

Faith & Science: My Perspective as a Scientist

Phil Anderson, Ph.D.
University of Texas at Dallas
Physics Department
Director, W. B. Hanson Center for Space Sciences

“I do not feel obligated to believe that the same God who has endowed us with sense, reasons, and intellect has intended us to forgo their use.” – *Galileo Galilei*

“The significance and joy in my science comes in those occasional moments of discovering something new and saying to myself, 'So that's how God did it.' My goal is to understand a little corner of God's plan.” – *Henry “Fritz” Schaefer, Graham Perdue Professor of Chemistry and director of the Center for Computational Quantum Chemistry at the University of Georgia*

“I find it as difficult to understand a scientist who does not acknowledge the presence of a superior rationality behind the existence of the universe as it is to comprehend a theologian who would deny the advances of science.” – *Wernher von Braun*

“The religion that is afraid of science dishonors God and commits suicide.” – *Ralph Waldo Emerson*

“Science without religion is lame, religion without science is blind.” – *Albert Einstein*

“When confronted with the order and beauty of the universe and the strange coincidences of nature, it's very tempting to take the leap of faith from science into religion. I am sure many physicists want to. I only wish they would admit it.” – *Tony Rothman, Physicist, Princeton University*

The Incredible Fine Tuning in the Universe's Design

Ratio of number of protons to number of electrons: $1:10^{37}$ (deviation from actual number)

- *if larger*: electromagnetism would dominate gravity, preventing galaxy, star, and planet formation
- *if smaller*: same as above

Ratio of Electromagnetic Force to Gravity: $1:10^{40}$

- *if larger*: all stars would be at least 40% more massive than the sun – stellar burning too brief and too uneven for life
- *if smaller*: all stars would be at least 20% less massive than the sun – incapable of producing heavy elements

Expansion Rate of Universe $1:10^{55}$

- *if larger*: no galaxies would form
- *if smaller*: universe would collapse, even before stars formed

Mass Density of Universe: $1:10^{59}$

- *if larger*: overabundance of deuterium from big bang – 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

Cosmological Constant: $1:10^{120}$

- *if larger*: universe would expand too quickly to form solar-type stars

Mathematical Beauty

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{x}$$

- e – base of natural logarithms
- Π – ratio of the circumference of a circle to its diameter

Shows profound connection between the most fundamental numbers in mathematics

Four fundamental forces of nature govern everything that happens in the universe

- Gravity – attraction between two objects that have mass or energy
- Weak force – responsible for particle decay
- Strong force – binds the fundamental particles of matter
- Electromagnetism – acts between charged particles

Outstanding question: If they are actual manifestations of a single great force of the universe, each should be able to merge with others – evidence that they can. Another example of the incredible design of the universe.

- All things are made up of sub-atomic particles that are invisible to the naked eye

Hebrews 11:3 “By faith we understand that the worlds were prepared by the word of God, so that what is seen was not made out of things which are visible.”

How Old is the Universe?

How do we know?

- The age of the chemical elements
- The age of the oldest star clusters
- The age of the oldest white dwarf stars
- Hubble – Hubble constant – universe is expanding
- Microwave background

Now – 13.7 Billion years

We can see that back that far in time with the Hubble Space Telescope – Quasars

How Big the Universe?

If universe static and we were at center, the observable universe would be 13.7 LY in radius – 27.4 LY in diameter (Light year: distance light travels in a year at 186,000 m/s - 5.878×10^{12} miles)

But Universe is expanding – expansion rate increasing – gives factor about 3 – size of the universe at least 90 billion light years

Can only be explained by some unseen energy – dark energy

➤ **There are more stars in the Universe than there are grains of sand on the Earth!**

Genesis 22:17 “Indeed I will greatly bless you, and I will greatly multiply your seed as the stars of the heavens and as the sand which is on the seashore; and your seed shall possess the gate of their enemies.”

Jeremiah 33:22 “As the host of heaven cannot be counted and the sand of the sea cannot be measured, so I will multiply the descendants of David My servant and the Levites who minister to Me.”

What is Science?

Observation and experimentation directed toward understanding of the natural world.

- a way of understanding the world, not a mountain of facts
- does not prove anything absolutely – all scientific ideas are open to revision in the light of new evidence
- involves making educated guesses (hypotheses) that are then rigorously and repeatedly tested

Why are we able to study nature?

Fundamental assumptions about nature:

- Order exists in nature – in the universe.
- Order can be discovered by observation and experimentation.
- Laws of nature are constant in time and place.
- The scientific method consists of careful observation of nature and an open-minded creative search for general ideas that agree with and predict those observations.
- **To be scientific, a statement must be capable of being proven wrong.**

Scientific Approach to the Study of Nature

Scientific Law

- concise verbal or mathematical statement of a relation – expresses a fundamental principle of science
 - ✓ Newton's law of universal gravitation.
- does not posit a mechanism or explanation of phenomena – merely a distillation of the results of repeated observation

Scientific Theory – general principle offered to explain a set of phenomena or observed facts

- comprises a collection of concepts
- uses rules (scientific laws) that express relationships between observations of such concepts
- constructed to explain, predict, and to master phenomena
- it makes falsifiable or testable predictions
- is supported by many strands of evidence, rather than a single foundation
- does not have to be perfectly accurate to be scientifically useful

Not all scientific predictions can be tested directly

- Core of earth
- Sun – energy
- Expansion of the universe

Requires models – creative thought

- No ultimate truths – all Provisional
- Okay as long as they are not contradicted

Interactions Between Science and Religion

Conflict – when either discipline threatens to take over the legitimate concerns of the other.

- Conflict Thesis (John William Draper and Andrew Dickson White) – intrinsic intellectual conflict between religion and science; inevitably leads to hostility.

Independence – treating each as quite separate realms of enquiry.

- Non-Overlapping Magisteria (NOMA) – science covers the empirical universe, while religion covers questions of moral meaning and ethical value.

Dialogue – suggesting that each field has things to say to each other about phenomena in which their interests overlap.

- Human knowledge, scientific or religious, can be developed only by those who have “fully and freely” given themselves to a human community.

Integration – aiming to unify both fields into a single discourse:

- Natural theology – existence of God can be inferred from the evidences of design in nature
- Theology of nature – main sources of theology lie outside science, but scientific theories may affect the reformulation of certain doctrines like creation
- Systematic synthesis – both science and religion contribute to the development of an inclusive metaphysics

Most Famous Conflict Historically: Heliocentricity

Psalm 93:1, Psalm 96:10, and 1 Chronicles 16:30 include text stating “the world is firmly established, it cannot be moved.”

Psalm 104:5 “The LORD set the earth on its foundations; it can never be moved.”

Ecclesiastes 1:5 “And the sun rises and sets and returns to its place.”

Galileo defended Copernicus’ heliocentrism:

- claimed it was not contrary to those Scripture passages
- took Augustine’s position on Scripture: not to take every passage literally, particularly when the scripture in question is a book of poetry and songs, not a book of instructions or history
- writers of the Scripture wrote from the perspective of the terrestrial world
 - from that vantage point the sun does rise and set

1616 – attacks on the ideas of Copernicus had reached a head

- Galileo went to Rome to try to persuade the Catholic church authorities not to ban his ideas.
- Cardinal Bellarmine, acting on directives from the Inquisition, ordered him to not to “hold or defend” the idea that the Earth moves and the Sun stands still at the center.

1633 – Galileo Sentenced by Spanish Inquisition

Sentence essentially three essential parts:

- Found “vehemently suspect of heresy”
 - Having held the opinions that the Sun lies motionless at the center of the universe and the Earth is not at its center and moves
 - One may not hold and defend an opinion as probable after it has been declared contrary to Holy Scripture
 - Required to “abjure, curse and detest” those opinions
- Ordered imprisoned; the sentence was later commuted to house arrest.
- Offending ‘Dialogue Concerning the Two Chief World Systems’ (had formal authorization from the Inquisition and papal permission in 1632) was banned
 - Publication of any of his works was forbidden, including any he might write in the future

1990 – Cardinal Ratzinger (later to become Pope Benedict XVI) defended the church

- Quoted philosopher Paul Feyerabend: “The Church at the time of Galileo kept much more closely to reason than did Galileo himself, and she took into consideration the ethical and social consequences of Galileo’s teaching too. Her verdict against Galileo was rational and just and the revision of this verdict can be justified only on the grounds of what is politically opportune.”

1992 – Pope John Paul II admitted the Church had made a ‘tragic mistake’ and apologized to him.

The GOD@#%\$ Particle

By Early 1960's, all fundamental particles known at the time should be massless at very high energies – could not explain how some particles gain mass at lower energies

1964 – Group led by Peter Higgs proposed Higgs mechanism, a way that some particles can acquire mass

- particle known as a scalar boson should also exist, with certain properties
- particle called the Higgs boson
- explains why particles have mass – and in turn why we exist. Without it the universe would have no physical matter, only energy.
- later become known as the “God particle”
- discovered in 2012 by the Large Hadron Collider at CERN in Switzerland

Created controversy: theologians objected to nickname and some scientists said no need for God anymore

But that wasn't where the nickname came from!

- 1993 American physicist Leon Lederman wrote a book on the Higgs boson
 - dubbed it “the God@#%\$ particle” because it was so hard to find
 - editor suggested “the God particle” instead

Discussion whether the discovery “disproves religion or supports creation” misses the point. “The fans and the foes of religion ... are overreaching on both sides. The quest for the Higgs boson, and its ultimate discovery, neither proves nor disproves God.” – Philip Clayton, Dean of Claremont School of Theology

Biggest Conflict Today – Evolution vs Creationism

Creationism:

- Literal interpretations of Genesis
 - God created the universe during 6 consecutive 24-hour days less than 10,000 years ago
 - All species of plants and animals that currently exist (and that once existed but are now extinct) descendants of original life forms that God created during the single week of creation

Non-Theistic Evolution

- Driven by blind, unguided natural forces without a goal
- If God exists, he played no part in the processes.
- If all life were to be wiped off the face of the Earth and life were to start over
 - absolutely no certainty that intelligent beings would evolve
 - no certainty that they would look much like homo sapiens

Theistic evolution:

Two types:

1. God started the Universe with the Big Bang: Let there be light.

- Universe followed a natural evolutionary progression – one that God was well aware of when he created it
- Eventually culminated in us

2. Universe is about 14 billion years old – Earth's crust developed about 4.5 billion years ago.

- God created the first cell
- species developed from that source in increasing complexity as observed by science
- new species evolve by natural processes
- God used evolution as a tool to guide his development of each new species
- God steered evolution to eventually produce human beings

Dr. Hugh Ross of Reasons to Believe (<https://reasons.org/>)

- “Scientific research and clear thinking consistently affirm the truth of the Bible and of the Good News it reveals.”
 - Pre-humans lived tens of thousands of years ago.
 - About 10,000–25,000 years ago. God replaced them with Adam and Eve. Unlike previous human-like species, they had souls and thus could attain heaven or hell after death.

'Cosmic Calendar'
developed by Carl Sagan

A billion years is hard to comprehend, much less 13.7 (or 4.5 since the formation of the Earth).

- Oldest fossils about 3.4 billion years old
- Is this enough time for life to have been generated abiotically and then to have evolved to its current state?
- Panspermia?

January	February	March	April	May	June	July	August	September	October	November						
																
New Year's Day: The Big Bang		Milky Way forms					Sun and planets form	Oldest known life (single celled).		First multi-cellular organisms						
December																
1	2	3	4	5	6	7	8	9	10	11						
12	13	14	15	16	17	18	19	20	21	22						
23	24	25	26	27	28	29	30	31								
15 Cambrian Explosion (burst of new life forms)	16	17 Emergence of first vertebrates	18 Early land plants	19	20 First four-limbed animals	21 Variety of insects begin to flourish	22	23	24 First dinosaurs appear	25 First mammalian ancestors appear	26	27 First known birds	28	29 Dinosaurs wiped out by asteroid or comet	30	31 10:15am Apes appear 9:24pm First human ancestors to walk upright 10:48pm Homo erectus appears 11:54pm Anatomically modern humans appear 11:59:45pm Invention of writing 11:59:50pm Pyramids built in Egypt 1 second before midnight: Voyage of Christopher Columbus

Presbyterian Church on Evolution

Presbyterian Church U.S. 1969 General Assembly (G.A.) approved theological statement on evolution:

- “Neither Scripture, our Confession of Faith, nor our Catechisms, teach the Creation of man by the direct and immediate acts of God so as to exclude the possibility of evolution as a scientific theory.”
- “If the Confession of Faith, or the Catechisms, appear in some manner to support the position of the General Assemblies of 1886, 1888, 1889 and 1924 this is not because of Scripture itself but rather because Scripture was interpreted with 17th Century perspectives and presuppositions.”
- “Our responsibility as Christians is to deal seriously with the theories and findings of all scientific endeavors, evolution included, and to enter into open dialogue with responsible persons involved in scientific tasks about the achievement, failures and limits of their activities and of ours. The truth or falsity of the theory of evolution is not the question at issue and certainly not a question which lies within the competence of the Permanent Theological Committee. The real and only issue is whether there exists clear incompatibility between evolution and the Biblical doctrine of Creation.”

2002 (214th G.A.):

- Reaffirms that God is Creator, in accord with the witness of Scripture and The Reformed Confessions.
- Reaffirms that there is no contradiction between an evolutionary theory of human origins and the doctrine of God as Creator.
- Encourages State Boards of Education across the nation to establish standards for science education in public schools based on the most reliable content of scientific knowledge as determined by the scientific community.
- Calls upon Presbyterian scientists and scientific educators to assist congregations, presbyteries, communities, and the public to understand what constitutes reliable scientific knowledge.

2014 – 221st General Assembly (G.A.)

Clergy Letter Project – “An endeavor designed to demonstrate that religion and science can be compatible and to elevate the quality of the debate of this issue.”

- Asked the 221st G.A. to join clergy including General Conference of the United Methodist Church, Southeast Florida Diocese of the Episcopal Church and Southwestern Washington Synod of the Evangelical Lutheran Church in America in designating the second Sunday in February as Evolution Sunday to recognize the influence that the theory of evolution has had in changing the world view of our natural environment.

The PC(USA)’s Office of Theology and Witness as well as the Advisory Committee on Social Witness Policy advised against the resolution.

The assembly has spoken most clearly in the 1969 statement, ‘Evolution and the Bible,’ from the former PCUS, reaffirmed by the 214th G.A. (2002). The statement affirms that there is no necessary contradiction between Christian faith as expressed in our church’s confessions and an affirmation of evolution as the means of creation. It does not go so far as to suggest Christians must affirm the scientific consensus on evolution: “Neither Scripture, our Confession of Faith, nor our catechisms, teach the creation of man by the direct and immediate acts of God so as to exclude the possibility of evolution as a scientific theory,” and that “it is not necessary to understand the Genesis account as a scientific description of Creation.”

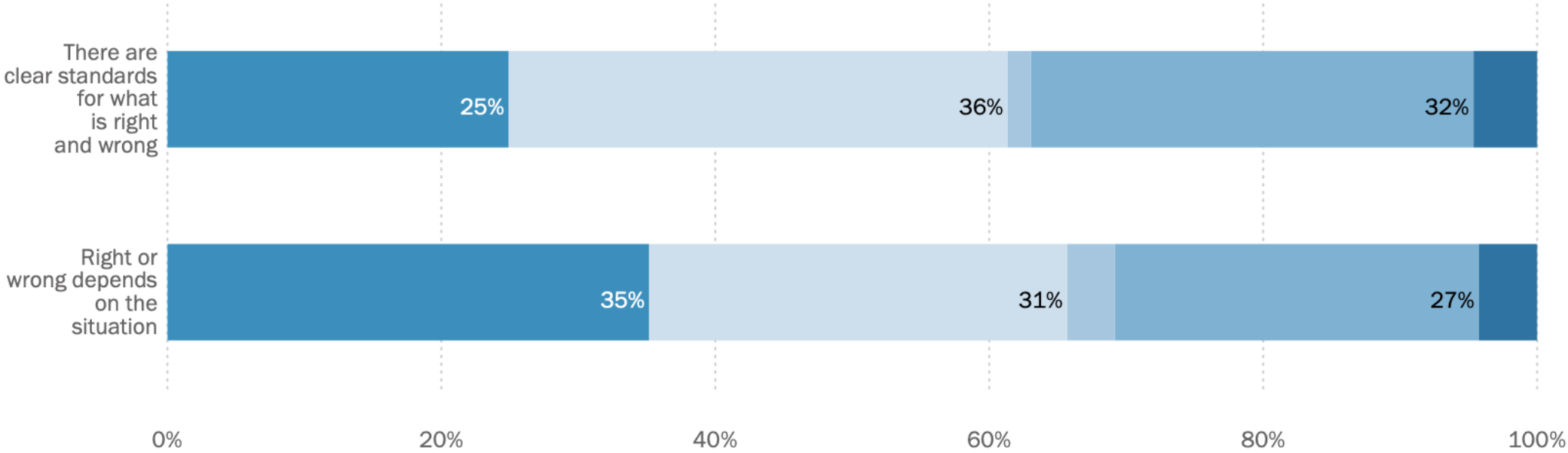
Disapproved by the 221st G.A.

Views about human evolution among members of the Presbyterian Church USA by belief in existence of standards for right and wrong

% of members of the Presbyterian Church USA who say humans...

- Evolved; due to natural processes
- Evolved; due to God's design
- Evolved; don't know how
- Always existed in present form
- Don't know

Belief in absolute standards for right and wrong



God is sitting in Heaven when a scientist says to Him, “Lord, we don’t need you anymore. Science has finally figured out a way to create life out of nothing. In other words, we can now do what you did in the ‘beginning.’”

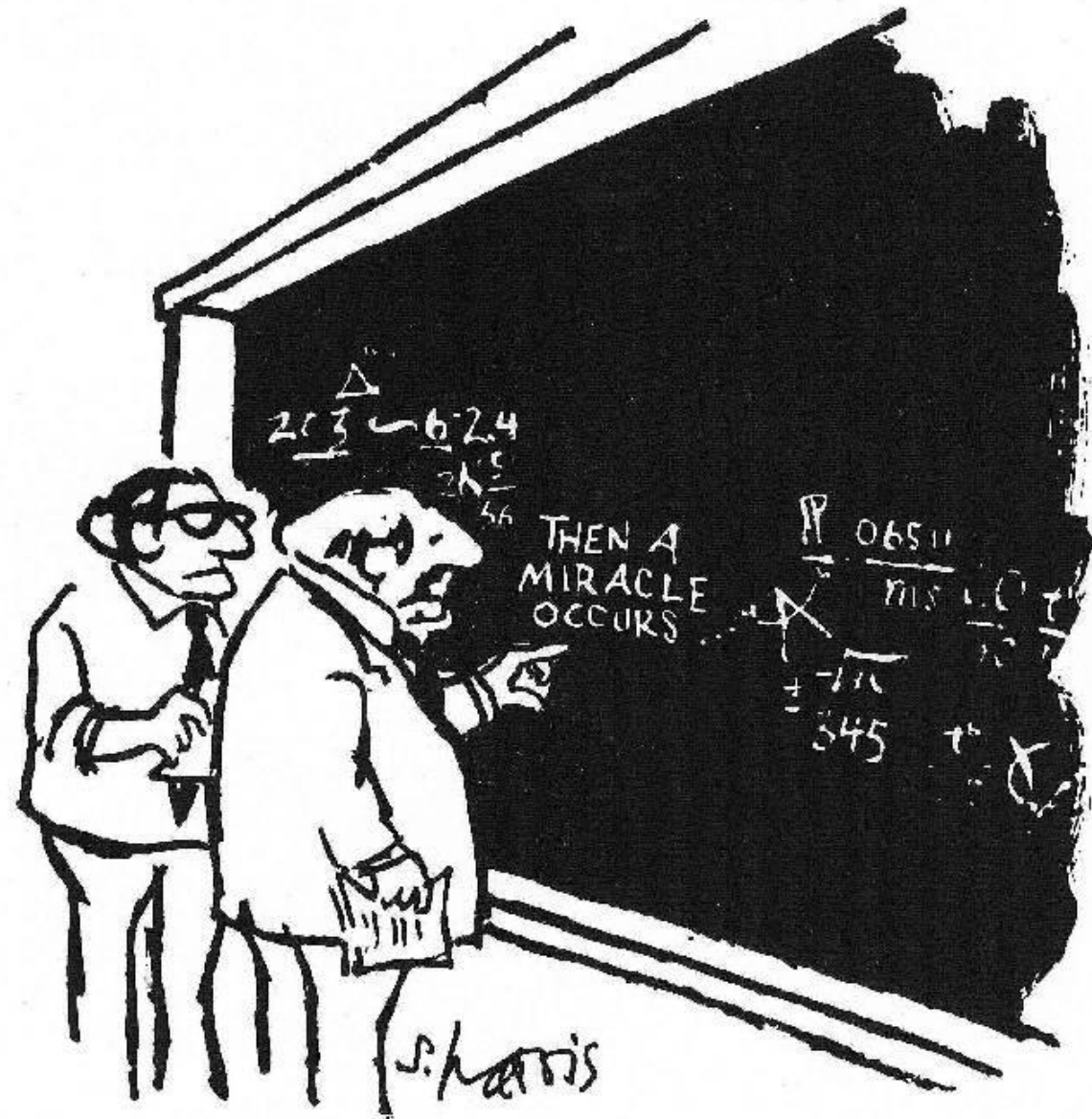
“Oh, is that so? Tell me ...” replies God.

“Well”, says the scientist, “we can take dirt and form it into the likeness of you and breathe life into it, thus creating man.”

“Well, that's interesting. Show me.”

So the scientist bends down to the earth and starts to mold the soil.

“Oh no, no, no ...” interrupts God. “Get your own dirt.”



"I think you should be more explicit here in step two."

Christianity and Aliens in Science Fiction

Is there intelligent life in the Universe? And what about God/the Messiah?

Remember the number of stars (more than grains of sand on the Earth)

First extrasolar planet discovered in 1995.

- Now over 4500
- Based on recent results, could be as many as 40 billion Earth-size planets orbiting in the habitable zones of sun-like stars and red dwarf stars just within the Milky Way Galaxy
- 11 billion of these estimated planets may be orbiting sun-like stars
- Billions of galaxies

Hard to believe intelligent life not in existence somewhere!

José Gabriel Funes, director of the Vatican Observatory (2006 – 2015)

- “The belief in aliens is compatible with belief in God.”
- “God became man in Jesus in order to save us. So if there are also other intelligent beings, it’s not a given that they need redemption. They might have remained in full friendship with their creator.”

C.S. Lewis, Out of the Silent Planet (1939)

- Voyagers from Earth land on Mars
- Inhabitants never experienced a fall
- Have no difficulty discerning the will of their creator

Lewis thought that meant we should stay out of space entirely:

“I look forward with horror to contact with the other inhabited planets, if there are such. We would only transport to them all of our sin and our acquisitiveness, and establish a new colonialism. I can't bear to think of it. But if we on Earth were to get right with God, of course, all would be changed. Once we find ourselves spiritually awakened, we can go to outer space and take the good things with us. That is quite a different matter.”

Ray Bradbury, The Man (1951)

- Main theme is the role of faith in gaining redemption
- The Messiah exists in many cultures and goes by many names
 - Space explorers find a planet where the population is in a state of bliss and completely ignores them.
 - They discover that an enigmatic visitor came to them, whom the spacemen come to believe is Jesus.
 - One decides to spend his life rejoicing in the man's glory.
 - Another uses the spaceship to try to catch up to the mysterious traveler, but at each planet he finds that 'He' has just left after spreading his message.
 - Other members of the crew remain on the planet to learn from the contented citizens, and are rewarded by the discovery that 'He' is still on the planet.

Arthur C. Clarke, *The Star* (1955) – made into a *Twilight Zone* episode

On an interstellar journey, an astrophysicist and a priest (also a physicist) debate about the existence of God in the wonders of the universe as they wish each other a Merry Christmas

- The astrophysicist believes in the random patterns.
- The priest believes it is God's grand design.
- Their ship picks up a subspace signal from a long-dead world, destroyed by a supernova.
- A planet on the edge of the solar system was so far from the supernova explosion that it escaped the worst.
 - holds the last remains of a race which was destroyed when the supernova hit.
 - remnants of art and other pieces of their culture stored with a computer record of their entire history
 - they had had a thousand years of peace before their extinction.
- The priest calculates that the star exploded in the year 3120 B.C.
- He realizes that it would have taken 3120 years for the light from this explosion to reach Earth, in the Eastern Hemisphere.
- Its star was the same star that shone down on Earth the day Jesus was born.
- The priest cries out to God, questioning why it had to be these people who had to lose their lives, why it could not have been a star with no life around it.
- The astrophysicist reads a poem from the archives:
It says that no one should mourn for them, for they lived in peace and love and saw the beauty of the universe. It says to grieve for those who live in pain and those who never see the light of peace. Whatever destiny was theirs, they fulfilled it. Their time had come, and in their passing, they passed their light on to another world. A balance was struck, and perhaps one day, humanity will light the way for another world.

Eyewitness to the Origins – Max B. Frederick

Some people say there is no need for a Christian to study a comparison of science and the bible. They say, “If the bible says it, I believe it. That’s enough for me.” Some people say it is a waste of time that should be used evangelizing. Others seem to take the position that the bible is truth and that Jesus claim that, “I am the way, the truth, and the life” is the definition of truth and anything else that claims to be true is a perversion of the meaning of the word truth And, besides, even if ‘my’ interpretation of the bible is not how God did it, He has the power, He could have done it that way if He had wanted to.

But I say: What about the thousands, perhaps hundreds of thousands, of our brightest young Christians that every year lose their faith due to this head in the sand attitude? They go to college. They learn that what they have been taught by well meaning Christians is pseudo science. They are ridiculed to shame. They look and feel stupid. They give Christianity a bad name among thinking people. They turn their backs on the religion of their parents. Isn't that a vast mission field? They could have been lights in this dark segment of our society, if only they had known the truth.

For too long, in the name of Christianity, we have been teaching science that is not true. For too long we have believed that the Christian theologians’ interpretation of the bible is truth no matter what scientists say. For too long we have been taught that scientists are wrong, if they do not agree with our interpretation of the facts. That is not what the bible teaches. The bible teaches that God created man to be a creature that was capable of recognizing the greatness of the creation of God by firsthand observation of the creation. That creature’s purpose is to glorify God by virtue of the fact that he actually does recognize the greatness of God.

Not only is God truth, but his creation is true, and reveals the greatness of the creator, even to those who have no other source of this truth.

“But what is truth?” you say. Webster defines truth to be that which is in accord with fact or reality. When Jesus said, “I am the way, the truth and the life,” He was saying that Jesus is the way, Jesus is that which is in accord with fact and reality, Jesus is life. In other words, Jesus is not some far out concept that is out of touch with reality. He does not ask you to believe something that is not true. He is down to earth and is compatible with everything else that is true. Truth is truth, whether it is found in the bible, or found in science. There is no discrepancy between truth found in the bible and truth from any outside source. No one needs to fear the truth of science. “You shall know the truth and the truth shall set you free.”

The argument is not between science and the bible, the argument is between the interpretations of scientists and the interpretations of theologians. Neither of them have a monopoly on the truth. It is not until the facts of science and the facts of the bible are seen to agree that one can be assured that either one has interpreted the truth correctly. Most scientists will not agree to be bound by that statement, but will agree that they are, in reality looking for the valid truth. Most current theologians have never considered that statement because they believe their interpretation of the bible is true in spite of contradiction by the facts of science.

On the other hand, I am proposing that many of the supposedly scientific interpretations of what the bible says, interpretations by well meaning Christian theologians, are not truth. They are not a correct interpretation of what the bible does say. In the long run, to the thinking mind, they bring into question the credibility of everything else these theologians teach. They lead many of our brightest young Christians to question their very faith. We cannot afford this waste. We must teach truth to the salvation of these potentially lost souls.