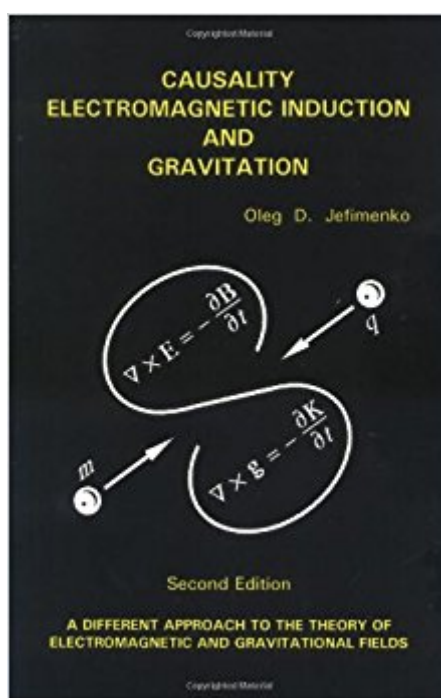


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Causality, Electromagnetic Induction, And Gravitation: A Different Approach To The Theory Of Electromagnetic And Gravitational Fields, 2nd Edition



Synopsis

This book is a strikingly new exploration of the fundamentals of Maxwell's electromagnetic theory and of Newton's theory of gravitation. Starting with an analysis of causality in the phenomenon of electromagnetic induction, the author discovers a series of heretofore unknown or overlooked electromagnetic interdependencies and equations. One of the most notable new results is the discovery that Maxwell's equations do not depict cause and effect relations between electromagnetic phenomena: causal dependencies in electromagnetic phenomena are found to be described by solutions of Maxwell's equations in the form of retarded electric and magnetic field integrals. A consequence of this discovery is that, contrary to the generally accepted view, time-variable electric and magnetic fields cannot cause each other and that both fields are simultaneously created by their true causative sources -- time-dependent electric charges and currents. Another similarly important discovery is that Lenz's law of electromagnetic induction is a manifestation of the previously ignored electric force produced by the time-dependent electric currents. These discoveries lead to important new methods of calculations of various electromagnetic effects in time- depended electromagnetic systems. The new methods are demonstrated by a variety of illustrative examples. Continuing his analysis of causal electromagnetic relations, the author finds that these relations are closely associated with the law of momentum conservation, and that with the help of the law of momentum conservation one can analyze causal relations not only in electromagnetic but also in gravitational systems. This leads to the discovery that in the time-dependent gravitational systems the momentum cannot be conserved without a second gravitational force field, which the author calls the "cogravitational, or Heaviside's, field." This second field, first predicted by Heaviside, relates to the gravitational field proper just as the magnetic field relates to the electric field. The author then generalizes Newton's gravitational theory to time-dependent systems and derives causal gravitational equations in the form of two retarded integrals similar to the retarded integrals for the electric and magnetic fields introduced previously. One of the most important consequences of the causal gravitational equations is that a gravitational interaction between two bodies involves not one force (as in Newton's theory) but as many as five different forces corresponding to the five terms in the two retarded gravitational and cogravitational field integrals. These forces depend not only on the masses and separation of the interacting bodies, but also on their velocity and acceleration and even on the rate of change of their masses. A series of illustrative examples on the calculation of these new forces is provided and a graphical representation of these forces is given. The book concludes with a discussion of the possibility of antigravitation as a consequence of the negative equivalent mass of the gravitational field energy.

The book is written in the style and format of a textbook. The clear presentation, the detailed derivations of all the basic formulas and equations, and the many illustrative examples make this book well suitable not only for independent studies but also as a supplementary textbook in courses on electromagnetic theory and gravitation. The second edition of the book refines and improves the first edition, especially in the presentation and development of Newton's gravitational theory generalized to time-dependent gravitational systems. The book has been augmented by several new Appendixes. Particularly notable are Appendixes 5, 6, and 8. Appendixes 5 and 6 present novel "dynamic" electric and gravitational field maps of rapidly moving charges and masses. Appendix 8 contains the little-known but extremely important Heaviside's 1893 article on the generalization of Newton's gravitational theory.

Book Information

Paperback: 224 pages

Publisher: Electret Scientific Co; 2 edition (March 14, 2000)

Language: English

ISBN-10: 0917406230

ISBN-13: 978-0917406232

Product Dimensions: 0.8 x 6 x 9 inches

Shipping Weight: 12 ounces (View shipping rates and policies)

Average Customer Review: 4.4 out of 5 stars 11 customer reviews

Best Sellers Rank: #811,890 in Books (See Top 100 in Books) #112 in [Books > Science & Math > Physics > Gravity](#) #556 in [Books > Science & Math > Physics > Electromagnetism](#) #26750 in [Books > Textbooks > Science & Mathematics](#)

Customer Reviews

The author is Professor of Physics at West Virginia University, USA.

The author resurrects some 1893 work by Heaviside to postulate that gravitational fields have more in common with electromagnetic law than the repulsion of static gravitation, and that both sciences can benefit from a time-dependent treatment that illustrates causality better than Maxwell's equations. Conclusions include a force of cogravity analogous to the magnetic force, non-instantaneous propagation of gravitation, and the existence of five (5) gravitational forces. Rejecting the idea that E and H cause each other, Jefimenko shows that mass, change in mass density, and mass currents are the origin of both the gravitation and cogravity vectors. Highly

recommended for those who want to learn fields and waves by thinking about them Urgently relevant because of the recent detection of gravity waves -- this book will give you a background even if you disagree with it.

I was mistaken to order this book. Trusting another review, I assumed that this is the "beginning" volume for understanding Jefimenko's formulation of electromagnetic and gravitation. It isn't. If you are unused to computing with delayed (retarded) potentials, as I am, then the "warm up" book would be "Electromagnetic Retardation and the Theory of Relativity." That would be the place to start exploring Jefimenko's point of view if you have already had a good course in electromagnetic theory. Otherwise, the author's book "Electricity and Magnetism" would be the right start. This volume begins with a chapter on causality, making the point that both the electric and the magnetic field arise causally from a common ancestor, but that they do not mutually cause each other. Given his formalism, the point is fair, and I think there is no use in contesting the point. However, the two do arise together from a common source and they do act as people have always supposed they act. So, this point seems to be a matter of intellectual precision and not really too practical---for now. I think that many main-stream physicists might object that Jefimenko is splitting hairs, but to me it seems to be wrong. We begin usually with Maxwell's equations in a differential form. With blundering calculations, we find them to be Lorentz invariant. So what? Well, we end up being forced to notice that time measurements at different locations have to be synchronized more carefully than we had imagined. We get effects usually called "special relativistic." But there is a problem in that we began saying time means one thing and we end up finding it means something a little different. So, Jefimenko's extra care is needed, and not wasted. I think his way is very important and gets too little attention.

This book is needed to read the other books by Jefiminko and presents the background for the ideas presented in them. I was able to follow the mathematics easily enough and the ideas presented while not mainstream were proved in detail. More people should take the time to read this and compare the results of current relativity physics. As with quantum mechanics there are two paths to the same answers each equally valid and correct. Alternate theories often are pseudo scientific and not proven but the results of Jefiminko are proved and give the same results as other methods. Worth reading to keep the mind working and looking at things in new ways. Reading the whole series is interesting and worthwhile.

Real science challenges the holes in ideas and theories and this book does that (Real Science). Down with Relativity (Matter (physical stuff) + time (abstract idea) + space (abstract area) = Nonsense (0 energy)) The Michelson-Morley experiment assumes too much and the bending of light that justified relativity I think better fits an aether model.

As the sub-title says, it's a different approach to the theory of electromagnetic and gravitational fields. The first few chapters are also a handy refresher course in magnetism and electromagnetic induction.

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