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KEY=BOOK - DAPHNE BRAEDON

A Modern Approach to Quantum Mechanics A Modern Approach to Quantum Mechanics *University Science Books* Inspired by Richard Feynman and J.J. Sakurai, A Modern Approach to Quantum Mechanics allows lecturers to expose their undergraduates to Feynman's approach to quantum mechanics while simultaneously giving them a textbook that is well-ordered, logical and pedagogically sound. This book covers all the topics that are typically presented in a standard upper-level course in quantum mechanics, but its teaching approach is new. Rather than organizing his book according to the historical development of the field and jumping into a mathematical discussion of wave mechanics, Townsend begins his book with the quantum mechanics of spin. Thus, the first five chapters of the book succeed in laying out the fundamentals of quantum mechanics with little or no wave mechanics, so the physics is not obscured by mathematics. 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Townsend's new text shuns the historical ordering that characterizes other so-called modern physics textbooks and applies a truly modern approach to this subject, starting instead with contemporary single-photon and single-atom interference experiments. The text progresses naturally from a thorough introduction to wave mechanics through applications of quantum mechanics to solid-state, nuclear, and particle physics, thereby including most of the topics normally presented in a modern physics course. **Introduction to Quantum Mechanics** *Cambridge University Press* Changes and additions to the new edition of this classic textbook include a new chapter on symmetries, new problems and examples, improved explanations, more numerical problems to be worked on a computer, new applications to solid state physics, and consolidated treatment of time-dependent potentials. **The Physics of Quantum Mechanics** *Oxford University Press* "First published by Cappella Archive in 2008." **Lectures on Quantum Mechanics** *Cambridge University Press* "Ideally suited to a one-year graduate course, this textbook is also a useful reference for researchers. Readers are introduced to the subject through a review of the history of quantum mechanics and an account of classic solutions of the Schr. **Modern Quantum Mechanics** *Cambridge University Press* A comprehensive and engaging textbook, providing a graduate-level, non-historical, modern introduction of quantum mechanical concepts. **Epistemology of Experimental Gravity - Scientific Rationality** *MultiMedia Publishing* The evolution of gravitational tests from an epistemological perspective framed in the concept of rational reconstruction of Imre Lakatos, based on his methodology of research programmes. Unlike other works on the same subject, the evaluated period is very extensive, starting with Newton's natural philosophy and up to the quantum gravity theories of today. In order to explain in a more rational way the complex evolution of the gravity concept of the last century, I propose a natural extension of the methodology of the research programmes of Lakatos that I then use during the paper. I believe that this approach offers a new perspective on how evolved over time the concept of gravity and the methods of testing each theory of gravity, through observations and experiments. I argue, based on the methodology of the research programmes and the studies of scientists and philosophers, that the current theories of quantum gravity are degenerative, due to the lack of experimental evidence over a long period of time and of self-immunization against the possibility of falsification. Moreover, a methodological current is being developed that assigns a secondary, unimportant role to verification through observations and/or experiments. For this reason, it will not be possible to have a complete theory of quantum gravity in its current form, which to include to the limit the general relativity, since physical theories have always been adjusted, during their evolution, based on observational or experimental tests, and verified by the predictions made. Also, contrary to a widespread opinion and current active programs regarding the unification of all the fundamental forces of physics in a single final theory, based on string theory, I argue that this unification is generally unlikely, and it is not possible anyway for a unification to be developed based on current theories of quantum gravity, including string theory. In addition, I support the views of some scientists and philosophers that currently too much resources are being consumed on the idea of developing quantum gravity theories, and in particular string theory, to include general relativity and to unify gravity with other forces, as long as science does not impose such research programs. CONTENTS: Introduction Gravity Gravitational tests Methodology of Lakatos - Scientific rationality The natural extension of the Lakatos methodology Bifurcated programs Unifying programs 1. Newtonian gravity 1.1 Heuristics of Newtonian gravity 1.2 Proliferation of post-Newtonian theories 1.3 Tests of post-Newtonian theories 1.3.1 Newton's proposed tests 1.3.2 Tests of post-Newtonian theories 1.4 Newtonian gravity anomalies 1.5 Saturation point in Newtonian gravity 2. General relativity 2.1 Heuristics of the general relativity 2.2 Proliferation of post-Einsteinian gravitational theories 2.3 Post-Newtonian parameterized formalism (PPN) 2.4 Tests of general relativity and post-Einsteinian theories 2.4.1 Tests proposed by Einstein 2.4.2 Tests of post-Einsteinian theories 2.4.3 Classic tests 2.4.3.1 Precision of Mercury's perihelion 2.4.3.2 Light deflection 2.4.3.3 Gravitational redshift 2.4.4 Modern tests 2.4.4.1 Shapiro Delay 2.4.4.2 Gravitational dilation of time 2.4.4.3 Frame dragging and geodetic effect 2.4.4.4 Testing of the principle of equivalence 2.4.4.5 Solar system tests 2.4.5 Strong field gravitational tests 2.4.5.1 Gravitational lenses 2.4.5.2 Gravitational waves 2.4.5.3 Synchronization binary pulsars 2.4.5.4 Extreme environments 2.4.6 Cosmological tests 2.4.6.1 The expanding universe 2.4.6.2 Cosmological observations 2.4.6.3 Monitoring of weak gravitational lenses 2.5 Anomalies of general relativity 2.6 The saturation point of general relativity 3. Quantum gravity 3.1 Heuristics of quantum gravity 3.2 The tests of quantum gravity 3.3 Canonical quantum gravity 3.3.1 Tests proposed for the CQG 3.3.2. Loop quantum gravity 3.4 String theory 3.4.1 Heuristics of string theory 3.4.2. Anomalies of string theory 3.5 Other theories of quantum gravity 3.6 Unification (The Final Theory) 4. Cosmology Conclusions Notes Bibliography DOI: 10.13140/RG.2.2.35350.70724 **When the Uncertainty Principle Goes to 11 Or How to Explain Quantum Physics with Heavy Metal** *BenBella Books* There are deep and fascinating links between heavy metal and quantum physics. No, really! While teaching at the University of Nottingham, physicist Philip Moriarty noticed something odd, a surprising number of his students were heavily into metal music. Colleagues, too: a Venn diagram of physicists and metal fans would show a shocking amount of overlap. What's more, it turns out that heavy metal music is uniquely well-suited to explaining quantum principles. In When the Uncertainty Principle Goes to Eleven, Moriarty explains the mysteries of the universe's inner workings via drum beats and feedback: You'll discover how the Heisenberg uncertainty principle comes into play with every chugging guitar riff, what wave interference has to do with Iron Maiden, and why metalheads in mosh pits behave just like molecules in a gas. If you're a metal fan trying to grasp the complexities of quantum physics, a quantum physicist baffled by heavy metal, or just someone who'd like to know how the fundamental science underpinning our world connects to rock music, this book will take you, in the words of Pantera, to "A New Level." For those who think quantum physics is too mind-bendingly complex to grasp, or too focused on the invisibly small to be relevant to our full-sized lives, this funny, fascinating book will show you that physics is all around us . . . and it rocks. **Entanglement and Quantum Error Correction with Superconducting Qubits** *Lulu.com* **Quantum Mechanics Theory and Experiment** *Oxford University Press* This textbook presents quantum mechanics at the junior/senior undergraduate level. It is unique in that it describes not only quantum theory, but also presents five laboratories that explore truly modern aspects of quantum mechanics. These laboratories include "proving" that light contains photons, single-photon interference, and tests of local realism. The text begins by presenting the classical theory of polarization, moving on to describe the quantum theory of polarization. Analogies between the two theories minimize conceptual difficulties that students typically have when first presented with quantum mechanics. Furthermore, because the laboratories involve studying photons, using photon polarization as a prototypical quantum system allows the laboratory work to be closely integrated with the coursework. Polarization represents a two-dimensional quantum system, so the introduction to quantum mechanics uses two-dimensional state vectors and operators. This allows students to become comfortable with the mathematics of a relatively simple system, before moving on to more complicated systems. After describing polarization, the text goes on to describe spin systems, time evolution, continuous variable systems (particle in a box, harmonic oscillator, hydrogen atom, etc.), and perturbation theory. The book also includes chapters which describe material that is frequently absent from undergraduate texts: quantum measurement, entanglement, quantum field theory and quantum information. This material is connected not only to the laboratories described in the text, but also to other recent experiments. Other subjects covered that do not often make their way into undergraduate texts are coherence, complementarity, mixed states, the density operator and coherent states. Supplementary material includes further details about implementing the laboratories, including parts lists and software for running the experiments. Computer simulations of some of the experiments are available as well. A solutions manual for end-of-chapter problems is available to instructors. **Mathematics of Classical and Quantum Physics** *Courier Corporation* Graduate-level text offers unified treatment of mathematics applicable to many branches of physics. Theory of vector spaces, analytic function theory, theory of integral equations, group theory, and more. Many problems. Bibliography. **Quantum Physics What Everyone Needs to Know** *Oxford University Press* "In question & answer format, discusses the history, science, applications, and relevant current issues of quantum physics in an accessible way for the non-scientist"-- **QUANTUM MECHANICS A TEXTBOOK FOR UNDERGRADUATE** *PHI Learning Pvt. Ltd.* This textbook is written as a basic introduction to Quantum Mechanics for use by the undergraduate students in physics, who are exposed to this subject for the first time. Providing a gentle introduction to the subject, it fills the gap between the available books which provide comprehensive coverage appropriate for postgraduate courses and the ones on Modern Physics which give a rather incomplete treatment of the subject leaving out many conceptual and mathematical details. The author sets out with Planck’s quantum hypothesis and takes the student along through the new concepts and ideas, providing an easy-to-understand description of core quantum concepts and basic mathematical structures. The fundamental principles and the mathe-matical formalism introduced, are amply illustrated through a number of solved examples. Chapter-end exercises and review questions, generally designed as per the examination pattern, serve to reinforce the material learnt. Chapter-end summaries capture the key points discussed in the text. Beside the students of physics, the book can also be used by students of chemistry and first-year students of all branches of engineering for gaining a basic understanding of quantum mechanics, otherwise considered a difficult

subject. **Quantum Mechanics Concepts and Applications** *John Wiley & Sons* Quantum Mechanics: Concepts and Applications provides a clear, balanced and modern introduction to the subject. Written with the student's background and ability in mind the book takes an innovative approach to quantum mechanics by combining the essential elements of the theory with the practical applications: it is therefore both a textbook and a problem solving book in one self–contained volume. Carefully structured, the book starts with the experimental basis of quantum mechanics and then discusses its mathematical tools. Subsequent chapters cover the formal foundations of the subject, the exact solutions of the Schrödinger equation for one and three dimensional potentials, time–independent and time–dependent approximation methods, and finally, the theory of scattering. The text is richly illustrated throughout with many worked examples and numerous problems with step–by–step solutions designed to help the reader master the machinery of quantum mechanics. The new edition has been completely updated and a solutions manual is available on request. Suitable for senior undergradutate courses and graduate courses. **Problems And Solutions On Quantum Mechanics** *World Scientific Publishing Company* The material for these volumes has been selected from the past twenty years' examination questions for graduate students at the University of California at Berkeley, Columbia University, the University of Chicago, MIT, the State University of New York at Buffalo, Princeton University and the University of Wisconsin. **Principles of Quantum Mechanics** *Springer Science & Business Media* R. Shankar has introduced major additions and updated key presentations in this second edition of Principles of Quantum Mechanics. New features of this innovative text include an entirely rewritten mathematical introduction, a discussion of Time-reversal invariance, and extensive coverage of a variety of path integrals and their applications. Additional highlights include: - Clear, accessible treatment of underlying mathematics - A review of Newtonian, Lagrangian, and Hamiltonian mechanics - Student understanding of quantum theory is enhanced by separate treatment of mathematical theorems and physical postulates - Unsurpassed coverage of path integrals and their relevance in contemporary physics The requisite text for advanced undergraduate- and graduate-level students, Principles of Quantum Mechanics, Second Edition is fully referenced and is supported by many exercises and solutions. The book's self-contained chapters also make it suitable for independent study as well as for courses in applied disciplines. **Advanced Quantum Mechanics The New Principia Part 1** *Notion Press* The New Principia Book 1 deals with the start of the New Principia — important scientific work — related to questions such as "How to find God," "How to travel in Time", "Travels in Outer Space" plus "Resolving the Andromeda Paradox" and more with proper explanations and some working methods for handling Ouija Boards, Near Death Experiences, Astral Projection, Hypnosis, Consciousness, Super-intelligent Machines and others. With The New Principia, the sky is not the limit. **Lectures On Computation** *Perseus Books* Covering the theory of computation, information and communications, the physical aspects of computation, and the physical limits of computers, this text is based on the notes taken by one of its editors, Tony Hey, on a lecture course on computation given b **1000 Solved Problems in Modern Physics** *Springer Science & Business Media* This book is targeted mainly to the undergraduate students of USA, UK and other European countries, and the M. Sc of Asian countries, but will be found useful for the graduate students, Graduate Record Examination (GRE), Teachers and Tutors. This is a by-product of lectures given at the Osmania University, University of Ottawa and University of Tebrez over several years, and is intended to assist the students in their assignments and examinations. The book covers a wide spectrum of disciplines in Modern Physics, and is mainly based on the actual examination papers of UK and the Indian Universities. The selected problems display a large variety and conform to syllabi which are currently being used in various countries. The book is divided into ten chapters. Each chapter begins with basic concepts containing a set of formulae and explanatory notes for quick reference, followed by a number of problems and their detailed solutions. The problems are judiciously selected and are arranged section-wise. The so- tions are neither pedantic nor terse. The approach is straight forward and step-- step solutions are elaborately provided. More importantly the relevant formulas used for solving the problems can be located in the beginning of each chapter. There are approximately 150 line diagrams for illustration. Basic quantum mechanics, elementary calculus, vector calculus and Algebra are the pre-requisites. **Quantum Mechanics in Drug Discovery** *Humana* This volume looks at applications of quantum mechanical (QM) methods in drug discovery. The chapters in this book describe how QM approaches can be applied to address key drug discovery issues, such as characterizing protein-water-ligand and protein-protein interactions, providing estimates of binding affinities, determining ligand energies and bioactive conformations, refinement of molecular geometries, scoring docked protein–ligand poses, describing molecular similarity, structure–activity-relationship (SAR) analysis, and ADMET prediction. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary software and tools, step-by-step, readily reproducible modeling protocols, and tips on troubleshooting and avoiding known pitfalls. Cutting-edge and unique, Quantum Mechanics in Drug Discovery is a valuable resource for structural and molecular biologists, computational and medicinal chemists, pharmacologists, and drug designers. **Quantum Mechanics Demystified** *McGraw Hill Professional* This clear, concise introduction to quantum mechanics is the perfect supplement and complement to the math-heavy texts that dominate the field. The author includes hundreds of worked examples to illustrate the processes discussed and Dirac's Method, explains how to obtain a desired result in familiar terms rather than with confusing terminology and formulas. **Lattice simulations of the Ø4 theory and related systems** *Tadeusz Pudlik* **Quantum Mechanics** *Cambridge University Press* The important changes quantum mechanics has undergone in recent years are reflected in this approach for students. A strong narrative and over 300 worked problems lead the student from experiment, through general principles of the theory, to modern applications. Stepping through results allows students to gain a thorough understanding. Starting with basic quantum mechanics, the book moves on to more advanced theory, followed by applications, perturbation methods and special fields, and ending with developments in the field. Historical, mathematical and philosophical boxes guide the student through the theory. Unique to this textbook are chapters on measurement and quantum optics, both at the forefront of current research. Advanced undergraduate and graduate students will benefit from this perspective on the fundamental physical paradigm and its applications. Online resources including solutions to selected problems, and 200 figures, with colour versions of some figures, are available at www.cambridge.org/Auletta. **Microwave Spectroscopy** *Courier Corporation* Two Nobel Laureates present a systematic, comprehensive account of the theory, techniques, experimental data, and interpretation involved in the study of microwave spectroscopy. Ideal as reference or text. 1955 edition. **Quantum Physics for Beginners** *CRC Press* The textbook covers the background theory of various effects discussed from first principles, as clearly as possible, to introduce students to the main ideas of quantum physics and to teach the basic mathematical methods and techniques used in the fields of advanced quantum physics, atomic physics, laser physics, nanotechnology, quantum chemistry, and theoretical mathematics. Many of the predictions of quantum physics appear to be contrary to our intuitive perceptions, and the student will learn how it comes about that microscopic objects (particles) behave in unusual ways that are called quantum effects, what we mean by quantum, and where this idea came from. The textbook is supplemented with Problems and Solutions in Quantum Physics, which contains a wide range of tutorial problems from simple confidence builders to fairly challenging problems that provide adequate understanding of the basic concepts of quantum physics. **Foundations of Quantum Mechanics An Exploration of the Physical Meaning of Quantum Theory** *Springer* Authored by an acclaimed teacher of quantum physics and philosophy, this textbook pays special attention to the aspects that many courses sweep under the carpet. Traditional courses in quantum mechanics teach students how to use the quantum formalism to make calculations. But even the best students - indeed, especially the best students - emerge rather confused about what, exactly, the theory says is going on, physically, in microscopic systems. This supplementary textbook is designed to help such students understand that they are not alone in their confusions (luminaries such as Albert Einstein, Erwin Schroedinger, and John Stewart Bell having shared them), to sharpen their understanding of the most important difficulties associated with interpreting quantum theory in a realistic manner, and to introduce them to the most promising attempts to formulate the theory in a way that is physically clear and coherent. The text is accessible to students with at least one semester of prior exposure to quantum (or "modern") physics and includes over a hundred engaging end-of-chapter "Projects" that make the book suitable for either a traditional classroom or for self-study. **Quantum Social Science** *Cambridge University Press* Written by world experts in the foundations of quantum mechanics, this book shows how elementary quantum mechanical principles can be applied to social sciences problems. Aimed at economists and psychologists, as well as physicists, it explores the exciting field of quantum social science. **Quantum Computing Explained** *John Wiley & Sons* A self-contained treatment of the fundamentals of quantum computing This clear, practical book takes quantum computing out of the realm of theoretical physics and teaches the fundamentals of the field to students and professionals who have not had training in quantum computing or quantum information theory, including computer scientists, programmers, electrical engineers, mathematicians, physics students, and chemists. The author cuts through the conventions of typical jargon-laden physics books and instead presents the material through his unique "how-to" approach and friendly, conversational style. Readers will learn how to carry out calculations with explicit details and will gain a fundamental grasp of: * Quantum mechanics * Quantum computation * Teleportation * Quantum cryptography * Entanglement * Quantum algorithms * Error correction A number of worked examples are included so readers can see how quantum computing is done with their own eyes, while answers to similar end-of-chapter problems are provided for readers to check their own work as they learn to master the information. Ideal for professionals and graduate-level students alike, Quantum Computing Explained delivers the fundamentals of quantum computing readers need to be able to understand current research papers and go on to study more advanced quantum texts. **Quantum Physics in Minutes** *Hachette UK* The fastest way to understanding quantum physics - learn about how our universe works, in minutes. Quantum physics is the most fundamental, but also the most bewildering, of sciences. Allowing for simultaneously dead-and-alive cats, teleportation, antimatter and parallel universes, it also underpins all digital technology and even life itself. But at last it's possible through this clear and compact book, illuminated with 200 simple diagrams for anyone to understand the strange and beautiful subatomic world, and hence the nature of reality itself. Contents include: inside the atom, the Higgs boson, Heisenberg's uncertainty principle, Schrödinger's cat, relativity, dark energy and matter, black holes, God playing dice, the Theory of Everything, the birth and fate of the Universe, string theory, quantum computing, superconductivity, quantum biology and consciousness, and much more. **Quantum Field Theory and the Standard Model** *Cambridge University Press* A modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems. **Quantum Information Theory** *Cambridge University Press* Developing many of the major, exciting, pre- and post-millennium developments from the ground up, this book is an ideal entry point for graduate students into quantum information theory. Significant attention is given to quantum mechanics for quantum information theory, and careful studies of the important protocols of teleportation, superdense coding, and entanglement distribution are presented. In this new edition, readers can expect to find over 100 pages of new material, including detailed discussions of Bell's theorem, the CHSH game, Tsirelson's theorem, the axiomatic approach to quantum channels, the definition of the diamond norm and its interpretation, and a proof of the Choi–Kraus theorem. Discussion of the importance of the quantum dynamic capacity formula has been completely revised, and many new exercises and references have been added. This new edition will be welcomed by the upcoming generation of quantum information theorists and the already established community of classical information theorists. **Quantum Dots Applications in Biology** *Springer Science & Business Media* Quantum Dots captures many diverse applications enabling utility in biological detection. Organized into five parts, the first two parts cover the use of QDs in imaging fixed and living cells (and tissues). Protocols are included for using QDs in routine as well as enabling applications. Part 3 shows early efforts aimed at using QDs in live animals. The final two parts demonstrate the versatility of QD technology in existing assay technology. **Quantum Mechanics** *Jones & Bartlett Learning* Quantum Mechanics and its applications are a vibrant, central part of today's research in both experimental and theoretical physics. Designed for the one-semester course, Quantum Mechanics expertly guides students through rigorous course material, providing comprehensive explanations, accessible examples, and intuitive equations. This text's in-depth coverage of essential topics, such as harmonic oscillator, barrier penetration, and hydrogen atoms, skillfully bridges the gap between sophomore introduction texts and lower-level graduate treatments. Students will find this user-friendly text, with numerous examples and applications, sets a solid foundation for future courses in the area of Quantum Mechanics. **Epistémologie de la gravité expérimentale - Rationalité scientifique** *MultiMedia Publishing* L'évolution des tests gravitationnels dans une perspective épistémologique encadré dans le concept de reconstruction rationnelle d'Imre Lakatos, fondée sur sa méthodologie de programmes de recherche. Contrairement à d'autres travaux sur le même sujet, la période évaluée est très longue, allant de la philosophie naturelle de Newton aux théories de la gravité quantique d'aujourd'hui. Afin d'expliquer de manière plus rationnelle l'évolution complexe du concept de gravité du siècle dernier, je propose une extension naturelle de la méthodologie des programmes de recherche que j'utilisais ensuite au cours de la communication. Je pense que cette approche offre une nouvelle perspective sur la manière dont le concept de gravité et les méthodes de test de chaque théorie de la gravité ont évalué dans le temps, par le biais d'observations et d'expériences. Je soutiens, sur la base de la méthodologie des programmes de recherche et des études des scientifiques et des philosophes, que les théories actuelles de la gravité quantique sont dégénératives, en raison du manque de preuves expérimentales sur une longue période et d'auto-immunisation contre la possibilité de la réfutabilité. De plus, un courant méthodologique est en cours de développement, attribuant un rôle secondaire, sans importance, aux vérifications par le biais d'observations et / ou d'expériences. Pour cette raison, il ne sera pas possible d'avoir une théorie complète de la gravité quantique sous sa forme actuelle qui inclura à la limite

la relativité générale, car les théories physiques ont toujours été ajustées, au cours de leur évolution, sur la base d'essais d'observation ou expérimentaux, et vérifiées par les prédictions effectuées. En outre, contrairement à une opinion répandue et aux programmes en cours concernant l'unification de toutes les forces fondamentales de la physique dans une théorie finale unique, basée sur la théorie des cordes, je soutiens que cette unification est généralement improbable et, de toute façon, impossible pour que l'unification soit développée sur la base des théories actuelles de la gravité quantique, y compris la théorie des cordes. En outre, je partage l'avis de certains scientifiques et philosophes selon lequel on consacre actuellement trop de ressources à l'idée de développer des théories de la gravité quantique, et en particulier de la théorie des cordes, qui devrait inclure la relativité générale et unifier la gravité avec d'autres forces, en particulier conditions dans lesquelles la science n'impose pas de tels programmes de recherche. SOMMAIRE: Introduction - Gravité - Tests gravitationnels - Méthodologie de Lakatos - Rationalité scientifique - - Programmes bifurqués - - Programmes unificateurs 1. La gravité newtonienne - 1.1 L'heuristique de la gravité newtonienne - 1.2 Prolifération des théories post-newtoniennes - 1.3 Tests des théories post-newtoniennes - - 1.3.1 Tests proposés par Newton - - 1.3.2 Tests des théories post-newtoniennes - 1.4 Anomalies de la gravité newtoniennes - 1.5 Point de saturation de la gravité newtonienne 2. Relativité générale - 2.1 L'heuristique du programme de la relativité générale - 2.2 Prolifération des théories post-einsteiniennes - 2.3 Formalisme paramétrisé post-newtonien (PPN) - 2.4 Tests de la relativité générale et des théories post-einsteiniennes - - 2.4.1 Tests proposés par Einstein - - 2.4.2 Tests des théories post-einsteiniennes - - 2.4.3 Tests classiques - - - 2.4.3.1 La précession du périhélie de Mercure - - - 2.4.3.2 La déviation de la lumière - - - 2.4.3.3 Le décalage vers le rouge gravitationnel - - 2.4.4 Tests modernes - - - 2.4.4.1 Le retard Shapiro - - - 2.4.4.2 La dilatation gravitationnelle du temps - - - 2.4.4.3 L'effet Lense-Thirring et l'effet géodésique - - - 2.4.4.4 Tests du principe d'équivalence - - - 2.4.4.5 Tests du système solaire - - 2.4.5 Tests en champ fort - - - 2.4.5.1 Lentilles gravitationnelles - - - 2.4.5.2 Ondes gravitationnelles - - - 2.4.5.3 Pulsars de synchronisation - - - 2.4.5.4 Environnements extrêmes - - 2.4.6 Tests cosmologiques - - - 2.4.6.1 L'univers en expansion - - - 2.4.6.2 Observations cosmologiques - - - 2.4.6.3 Surveillance des lentilles faibles - 2.5 Les anomalies de la relativité Générale - 2.6 Le point de saturation de la relativité générale 3. Gravité quantique - 3.1 L'heuristique de la gravité quantique - 3.2 Tests de la gravité quantique - 3.3 Gravité quantique canonique - - 3.3.1 Tests proposés pour le GCC - - 3.3.2. Gravité quantique à boucles - 3.4 La théorie des cordes - - 3.4.1 Heuristique de la théorie des cordes - - 3.4.2. Anomalies de la théorie des cordes - 3.5 Autres théories de la gravité quantique - 3.6 Unification (la théorie finale) 4. Cosmologie Conclusions Bibliographie Notes DOI: 10.13140/RG.2.2.22585.31848 **Epistemologia gravitației experimentale – Raționalitatea științifică** *MultiMedia Publishing* Evoluția testelor gravitaționale dintr-o perspectivă epistemologică încadrată în conceptul de reconstrucție rațională al lui Imre Lakatos, pe baza metodologiei acestuia a programelor de cercetare. Perioada evaluată este foarte vastă, începând cu filosofia naturală a lui Newton și până la teoriile gravitației cuantice din zilele noastre. Pentru a explica mai rațional evoluția complexă a conceptului de gravitație din ultimul secol, propun o extindere naturală a metodologiei programelor de cercetare pe care o folosesc apoi pe parcursul lucrării. Consider că această abordare oferă o nouă perspectivă asupra modului în care au evaluat în timp conceptul de gravitație și metodele de testare a fiecărei teorii a gravitației, prin observații și experimente. Argumentez, pe baza metodologiei programelor de cercetare și a studiilor oamenilor de știință și filosofilor, că actualele teorii ale gravitației cuantice sunt degenerative, datorită lipsei dovezilor experimentale pe o perioadă îndelungată de timp și a auto-imunizării împotriva posibilității falsificării. Mai mult, în prezent este în curs de dezvoltare un curent metodologic care atribuie un rol secundar, neimportant, verificărilor prin observații și/sau experimente. Din această cauză, nu va fi posibilă o teorie completă a gravitației cuantice în forma actuală care să includă la limită relativitatea generală, întrucât teoriile fizice au fost dintotdeauna ajustate, în decursul evoluției lor, pe baza testelor observaționale sau experimentale, și verificate prin predicțiile făcute. De asemenea, contrar unei opinii răspândite și a unor programe active actuale privind unificarea tuturor forțelor fundamentale ale fizicii într-o singură teorie finală, pe baza teoriei corzilor, argumentez că este puțin probabil în general să se realizeze această unificare, și nu este posibil oricum ca unificarea să se elaboreze pe baza teoriilor actuale ale gravitației cuantice, inclusiv prin teoria corzilor. În plus, susțin punctele de vedere ale unor oameni de știință și filosofi că în prezent se consumă mult prea multe resurse pe ideea dezvoltării teoriilor gravitației cuantice, și în special teoria corzilor, care să includă relativitatea generală și să unifice gravitația cu celelalte forțe, în condițiile în care știința nu impune astfel de programe de cercetare. CUPRINS: Introducere - Gravitația - Teste gravitaționale - Metodologia lui Lakatos - Raționalitatea științifică - Extinderea naturală a metodologiei lui Lakatos - - Programe bifurcate - - Programe unificatoare - Abrevieri 1. Gravitația newtoniană - 1.1 Euristicile gravitației newtoniene - 1.2 Proliferarea teoriilor post-newtoniene - 1.3 Teste ale teoriilor post-newtoniene - - 1.3.1 Teste propuse de Newton - - 1.3.2 Teste ale teoriilor post-newtoniene - 1.4 Anomalii ale gravitației newtoniene - 1.5 Punctul de saturație în gravitația newtoniană 2. 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Gravitația cuantică - 3.1 Euristicile gravitației cuantice - 3.2 Teste ale gravitației cuantice - 3.3 Gravitația cuantică canonică - - 3.3.1 Teste propuse pentru GCC - - 3.3.2. Gravitația cuantică în bucle - 3.4 Teoria corzilor - - 3.4.1 Euristicile teoriei corzilor - - 3.4.2. Anomalii ale teoriei corzilor - 3.5 Alte teorii ale gravitației cuantice - 3.6 Unificarea (Teoria Finală) 4. Cosmologia Concluzii Note Bibliografie DOI: 10.13140/RG.2.2.14582.75842