

Classical Optics

Reading Notes of Quantum Optics by M. Fox

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1 Maxwell's Equations and Electromagnetic Waves

The classical description, which is based on the theory of electromagnetic waves governed by Maxwell's equations, is adequate to explain the majority of optical phenomena and forms a very persuasive body of evidence in its favour. It is for this reason that most optics texts are developed in terms of wave and ray theory, with only a brief mention of quantum optics, only when classical explanations are inadequate.

The Theory of light as electromagnetic waves was developed by Maxwell in the second half of the nineteenth century and is considered as one of the great triumphs of classical physics.

► **Electromagnetic Fields:** Maxwell's equations describe two fundamental electromagnetic fields. Hence the name, electric and magnetic fields are the two. With two other variables related to these fields, **Electric Displacement D** and **Magnetic Displacement**. These two are where we included the effects and response of the medium that the fields are propagating into.

► The Dielectric response of a medium is determined by the **Electric Polarization P**