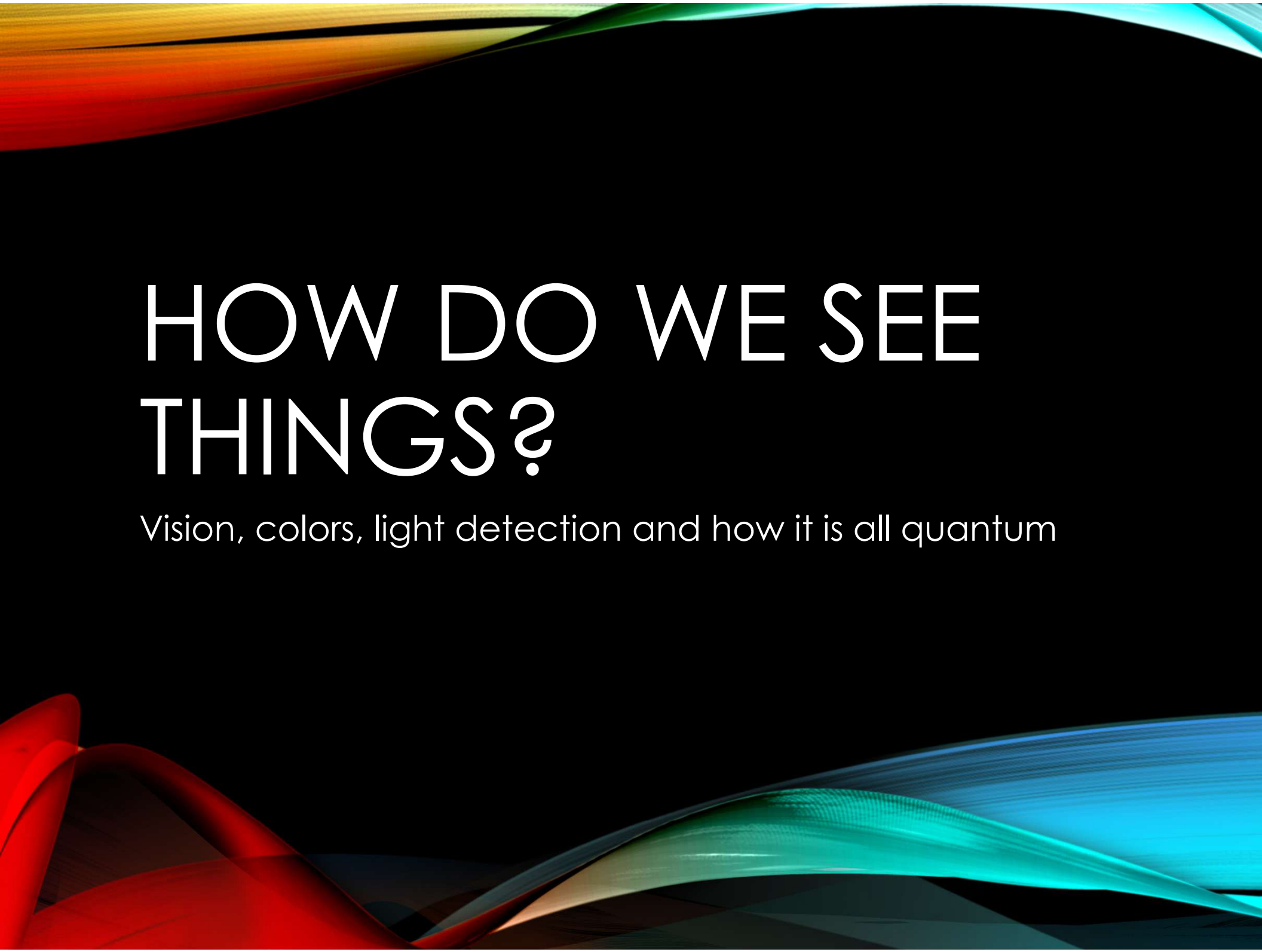
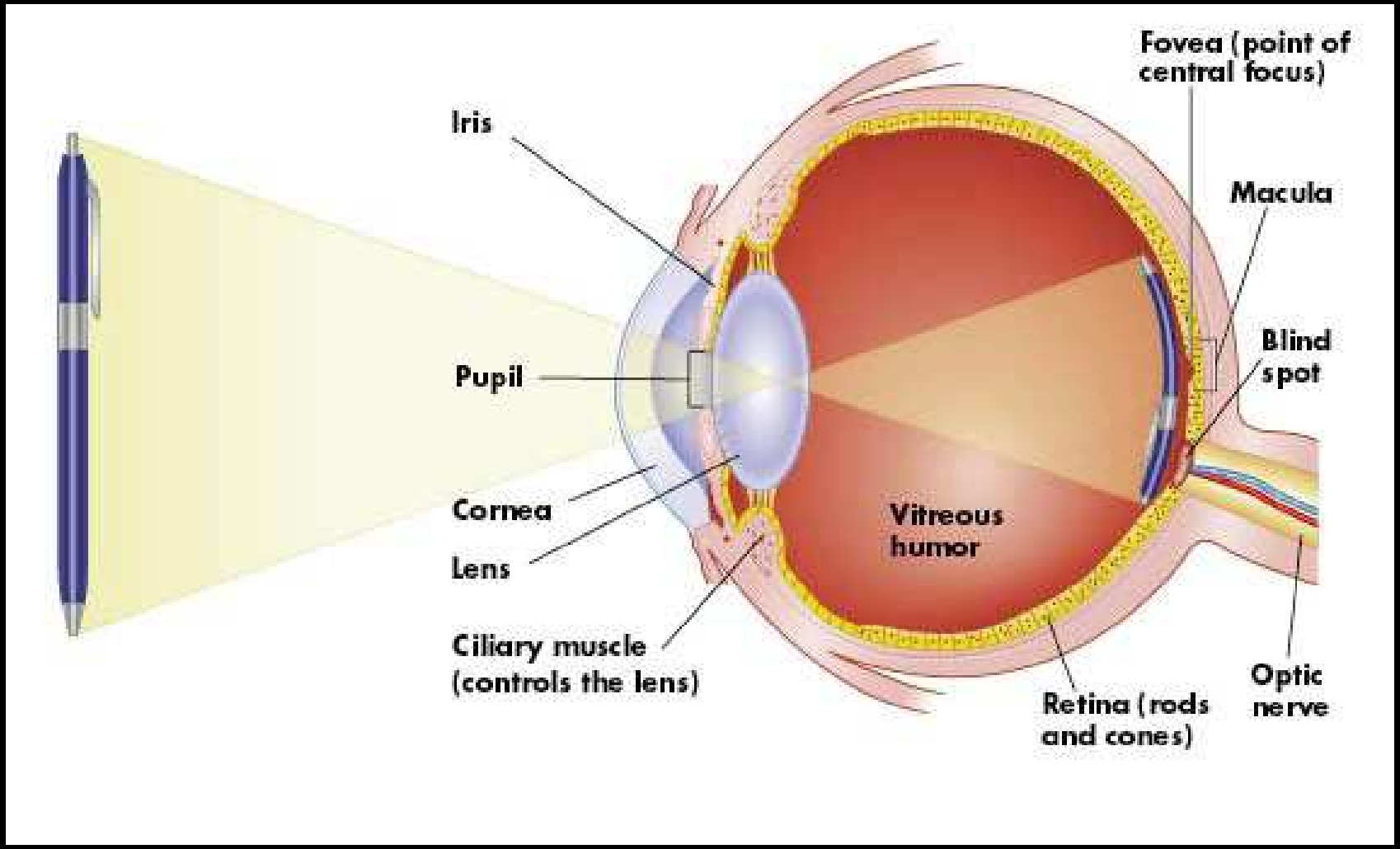
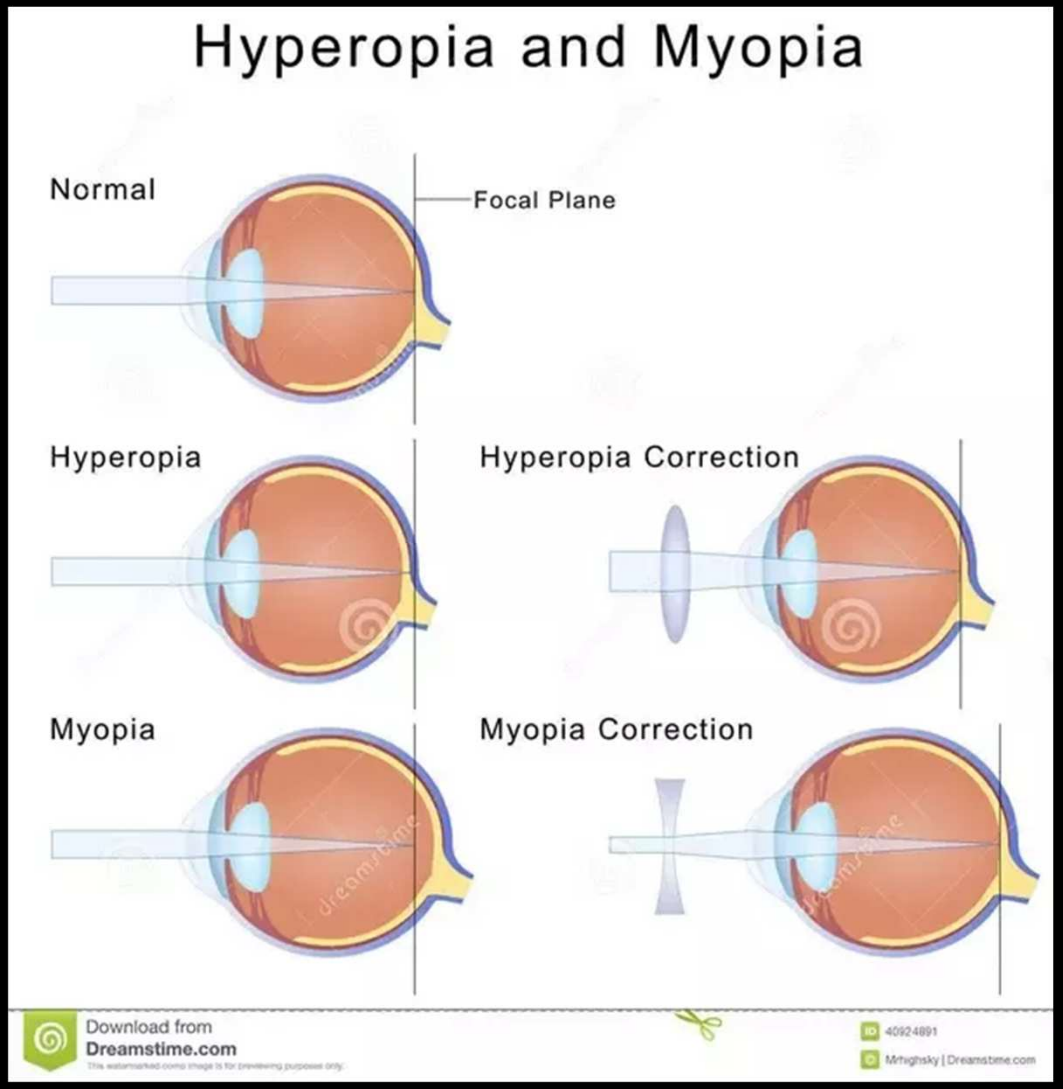

HOW DO WE SEE THINGS?
Vision, colors, light detection and how it is all quantum

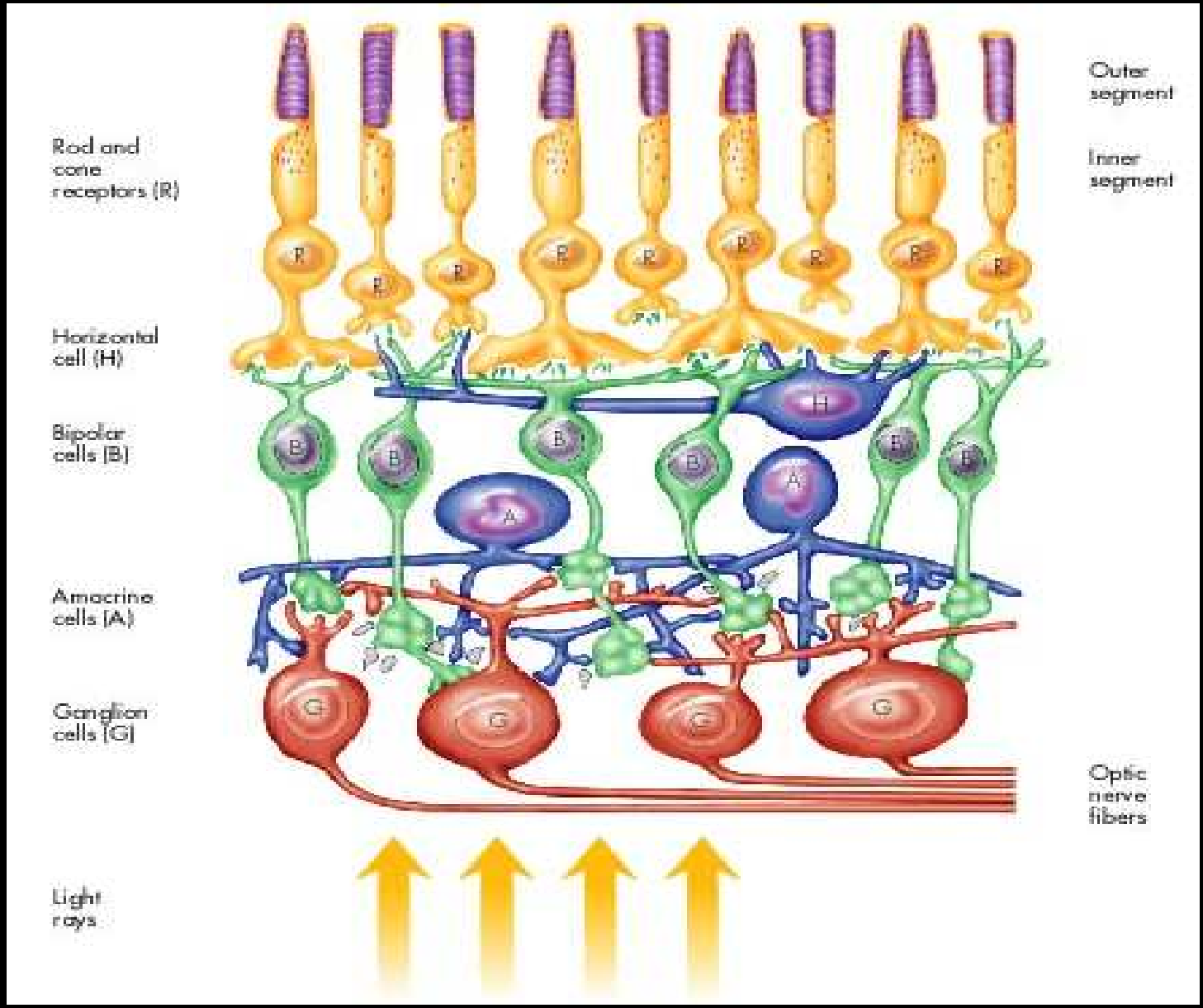
OUR INTERNAL OPTICAL SYSTEM



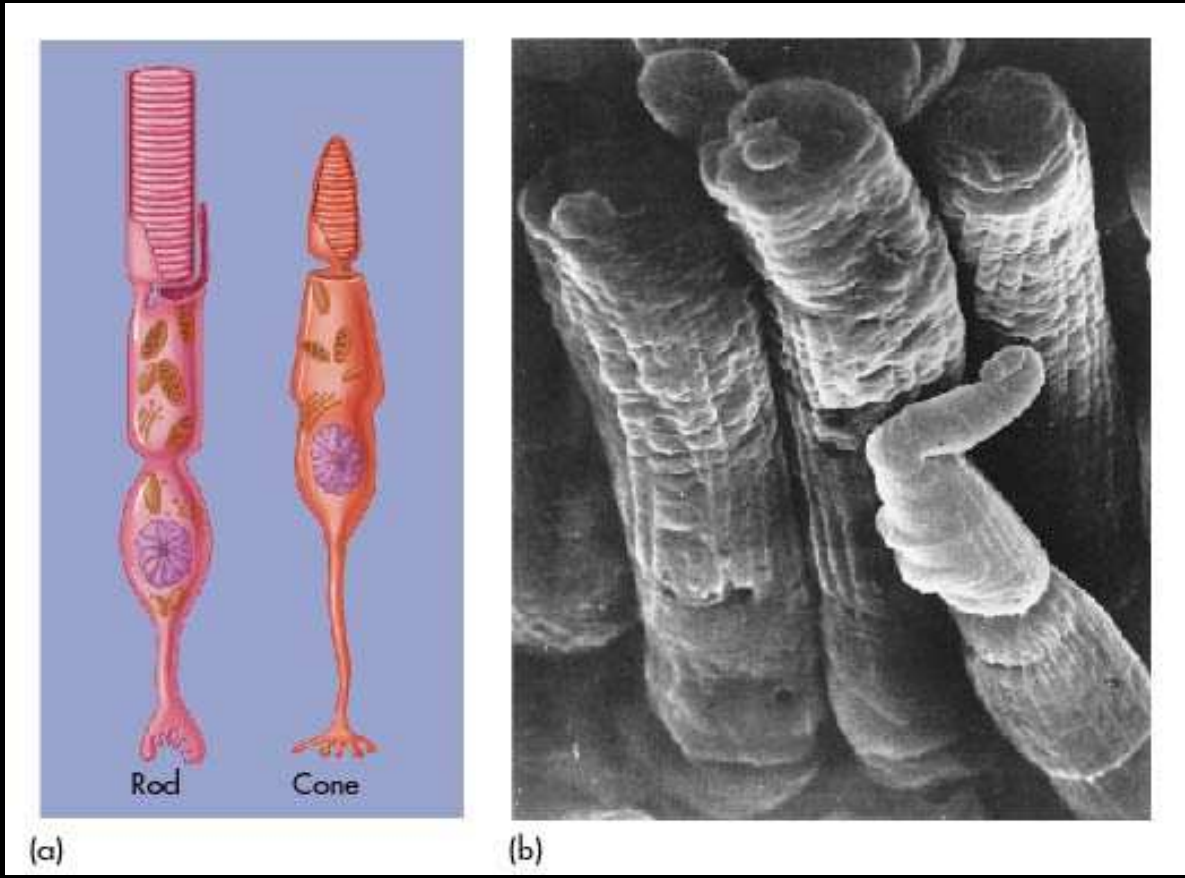
OUR INTERNAL OPTICAL SYSTEM



LIGHT TO ELECTIC SIGNAL CONVERSION

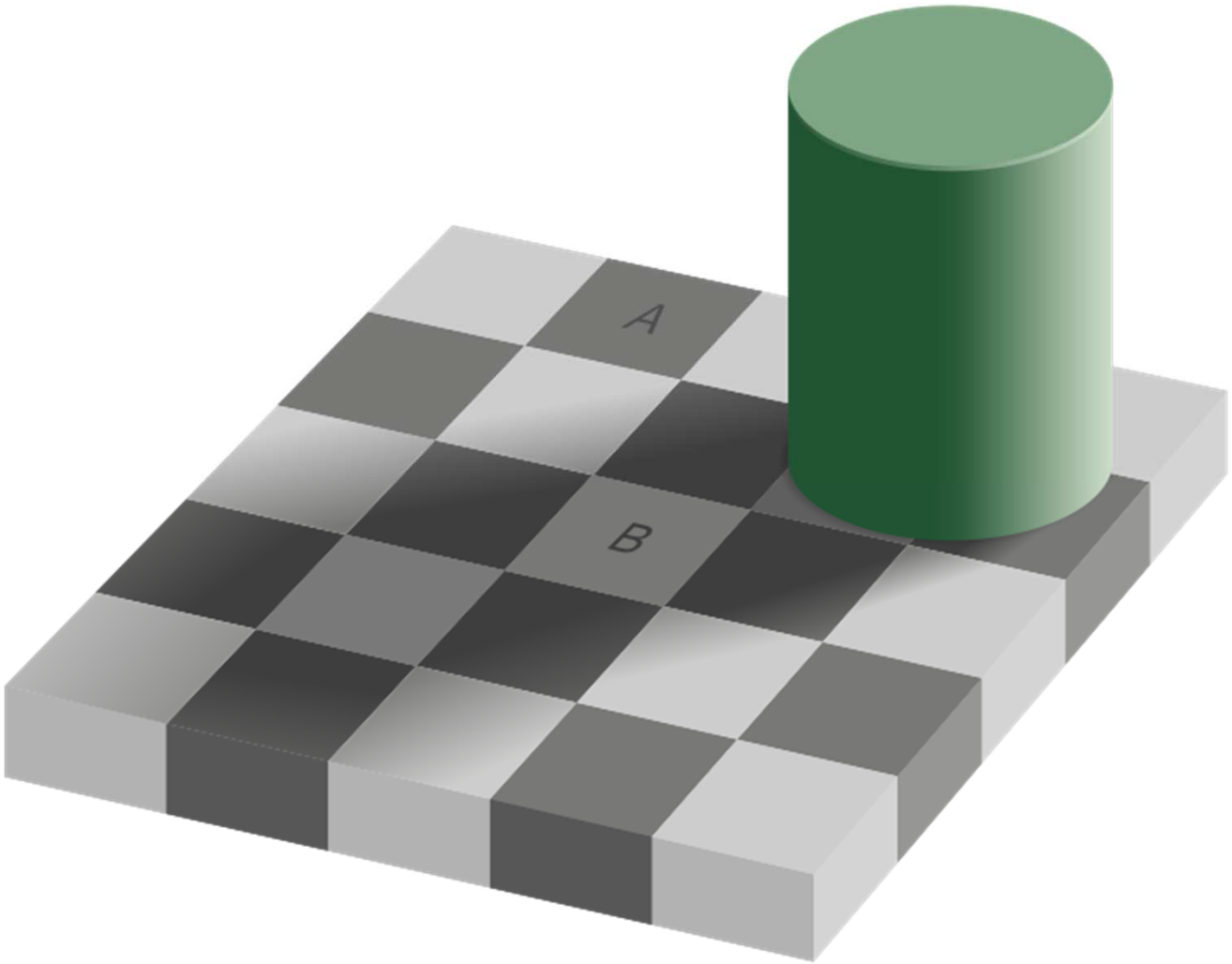


HOW WE SEE COLORS

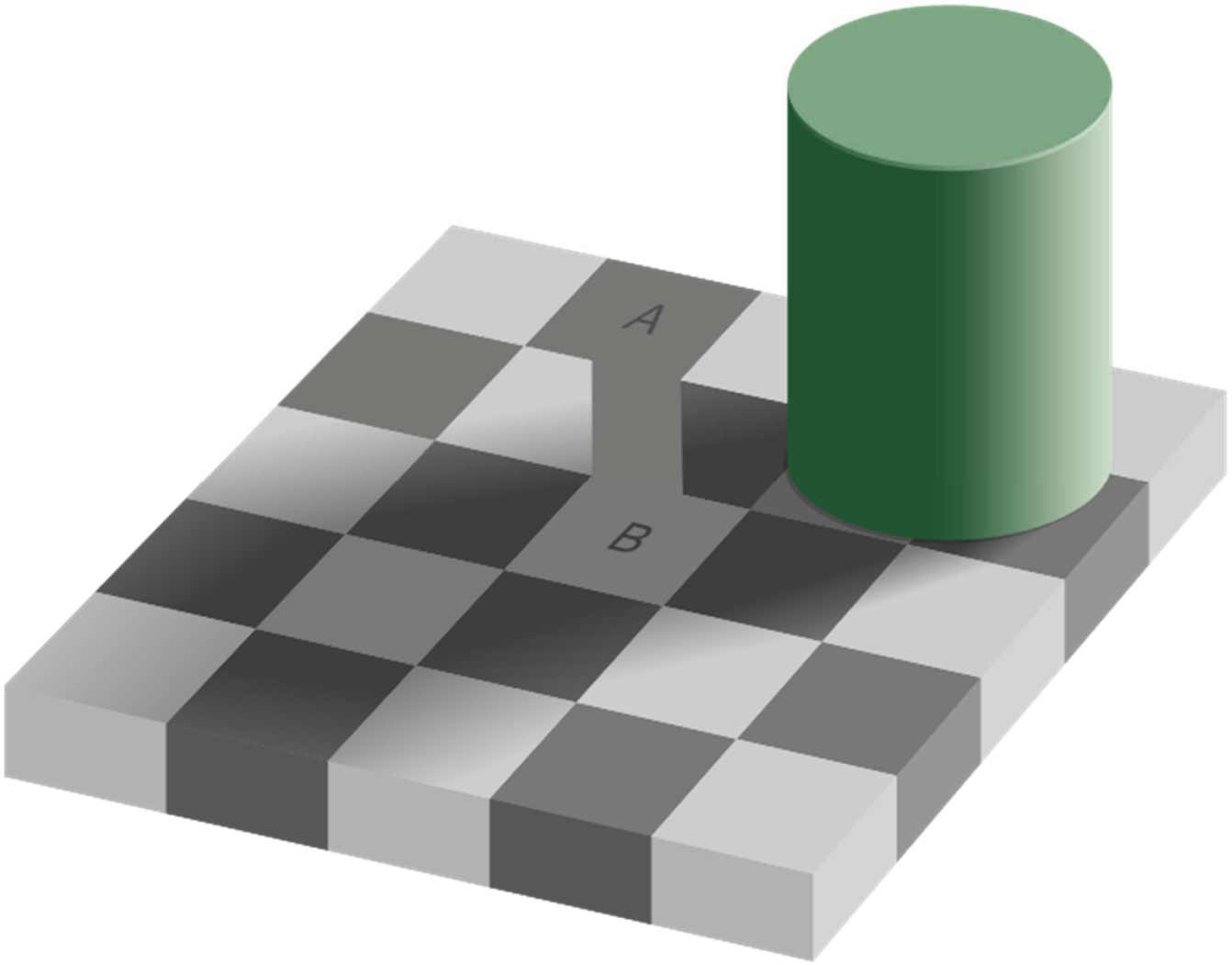


- Cones:
  - Less sensitive
  - Need high light level
  - Responsible for color vision
- Rods:
  - More sensitive
  - Highly sensitive
  - Operate on grey scale

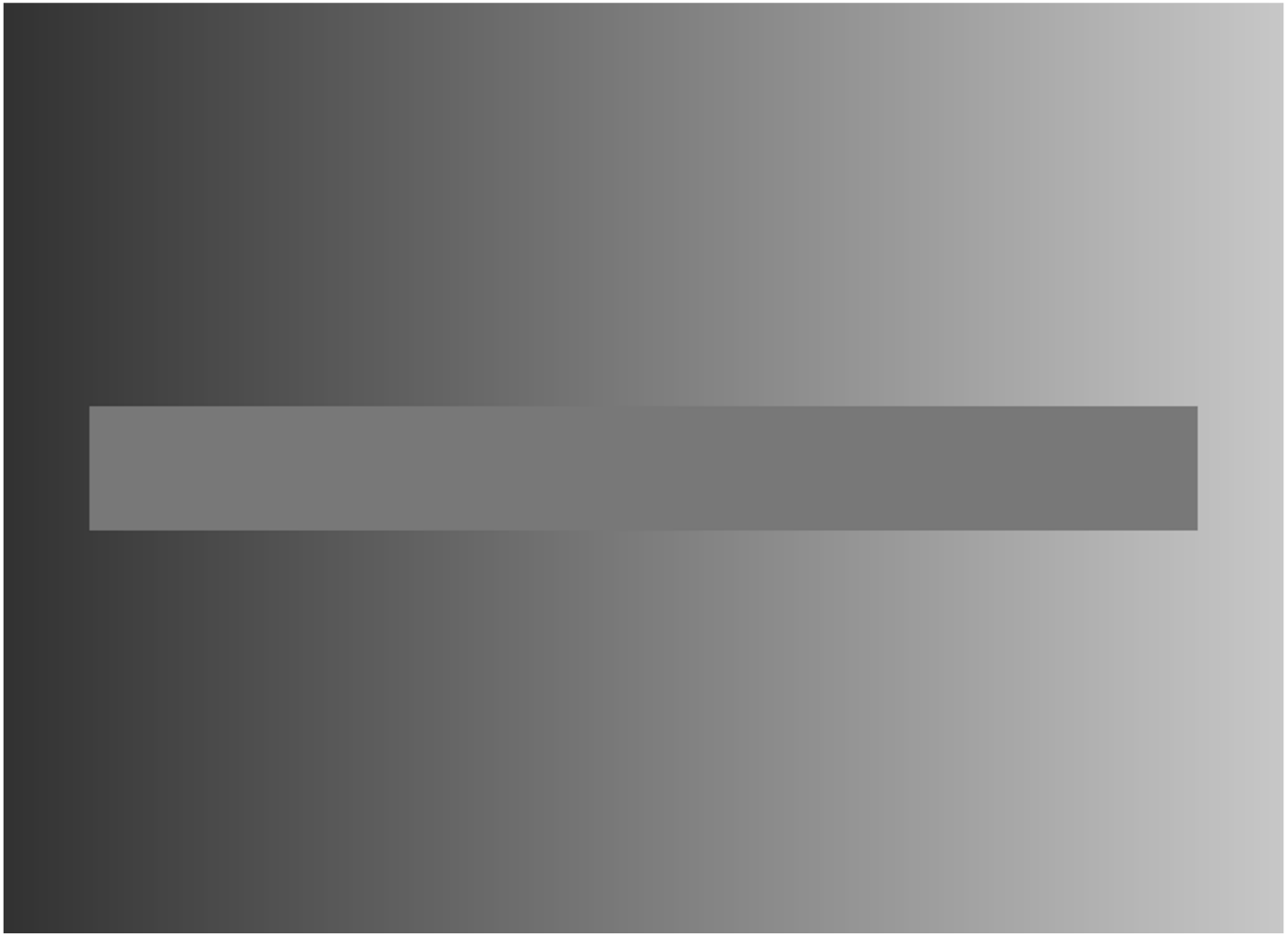
Brightness optical illusion



Brightness optical illusion

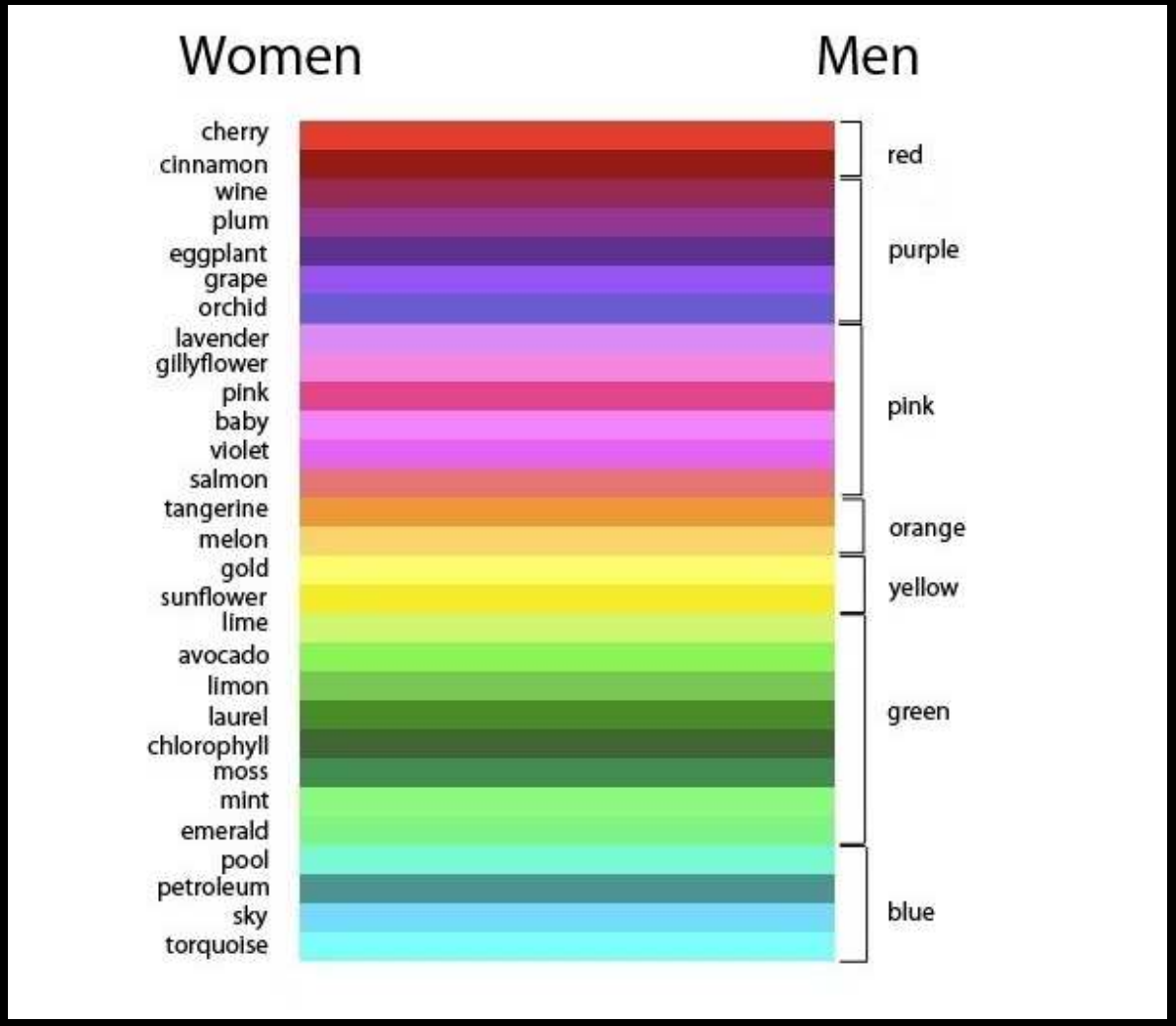


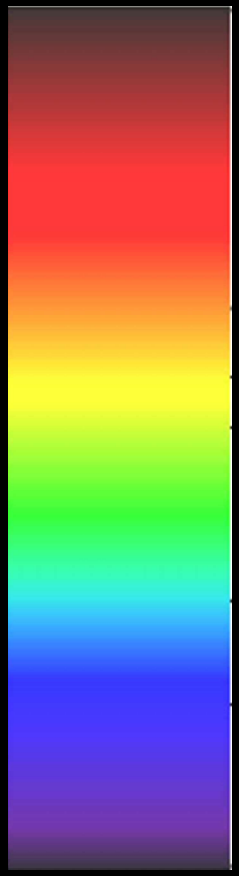
Brightness optical illusion



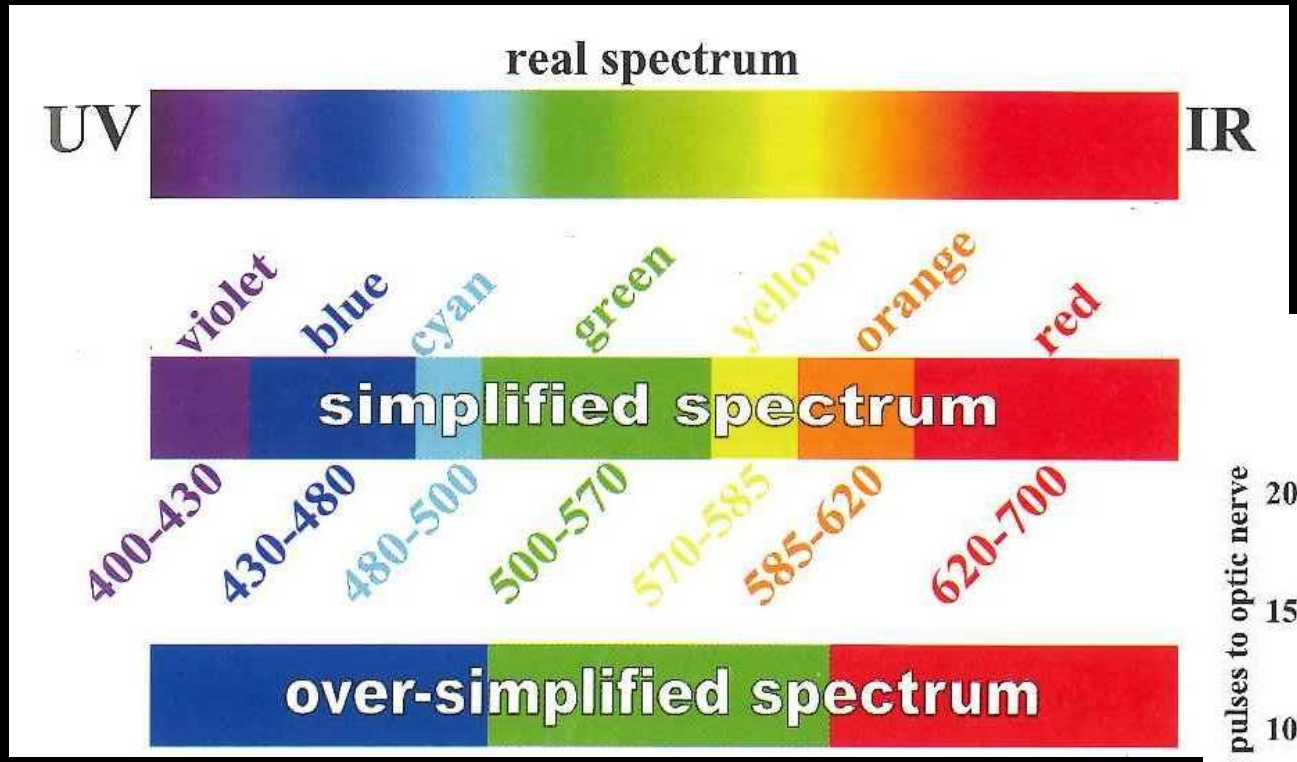
Brightness optical illusion

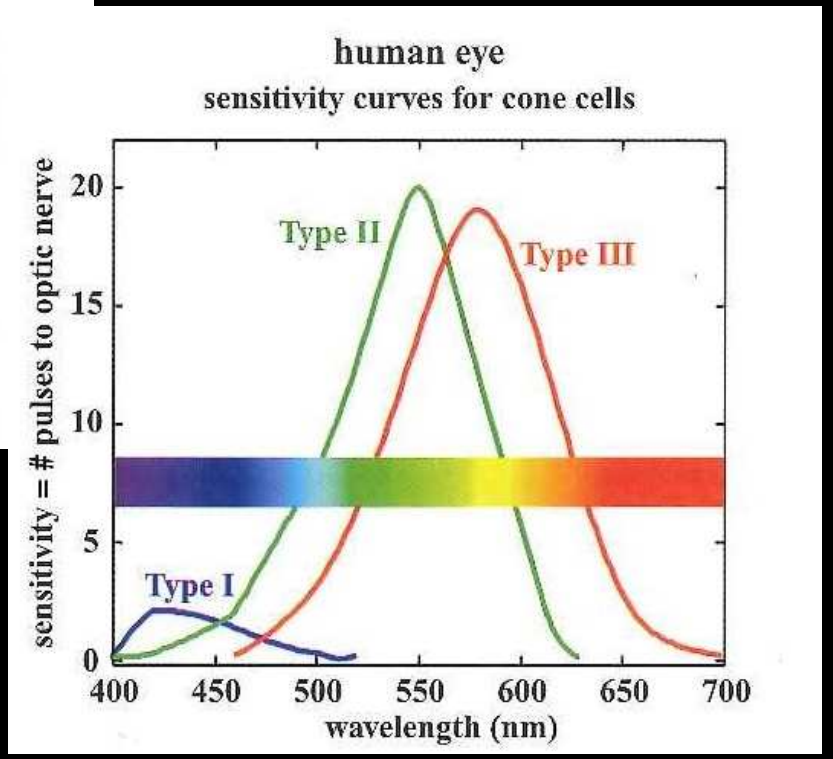
HOW MANY COLORS OUR EYES CAN SEE?



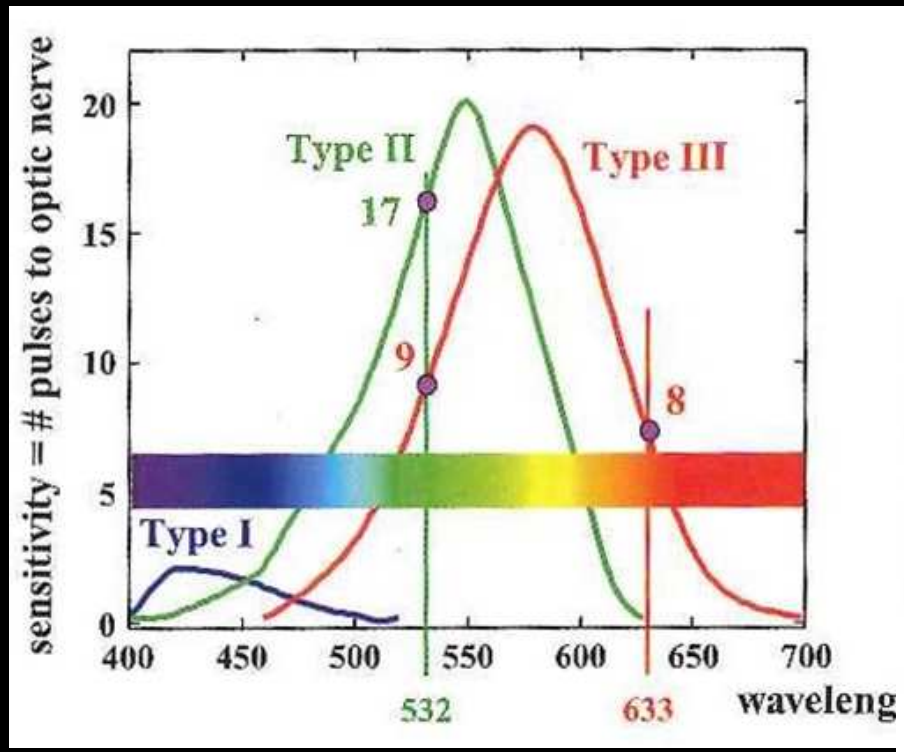


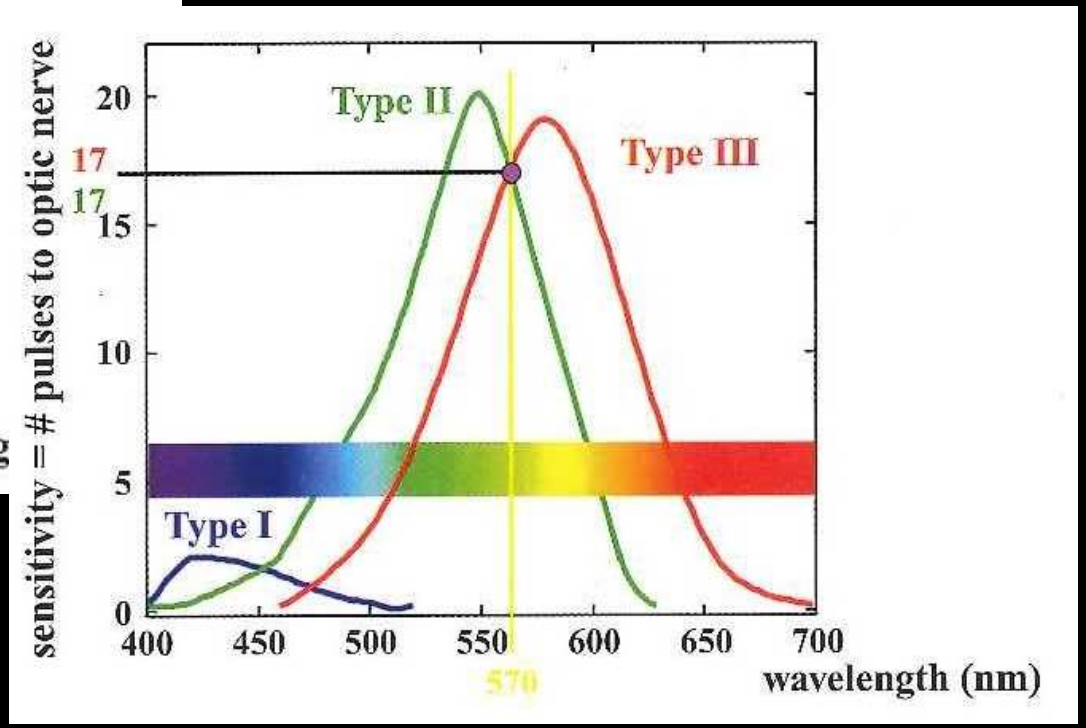
HOW MANY COLORS OUR EYES CAN SEE?

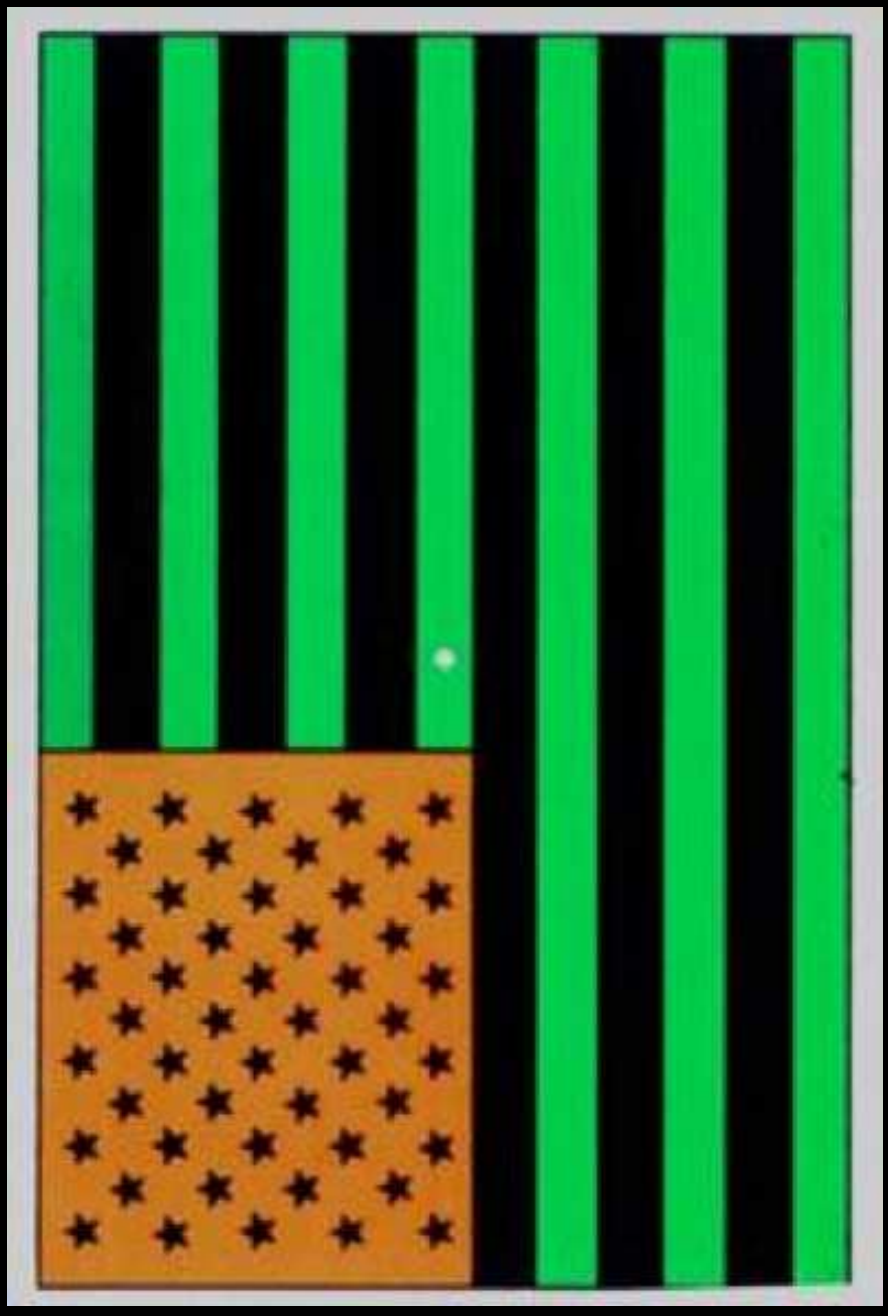




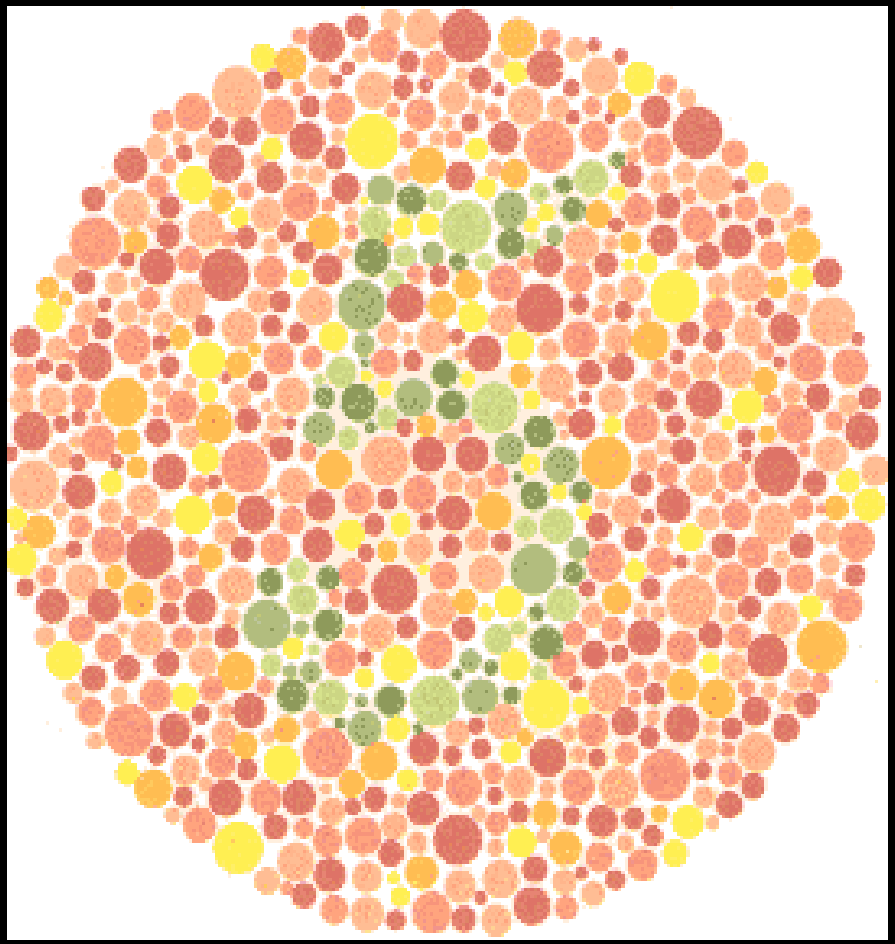
HOW MANY COLORS OUR EYES CAN SEE?



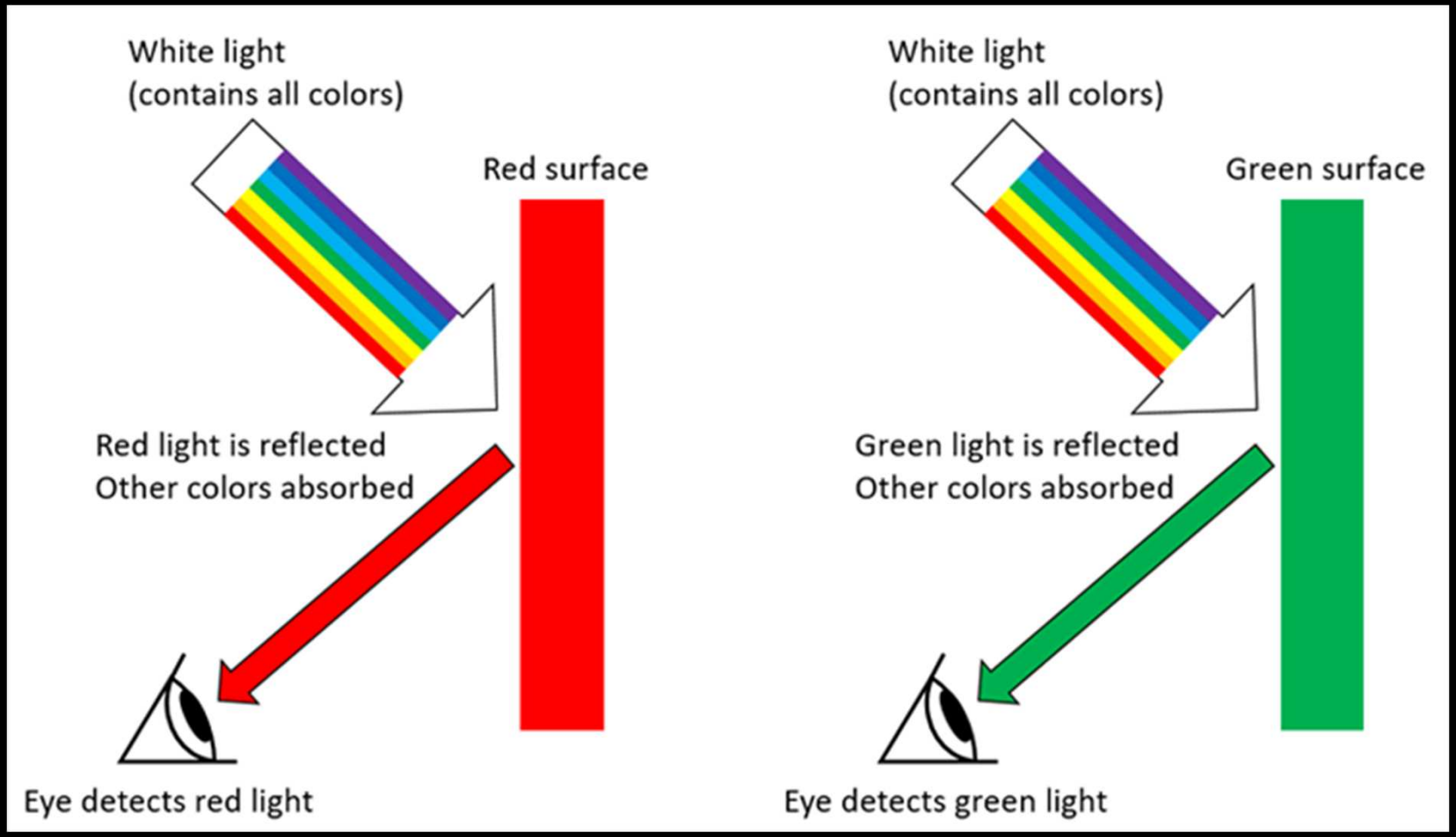




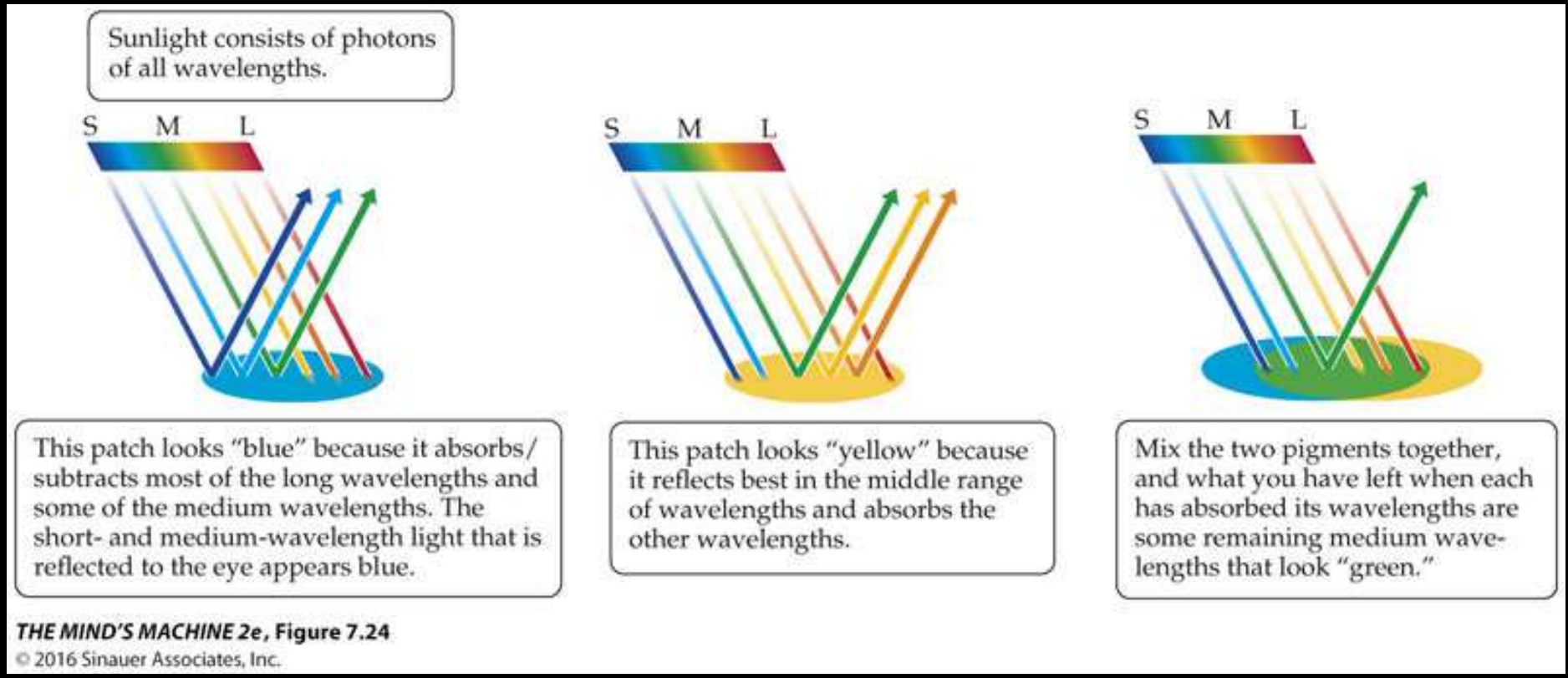
COLORBLINDNESS: ISHIHARA TEST



WE SEE OBJECTS IN COLOR?

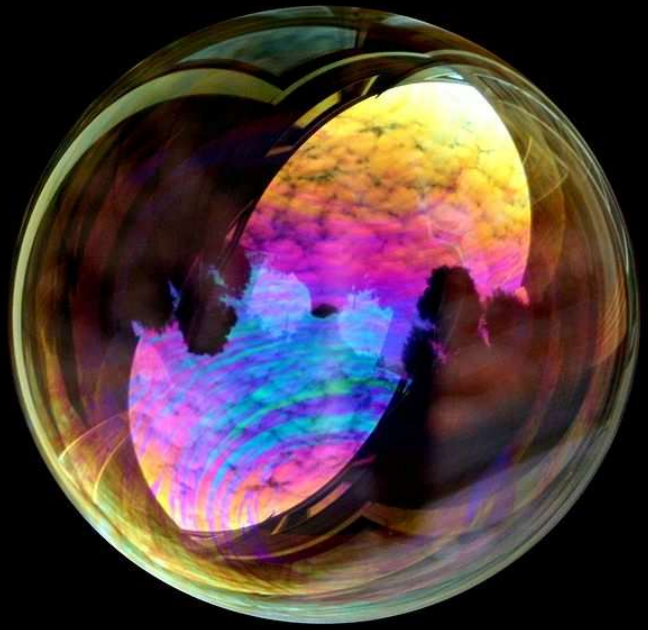


WHY COLOR MIXING WORK

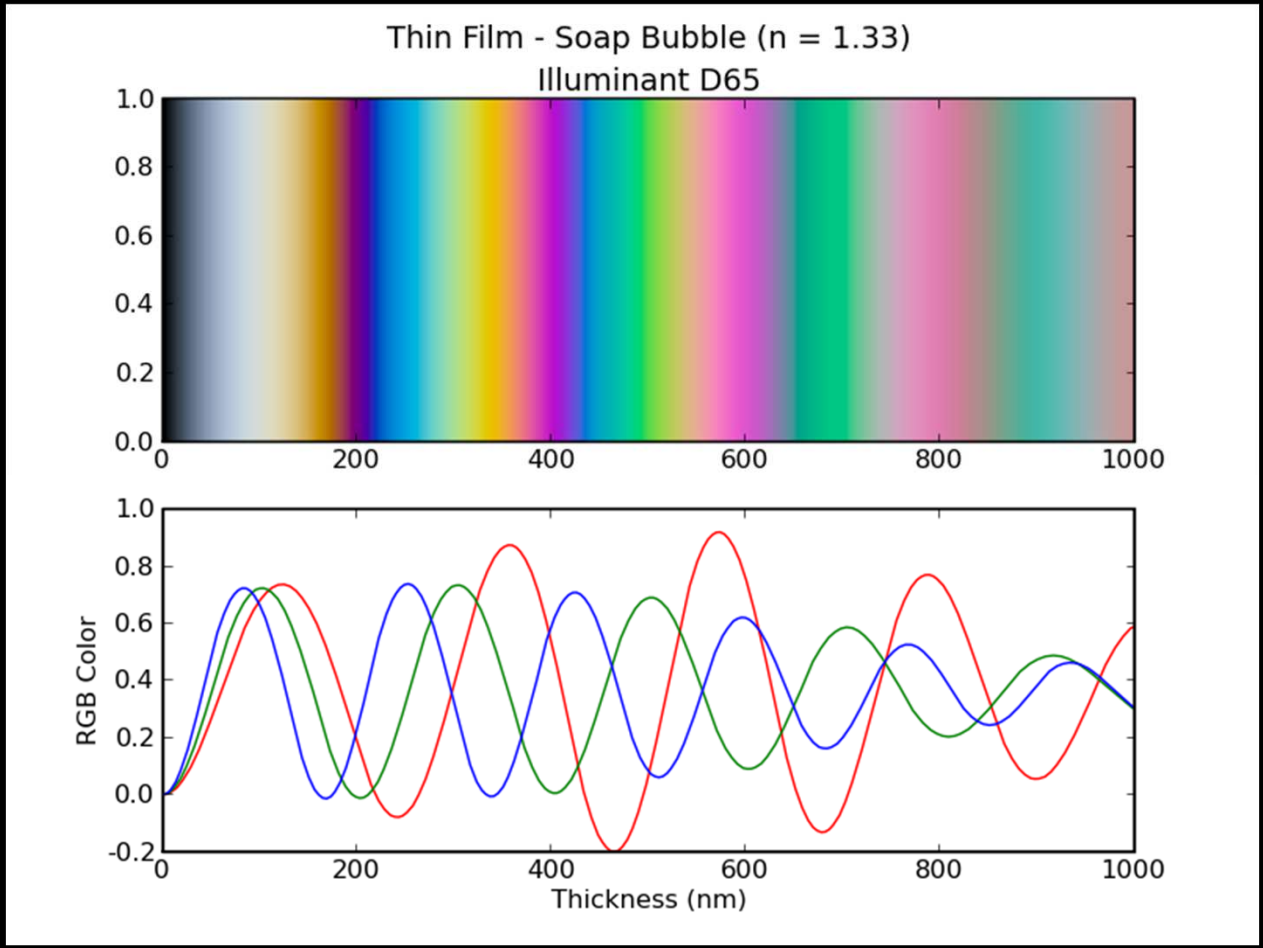


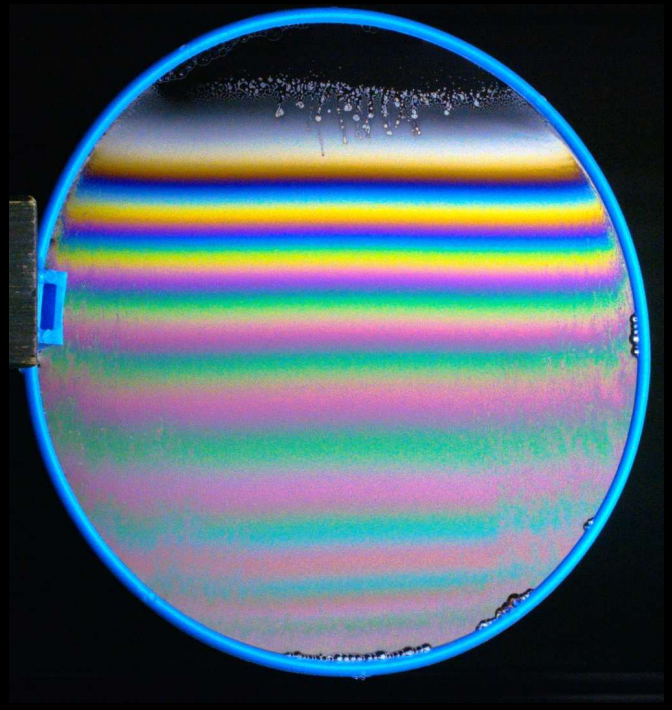
***THE MIND'S MACHINE 2e*, Figure 7.24**

COLORFUL FILMS

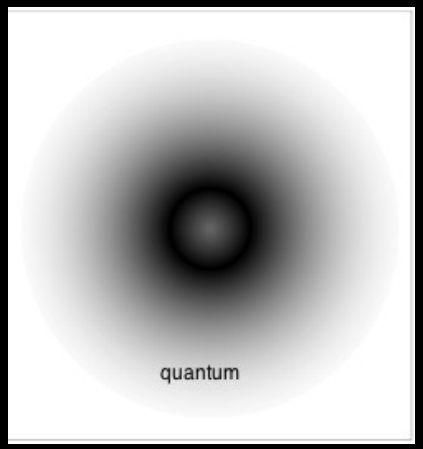


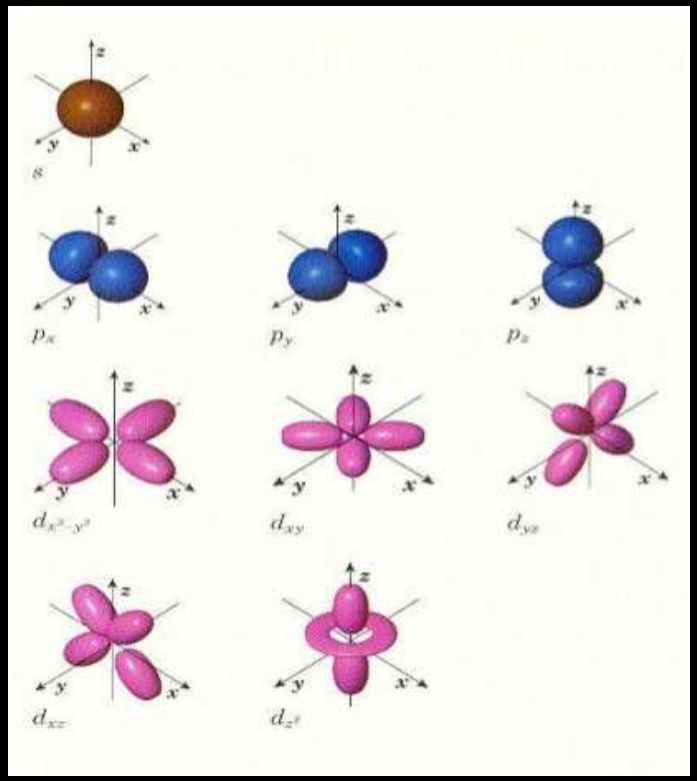
COLORFUL FILMS

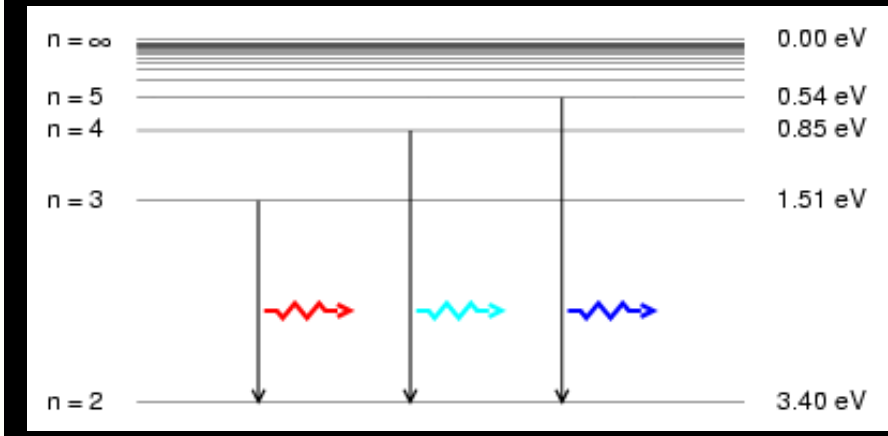




ELECTRONS AND COLORS



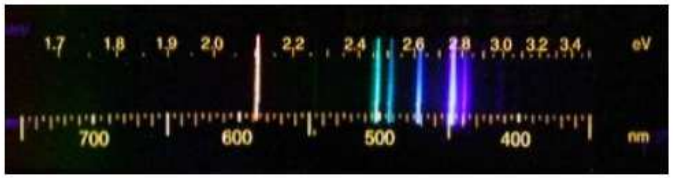




ATOMIC/MOLECULAR SPECTRA

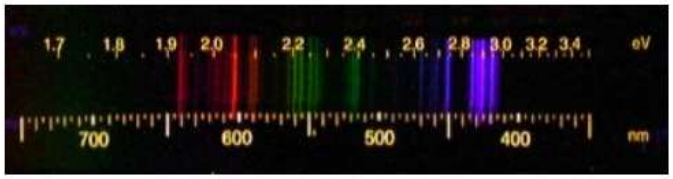
Hydrogen: a simple atom with a simple spectrum. Besides the three lines shown here, you may be able to see another in the blue near 410 nm.

Helium: slightly more complex than hydrogen, with one yellow line and a number in the blue.



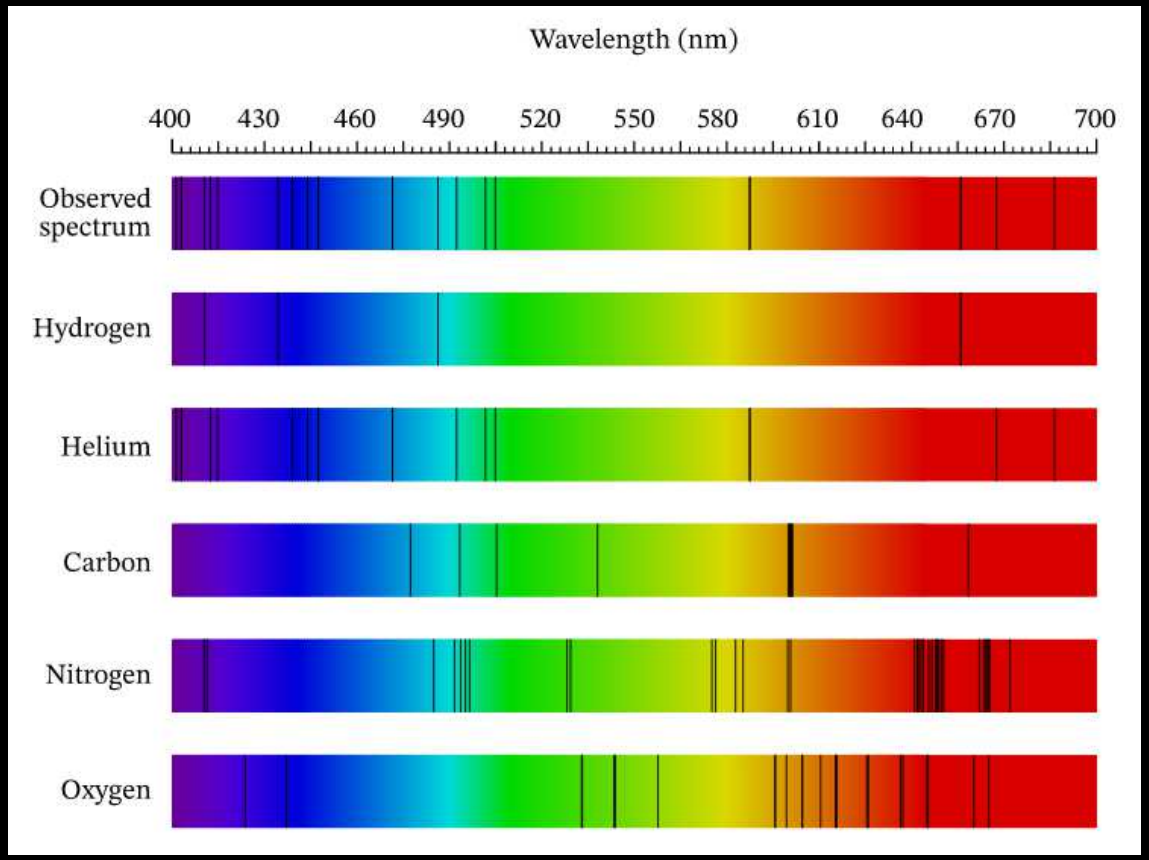
Neon: a very large number of lines in the red give neon signs their distinctive pink colors, but notice the two green lines.

Argon: the pastel color of argon is due to a wide range of lines throughout the spectrum.

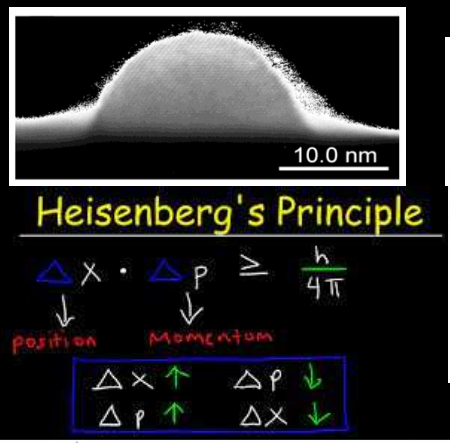


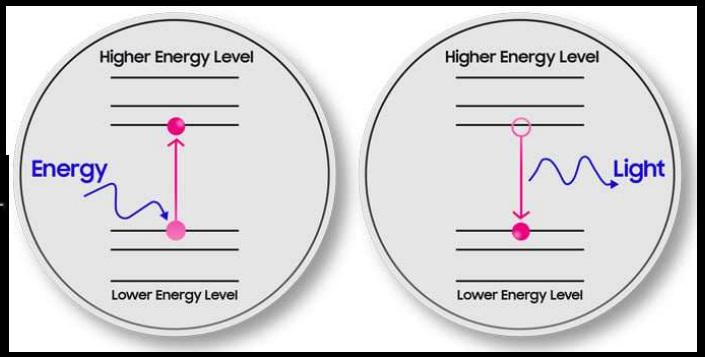
Mercury: the strongest line, at 546 nm, gives mercury a greenish color.

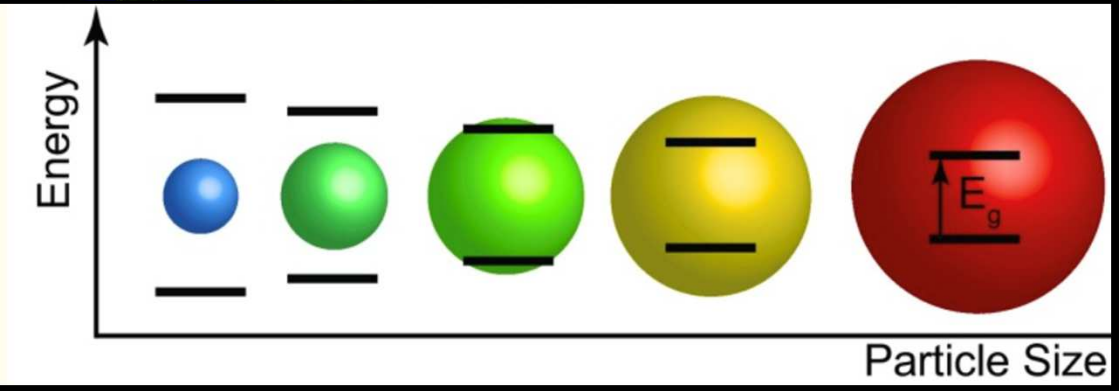
ATOMIC/MOLECULAR SPECTRA

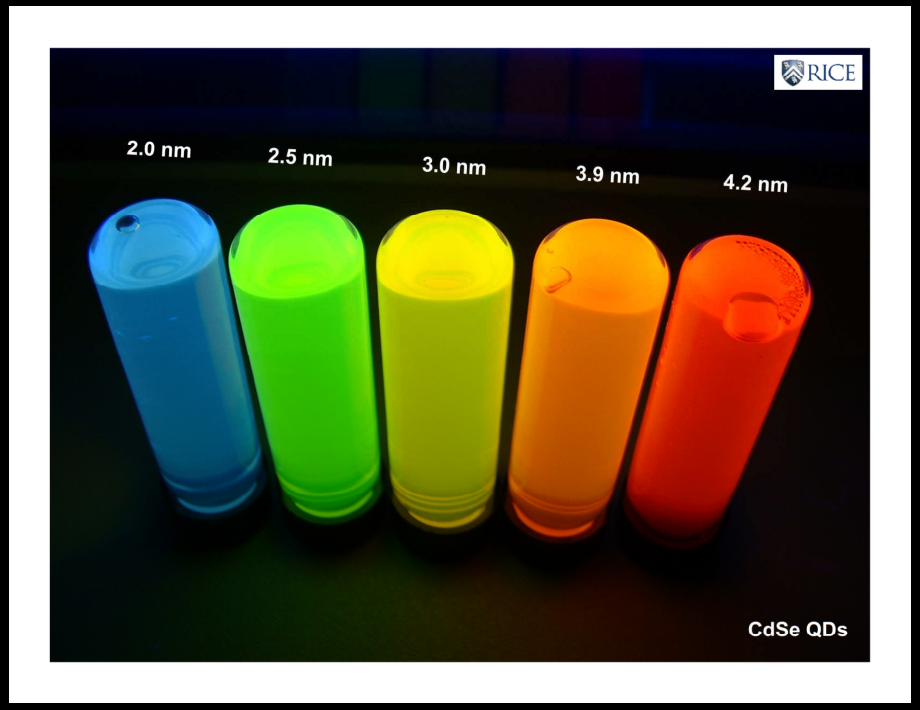


QUANTUM DOTS: "ARTIFICIAL ATOMS"

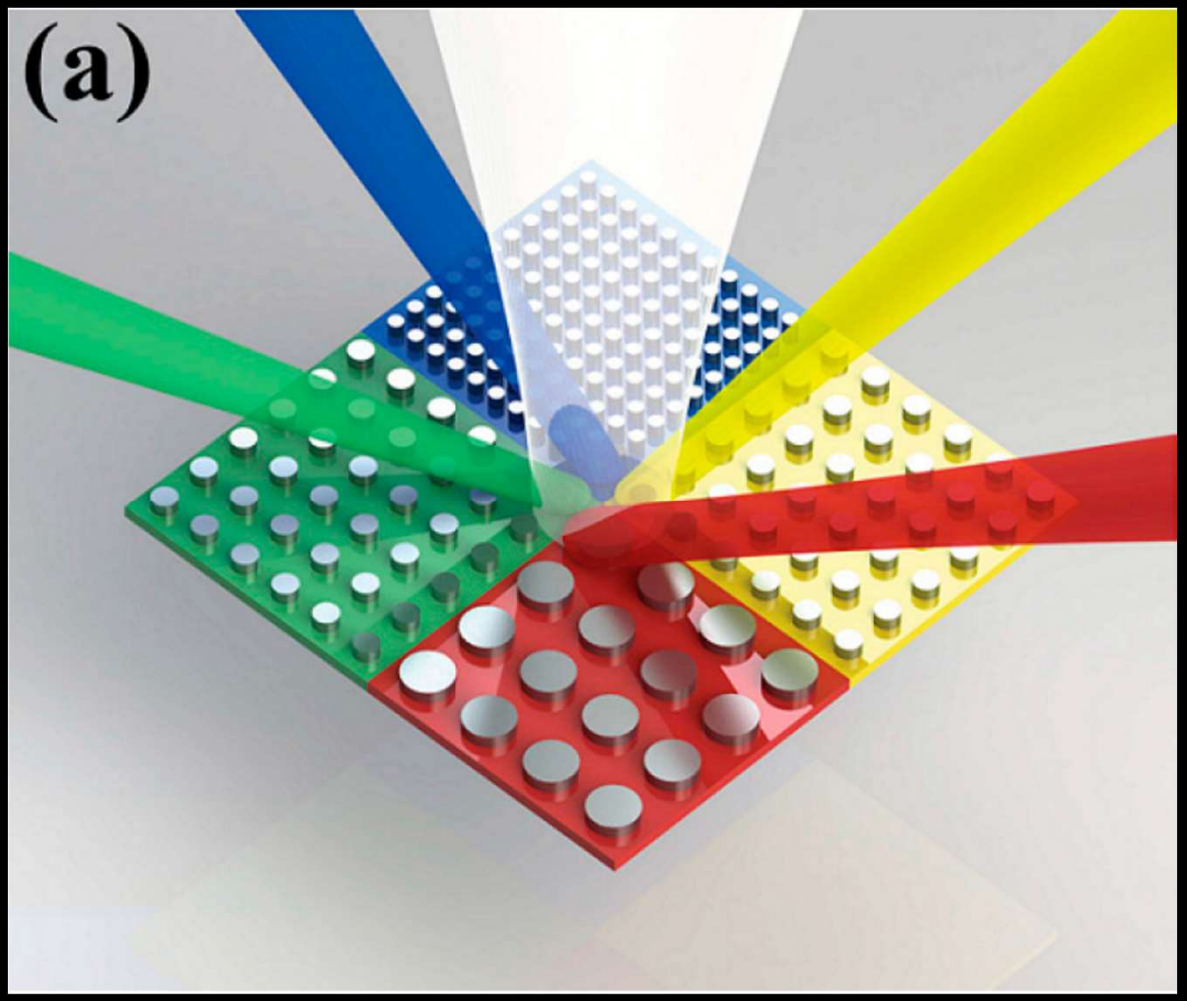


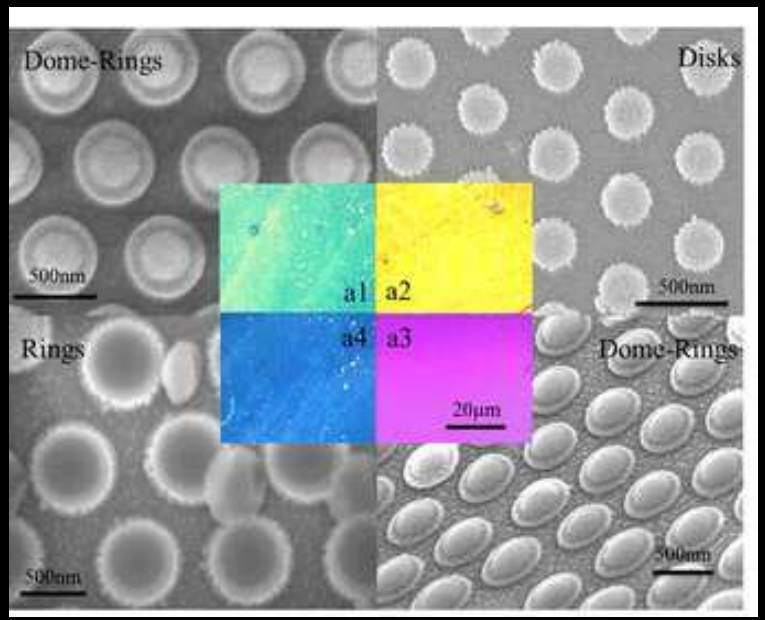




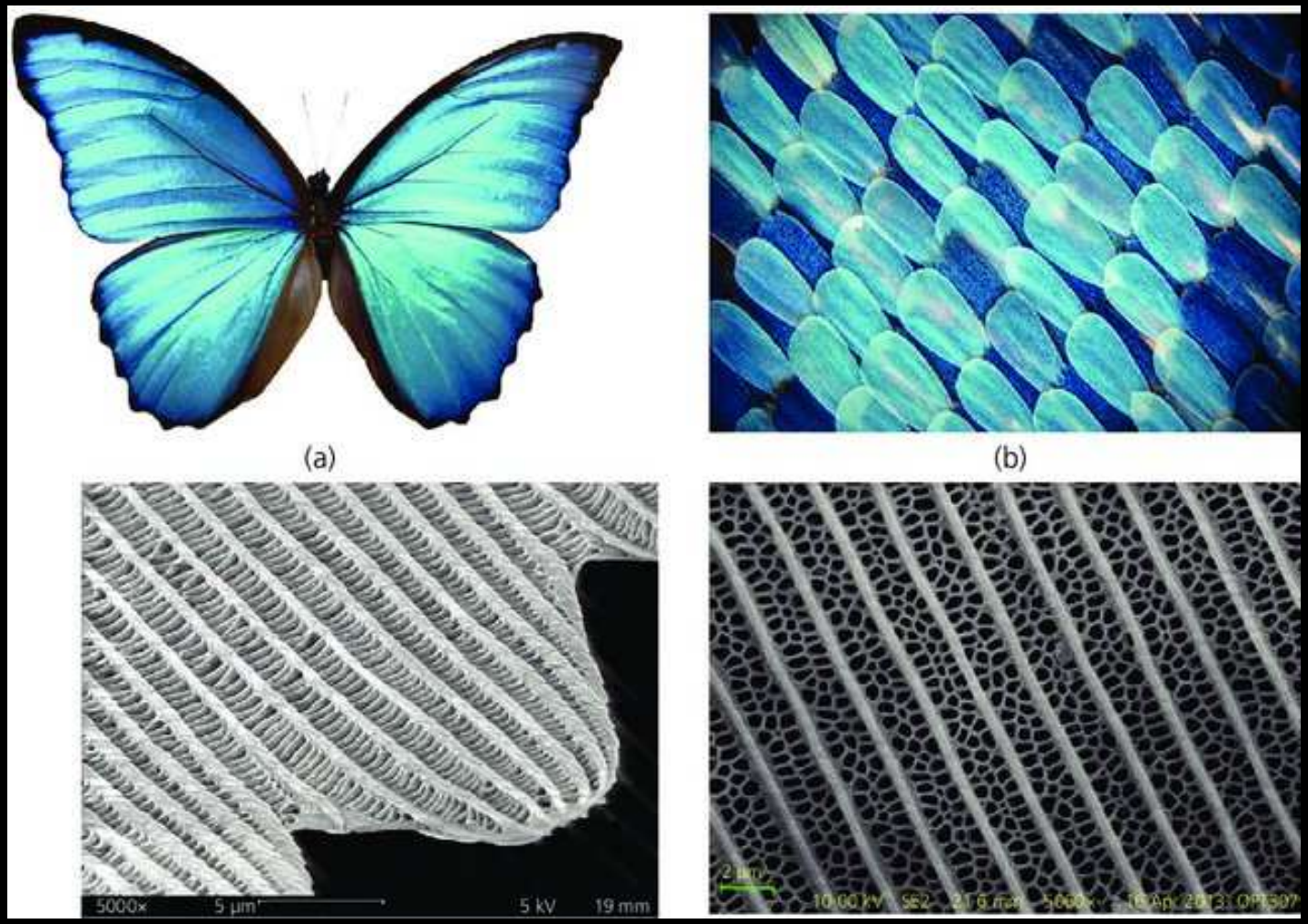


ENGINEERED COLORS

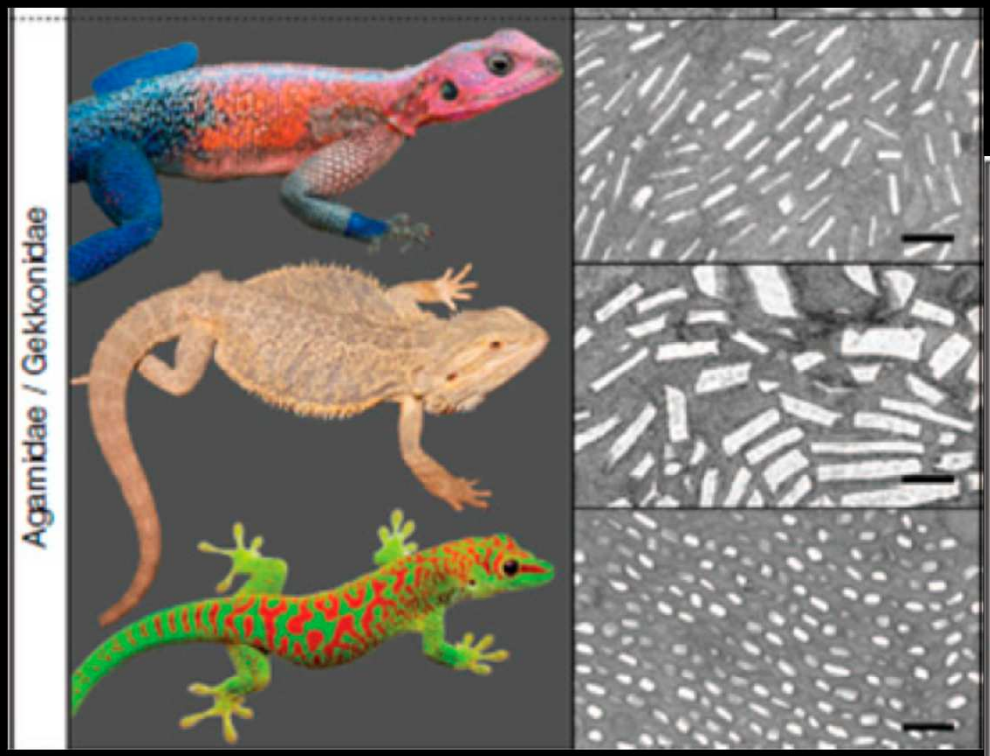


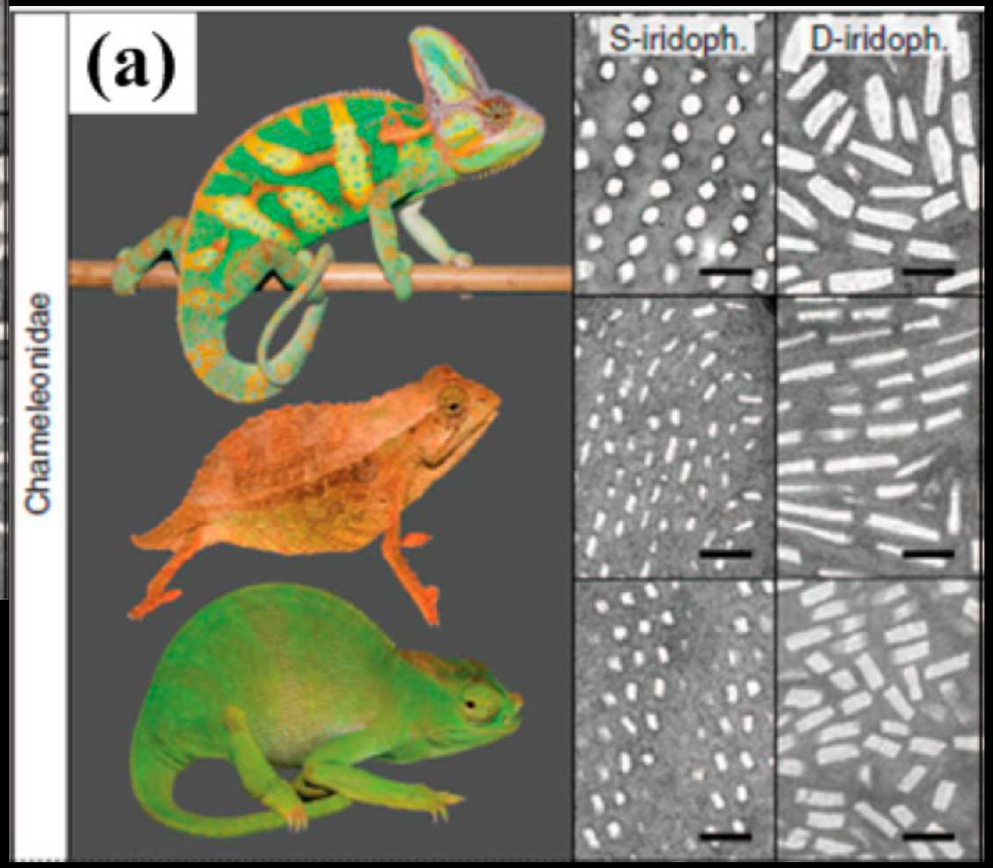


NATURAL NANOSTRUCTURES



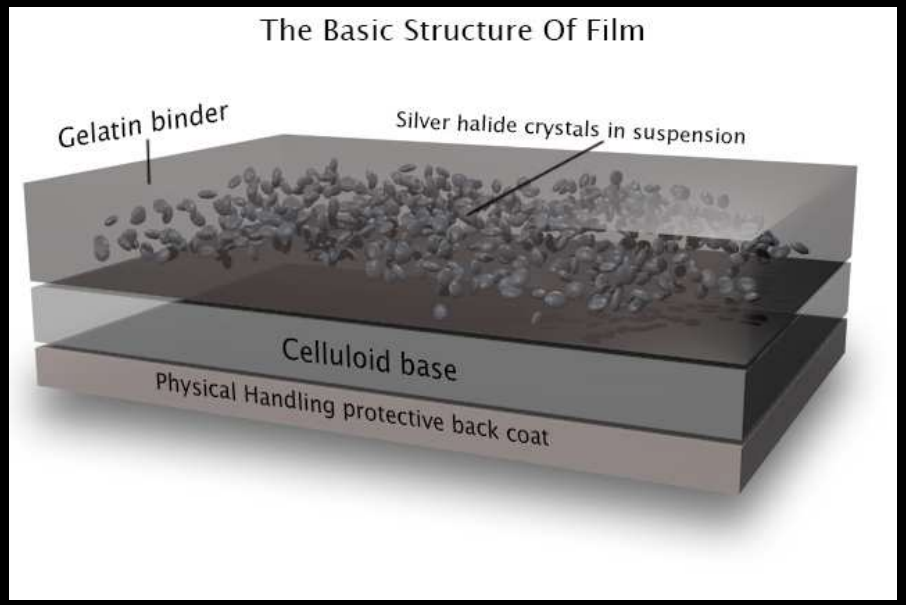
NATURAL NANOSTRUCTURES

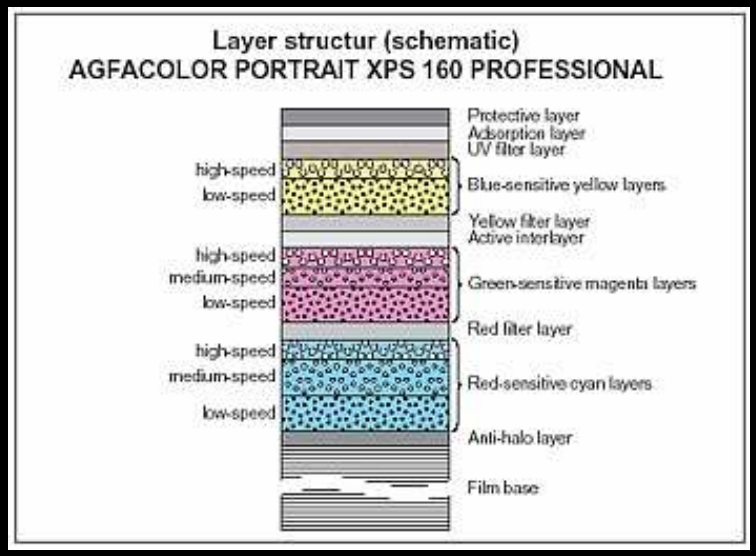




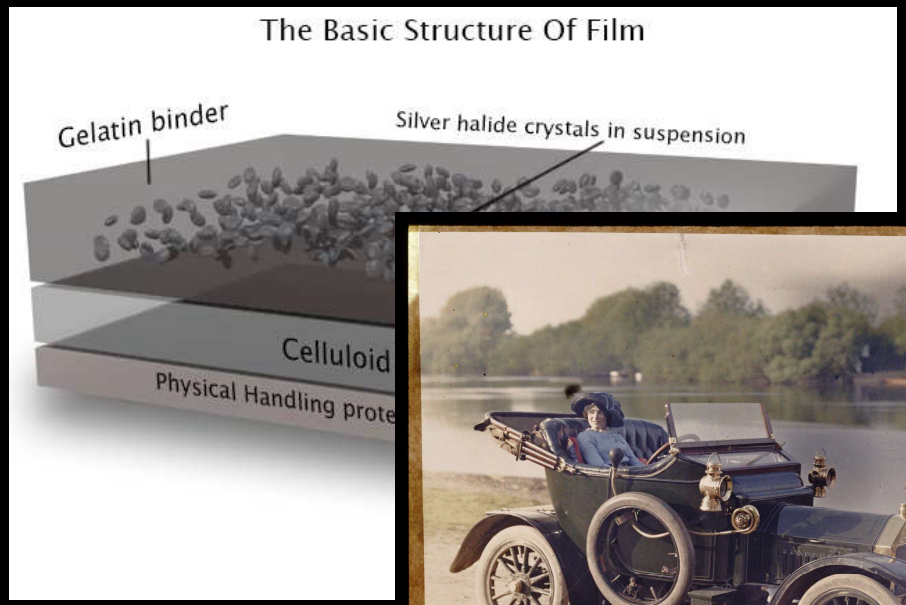
COPYING NATURE

HOW DO WE DETECT LIGHT: OLDEN DAYS





HOW DO WE DETECT LIGHT: OLDEN DAYS



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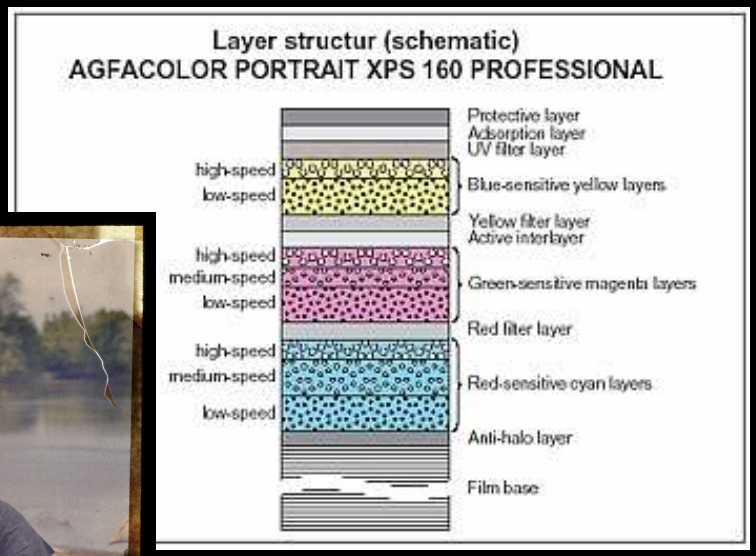
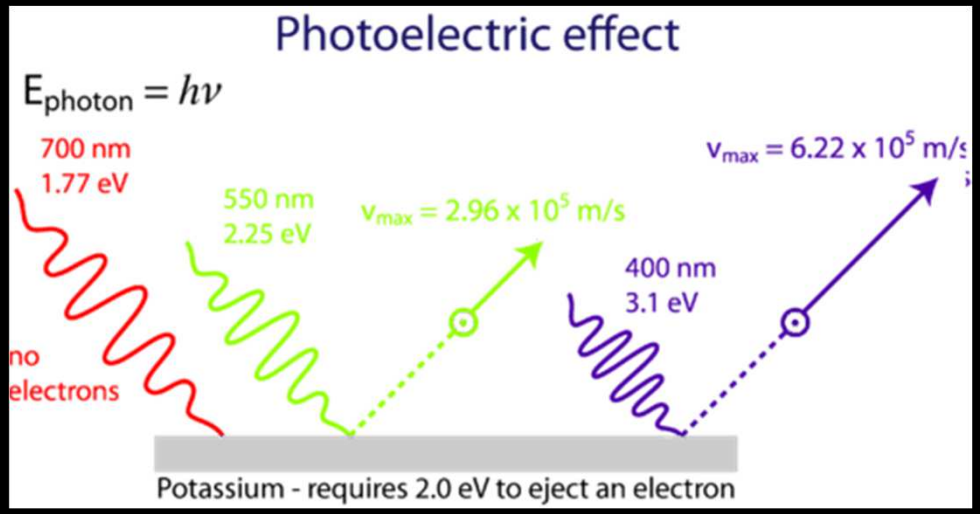
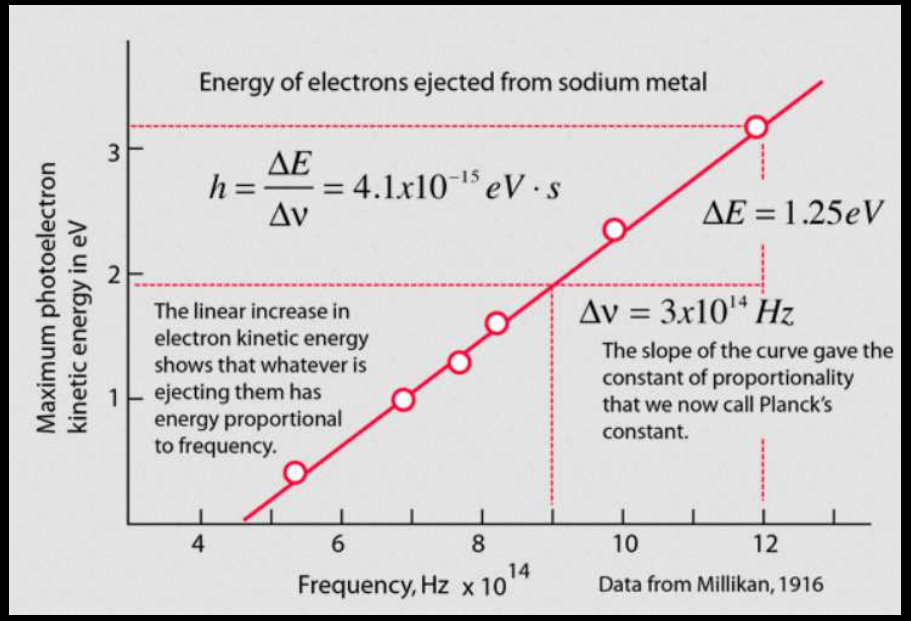


PHOTOELECTRIC EFFECT





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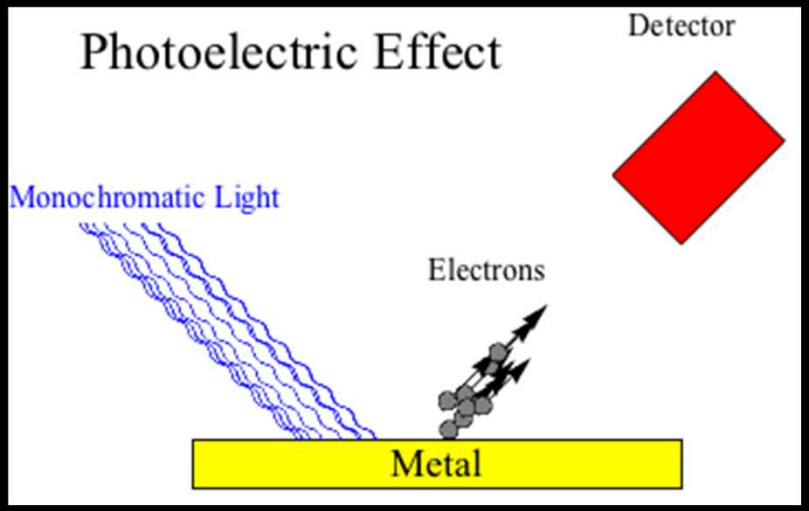
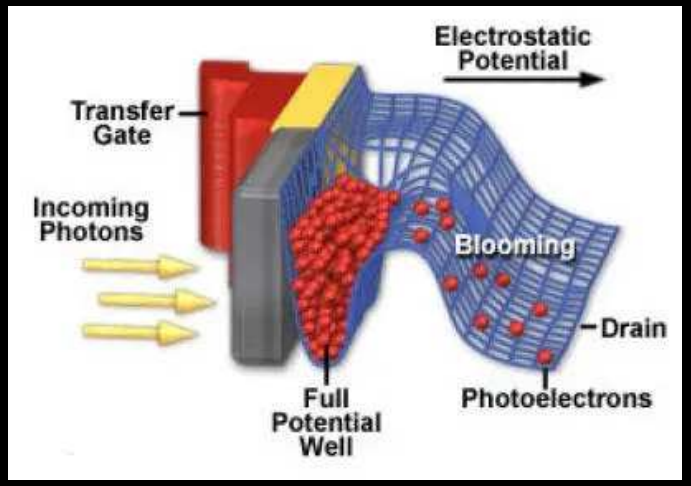
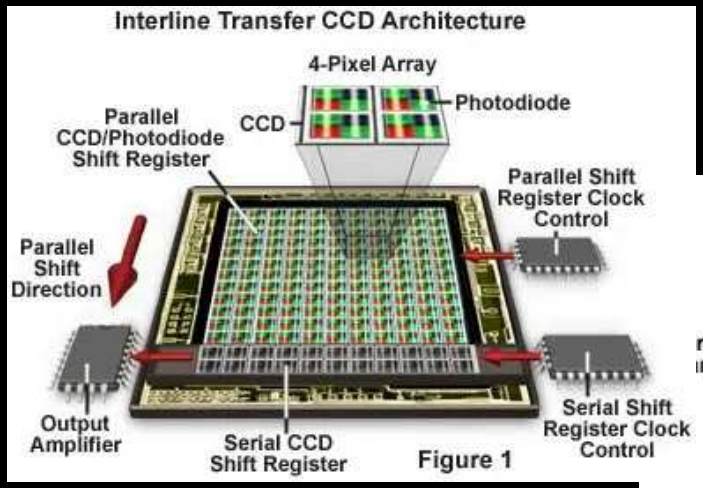
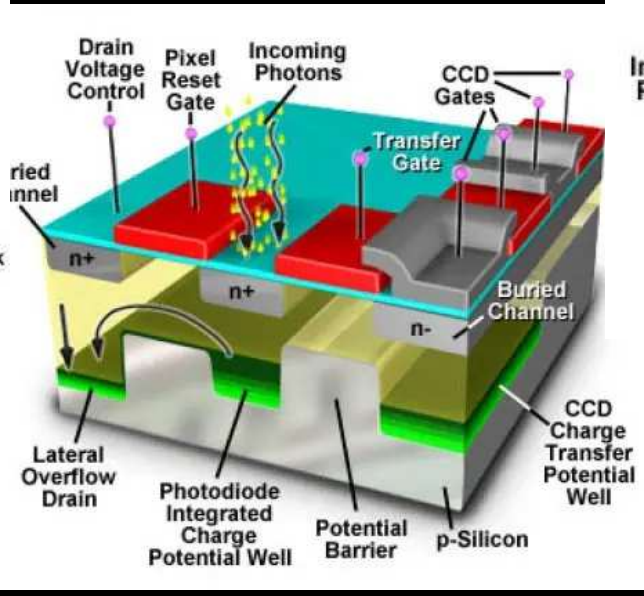
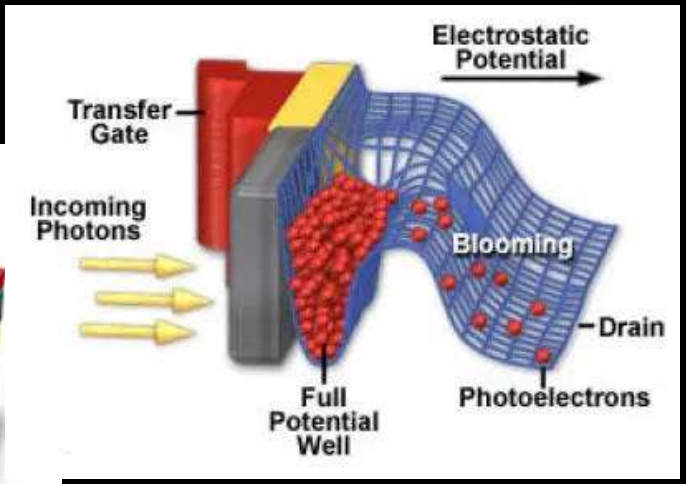




PHOTODETECTORS AND CCD CAMERAS







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