

# Summary of the universe in a nutshell



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Chapter 1: Brief Description: This chapter chronicles the works of Albert Einstein, predominantly his dual theories of Special Relativity and General Relativity. Special Relativity involves time, which was established as subjective and relative to the object in question. He also worked to establish the consistency of the speed of light as a daunting measure which cannot be surpassed ( $E=MC^2$ ). His General Theory of Relativity pushed forth the idea that space and time were not independent, but rather connected in some fabric which is curved. Link to the Course: The equation  $E=MC^2$  is looked at within the final unit of study for our physics course. In addition, this chapter looks heavily at the contradiction between the works of Einstein and Newton. Newton, and the laws which he advocated, are virtually the main fixture of our course.

His perspective of a flat universe with a timeline that spanned infinitely forward and backward had become outdated. Questions and Concerns: I had trouble getting over the seemingly hard headedness of Einstein in the matter of Quantum Theory (unpredictability) and an expanding universe. Red Dwarf Link: In episode 102: Future Echoes the crew see images of the near and distant future as the ship accelerates past the speed of light. Chapter 2: Brief Description: This chapter introduces us to the bulk of ideas which will be discussed with more depth throughout the rest of the novel.

Amongst them are supersymmetry, Quantum Theory, Superstrings, P-Branes and the fate of the universe. These are all quintessential in explaining the elusive nature of time, which seemingly has both direction and shape. M-Theory (a united theory splicing many contemporary explanations together)

is introduced. The singularity is the primary focus which calls upon all these ideals.

Link to the Course: Black holes are discussed briefly in this chapter by a nice equation is given which includes Planck's Constant. It can be used to calculate the entropy within a black hole.  $S = \frac{Akc^3}{4hG}$  (S is Entropy, A is area of the event horizon of the black hole, h is Planck's constant, G is Newton's gravitational constant, c is the speed of light, k is Boltzmann's constant). Time is a variable which is used in many equations in our course (mainly Kinematics). Einstein's solution involving the photoelectric effect was also discussed.

Questions and Concerns: Feynman's principle of multiple histories was difficult to fathom. In addition it was hard dealing with jumps from superstring to supersymmetry in an attempt to explain many of the same scenarios. This was by far the most difficult chapter to comprehend. I will most likely attempt to read it and absorb more once again in the future.

Red Dwarf Link: Holography is discussed toward the end of the chapter. One of the main characters within Red Dwarf is Arnold Judas Rimmer, a holographic representation of a shipmate who once lived and worked within Red Dwarf. Chapter 3: Brief Summary: This chapter lives up to its title. It examines virtually the entire history of the universe, from singularity to possibilities for several endings.

The Anthropic Principle is a main focus of the chapter and explains why we perceive the universe the way we do. Every significant variable has been accounted for as we begin to perceive why life emerged in this specific

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history and why it cannot in many others. Link to the Course: Another equation was produced in this chapter, this time by Edwin Hubble. Hubble's law discusses the connection between an entities distance from earth and the rate at which it is expanding away from us.  $V = HR$  (V is velocity, H is Hubble's constant for the rate of expansion in the universe and R is distance from earth).

The two variables of radius and velocity were worked around heavily in Kinematics. Questions and Concerns: This chapter was actually quite a bit of fun to read about. The Anthropic Principal was probably my favourite idea presented within the book and just seemed to make a lot of sense. Red Dwarf Link: In episode 301: Backwards the crew of the Red Dwarf enter a "time hole" in which they are transported back to earth in the year 1993. However, the universe at this time is receding as gravity has eventually caught up with the initial force of the Big Bang.

Everything in this time frame is backwards. Chapter 4: Brief Summary: This chapter revolves almost entirely around supersymmetry, the Uncertainty Principal and black holes. As we look to make predictions of the future, it seems as if stars collapsed into a point of infinite density may impede on this. Indeed, black holes or dark stars, as they were previously referred to as, may suck in a single member of a supersymmetry pairing. The implications for this are nearly catastrophic as it means predicting the future may be impossible if all information may be lost once it enters a black hole.

The p-brane theory however, explains that this may not be the case. Link to the Course: I remember vividly a time in Unit 2 when Mr. Bruni made us to a

whole case study on black holes. Well here you go, sir, a full chapter on your favourite topic (looks like you and Hawking have something in common). A nice equation was stated which can allow someone to calculate the radius of a black hole:  $R = \frac{2GM}{c^2}$  (R is black holes radius of the event horizon)

Questions and Concerns: I was astonished to learn that black holes do in fact come to an end. Society puts this stigma on them which makes it seem as if they are this looming threat which survive forever trying to suck everything in.

It turns out that their pretty stable and not that bad of guys. In fact, their gravitational presence may be responsible for our existence! Thanks huge black holes at the center of the Milky Way! By the way, is the p-brane theory still viable in relation to black holes? Red Dwarf Link: Wormholes, which are discussed in this chapter, play a significant role in the plot development of episode 604: Rimmerworld. One of the crew members enters one and experiences time dilation, contributing to one of the series most hilarious episodes. Chapter 5: Brief Summary: This chapter looks solely at the possibility of space travel and how one would go about travelling in time.

Causality is briefly discussed, but the main focus of the chapter is cosmic strings and the warping of spacetime in such a fashion that time travel would be possible. Unfortunately, it appears that the laws of physics do not like the idea of time tampering. It seems that on a macroscopic scale, being able to return to a previous moment is highly unlikely. We're all terribly sorry Mr. Thorne. Link to the Course: We discussed time travel one day in the month of September if I recall correctly.

But in addition to this, I believe the Godel theorem is highly applicable in its implications. With it, it helps us understand that no one system which we try to work through can ever produce all the results which we could hope for (which will certainly be infinite in the science world). I am talking primarily of math. Not so tough anymore, eh? Questions and Concerns: This was by far the most interesting chapter for me.

I wish to go back in time and right all the wrongs which occurred to me and as such I was pretty upset when Hawking said it was almost impossible (in terms of how we understand it today). The Godel's incompleteness theorem made me very happy by stifling those know-it-alls, how does it make you feel? Red Dwarf Link: In episode 701: Tikka To Ride the crew travels back in time and gets mixed up in the assassination of President John F. Kennedy. Causality is the main focus of the plot.

Chapter 6: Brief Summary: The shortest chapter in the book, it is concerned completely with the future of mankind itself and our progress as a civilization. Human Genetic Engineering is a main focal point and deemed as inevitable by Hawking. The progress of technology is highlighted and it becomes apparent that Mr. Hawking is speculative toward the idea of advanced civilizations other than our own already being established. Move aside, Picard, Dave Lister is the embodiment of human future.

Link to the course: The only way I can link this chapter to the course is the Catholic ethics which are discussed within it. In relation to Human Genetic Engineering, we think it's bad, real bad. I myself can agree totally, since I

don't feel its fair to tamper with human life in such a way. People are perceived by Catholics as the embodiment of the Holy Spirit anyways.

Let God play God in this aspect of science. Questions and Concerns: Well Mr. Hawking, I don't like the fact you kept pushing that Human Genetic Engineering was inevitable. I don't want some being which is superior to me (hard to imagine) out muscling and outthinking me, inheriting the world which my God died for.

I hate the notion of anyone being better then me (we are all equal) and I hate the X-Men comics even more for glorifying it. On the other hand, I agree with Hawking in his perception of the Universe, in terms of life at least. No wonder were both such huge fans of Red Dwarf. Red Dwarf Link: Red Dwarf as a whole is a link to this chapter. It deals with the future and one in which humans have not interacted with any other forms of INTELLIGENT life. Specifically, episode 402: DNA is linked to the idea of Human Genetic Engineering.

Here Lister uses the power of the derelict vessel they discover to make several alterations to his own DNA (only temporarily) Chapter 7: Brief Summary: The final chapter revolves around branes and the nature of the universe which we live in. It was quite interesting to see that there may be other dimensions which are affecting us, with the people of earth being totally unaware. Dark Matter is investigated and solutions are offered as to why several related anomalies occur. This was a good way to wrap up an already exceptional book.

Links to the course: Planck's length was a heavy topic within the chapter.

Planck...sounds familiar. Although we did not investigate these specific ideas, his other works were highlighted within the final unit of the course.

Questions and Concerns: There is only one I virtually have about this unit.

What are the thoughts on branes and their potential in explaining phenomena in contemporary physics? Red Dwarf Link: The idea that our universe is one of many in a multiverse is investigated in episode 206: Parallel Universe. Rest assured, the resultant plot was quite hilarious