

*“The Greatest Story Ever Told”*

Please note the excellent lead paragraph.

What main scientists and discoveries does Tyson address in this chapter?

What are the four forces we know and love?

What are quarks? What is gravity? What is the speed of light? What is a light year? What are hadrons? What is CERN?

How long since the Big Bang? What happened in the early seconds of the Big Bang? The first couple of minutes? And then the next 380,000 years? And the next billion years?

What happened to temperatures? To spaces?

How many galaxies formed? What do we owe to stars and galaxies? How big is the Milky Way compared to other galaxies we know and love?

What is the importance of anaerobic bacteria?

In chapter 1, what is the most important thing you learned?

*“On Earth as in the Heavens”*

What is so important about Newton and his laws of gravitation? How does gravity work elsewhere, beyond the Earth?

Where did helium come from? Where did the heavy elements come from? What is the fine-structure constant?

What is “nebulium”? What has it to do with oxygen?

What do we know about *Pioneer I and II* and about *Voyager I and II*? What have we learned from this spacecraft? Where are they now?

What are the laws of conservation? What do they tell us about mass and energy? Momentum? Electrical charges?

What is dark matter? Who sees it? Where and when?

“ . . . after the laws of physics, everything else is opinion”: your understanding of that remark? Your comments?

What is the significance of whipped cream in cocoa?

*“Let There Be Light”*

What is an atom? Where did atoms come from? When did they first appear? What did you learn about atomic structure in school? Has our knowledge changed at all?

What are photons? What is their role in the universe?

Who is the father of Big Bang cosmology? Consider Alpher and Herman, what is the significance of the temperature of the cosmic background? What is the temperature of the universe?

What is the cosmic microwave background? Why does it matter?

What is the “point of last scatter”?

Explain: “Where matter accumulated, the strength of gravity grew, enabling more and more matter to gather. These regions seeded the formation of galaxy superclusters while other regions were left relatively empty” (p. 58).

What is dark energy? How does it differ from dark matter? How does it contribute to the universe’s expansion?

“ . . . most of the universe is made of stuff about which we are clueless” (p. 60). What do you think?