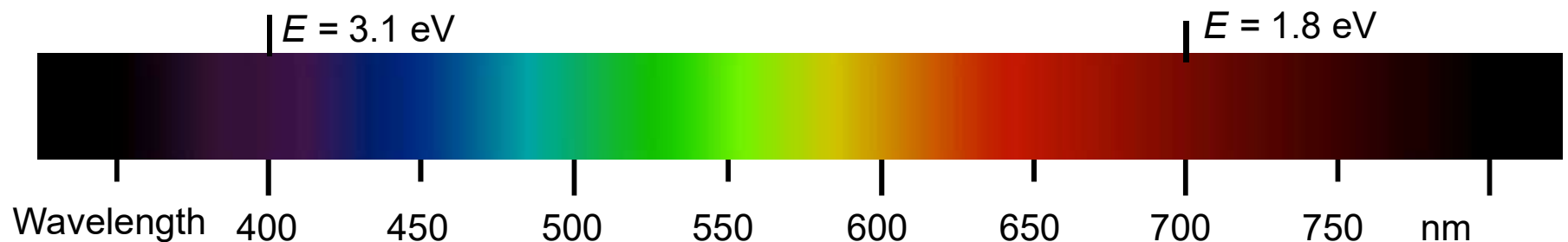
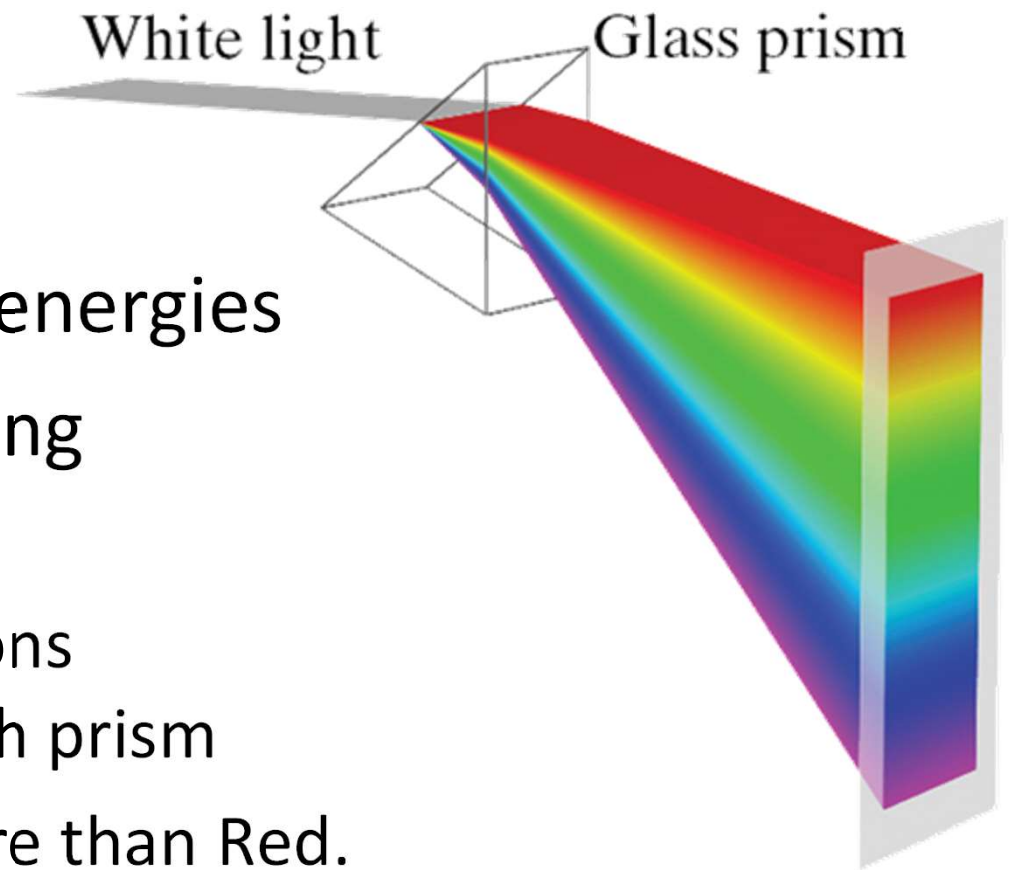


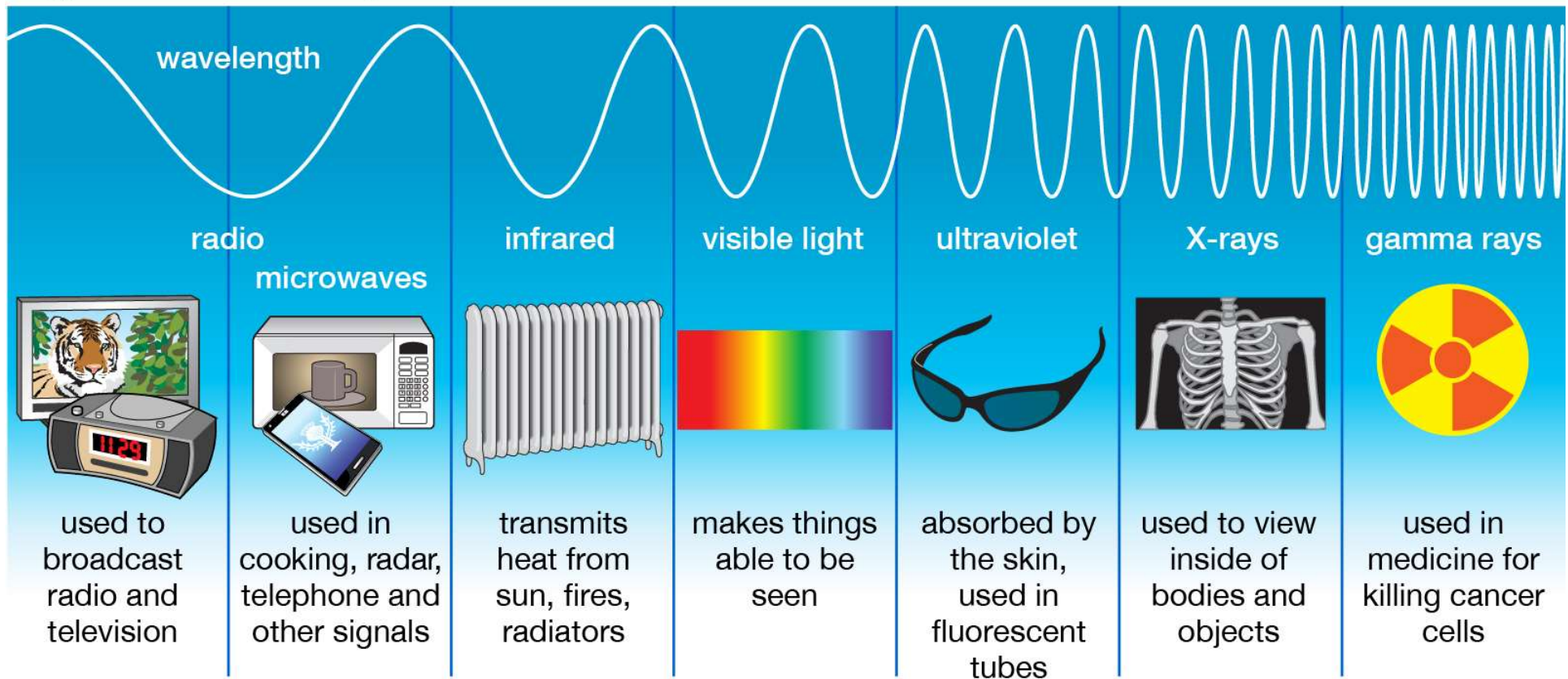
WHITE LIGHT

- White Light contains photons of different energies
- Can separate by passing through a glass prism
 - Different energy photons interact differently with prism
 - Violet slows down more than Red.
 - Violet bends more than Red.

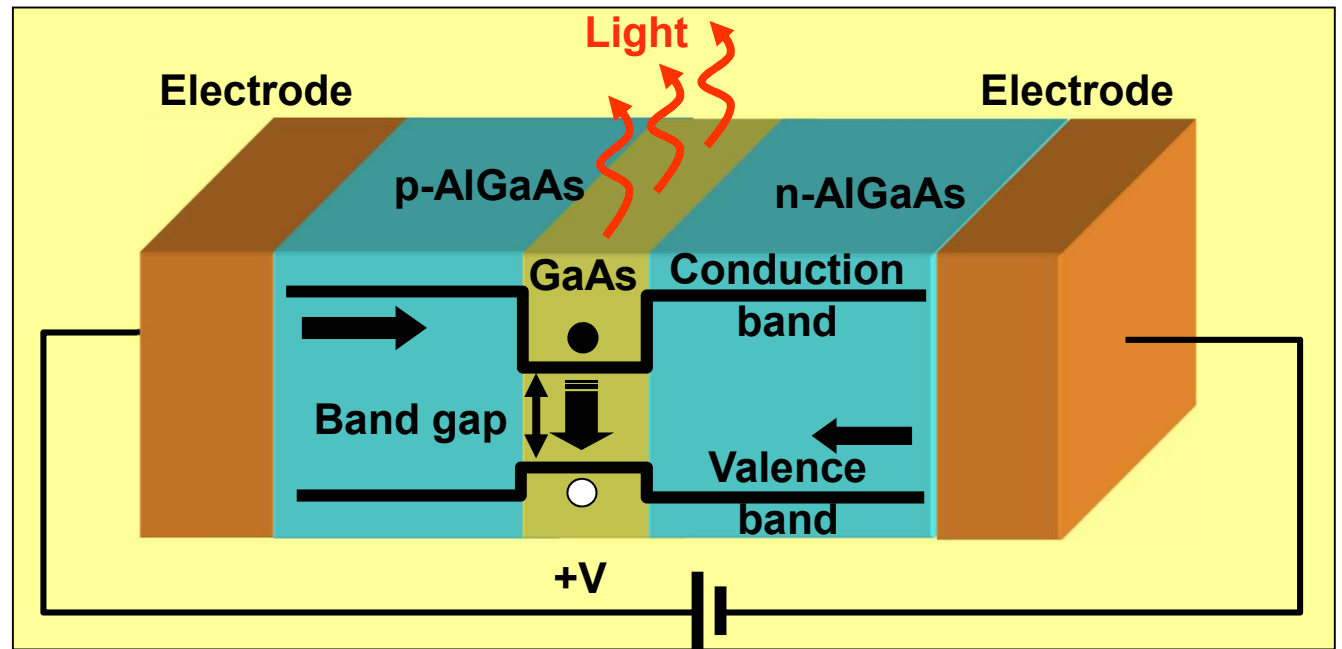
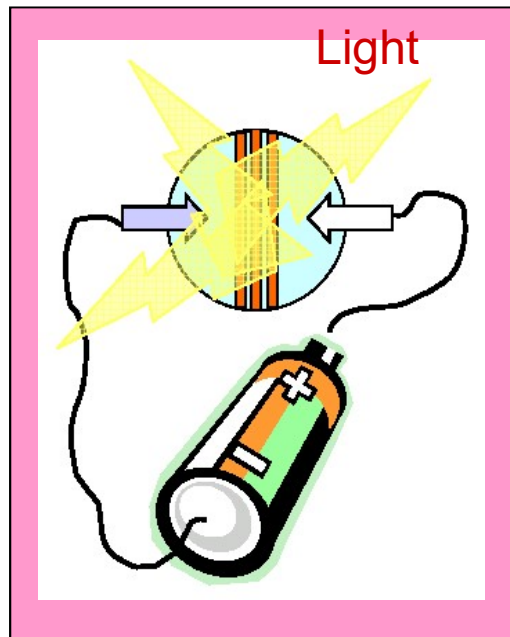


Light

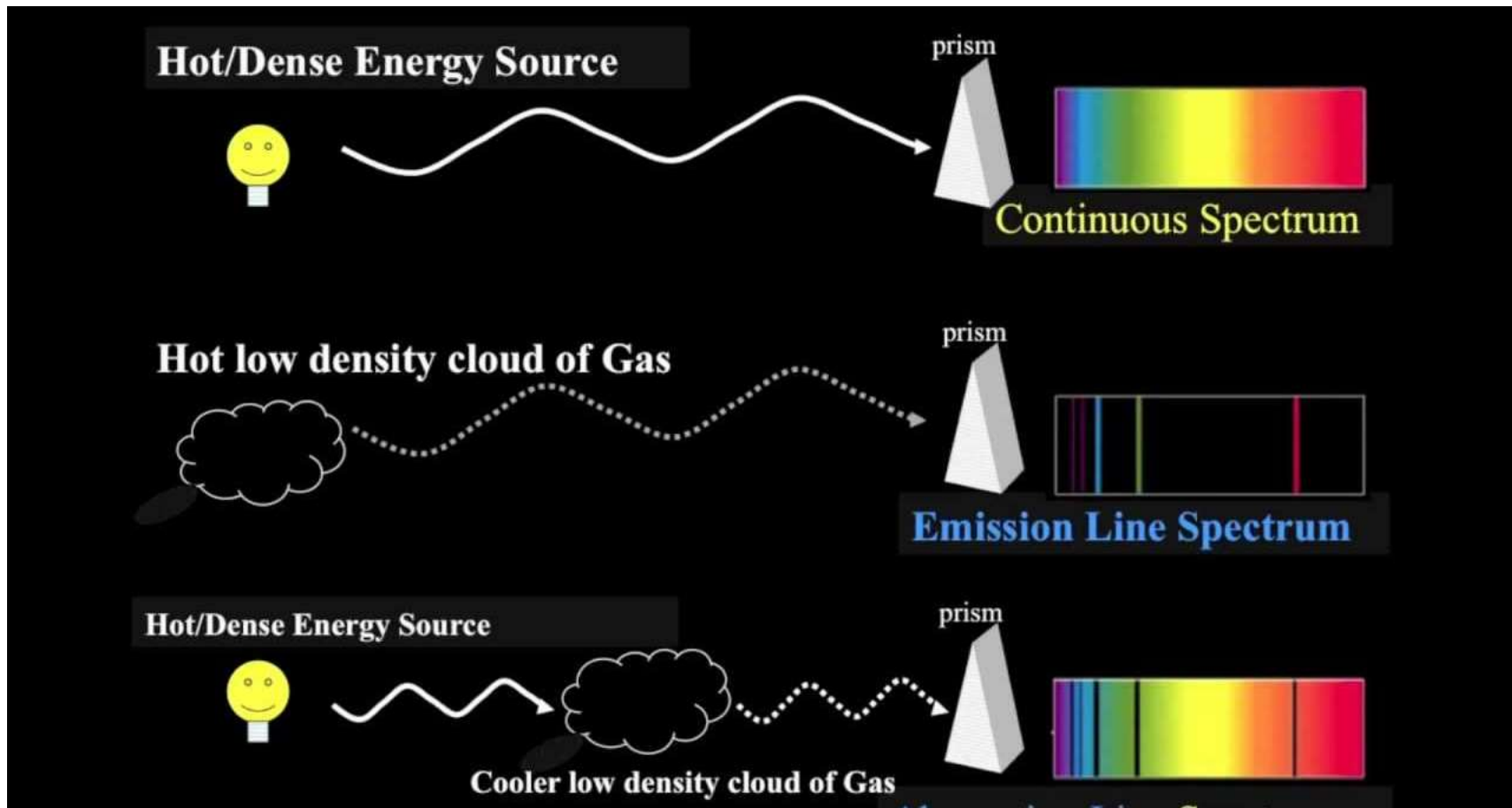
Types of Electromagnetic Radiation



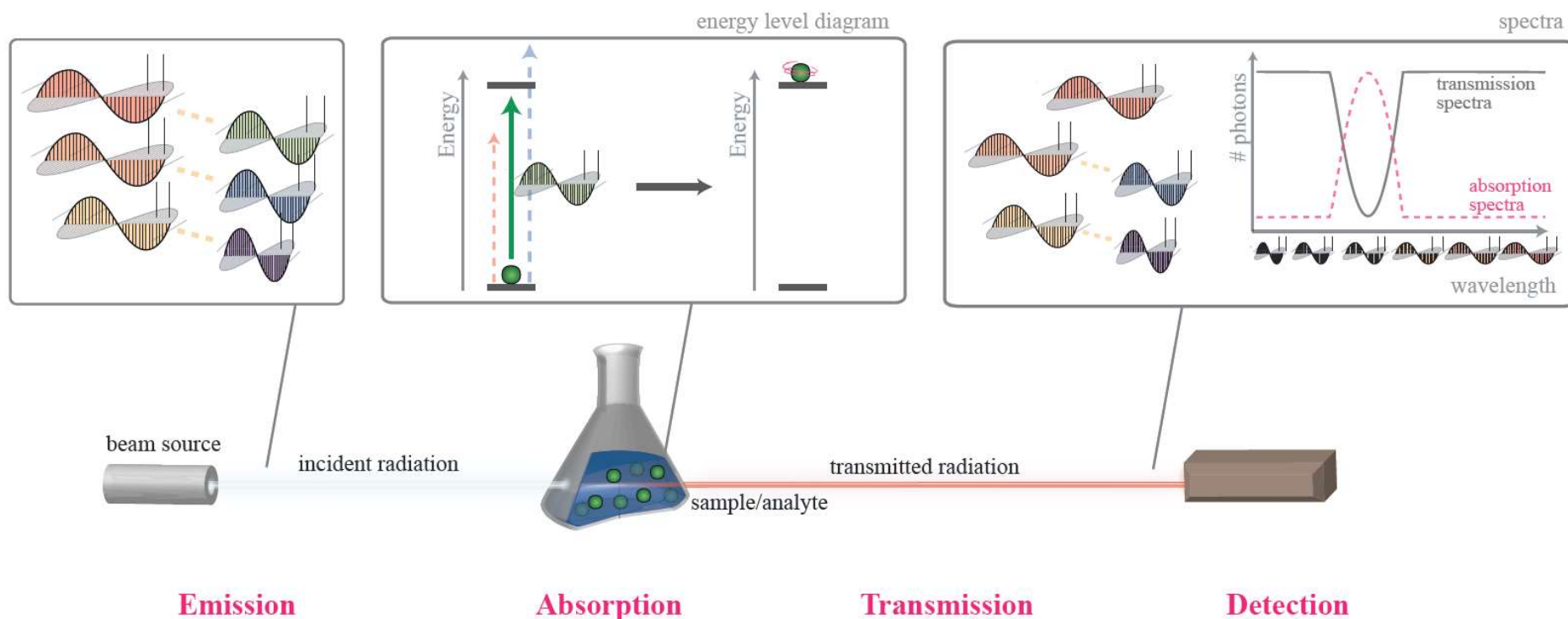
Light emitting diode (LED)



Light as a tool: Spectroscopy

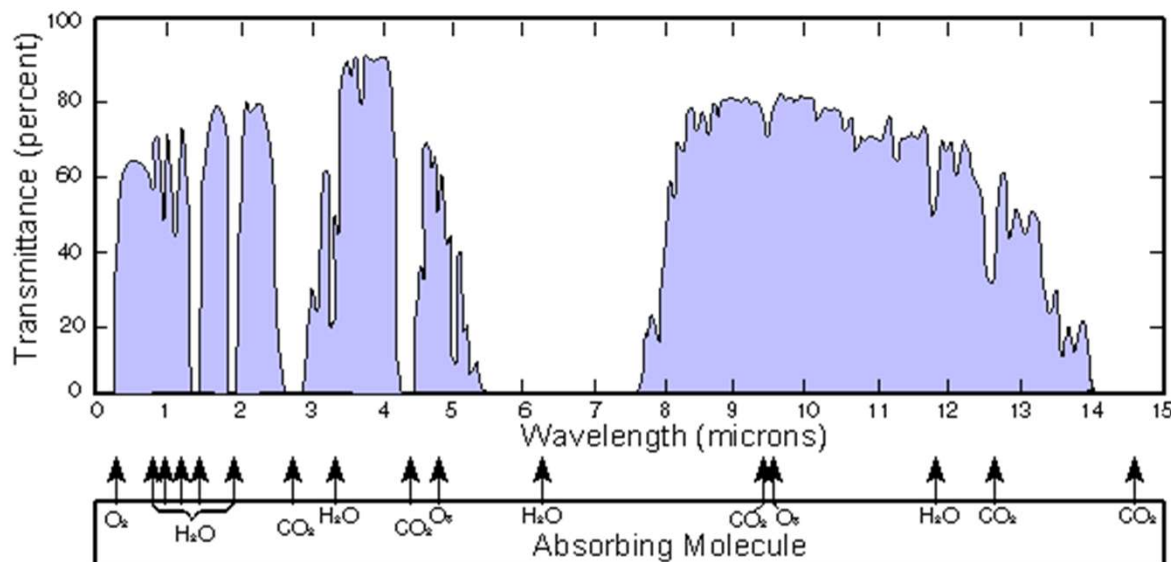
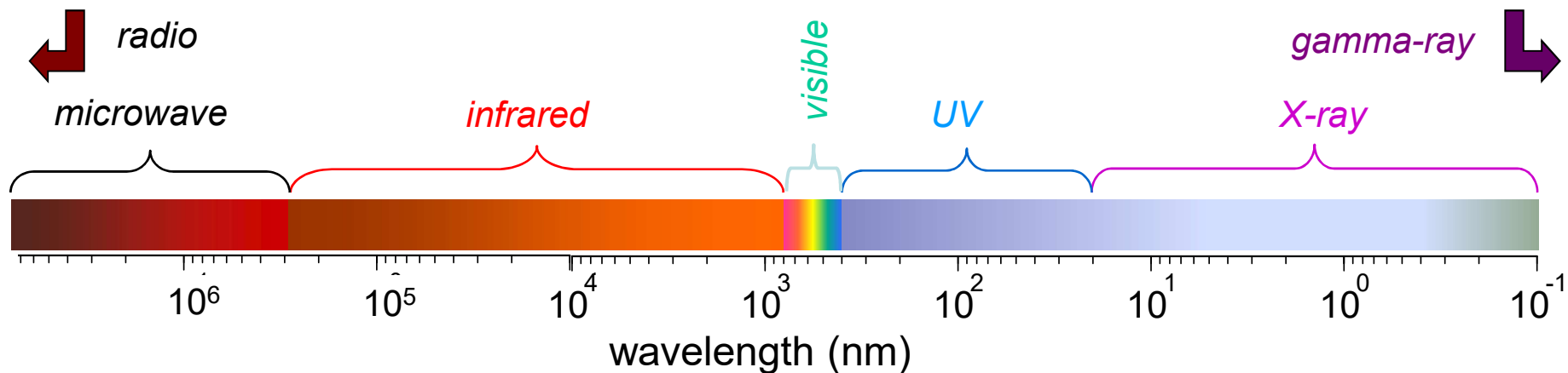


Light as a tool: Absorption spectroscopy

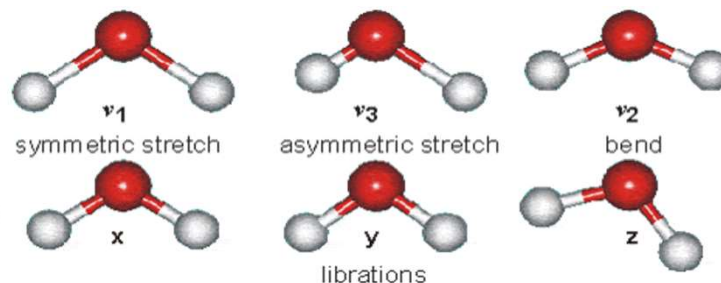


Why IR?

IR spectroscopy

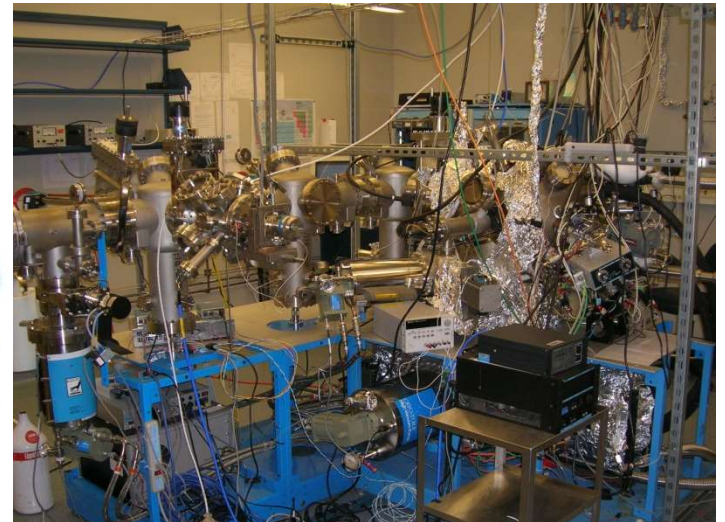
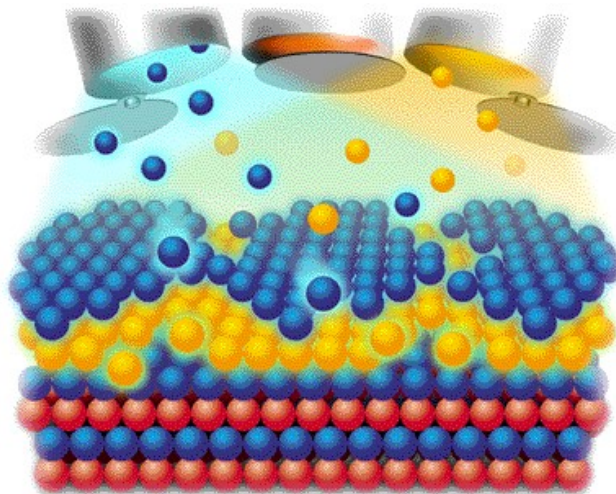


Water vibrations



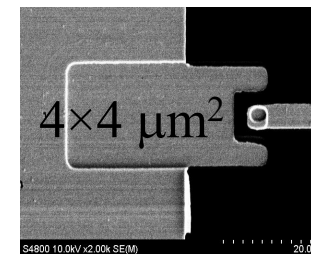
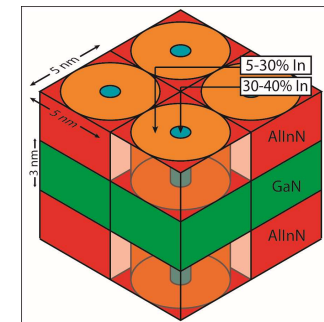
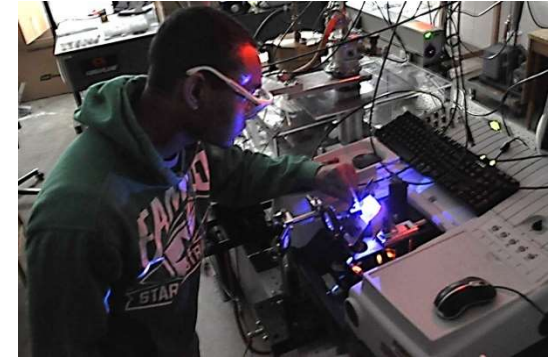
What do we do? New materials for IR lasers

Material growth: The materials are deposited one atomic layer at a time



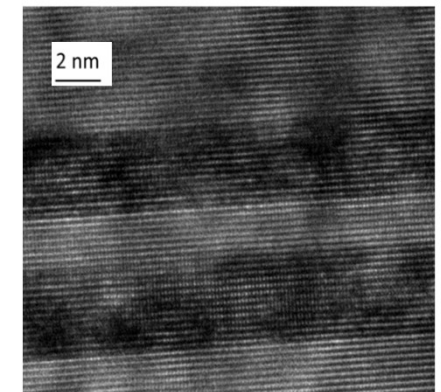
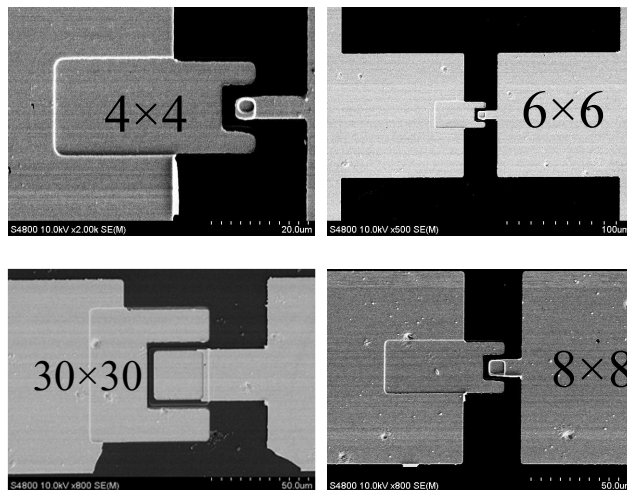
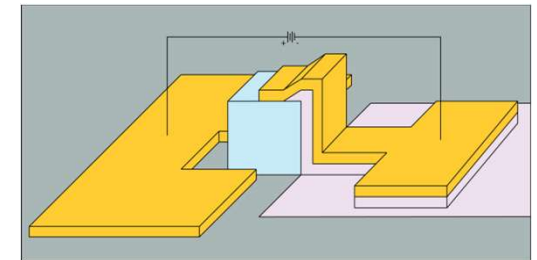
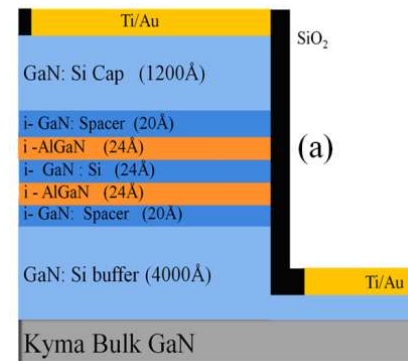
What do we do?

- Design of new materials
- Infrared spectroscopy
- Computer modeling of material properties
- Device fabrication and device measurements

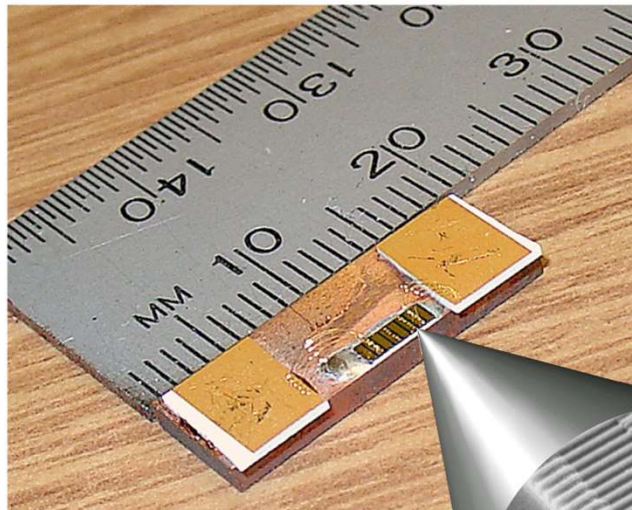


Device design, fabrication and testing

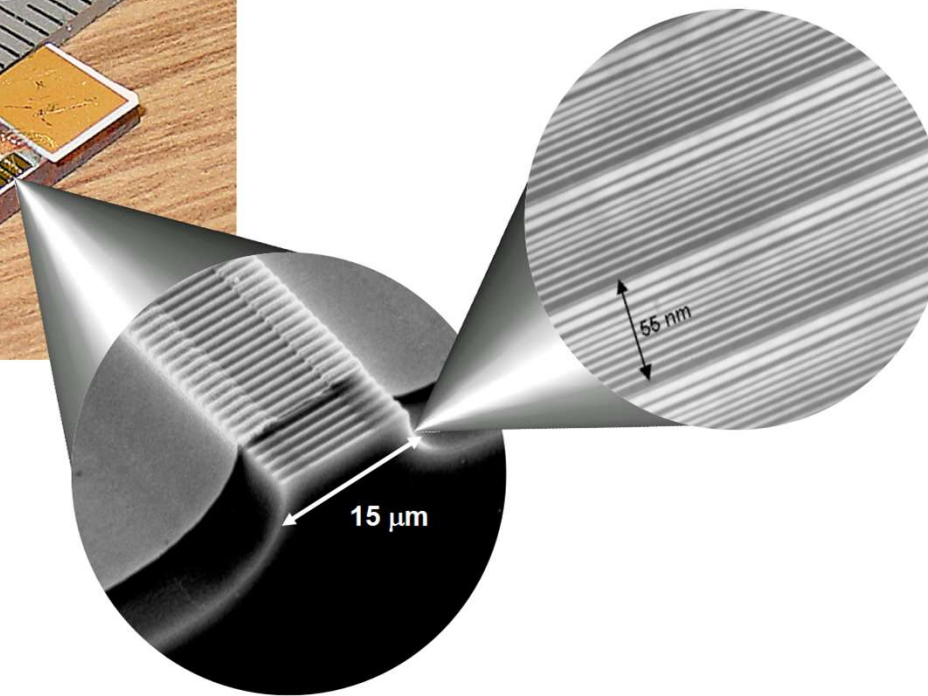
Device fabrication at the Birck Nanotechnology Center



Infrared laser devices



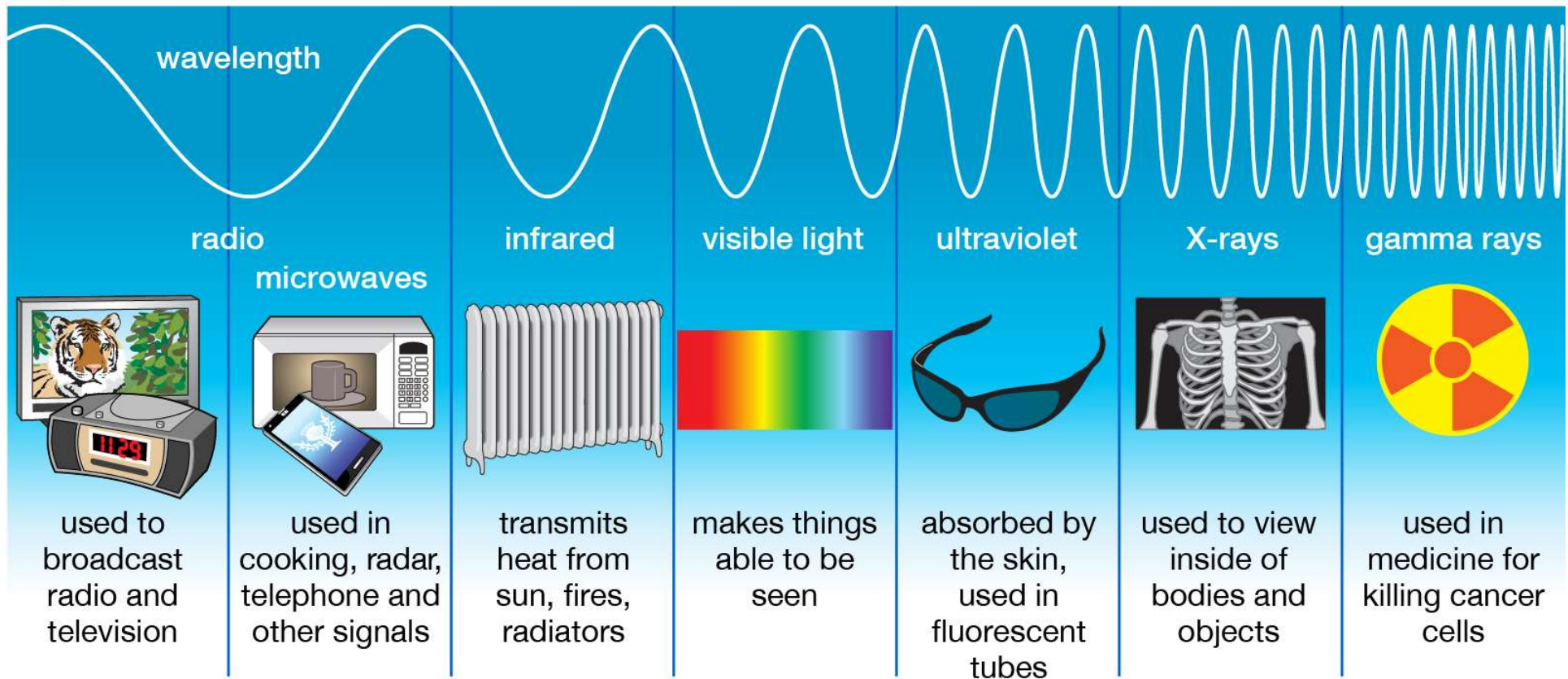
hundreds of
nanometer-size layers



Devices the size of a
human hair

Light

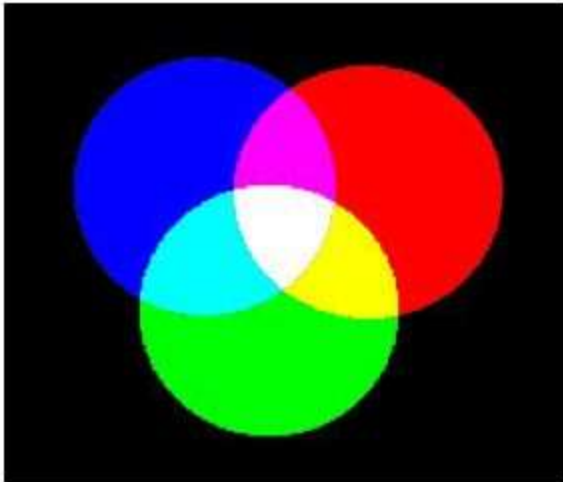
Types of Electromagnetic Radiation



Visible light - color

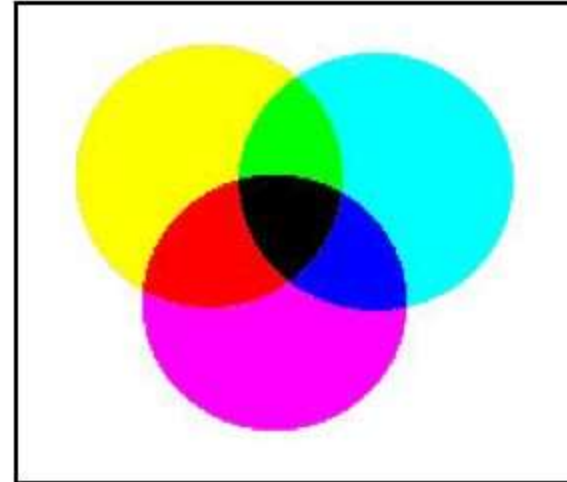
RGB

red, green, blue--
used in CRTs
Additive mixing of
light sources



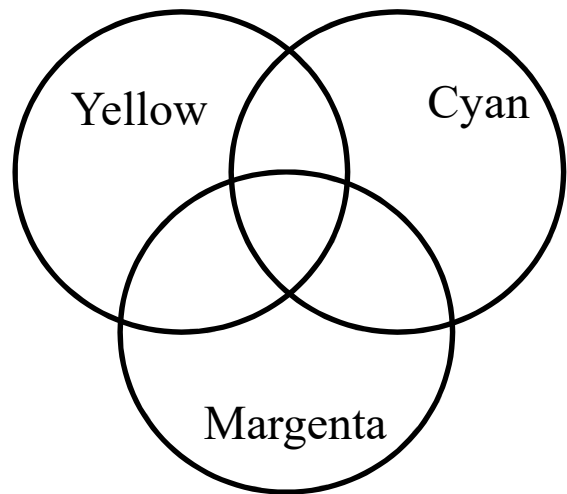
CMYK

cyan, magenta, yellow,
black—used in printing
Subtractive mixing of
absorbing pigments

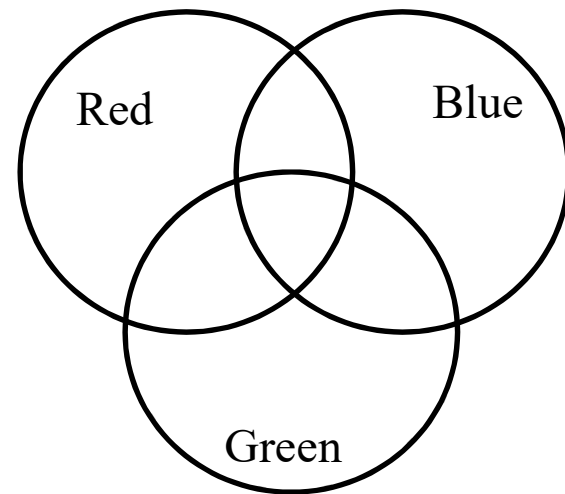


Visible light: experiments

**Mixing pigment (paint): color
in the circles with highlighters**



**Mixing light: observe finger
lights, then draw what you
see**



Invisible light Part 1: Ultraviolet radiation

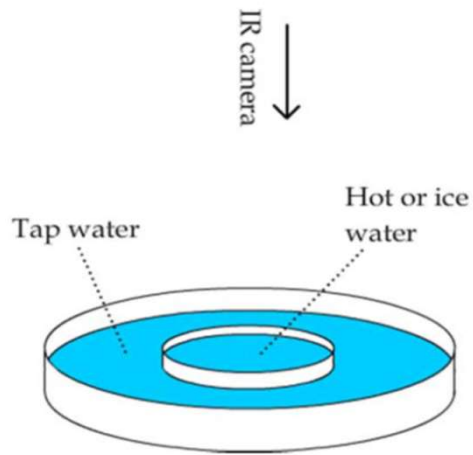
<https://www.youtube.com/watch?v=NJhuf0Um-Eo>

Invisible light Part 2: Infrared radiation

Exploring Infrared Imaging



Experiment: Infrared imaging of heat transfer



In this activity, you will put a cup of hot or ice water into a dish of tap water and observe what happens under an IR camera.