

# Modeling Eyesight: A Mathematical 3D Representation of Vision

## Summary

Vanderbilt researchers have developed a model for representing the complex geometrical and biochemical basis for vision. The model and corresponding software is built on real-world biochemical parameters, and as such, has great potential for use as an educational tool. It is envisioned that the model and software will be coupled with an interactive graphical user interface whereby students of all ages can engage with an animated model of the eye to learn more about how our eyesight works. Doing so will enable students to discover how mathematics and biology can be joined to study the biological wonders around us.

## Addressed Need

Photoreceptor cells, made up of rods and cones which convert light into a biological signal and allow us to see, have intricate geometries and distinct biochemistries that make them difficult to represent mathematically. To address this challenge, Vanderbilt researchers have found a way to greatly simplify the mathematical model while still capturing the fine detail required to predict their biochemical behavior. Such a model could be utilized as an educational tool for students of all ages. For younger students, the model can be coupled with an interactive eye animation to present the human visual system in an engaging way. At higher education levels, the model can be explored in greater detail to reveal the coupling between the mathematical world and the biochemical world. The ability to

change various biochemical parameters and immediately see the impact on the rods and cones can be a great resource to educators and students alike.

## Unique Features

- ◇ Near real-time modeling of rods and cones
- ◇ An exciting new educational tool that couples mathematics and biochemistry
- ◇ Straightforward integration with existing educational eye simulations or animations

## Technology Development Status

The rod and cone model is complete and additional refinement of the biochemical parameters is ongoing. We are currently seeking a partner to develop an interactive eye simulation/animation around the model for use as an educational tool.

## Intellectual Property Status

- ◇ A software copyright has been filed

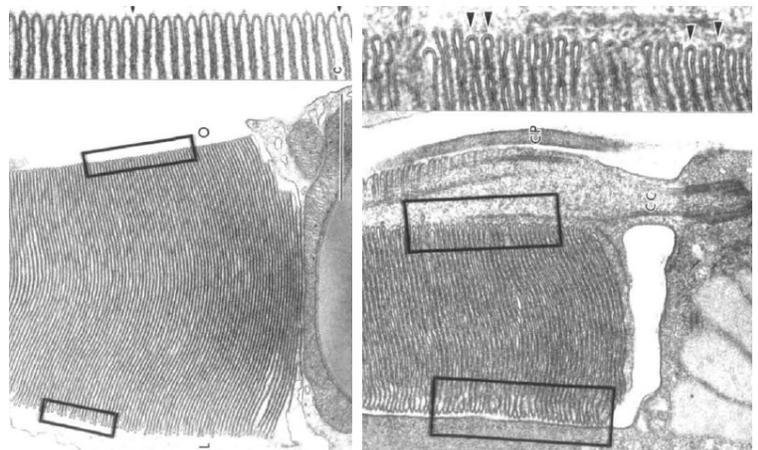


Fig. 1: The model and corresponding software developed at Vanderbilt is able to model the complex geometry and biochemistry of the rods and cones that make up vertebrate photoreceptor cells. It presents an exciting opportunity for use as an educational tool.

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### INVENTORS:

Emmanuele DiBenedetto, Ph.D., and others

[Visual Transduction of the Eye](#)

### VU REFERENCE: VU 17038

Visit <http://cttc.co/technologies> for available Vanderbilt technologies for partnering