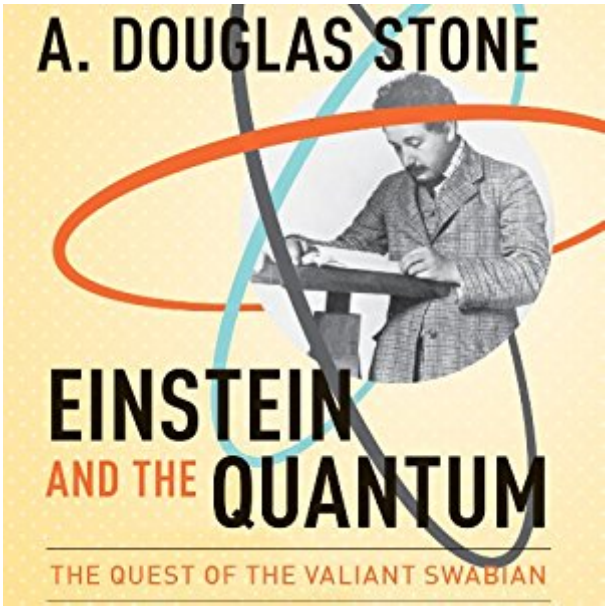
Einstein And The Quantum: The Quest Of The Valiant Swabian



Synopsis

Einstein and the Quantum reveals for the first time the full significance of Albert Einstein’s contributions to quantum theory. Einstein famously rejected quantum mechanics, observing that God does not play dice. But, in fact, he thought more about the nature of atoms, molecules, and the emission and absorption of light - the core of what we now know as quantum theory - than he did about relativity. A compelling blend of physics, biography, and the history of science, Einstein and the Quantum shares the untold story of how Einstein - not Max Planck or Niels Bohr - was the driving force behind early quantum theory. It paints a vivid portrait of the iconic physicist as he grappled with the apparently contradictory nature of the atomic world, in which its invisible constituents defy the categories of classical physics, behaving simultaneously as both particle and wave. And it demonstrates how Einstein’s later work on the emission and absorption of light, and on atomic gases, led directly to Erwin Schrodinger’s breakthrough to the modern form of quantum mechanics. The book sheds light on why Einstein ultimately renounced his own brilliant work on quantum theory, due to his deep belief in science as something objective and eternal. A book unlike any other, Einstein and the Quantum offers a completely new perspective on the scientific achievements of the greatest intellect of the twentieth century, showing how Einstein’s contributions to the development of quantum theory are more significant, perhaps, than even his legendary work on relativity.

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Customer Reviews

Stone makes a very good case for the notion that Einstein was, contrary to popular belief - or at

least contrary to MY belief - genuinely instrumental in the evolution of thought and science leading to quantum theory. I had had the impression that after his development of General and Special Relativity, Einstein stodgily resisted the growing evidence establishing the legitimacy of quantum theory, until near the end of his life, he grudgingly conceded that it had at least some value. Which, I guess, after reading Stone, I find was not an altogether incorrect understanding, but was definitely an incomplete understanding. Einstein's central role in the concepts of "light quanta" and Bose-Einstein condensates, along with other notions he developed, turned out to be foundational in the maturing of quantum thought. The book is easily readable but ably sets out enough sophisticated science to keep a curious lay reader interested. I thought this book was well worthwhile.

WHAT THIS BOOK IS ABOUT: Edna St.Vincent Millay's luminous sonnet closes, "Fortunate they, who through but once only and far away, have heard her massive sandal set on stone." Since Euclid, there have been many who in their lifetimes have taken received ideas on the nature of nature, questioned profoundly, and achieved at least one thought-shaking understanding. The history of mathematics is filled with such beauty. Some have made more than one such contribution: Newton, for example, in physics and, perhaps more arguably, Darwin in geology (his theory of coral reef formation, e.g.,) and biology (the theory of natural selection as the driver of diversity & evolution).Few, however, if any have followed Euclid as purely as Einstein. It is among the triumphs of Stone's magnificent book "Einstein and the Quantum" to make clear the depth, breadth, and height of Einstein's direct and indirect impact on physics in the 20th century. He begins, however, in the sometimes shadowed area of the origins of quantum theory in which Planck's contributions are often spotlighted.Stone explains his focus, writing, "It is crucial to understand that while relativity theory is an important part of modern physics, for most of us quantum mechanics is the theory of everything. ...Since quatum mechanics is the big kahuna, it behooves us to understand the role of Einstein in the "other" revolution of the twentieth century, the quantum one." (p. 4)MORE DETAILS: This---understanding Einstein's role and why it matters---is precisely what Stone achieves in the 29 chapters and 290 pages of "Einstein and the Quantum."Doing so requires writing accessibly about--the nature of nature in areas such as light and physical forces in classical physics--the work of Planck in the late 1890s and 1900s--Einstein's miraculous years between 1905 and 1909 when he published (in the Annalen der Physik) on the nature & transformation of light, the electrodynamics of moving bodies, the theory of light production and absorportion, Planck's theory of of radiation and the theory of specific heat, and on the nature and production of radiation.--the

concurrent history of skepticism and eventual recognition of Einstein’s world-changing thought among the other giants of this time--Einstein’s modus operandi which, as described by Stone, involved going to the heart of what was inconsistent or impossible in other theories, then worrying these inconsistencies until he found the simpler, more elegant, more comprehensive solutions(This seems to me among the most fascinating & valuable aspects of Stone’s analyses)--the brick walls when quantum theory would not yield to all his efforts--his shift to issues such as the nature of time & space--Einstein’s influence on other scientists, including his amazing recognition of a radical new statistical concept almost hidden in a paper by the then-unknown Indian physicist, Bose--and the tensions, disappointments and hopes of his later years when he strove to find & express a Unified Field Theory. This was gallant but unsuccesful and is now continued in contemporary expressions (string theory, e.g.,)Stone gives enough detail to permit following this history technically, given some understanding of mathematics and physics. Happily, in most instances, Stone offers fine accesibility to readers with scientific knowledge in other fields, and for non-scientists to follow with fascinated appreciation.Some of Einstein’s personal life (as the Valiant Swabian courting his first wife, their falling out, and the Berlin years with his second wife) is inter-woven. However much of Einstein qua Einstein emerges from the letters be wrote to life-long friends, often almost in exultation about reaching a beautiful insight, a hard-won understanding. He describes himself as a contemplative, a theorist, happiest with undisturbed time to think---and think, and think.Readers may feel close to the man, as well as the mind, reading this book. The chapter titles are examples of Stone’s deft touch, including, for example, "The Impudent Swabian," "More Heat Than Light," "Entertaining the Contradiction," "Calamity Jeans" (a particularly clear & brilliantly written chapter), and "Lamenting the Ruins."OTHER FEATURES: "Einstein and the Quantum" is embellished with detailed chapter notes augmenting the footnotes, with a fine reference list of further reading on Einstein’s writings & correspondence, biographical works on Einstein, Einstein & quantum theory, quantum theory & quantum mechanics, biographical material on other scientists, original scientific articles; an excellent detailed index and splendid appendix on the three thermal radiation laws that reaaders may find helpful---even essential---to study first.ANY READER ALERTS? Yes.--The reproduction of Einstein’s letter to Schroedinger of February 28, 192 appears to have been printed with weak dishwater (p. 236). There is no excuse for the apparent penury of not printing whatever is worth including dark enough to be readable.. The same problem occurs in some charts and other illustrations.--An appendix showing what else was happening concurrently in the physics community would make this book more valuable. Readers can make their own timelines & concordates but this is tedious and unnecessary. The appendix on other physicists appreciated as it is, is

insufficient.OVERALL: Five stars--actually were this possible, a galaxy for this book: Stone’s originality in examining Einstein & quantum theory in this depth, the skill with which the book is organized and written, and the sense of immersion in a world of beauty bare and of true genius. Bravo, bravissimo, Professor Stone!

I haven’t finished it yet but it is pretty thorough. Covers Einstein of course but also offers a lot of insight into Planck and Maxwell of just slightly less genius. Many others are mentioned in a lesser vein.

Reads like a story. Very fun reading on Einstein. He knows his subject.

The highly readable Einstein and the Quantum is,by far, the best science history/biography I haveever read. I can only hope that it will have a greatinfluence on the teaching of undergraduate physicsand science in general. Einstein and the Quantumreveals the main focus of Einstein’s passion duringhis miraculous decade. Readers of Walter Isaacson’sEinstein owe it to themselves to complete the storyby reading A. Douglas Stone’s marvelous book.

Most of the quantum theoryÃ¢Â Â™s references briefed EinsteinÃ¢Â Â™s contribution in the theory by his explanation of the photoelectric effect phenomena by proposing the light quanta hypothesis. Few others added hesitantly Bose-Einstein Statistic, and the theory of stimulation emission of radiation.But this book is unique: it follows EinsteinÃ¢Â Â™s efforts to understand the quantum behavior of the nature starting from PlankÃ¢Â Â™s theory (1900) to the foundation of Bose-Einstein statistics and the wave properties of the matter (1925).Douglas Stone understands the quantum theory well and digests EinsteinÃ¢Â Â™s contributions to it (through 25 years) also very well. He describes EinsteinÃ¢Â Â™s quantum travel staring from his attempts to unlock the secrets of PlankÃ¢Â Â™s radiation law (E=hv):1. Einstein started (1901) studying PlankÃ¢Â Â™s radiation theory only four months after its publishing.2. EinsteinÃ¢Â Â™s fundamentals studies in statistical mechanics which are the foundations for many of his later breakthroughs (1902-1904).3. Photoelectric Effects explanation by introducing the Light Quanta Hypothesis (1905).4. Einstein demonstrated that Planck formula requires the concept of the light quanta (1906).5. The theory of heat Capacity and itÃ¢Â Â™s relation with quantum theory of radiation (1906-1909). Einstein predicted that due to quantization of vibrational energy, the specific heat of solids go to zero as the temperature is lowered. He concluded that quantum mechanics was required for any correct atomic

theory.6. In his paper Ã¢Â ÂœOn the present status of the Radiation ProblemÃ¢Â Â• (1909), Einstein extended the quantum theory to the heart of MaxwellÃ¢Â Â™s fundamental equation of optics by arguing that light has both wave and particle properties and demonstrating that this equation have to be replaced with one that contains the charge of the electron (e).7. Salzburg Meeting (1909), Einstein had chosen to talk about radiation problem and quantum hypothesis instead of the now-accepted relativity theory. He introduced a Ã¢Â Âˆmirror Ã¢Â Â™ thought experiment to support his argument.8. Einstein struggled fruitlessly for more than two years to explain light quanta by adding quantum constant (h) to MaxwellÃ¢Â Â™s equations (1909-1910).9. Walther Nernst referred (1910) to EinsteinÃ¢Â Â™s quantum hypothesis without mentioning Planck at all. He concluded that radiation theory has become something very different in EinsteinÃ¢Â Â™s hand: a vision of completely new electromagnetic and molecular theory.10. Einstein presented the First Solvay Congress (1911) and gave report on the problem of specific heat.11. Einstein temporarily cut off quantum studies and devoted himself for gravitation problem (1912-1915): The general theory of Relativity.12. Stimulated Emission of Radiation Theory (1916-1917): EinsteinÃ¢Â Â™s quantum masterpiece that conforms completely to modern quantum mechanics.13. Einstein developed his concept of Ghost Fields for light quanta to explain how it could exhibit the interference effects associated with waves (1917).14. Einstein introduced the problem of quantizing chaotic motion of the electron in Bohr-Sommerfeld atom (1917).15. Einstein suggested new experiment to investigate and detect the light quanta based on Doppler Effect (1921). It was eventually flawed.16. Bose Einstein statistics (1924 - 1925).This is all about the first quantum theory, although he had major contributions in the modern and second quantum theory: Quantum mechanics:a) EinsteinÃ¢Â Â™s Insight of wave-particle duality guided De Broglie toward Wave properties of the electron.b) EinsteinÃ¢Â Â™s work in Quantum Ideal Gas theory guided Schrodinger toward Wave Mechanics.c) EinsteinÃ¢Â Â™s Insight of Ghost Field that precedes the photon guided Max Born toward the probability wave of the electron (The interpretation of Wave Mechanics).d) EinsteinÃ¢Â Â™s Insight of (the theory which decides what can be observed) guided Heisenberg to his uncertainty principle.Additionally, this book contains interesting history which not very known such as:1) Walther NernstÃ¢Â Â™s visit (1909) to Einstein to discuss specific heat made Einstein Ã¢Â Â“ who was unknown in Zurich at that time Ã¢Â Â“ suddenly famous. People said Ã¢Â ÂœThat Einstein must be a cleaver fellow if the great Nernst comes all the way from Berlin to Zurich to talk to himÃ¢Â Âœ.2) EinsteinÃ¢Â Â™s postcard to Bose congratulating him on his paper, gave Bose a sort of passport for study leave in Europe for two years where he eventually met Einstein in October 1925.I recommend this book to any person interest in the quantum theory

history, EinsteinÃ¢Â Â™s contributions on it and anyone interests in history of science in general.

Einstein and the Quantum: The Quest of the Valiant Swabian Einstein Already had it, But He Did not See it: Part 0: The Discarded Term from the Einstein-Hilbert-Action (Einstein had it Book 1) Prince Valiant Vol. 15: 1965-1966 (Prince Valiant) Prince Valiant Vol. 16: 1967-1968 (Vol. 16) (Prince Valiant) Advanced Molecular Quantum Mechanics: An Introduction to Relativistic Quantum Mechanics and the Quantum Theory of Radiation (Studies in Chemical Physics) How Einstein gives Dirac, Klein-Gordon and SchrÃ¶dinger: Deriving the SchrÃ¶dinger, Dirac and Klein-Gordon Equations from the Einstein-Field-Equations via an Intelligent Zero Einstein's Cosmos: How Albert Einstein's Vision Transformed Our Understanding of Space and Time: Great Discoveries Frank Einstein and the Electro-Finger (Frank Einstein series #2): Book Two Frank Einstein and the EvoBlaster Belt (Frank Einstein series #4): Book Four Frank Einstein and the BrainTurbo (Frank Einstein series #3): Book Three Frank Einstein and the Antimatter Motor (Frank Einstein series #1): Book One The Road to Relativity: The History and Meaning of Einstein's "The Foundation of General Relativity", Featuring the Original Manuscript of Einstein's Masterpiece Einstein: A Life of Genius (The True Story of Albert Einstein) (Historical Biographies of Famous People) Â¿Quien fue Albert Einstein? / Who Was Albert Einstein? (Spanish Edition) (Quien Fue? / Who Was?) Dance of the Photons: From Einstein to Quantum Teleportation Beyond Einstein: The Cosmic Quest for the Theory of the Universe Quantum Nanoelectronics: An introduction to electronic nanotechnology and quantum computing Quantum Runes: How to Create Your Perfect Reality Using Quantum Physics and Teutonic Rune Magic (Creating Magick with The Universal Laws of Attraction Book 1) Covariant Loop Quantum Gravity: An Elementary Introduction to Quantum Gravity and Spinfoam Theory (Cambridge Monographs on Mathematical Physics) Quantum Ontology: A Guide to the Metaphysics of Quantum Mechanics