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Abstract

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The Odyssey of Light

Light seems timeless yet it has a history, it is the history of the human understanding of its nature. Its history is complicated and even tortuous, as it reflects perfectly ways often science progresses. It first goes some way ahead followed by some backtracking, then taking new directions, to find itself in a cul-de-sac facing utter confusion and looking for a new synthesis. The ancient Greeks have already developed a respectable body of knowledge about it. Has not Archimedes burned at distance the invading fleet threatening Syracuse using the power of the Sun concentrated through mirrors? Even if the story is a legend it shows at least that people have considered optics in its practical aspects.

It was through Hassan Ibn al-Haitham from the city of Basra in actual Iraq that the revolution occurred as he clearly spelled out for the first time the way human vision proceeds. For this paradigmatic shift, he is considered as the father of optics. Beside the use of lens which ultimately led to the fabrication of the first refractor then the microscope in the century, the hotly debated issue on the theoretical front at the Renaissance was on its nature. Each of the corpuscular and the wavy nature of light had its champions and it was not until the beginning of the 18th century with the discovery of polarisation but especially the interference phenomena in the Young's two slits experiment that the wave nature of light won the day and Newton's viewpoint lost. In the mean time, a deep connection between electricity and magnetism was unearthed by the Danish physicist Oersted. What further consolidated the victory of the wavy nature of light was Maxwell's theory which subsumed all what was ever known about light, electricity and magnetism in four wondrous equations, a crowning moment for mathematical physics. The twentieth century, the century of the quanta brought a new twist in the story of light. As hinted by Planck in 1900 and

boldly postulated by Einstein in 1905 to explain neatly a number of unsolved mysteries, light has to be made of corpuscles or photons as those grains of light were baptised later on. Yet the wave aspect of light was needed to properly explain a host of other phenomena and so we had to live with this contradiction, politely called dualism. The development of quantum theory in the twenties and its subsequent extension called quantum field theory brought some appeasement and has "shown" how we could peacefully live with this schizophrenic behaviour of light without developing schizophrenia oneself.

Laser too is a pure product of quantum theory. It is concentrated light coming in one unblended color which brought new light to its behavior and opened up a wide range of applications from cutting iron sheets, to the CD-ROM reader we use in our computers to measuring the Earth Moon distance with centimetric accuracy.

Have we unravelled all the secrets of light? You bet not.