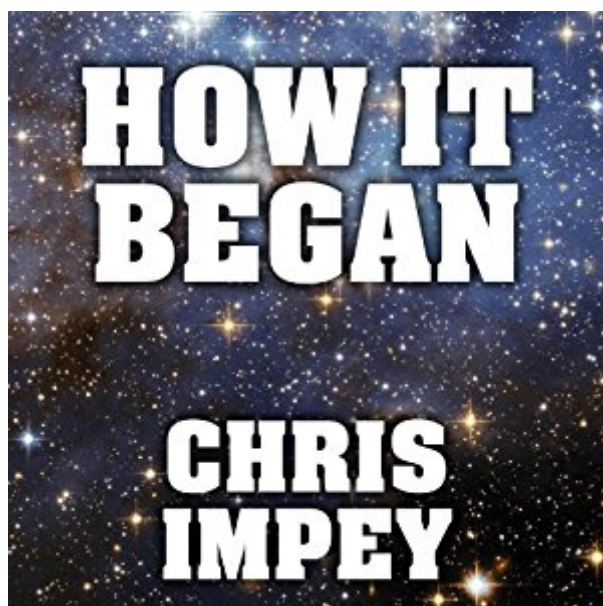


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# How It Began: A Time-Traveler's Guide To The Universe



## Synopsis

In this vibrant, eye-opening tour of milestones in the history of our universe, Chris Impey guides us through space and time, leading us from the familiar sights of the night sky to the dazzlingly strange aftermath of the Big Bang. What if we could look into space and see not only our place in the universe but also how we came to be here? As it happens, we can. Because it takes time for light to travel, we see more and more distant regions of the universe as they were in the successively greater past. Impey uses this concept - "look-back time" - to take us on an intergalactic tour that is simultaneously out in space and back in time. Performing a type of cosmic archaeology, Impey brilliantly describes the astronomical clues that scientists have used to solve fascinating mysteries about the origins and development of our universe. The milestones on this journey range from the nearby to the remote: We travel from the Moon, Jupiter, and the black hole at the heart of our galaxy all the way to the first star, the first ray of light, and even the strange, roiling conditions of the infant universe, an intense and volatile environment in which matter was created from pure energy. Impey gives us breathtaking visual descriptions and also explains what each landmark can reveal about the universe and its history. His lucid, wonderfully engaging scientific discussions bring us to the brink of modern cosmology and physics, illuminating such mind-bending concepts as invisible dimensions, timelessness, and multiple universes. A dynamic and unforgettable portrait of the cosmos, *How It Began* will reward its listeners with a deeper understanding of the universe we inhabit as well as a renewed sense of wonder at its beauty and mystery.

## Book Information

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## Customer Reviews

(Review published in MIT's The Tech on April 13, 2012) I grew up in the Panamanian countryside, under pristine skies bursting with stars. Defenseless against the nightly spectacle, I had no choice but to become a backyard astronomer. A Spanish translation of Isaac Asimov's *The Universe* (1966) transformed a romantic interest in constellations into a healthy scientific understanding of the cosmos. Asimov's tome, although dated, satisfied my thirst for cosmological knowledge long enough for me to shift my attention to more mundane things. Two decades went by until I discovered -- with a mix of delight and trepidation -- that while I was not looking, a third revolution in cosmology, by no means smaller than those triggered by Copernicus and Hubble, was taking place right under my nose, during my lifetime. Obscure and puzzling terms, such as dark matter and dark energy, were now ubiquitous in a discussion that I no longer recognized as familiar and that -- much to my dismay -- I was no longer able to follow with confidence. The good old Big Bang I was familiar with had now been revised and expanded to include exotic concepts such as an inflationary stage, an accelerating rate of expansion, and the possibility that our whole universe may be only a tiny part of a bubbling multiverse, explainable by means of microscopic vibrating strings. Ouch! Eager to catch up with the fantastic new questions and findings of the ongoing third cosmological revolution, I searched again for an instructive and entertaining book that could do for me now what Asimov's book had done 20 years earlier. Alas! A pilgrimage through the pages of a dozen books, each with diverse strength and shortcomings, was necessary for me to catch up with our current understanding of the universe.

As I read this book, the most striking sense that I got was the overwhelming size of the universe. These are numbers that I can't even fathom, approaching infinite from both a large perspective and a small perspective. From the large perspective, here are some numbers quoted in the book. The size of the universe is  $10$  to the  $34$ th power (that is 34 zeroes after ten) light years where a light year is approximately 5.8 trillion miles. The total mass (weight) of the universe is  $10$  to the  $54$ th power kilograms. There are 100 billion galaxies (Milky Way is just one) in the universe. The universe is 14 billion years old. From a small perspective, in the process of finding out how the universe started, physicists have been pursuing smaller and smaller items, coming to the concept of a quark which can only be identified through collisions from these huge accelerator units. This is impressive stuff to the layman in the world of astronomy like myself and therefore very interesting. The book pursues the origination of the universe by starting with the earth, the moon, the solar system, our galaxy and continuing onto other galaxies in the universe that have been found via telescopes on earth and the

Hubble telescope. Through this trip, the author shares stories of important physicists along the way, Hubble, Einstein, Lemaitre (sp?) etc. and stories regarding himself. The stories regarding himself are apparently provided for human interest and are not a highlight of the book. In these stories, we find how dedicated and eccentric these individuals are (including the author, I daresay), but I suppose that this is necessary to come to the conclusions that they have.

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