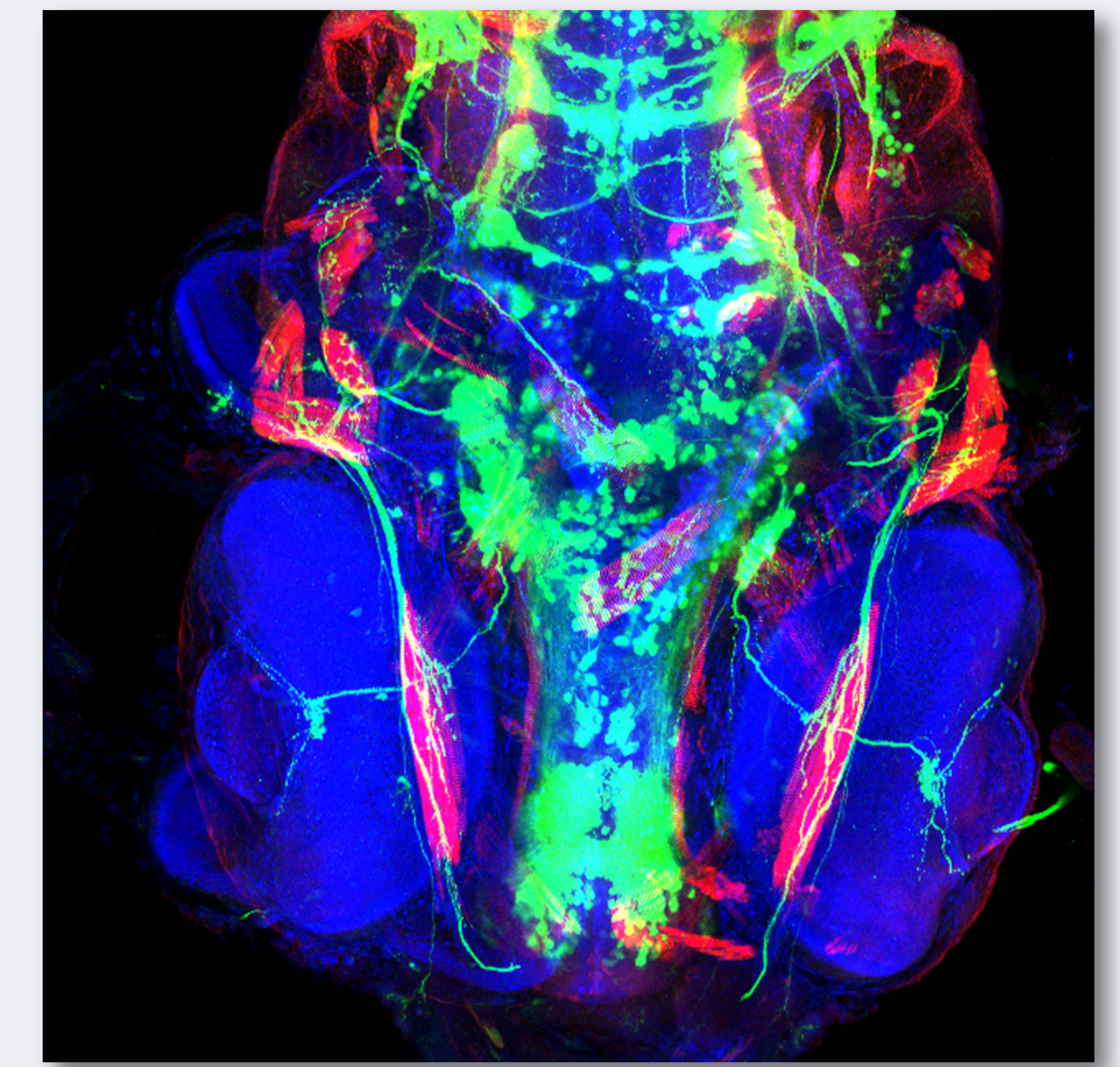
Mosaicking
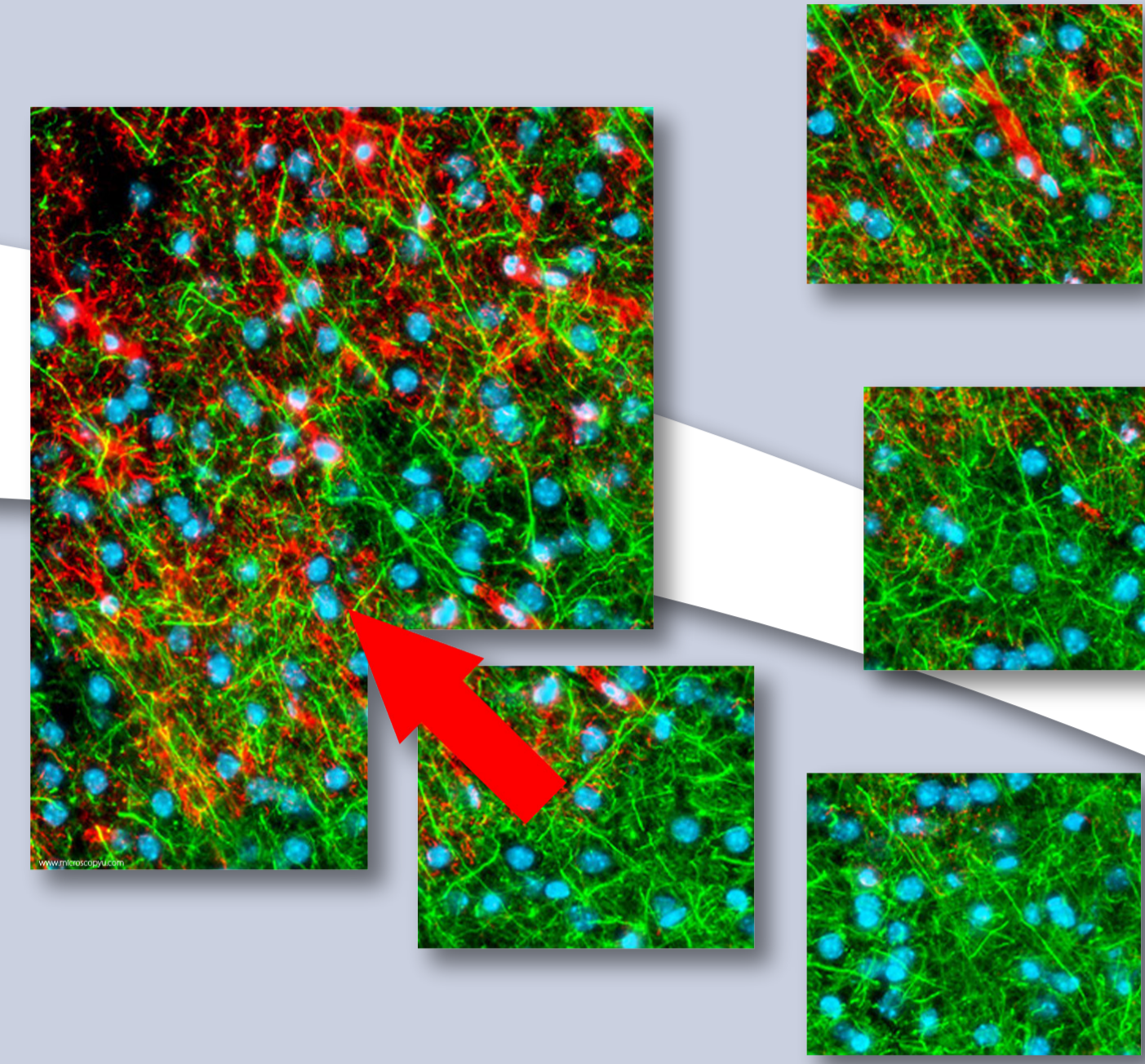
-The overlapping fields are reassembled into a complete mosaic
-Correction for optical distortion is also applied so the tiles align correctly

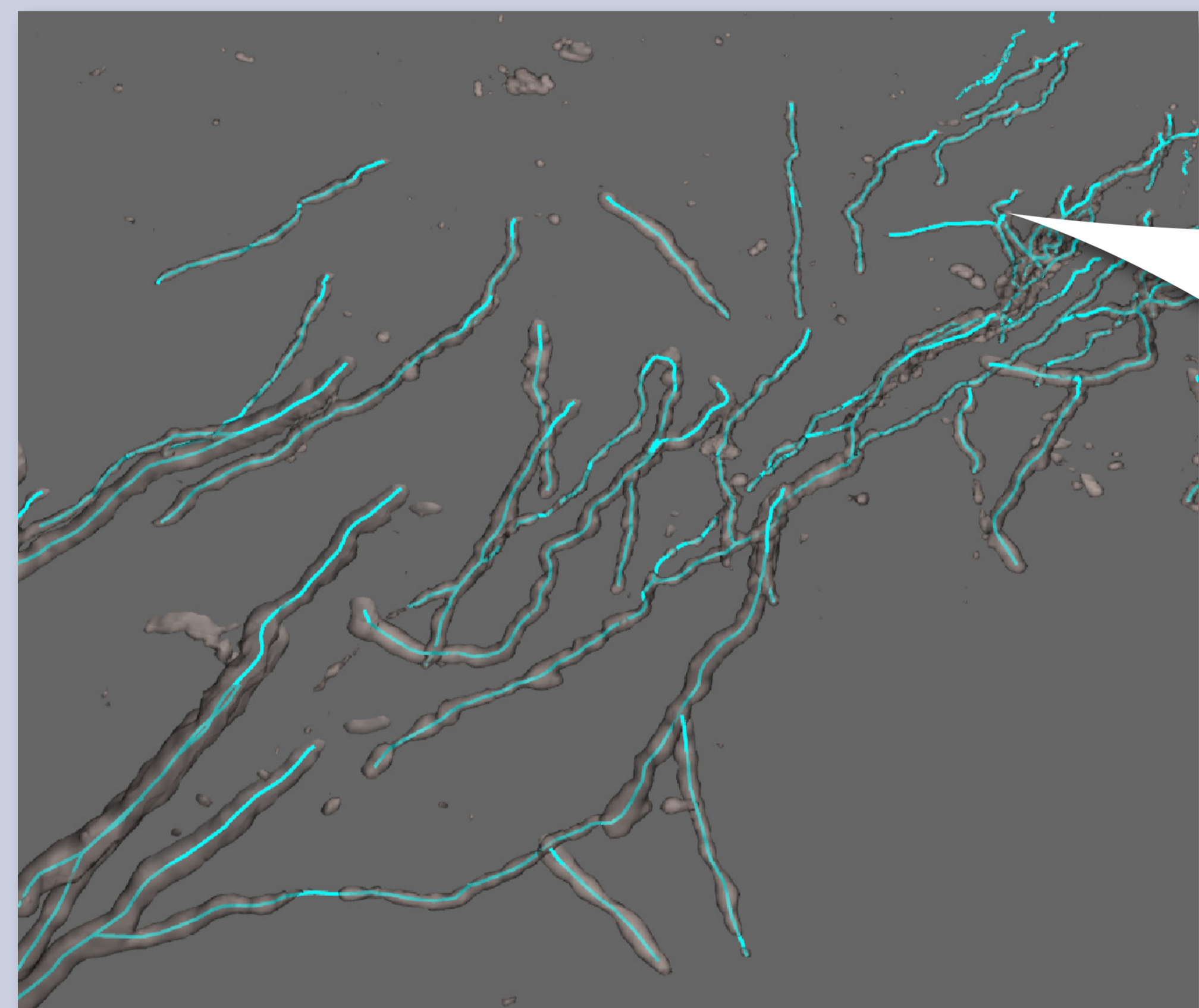## Registration

Zebrafish

Dorsal Volume

Ventral Volume

- The orientation between the dorsal and ventral images is arbitrary, where the translation and rotation parameters that align the volumes are unknown
- A combination of brute force registration and phase correlation methods are used to calculate the transform parameters of a suitable rigid transformation

Macaque

Hundreds of Deformable Sections

Visualization

Zebrafish

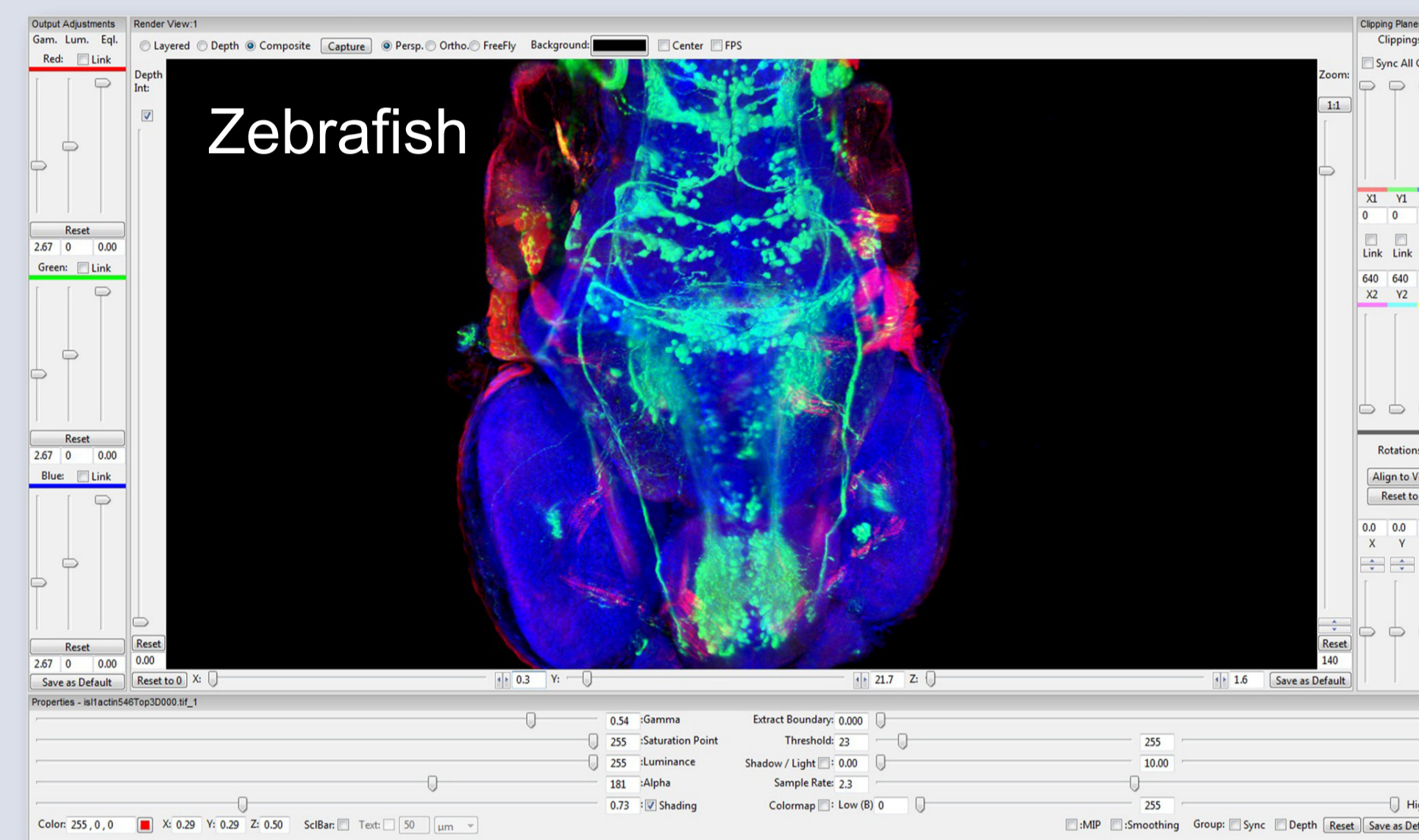- Volume rendering shown in Fluorender.

Data Analysis

Zebrafish 3D and 4D Data Exploration
-Cell movements
-Neuronal circuitry
-Tissue development during conventional analysis of wildtype and mutant embryos and larvae
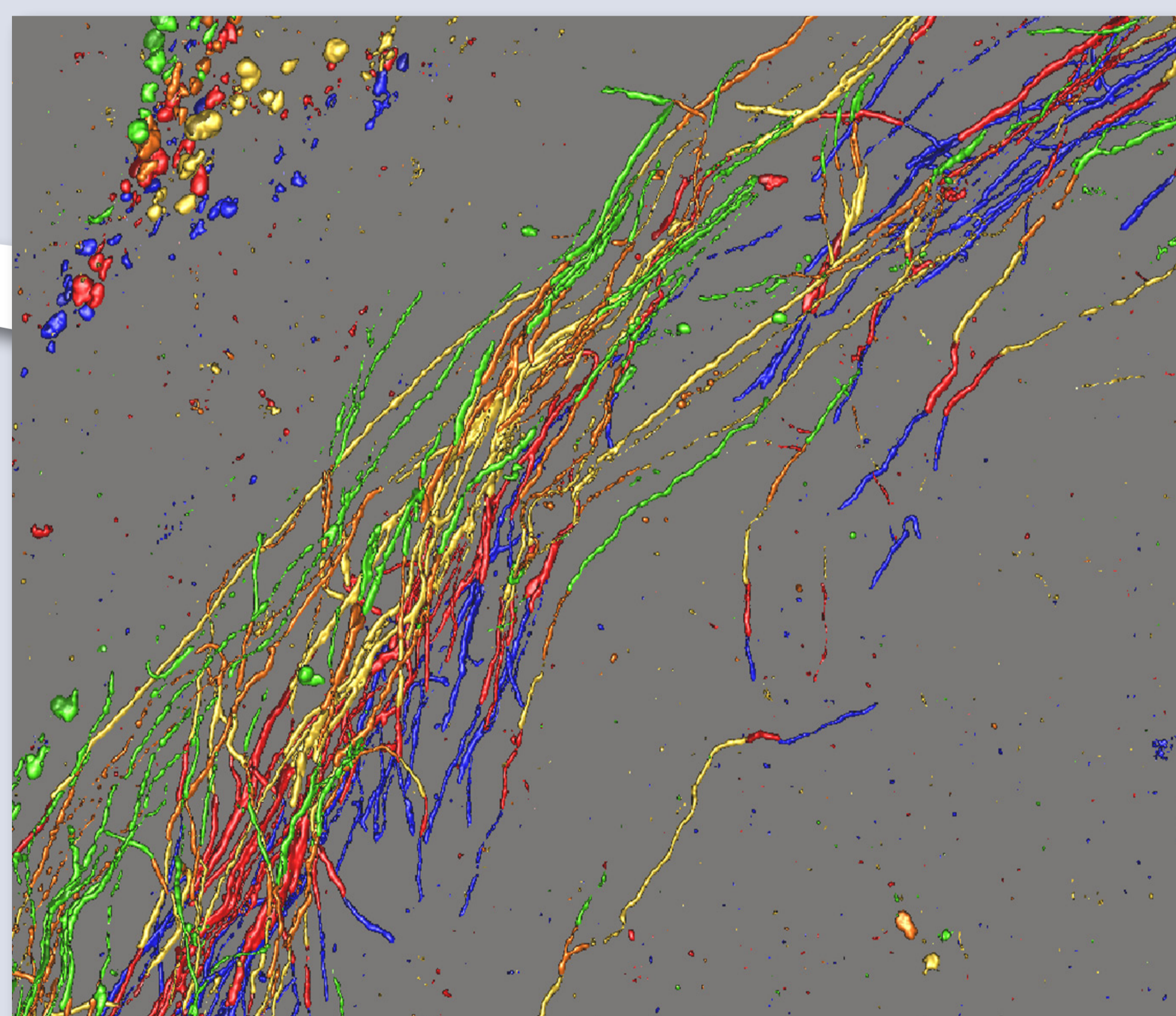
Axon Traces

Macaque Axon Exploration
-Connectivity analysis
-Axon length and path variations
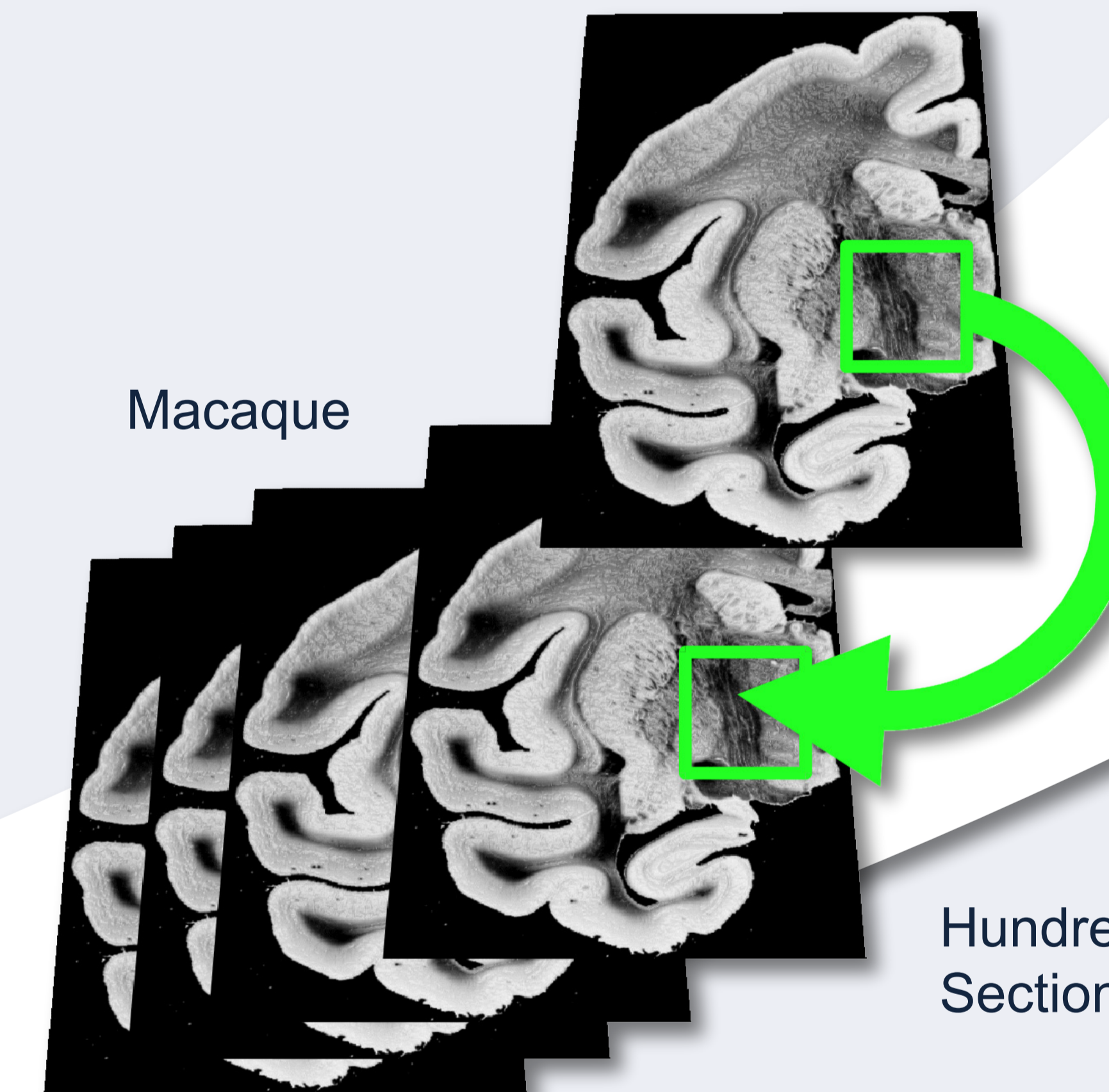-Differences in axons imaged with different markers

Macaque Axons

- Isosurface rendering of axons in the region of interest over five consecutive serial sections. Colors represent different sections.

-Sections are easily deformed during the sectioning, staining, and mountning processes
-For axon alignment, we first trace the axons in each section independently
-The traced axons are used to derive landmarks to be used in nonrigid landmark-based registration

Acknowledgements

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