

Progress in Mathematical Physics

Arnold Sommerfeld

Mathematical Theory of Diffraction

**Raymond J. Nagem
Mario Zampolli
Guido Sandri
Translators**



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Mathematical Theory Of Diffraction

Mezhlum A. Sumbatyan



Mathematical Theory Of Diffraction:

Mathematical Theory of Diffraction Arnold Sommerfeld, 2012-12-06 Arnold Sommerfeld's *Mathematische Theorie der Diffraction* marks a milestone in optical theory full of insights that are still relevant today. In a stunning tour de force, Sommerfeld derives the first mathematically rigorous solution of an optical diffraction problem. Indeed, his diffraction analysis is a surprisingly rich and complex mix of pure and applied mathematics, and his often-cited diffraction solution is presented only as an application of a much more general set of mathematical results. The body of Sommerfeld's work is devoted to the systematic development of a method for deriving solutions of the wave equation on Riemann surfaces, a fascinating but perhaps underappreciated topic in mathematical physics.

The Mathematical Theory of Huygens' Principle Bevan B. Baker, E. T. Copson, 2003 Baker and Copson originally set themselves the task of writing a definitive text on partial differential equations in mathematical physics. However, at the time the subject was changing rapidly and greatly, particularly via the developments coming from quantum mechanics. Instead, the authors chose to focus on a particular area of the broad theory, producing a monograph complete in itself. The resulting book deals with Huygens' principle in optics and its application to the theory of diffraction. Baker and Copson concern themselves with the general theory of the solution of the PDEs governing the propagation of light. Extensive use is made of Green's method. A chapter is dedicated to Sommerfeld's theory of diffraction, including diffraction of polarized light by a perfectly reflecting half-plane and by a black half-plane. New material was added for subsequent editions, notably Rayleigh's method of integral equations to the problem of diffraction by a planar screen. Some of the simpler diffraction problems are discussed as examples. Baker and Copson's book quickly became the standard reference on the subject of Huygens' principle. It remains so today.

[Equations of Mathematical Diffraction Theory](#) Mezhlum A. Sumbatyan, Antonio Scalia, 2004-09-29 *Equations of Mathematical Diffraction Theory* focuses on the comparative analysis and development of efficient analytical methods for solving equations of mathematical diffraction theory. Following an overview of some general properties of integral and differential operators in the context of the linear theory of diffraction processes, the authors provide estimates of the operator norms for various ranges of the wave number variation and then examine the spectral properties of these operators. They also present a new analytical method for constructing asymptotic solutions of boundary integral equations in mathematical diffraction theory for the high frequency case. Clearly demonstrating the close connection between heuristic and rigorous methods in mathematical diffraction theory, this valuable book provides you with the differential and integral equations that can easily be used in practical applications.

[Advanced Studies in the Mathematical Theory of Scattering, Volume 3](#) Jean-Michel L. Bernard, 2024-10-11 This book presents a collection of independent mathematical studies describing the analytical reduction of complex generic problems in the theory of scattering and propagation of electromagnetic waves in the presence of imperfectly conducting objects. Their subjects include a global method for scattering by a multimode plane, diffraction by an impedance curved wedge, scattering by

impedance polygons advanced properties of spectral functions in frequency and time domains bianisotropic media and related coupling expressions and exact and asymptotic reductions of surface radiation integrals The methods developed here can be qualified as analytical when they lead to exact explicit expressions or semi analytical when they drastically reduce the mathematical complexity of studied problems Therefore they can be used in mathematical physics and engineering to analyse and model but also in applied mathematics to calculate the scattered fields in electromagnetism for a low computational cost

Water Waves: The Mathematical Theory with Applications James Johnston Stoker, 2019-04-17 First published in 1957 this is a classic monograph in the area of applied mathematics It offers a connected account of the mathematical theory of wave motion in a liquid with a free surface and subjected to gravitational and other forces together with applications to a wide variety of concrete physical problems A never surpassed text it remains of permanent value to a wide range of scientists and engineers concerned with problems in fluid mechanics The four part treatment begins with a presentation of the derivation of the basic hydrodynamic theory for non viscous incompressible fluids and a description of the two principal approximate theories that form the basis for the rest of the book The second section centers on the approximate theory that results from small amplitude wave motions A consideration of problems involving waves in shallow water follows and the text concludes with a selection of problems solved in terms of the exact theory Despite the diversity of its topics this text offers a unified readable and largely self contained treatment

Equations of Mathematical Diffraction Theory Mezhlum A. Sumbatyan, 2005

Mathematical Theory of X-ray Powder Diffractometry Arthur James Cochran Wilson, 1963

Fundamental Problems in the Mathematical Theory of Diffraction V. D. Kupradze, 1952 Encyclopaedia of Mathematics M. Hazewinkel, 2013-12-01 A Treatise on the Mathematical Theory of Elasticity Augustus Edward Hough Love, 1892 An indispensable reference work for engineers mathematicians and physicists this book is the most complete and authoritative treatment of classical elasticity in a single volume Beginning with elementary notions of extension simple shear and homogeneous strain the analysis rapidly undertakes a development of types of strain displacements corresponding to a given strain cubical dilatation composition of strains and a general theory of strains A detailed analysis of stress including the stress quadric and uniformly varying stress leads into an exposition of the elasticity of solid bodies Based upon the work energy concept experimental results are examined and the significance of elastic constants in general theory considered Hooke's Law elastic constants methods of determining stress thermo elastic equations and other topics are carefully discussed Back cover

Theory of Seismic Diffractions Kamill Davydovich Klem-Musatov, 1994 Presents a complete mathematical description of diffractions caused by seismic velocity discontinuities Diffraction theory provides important physical insights into seismology and is a necessary part of describing the nature of a seismogram The author describes elastic wave theory and relates it to the high frequency approximations of ray theory

An Introduction to the Mathematical Theory of Inverse Problems Andreas Kirsch, 1996-09-26 Following Keller 119 we call two problems inverse

to each other if the formulation of each of them requires full or partial knowledge of the other. By this definition it is obviously arbitrary which of the two problems we call the direct and which we call the inverse problem. But usually one of the problems has been studied earlier and perhaps in more detail. This one is usually called the direct problem whereas the other is the inverse problem. However, there is often another more important difference between these two problems. Hadamard (see 91) introduced the concept of a well-posed problem originating from the philosophy that the mathematical model of a physical problem has to have the properties of uniqueness, existence, and stability of the solution. If one of the properties fails to hold, he called the problem ill-posed. It turns out that many interesting and important inverse problems in science lead to ill-posed problems, while the corresponding direct problems are well-posed. Often, existence and uniqueness can be forced by enlarging or reducing the solution space, the space of models. For restoring stability, however, one has to change the topology of the spaces, which is in many cases impossible because of the presence of measurement errors. At first glance, it seems to be impossible to compute the solution of a problem numerically if the solution of the problem does not depend continuously on the data, i.e. for the case of ill-posed problems. Encyclopaedia of Mathematics Michiel Hazewinkel, 2013-12-01

Mathematical Theory of Optics R. K. Luneburg, 2023-11-15. This title is part of UC Press's Voices Revived program, which commemorates University of California Press's mission to seek out and cultivate the brightest minds and give them voice, reach, and impact. Drawing on a backlist dating to 1893, Voices Revived makes high-quality, peer-reviewed scholarship accessible once again using print-on-demand technology. This title was originally published in 1964. *Mathematical Theory of Feynman Path Integrals* Sergio Albeverio, Rafael Høegh-Krohn, Sonia Mazzucchi, 2008-05-30. The 2nd edition of LNM 523 is based on the two first authors' mathematical approach of this theory presented in its 1st edition in 1976. An entire new chapter on the current forefront of research has been added. Except for this new chapter and the correction of a few misprints, the basic material and presentation of the first edition has been maintained. At the end of each chapter, the reader will also find notes with further bibliographical information. Mathematical Theory of Incompressible Nonviscous Fluids Carlo Marchioro, Mario Pulvirenti, 2012-12-06. Fluid dynamics is an ancient science, incredibly alive today. Modern technology and new needs require a deeper knowledge of the behavior of real fluids, and new discoveries or steps forward pose quite often challenging and difficult new mathematical problems. In this framework, a special role is played by incompressible nonviscous flows, sometimes called perfect flows. This is a mathematical model consisting essentially of an evolution equation, the Euler equation for the velocity field of fluids. Such an equation, which is nothing other than the Newton laws plus some additional structural hypotheses, was discovered by Euler in 1755 and although it is more than two centuries old, many fundamental questions concerning its solutions are still open. In particular, it is not known whether the solutions for reasonably general initial conditions develop singularities in a finite time, and very little is known about the long-term behavior of smooth solutions. These and other basic problems are still open, and this is one of the reasons why the mathe-

mathematical theory of perfect flows is far from being completed Incompressible flows have been attacked by many distinguished mathematicians with a large variety of mathematical techniques so that today this field constitutes a very rich and stimulating part of applied mathematics

A Treatise on the Mathematical Theory of Elasticity, Theoretical and Mathematical Physics Vasilii Sergeevich Vladimirov, Evgenii Frolovich Mishchenko, A. K. Gushchin, 1988 **Mathematical Theory of Optics** Rudolf Karl Luneburg, 1966 **A Treatise on the Mathematical Theory of Elasticity** Augustus Edward Hough Love, 1944-01-01 The most complete single volume treatment of classical elasticity this text features extensive editorial apparatus including a historical introduction Topics include stress strain bending torsion gravitational effects and much more 1927 edition

Mathematical Theory Of Diffraction Book Review: Unveiling the Power of Words

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