Quantum electrodynamics the strange theory of light and matter pdf

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Famous the world over for the creative brilliance of his insights into the physical world, Nobel Prize-winning physicist Richard Feynman also possessed an extraordinary talent for explaining difficult concepts to the nonscientist. QED--the edited version of four lectures on quantum electrodynamics that Feynman gave to the general public at UCLA as part of the Alix G. Mautner Memorial Lecture series--is perhaps the best example of his ability to communicate both the substance and the spirit of science to the layperson.The focus, as the title suggests, is quantum electrodynamics (QED), the part of the quantum theory of fields that describes the interactions of the quanta of the electromagnetic field-light, X rays, gamma rays--with matter and those of charged particles with one another. By extending the formalism developed by Dirac in 1933, which related quantum and classical descriptions of the motion of particles, Feynman revolutionized the quantum mechanical understanding of the nature of particles and waves. And, by incorporating his own readily visualizable formulation of quantum mechanics, Feynman created a diagrammatic version of QED that made calculations much simpler and also provided visual insights into the mechanisms of quantum electrodynamic processes. In this book, using everyday language, spatial concepts, visualizations, and his renowned "Feynman diagrams" instead of advanced mathematics, Feynman successfully provides a definitive introduction to QED for a lay readership without any distortion of the basic science. Characterized by Feynman's famously original clarity and humor, this popular book on QED has not been equaled since its publication. "synopsis" may belong to another edition of this title. Buy Used Price: US$ 15,000.00 Convert Currency Shipping: Free Shipping Within U.S.A. Destination, rates & speeds Add to basket verified_user30 Day Return Policy QED The Strange Theory of Light and Matter Lectures by Richard Feynman I stumbled across a curious black book entitled QED The Strange Theory of Light and Matter, by Richard Feynman. I opened to find it was a series of lectures given in honor of Feynman’s late wife, Alix, a literary person with physics cravings. As stated, the lectures were constructed to be “understandable to [Alix] and other non-physicists” (forward). QED, a.k.a. quantum electrodynamics, seldom considered a topic for non-physicists, speaks of electrons and photons, space-time and probability, among other things. Feynman placates any fears early on stating, “What one fool can understand, another can” (x). Perhaps this is all the confidence one needs to tackle QED. A physicist dedicated to tying loose ends (I soon learned), Feynman qualifies QED understanding with, “No, you’re not going to be able to understand it…it is my task to convince you not to turn away because you don’t understand it…that is because I don’t understand it. Nobody does” (9). At this point the only thing I understand is that we are all equally misunderstanding fools! Mixing humor with humility, Feynman quickly engages physics from the ground up, breaking the cycles of Venus down to the counting beans, in a historical reference to the Mayan people. Further, he states that all physics breaks down to the counting of beans; we learn tricky rules simply because it’s faster. The reader is to realize that no person of science understands why nature behaves as it does; one can only know how nature behaves. Introducing light as particles, the photomultiplier tube (PMT), and common light effects (bending as it enters water, reflects off a mirror, separates into colors in an oily puddle), one gets the feeling that Feynman is hand-holding. Somehow he manages to cover large topics efficiently (condensing seven years into 4 lectures). The author employs intuitive theories, likely similar to the thoughts of his audience (holes and spots in a mirror to explain transmitted and reflected waves), and picks apart the problems through simple and effective examples. The examples have a bit of an animated feel as the ‘characters’ are brought to life—“how a photon makes up its mind” (19). He carries our thoughts beyond intuition, and suddenly one finds that light traveling a non-straight path is not such an appalling idea after all! Feynman quietly slips in concepts, such as probability and amplitude, being particularly careful not to overwhelm the reader. Feynman’s blatant honesty creates a level of comfort: “We haven’t got a good model to explain partial reflection by two surfaces; we just calculate the probability that a particular PMT will be hit by a photon reflected from a sheet of glass” (24). As the ideas slowly mounted and I grew wary of Feynman’s kindness, fearing a looming cloud of confusion, he exclaimed, “Brace yourselves for this…All we do is draw little arrows on a piece of paper” (24). Feynman, again, best qualifies his statement with, “this absurd process of combining little arrows computes the right answer for those phenomena you are familiar with” (35). Poof, the cloud disappeared. Feynman began each lecture with the customary, “those of you who have heard the other lectures will also find this lecture incomprehensible, but you know that’s all right” (77), and a quick review of what was previously discussed. It’s hard to isolate, but hearing these words from a giant in the field and actually feeling comforted by them added immensely to Feynman’s appeal. He spoke as if sitting across from the reader in a lounge. I feel confident with my understanding of concepts (or at least the application of concepts) such as the Uncertainty Principle, lenses, refraction, and reflection. Feynman, however, completely revamped what I consider understanding, and in a permanent way! He offers a particularly creative approach to the Uncertainty principle involving two blocks, PMTs, and little connected arrows. When creating a lens the author whispers, “let’s ‘fool the light,’ so that all the paths take exactly the same amount of time” (57)—I suspect few are surprised to find the image is enhanced. Feynman builds a level of trust such that he can state, “the theory continues to be successful at explaining every phenomenon of light,” (59) and we believe him. Following the first two lectures, Feynman discusses space-time diagrams (now known as Feynman Diagrams) and the simple rules of electron and photon activity. I never found ‘energy quantization’ a satisfactory picture of what keeps electrons in orbit around a nucleus; through an infinity of photon-exchanges put forth by Feynman I hold a more reasonable explanation of what occurs. Bragg Reflection and X-ray diffraction are easily visualized using QED and Feynman’s little summed stopwatch arrows. (The stopwatch spinning relates to photon frequency). It’s hardly intuitive that photons ‘clump,’ known as stimulated emission, a property used in laser production, but it flowed effortlessly from QED.. Feynman then applies the QED to nuclear physics and finds gross discrepancies from experiment—hence the tangible need for new physics (QCD). Feynman discusses issues key to all of physics, both known and unknown. While many obsess over what’s new in the field, Dr. Feynman stops us and proves that there is much to explore in what is ‘already known.’ Without this foundation physics is merely a jumble of numbers and formulae. While QED was written nearly twenty years ago, the questions in nuclear physics are largely the same—what is the source of mass? What is the source of gravity, and can we formulate quantum gravity? Can the forces be unified (GUT)? I cannot envision packing more material more effectively into an undersized book (covering only four lectures). Given the scope of the project, nothing (of which I am aware) was missing from Feynman’s discussion. The points were made wonderfully lucid with thorough examples using simple materials and setups. At times one might feel the ideas simple, but further consideration exposes the genius of Richard Feynman—he has the ability to make truly subtle and complex ideas comfortable and accessible. All that is missing is another set of lectures concerning the state of affairs in physics today, a project that will unfortunately remain undone. QED The Strange Theory of Light and Matter is a magical book of physics, one I highly recommend for students of all levels. A wayward scientist could rekindle her path with Feynman’s words. Physics majors could be reminded that physics is fun and inspiring. Those considering physics would be served especially well by Feynman’s work, providing structure for much of the substance they might soon absorb. Curious family and friends with no physics experience should read QED as a third or fourth physics book—the ideas are most effective when considered against some underlying knowledge of the topics. I would hesitate to offer Feynman’s book to policy makers and congressman for the simple fact that his effortless approach almost makes physics look too easy, and we wouldn’t want them cutting funding, would we?!

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