



# Multidimensional Processing and Visual Rendering of Complex 3D Biomedical Images.

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HAT: 6.3a (6.3.1.9), 6.3c (6.3.2.5) TA: 6.3 Human Health and Performance TRL: start 3 / current 4

## OVERVIEW

The proposed technology uses advanced image analysis techniques to maximize the resolution and utility of medical imaging methods being used during spaceflight. We utilize COTS technology for medical imaging, but our applications require higher resolution assessment of the medical images than is routinely applied with nominal system software. By leveraging advanced data reduction and multidimensional imaging techniques utilized in analysis of Planetary Sciences and Cell Biology imaging, it is possible to significantly increase the information extracted from the onboard biomedical imaging systems. Year 1 focused on application of these techniques to the ocular images collected on ground test subjects and ISS crewmembers. Focus was on the choroidal vasculature and the structure of the optic disc. Methods allowed for increased resolution and quantitation of structural changes enabling detailed assessment of progression over time. These techniques enhance the monitoring and evaluation of crew vision issues during space flight.

## RESULTS

- Successful method development for isolation of ocular tomography substructures indicating feasibility of tracking structural changes over time.
- **Successful integration with NASA/JSC medical team.**

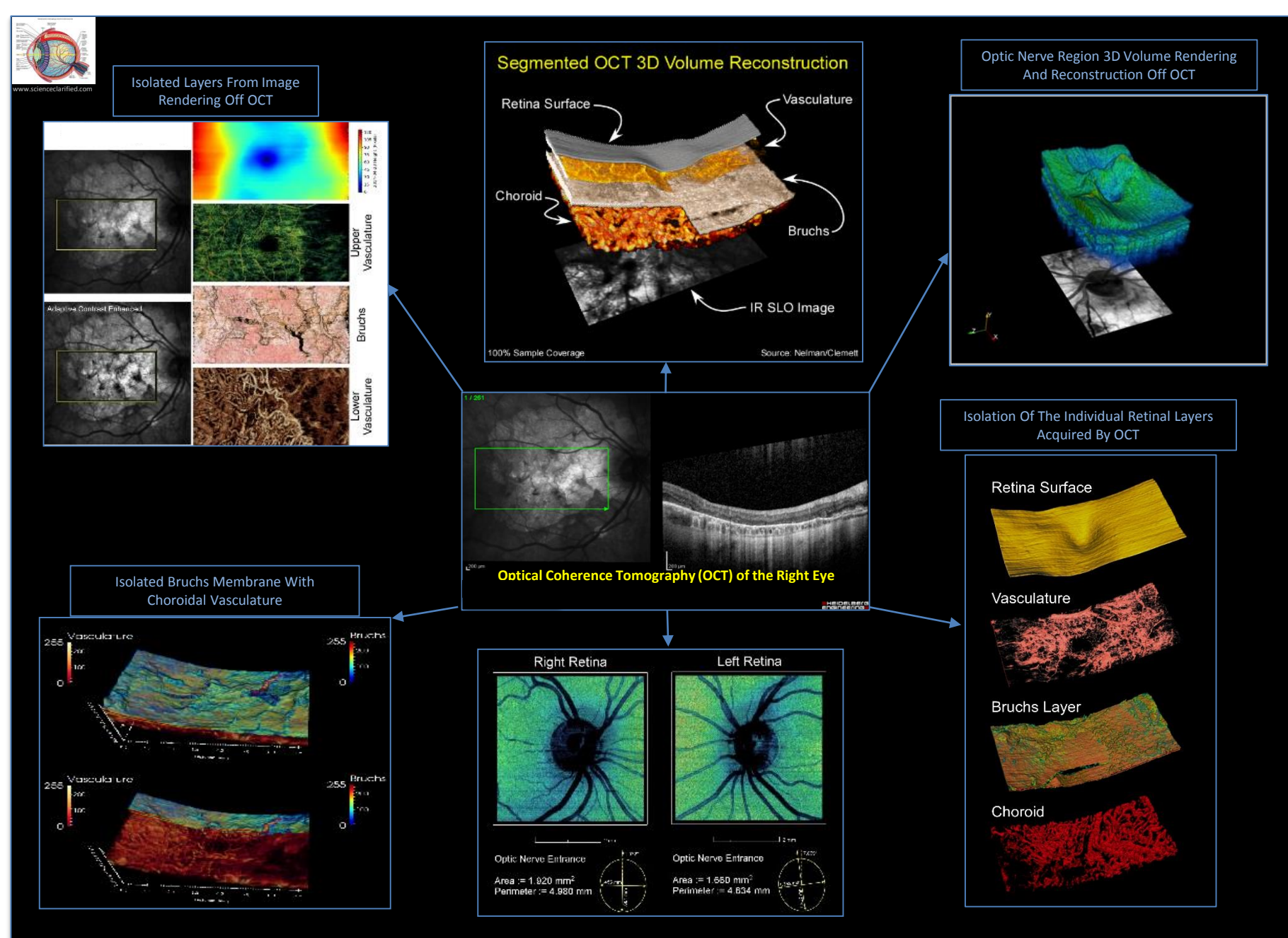


Image rendering shown is not available through Heidelberg software. (Source: Clemett/Nelman)

## INFUSION SPACE / EARTH

- This technology may be incorporated in to current operational ocular assessments for ISS – ISS program, as well as in the general medical community.

## INNOVATION

This technology will enhance the monitoring and evaluation of crew vision issues during space flight.

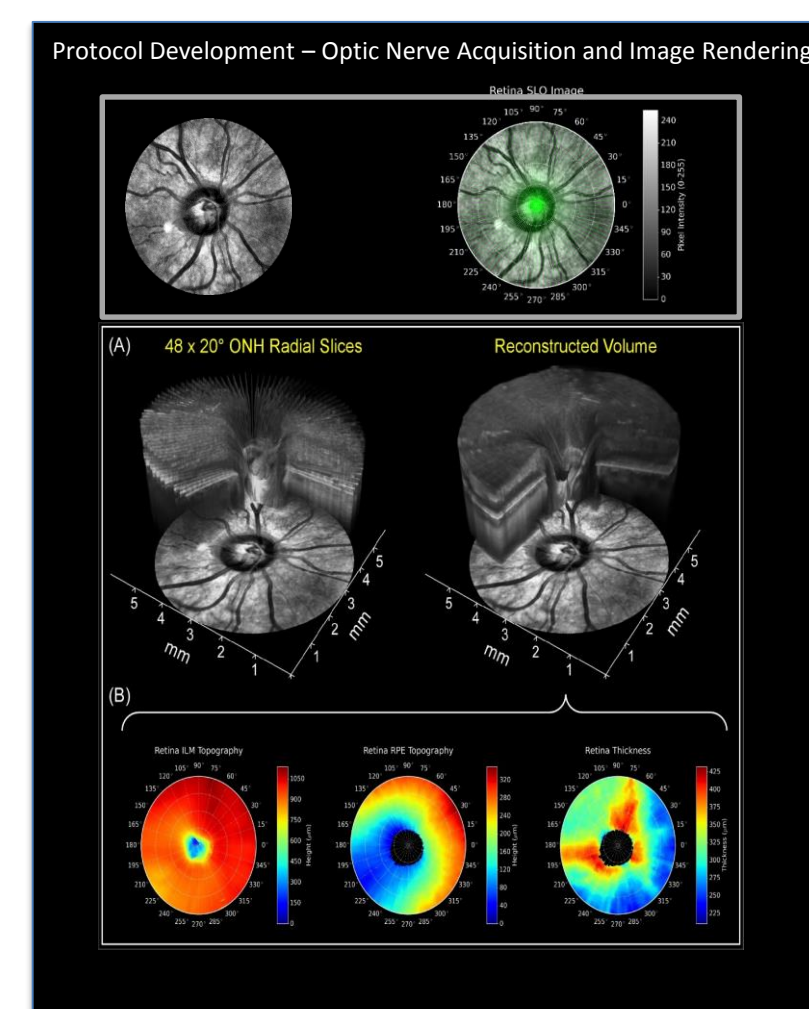


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## PARTNERSHIPS / COLLABORATIONS

This technology involves strong collaborations with David Brown, MD at Baylor College of Medicine and Richard Spaide, MD of Vitreous, Retina, Macula Consultants of New York. Dr. Brown and Dr. Spaide are both medical retinal specialists that provide clinical expertise for the interpretation and optimization of OCT and ocular ultrasound images. In addition, they have extensive expertise working with ocular instrumentation currently used on board ISS.

## TECHNOLOGY – ISS PROGRAM AND CLINICAL GROUND APPLICATIONS

Successful protocol development of 3D structural analysis using commercial OCT that can be used both by the ISS program as well as by the general medical community.

## FUTURE WORK

This technology (TA6.3) will enable the optimization and validation of enhanced medical imaging requirements and techniques supporting Exploration medical imaging suites. Future work will expand to ultrasound technology initially to combine imagery information specific to ocular imaging with continued work expanding to non-ocular ultrasound images.