Belleville First Assembly of God
Defending Your Faith - 2017

Topic 8: The Physical Sciences

Class Goal: Equip the believer to respond to common challenges to Christianity in order to evangelize the lost and to disciple those with doubts.

Objectives for Meeting Our Goal: Upon completing this class, the believer should be able to...
1. Recognize common challenges to Christianity, categorize them, and…
2. Prayerfully and gently respond to these challenges (2 Tim 2:23-26; 1 Peter 3:15)

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1. Questions from previous discussions or challenges from skeptics?

2. Astrophysics: The Cosmological Argument: (*kosmos* = world) The world could not exist on its own, so there must have been a first cause. From Topic 7, we found that this first cause is God. But is there testable evidence that supports this philosophical conclusion? Yes!

   a. The Doppler Shift points to a beginning (objects moving away from us have their light wavelengths stretched. A longer wavelength equates to a lower frequency: a red-shift. Stars in our galaxy are moving both toward and away from us, depending where you look. But all nebulae are greatly red-shifted, moving away from us (Slipher, 1905). In 1927, Edwin Hubble proved that all galaxies are also retreating from our galaxy. Extrapolate backwards, and you have the Big Bang… a beginning (Genesis 1:1).

   b. Einstein's theory of general relativity mathematically demonstrates the universe's expansion, which means it had a beginning. He added a constant to his field equation to force it to model a static, eternal universe (the prevailing theory of the day). But he later recanted (after discussing with Hubble). An expanding universe infers a beginning.

   c. Penzias & Wilson (Bell Labs) discovered a ubiquitous, uniform energy source in the universe at 3 degrees Kelvin, close to the temperature predicted by the minority of Big Bang advocates in 1965. After this discovery, Princeton researchers determined that if the universe was expanding, then any remnant energy reaching back to us would have a stretched wavelength in the microwave region, which is exactly what Penzias & Wilson discovered. A ubiquitous, smooth, uniform microwave background radiation of 3 degrees Kelvin can only be explained by a single explosion, thereby pointing to a single beginning.

3. Physics and Chemistry: The Teleological Argument: (*telos* = purpose, design)

   a. A watch is obviously designed and constructed by an intelligent and capable agent, not by blind, natural forces and chance. How much more of an intelligent Agent is necessary for our universe? The universe evidences too much complexity and preciseness (fine-tuning) to be the product of random chance, thereby leaving an intelligent Designer as the sole explanation. From Topic 7, we found that this Designer is YHWH of Scripture. An honest review of science reveals close accordance with Scripture (Colossians 1:15-17; Romans 1:20; Psalm 19:1-4; etc.).

b. Fine-tuning in physics and chemistry (physical constants necessary to support life): The strong nuclear and electromagnetic forces are responsible for the unusually efficient production of carbon, the element upon which all known life is based. Any deviation in potency means no carbon. A slightly weaker gravitational constant and matter flies apart; a little stronger and all collapses together. If the ratio of masses for protons and electrons (a proton is roughly 1836.1526 times the mass of the electron) were changed by any degree, the stability of many common chemicals would be compromised. Also of immense importance is the planet's location in galaxy, type of star, etc.).[1] [also see the attached]

4. Conclusion: No other sacred book opens itself to the scrutiny of secular physics, chemistry, and cosmology, and comes out in strong agreement. As Galileo reminds us, one would expect the "two books" of God (nature and Scripture) to agree with each other because they both have the same Author. When coupled with our previous discussion on philosophy, we therefore have strong justification that our Biblical beliefs are true.

5. Defend Your Faith: How would you employ scientific reasoning to answer the following challenges?

a. Challenge: Carl Sagan claimed that there is nothing special about humanity because given the billions of galaxies (each containing) billions of stars, surely other forms of intelligent life exist.

Given the uniqueness of our planet's location in the perfect solar system, with the right sun, and that solar system's position in the galaxy, and in the perfect type of galaxy, and many other "just right" parameters, and the lack of discovery of any other such conditions, Earth alone can house intelligent life.

b. Challenge: The most popular refutation to the argument from Fine-Tuning is the idea of the "multiverse", which roughly states that our universe is merely one of an infinite number of universes, and ours just happened to be the one that got all of the physical constants finely-tuned for intelligent life. What is wrong with this argument?

(1) There is no way to test such a theory because it lies outside of observation, by definition.

(2) An infinite number of universes necessitates an infinite number of our universe, which only exacerbates the problem for skeptics, not eliminate it.

(3) Even if "multiverse" is true, then the question of origin remains… where did it come from?

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[1] Gonzalez, Guillermo, *The Privileged Planet: How Our Place in the Cosmos is Designed for Discovery* (Washington, DC: Regnery Publishing, 2004), and
Heeren, Fred *Show Me God: What the Message from Space is Telling Us About God* (Wheeling, IL, Day Star Publications, 2000), and
Ross, Hugh, *Improbable Planet: How Earth Became Humanity's Home* (Grand Rapids, MI, Baker Books, 2016)

Evidence for the Fine Tuning of the Universe by Richard Deem

Introduction

According to Carl Sagan, the universe (cosmos) "is all that is or ever was or ever will be." However, the idea that the universe is all is not a scientific fact, but an assumption based upon materialistic naturalism. Since Carl Sagan's death in 1996, new discoveries in physics and cosmology bring into questions Sagan's assumption about the universe. Evidence shows that the constants of physics have been finely tuned to a degree not possible through human engineering. Five of the more finely tuned numbers are included in the table below. For comments about what scientists think about these numbers, see the page *Quotes from Scientists Regarding Design of the Universe*.

Fine Tuning of the Physical Constants of the Universe

Parameter	Max. Deviation
Ratio of Electrons: Protons	$1:10^{37}$
Ratio of Electromagnetic Force: Gravity	$1:10^{40}$
Expansion Rate of Universe	$1:10^{55}$
Mass Density of Universe[1]	$1:10^{59}$
Cosmological Constant	$1:10^{120}$

These numbers represent the maximum deviation from the accepted values, that would either prevent the universe from existing now, not having matter, or be unsuitable for any form of life.

Degree of fine tuning

Recent Studies have confirmed the fine tuning of the cosmological constant (also known as "dark energy"). This cosmological constant is a force that increases with the increasing size of the universe. First hypothesized by Albert Einstein, the cosmological constant was rejected by him, because of lack of real world data. However, recent supernova 1A data demonstrated the existence of a cosmological constant that probably made up for the lack of light and dark matter in the universe.[2] However, the data was tentative, since there was some variability among observations. Recent cosmic microwave background (CMB) measurement not only demonstrate the existence of the cosmological constant, but the value of the constant. It turns out that the value of the cosmological constant exactly makes up for the lack of matter in the universe.[3]

The degree of fine-tuning is difficult to imagine. Dr. Hugh Ross gives an example of the least fine-tuned of the above four examples in his book, *The Creator and the Cosmos*, which is reproduced here:

One part in 10^{37} is such an incredibly sensitive balance that it is hard to visualize. The following analogy might help: Cover the entire North American continent in dimes all the way up to the moon, a height of about 239,000 miles (In comparison, the money to pay for the U.S. federal government debt would cover one square mile less than two feet deep with dimes.). Next, pile dimes from here to the moon on a billion other continents the same size as North America. Paint one dime red and mix it into the billions of piles of dimes. Blindfold a friend and ask him to pick out one dime. The odds that he will pick the red dime are one in 10^{37}. (p. 115)

The ripples in the universe from the original Big Bang event are detectable at one part in 100,000. If this factor were slightly smaller, the universe would exist only as a collection of gas - no planets, no life. If this factor were slightly larger, the universe would consist only of large black holes. Obviously, no life would be possible in such a universe.

Another finely tuned constant is the strong nuclear force (the force that holds atoms together). The Sun "burns" by fusing hydrogen (and higher elements) together. When the two hydrogen atoms fuse, 0.7% of the mass of the hydrogen is converted into energy. If the amount of matter converted were slightly smaller—0.6% instead of 0.7%— a proton could not bond to a neutron, and the universe would consist only of hydrogen. With no heavy elements, there would be no rocky planets and no life. If the amount of matter converted were slightly larger—0.8%, fusion would happen so readily and rapidly that no hydrogen would have survived from the Big Bang. Again, there would be no solar systems and no life. The number must lie exactly between 0.6% and 0.8% (Martin Rees, *Just Six Numbers*).

Fine Tuning Parameters for the Universe

1. strong nuclear force constant
   if larger: no hydrogen would form; atomic nuclei for most life-essential elements would be unstable; thus, no life chemistry
   if smaller: no elements heavier than hydrogen would form: again, no life chemistry
2. weak nuclear force constant
   if larger: too much hydrogen would convert to helium in big bang; hence, stars would convert too much matter into heavy elements making life chemistry impossible
   if smaller: too little helium would be produced from big bang; hence, stars would convert too little matter into heavy elements making life chemistry impossible
3. gravitational force constant
   if larger: stars would be too hot and would burn too rapidly and too unevenly for life chemistry
   if smaller: stars would be too cool to ignite nuclear fusion; thus, many of the elements needed for life chemistry would never form
4. electromagnetic force constant
   if greater: chemical bonding would be disrupted; elements more massive than boron would be unstable to fission
   if lesser: chemical bonding would be insufficient for life chemistry
5. ratio of electromagnetic force constant to gravitational force constant
   if larger: all stars would be at least 40% more massive than the sun; hence, stellar burning would be too brief and too uneven for life support
   if smaller: all stars would be at least 20% less massive than the sun, thus incapable of producing heavy elements
6. ratio of electron to proton mass
   if larger: chemical bonding would be insufficient for life chemistry
   if smaller: same as above
7. ratio of number of protons to number of electrons
   if larger: electromagnetism would dominate gravity, preventing galaxy, star, and planet formation
   if smaller: same as above
8. expansion rate of the universe
   if larger: no galaxies would form
   if smaller: universe would collapse, even before stars formed
9. entropy level of the universe
   if larger: stars would not form within proto-galaxies
   if smaller: no proto-galaxies would form
10. mass density of the universe
    if larger: overabundance of deuterium from big bang would cause stars to burn rapidly, too rapidly for life to form
    if smaller: insufficient helium from big bang would result in a shortage of heavy elements

11. velocity of light
    if faster: stars would be too luminous for life support *if slower*: stars would be insufficiently luminous for life support
12. age of the universe
    if older: no solar-type stars in a stable burning phase would exist in the right (for life) part of the galaxy
    if younger: solar-type stars in a stable burning phase would not yet have formed
13. initial uniformity of radiation
    if more uniform: stars, star clusters, and galaxies would not have formed
    if less uniform: universe by now would be mostly black holes and empty space
14. average distance between galaxies
    if larger: star formation late enough in the history of the universe would be hampered by lack of material
    if smaller: gravitational tug-of-wars would destabilize the sun's orbit
15. density of galaxy cluster
    if denser: galaxy collisions and mergers would disrupt the sun's orbit
    if less dense: star formation late enough in the history of the universe would be hampered by lack of material
16. average distance between stars
    if larger: heavy element density would be too sparse for rocky planets to form
    if smaller: planetary orbits would be too unstable for life
17. fine structure constant (describing the fine-structure splitting of spectral lines) *if larger*: all stars would be at least 30% less massive than the sun
    if larger than 0.06: matter would be unstable in large magnetic fields
    if smaller: all stars would be at least 80% more massive than the sun
18. decay rate of protons
    if greater: life would be exterminated by the release of radiation
    if smaller: universe would contain insufficient matter for life
19. ^{12}C to ^{16}O nuclear energy level ratio
    if larger: universe would contain insufficient oxygen for life
    if smaller: universe would contain insufficient carbon for life
20. ground state energy level for ^{4}He
    if larger: universe would contain insufficient carbon and oxygen for life
    if smaller: same as above
21. decay rate of ^{8}Be
    if slower: heavy element fusion would generate catastrophic explosions in all the stars
    if faster: no element heavier than beryllium would form; thus, no life chemistry
22. ratio of neutron mass to proton mass
    if higher: neutron decay would yield too few neutrons for the formation of many life-essential elements
    if lower: neutron decay would produce so many neutrons as to collapse all stars into neutron stars or black holes
23. initial excess of nucleons over anti-nucleons
    if greater: radiation would prohibit planet formation
    if lesser: matter would be insufficient for galaxy or star formation
24. polarity of the water molecule
    if greater: heat of fusion and vaporization would be too high for life
    if smaller: heat of fusion and vaporization would be too low for life; liquid water would not work as a solvent for life chemistry; ice would not float, and a runaway freeze-up would result
25. supernovae eruptions
    if too close, too frequent, or too late: radiation would exterminate life on the planet
    if too distant, too infrequent, or too soon: heavy elements would be too sparse for rocky planets to form
26. white dwarf binaries
    if too few: insufficient fluorine would exist for life chemistry
    if too many: planetary orbits would be too unstable for life

if formed too soon: insufficient fluorine production
if formed too late: fluorine would arrive too late for life chemistry

27. ratio of exotic matter mass to ordinary matter mass
    if larger: universe would collapse before solar-type stars could form
    if smaller: no galaxies would form
28. number of effective dimensions in the early universe
    if larger: quantum mechanics, gravity, and relativity could not coexist; thus, life would be impossible
    if smaller: same result
29. number of effective dimensions in the present universe
    if smaller: electron, planet, and star orbits would become unstable
    if larger: same result
30. mass of the neutrino
    if smaller: galaxy clusters, galaxies, and stars would not form
    if larger: galaxy clusters and galaxies would be too dense
31. big bang ripples
    if smaller: galaxies would not form; universe would expand too rapidly
    if larger: galaxies/galaxy clusters would be too dense for life; black holes would dominate; universe would collapse before life-site could form
32. size of the relativistic dilation factor
    if smaller: certain life-essential chemical reactions will not function properly
    if larger: same result
33. uncertainty magnitude in the Heisenberg uncertainty principle
    if smaller: oxygen transport to body cells would be too small and certain life-essential elements would be unstable
    if larger: oxygen transport to body cells would be too great and certain life-essential elements would be unstable
34. cosmological constant
    if larger: universe would expand too quickly to form solar-type stars

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Taken from *Big Bang Refined by Fire* by Dr. Hugh Ross, 1998. Reasons To Believe, Pasadena, CA.

The Creator and the Cosmos by Dr. Hugh Ross

A classic book for modern Christian apologetics and science. Dr. Ross presents the latest scientific evidence for intelligent design of our world and an easy to understand introduction to modern cosmology. This is a great book to give agnostics, who have an interest in cosmology and astronomy.

REFERENCES

1. For further information, visit the website of Dr. Edward Wright, Ph.D., Professor of Astronomy at UCLA
2. The amount of light and dark matter is only 30% of that necessary for a "flat" universe (one which contains the critical mass - the amount necessary to stop the expansion of the universe).
3. Sincell, M. 1999. Firming Up the Case for a Flat Cosmos. *Science* 285: 1831.