The growing interest in understanding the nature and even the possibility of manipulation of nature for the well being of the society is the aim of any systematic study of science. As Robert Matthews, Science correspondent, the London Sunday Telegraphs writes ‘It is all around you, yet you can not feel it. Its effect may have lit up the universe in the big bang but today just lights up your office, yet it is nothing.’ Such are the paradoxical features of one of the hottest topic in contemporary physics, the ‘vacuum’. Many researchers see vacuum as the central ingredient of 21st century physics. Peter Milonni of Los Alamos National Laboratory in New Mexico says that the vacuum can have all sorts of wonderful effects over an enormous range of scales, from the microscopic to cosmic. It is proving to be reservoir of magical effects: force fields that emerge from nowhere, particles popping in and out of existence. Some even contemplates the prospect of harnessing limitless supply of energy.

Three American physicists B.Haisch, H.E.Puthoff and A.Rueda recently developed a revolutionary concept. They proposed that the interaction of fluctuations in vacuum in the form of electromagnetic radiation with matter at the level of quarks and leptons is the origin of inertia and accounts for the Newton’s laws. Their work is based on the Apriori assumption of the existence of zero point energy as proposed by stochastic electrodynamics. They have initially worked out a mechanism in which the interaction of vacuum radiation with matter at the level of quarks and leptons gives rise to resistance for
accelerated motion that may partially account for inertial mass of objects. Later the same group of scientists proposes another theory.

According to them the physical momentum of an object is related to the radiative momentum flux of the vacuum instantaneously contained in the characteristic proper volume of the object. The interaction process between the accelerated object and the vacuum appears to generate a physical resistance (reaction force) to acceleration suggestive of what has been historically known as inertia. They have presented an approach to understanding the origin of inertia involving the electromagnetic component of the quantum vacuum and propose this as a step towards an alternative to Mach's principle. They put forward that preliminary analysis of the momentum flux of the classical electromagnetic zero-point radiation impinging on accelerated objects as viewed by an inertial observer suggests that the resistance to acceleration attributed to inertia, may be at least in part, a force of opposition originating in the vacuum. This analysis avoids the ad hoc modeling of particle-field interaction dynamics used previously by Haisch, Rueda and Puthoff to derive a similar result.

In the present study, a slightly deviated approach is taken up and the possibility of the presence of an all-pervading force field medium of electrical origin is anticipated. If such a medium, namely, Equilibrium Cosmic Field is accepted then that may substitute the hitherto abandoned ether medium. The inertia of an object may be explained on the basis of the interaction of ECF and accelerating charge-object.
In the first chapter the characteristics of matter, charge, fields, and energy are critically analyzed and the concept of force field is enlightened. The basic requirement of a medium for the propagation of electromagnetic energy is presented. The chapter two deals with the electric nature of the universe. The presence of an Equilibrium Cosmic field is envisaged from the fundamental concept of classical electrodynamics. In the chapter three the possibility of the ECF to account simultaneously for the wave concept and the quantum concept of radiant energy is presented.

The vacuum fluctuations that give rise to the zero point energy of the vacuum, which, till date is either an adhoc assumption or simply taken to be an out come of quantum laws. An explanation of zero point energy on the basis of ECF is attempted in chapter four. The vacuum fluctuation is expected to be due to the intrinsic motion of the charge-particles in the cosmic field. The chapter four deals with quantum nature of radiation, emission and absorption processes and accounts for the Lamb shift on the basis of Equilibrium Cosmic Field.

In chapter five, an attempt is made to show that the inertial mass of an object is the consequence of the interaction between the ECF and charge-object. The space is modified by the presence of fields and the equilibrium cosmic field is the reservoir of energy. At the end, the out come of the present analysis is summarized in chapter six.

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