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The Elegant Universe

The Elegant Universe, written by Brian Greene, seeks to clarify the details of our universe and the components that make it up. The book promises to deliver a simple explanation for one of the least understood and most confusing realms in academia: the quantum world. By understanding the complications within quantum mechanics, Greene hopes that readers can make the connection between quantum theories and the framework of our universe and clear up any misconceptions one may have about the laws of the universe.

The Elegant Universe is structured in a simple method, based on the difficulty of topics discussed. The book contains the following five chapters: The Edge of Knowledge; The Dilemma of Space, Time, and the Quanta; The Cosmic Symphony; String Theory and the Fabric of Spacetime; and Unification in the Twenty-First Century. Greene effectively builds from the bottom, establishing a foundation of theories and laws such as Newton’s laws of gravity, before expanding to the universe and how these laws may relate to our surroundings and the universe in the form of superstring theory and other similarly complicated topics. By doing so, Greene helps introduce such difficult topics to those who may not have learned physics or anything quantum-related.

Because quantum theory is so abstract, Greene also uses analogies and examples to help the reader understand it in simpler terms. Greene explains superstring theory by describing it in terms of “music”. Specifically, fundamental particles are made up of vibrating strings like that of a guitar and how each distinct pitch from a single guitar string is synonymous to a different particle. Graphics are also somewhat incorporated into the explanations, and are easy to interpret and relate with the explanations. This allows readers to avoid the jargon and complexity that would be a huge obstacle in learning such complicated laws.

However, there are some instances in which Greene fails to make certain details clear to readers. Though uncommon, The Elegant Universe sometimes includes long walls of text with no diagrams or comparisons to make difficult content easier to comprehend. But as I read more into these larger blocks of text, I realized that these explanations were simply too abstract to put into a clear diagram. When the concepts were extremely difficult to provide concise definitions, Greene simply did the best he could to explain and compare to laws on planet Earth. Nevertheless, Greene did his best to make sure that readers understood the presented topics.

In the book, Greene seems to shift between a beginning, light-hearted tone to a more serious, academic voice. The reason why is probably because the introduction provided an easy overview of the concepts and did not require as much formal language. However, as Greene delves deeper into the meat of quantum mechanics, his language and voice change entirely; it is similar to that of a professor lecturing his or her class on an entirely new and difficult topic, and the topic is so difficult to visualize that even the professor may be unable to explain clearly.

Greene’s deep understanding and his simple explanations really originate from his previous studies on the law of the universe, from his publication of Fabric of the Cosmos to his special Ted talks. Greene has also published many other works and connects most of his books with one another, creating a collection of non-fiction books that spin a great tale of our universe. When I finished reading The Elegant Universe, I immediately watched his Ted talks and made the relation to what he speaks about in his presentation to his explanation in his book.

My favorite part of the book is when Greene explains Planck’s interpretation of energy in the form of “lumps” and how this type of energy is very similar to the behavior of electrons when excited. The analogy involves an infinite number of children within a factory that must pay 85 cents to leave the building. However, each child is given a certain monetary currency (nickel, dime, quarter, dollar, etc) and has to catch the falling money from above. Children who obtained coins in general would be unable to leave the building because there is an infinite number of children, while those with even a one-dollar bill could leave the building immediately.

The explanation seems odd, but it is easier to understand than if told in terms of quantum theory. In this explanation, the currency represents the variation of energy particles (photons) emitted at the electrons while the children represent the electrons that are excited. Just as there is change in the currency analogy when the children pay to leave the building, there is leftover energy that is not dependent on the energy but the frequency of the photon shot at the electrons. From this analogy, Greene then goes on to relate Einstein’s theory of energy (E= MC^2) in which frequency of the light shone determines the speed of the ejected electrons while the intensity of the light shone determines the number of ejected electrons.

Beyond the discussion of abstract physics concepts, Greene concludes the book with commentary on how these discoveries will influence future quantum theories in the twenty-first century. Greene states that in order for quantum theorists to make advances, the two sides of quantum mechanics (Einstein’s theory of relativity against Newton’s laws) must merge each of their laws to create a unified theory known as M-theory. The result of M-theory is the foundation of superstring theory and defines all particles with the same fundamental building block made up of vibrating strings. When these theories are accepted, Greene believes that scientists will finally be taking a step in the right direction.

Overall, I would recommend this book to anyone who may be interested in a wide variety of physics topics, from basic concepts related to the properties of light to the supersymmetry of all attractive forces. However, it may take time and patience to comprehend the text and diagrams as it can get complicated in certain sections of the book. Nonetheless, The Elegant Universe is a great read that grabs the reader’s attention harder than a supermassive black hole.