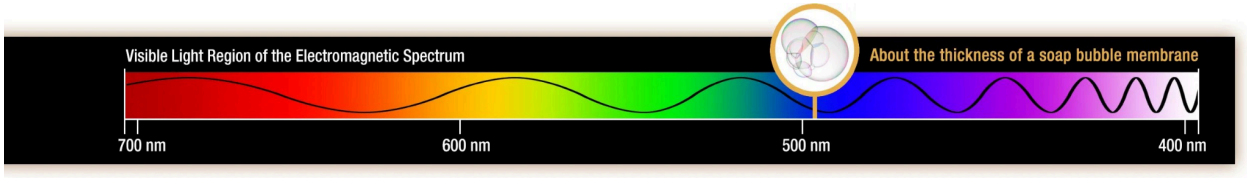
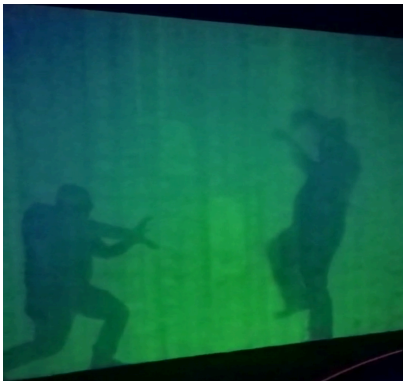
Luminescence

Light is made of waves, and what we see as **colored light is actually waves of different wavelengths and energies**. Red light has a longer wavelength and less energy, while blue light is shorter and has more energy. In the rainbow picture below [1], notice how the size of the wiggles, representing the wavelength of light, keeps changing as color changes. Wavelengths never repeat. **Each color of light has a unique wavelength (and energy), like a fingerprint**!



Try shining a laser pointer at a bottle of tonic water. If you try with red or green light, nothing will happen, as they don't have the right amount of energy. However, when you try it with near ultra-violet light, you will see the water glow blue! This is called **fluorescence, where a material absorbs light at one energy and re-emits it at another, lower energy**. Tonic water contains a chemical called quinine, which is able to absorb ultraviolet light. This excites the atoms and causes them to reemit it as blue light. The reemission happens almost instantly, so the tonic water will stop glowing as soon as the light is turned off [2].



Next, try shining a laser pointer at the green powder and paper on the table. Like the tonic water, only the blue, near-UV light has the right energy to cause a change. However, these materials glow green, and keep glowing after the light is turned off! This is known as **phosphorescence, and lasts longer than fluorescence**. The atoms in these materials get excited differently, so they emit a lower energy light for a much longer amount of time [3]. If you've ever seen glow-in-the-dark stars on a ceiling, or glowing walls at museums with shadows that "stay" after a flash like in the photo, this is how they work!

[1] National Aeronautics and Space Administration, Science Mission Directorate. (2010). Visible Light. Retrieved October 21, 2025, from NASA Science website: http://science.nasa.gov/ems/09_visiblelight

[2] The Editors of Encyclopaedia Britannica (2025, October 10). *fluorescence*. *Encyclopedia Britannica*. https://www.britannica.com/science/fluorescence

[3] Gundermann, K. (2023, June 29). *luminescence*. *Encyclopedia Britannica*. https://www.britannica.com/science/luminescence