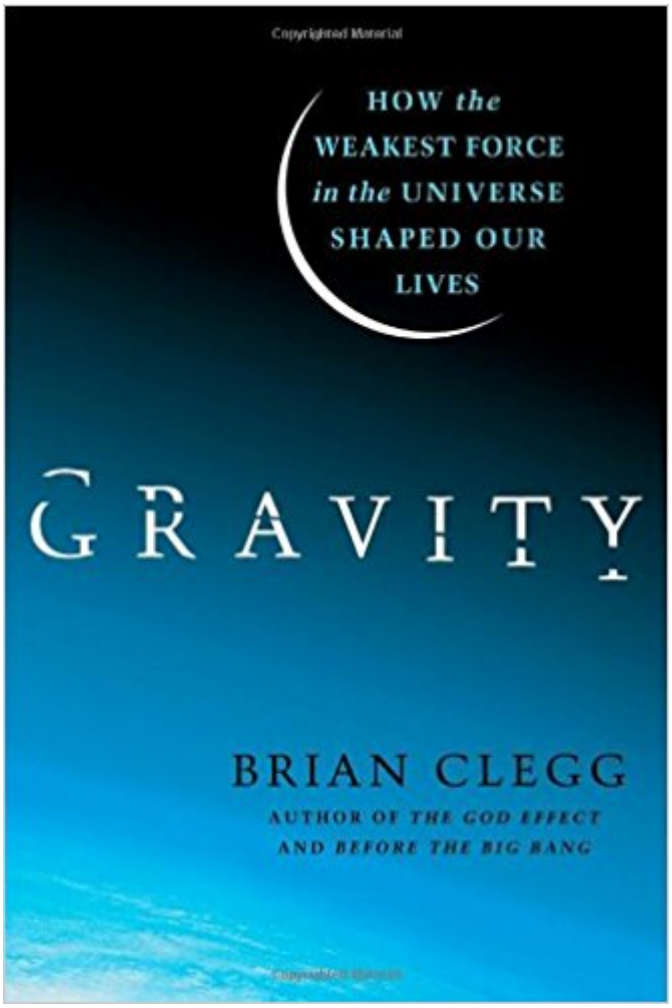
Gravity: How The Weakest Force In The Universe Shaped Our Lives



Synopsis

A history of gravity, and a study of its importance and relevance to our lives, as well as its influence on other areas of science. Physicists will tell you that four forces control the universe. Of these, gravity may the most obvious, but it is also the most mysterious. Newton managed to predict the force of gravity but couldn’t explain how it worked at a distance. Einstein picked up on the simple premise that gravity and acceleration are interchangeable to devise his mind-bending general relativity, showing how matter warps space and time. Not only did this explain how gravity worked â “ and how apparently simple gravitation has four separate components â “ but it predicted everything from black holes to gravity’s effect on time. Whether it’s the reality of anti-gravity or the unexpected discovery that a ball and a laser beam drop at the same rate, gravity is the force that fascinates.

Book Information

Hardcover: 336 pages

Publisher: St. Martin’s Press (May 22, 2012)

Language: English

ISBN-10: 0312616295

ISBN-13: 978-0312616298

Product Dimensions: 5.9 x 28.7 x 217.4 inches

Shipping Weight: 14.4 ounces (View shipping rates and policies)

Average Customer Review: 4.6 out of 5 stars 11 customer reviews

Best Sellers Rank: #612,098 in Books (See Top 100 in Books) #86 inÂ Books > Science & Math > Physics > Gravity #3351 inÂ Books > Science & Math > History & Philosophy #21073 inÂ Books > Textbooks > Science & Mathematics

Customer Reviews

Gravity is one of the most accepted laws of science. Drop an object and it falls to earth because of the attraction between the earth and the object. What alerts the earth and the object to act? Is there a sort of communication between them? Theoretical physicists have struggled to explain gravitational attraction over distance since Einstein posed his theories of special and general relativity. Quantum theory, string theory, M theory, and other theoretical inquiries have failed to solve the riddle. In his history of gravity from the Big Bang to the present, popular science author Clegg recounts international efforts to understand what is thought to be the weakest yet most essential force holding the universe together. Black holes, warps in space and time, and antimatter

are featured in this wide-ranging account, which will be of interest to science students and readers of science fiction. --Rick Roche

â œAlthough by far the feeblest of the four universal forces, gravity is the only one we experience continuously. Every inquisitive person should read a book about it, preferably this one . . . Clegg's skills never flag and his account remains lucid and free of jargon, bad jokes, and math phobia.â • â •Kirkus (starred review)â œClegg's accessible presentation offers insight into everything from Aristotelian science to black holes and string theory as it reveals the complexities and surprise of a familiar force that continues to surprise scientists.â • â •Publishers Weekly

Brian Clegg's succinct expose of what science has often referred to as the weakest force but which science now suggests is the progenitor of all futures is the paradox of what is 'Gravity'. A clever admix of the historical and the more contemporary thinking that is further infused with detailed analysis, yet this is an eminently readable thesis that folds time and space into the inevitable dance between uncertainty and predictability, between general and special relativity and between action across the 'ether' and across dark matter. If a black hole is indeed a time machine, then gravity must be its timekeeper. I thoroughly recommend this book to all who thirst for knowledge.

Great book on what we know and what we don't know about gravity. It's a refresher on basic physics and the scientific process too! It is written in a very entertaining style and really lays out how our views of gravity have developed throughout history. It traces the understanding of gravity from Newton through Einstein to the quantum guys.

One of the best science writer's I have read; thorough and clear.

I am fascinated by gravity. I would like to understand not just how to accurately calculate its magnitude by Newton's formula or Enstein's General Relativity, I would like to understand how space-time is actually deformed by mass. How is the information that mass is present transmitted to space-time. So, I was disappointed that I didn't really learn anything new in Brian Clegg's book. I did not get my questions answered. The book begins with an interesting historical summary of theories of gravity. He eventually gets to general relativity. I didn't really learn anything new. If one does not have an understanding of Newtonian gravity then this book would be interesting. If one has never read about the development of general relativity, then the history is interesting. For readers who

have previously read about Newton and Einstein, there is little new material. There is a very brief mention of quantum gravity and modified theories of gravity that may preclude the need for the invention of dark matter, but the word brief is important. This book is aimed directly at the non-mathematical science enthusiast who wants a historical perspective on gravity and is satisfied with a very limited description of general relativity or other modified theories of gravity. No math is provided. There are brief descriptions of gravitons without much discussion. I didn't get my questions on the mechanism for the deformation of space-time by mass, explained.

Interesting

It is difficult to write a review after concurrently finishing The Edge of the Universe, The Particle at the End of the Universe, and Brian Clegg's fine book Gravity--the latter two books are highly recommended both deserving of forthcoming reviews. One will find a large crossover between the contents Clegg's book and the Caroll's The Particle at the End of the Universe.Brian Clegg has written a very interesting and popular level book for semi-initiated science readers. Indeed, most of the contents of this book should be familiar as gravity has been the driving force behind the success of Newtonian physics and Einstein's subsequent general theory of relativity. And, of course the Holy Grail for gravity is now the "search" for a quantum theory of gravity, a theory of everything by another name. What makes Clegg's standout from other books that mention the same issues, however, is written in an enjoyable and logical style. As the previous review does not say too much by way of the contents of the chapters, it is here that I will briefly turn my attentions.The book is premised on the importance of gravity, not only for our daily lives but for the history of science, both issues that comprise chapter 1. The chapters are small and self-contained, meaning that a subsequent chapter is not premised on reading the previous chapter.Chapters 2 through 5 look at the development and treatment of the gravity and the cosmos, from Aristotle to Ptolemy to Galileo until the reader reaches Newton. Most of this information can be gleaned from other popular level science books, but that in no way detracts from Clegg's writing style which enables the reader to easily follow the contents, and easy to memorize which is unspoken goal for many readers.Chapter 5 talks about action-at-a-distance and Newtonian physics, focusing on his theory of gravity. This lays the foundation for Newton's detractors and the introduction to alternative views about gravity as Newton has brought the entirety of the cosmos down to earth (no pun intended). Clegg also makes mention--and this is true throughout the entire book--of interesting and collateral issues that Glegg calls "gravitational mysteries" such as the moon and tidal forces. Returning to action-at-a-distance,

Clegg paves the way for Einstein’s revolution.Chapters 6 and 7 Clegg iterates Einstein’s miracle year, 1905, and unpacks the topics of each one of Einstein’s works, focusing on STR. The focus shifts from STR to the general theory of relativity. Clegg provides simple illustrations regarding the POE (principle of equivalence), the nature and properties of spacetime eventually getting to Minkowski’s spacetime (4-D ontology) that Einstein subsequently accepted. Clegg focuses on simple examples for spacetime aside from the same "ball in a rubber sheet analogy," and why and where such analogies breakdown. Clegg discusses popular issues such as gravitational waves, gravitational lensing, and the bending of light (which he returns to later). Again, Clegg writes on these matters in an easy top digest fashion making them easy to memorize.In Chapter 8 the book begins to turn towards quantum physics, the structure and utility of atomic particles, and the four fundamental forces. The issue of gravitons turns the reader back to events in spacetime such as black holes, the singularity, hawking radiation and other issues. These issues are somewhat of an outline for Chapters 9 and 10.In Chapter 9 we "enter the quantum" where Clegg discusses the hunt for a quantum theory of gravity and the main theories for a new quantum theory of quantum theory of gravity such as string theory, M--theory, loop quantum gravity, and twistor theory. Each alternative is subsequently unpacked throughout the remainder of the chapter. Chapter 10 reverts back to spacetime, looking at phenomena that back up the general theory of relativity.The final chapter unpacks the history of antigravity proponents and their failed attempts at creating artifacts (e.g., ships that can fly close to the speed of light, gyroscopes, etc.). Clegg includes an interesting discussion about the history of flying saucers. There are many more issues that are touched upon in the book, but many of these issues care also found in other books such as the two mentioned about. Again, Clegg’s book gets a good rating for the reasons above and because of the collateral scientific facts that one does not usually find in other books in the same genre such (e.g., flying saucers, and pseudoscience).Of particular import for this reviewer is his commentary following the final chapter, statements that are not uncommon when reading academic journals, overhear at seminars or when reading graduate level textbooks. For example, taking a cue from the iconic Richard Feynman, Clegg has an honest moment about the nature and limitations of science, which follow logically from the final chapter of the book that highlights attempts to create antigravity that Clegg presently assigns to the category of "science fiction."After quoting Feynman at length, Clegg points out that Feynman "was explaining . . . physics is never going to be able to answer the ultimate question: `Why?’ We can describe how nature behaves with more and more accuracy. We can observe apparent laws and constants of nature. But we can never observe questions like, `Why does gravity attract?’" In popular level reading one rarely is confronted by such honesty, which is

welcome for those of us who are more inclined towards second-order disciplines such as the philosophy of physics, where both scientists and avid readers would do well in reading books by Tim Maudlin et seq.Clegg broadly addresses the idea of multiverse (not any specific multiverse theory) in conjunction with the "weak" anthropic principle concluding, "So given the multiverse, the simple answer to `Why are things like they are?' is that they have to be or we wouldn't be here. Many people (including me) find this answer facile. Even if you accept it, all we've done is push back the `Why' a stage to ask instead `Why does the multiverse exist?' At this level we move away from science and get to metaphysics or theology." (Pages 283-84). As a reviewer my job is not to preach, but this makes Clegg's book all the better. I simple offer a hearty--bravo! A very enjoyable book.