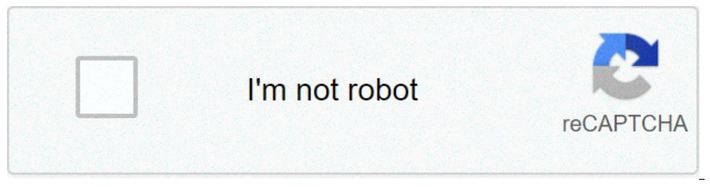

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Textbook by Richard Feynman Not to be confused with The Character of Physical Law This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.Find sources: "The Feynman Lectures on Physics" – news · newspapers · books · scholar · JSTOR (August 2019) (Learn how and when to remove this template message) The Feynman Lectures on Physics The Feynman Lectures on Physics including Feynman's Tips on Physics: The Definitive and Extended Edition (2nd edition, 2005)AuthorRichard Feynman, Robert B. Leighton, Matthew SandsCountryUnited StatesLanguageEnglishSubjectPhysicsPublisherAddison–WesleyPublication date1964. revised and extended edition in 2005OCLC19455482Websitefeynmanlectures.caltech.edu The Feynman Lectures on Physics is a physics textbook based on some lectures by Richard Feynman, a Nobel laureate who has sometimes been called "The Great Explainer".[1] The lectures were presented before undergraduate students at the California Institute of Technology (Caltech), during 1961–1963. The book's co-authors are Feynman, Robert B. Leighton, and Matthew Sands. The Feynman Lectures on Physics is perhaps the most popular physics book ever written. More than 1.5 million English-language copies have been sold; probably even more copies have been sold in a dozen foreign-language editions.[2] A 2013 review in Nature described the book as having "simplicity, beauty, unity ... presented with enthusiasm and insight".[3] Description The textbook comprises three volumes. The first volume focuses on mechanics, radiation, and heat, including relativistic effects. The second volume covers mainly electromagnetism and matter. The third volume covers quantum mechanics; for example, it shows how the double-slit experiment demonstrates the essential features of quantum mechanics. The book also includes chapters on the relationship between mathematics and physics, and the relationship of physics to other sciences. In 2013, Caltech in cooperation with The Feynman Lectures Website made the book freely available, on the web site.[4] Background Feynman the “Great Explainer”: The Feynman Lectures on Physics found an appreciative audience beyond the undergraduate community. By 1960, Richard Feynman’s research and discoveries in physics had resolved a number of troubling inconsistencies in several fundamental theories. In particular, it was his work in quantum electrodynamics for which he was awarded the 1965 Nobel Prize in physics. At the same time that Feynman was at the pinnacle of his fame, the faculty of the California Institute of Technology was concerned about the quality of the introductory courses for undergraduate students. It was thought the courses were burdened by an old-fashioned syllabus and the exciting discoveries of recent years, many of which had occurred at Caltech, were not being taught to the students. Thus, it was decided to reconfigure the first physics course offered to students at Caltech, with the goal being to generate more excitement in the students. Feynman readily agreed to give the course, though only once. Aware of the fact that this would be a historic event, Caltech recorded each lecture and took photographs of each drawing made on the blackboard by Feynman. Based on the lectures and the tape recordings, a team of physicists and graduate students put together a manuscript that would become The Feynman Lectures on Physics. Although Feynman's most valuable technical contribution to the field of physics may have been in the field of quantum electrodynamics, the Feynman Lectures were destined to become his most widely-read work. The Feynman Lectures are considered to be one of the most sophisticated and comprehensive college-level introductions to physics.[5] Feynman himself stated in his original preface that he was “pessimistic” with regard to his success in reaching all of his students. The Feynman lectures were written “to maintain the interest of very enthusiastic and rather smart students coming out of high schools and into Caltech”. Feynman was targeting the lectures to students who, “at the end of two years of our previous course, [were] very discouraged because there were really very few grand, new, modern ideas presented to them”. As a result, some physics students find the lectures more valuable after they have obtained a good grasp of physics by studying more traditional texts, and the books are sometimes seen as more helpful for teachers than for students.[6] While the two-year course (1961–1963) was still underway, rumors of it spread throughout the physics research and teaching community. In a special preface to the 1989 edition, David Goodstein and Gerry Neugebauer claimed that as time went on, the attendance of registered undergraduate students dropped sharply but was matched by a compensating increase in the number of faculty and graduate students. Co-author Matthew Sands, in his memoir accompanying the 2005 edition, contested this claim. Goodstein and Neugebauer also stated that, “it was [Feynman’s] peers — scientists, physicists, and professors — who would be the main beneficiaries of his magnificent achievement, which was nothing less than to see physics through the fresh and dynamic perspective of Richard Feynman”, and that his "gift was that he was an extraordinary teacher of teachers". Addison-Wesley published a collection of exercises and problems to accompany The Feynman Lectures on Physics. The problem sets were first used in the 1962-1963 academic year, and were organized by Robert B. Leighton. Some of the problems are sophisticated and difficult enough to require an understanding of advanced topics, such as Kolmogorov's zero–one law. The original set of books and supplements contained a number of errors, some of which rendered problems insoluble. Various errata were issued, which are now available online.[7] Addison-Wesley also released in CD format all the audio tapes of the lectures, over 103 hours with Richard Feynman, after remastering the sound and clearing the recordings. For the CD release, the order of the lectures was rearranged from that of the original texts. The publisher has released a table showing the correspondence between the books and the CDs. In March 1964, Feynman appeared once again before the freshman physics class as a lecturer, but the notes for this particular guest lecture were lost for a number of years. They were finally located, restored, and made available as Feynman's Lost Lecture: The Motion of Planets Around the Sun. In 2005, Michael A. Gottlieb and Ralph Leighton co-authored Feynman's Tips on Physics, which includes four of Feynman's freshman lectures which had not been included in the main text (three on problem solving, one on inertial guidance), a memoir by Matthew Sands about the origins of the Feynman Lectures on Physics, and exercises (with answers) that were assigned to students by Robert B. Leighton and Rochus Vogt in recitation sections of the Feynman Lectures course at Caltech. Also released in 2005, was a "Definitive Edition" of the lectures which included corrections to the original text. An account of the history of these famous volumes is given by Sands in his memoir article “Capturing the Wisdom of Feynman",[8] and another article "Memories of Feynman" by the physicist T. A. Welton.[9] In a September 13, 2013 email to members of the Feynman Lectures online forum, Gottlieb announced the launch of a new website by Caltech and The Feynman Lectures Website which offers "[A] free high-quality online edition" of the lecture text. To provide a device-independent reading experience, the website takes advantage of modern web technologies like HTML5, SVG, and MathJax to present text, figures, and equations in any sizes while maintaining the display quality.[10] Contents Volume I: Mainly mechanics, radiation, and heat Preface: “When new ideas came in, I would try either to deduce them if they were deducible or to explain that it was a new idea … and which was not supposed to be provable.” Chapters Atoms in motion Basic Physics The relation of physics to other sciences Conservation of energy Time and distance Probability The theory of gravitation Motion Newton's laws of dynamics Conservation of momentum Vectors Characteristics of force Work and potential energy (A) Work and potential energy (conclusion) The special theory of relativity Relativistic energy and momentum Space-time Rotation in two dimensions Center of mass; Moment of inertia Rotation in space The harmonic oscillator Algebra Resonance Transients Linear systems and review Optics: The principle of least time Geometrical optics Electromagnetic radiation Interference Diffraction The origin of the refractive index Radiation damping. Light scattering Polarization Relativistic effects in radiation Color vision Mechanisms of seeing Quantum behavior The Relation of Wave and particle viewpoints The kinetic theory of gases The principles of statistical mechanics The brownian movement Applications of kinetic theory Diffusion The laws of thermodynamics Illustrations of thermodynamics Ratchet and pawl Sound. The wave equation Beats Modes Harmonics Waves Symmetry in physical laws Volume II: Mainly electromagnetism and matter Chapters Electromagnetism Differential calculus of vector fields Vector integral calculus Electrostatics Application of Gauss' law The electric field in various circumstances The electric field in various circumstances (continued) Electrostatic energy Electricity in the atmosphere Dielectrics Inside dielectrics Electrostatic analogs Magnetostatics The magnetic field in various situations The vector potential Induced currents The laws of induction The Maxwell equations Principle of least action Solutions of Maxwell's equations in free space Solutions of Maxwell's equations with currents and charges AC circuits Cavity resonators Waveguides Electrodynamics in relativistic notation Lorentz transformations of the fields Field energy and field momentum Electromagnetic mass (ref. to Wheeler–Feynman absorber theory) The motion of charges in electric and magnetic fields The internal geometry of crystals Tensors Refractive index of dense materials Reflection from surfaces The magnetism of matter Paramagnetism and magnetic resonance Ferromagnetism Magnetic materials Elasticity Elastic materials The flow of dry water The flow of wet water Curved space Volume III: Quantum mechanics Chapters Quantum behavior The relation of wave and particle viewpoints Probability amplitudes Identical particles Spin one Spin one-half The dependence of amplitudes on time The Hamiltonian matrix The ammonia maser Other two-state systems More two-state systems The hyperfine splitting in hydrogen Propagation in a crystal lattice Semiconductors The independent particle approximation The dependence of amplitudes on position Symmetry and conservation laws Angular momentum The hydrogen atom and the periodic table Operators The Schrödinger equation in a classical context: a seminar on superconductivity Abbreviated editions Six readily-accessible chapters were later compiled into a book entitled Six Easy Pieces: Essentials of Physics Explained by Its Most Brilliant Teacher. Six more chapters are in the book Six Not So Easy Pieces: Einstein's Relativity, Symmetry and Space-Time. “Six Easy Pieces grew out of the need to bring to as wide an audience as possible, a substantial yet nontechnical physics primer based on the science of Richard Feynman... General readers are fortunate that Feynman chose to present certain key topics in largely qualitative terms without formal mathematics…”[11] Six Easy Pieces (1994) Chapters: Atoms in motion Basic Physics The relation of physics to other sciences Conservation of energy The theory of gravitation Quantum behavior Six Not-So-Easy Pieces (1998) Chapters: Vectors Symmetry in physical laws The special theory of relativity Relativistic energy and momentum Space-time Curved space The Very Best of The Feynman Lectures (Audio, 2005) Chapters: The Theory of Gravitation (Vol. I, Chapter 7) Curved Space (Vol. II, Chapter 42) Electromagnetism (Vol. II, Chapter 1) Probability (Vol. I, Chapter 6) The Relation of Wave and Particle Viewpoints (Vol. III, Chapter 2) Superconductivity (Vol. III, Chapter 21) Publishing information Feynman R, Leighton R, and Sands M. The Feynman Lectures on Physics . 3 volumes 1964, 1966. 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