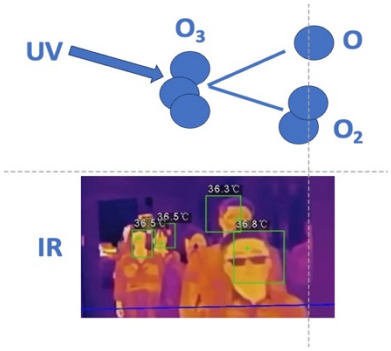
Invisible Light

In the previous essay we discussed the discovery of "light" at wavelengths outside of those that are visible to the human eye. We described both infrared and ultraviolet in terms of their wave-like properties. Infrared or beyond red is characterized by wavelengths longer than the 700 nanometers of red visible light. Ultraviolet is characterized by wavelengths shorter than the 400 nanometers of violet light.

After a century of research during the 1800s scientists worked out that light had the dual nature of both wavelike and particle like properties. Light acts like a particle in that each wavelength corresponds to a particular energy of what has come to be called a "photon."

The photons of infrared light are low energy. They are often referred to as "heat radiation". Every solid body emits radiation at infrared wavelengths depending on its temperature. The human body emits radiation at about 98° Fahrenheit. Night vision goggles and cameras detect people through the difference in temperature between the human body and the surrounding temperature. This was illustrated in the movie "The Thomas Crown Affair" (1999 version). The art thieves disabled the air conditioning system such that the temperature went up to body-heat temperature, which made it impossible to differentiate the images of the thieves as there was no difference with the background temperature.



Ultraviolet light, on the other hand, is at the higher end of the energy spectrum. The key behavior of UV is more like little bullets. A UV photon strikes a molecule and breaks it apart. An example is ozone, which is 3 oxygen atoms bound together as O_3. The UV photon breaks an oxygen atom off leaving regular oxygen O_2 along with the oxygen atom. More generally, UV photons are capable of breaking the bonds in many molecules, including DNA. We are most familiar with UV damage through sunburn that we experience with too much exposure at the beach. Sunscreens filter out the UV and prevent or decrease the effects of too much exposure to the Sun's UV. We will see in later essays how UV is intimately connected to ozone.