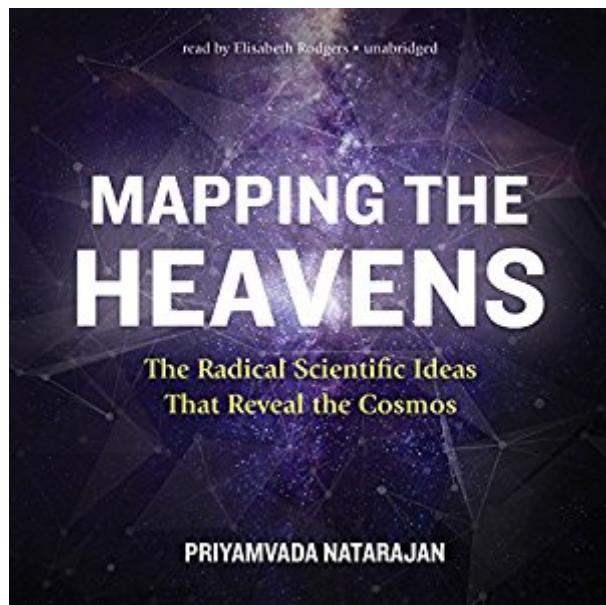


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# Mapping The Heavens: The Radical Scientific Ideas That Reveal The Cosmos



## Synopsis

Mapping the Heavens provides a tour of the "greatest hits" of cosmological discoveries - the ideas that reshaped our universe over the past century. The cosmos, once understood as a stagnant place filled with the ordinary, is now a universe that is expanding at an accelerating pace, propelled by dark energy and structured by dark matter. Priyamvada Natarajan, our guide to these ideas, is at the forefront of the research - an astrophysicist who literally creates maps of invisible matter in the universe. She not only explains for a wide audience the science behind these essential ideas but also provides an understanding of how radical scientific theories gain acceptance. The formation and growth of black holes, dark matter halos, the accelerating expansion of the universe, the echo of the big bang, the discovery of exoplanets, and the possibility of other universes - these are some of the puzzling cosmological topics of the early 21st century. Natarajan discusses why the acceptance of new ideas about the universe and our place in it has never been linear and has always been contested even within the scientific community. And she affirms that, shifting and incomplete as science always must be, it offers the best path we have toward making sense of our wondrous, mysterious universe.

## Book Information

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## Customer Reviews

In this interesting book, the author covers the history of the major discoveries about the cosmos - the universe we live in. Her purpose is to show us the importance of science as a human endeavor - though not entirely objective - in making sense of our natural world. And I agree with her

that "it still offers the best prescription for weighing evidence and making sense of the natural world." She continues, "Shifting and incomplete as it may be, science is self-correcting. It is the best method we have to navigate and make sense of this wondrous universe of ours." And with that being said, we begin our journey about 2000 to 1600 BCE with one of the first recorded images of the heavens discovered in eastern Germany — the Nebra Sky Disk. Another notable discovery was the Venus Tablet of the seventh century BCE Babylon. As we move beyond the sixth century BCE, we are introduced to the great Greek minds of the time and their contributions to science — think Eratosthenes and Ptolemy among many other great minds. By the sixteenth century CE we learn of the Copernican heliocentric system. There are so many contributors through the ages. Some others are Tycho Brahe, Galileo Galilei, Johannes Kepler, and Newton. In recent times, we have the work of Einstein who revolutionized our understanding of the cosmos. Hubble showed us that galaxies were moving away from us with velocity increasing with distance. It appeared we lived in an expanding universe. Our attention now turns to black holes and their accompanying event horizon, but let's not forget the neutron stars, pulsars, and quasars. All of this discovery is "emblematic of how instruments have helped make theory real." Perplexing discoveries led to the eventual acceptance of something called dark matter. The whole story of this thing called dark matter is detailed quite nicely by the author. Another interesting story is the discovery that the universe is not just expanding, it is accelerating in its expansion. In this story we learn of the cosmological constant and something called dark energy. This energy makes up about 70 percent of the total mass-energy sum of the universe. How little we know about this strange universe we live in. Next, we learn about the history of the discovery of the cosmic background radiation — the primordial remnant of the big bang era (380,000 years after the bang). The energy of this radiation is estimated to exceed "that from all the starlight in all the galaxies combined and accounts for 99 percent of the total radiation in the universe." In the next to last chapter, I learned an interesting thing. It seems that to fully specify all the relevant properties of our universe, we need to know just six numbers. These numbers have been empirically determined, and even the slightest deviation would result in our nonexistence. For example, one is  $D$ , the number of spatial dimensions in our universe. Together these are called the cosmological parameters. Discoveries today are generally not made by lone individuals according to the author. Today's challenges "require massive teams of hundreds of bright scientists contributing specialized training to nearly corporate endeavors." We now require large, expensive equipment and significant resources in order to make discoveries — large telescopes, supercomputers, etc. I can't wait to see what new discoveries lay ahead.

Reading your book "Mapping of Havens" was an exciting and enjoyable experience. It was enjoyable because it was not read like a classic scientific book. Instead, it felt like reading a collection of detective stories that take the reader through the eyes of the investigator. First person style, conveyed your passion for the topics presented and helped me to identify with it even more. But it was also exciting because for the first time I could see the cosmological "big picture" and realized that humanity is way past relativity theory.

Maybe the best way to learn science is to read the history of discoveries. Priyamvada Natarajan has a terrific voice that makes her prose eminently readable, and she has a finely tuned story sense. I felt as though she was writing directly to me at times. She is, of course, not only a science writer, but a prominent scientist, doing cutting edge research in this very field, so the combination makes for an outstanding book.

This book has several parallel tracks - physics concepts, instruments used to observe the universe, politics among scientists, anecdotes, philosophical musings etc. It starts with the ancient history of mapping the stars (great idea) and progresses to modern times. Of the seven chapters, I enjoyed the first four and struggled to complete the last two. In the last chapter, the author just went in all directions. Another complaint I have is the writing style - long sentences and too many complicated words. The best part to me was chapter four on dark matter. It answered some fundamental questions that I had (Why do we call them 'matter'). I would have liked the entire book from then on to focus on just dark matter.

This may be the most superb book on the history of astronomy and astrophysical discoveries ever written..I have a phd in electrical engineering from MIT, and a fairly high level of mathematical sophistication. I can honestly say that this book is a pleasure to read, and at just the right level for the "scientifically motivated" public. I was excited to find after reading the book that Modern physics is profoundly incomplete due to the lack of explanation for dark energy and dark matter. I am sure that there are more technical accounts of the subject matter, but none that are so superbly written and make such pleasurable reading!

A good book describing the process and some of the intrigues that happened as astronomers reached the currently accepted state of our universe. Clearly aimed at those who like to know about science without the professional jargon that often comes with the information.

Slow to get to one of the themes the book promotes, dark energy, but nevertheless, an excellent history of map making from flat earth to curved earth to galaxies to the CBR.

Well written, informative and insightful. I couldn't put it down. It takes you on a cosmic journey that starts with the Big Bang and ends with the infinite power of the human mind.

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