

Some Preliminary Views on Students' Models of the Physics of the Eye*

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Overview

- Part of MMMM project
 - “conducting research on the reasoning and models that students use as they transfer basic physics knowledge to the application of physics in contemporary medicine”
 - “develop active engagement teaching-learning materials to help students learn about the applications of 20th and 21st Century physics to contemporary medical diagnosis and procedures”

As quoted from MMMM website

Overall Goal

- To learn how students perceive a series of models of the human eye
- Simultaneously gain info about what they know about the eye

The Models

- **Anatomically Correct**
 - No optics
- **Black metal CENCO**
 - Corrections for optical defects
- **White plastic**
 - Corrections & Accommodation
- **Accommodation applet**

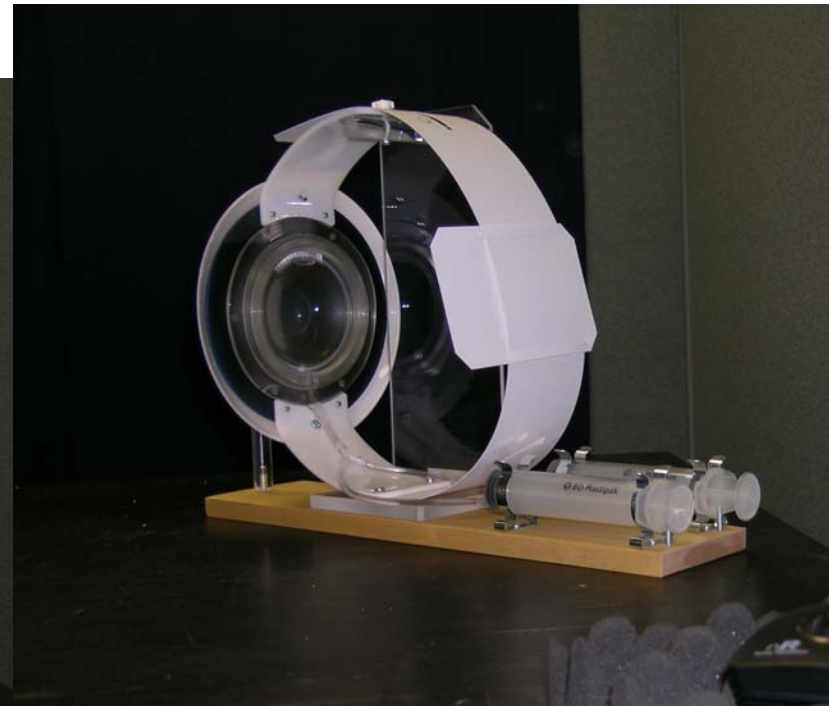
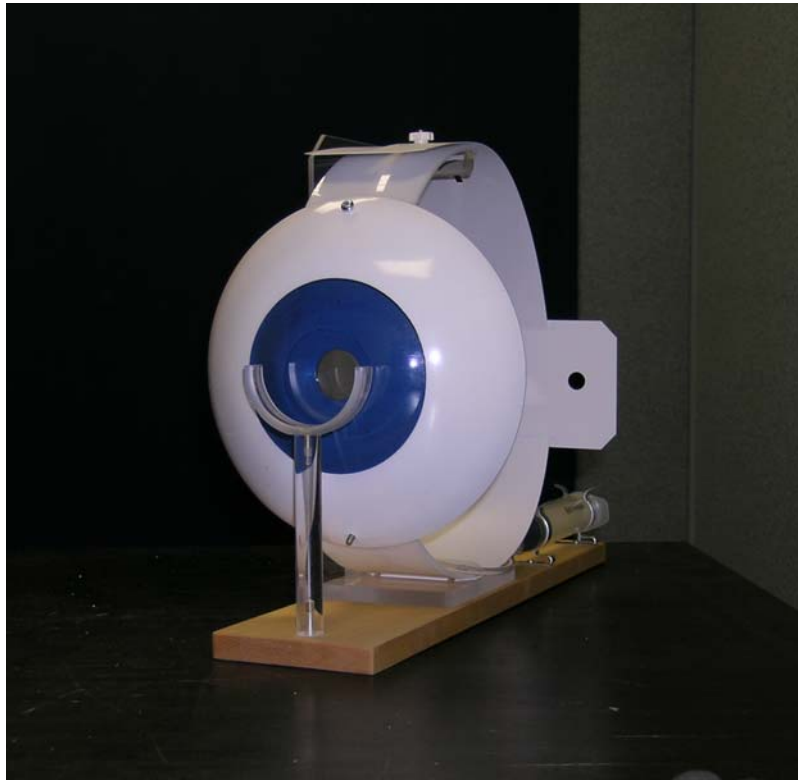
Anatomically Correct



Black metal CENCO



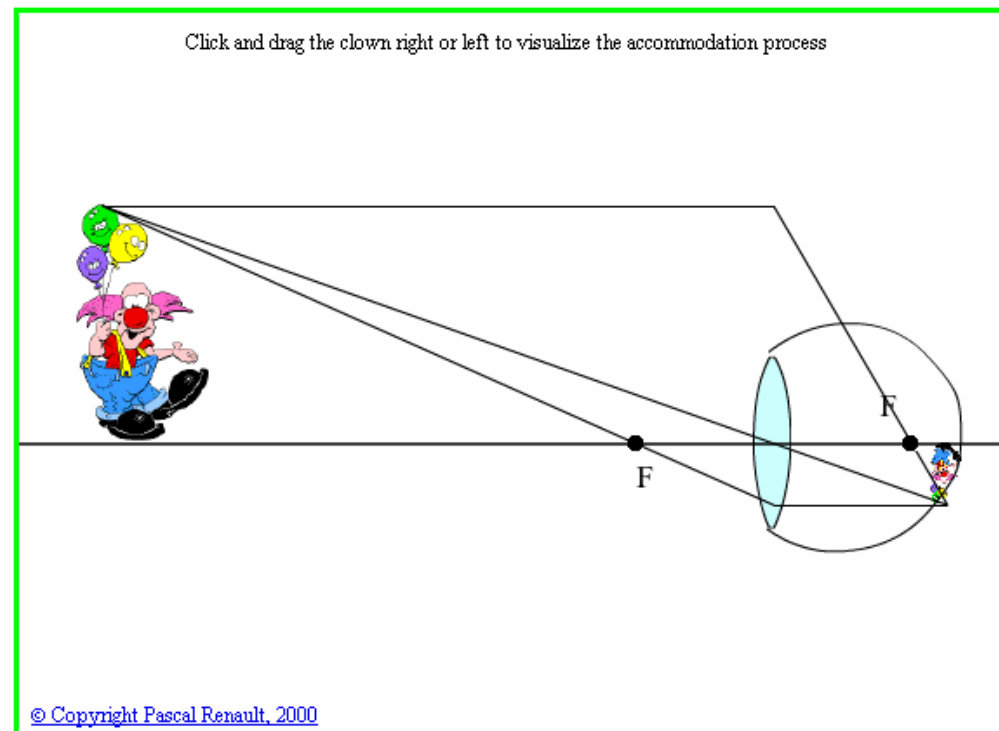
White plastic



Accommodation applet



Accommodation



http://mysite.verizon.net/vzeoacw1/eye_applet.html

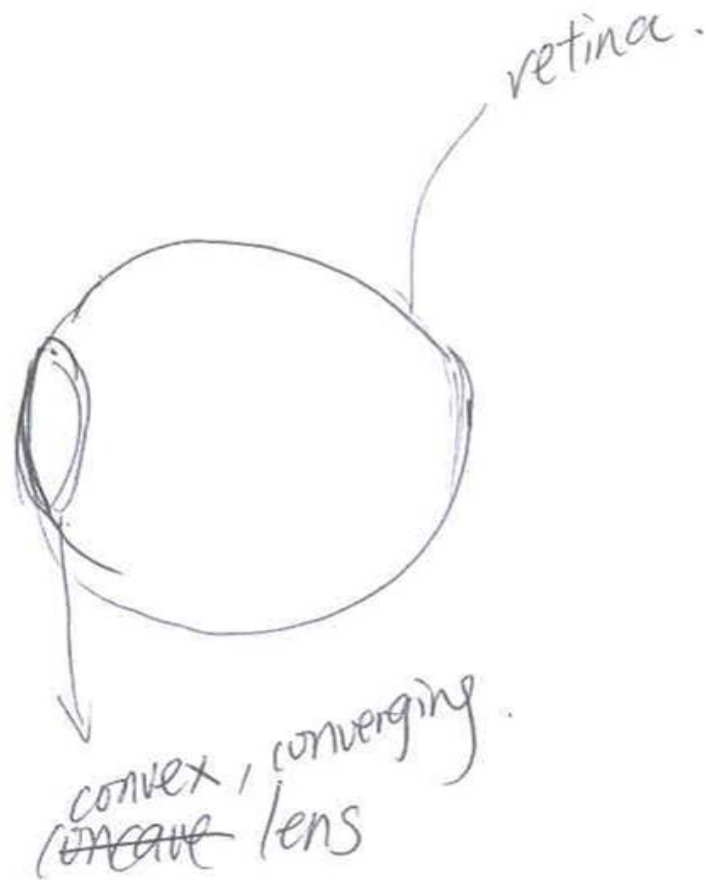
Phase I – Models of Human Eye

- N=13
 - Early undergraduates
 - Graduates
- Varying levels of knowledge of human eye and of Optics in general.

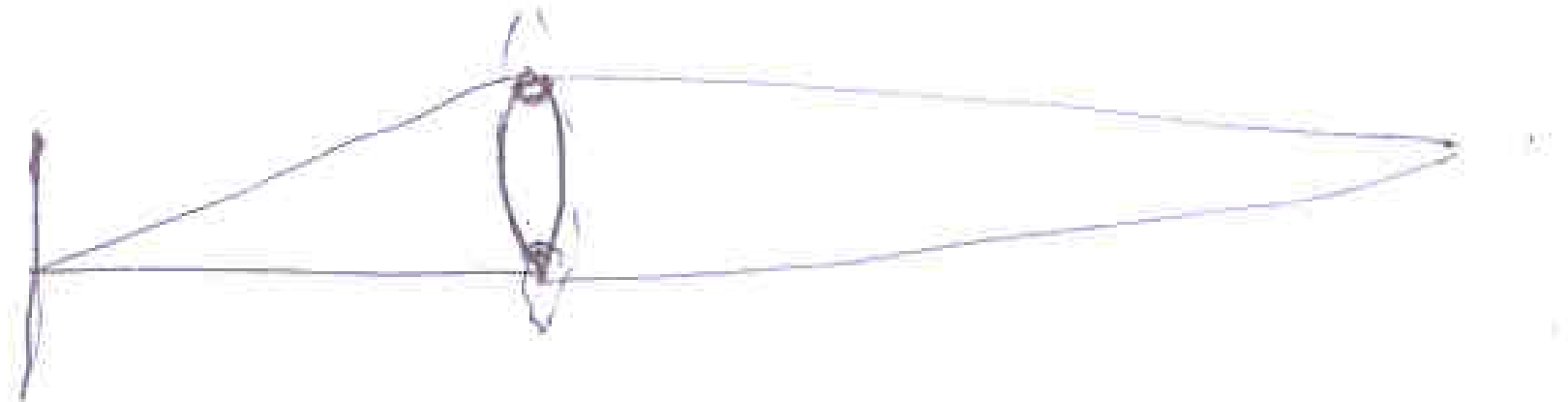
Emerging trends ...

- The eye is made of two parts – a lens and a screen (retina)
- Very few students include other parts such as iris, cornea, etc

Sample Drawings



Sample Drawings



When asked about defects ...

- Less than half of the interviewees could explain near and far sightedness.
 - Most of those interviewees had the defect
- Most students feel that near/far sightedness is a problem with the LENS, and very few mentioned the shape of the eye.

Phase 2 – Models of Human Eye

- N=5
 - Upper-level undergraduates
- All enrolled in 600-level Optics course
 - had talked about the eye during lecture

The Models

- Anatomically Correct

- No optics

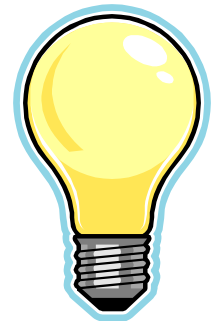
- ✓ ~~Black metal~~ ~~COEN@Ck~~ Black plastic

- Corrections for optical defects

- White plastic

- Corrections & Accommodation

- Accommodation applet



Black plastic PASCO



Photo from PASCO website

Emerging Trends ...

- Many more comments on the **FUNCTIONS** of the models
 - Less emphasis on aesthetics (form)
- Dual-lens system
 - First lens (Cornea?)
 - Second lens (Lens)
 - Contained all of the **PHYSICS** in their explanations

Future Plans

- Full scale data analysis
 - Use results to determine the most appropriate and beneficial model for the rest of the study

Continue with the project ...

- Long term: develop teaching and learning materials about vision defects
 - Diagnosis and Correction

Thank you!

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<http://web.phys.ksu.edu/MMMM>