

The Cosmos & the Bible



Looking at Modern Cosmologies

Robert C. Newman



What is Cosmology?

- A study of the known parts of the universe to try to describe the whole universe
- Using the information now reaching earth to reconstruct the entire history of the cosmos



Importance Philosophically

- One of the most basic questions we can ask
- Hannes Alfvén – "A waste of time"
- Too important to be ignored
- But a large variety of cosmological models

Importance Biblically

- The universe is created.
- Its Creator is a person.
- The Creator will one day call us to account for our every thought and action.
- The Creator has embedded evidence in the cosmos that it is created.

Importance Scientifically

- One of the most basic questions of science
- We have more evidence than ever, from:
 - Radio telescopes
 - Artificial satellites
 - Understanding of nuclear & particle physics
- The evidence points to a created cosmos.

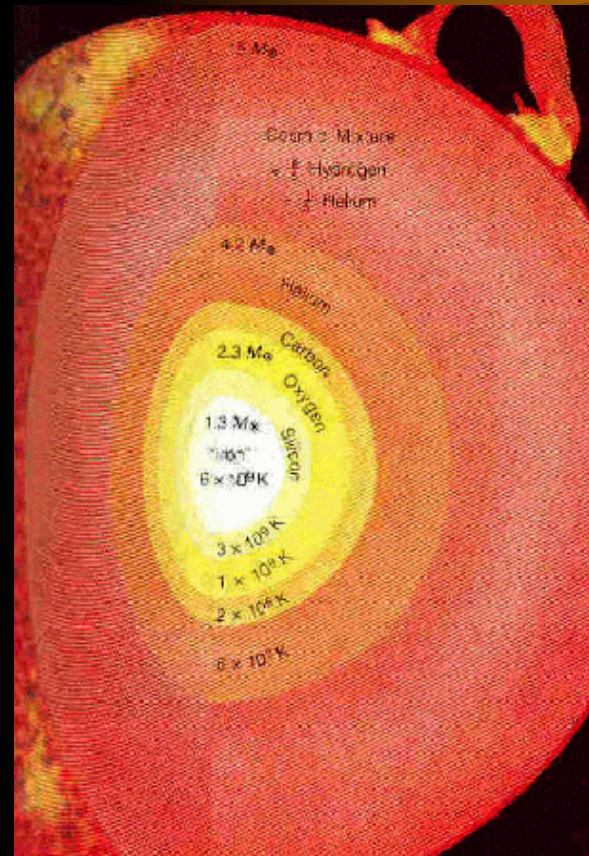


Overview

- Scientific data relevant to cosmology
- Various cosmological models:
 - Some proposed by secular scientists
 - Some proposed by Bible believers
- We suggest a best model, using both scientific & biblical data

What are Stars?

- Massive balls of gas, held together by own gravity, like our sun
- Temperature 1000s of degrees at surface, millions at center
- Heat produced by nuclear reaction like hydrogen bomb
- Enough H in star of sun's size to burn for about ten billion years

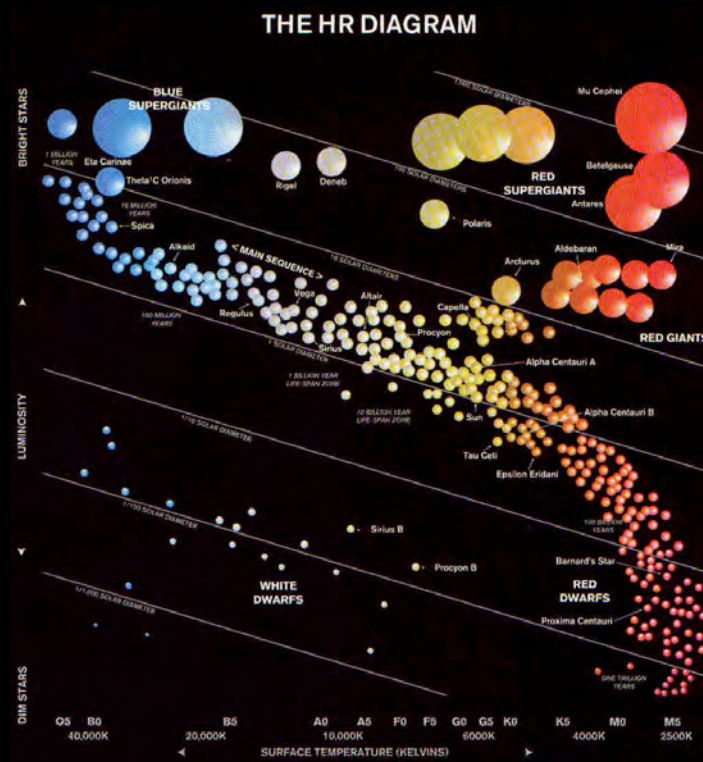


How do we know stars are suns?

- Measuring their distances
 - The jumping finger
 - Parallax using width of earth's orbit
- Apparent brightness of objects decreases with square of distance; stars are as bright as the sun.
- Measuring their masses; they cover a range that includes the sun.
- Stars vary greatly in size, mass, color; the Main Sequence stars

Hertzsprung-Russell Diagram

Brighter ↗



Cooler →

A Miniature Universe?

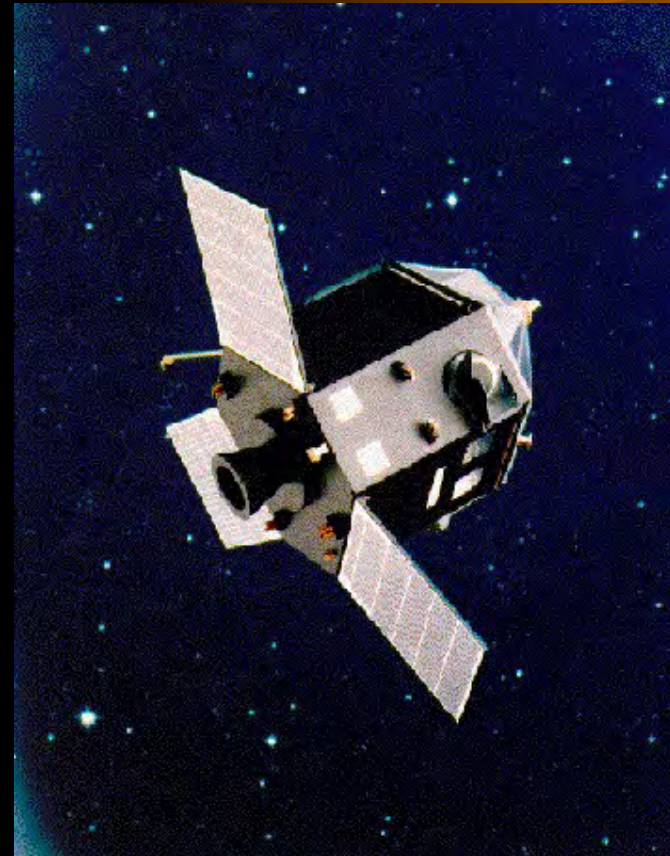
- Harold Camping, Family Radio
- The whole universe is only a few light-years across.
- The parallax method shows the thousand nearest stars are closer, but doesn't show how far the background stars are.
- All distance measurements used on the background stars are unreliable.

Problems for a miniature universe

- Binary stars – compare speed in orbit to apparent size of orbit.
- Dimmer stars – would be too small to hold their hot gases
- Star clusters – give same sort of pattern as nearby stars, explained by same mechanism if they are at great distances

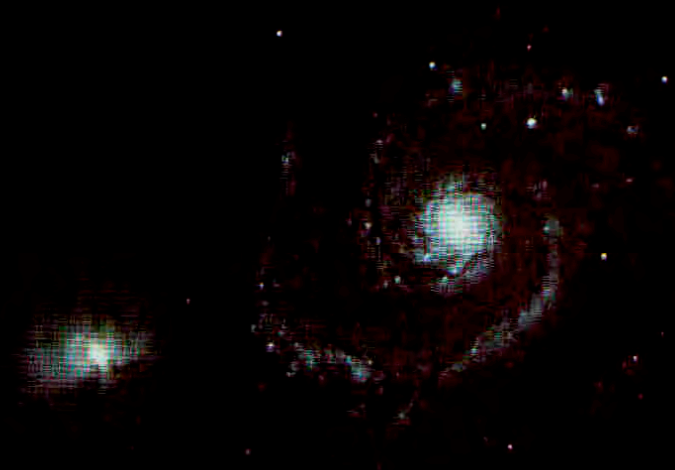
Problems for a miniature universe

- Recent activity of Hipparcos satellite
- Measures over a hundred times further using parallax than previous observations.
- No sign of stars stopping beyond a few light years.



Galaxies

- Huge collections of stars, up to hundreds of billions
- Some are shaped like pinwheels (spirals), most like spheres, footballs, M & Ms (ellipticals), a few rather shapeless (irregulars)
- These appear to be at distances of millions to billions of light-years.



Distances to Galaxies

- Not measured by parallax, as too far away
- Methods depend on comparing apparent & actual brightness of various objects
 - Main sequence stars – color → brightness
 - Variable stars – period → brightness
 - Brightest stars & brightest (globular) clusters tend to have a fixed brightness
 - Brightest galaxies in cluster same tendency

An Optically Small Universe?

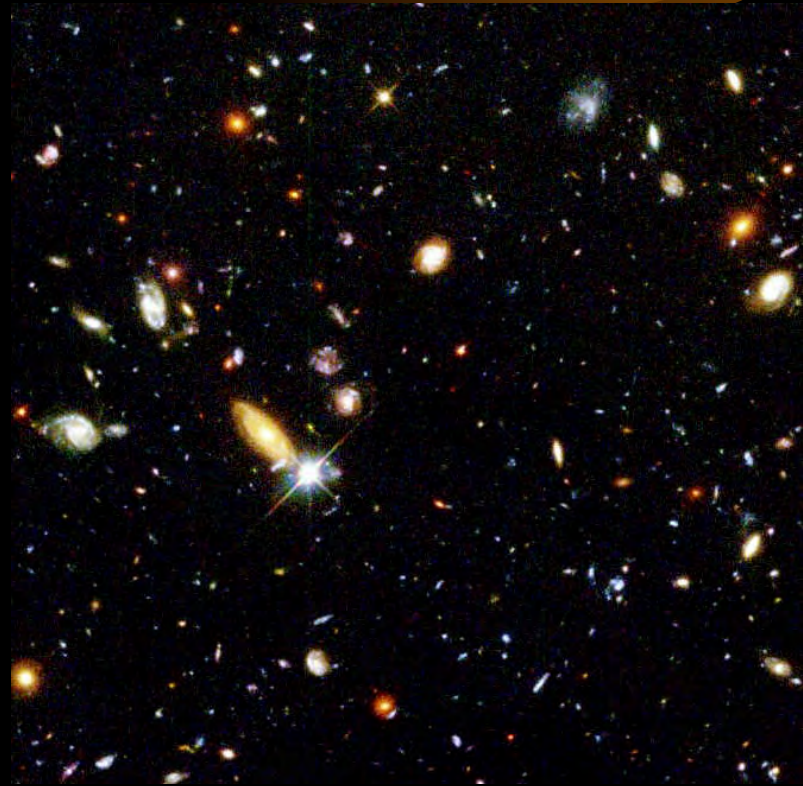
- Parry Moon & Domina Spencer
- Some features of Einstein's Relativity could be explained otherwise if light travels in circles of radius 5 light-years.
- So perhaps universe is just a dozen stars within this distance & their multiple images.
- View attracted little interest in secular circles, but much among young-earth creationists.

Biblical Problems

- Bible indicates a large number of stars, like sand on seashore, not just a few stars of which we see multiple images.
- This model doesn't solve problem of light travel-time anyway.
 - Light from objects that look thousands of light-years away must have made many circuits and taken thousands of years to do so.

Scientific Problems

- View postulates that all stars we see are just multiple images of the few within ten light-years.
 - Like the multiple images in paired mirrors in clothing stores or amusement parks
- But look at astronomical photos!
 - Too much variety
 - Too many large objects with coherent structure



Galactic Redshifts

- In 1920s Slipher & Hubble found that all but the closest galaxies have their light shifted to the red, and shifted by greater amounts the greater their distance.
- Redshift – dark or light lines in spectrum are at longer wavelengths (redder color) than for same lines in lab on earth.

Sources of Redshift

- Gravity redshift – light coming out of a gravity field is redshifted; stronger field gives more redshift.
- Motion redshift – used in police radar to catch speeders; motion away is redshifted, motion toward is blueshifted; amount indicates speed.
- We have more experience with 'redshift' of sound waves from autos coming & going.

Explaining Cosmic Redshift

- Gravity redshift requires enormous gravity field with no explanation for such.
- Motion redshift implies universe is expanding, as though from an explosion, though most cosmologists think this is space expanding rather than physical movement of galaxies.

"Tired Light" Explanation

- Jean-Pierre Vigièr, et al, give this alternative to motion redshift.
- Light is redshifted when traveling over long distances due to some unknown mechanism.
- Not impossible for a finite, created universe, though even here this postulates an unknown mechanism for which there is no other evidence.

"Tired Light" Problems

- Gravity is attractive, so how can a universe remain static rather than collapsing?
- Stars don't burn forever, so how recycle to have an eternal universe?
- If universe is infinite in size & age, it violates Olbers' paradox.

The Problem of Olbers' Paradox

- The sky is relatively dark at night, but in an infinite, eternal universe it should be at least as bright as the sun's surface!
 - Imagine universe divided up into spherical shells centered on us (like layers of an onion)
 - If stars reasonably uniform in distribution, then number of stars per shell increases with square of distance.
 - But apparent brightness of each star decreases with square of distance, so each shell provides an equal amount of brightness, and total will be infinite!

The Solution to Olbers' Paradox

- Analogous to question of how deep one must go into woods to see only tree trunks all around.
- To have a dark sky, universe must not be deep enough to see only star surfaces in all directions.
- Thus the universe is of finite age, or finite size, or average star density = 0.

A Young "Created Light" Universe

- Most common young-earth view
- Universe very large, but only some 10,000 years old
- Since most objects visible in large telescopes are more than 10,000 light-years away, the light coming from them must have been created on the way.

Problems with a Young "Created Light" Universe



- Stars & galaxies are sending us a stream of information about their history.
- For objects $> 10,000$ light-years away, this history (on this view) is fictitious, telling us what the object would have been doing had it existed.
- Given that God cannot lie, it seems this view has more problems than an old universe view.

Changing Speed of Light

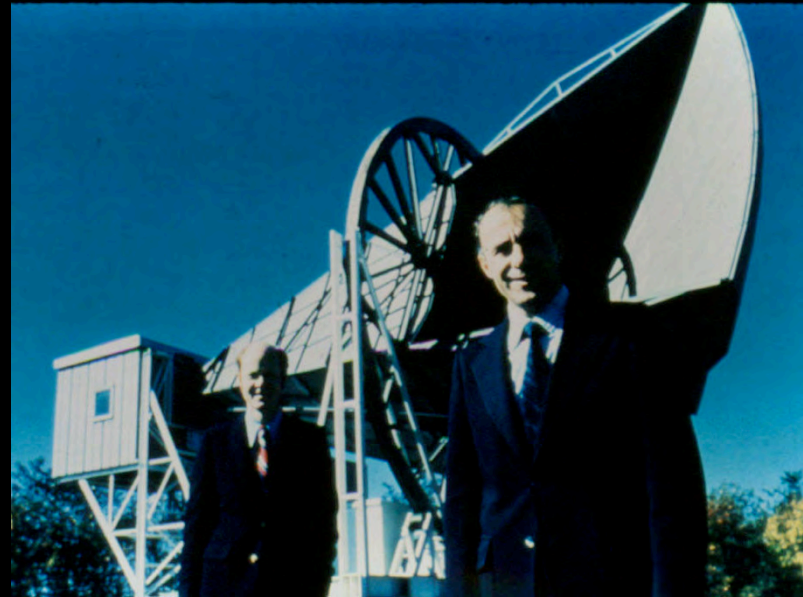
- Barry Setterfield, to avoid this problem, suggested speed of light was infinite at creation, has recently settled down to current value.
- Thus Adam & Eve could see distant stars right away.
- No need to accuse God of giving us fictitious history.

Problems with Changing Speed of Light

- Einstein's equation $E = mc^2$ measures energy produced by nuclear reactions.
- If humans existed when c was 100x larger, then c^2 was 10,000x larger, and sun would fry the earth!
- If m is adjusted downward to keep E constant, then masses too small to keep air or people on earth.

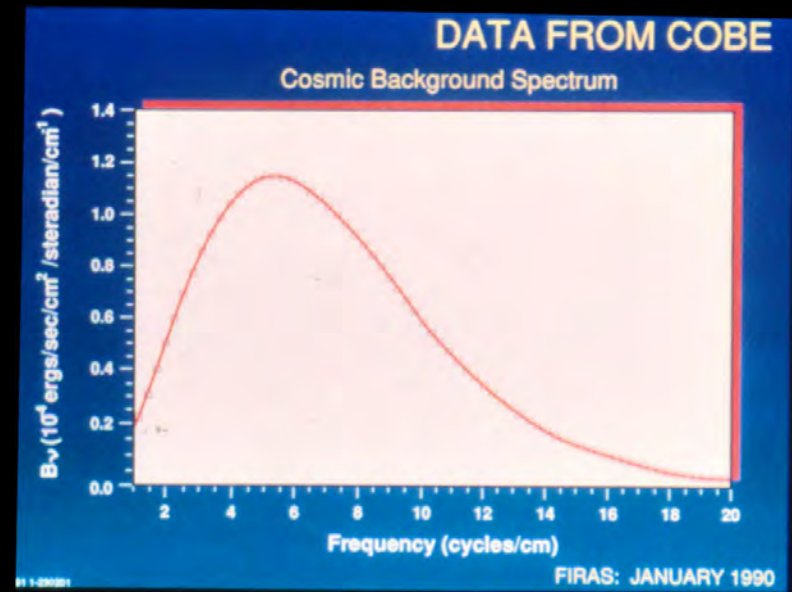
The Isotropic Radio Background

- Won Nobel prize for discoverers Penzias and Wilson.
- At radio wavelengths, sky is not black but gray.
- This is very uniform in all directions, times and seasons, so it comes from beyond our galaxy.



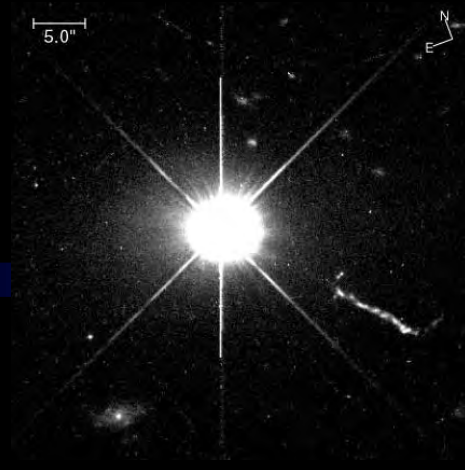
The Isotropic Radio Background

- The recent COBE observations show a perfect fit to a 2.7 degree blackbody.
- The individual data points fit the predicted curve in a spectacular way.



Significance of the Isotropic Radio Background

- It was predicted years in advance by George Gamow as a natural consequence of a 'Big-Bang' cosmology.
- In such a scheme, it is the glow from the time when the universe became transparent, about 100,000 years after its creation.
- Other cosmologies have no natural explanation for this phenomenon.



Quasars

- Look like stars through optical telescopes
- Unusually bright in radio telescopes
- Have enormous redshifts, with most of them apparently billions of light-years away.

The Steady-State Cosmology

- Bondi, Gold and Hoyle
- Takes account of redshifts & finite lifespan of stars
- Seeks to preserve an infinite, eternal universe (no Creator); seen as more satisfying philosophically
- Universe is constantly expanding, but new matter pops into existence to keep density constant.

Problems for the Steady-State Cosmology

- Violates virtually all known conservation laws!
- Doesn't have a natural explanation for:
 - Isotropic radio radiation
 - Quasar density being higher earlier in history of universe

The Big-Bang Cosmology

- Fits observations of expanding universe and stars of finite age.
- Predicts isotropic radio radiation, giving its frequency dependence exactly and its temperature approximately.
- Fits observation that quasars more common early in history of universe.

Varieties of the Big-Bang Cosmology

- No-bounce version – universe began at the big bang.
- One-bounce version – eternal universe, bounced once at the big bang.
- Oscillating version – eternal universe, bouncing every 100 billion years; bounced at last big-bang event.

No-Bounce Big-Bang

- George Lemaitre
- Universe has not always existed.
- It came into existence at the big-bang event.
- Future:
 - It might expand forever.
 - It might collapse into a black hole.

One-Bounce Big-Bang

- George Gamow
- Universe has always existed.
- Far back in past – just a thin soup of H gas
- Gradually pulled together by gravity.
- Bounced at big-bang event.
- Since then – formed galaxies, stars, planets, life
- Future – all will end with a whimper.

Oscillating Big-Bang

- Sagan, Asimov have popularized
- Eternal, like Gamow's One-Bounce
- But have bounce every 100 billion years
- Perhaps each bounce changes the basic physical constants, giving a different type of universe each time round.
- For each cycle, universe ends with a bang.

Problems for an Oscillating Big-Bang

- Universe doesn't appear to have enough matter to collapse; in fact, expansion appears to be speeding up.
- A contracting universe would collapse into a black hole instead of bouncing.
- Even if both were not problems, would a universe be able to expand & contract forever without irreversible changes?

Problems for an One-Bounce Big-Bang

- Shares problems of bounce with oscillating big-bang.
- Problem of infinitesimal rate of contraction producing a single universe-wide big-bounce

No-Bounce Big-Bang Favored



- Most cosmologists are working with varieties of this today, at least to the extent that our universe is finite in size and began with the big bang.
- Many are apparently hoping that our universe is just a subset of an infinite, eternal universe, of which ours is just a transient bubble, but it is hard to see how to test this.

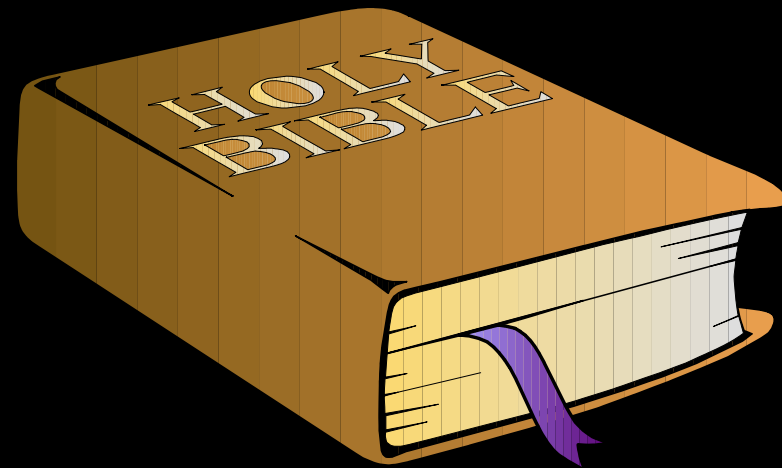
Summary of Scientific Data

- Still cannot specify a single model, but:
 - The universe is very large.
 - The universe is very old, but of finite age.
 - The universe appears to be created.
 - Some variety of the no-bounce big-bang best fits the current data.



Biblical Data

- The Bible pictures the universe as immeasurably large but finite.
- It says the cosmos was created at a finite time in the past by the infinite, personal God of the Bible, and it evidences his craft.
- It pictures the universe as running down.
- Many see the Bible as picturing a young universe.



Universe as Immeasurably Large

I will make the descendants of David... as countless as the stars of the sky and as measureless as the sand of the seashore –
Jeremiah 33:22

When I consider your heavens, the work of your fingers, the moon and stars, which you have set in place, what is man that you are mindful of him? – Psalm 8:3-4

Universe as Finite



He determines the number of the stars and
calls them each by name – Psalm 147:4

Universe as Created

In the beginning God created the heavens and the earth – Genesis 1:1

By faith we understand that the universe was formed at God's command, so that what is seen was not made out of what is visible – Hebrews 11:3

Universe as Designed



The heavens declare the glory of God, the skies
proclaim the work of his hands – Psalm 19:1

Since the creation of the world God's invisible
qualities – his eternal power and divine nature –
have been clearly seen, being understood from
what has been made, so that men are without
excuse – Romans 1:20

Universe Running Down



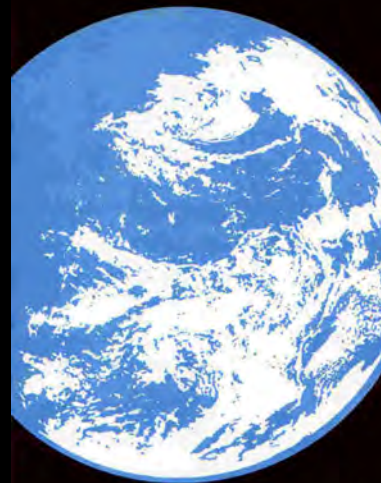
In the beginning you laid the foundations of the earth, and the heavens are the work of your hands. They will perish, but you remain; they will all wear out like a garment. Like clothing you will change them and they will be discarded – Psalm 102:25-27

Universe Young?

- The traditional understanding of the Bible
- Main reason for the influence of the young-earth creation movement among Bible-believers.
- Bible does not teach the earth is young.
- Bible does not say the days of Genesis 1 are literal or consecutive.
- Bible does not say the genealogies of Genesis 5 and 11 should be added up to get a chronology.

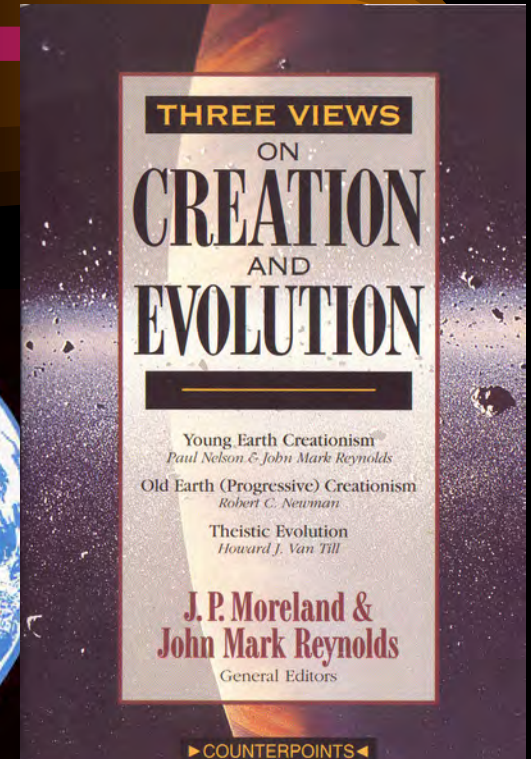
Universe Old?

- A universe billions of years old is not taught in the Bible either, but it does not disagree with a fair and reasonable interpretation of the biblical creation account.
- See my arguments in *Genesis One & the Origin of the Earth* and in *Three Views on Creation & Evolution*, plus those of Hugh Ross in *Creation and Time*.



Genesis One and the Origin of the Earth

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The Cosmos & the Bible

- Scientific Data relevant to Cosmology
- Various Cosmological Models
 - Some proposed by secular scientists
 - Some proposed by Bible believers
- Propose a Best Model, using both Scientific & Biblical Data
 - An old, created universe like we actually see!