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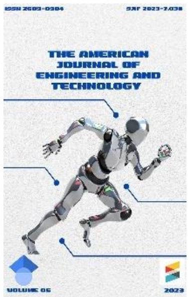

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Research Article

SOME CONSIDERATIONS IN THE STUDY OF LIDHT

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ABSTRACT

information about the preliminary work done on the study of light, the experiments conducted, the achievements and shortcomings, and the conflicting theories encountered. Experiments conducted by physicists were explained.

KEYWORDS

Red light, violet light, material point, point charge, point light source, light spectrum.

INTRODUCTION

The source of light for us, simply put, is the Sun. Some rays (X-rays, etc.) are the closest and most harmful types of light energy to human life. Over the years, a number of scientific mysteries have arisen regarding the properties of light and the properties of the sources that produce it.

As you readers know, the human eye can see light with wavelengths ranging from 0.4 microns (violet light) to 0.7 microns (red light). Light sources transmit energy into the surrounding space. The photometry department studies the energies emitted by light sources. It has several basic dimensions. The most important of them is the flow of light. Light sources can be divided into natural (Sun, lightning in the atmosphere) and artificial (electric lamps, gas discharge lamps, etc.). Just as in the mechanics section of a physics course the concepts of a point charge - a material point - are used, in the electricity section - in optics the concept of a point source of light, that is, a point source, is widely used.

A light source whose specific dimensions are negligible compared to the distance to the location under study is called a point source. A point source is also an idealized concept; it is assumed that it directs the light beam evenly in all directions. The branch of optics that studies the energy characteristics of light is called photometry.

The following quantities are used in photometry:

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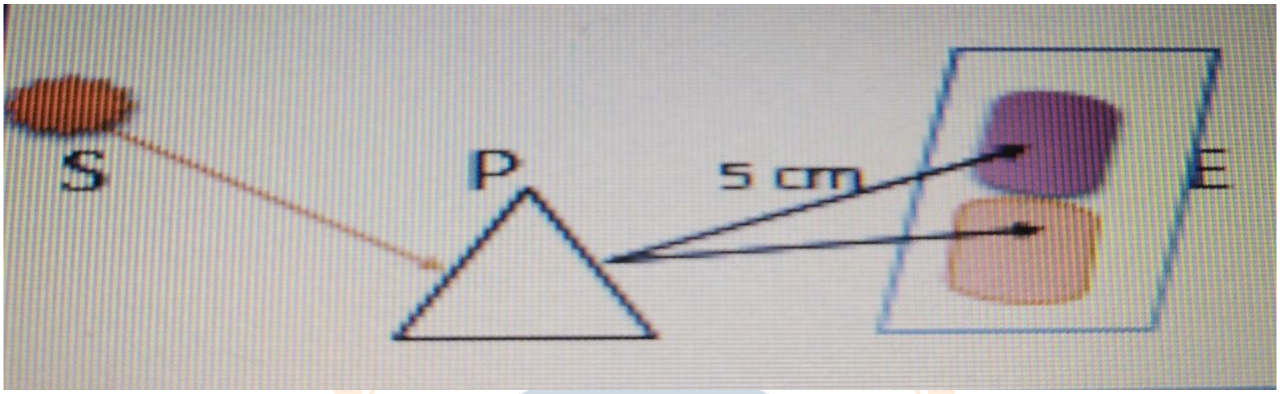
- energy quantities: in this case, the energy characteristics of light are considered without taking into account its impact on the receiver;

- characteristics of light: the physiological effect of light on the eye or other receptors is taken into account and, based on this effect, its power is estimated.

The main energy quantity of photometry is radiant flux.

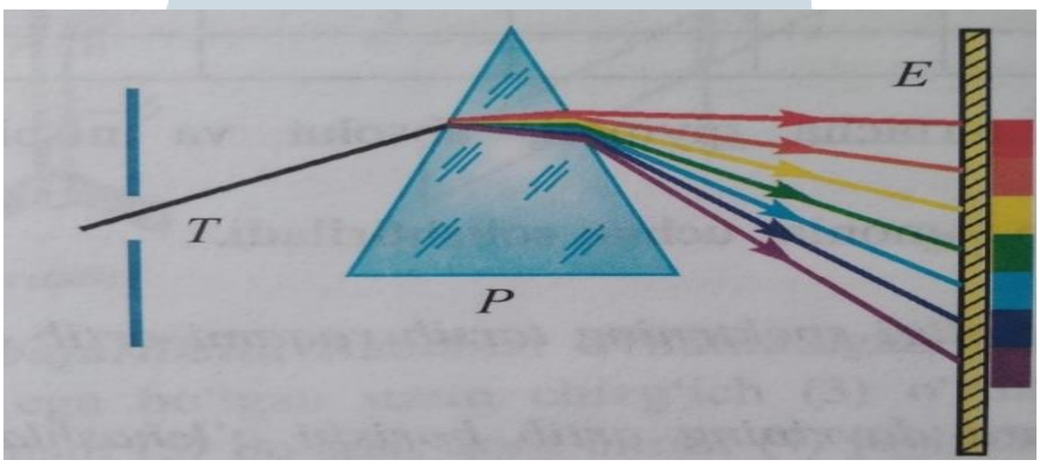
The great English physicist Isaac Newton also did a number of works on the study of light rays and achieved excellent results. Descartes' experiences (1620-1630) aroused Newton's interest in studying these properties of light and attracted his attention.



(Picture 1). Cartesian experience. Expression of the law of refraction of light.

He focused the light on a glass prism and saw that the light was divided into two parts (red and yellow) on white paper, which acted as a screen, at a distance of 5 cm from the prism. With the help of Ш, Descartes expressed the law of refraction of light.

Newton, who observed this experiment, focused his attention on the distance between the prism and the white paper that served as the screen, that is, the distance between objects. In his experiment, Newton introduced a beam of light through a slit into a darkened room and held a prism to it. The distance between the prism and the screen (wall) was increased to 5-6 meters. He then noticed that the light coming out of the prism was divided into 7 different colors on the screen (wall). Newton called the collection of different colors that appear when light passes through a prism a spectrum (from the Latin spectrum - to see).



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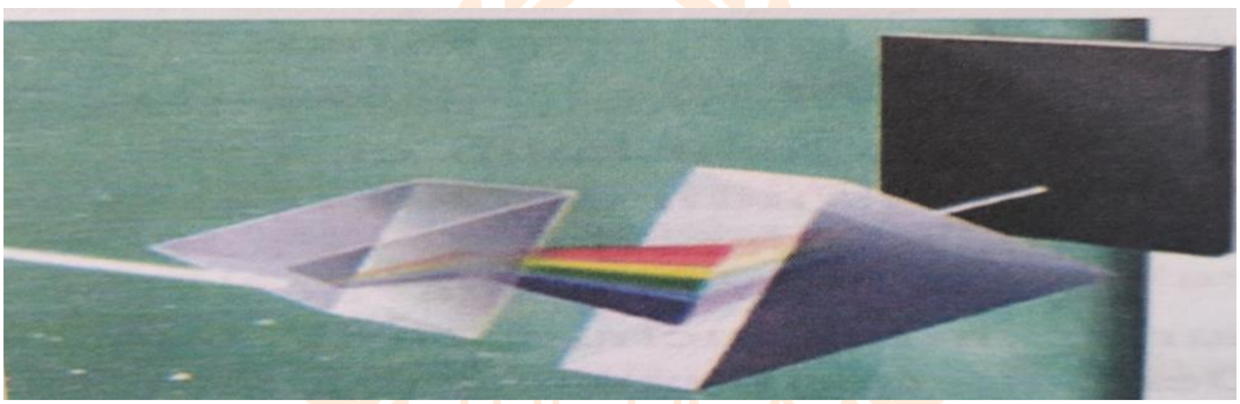
(Figure 2). The appearance of seven different colors when light passes through a prism.

Newton noticed that when the gap was covered with red glass, there was only a red spot on the wall, and when it was covered with green glass, there was only a green spot on the wall. Therefore, he also studied the refraction of rays. Although Newton did not know the reason for this, in this experiment he showed that white is a complex color. The spectrum (set of colors) consists of 7 different colors: red, gold, yellow, green, orange, blue and violet. Newton conducted many experiments proving the complexity of white. The modern analysis of this experience can be explained as follows;

If a second prism, rotated 180^0 relative to the first, is placed in the path of light, separated into colors after passing through the first prism, this prism will act as a converging lens, and the point where the light ray arrives from it, the concentrated substances will become white.



(Figure 3). The complexity of white. An experiment showing that light passing through a prism splits into seven different colors and returns to white light.

At the end of the 17th century, two conflicting theories about the nature of light emerged: one was the corpuscular theory created by Newton, and the other was Huygens' wave theory. According to the corpuscular theory of light, light is a stream of very small material particles (corpuscles) propagating at high speed. The color effect of light is explained by the flow of corpuscles: the largest corpuscles emit red light, and the smallest ones emit violet light.

According to the wave theory of light, light consists of a current propagating at high speed in a space consisting of an elastic medium. According to this theory, the laws of reflection and refraction of light are explained on the basis of laws that apply to all waves. The color of light depends on its wavelength. The colors of light (Spectrum) begin with red light with the longest wavelength $l=7.6*10^{-7}$ m and end with violet light with the shortest wavelength $l=3.8*10^{-7}$ m. Both theories satisfactorily explained the laws of some light phenomena , for example, the laws of reflection and refraction of light. However, phenomena such as interference, diffraction and polarization of light could not be explained by these theories.

By the end of the 18th century, most physicists gave preference to Newton's corpuscular theory. At the beginning of the 19th century, thanks to the research of the English physicists Young and Fresnel, the wave theory received great development. The Huygens-Young-Fresnel wave theory successfully explained all light phenomena known at that time, including light interference, diffraction and polarization.

In 1873, the English scientist J. Maxwell theoretically proved that light consists of electromagnetic waves propagating at a speed of $c=3*10^8$ m/s. G. Hertz confirmed this theory experimentally.

The achievements of the German physicist Wilhelm Wien are very effective in this area. In 1893, he published his scientific work on the spectral distribution of radiation from a heated body. V. Vin, using mathematical expressions, showed that as the temperature of heated bodies increases, the color of the radiation also changes.

In 1905, Albert Einstein, the great scientist studying light, took a bold step. The famous physicist M. Planck put forward the idea that light propagates in the form of separate portions, and A. Einstein believed that light has a quantum system, and this is a flow of light quanta (he showed that it consists of photons).

In 1928, Chandrasekhara Raman, a researcher at the University of Calcutta in India, and his students discovered that new spectral lines appeared near the red and blue colors of the main spectrum when studying the composition of the spectrum of light after passing through various substances. This physical phenomenon was later called the "Raman effect."

Discoveries in the study of new properties of light have not gone unnoticed. In 1911 W. Wynne, 1918 M. Planck, 1921 A. Einstein, 1923 R. Milleken, 1927 A. Compton and 1930 K. Raman studied the properties of light and received the Nobel Prize for physics for his great discoveries.

The search for new discoveries and inventions related to light continues today. Much work in this direction is being carried out in all countries of the world, including in Uzbekistan.

This scientific article on the study of light is recommended reading for students interested in the properties and nature of light.

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