MR2001084 (2004g:78003) 78-02 (78A02)
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★**Advanced electromagnetism and vacuum physics.**
World Scientific Series in Contemporary Chemical Physics, 21.
World Scientific Publishing Co., Inc., River Edge, NJ, 2003. *xviii*+774 *pp*. $96.00.
ISBN 981-238-367-0

This nonclassical book is dedicated to a large audience of researchers: scientists, engineers, professors and students wise enough to keep a critical outlook whenever confronted with the chilling dogmas of contemporary physics and also a critical stance with respect to the present book. According to the author, readers will find a tantalizing amount of material calculated to nurture their thoughts and arouse their suspicions, to some degree at least, on the so-called validity of today's most celebrated physical theories.

The author claims to prove from a mathematical point of view that Maxwell's equations are not complete since a scalar polarization must be taken into account in the equations. In spite of the success of the Maxwell theory in our present technology, the author believes that the last word on Maxwell's equations has not yet been said. For him, the reason is that Maxwell's equations raise a number of fundamental questions which have not been answered in a satisfactory manner to date. In view of a prevalent trend towards a hydrodynamic description of matter and radiation, the author proposes in this book another hydrodynamic wave model for the existence and the propagation of matter and radiation in the vacuum where equations of electrodynamics can be derived from simple fundamental principles. He claims to answer the above unanswered questions. His approach is essentially rooted in the possible existence of scalar inhomogeneous waves in the vacuum.

According to present ideas, there is no ether. However, the modern view of the vacuum is closely related to the presence of a fluctuating field in the vacuum. The energy, also called zero-point energy, associated with motion, persists even at the absolute zero of temperature, where classically all motion ceases. Therefore, the author considers that the concept of an ether is back in physics through the existence of a fluctuating quantum vacuum. There is no doubt concerning the reality of vacuum field fluctuations which must be taken into account in explaining the Lamb shift, the Casimir effect and spontaneous emissions. More and more physicists think that vacuum physics holds the keys to a full understanding of the forces of nature and the constitution of matter and radiation, which justifies the title of this book.

The author admits that his book contains a number of concepts and new theoretical results some of which are in contradiction with the interpretation generally admitted by the scientific community. However, the author is convinced that the formulation of physics from a wave point of view brings a consistent interpretation of our surrounding physical universe and paves the way for brighter insights into and better understanding of matter and radiation. Here is a review of some of the most salient features the reader may find in this book.

The first point deals with the fundamental role played by Newton's third law in physics. This law allows us to distinguish between internal and external forces within a system. Whatever the physical origin of these forces, this law must apply everywhere in physics. Besides, the violation of this law implies the existence of an ether which serves as a supporting medium accounting for the existence and the propagation of matter and radiation. Theoretical considerations and numerous experiments reviewed in this book demonstrate how stubborn certain physicists are: denying the physical existence of such an ether is not justified any more.

The second point deals with the discovery of soliton solutions in the framework of a linear theory and the possibility for a wave packet to propagate with a constant shape in a dispersive medium. Indeed, the study of the properties of dissipation and dispersion of hyperbolic equations has shown itself far richer than the description usually given in the literature. The error, made by all the authors since L. de Broglie's first work on wave packets, consists in considering one-dimensional wave packets of homogeneous waves and imposing twice the relation of dispersion in the formulation of the wave packet. In fact, the author demonstrates that all hyperbolic equations admit soliton solutions. Two causes account for the existence of such solutions:

- The first one is the existence of several ways to compose Fourier modes to form a wave packet.
- The second is the possibility of forming a wave packet from inhomogeneous standing waves.

Consequently, the material particles and the mediator particles which are associated to the forces can be represented by inhomogeneous standing wave packets. These wave packets are real entities intertwined with the wave medium in which they move, which should make it possible to solve the problem of wave-corpuscle duality. The physical concept of a wave packet is indispensable for the understanding of the three main theories (electromagnetism, quantum mechanics and general relativity) which describe the physical universe. Indeed, it allows us to explain the interaction between matter and radiation and the propagation of matter and radiation by supposing that the deformation of the wave medium in the shape of radiation can penetrate matter to put it in motion. If the electron and photon are point particles without any spatial extension, then their interaction is impossible either by a process of collision or by any wave phenomenon through their associated fields. Even in classic mechanics, one knows that the concept of a material point is a mathematically idealized image used only with the aim of facilitating the calculations.

The third important point of this book is the new interpretation proposed for quantization which results from the deformation of the waves during their phase of acceleration. The impossibility for these waves to deform in a manner different from an oscillatory way implies the existence of a quantization in $\hbar$ and q^2. Far from being a discontinuous phenomenon, quantization is on the contrary a wave effect. Indeed, if an observer imposes in an experiment initial and boundary conditions at variance with the properties of propagation and deformation of these waves, there will result a quantization of the observed phenomenon because the wave medium imposes its law. This new approach is consistent with both the wave and quantization aspects that one finds for example in the theoretical and experimental study of solid state physics. The periodic structure of solids and the principle of superposition of waves allow one to explain the behavior of the free or weakly bound electrons and to introduce the notion of the effective mass of an electron. All this reveals a profound unity of physics. If the probabilistic approach of quantum mechanics allowed us to successfully predict the results of numerous experiments, it did not however give a clear description of the physical Universe and reconcile the two points of view of wave and corpuscle. In contrast, the approach described in this book gives a clear and substantial description which appears to be capable of proposing physical mechanisms working together in the physical Universe within the framework of a linear theory. Certainly, the author agrees that the approach presented in this book is still incomplete in numerous aspects and would require an important research effort to offer a completely satisfactory alternative to the theories used at the present time. If this approach should turn out to be inaccurate, he thinks it would then be necessary to reconsider all of physics in a new framework related to non-linear theories. However, nothing at the present time justifies the questioning of a physical principle as important as the principle of superposition of waves in the vacuum.

The fourth point concerns the meaning of restricted relativity theory, which is neither relative nor restricted. The existence of the factor γ can be understood easily if one admits that material particles are constituted by standing waves. Relativity theory is not the consequence of a change of reference frame, because the covariance of the laws of physics is not a necessity imposed by nature. Furthermore this theory does not imply a change of reference frame but only a change of coordinates. Besides, so-called restricted relativity theory is not limited to uniform movement, as proved by the existence of relativist dynamics of the accelerated motion of particles in the laboratory frame. Indeed, it is particularly remarkable that no relativist physicists try to explain the presence of the γ-factor which differentiates Newtonian dynamics of the relativistic dynamics in the laboratory frame. This γ-factor depending on time can certainly not result from a change of reference frame. That is why the author takes great care to distinguish the Lagrangian point of view of following a particle in a given reference frame from the point of view of a change of reference frame. Furthermore, it is impossible to put a particle in uniform motion with respect to a given reference frame without previously communicating an acceleration; it follows that the dichotomy made by relativity theory between uniform motion and accelerated motion is then incomprehensible.

The critical study of relativity theory presented in this book shows that this theory cannot give a satisfactory description of some experiments: Doppler effect, Sagnac effect, Mössbauer effect, experiment of Michelson and Morley, experiment of Hafele and Keating. This led the author to reinterpret the experiment of Hafele and Keating and to propose an experiment to confirm his new interpretation. Some physicists assert that the theory of relativity was proved with a great precision on the experimental level. This assertion has no foundation because on one hand the precision reached in the measurement of the kinetic energy of a bundle of particles in an accelerator is about 0.3%, and on the other hand no one has ever made measurements in different inertial frames and compared the measurements to demonstrate the change of space-time units predicted by the theory. Besides, apart from the experiment of Hafele and Keating, all the experiments have been made in the reference frame of the Earth. However, the experiments with an electrostatic pendulum of Trouton-Noble and other experiments described in this book proved that the absolute motion of the Earth in the ether can be observed by internal experiments. These experiments allow us to reject the special theory of relativity. Such criticisms have not been lacking since the advent of the special theory of relativity, they have been the object of a censorship unequalled in the history of science.

The author puts in evidence throughout his book a thread, namely the study of longitudinal inhomogeneous waves, which made it possible to interpret relativity theory and quantization from a wave point of view. Moreover, the study of inhomogeneous standing waves in the ether allowed us also to find Maxwell's equations. So the three main theories which govern the physical Universe can be described and understood in a simpler manner if one admits the existence of inhomogeneous standing waves in the ether.

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