What is light and how can we use it?

Who are we?

Prof. Stephanie Law and Prof. Matt Doty are both faculty in the Department of Materials Science and Engineering at UD who focus on the interaction of light with different types of materials. Prof. Law's research focuses on creating and measuring new materials in which light behaves in unusual ways, like bending backward, focusing into tiny spots, or moving very slowly. Prof. Doty's research focuses on understanding how light behaves in materials on ultra-fast timescales and how light behaves in very small structures.

Why light?

Most people are naturally curious about light, wondering why the sky is blue, how rainbows form, why objects look different underwater, how glasses and microscopes work, and so on. Educators can use this curiosity about light to introduce students to a variety of concepts including waves and colors, and a variety of technologies including solar cells and lasers. The physics of light does not require advanced math and can be made accessible to students with a variety of backgrounds

What will we learn?

- **What is light?** The first topic will explain the basics of light. We will discuss the idea of light as a wave, describe the electromagnetic spectrum from gamma rays through visible light to radio waves, and talk about reflection, transmission, and absorption of light. The wave concepts developed here can be applied to waves of any type.
    - This topic addresses the 8th grade storyline on Waves and Electromagnetic Radiation and the 4th grade storyline on modeling waves.
- **How can we use light?** This topic will focus on "ray optics." We will do a variety of hands-on demonstrations showing how light bends when it enters different materials, how lenses work to focus light, and what happens when multiple lenses are used together. The basics of ray tracing to predict the path of light will be taught.
    - This topic addresses the 1st grade storyline on understanding what happens to light when different materials are placed in the beam and the 8th grade storyline understanding how light is reflected, transmitted, or absorbed in various materials.
- **How do we perceive color?** This topic will focus on color. We will discuss how prisms break white light into the rainbow, what makes the colors different, why different objects have different colors, and how the human eye works including both color vision and color blindness.
    - This topic addresses the 12th grade physics storylines on Light and Color.
- **Other topics depending on interest.** Depending on the specific interests of the seminar participants, we are happy to cover any of the following additional topics: Lasers, non-visible light including x-rays, light from heat (infrared), microwaves, fluorescence, solar cells, optical communication, and LEDs.