

The Principle of Differentiation into Physical and Mathematical Theories

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Abstract

The article formulates the main principle of physics, which underlies this science. This principle has been called by the author of this article the Principle of differentiation into physical and mathematical theories. The article gives examples of the application of this principle in quantum mechanics and cosmology. A more detailed proof of the principle of equivalence of the electromagnetic field and the field of strong interaction to a free material particle is given. This principle, formulated in the article "Electrodynamics in Curvilinear Coordinates and the Equation of a Geodesic Line", revealed the nature of the mass of elementary particles and became the basis for the formulation of the Principle of differentiation into physical and mathematical theories.

Keywords

Origin of the Universe, Expansion of the Universe, Corpuscular Wave Dualism, The Principle of Differentiation into Physical and Mathematical Theories

1. Introduction

The Principle of differentiation into physical and mathematical theories is formulated as follows. Physics considers only objects that really exist in nature. They are called physical objects. These are objects that can be observed experimentally. Theories constructed using only physical objects are physical theories. Objects that do not exist in nature and underlie the theories that use the mathematical apparatus are mathematical objects. Theories constructed using mathematical objects are mathematical theories.

An example of an object that does not exist in nature is the ether. Michelson's experiment, the appearance in physics of the concept of the electromagnetic field as a real physical object and the creation of the theory of relativity by Einstein—all this showed that the ether does not exist in nature.

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Principles of Advanced Mathematical Physics Robert D. Richtmyer, 2012-12-06 A first consequence of this difference in texture concerns the attitude we must take toward some or perhaps most investigations in applied mathematics at least when the mathematics is applied to physics. Namely those investigations have to be regarded as pure mathematics and evaluated as such. For example some of my mathematical colleagues have worked in recent years on the Hartree Fock approximate method for determining the structures of many electron atoms and ions. When the method was introduced nearly fifty years ago physicists did the best they could to justify it using variational principles intuition and other techniques within the texture of physical reasoning. By now the method has long since become part of the established structure of physics. The mathematical theorems that can be proved now mostly for two and three electron systems hence of limited interest for physics have to be regarded as mathematics. If they are good mathematics and I believe they are that is justification enough. If they are not there is no basis for saying that the work is being done to help the physicists. In that sense applied mathematics plays no role in today's physics. In today's division of labor the task of the mathematician is to create mathematics in whatever area without being much concerned about how the mathematics is used that should be decided in the future and by physics.

Mathematical Methods in Physics Philippe Blanchard, Erwin Bruening, 2012-12-06 Physics has long been regarded as a wellspring of mathematical problems. Mathematical Methods in Physics is a self-contained presentation driven by historic motivations excellent examples detailed proofs and a focus on those parts of mathematics that are needed in more ambitious courses on quantum mechanics and classical and quantum field theory. Aimed primarily at a broad community of graduate students in mathematics mathematical physics physics and engineering as well as researchers in these disciplines.

Foundations of Mathematical Physics Chirag Verma, 2025-02-20 Foundations of Mathematical Physics is a compelling introduction for undergraduates venturing into the intricate relationship between mathematics and physics. We navigate the core principles that sculpt the universe from the quantum to the cosmic scale making this book an essential companion for students unraveling the physical world's mysteries through mathematical lenses. Structured to bridge theoretical concepts with practical applications we meticulously unfold the marvels of mathematical physics ensuring each topic is approachable without sacrificing depth. This book offers a unique blend of theory worked examples and problem sets that challenge and engage students facilitating deep comprehension. We stand out by demystifying complex ideas making this an invaluable resource for students with varied proficiency in mathematics or physics. Whether you aim to grasp the fundamentals of quantum mechanics delve into special relativity's elegance or understand general relativity's geometric beauty this book paves the path for a profound understanding of the universe through mathematical frameworks. Embark on this intellectual journey to discover how mathematical physics illuminates the universe's workings in an accessible and inspiring way.

Variational Principles in Mathematical Physics, Geometry, and Economics Alexandru

Kristály, Vicențiu D. Rădulescu, Csaba Varga, 2010-08-19 A comprehensive introduction to modern applied functional analysis Assumes only basic notions of calculus real analysis geometry and differential equations **Boundary and Eigenvalue**

Problems in Mathematical Physics Hans Sagan, 2012-04-26 Well known text uses a few basic concepts to solve such problems as the vibrating string vibrating membrane and heat conduction Problems and solutions 31 illustrations

Mathematics and the Physical World Morris Kline, 2012-03-15 Stimulating account of development of mathematics from arithmetic algebra geometry and trigonometry to calculus differential equations and non Euclidean geometries Also describes how math is used in optics astronomy and other phenomena Physical Principles of Chirality in NMR Piotr Garbacz, 2024-09-20 How can we study one of the most elusive molecular properties chirality using nuclear interactions with the magnetic field that are apparently insensitive to handedness This book answers this question from the physicochemical point of view by providing a clear coherent and comprehensive review of methods used in NMR studies of chirality Presented arguments based on fundamental physical and chemical laws and in depth descriptions of new methods utilizing purely physical interactions are mainly addressed to spectroscopists in both academia and industry The introductory chapters provide the reader with the basics of NMR spectroscopy as a tool for the study of chiral compounds and those more interested in the methods of chiral discrimination will benefit from the brief description of their common points and reasons why some of them may or may not work In the following chapters the book shows rapid progress in a newly emerging field of chirality sensitive NMR in particular a search for effects that give direct information about the absolute configuration of a molecule **Mathematical Physics** Francis Bitter, 2004-01-01 Reader friendly guide offers illustrative examples of the rules of physical science and how they were formulated Topics include the role of mathematics as the language of physics nature of mechanical vibrations harmonic motion and shapes geometry of the laws of motion more 60 figures 1963 edition

Mathematics And The Natural Sciences: The Physical Singularity Of Life Giuseppe Longo, Francis Bailly, 2011-03-04 This book identifies the organizing concepts of physical and biological phenomena by an analysis of the foundations of mathematics and physics Our aim is to propose a dialog between different conceptual universes and thus to provide a unification of phenomena The role of order and symmetries in the foundations of mathematics is linked to the main invariants and principles among them the geodesic principle a consequence of symmetries which govern and confer unity to various physical theories Moreover an attempt is made to understand causal structures a central element of physical intelligibility in terms of both symmetries and symmetry breakings A distinction between the principles of conceptual construction and of proofs both in physics and in mathematics guides most of the work The importance of mathematical tools is also highlighted to clarify differences in the models for physics and biology that are proposed by continuous and discrete mathematics such as computational simulations Since biology is particularly complex and not as well understood at a theoretical level we propose a unification by concepts which in any case should precede mathematization This constitutes an outline for unification also

based on highlighting conceptual differences complex points of passage and technical irreducibilities of one field to another Indeed we suppose here a very common monist point of view namely the view that living objects are big bags of molecules The main question though is to understand which theory can help better understand these bags of molecules They are indeed rather singular from the physical point of view Technically we express this singularity through the concept of extended criticality which provides a logical extension of the critical transitions that are known in physics The presentation is mostly kept at an informal and conceptual level a [Advances in Differential Equations and Mathematical Physics](#) Eric Carlen, Evans M. Harrell, Michael Loss, 1998 The text offers a combination of certain emerging topics and important research advances in the area of differential equations The topics range widely and include magnetic Schroedinger operators the Boltzmann equations nonlinear variational problems and noncommutative probability theory The text is suitable for graduate and advanced graduate courses and seminars on the topic as well as research mathematicians and physicists working in mathematical physics applied mathematics analysis and differential equations **Mathematical Physics** Donald H. Menzel, 2012-05-23 Useful treatment of classical mechanics electromagnetic theory and relativity includes explanations of function theory vectors matrices dyadics tensors partial differential equations other advanced mathematical techniques Nearly 200 problems with answers **A Concise Handbook of Mathematics, Physics, and Engineering Sciences** Andrei D. Polyandin, Alexei Chernoutsan, 2010-10-18 A Concise Handbook of Mathematics Physics and Engineering Sciences takes a practical approach to the basic notions formulas equations problems theorems methods and laws that most frequently occur in scientific and engineering applications and university education The authors pay special attention to issues that many engineers and students **Other Proof of Poincaré's Hypothesis** Аркадий Сирис, 2024-08-08 Not so long ago about 30 years ago not only the world community of mathematicians but other scientific communities and even non scientific communities with close attention some with partiality some without partiality but followed with interest and even delved into scientific details of the proof of the Russian mathematician Grigory Perelman of the hypothesis that was formulated in 1904 by the outstanding French mathematician Henri Poincaré I was also interested in the same evidence True the reason for my interest was not so much Perelman's proofs in their mathematical details but rather the formulation of the hypothesis itself which seemed to me an extremely interesting formulation of the problem of such manifolds the topological and metric properties of which in their unity with each other are the cause of the geometric shape of the space of the universe If someone asks why start the same scientific business if there is already a mathematical proof of the same hypothesis Firstly if anything determines the geometric shape of any space including the space of the universe then perhaps its physical content If so then from the standpoint of the spatial unity of the geometric form of the space of the universe and the physical content of the same geometric form Poincaré's mathematical hypothesis is certainly a theoretically incomplete hypothesis All the same justifies the need for the science of physical and geometric science in their unity with themselves and among themselves to

prove those manifolds physical and geometric manifolds the natural properties of which in their unity with each other are responsible for the spatial unity of the universe with itself Secondly since truth is not an absolute truth it reveals itself each time as a relative truth which does not prohibit but permits another proof of the same mathematical hypothesis which in a given place is no longer mathematical but geometrically physical and physically geometric

Mathematical Methods for Accident Reconstruction Harold Franck, Darren Franck, 2009-09-15 Over the past 25 years Harold and Darren Franck have investigated hundreds of accidents involving vehicles of almost every shape size and type imaginable In Mathematical Methods for Accident Reconstruction A Forensic Engineering Perspective these seasoned experts demonstrate the application of mathematics to modeling accident reconstructions

Masters of Theory Andrew Warwick, 2011-04-15 Winner of the the Susan Elizabeth Abrams Prize in History of Science When Isaac Newton published the Principia three centuries ago only a few scholars were capable of understanding his conceptually demanding work Yet this esoteric knowledge quickly became accessible in the nineteenth and early twentieth centuries when Britain produced many leading mathematical physicists In this book Andrew Warwick shows how the education of these masters of theory led them to transform our understanding of everything from the flight of a boomerang to the structure of the universe Warwick focuses on Cambridge University where many of the best physicists trained He begins by tracing the dramatic changes in undergraduate education there since the eighteenth century especially the gradual emergence of the private tutor as the most important teacher of mathematics Next he explores the material culture of mathematics instruction showing how the humble pen and paper so crucial to this study transformed everything from classroom teaching to final examinations Balancing their intense intellectual work with strenuous physical exercise the students themselves known as the Wranglers helped foster the competitive spirit that drove them in the classroom and informed the Victorian ideal of a manly student Finally by investigating several historical cases such as the reception of Albert Einstein s special and general theories of relativity Warwick shows how the production transmission and reception of new knowledge was profoundly shaped by the skills taught to Cambridge undergraduates Drawing on a wealth of new archival evidence and illustrations Masters of Theory examines the origins of a cultural tradition within which the complex world of theoretical physics was made commonplace

Computing and Simulation for Engineers Ziya Uddin, Mukesh Kumar Awasthi, Rishi Asthana, Mangey Ram, 2022-06-29 This book presents the reader with comprehensive insight into various kinds of mathematical modeling and numerical computation for problems arising in several branches of engineering such as mechanical engineering computer science engineering electrical engineering electronics and communication engineering and civil engineering The book Discusses topics related to clean and green energy production and storage Bridges the gap between core theory and costly industrial experiments Covers advanced biomechanics and nanodrug delivery topics Explores diversified applications of mathematical techniques to solve practical engineering problems The text in this book emphasizes mathematical treatment of soft

computing image and signal processing fluid flows in various geometries biomechanics biological modeling a mathematical description of the solar cell analytical and numerical treatment of problems in fracture mechanics and antenna design modeling It also discusses the numerical computations of biomechanics problems and problems arising in cryptography The text further covers optimization techniques that are useful for real world problems This material is primarily written for graduate students and academic researchers in a number of engineering fields including electrical electronics and communication industrial manufacturing mechanical computer science and mathematics

Clifford Algebras and their Applications in Mathematical Physics Rafał Abłamowicz, 2000 The second part of a two volume set concerning the field of Clifford geometric algebra this work consists of thematically organized chapters that provide a broad overview of cutting edge topics in mathematical physics and the physical applications of Clifford algebras from applications such as complex distance potential theory supersymmetry and fluid dynamics to Fourier analysis the study of boundary value problems and applications to mathematical physics and Schwarzian derivatives in Euclidean space Among the mathematical topics examined are generalized Dirac operators holonomy groups monogenic and hypermonogenic functions and their derivatives quaternionic Beltrami equations Fourier theory under Mobius transformations Cauchy Reimann operators and Cauchy type integrals

Quantum Mathematical Physics Walter Thirring, 2013-04-18 This edition combines the earlier two volumes on Quantum Mechanics of Atoms and Molecules and on Quantum Mechanics of Large Systems thus including in a single volume the material for a two semester course on quantum physics Since this volume is already quite heavy I could not include many new results which show how lively the subject is I just want to mention that inequality IV 4 1 1 has been sharpened by T Weidl by a factor 2 and the difficult problem 1 of III 4 6 has been solved by A Martin I have to thank N Ilieva for the devotion in preparing this new edition Vienna November 2001 Walter Thirring Preface to the Second Edition Quantum Mechanics of Atoms and Molecules Ever since the first edition of this volume appeared in 1980 quantum statistical mechanics has flourished Innumerable results in many areas have been obtained and it would require a series of volumes to do justice to all of them On the other hand the first edition was already rather crowded with many details so it would not be overburdened any more Thus I added only one chapter on quantum ergodic theory where one can get the main notions across without too much pain Nevertheless many subjects treated in the book had splendidly developed ever since and the only way out I could see is to add some recent references which the interested reader can consult

Convolutions in French Mathematics, 1800-1840 Ivor Grattan-Guinness, 2017-01-25 **Convolutions in French Mathematics, 1800-1840** I. Grattan-Guinness, 1990-07-01

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