

Week 2: May 11

Science, God and the Universe

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I. In the beginning

- A. Genesis 1:1-3
 - 1. Created the Heavens, the Earth
 - 2. Earth formless, empty, darkness over surface
 - 3. Spirit of God hovering over the waters
- B. Robert Jastrow, Ph.D, NASA scientist, *God and the Astronomers*
 - 1. Notes "strange developments" in Astronomy
 - 2. Main essence is that the universe in some sense, had a beginning at a certain moment in time.
- C. Previous evolutionary thought was that the universe just existed
 - 1. No beginning, no end
 - 2. Carl Sagan in his book *Cosmos*, "The cosmos is all that is, or ever was, or ever will be."

II. How did it begin?

- A. Michelson & Morley, Physicists, 1887
 - 1. Discovery about the speed of light
 - 2. Speed of light = 186,000 miles/sec
 - 3. Constant speed, regardless of the observer (moving away or toward the source)
- B. Einstein's Special Theory of Relativity, 1905
 - 1. Flow of time is not equal in all situations
 - 2. Measurements of length, mass, velocity & time are relative to the observer ("time dilation").
 - 3. Example: Twin brothers, one stays on earth, other flies in a spaceship to a nearby star, 99% of speed of light. Upon return to earth, he finds his brother long deceased but he has only experienced a few weeks of travel. The brother experienced decades of time passage when the space traveling brother's time had been "dilated" by his incredible velocity.
- C. Hafele-Keating Experiment, 1971
 - 1. 3 atomic clocks: 1 on the ground, 1 on a plane flying West and 1 on a plane flying East.

2. Both planes flew around the world. When they landed and compared to the stationary clock, the West bound plane gained time and East bound plane lost time.

D. Vesto Slipher, American Astronomer, 1913

1. Discovered about a dozen galaxies in our vicinity were rapidly moving away from us at enormous speeds (up to 2 million MPH).
2. He changed the way astronomers viewed the cosmos.

E. Einstein published General theory of relativity, 1915

1. Extended his first theory to include measurements of time, space, matter & length from an observer who is accelerating.
2. It predicted that all matter in the universe was moving away from a point.
3. Bottom line, the universe is expanding.

F. Willem De Sitter, Dutch Astronomer

1. Found a mathematical error in Einstein's work
2. The correction showed that the universe was expanding away from its point of origin.
3. Confirmed Slipher's findings in 1913.
4. Bottom line, the universe is finite.

G. Edwin Hubble, American Astronomer

1. Mt. Palomar telescope discovered that the further away the galaxies, the faster they move away from their point of origin.
2. Led astronomers to develop the belief that the universe must have begun at a single point in space.
3. He formulates the idea of the "red shift", which to the idea of the "Big Bang" theory. Much like the doppler effect.
4. The Big Bang led to other theories & discoveries.

III. Time and Space

A. 1968 & 1970, Stephen Hawking, George Ellis, Roger Penrose

1. Discovered an amazing prediction within Einstein's theories
2. They discovered that time & space are not infinite (like De Sitter)
3. Time and space had a beginning that corresponds to the origin of matter or energy.

B. This discovery shocked & angered the scientific community.

1. Einstein reacted angrily at his mistake being discovered

2. He conceded that if the universe had a beginning point, then it must have had a beginning.

3. Einstein even tried to explain it away with an imaginary mathematical constant called the "Cosmological Constant".

4. He later regretted doing this & called it the biggest error of his career.

C. The Big Bang comes from a concept that a ball of matter exploded:

1. Also known as the "Cosmic Egg"

2. From where did this matter originate?

3. Order from chaos goes against the laws of physics

IV. Order & Design in the Universe

A. The Force of Gravity: The force that causes one mass to be attracted to another mass. Unknown why, but what IS known is that 1% higher & the sun would be too close and Earth would burn, 1% lower and Earth would freeze.

B. The Nuclear Force: The force that keeps protons in an atom. If force is increased, protons would be attracted to the nucleus & universe would consist of mainly heavy elements (metals). The chemicals of life would be almost non-existent. A decrease in the forces would produce Hydrogen, which cannot support life.

C. Earth's distance from the sun: A few percent either way (too close/too far) is critical to the existence of life.

D. Earth's rotation time: The time of rotation affects weather patterns.

E. Size of the moon: Gravitational effect from the moon affects the weather & tides. If the moon was slightly larger, the gravitational pull would increase, resulting in massive tides & winds. If the moon was too small, the tides & winds would be too small and the Earth would overheat.

V. Physics & the Laws of Thermodynamics

A. Over 125 years and they have been fully described.

1. Some of the strongest evidence for the universe having a definite beginning & intelligent design.

2. There are actually 4 laws (0th, 1st, 2nd, 3rd). Only 1st & 2nd apply directly to our study.

B. 1st law of Thermodynamics

1. Energy cannot be created or destroyed under natural circumstances.

2. Matter can only be converted from one state to another (liquid to gas, liquid to solid, solid to gas).

3. Without fail, no new matter shows up in the universe, nor is any being destroyed.

C. 2nd law of Thermodynamics

1. The "law of Entropy". As time progresses, matter always changes from states of order to disorder.
2. The orderliness of the universe is steadily decreasing and is cooling off.
3. Deck of cards example: Shuffling an ordered deck always goes from order to randomness. Given any amount of time it will never go the other way.
4. Wind up clock example: Winding up a clock spring & letting it go releases energy stored in the spring. It moves parts in the clock until all energy is gone. The clock can never wind itself back up. Energy always decreases.