

Before the Beginning to After the End

Lecture 1 - October 1st, 2011

Today:

Three key discoveries that have helped shape modern cosmology

- 1. There is more "dark matter" than ordinary matter in spiral galaxies.
- 2. The Universe's current rate of expansion is increasing in time
- 3. The Big Bang was preceded by a period of exponential expansion we call "inflation".

List of coming lectures:

- 2. October 8th: In the beginning: the inflationary epoch
- 3. October 15th: Let there be light: The Big Bang
- 4. October 22nd: The Cosmic Microwave Background Radiation
- 5. October 29th: Structure: The Rise (and Infall) of Dark Matter
- 6. November 5th: The Dark Energy Crisis
- 7. November 12th: Speculations in Cosmology I: Extra Dimensions
- 8. November 19th: Speculations in Cosmology II: Massive Gravity (two week hiatus)
- 9. December 10th: The eternal silence of these infinite spaces terrifies me (The Future of the Universe)

Goals and Philosophy

These lectures will attempt to give an introduction to three things:

- 1. The consensus view on what physics we know about each epoch of the Universe's existence.
- 2. An explanation of the key theoretical and observational discoveries that support that view.
- 3. Mention and explanation of the major controversies that surround many of these conclusions.

In the first lecture, today, my goal will be to give an overview of the entire history of the Universe - 14 billion years in 60 minutes. So hold on to your hats! The subsequent lectures will proceed at a slower pace. Today will be different, too, in that I will chiefly discuss only those points on which there is the broadest agreement among physicists and cosmologists. Future lectures will be richer in speculation, dissent, feuds, and controversy.



I will also attempt, as far as possible, to tell the human side of this story. I will explain how breakthroughs came about, and how they had to fight for acceptance. This will include discussions of what different schools of thought there are right now about what comes next, as well as my opinion about the current state of research

Finally: although I am a theoretical cosmologist myself, I will explain the absolutely critical role that observations and experiments have played both in establishing the cosmological model we now accept and what coming experiments will be needed to figure out what's really going on.

Suggested Reading

The early Universe has attracted many popular accounts, some penned by the most distinguished scientists of our times. This is a brief list of some of these works which you may find a useful reference during these lectures.

- 1. The First Three Minutes, Steven Weinberg.
- 2. A Brief History of Time, Stephen Hawking
- 3. Blind Watchers of the Sky, Rocky Kolb
- 4. Just Six Numbers, Martin J. Rees

Suggested websites:

I will put links to some sites that I find useful on my lecture webpage,

www.markcwyman.com/comptonlectures

