Visible Blood Cells? - Entoptic Phenomena - An Exploration into 'Floaters'

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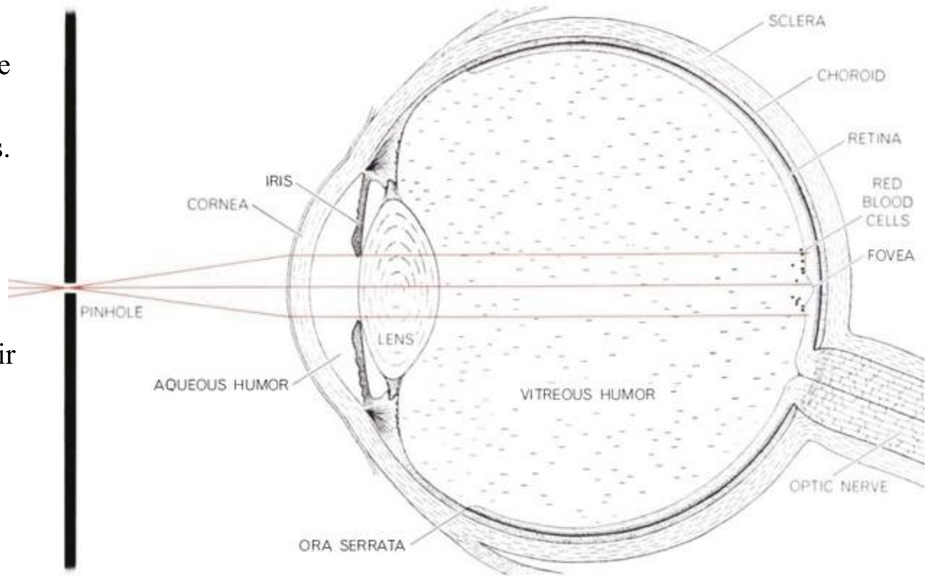
Abstract

The human eye is an engineering marvel. Light is transformed into electric signals and carried to the brain by the optic nerve. Floaters, a diffraction inside the inner eye, are a phenomenon people can experience under the right conditions. Their image is primarily from clusters of blood cells floating in the vitreous humor of the eye. Following the pattern of former research, we explored different methods in observing floaters, such as certain wavelengths of light to detect them more clearly. Optical study of these floaters could explain their correlation with reduced sight.

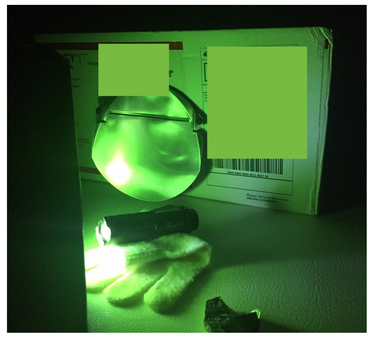
Figure 1: Structure of Eye with Floaters

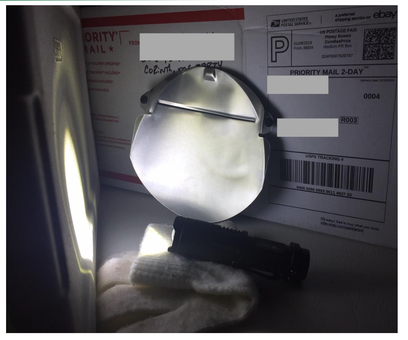


How do we see Floaters?

- Light forms an inverted image on the fovea of the eye from lens behind cornea
- Blood cells or floating tissue intercept the light and create circular diffraction image on fovea
- Lying on one's back will make the floaters appear more clearly than when standing up since cells are closer to the fovea receptor and diffraction pattern becomes smaller
- Unobstructed light, blue, green and red produced the most floaters in ascending order of wavelength

Figures 2-3: Testing for Wavelength Effect on Floaters





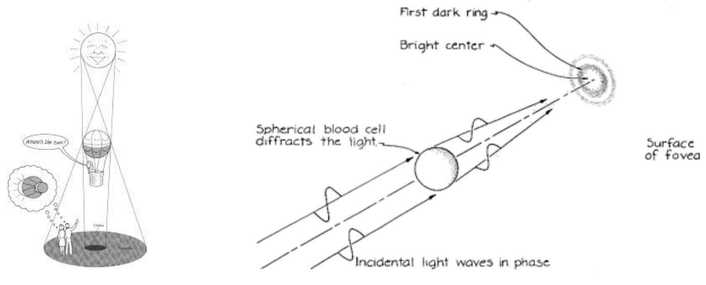
What are Entoptic Phenomena?

Lies or originates within the eyeball – used especially of visual sensations due to the shadows of retinal blood vessels or of opaque particles in the vitreous body falling upon the retina

Appearance of Floaters

- Individual cells ==> Circles
- Strings of cells ==> Hairs
- Cell closer to the retina ==> Clearer image

The Physics



What causes Floaters?

Formation

- Red blood cells leak out of the retina and into the vitreous humor
- The cells swell into spheres which causes the loss of most of the hemoglobin
- The loss of hemoglobin results in the loss of red color
- The spheres drift in the vitreous humor
- The spheres drift individually or as a string of cells

Possible Health Causes

- Partial liquefaction of vitreous humor
- Inflammation of the back of the eye
- Bleeding in the eye
- Torn or detached retina

Areas of Future Exploration

- Relationship between the viscosity of the vitreous humor and:
  - Light refraction.
  - Eye floater frequency.
  - Eye floater prevention

Works Cited

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