Diffraction of Light

by Hamid – October 2012

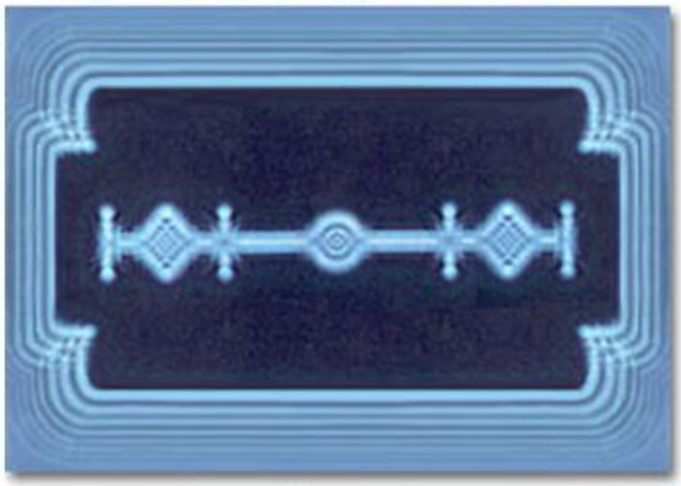
Usually it is believed that diffraction finds ready explanations only in terms of the wave theory of light, whereas on the basis of new investigations this theory itself is essentially wrong [**1**]. This theory advanced by *Christian Huygens (1629-1695)* and used by *Thomas Young (1773-1829)* to explain double-slit experiment. Here, it is aimed to highlight the insufficiencies of such explanations and to prove that the results of diffraction experiment, the same as the results of double-slit experiment, are strong convincing evidence for particle nature of light. The following explanations are part of an internet source; they are generally almost common in many other sources that analyze diffraction phenomenon:

"*In his 1704 treatise on the theory of optical phenomena (Opticks), Sir Isaac Newton wrote that "****light is never known to follow crooked passages or to bend into the shadow****". He explained this observation by describing how particles of light always travel in straight lines, and how objects positioned within the path of light particles would cast a shadow because the particles could not spread out behind the object.*

On a large scale, this hypothesis is supported by the seemingly sharp edges of shadows cast by rays from the sun. However, on a much smaller scale, when ***light waves*** *pass near a barrier, they tend to bend around that barrier and spread at oblique angles. This phenomenon is known as diffraction of the light, and occurs when* ***a light wave*** *passes very close to the edge of an object or through a tiny opening, such as a slit or aperture. ……*

A very simple demonstration of light diffraction can be conducted by holding one hand in front of a strong light source and slowly bringing two fingers close together while observing the light transmitted between them. As the fingers approach one another and come very close together (almost touching), one can begin to see a series of dark lines parallel to the fingers. The parallel dark lines together with the bright areas between them are actually ***diffraction patterns****. This effect is clearly demonstrated in the below figure, for diffraction rings that appear surrounding the sharp edges of a razor blade when it is illuminated with intense blue light from a laser source. …..****"***

Light Diffraction by a Razor Blade



http://micro.magnet.fsu.edu/primer/lightandcolor/diffractionintro.html

According to this kind of logic, diffraction occurs because when **light waves** pass near a barrier they tend to bend around that barrier and spread at oblique angles! This

explanation is of course not convincing because there isn't any reasoning behind it, but rather is only a belief and a poor justification of wave theory of light. In fact; within the current dominant paradigm [**1**], it is impossible to find the cause of formation of dark and bright fringes in diffraction phenomenon, the pattern of which is similar with double-slit patterns, as can be seen in above figure. In other words, the existing and most widely accepted interpretation of quantum mechanics is unable to explain this phenomenon. It should be reminded that on the basis of Thomas Young's wave theory, combination (superposition) of two light waves is the reason for formation of double-slit patterns. But in this experiment a razor blade is illuminated with intense blue light from **a laser source**, nevertheless dark and bright fringes have been formed. Why? It can be answered only by a realistic and logical interpretation of quantum mechanics, through which we can prove that light has only particle nature. It paves the way for understanding and interpreting ***the quantum gravity*** and ***the theory of everything*** [**2**].

Diffraction experiment and also double-slit experiments represent the **difference** between and the classification of particles, in accord with "**the new probability wave function***".* **Diffraction** (*Bending, Beugung, Tafarogh*) is the only phenomenon that occurs in every one of these experiments.

When the barrier used in diffraction experiment is illuminated with the main source of light particles, regardless of the characteristics of this source the barrier provides a huge number of point sources of light that all together make a secondary source. The edges of the barrier, or the cutting edges of small opening(s) on the barrier, determine the shape of secondary source that itself determines the general shape of pattern on the screen. Look at the above figure again. Therefore, we can say:

1) The edge of a barrier like a thin card or a razor blade (for example, the upper edge) provides a linear source of light. This linear source consists of a huge number of point sources which are so closely placed near each other that they seem like a line.
2) Two cutting edges of a slit on the barrier together play the role of two parallel linear sources that are very near to each other. Both patterns coincide nearly to and strengthen each other. It is the case that happens in one-slit experiment.
3) The cutting edges of two slits on the barrier together play the role of four parallel linear sources that are very near to each other. Four patterns coincide nearly to and strengthen each other. It is the case that happens in double-slit experiment.
4) When the barrier is a diffraction grating, which has closely-spaced, fine and parallel grooves, the grating, as secondary source, plays the role of a multiple parallel sources.
5) When the diffraction phenomenon appears by a circular aperture, the pattern is circular. In this case, the cutting edge of aperture on the barrier plays the role of a ring-shaped source of light.

References:

1. More details regarding the current dominant paradigm of "wave theory" and "wave-particle duality" of light are provided in the following articles:
   - The Failure of Thomas Young's Wave Theory, toequest.com. June 2012.
   - Der Misserfolg von Thomas Young Wellentheorie , toequest.com, Juli 2012.
2. More details regarding *quantum gravity* and *theory of everything (TOE)* are provided in the following articles:
   - Exact Planck Length Unveils Quantum Gravity , toequest.com, August 2011.
   - Genaue Planck-Länge enthüllt die Quantengravitation , toequest.com, März 2012.