

What to expect: Light

Light is such an important part of our daily world that we take it for granted. Humans and most of the animal world needs to have at least some minimum of light to see and experience their surroundings. Plants need light to grow.

However, when asking "What is light?", you may find that there may be as many answers as people you ask. If you go to Wikipedia you will find a very long entry. In fact, it took a long time until physics reached the understanding about light which it now has.

Only in the beginning of the 20th century physicists finally got a handle on understanding light. The reason why the phenomenon of light is more difficult to grasp is that light behaves like a wave as well as a particle.

In the first week you will be introduced to light as a wave, namely an electromagnetic wave. You will learn more about electromagnetic waves and their specific character. In contrast to water waves or sound waves, light waves do not need something to travel in. That's why you can see in deep space, but not hear anything.

In the 19th century, physicists generally believed that just as water waves must have a medium to move across (water), and audible sound waves require a medium to move through (air). Thus they thought that light waves require a medium, which was called the "luminiferous" (i.e. light-bearing) "ether". That this is not the case was shown by two physicists, Michelson and Morley at Case Western University in 1887. Michelson received the Nobel Prize for this discovery in 1907, becoming the first American winning a Nobel Prize.

Light being a wave leads to phenomena like diffraction and interference, something that is well known for e.g. water waves. Since the wavelength of visible light is so small, one has to look very closely to see this.

On the other hand light behaves like quanta or particles. In 1900 the physicist Max Planck had to postulate that light must behave like small energy packets (he called them quanta) in order to explain his observation about radiation from a black body. In 1905, Albert Einstein used the idea of light quanta to explain an observation that light shining on a metal could change current (the photo-electric effect), and suggested that these light quanta had a "real" existence. Einstein won the Nobel Prize for his interpretation and explanation about light.

Looking at light as a quantum will lead you into the microscopic world of atoms.

Your initial journey into light phenomena will end with Photometry, i.e. how light intensity is measured.