The OPTRICKS Suitcase

Optics is Light Work!!

Dr. Murty
The Wizard of Light

The International Society for Optical Engineering

Optical Society of America
Rochester Section

OPTICAL SOCIETY OF SOUTHERN CALIFORNIA

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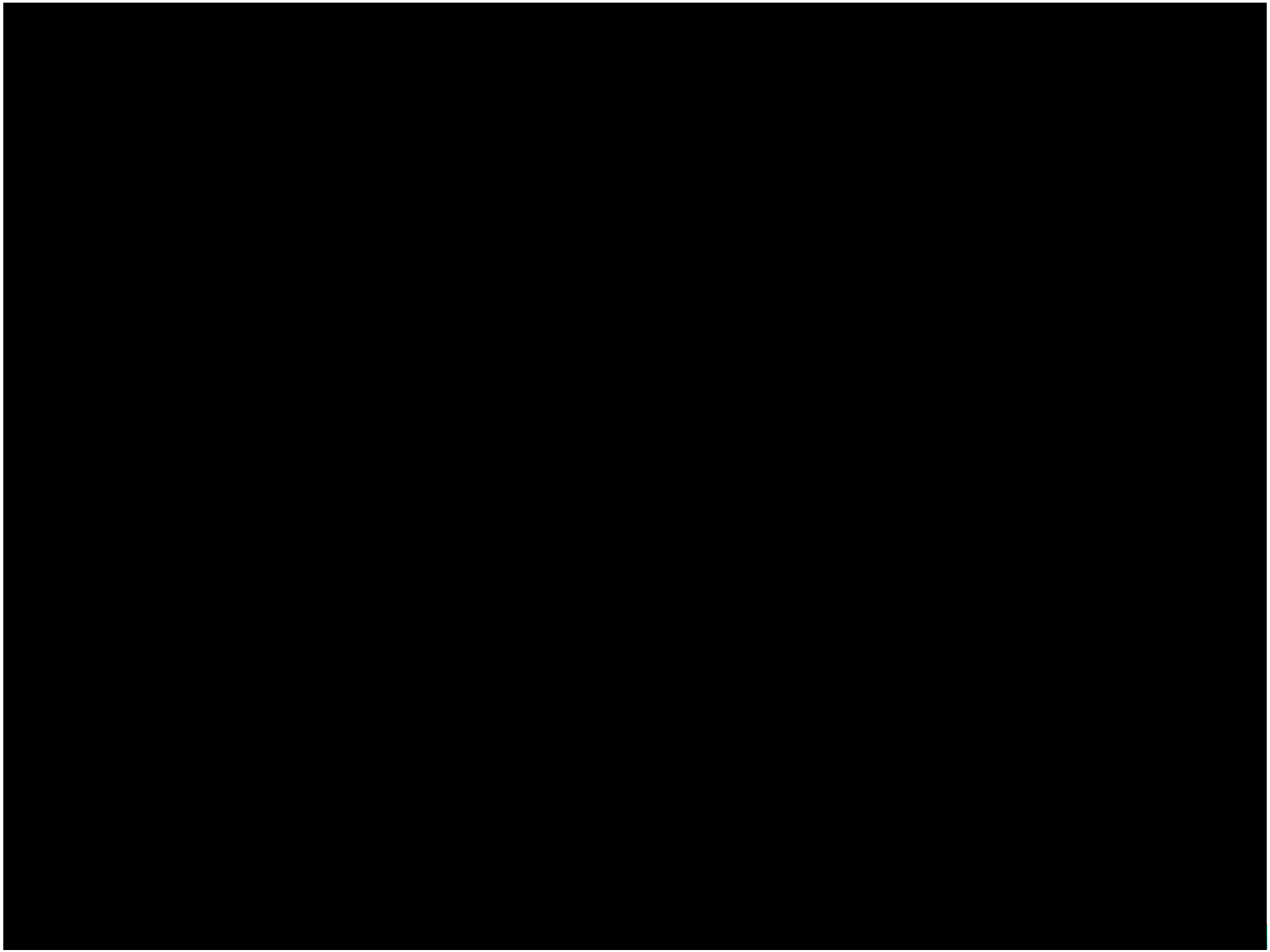
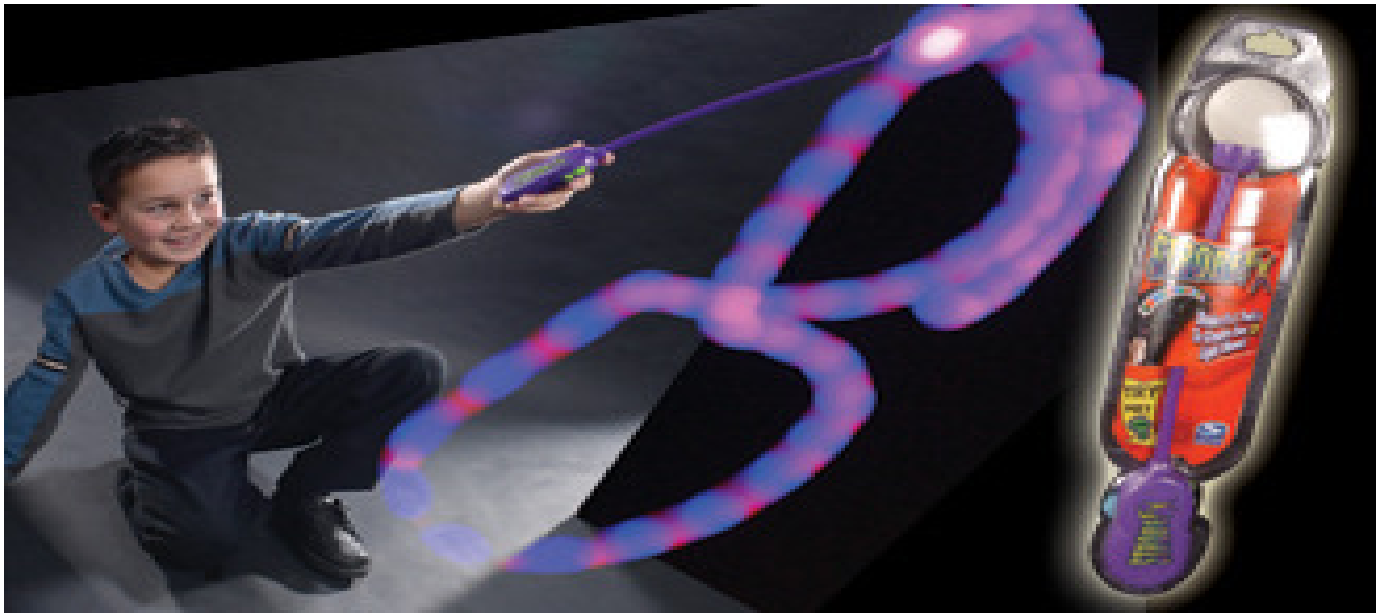


Strobe FX



http://www.spinmaster.com/docs/comm/StrobeFX.mov

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The X-Light

Colors moving in Space-Time

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Part I – How Do We "See" the World Around Us?

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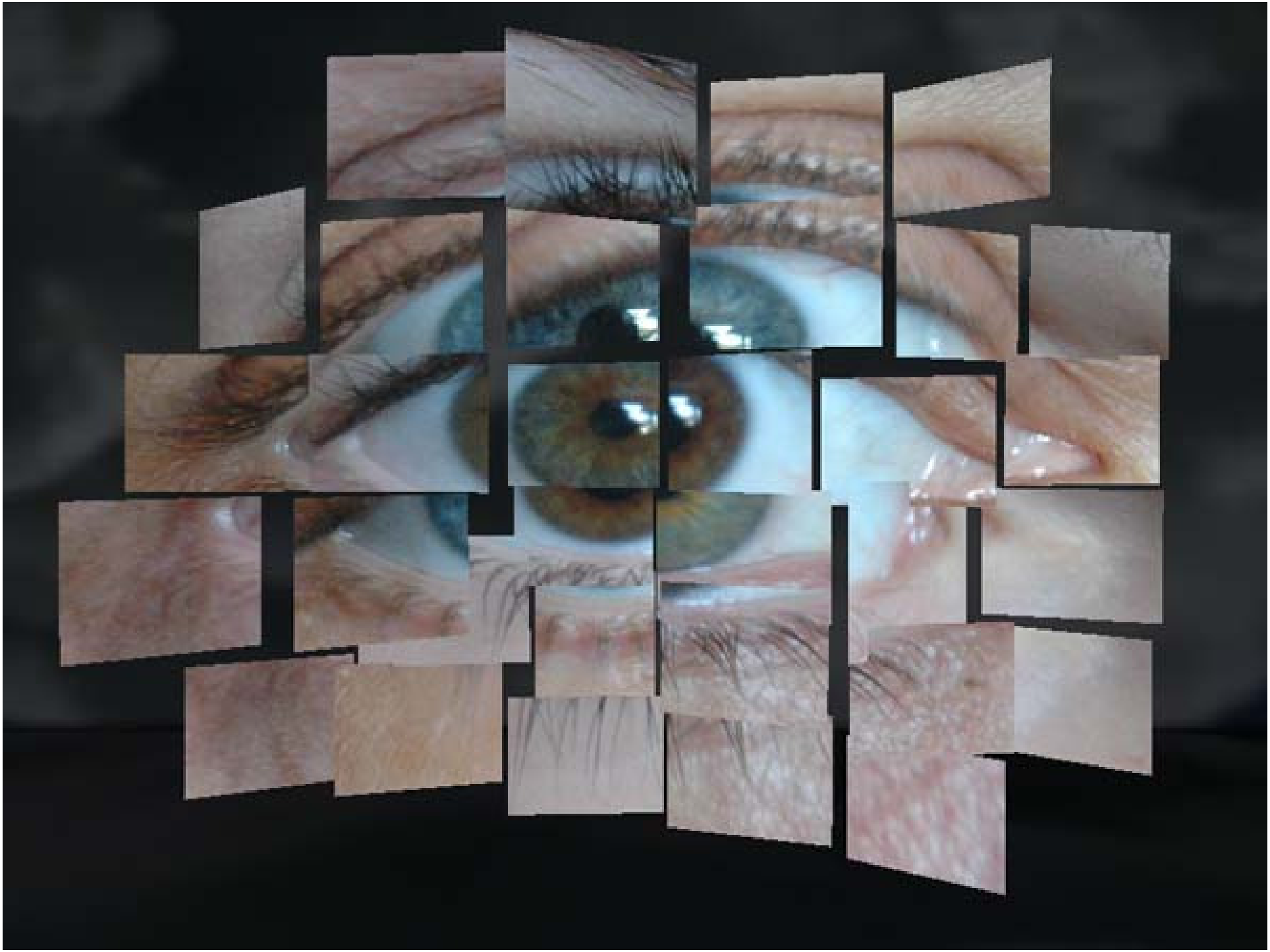

EyeBall Optics

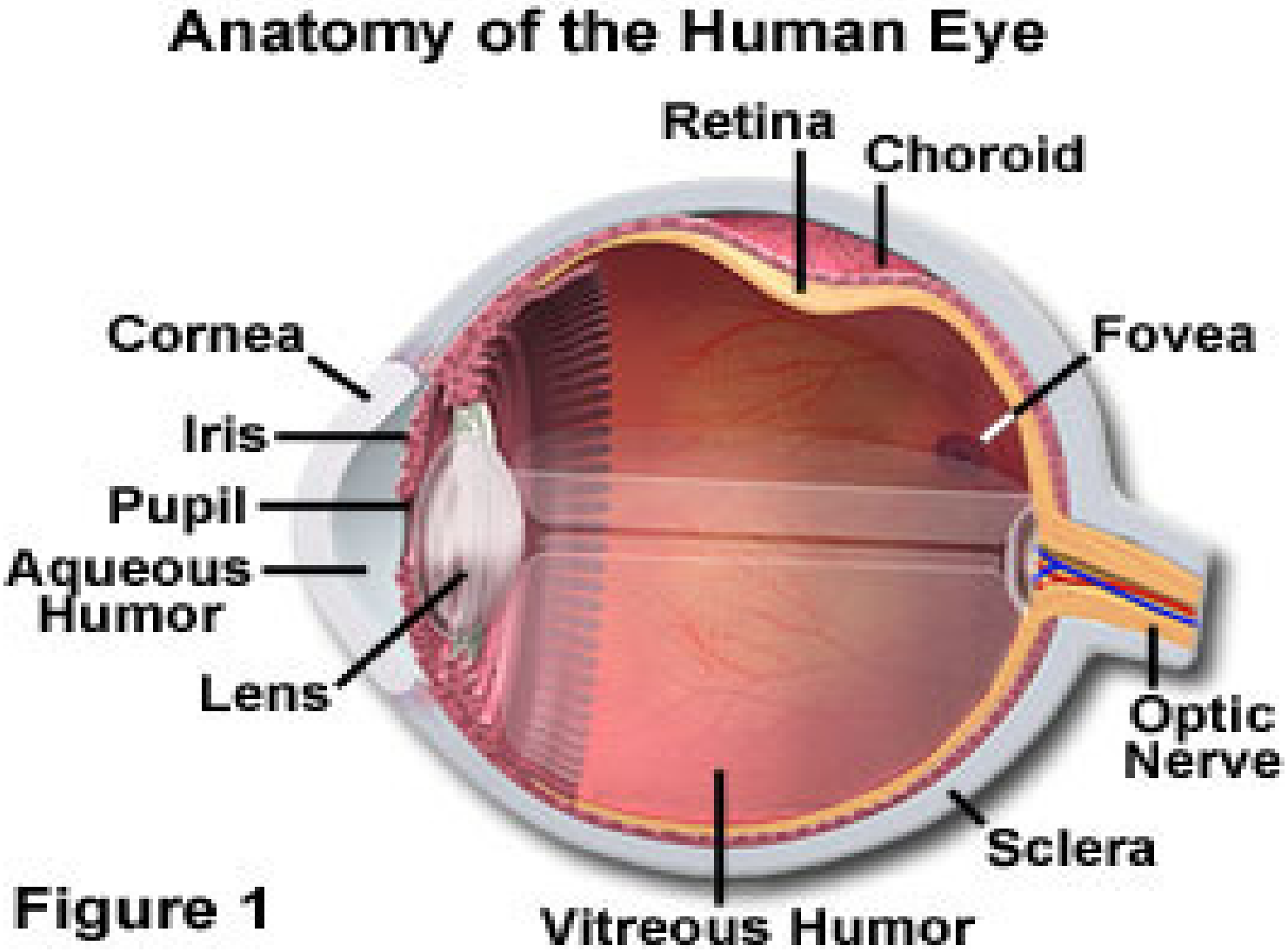

Figure 1

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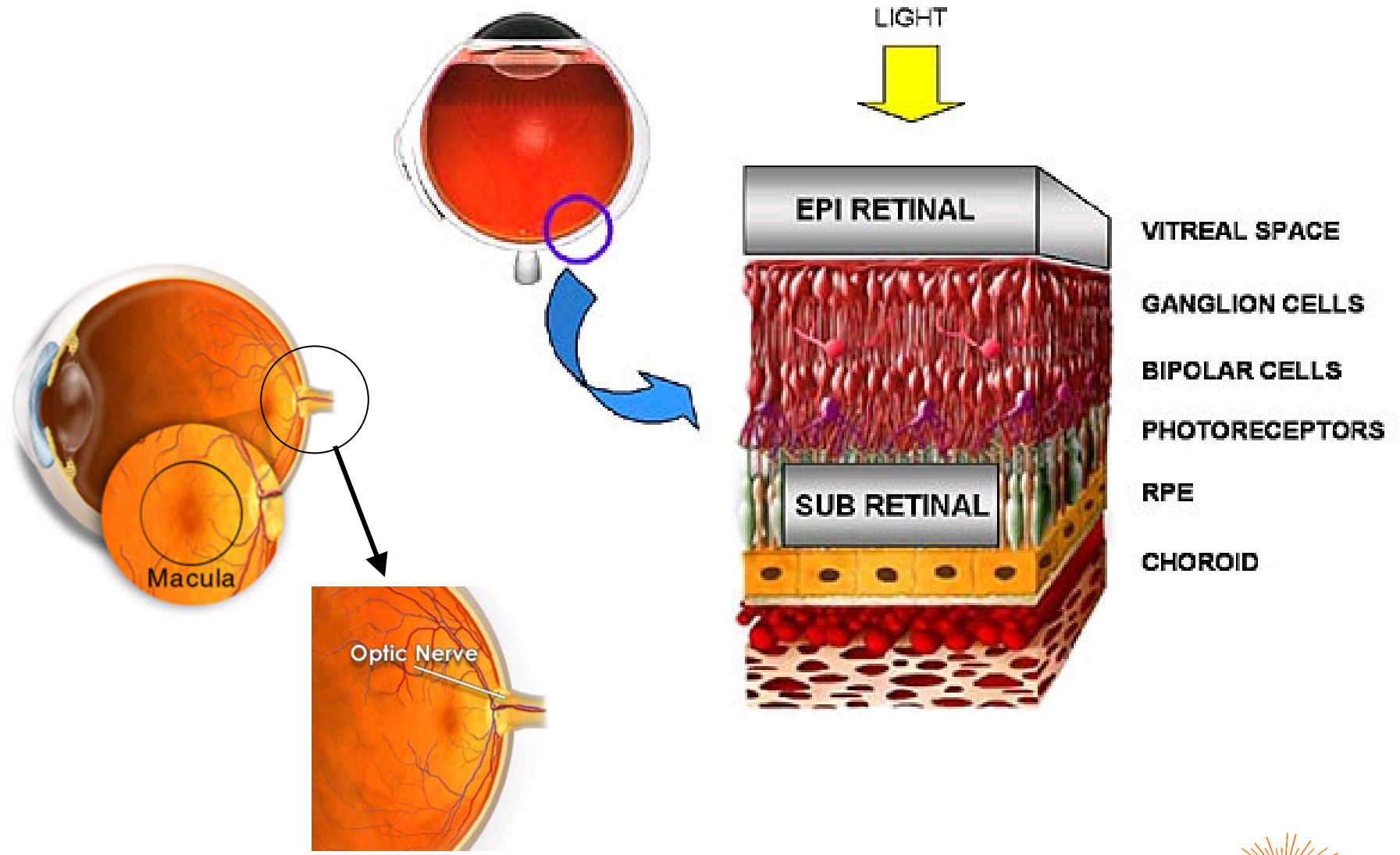
The Retina as a Detector



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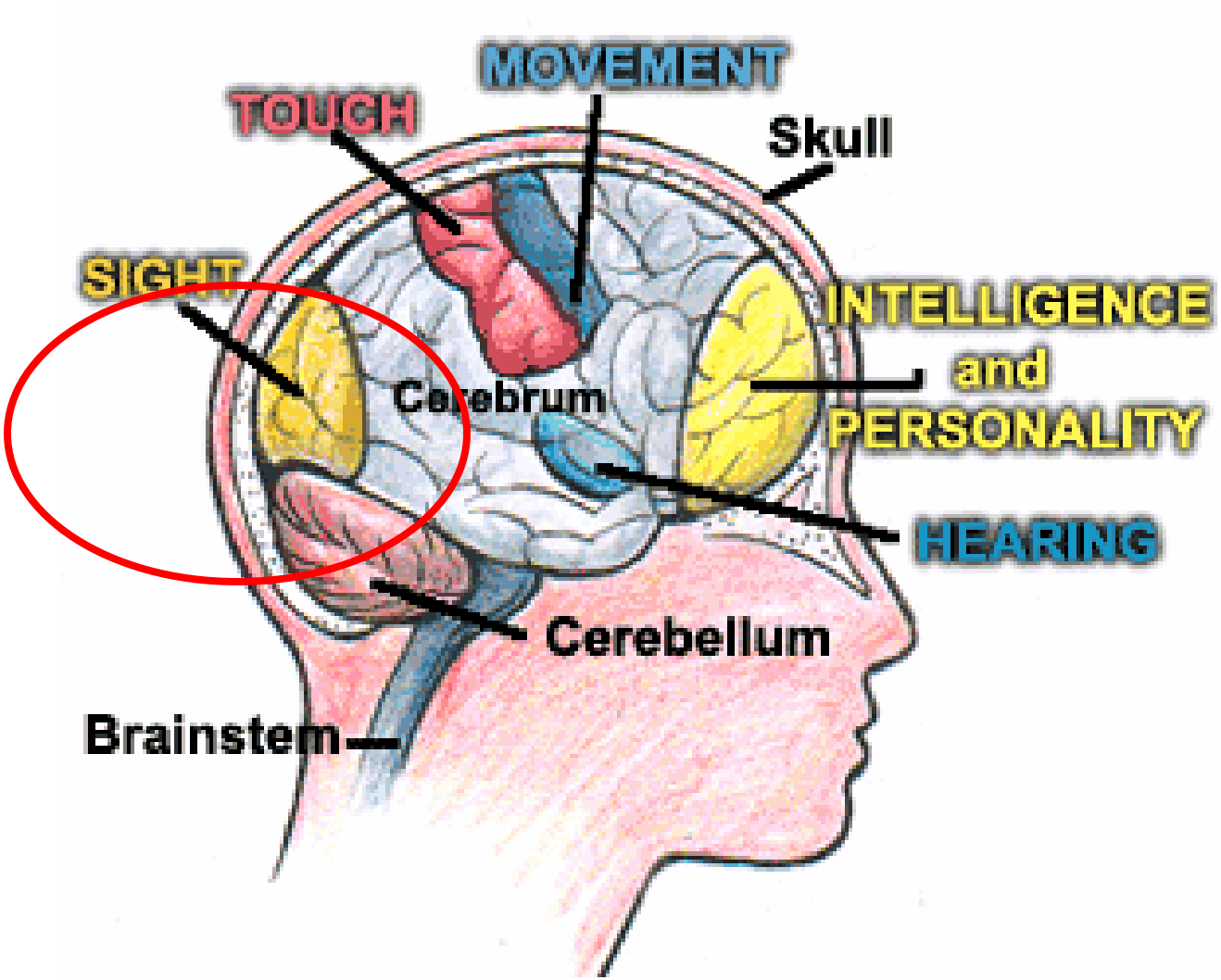
The Brain as a Computer



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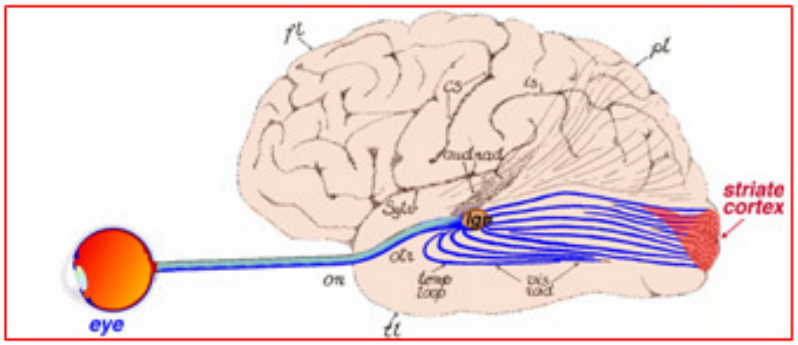
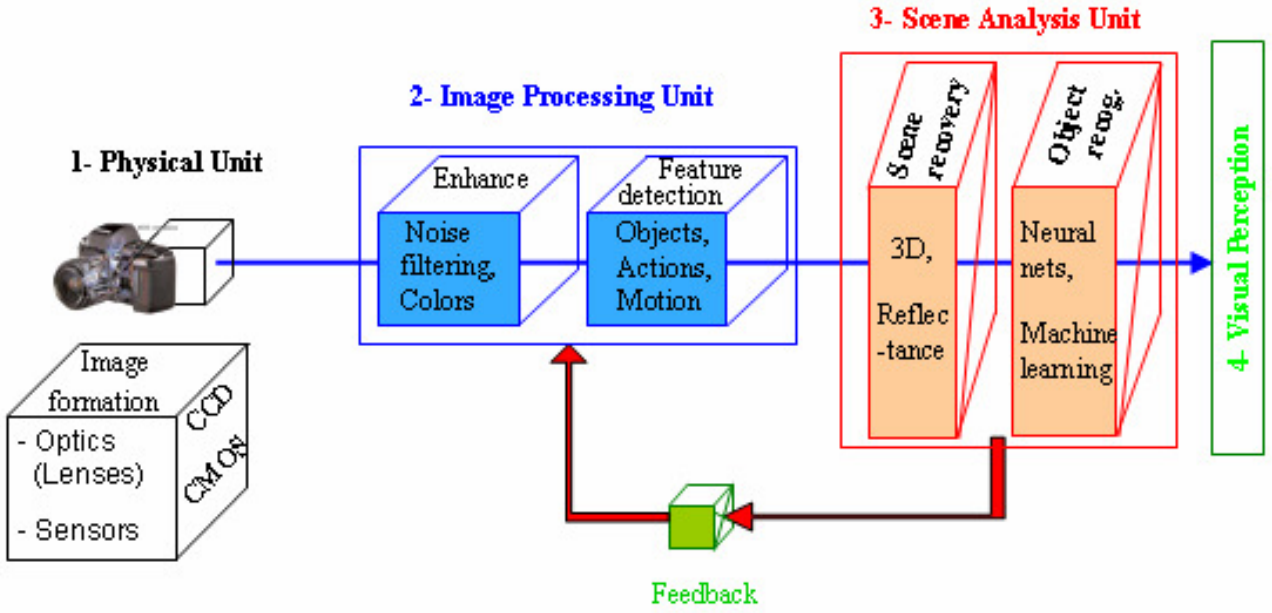
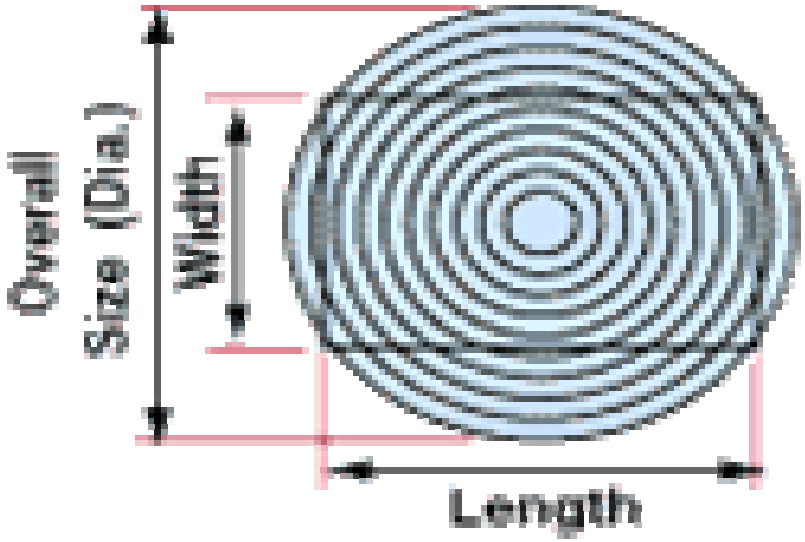
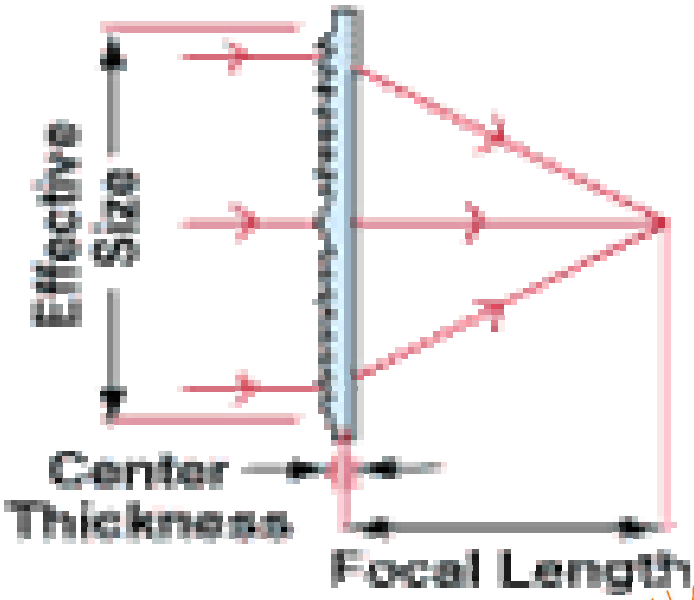
Part II – How Do We "Interpret" the World we "See" Around Us?





What's a Fresnel Lens Anyway?





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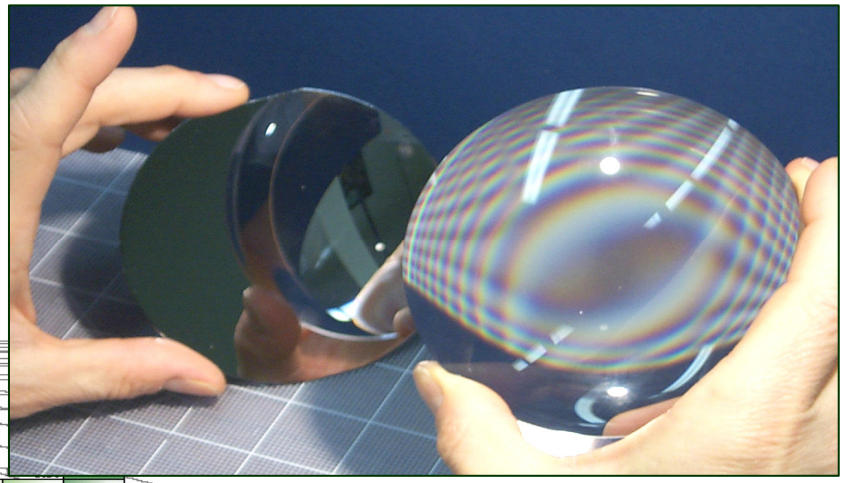
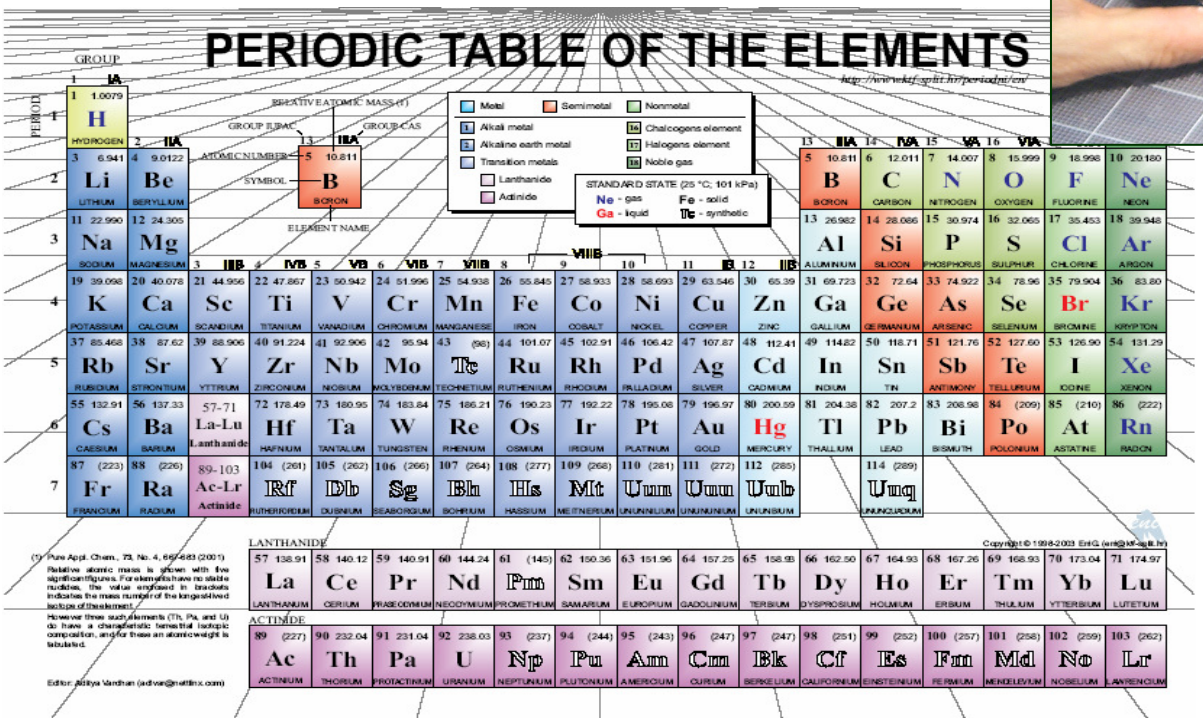
Optical Engineers Work with Materials That Reflect or Transmit Light

Si – polished silicon wafer mirror-like reflector





SiO_2 – clear silica lens focuses light

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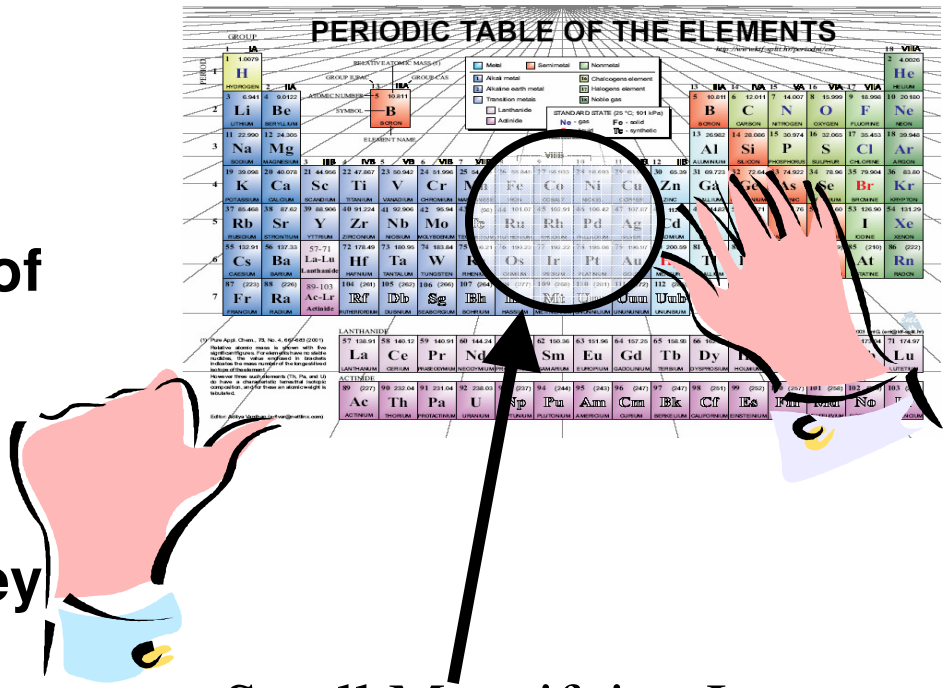
Magic Dots

Most printed material is made up of lots of Dots!!

- **Have you ever wondered how printing works?**
- **Most modern printers use lots of dots to make up the text & images that you see.**
- **Do you know what color ink they use?**
- **Use the small magnifying lens to look at the Periodic Table. Do you see the Magic Dots??**



Small Magnifying Lens

Hold the lens about 1 inch above the paper.

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What is Light??

Light is Like a Vibrating Wave

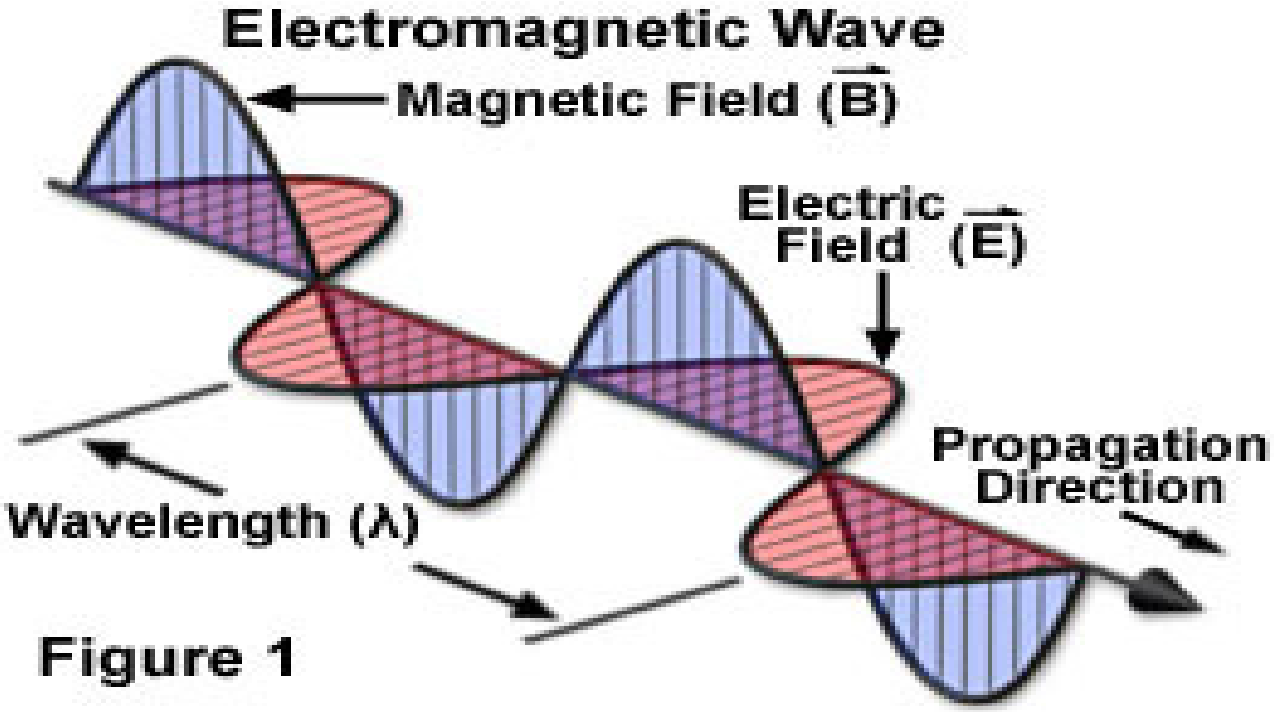
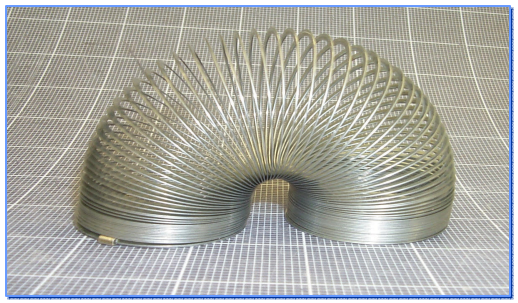


Figure 1



Slinky

- Light is like pure energy with no rest mass (because it is never at rest!!)

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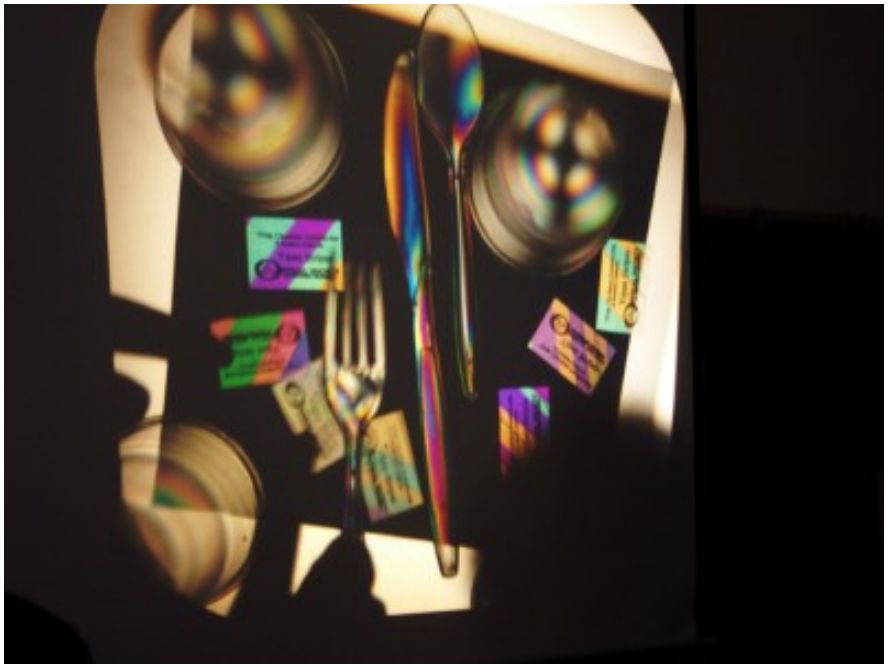
Magic Stripes - Polarization



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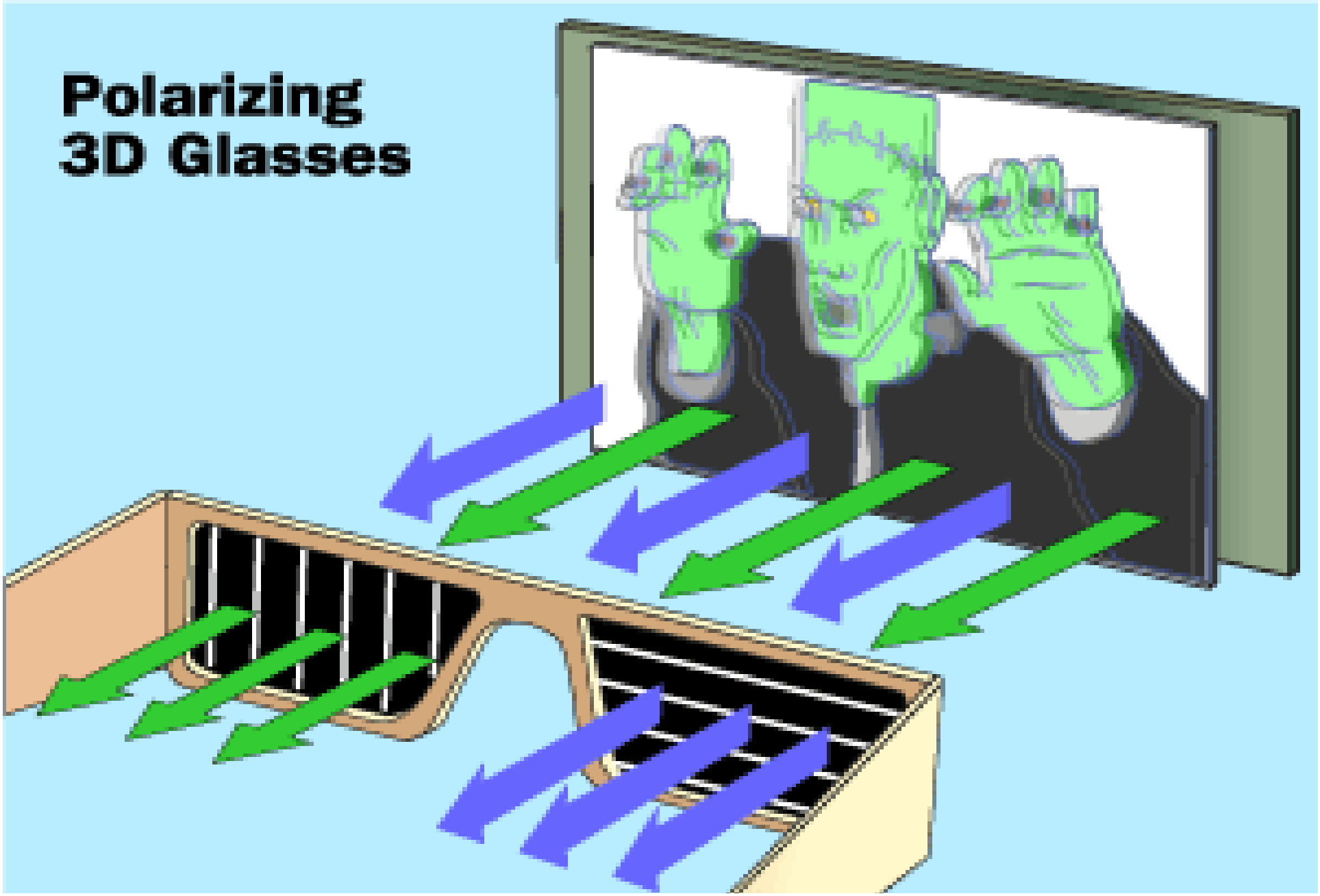
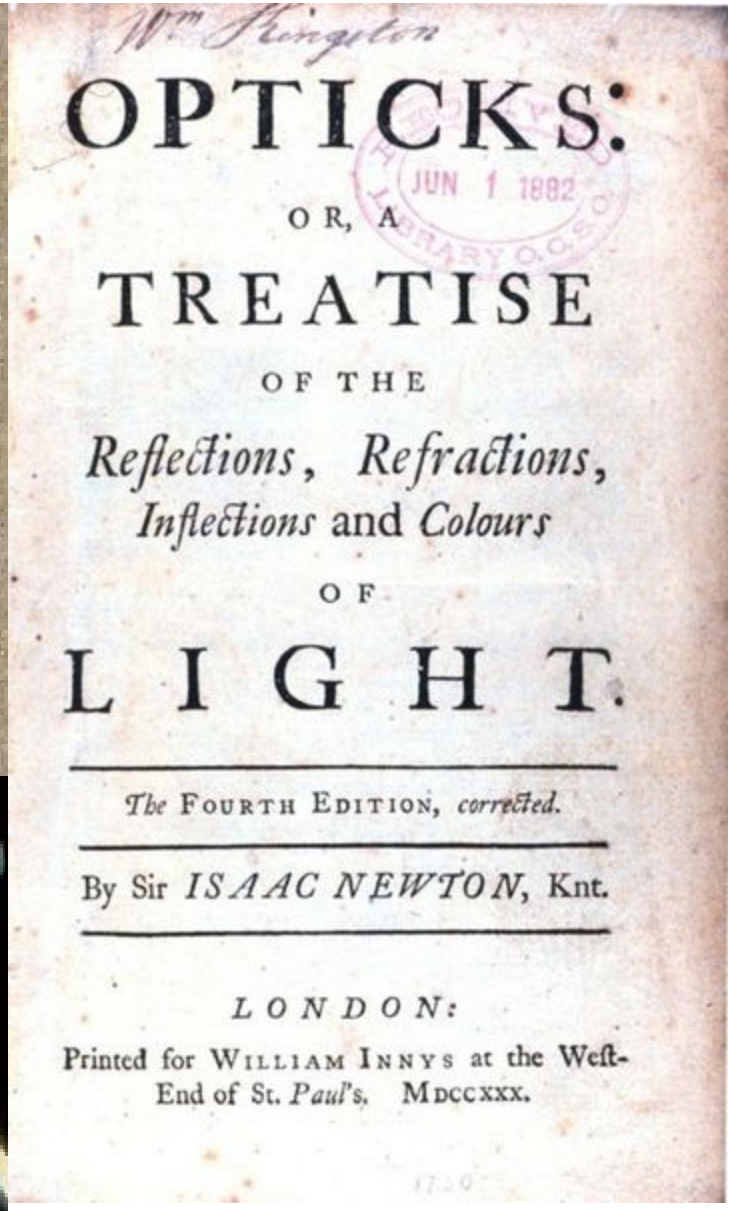


The polarized glasses allow only one of the images into each eye because each lens has a different polarization. Image courtesy of howstuffworks.com



Wm Pickington

OPTICKS:

OR, A

TREATISE

OF THE

Reflections, Refractions, Inflections and *Colours*

OF

L I G H T.

The FOURTH EDITION, *corrected.*

By Sir *ISAAC NEWTON*, Knt.

LONDON:

Printed for WILLIAM INNYS at the Weſt-End of St. *Paul's*. MDCCXXX.

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Rainbow Peephole®

Diffraction Gratings

- Light from the flashlight is “redirected” in passing through the plastic peephole to the eye.
- Where do the colors come from?
- Do you see a regular pattern?
- Identify the colors. Are they the same in each spot?
- Does the pattern change if the flashlight is close or far from the peephole? How?
- Do you see colors from other people's flashlights, even those far away from you?
- Do you see colors from the room lights?
- The regular array of bumps on the plastic peephole's surface allows us to see the color in white light through “diffraction.”

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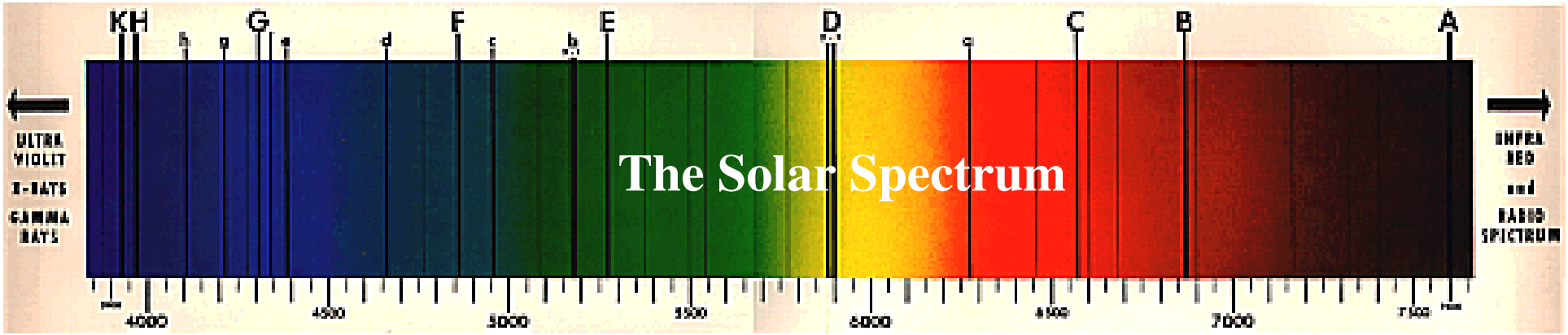
We can know what is in the light source by understanding the spectrum.



UV
X-Ray
Cosmic

Visible

IR
Radio

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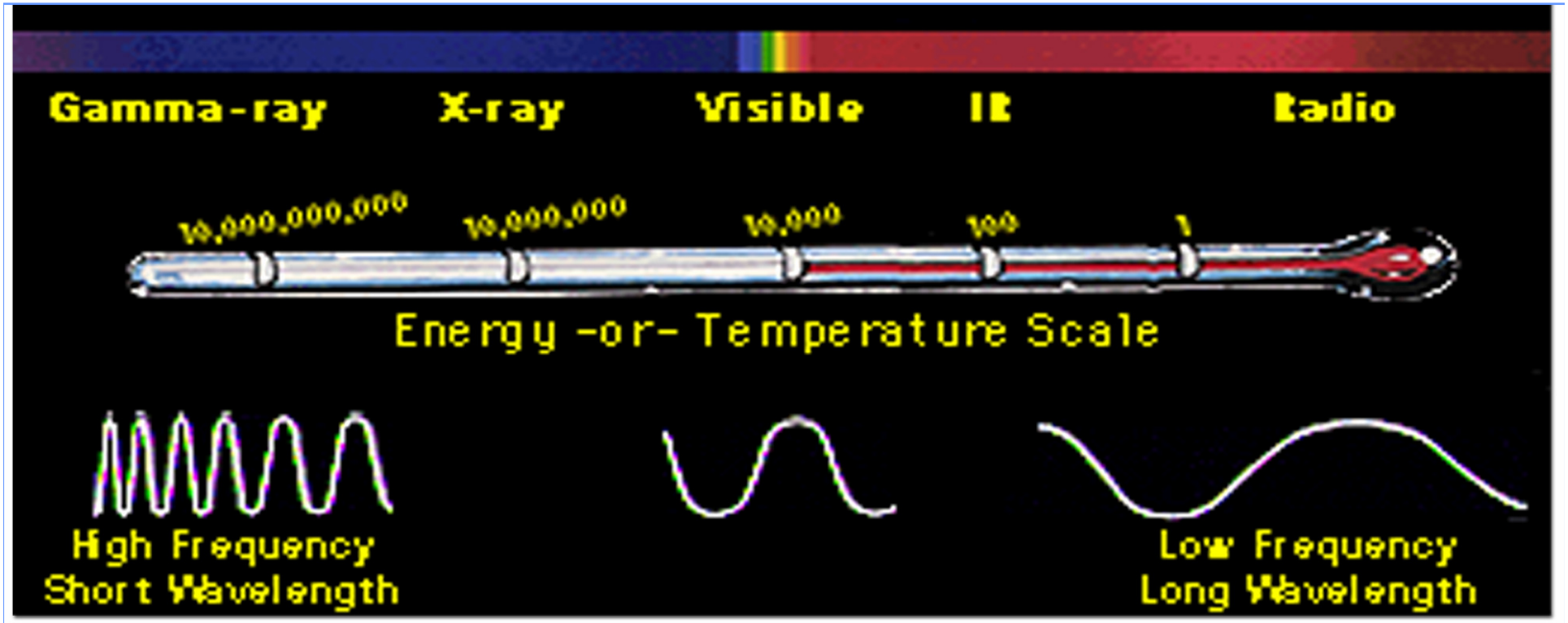
LIGHT -
Electromagnetic Spectrum



The electromagnetic spectrum. Radio has long wavelengths and low energies, while gamma rays have very short wavelengths and high energies.

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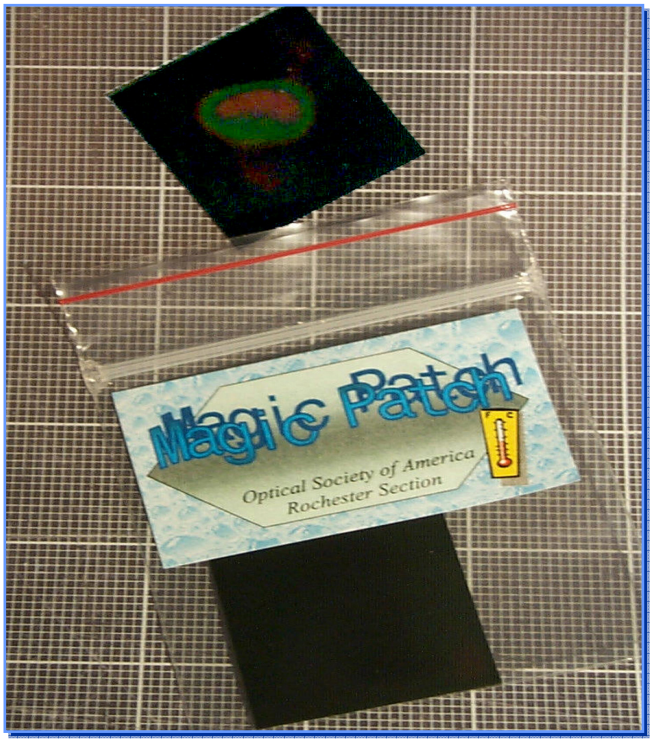
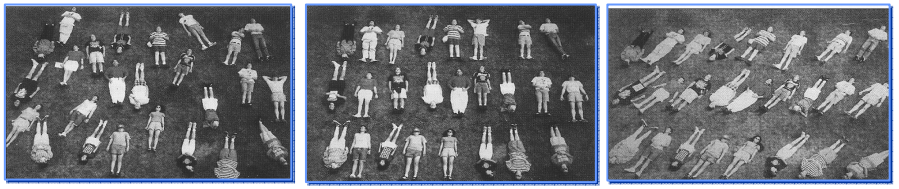
Magic Patch (temperature data vs. color)

- Place the patch on your wrist and perform the “vampire test.”
- The “*Magic Patch*” changes color with the heat from your body. The “living dead” give off no heat!
- Where do the colors come from?
- Does anyone see a vein or artery?
- This is an example of “selective reflection” by liquid crystals, painted onto the black paper.
- Liquid crystal are “ordered,” just like the students across the page.
- Scientists use liquid crystals to build displays for watches and computer games.





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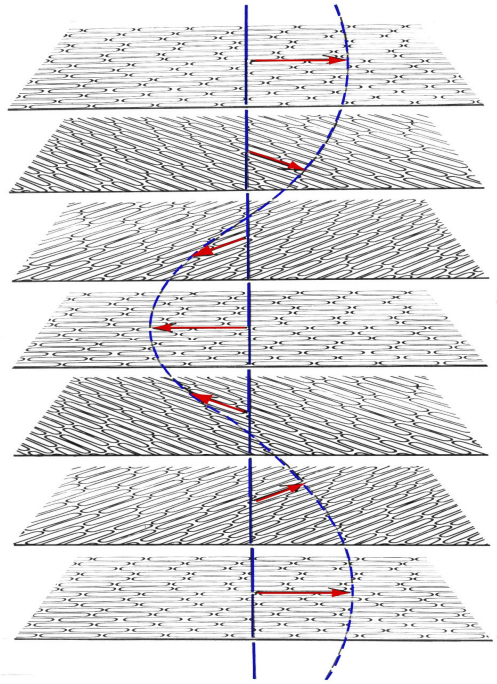
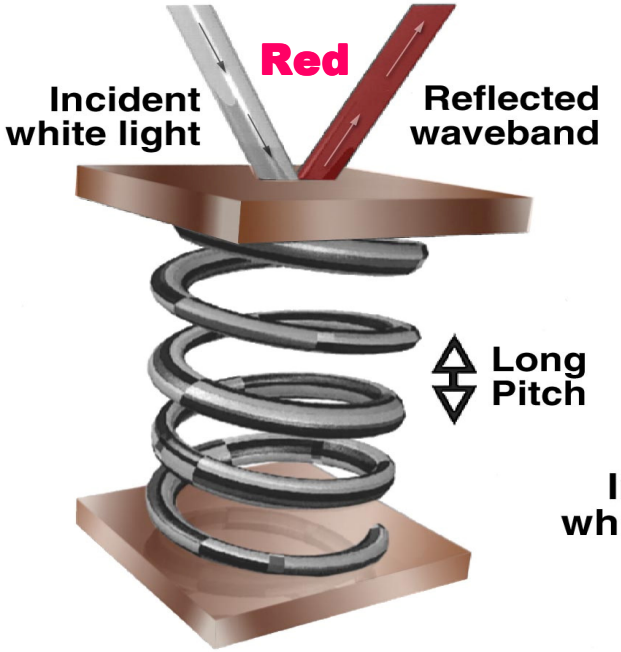
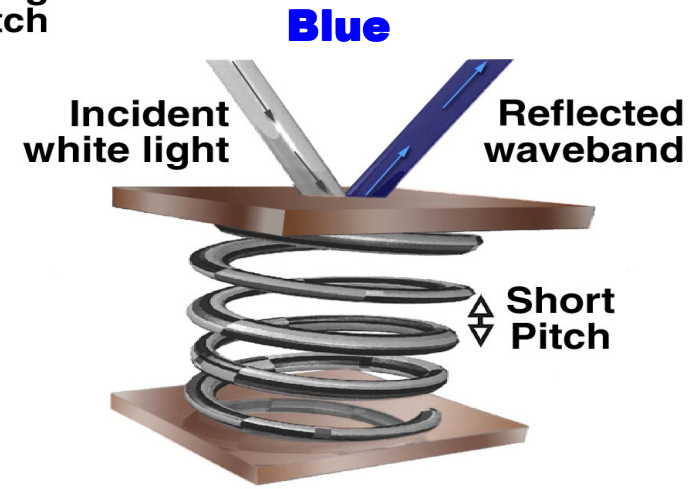
Selective Reflection in Cholesteric Liquid Crystals







- Within each layer, molecules (students) align with long axes (bodies) parallel to plane of layer.
- Protruding side groups force molecules in adjacent layers to be displaced, creating a twisted, helical structure.

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Interference

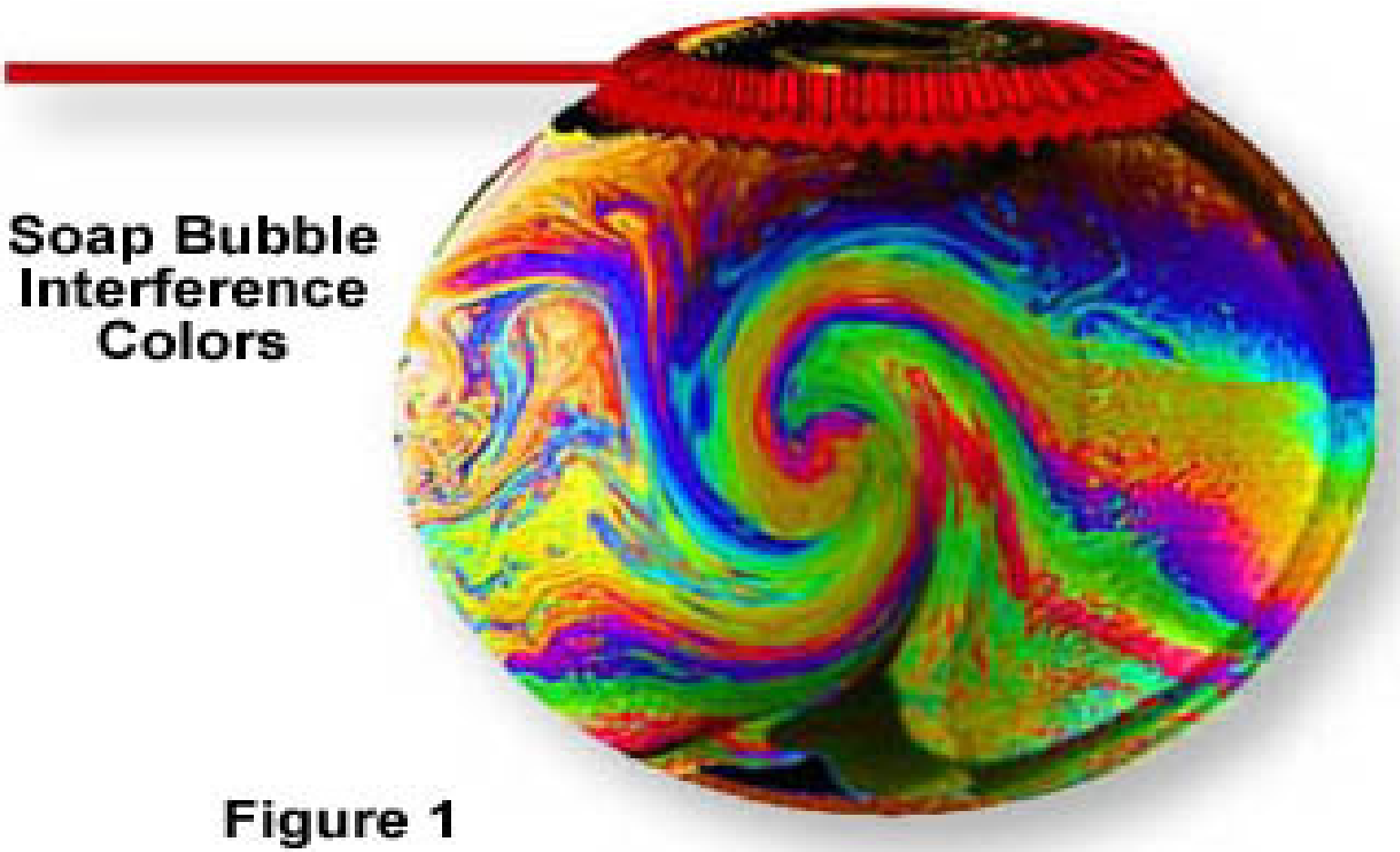

Figure 1

This is a whole other topic that is fascinating and exciting. Come have more fun….

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