Is Distant Starlight a Problem?

Arlington, WA
Nov. 20, 2015

Distant Galaxies in a young universe?

What Is Cosmology?

- The science of the universe as a whole
- The object is to describe and explain the universe
- We try to explain the data in terms of cosmological models
- Recent advances (e.g., Hubble telescope) have yielded a vast collection of observations

Biblical Cosmology

Goals 1. Critique non-biblical cosmologies
- Big bang problems
- Evidence of recent creation

2. Explain reality within a Biblical framework
- Distant starlight
- Red-shifts
- Background radiation
- Structures – galaxies, collisions, supernovas

Biblical Cosmology

Main Challenge – Distant starlight in a young universe

Possible Strategies

- Distances wrong – curved space
- Decaying speed of light (Setterfield)
- Different clock rates (Humphries, Hartnett)
- Mature Creation (Philip Gosse, Faulkner)
- Illusionary History (Tipler – Multiple black holes)
- Instrumentalism – theories just useful fictions (G. Clark)

Distances- Solar System

Radar distance to Venus

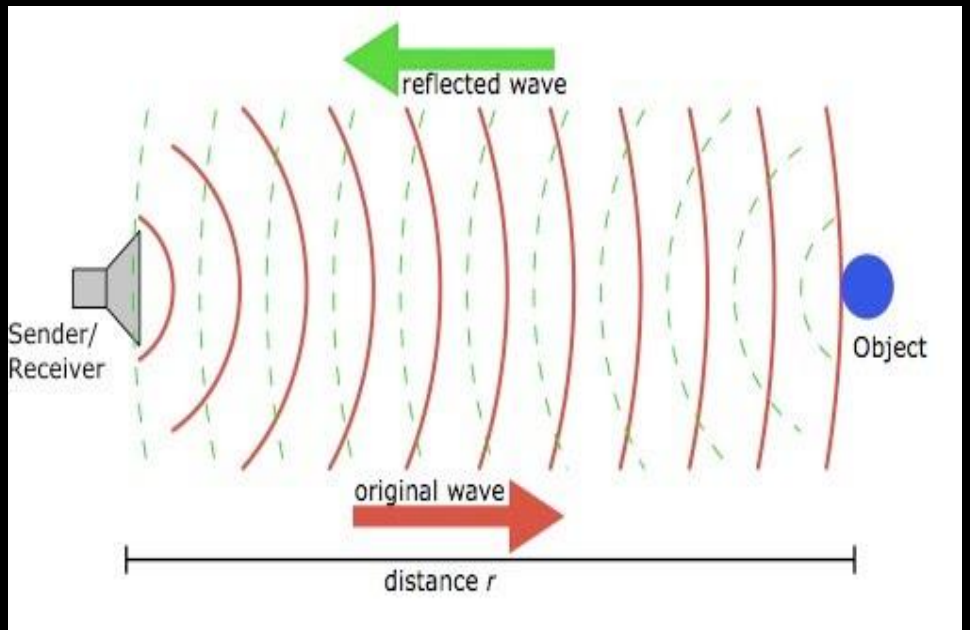
Average time delay T = 997 sec

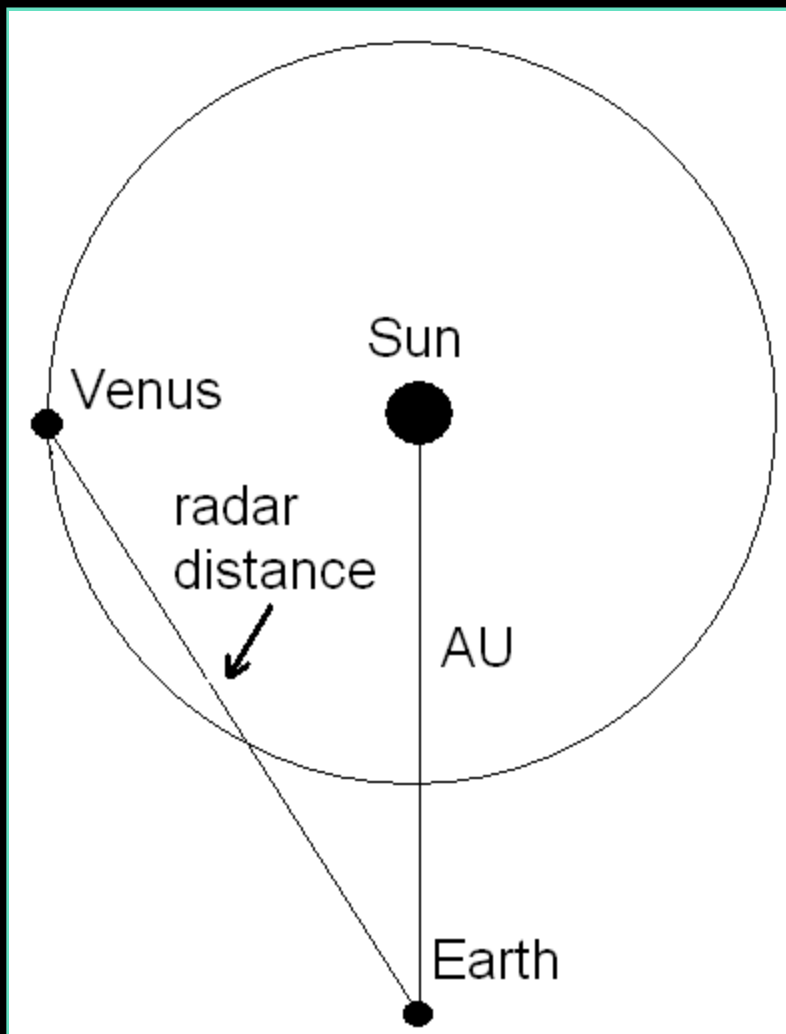
c = 299,792 km/s

Earth-Sun distance (AU) =

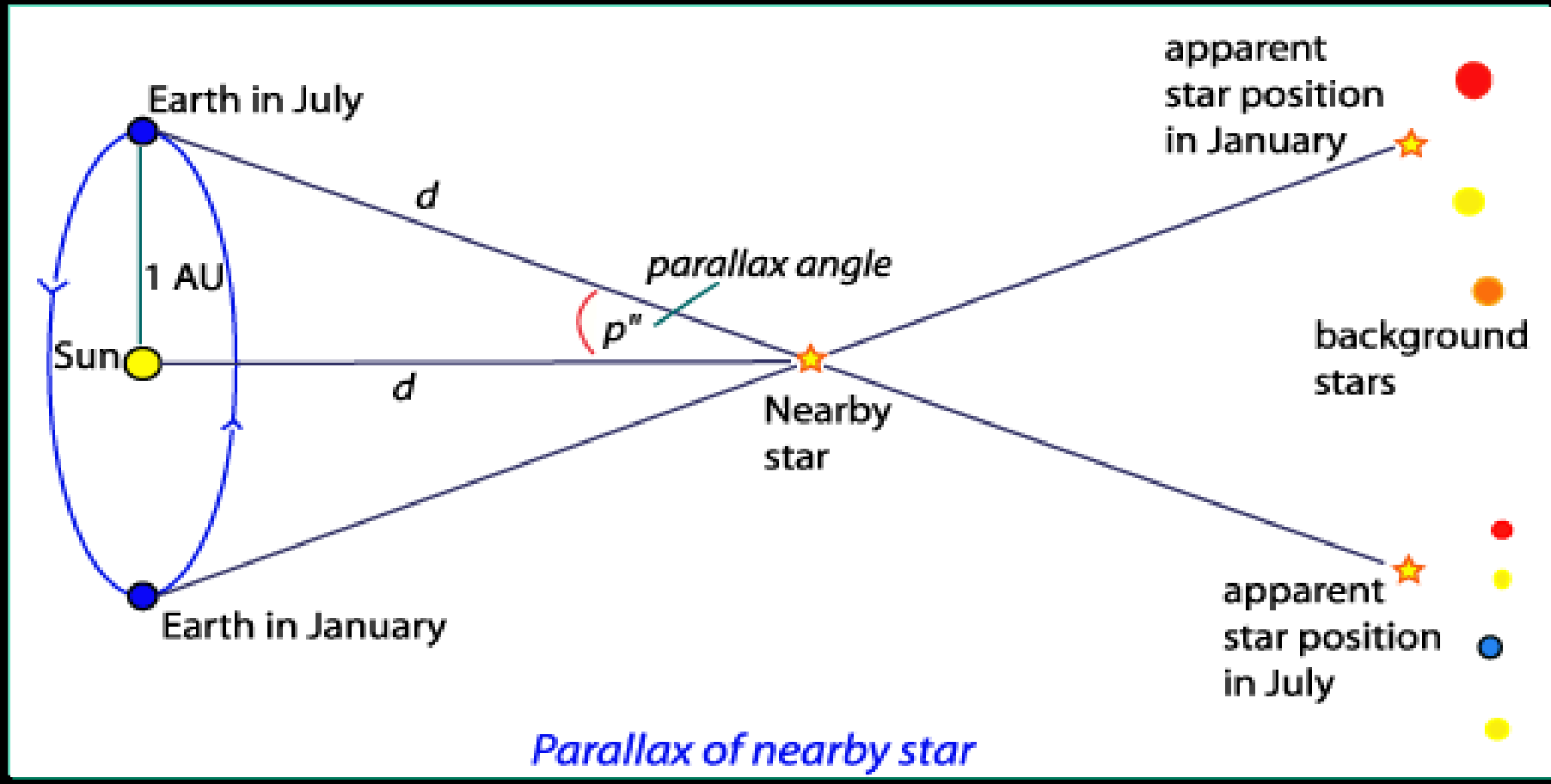
Average distance = T·c / 2

149,600,000 km (93 million miles)





Distances – Parallax



Nearest star (Proxima Centauri) p = 0.772”

d = 1/tan(p) = 1/p = 1/ 0.772” = 1.3 parsec = 4.24 light years

1 parsec = 3.26 light year

Accurate to about 1000 light years

Distances - Standard Candles

1. Use parallax to find the intrinsic brightness of special stars (Cepheids, novas, supernovas, etc.)

2. Then use inverse square law to estimate the distance using the observed brightness.

$d = 10^{(m-M+5)/5}$ in parsecs.

M = brightness the star would have at 10 parsecs.

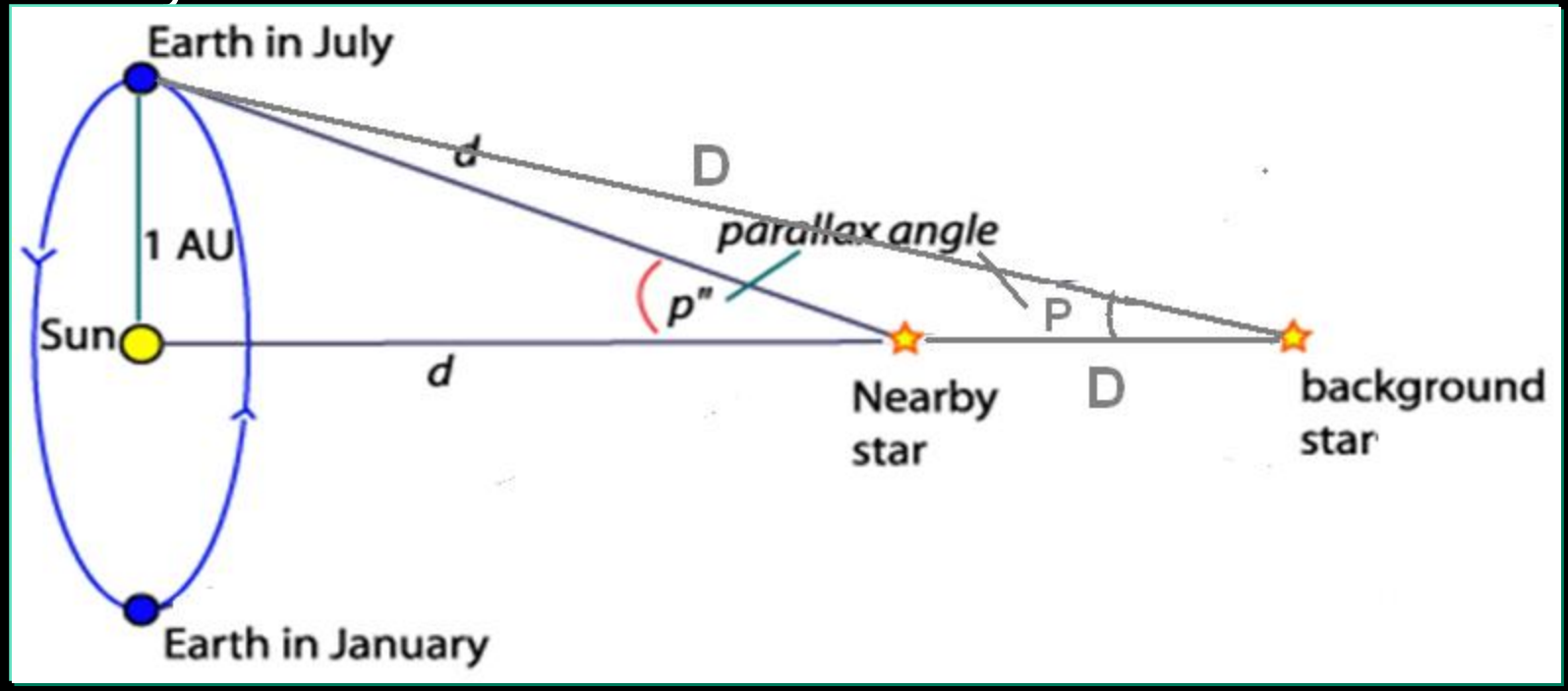
m = observed brightness

For distant galaxies use red-shift, assuming red-shift is proportional to distance.

This gets distances up to 13 billion light years.

Distances – Parallax

We measure p relative to background stars, assumed to be at infinity. What if the most distant stars are at distance D?



Measured parallax = p – P = 1/d – 1/D = (D-d)/dD

Apparent distance = dD/ (D-d)

Distances – Parallax

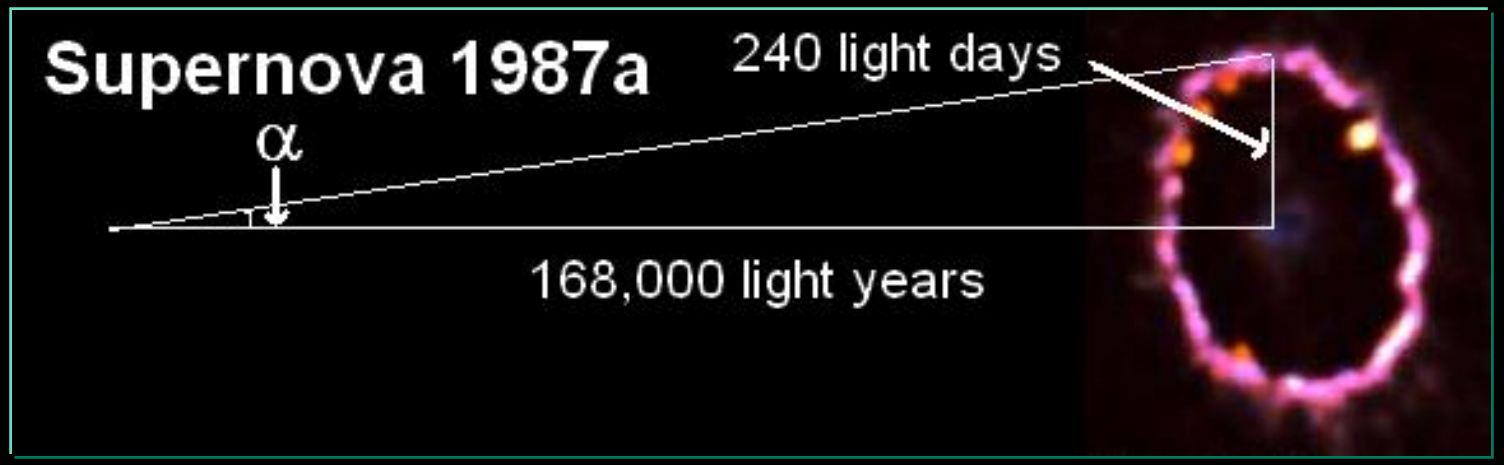
For D = 6000 light years:

Apparent d	Actual d
101 light years	100 light years
1200	1000
infinite	6000

Distances – A Check

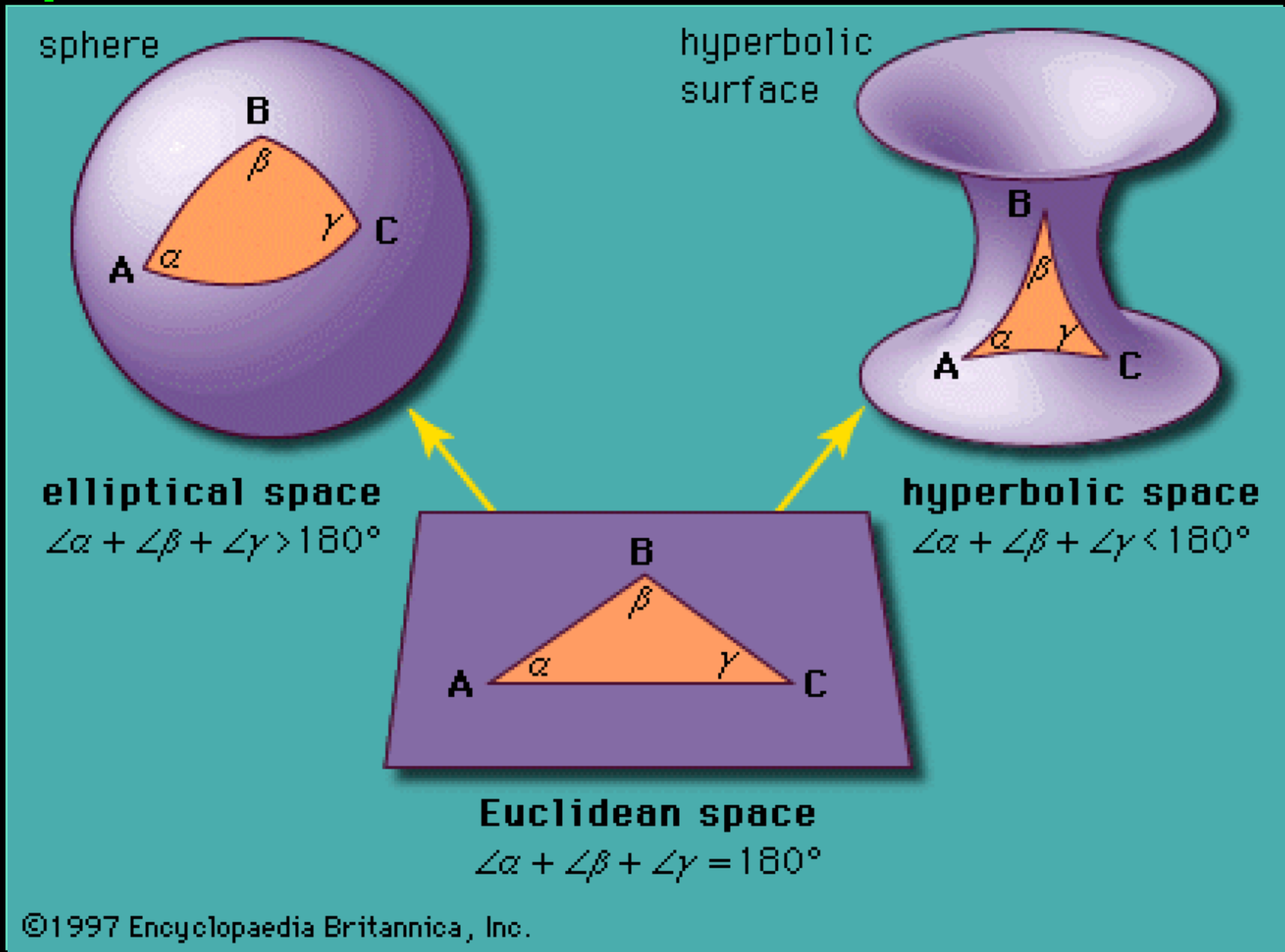
If we know the actual size of an object, we could get its distance from its angular size.

For Supernova 1987a, we measure angle α and the radius to calculate a distance of 168,000 light years.



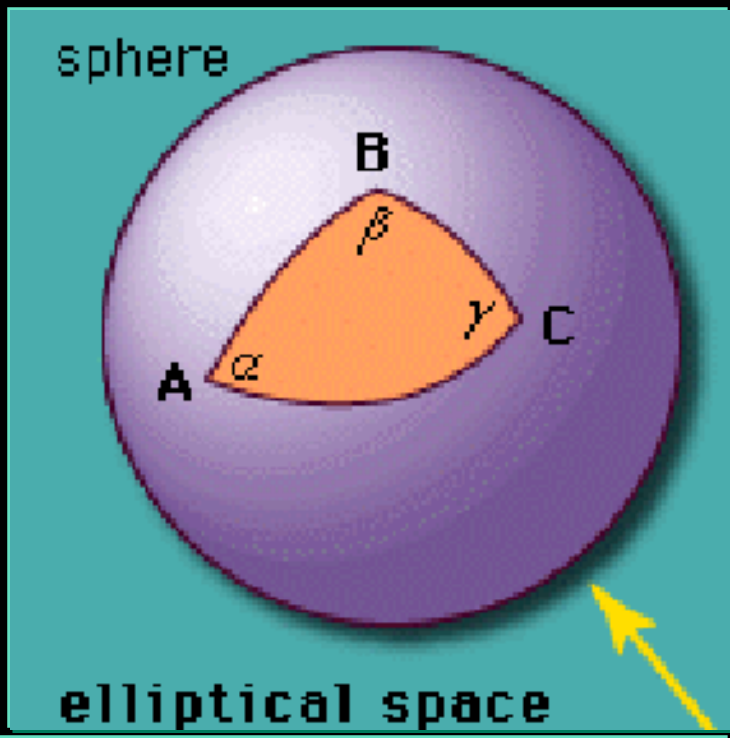
But this assumes normal Euclidean space.
What if space is curved?

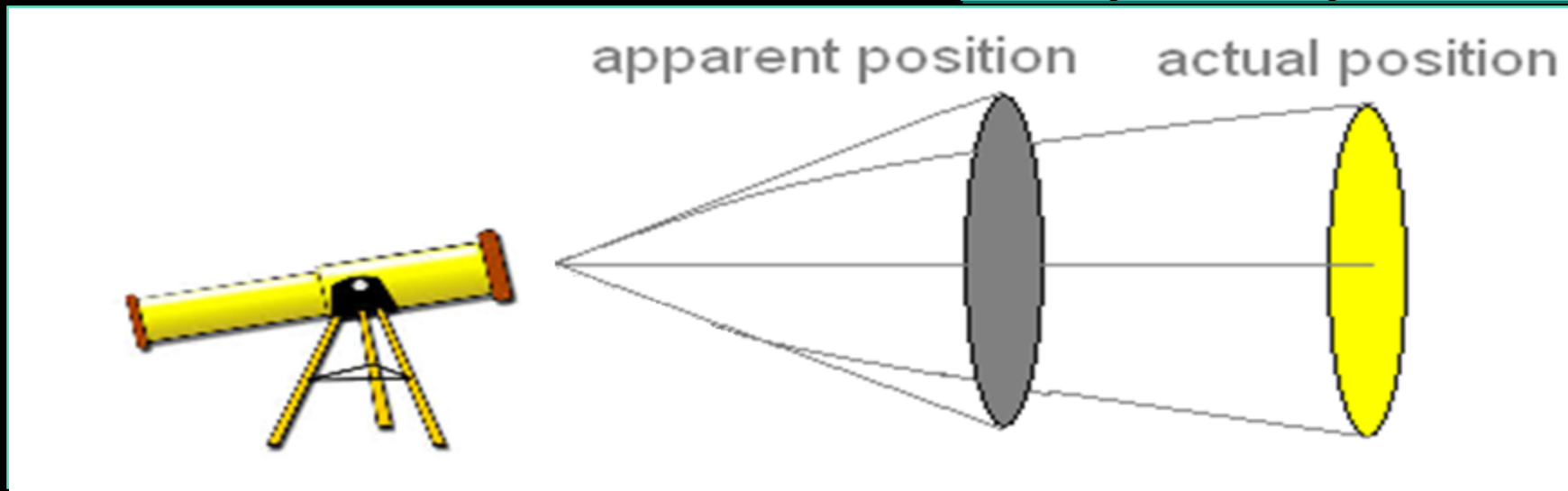
Is Space Curved?



Elliptical Space

Stars seem closer than they actually are.

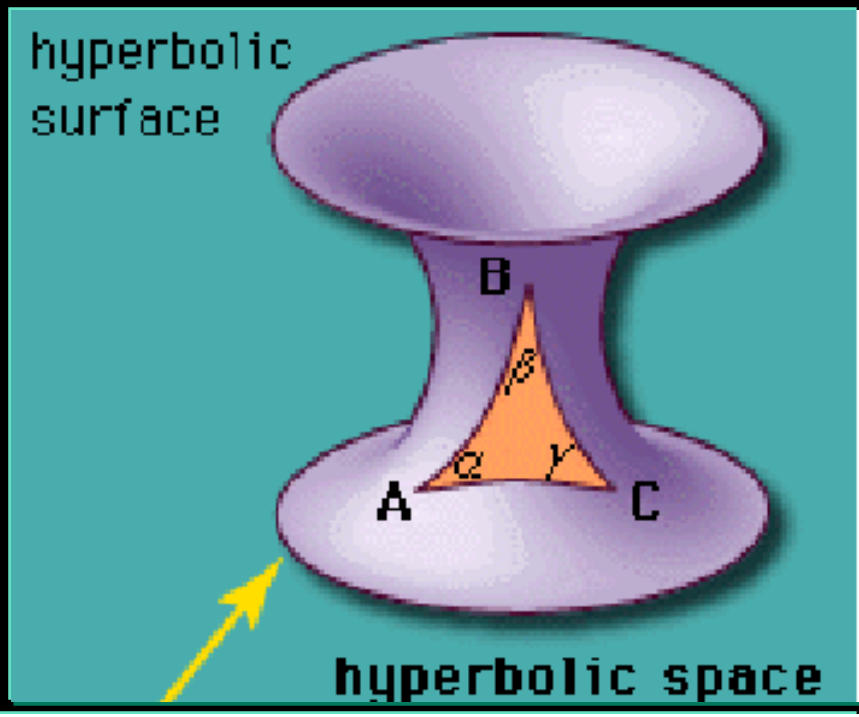


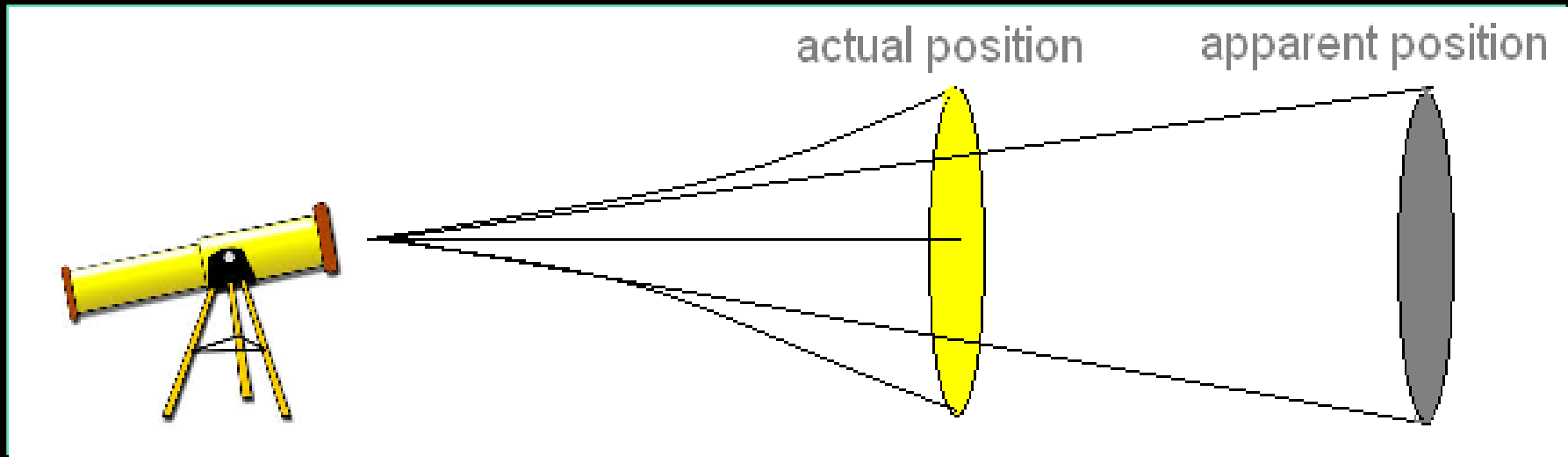


Hyperbolic Space

Stars seem further than they are.
If the furthest star is moving away at speed of light c, the furthest d = 3000 ly.

d' (apparent) = R sinh(d/R)
For d' = 12 billion ly, d = 3000 ly
Curvature R = 160 ly





Curved Space

- Supernova 1987a

  Actual distance d = R · Inverse(sinh(d'/R))

  Apparent distance d' = 168,000 ly R = 160 ly

  Thus d = 1224 ly

Actual d (ly)	M or Angular size	Relative parallax
32	32.2	40
160	187	510
1600	1.8 million	38 billion

- R could vary in space, allowing more fudging.
- Adam would see first star 4.2 years after creation.
- Need mature creation for stars and galaxies.

Decreasing Speed of Light: C-decay

- Barry Setterfield – c infinite at creation, exponential decay.
- Some evidence for cdk over last 300 hundred years

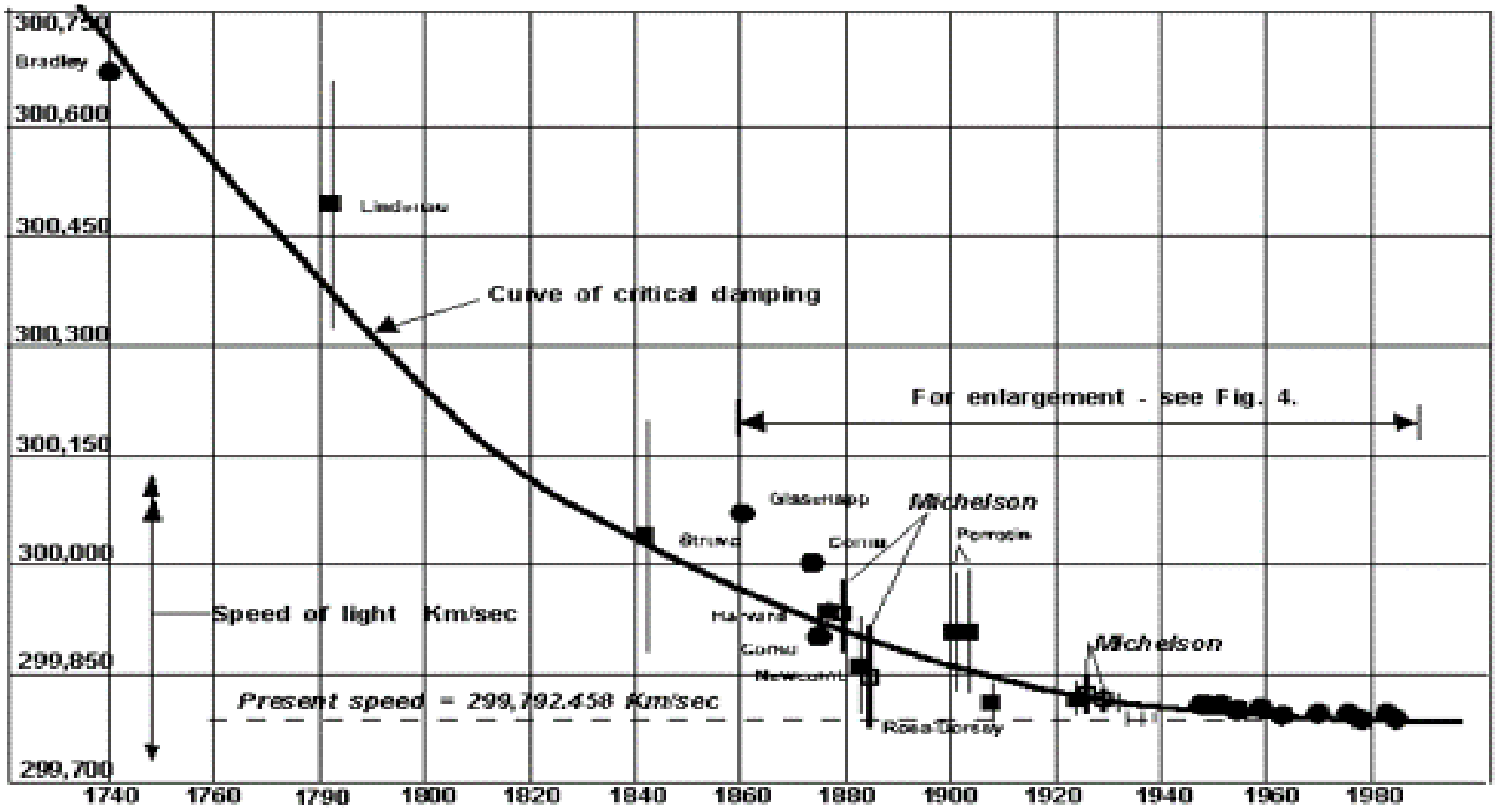


Fig. 3. The decrease in the speed of light 1740 - 1983

Decreasing Speed of Light: C-decay

Changes in c affect other constants:

● Conservation of energy. $E = hc/\lambda$. If wavelength constant

$h = E \lambda / c$ = Boltzmann's constant

● Maxwell's equations. Permeability and permittivity of space

$$c = 1/\sqrt{\mu\varepsilon}$$

● Atomic clock rates and radio-active decay rates are proportional to c. These clocks tick 14 billions years during only 6 days of earth rotation time (gravity is not affected).

● These changes are explained using a changing "zero-point energy field" , the intrinsic quantum energy inherent in a vacuum. This and plasma physics explains rapid formation of planets, stars and galaxies.

Decreasing Speed of Light: C-decay

Critique

- No recent measured change in c, h, or m.
- Highly speculative
- Hartnett: c-decay ruled out by Pulsar B1913+16 change in period (21,000 ly away), which depends on c.

[see rebuttal at www.setterfield.org]

Alternative: C Varies with position

Perhaps c is very large in weak gravitational fields, far away from stars. Could get suitable math, but no physical mechanism. Ad hoc.

Time Dilation - Motion

Could a clock on a distant galaxy (clockG) count 10 billion years, as seen from earth, during less than 1000 years counted on an earth clock (clockE)?

1. Motion: ClockG moving away from earth appears to tick slower, since the time between ticks increases.

2. Special Relativity: Clock G moving through space will itself tick slower.

3. Cosmological expansion: ClockG embedded in expanding space appears to tick slower, corresponding to a red-shift.

In all cases ClockG ticks slower than ClockE.
Wrong direction, and the difference is too small.

Time Dilation - Gravitational

Clocks at rest close to a gravitational source tick slower.

A strong gravitational source at the edge of the universe could cause the observed red-shifts, but this causes clockG to slow down.

We need a strong gravitational source near the Earth, which is not observed.

Gravity does not affect clocks in a homogeneous universe, nor in free-fall in a spherically symmetric universe.

1. White-Hole Cosmology

Russell Humphreys (1994) *Starlight and Time*
- Earth near center of a bounded expanding universe.
- Relativistic gravitational time dilation allegedly slows earth clocks.

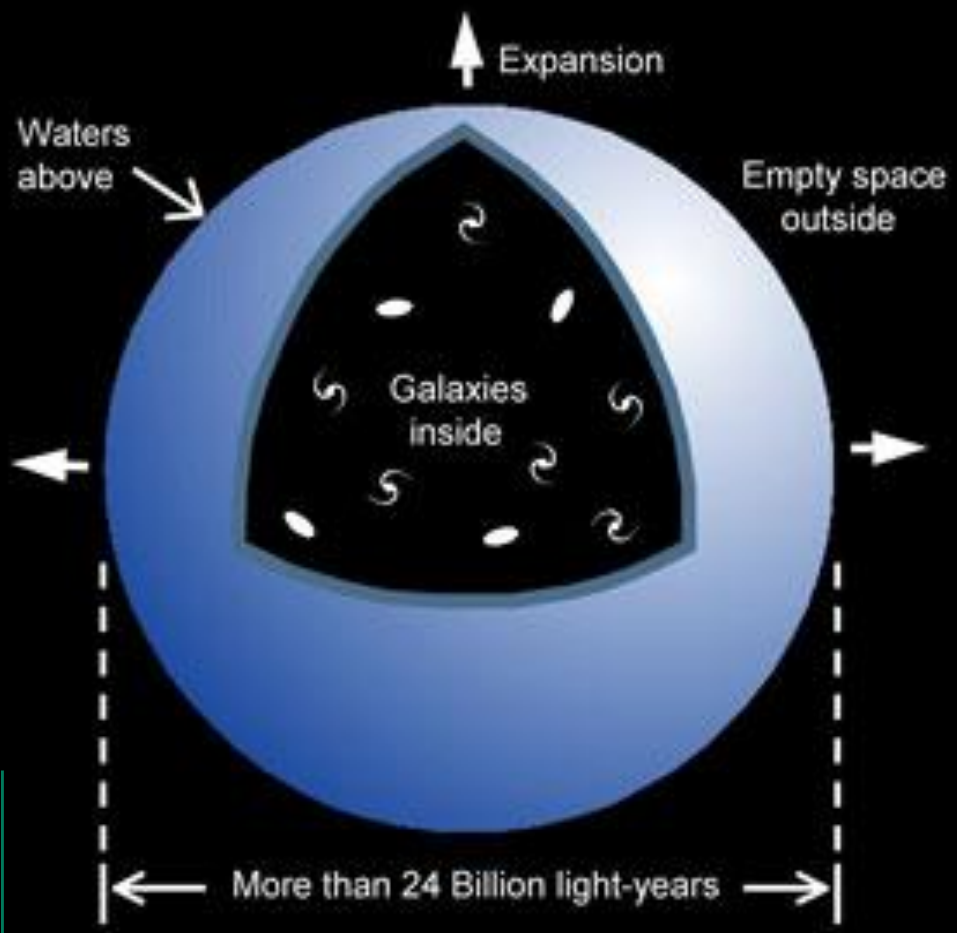
Problems:
- Hard to get enough time dilation, predicts blue shifts.
- Humphreys (2008): Not enough time dilation for nearby stars and galaxies, equations too complex to analyze.

2. Timeless Zone Cosmology

Humphreys 2008.
Expansion of Waters above (20 times mass of visible universe), plus creation of galaxies results in a time-less zone about the earth.

Earth clocks stop while galaxies age billions of years.

$$T_0 = T\sqrt{1 - \frac{2GM}{Rc^2}}$$



2. Timeless Zone Cosmology

Assumptions

1. Novel solution to relativistic equations, not widely accepted.

2. Potential inside hollow shell depends on tension caused by expansion of shell. Contrary to Birkhoff's Theorem.

3. Imaginary time entails zero time
   Usually imaginary time means equation doesn't hold.
4. "Waters above" exist in massive thin shell, expanding in miraculous bursts.

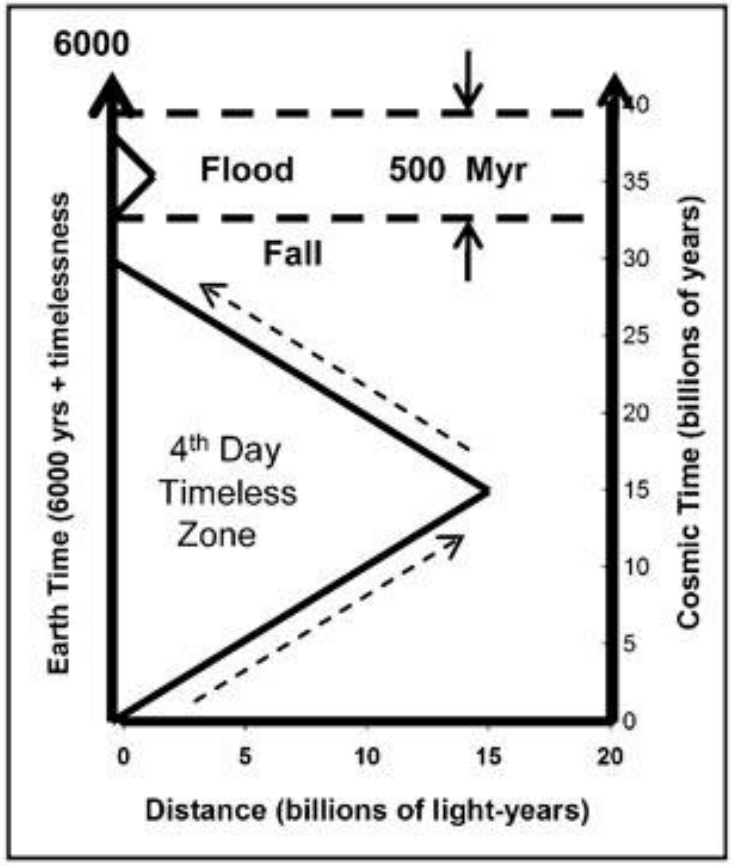


Figure 1. The timeless zones enable galaxy light to arrive on earth quickly. The large triangular timeless zone in the middle of the figure is due to the primary creation and stretching of the heavens on Day Four. The smaller triangular timeless zone near the top of the figure is due to a secondary stretching event. Humphreys suggests this occurred during the Genesis Flood.

2. Timeless Zone Cosmology

Problems

1. Potential is constant inside shell. If time stops at earth it stops everywhere in space.

2. Perturbations due to galaxy creation drive relative time dilation, but it is not spelled out how.

3. No detailed calculations are given. In 2013 Humphreys noted that his (2008) model is “far from being complete”, but he has as yet published no updates.

3. Time Dilation – Fifth Dimension

Carmeli Cosmology

John Hartnett (2007) *Starlight, Time and the New Physics*

- Carmeli's extension of general relativity
  applied to 5-d cosmology (time, space, speed)
- earth near center, time dilation due to expansion of space

$$ds^2 = \tau^2 dv^2 - (dx^2 + dy^2 + dz^2) + c^2 dt^2$$

- $\tau = H_0^{-1}$ = Observed Cosmic time = 13.56 Gyr
- H_0 = Hubble's constant
- v = Is the space velocity at a given point in space
- t = time
- c = the speed of light
- x,y,z = Normal 3d spatial dimensions

3. Time Dilation – Fifth Dimension

Problems:

- novel physics, no detailed calculations.

- Hartnett (2015) assessment:

”It has a new dimension, the expansion velocity of the universe. What that exactly is I don’t really understand.

“The cosmology still has several unsolved problems. Unfortunately no general 5 dimensional cosmology exists. Carmeli never found such a theory. To date I have not found the required space-time-velocity theory, with an extra time-like dimension, that fits the Creation period, though I am continuing to search.”

- Hartnett (2015) now prefers Lisle’s model.

Slow Earth Clocks

● These models usually involve novel physics, miraculous spurts of expansions, are ad hoc, and have not been worked out in detail.

● Humphreys' models need a strongly geo-centric universe, with Earth near the bottom of a sharp gravitational well.

● Hartnett & Humphreys oppose geo-centricity; they have our Galaxy near the center. But this requires mature creation for our Galaxy, to solve the distant starlight problem for stars nearer than 30,000 light years.

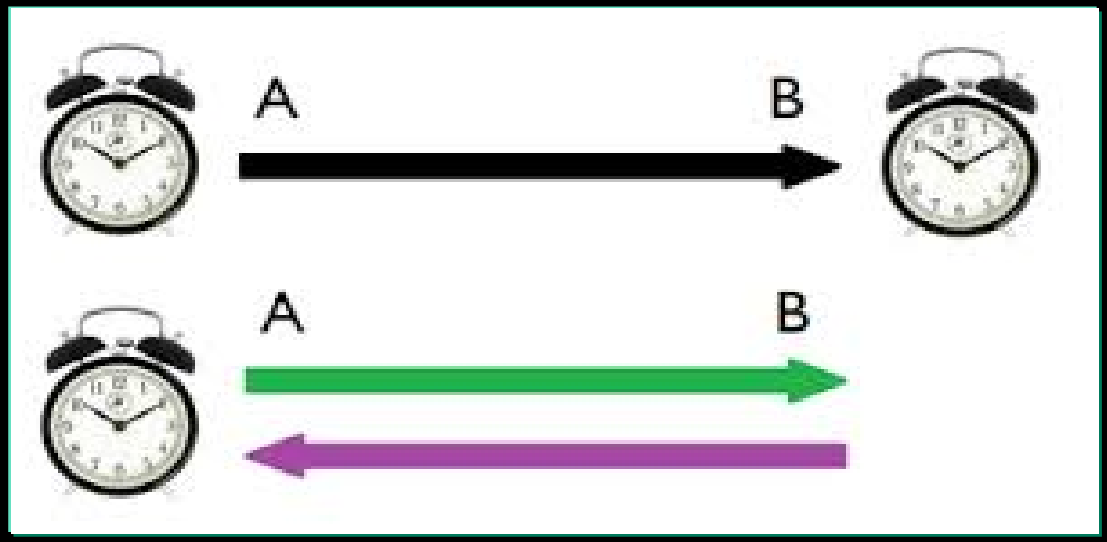
Slow Earth Clocks

● It is simpler to postulate that the earth's rotation on Day 4 lasted billions of years. But this raises the problem of the vegetation created on Day 3, which had not yet sprouted on Day 6 (Gen.2:5).

● Or perhaps the Earth was enclosed in a (miraculous) time bubble during Day 4, when elsewhere in the universe clocks ticked much faster.

Anisotropic Light-speed Convention

Jason Lisle (2001, 2010)
Special relativity assumes c is same in all directions.
But we can measure only the 2-way speed.

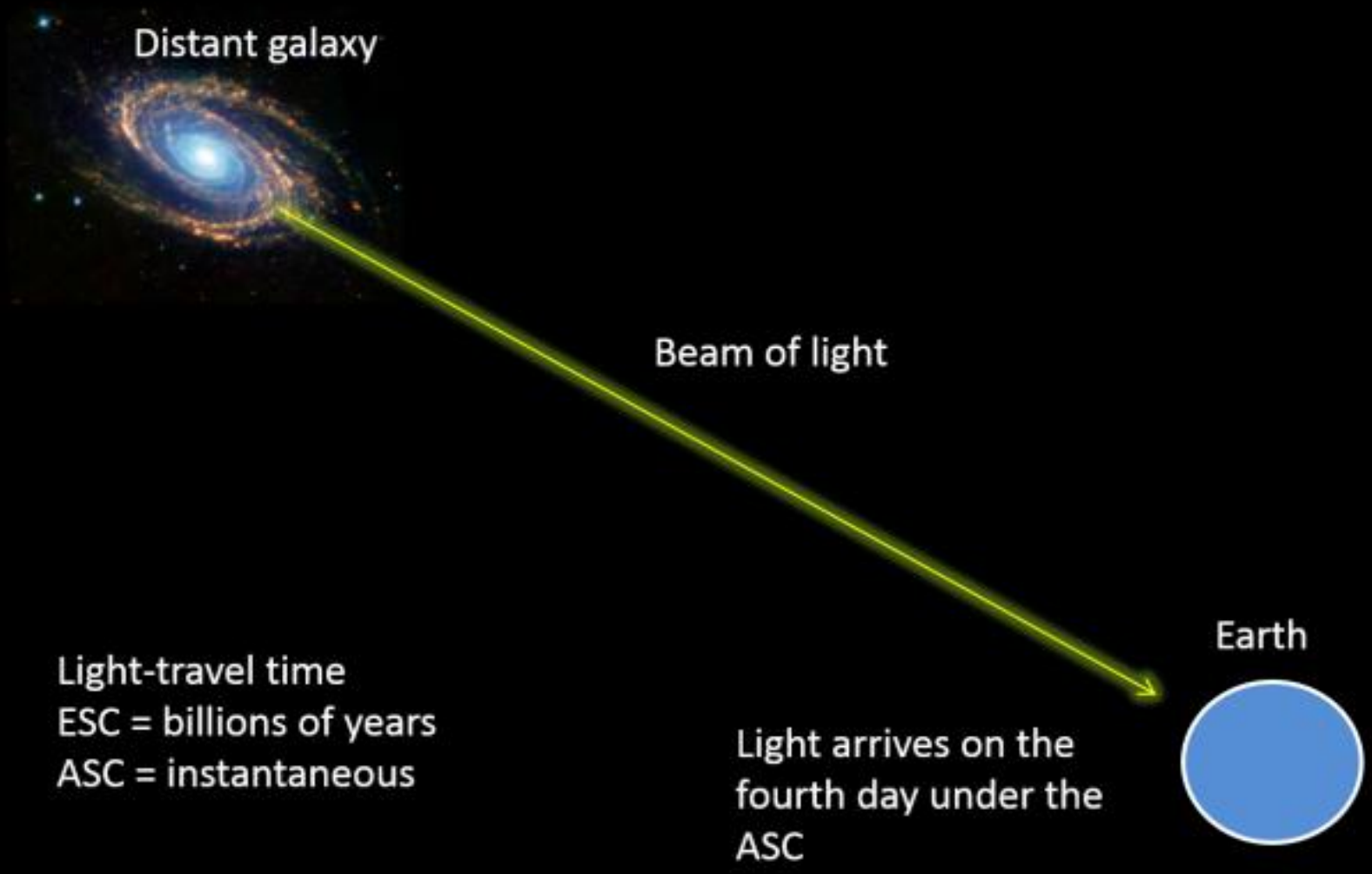


Isotropic Convention: Einstein assumed c same both ways.

An-isotropic Convention: assumes c is infinite towards observer, and c/2 away. Two-way speed = c

Anisotropic Light-speed Convention

An-isotropic Convention: assumes c is infinite towards observer, and c/2 away. Two-way average speed is c



Anisotropic Light-speed Convention

Just a Convention? Language of Appearance

In ASC we define an event to occur when we see it. We adjust clocks along light path so they all read the same time when the light passes them. Light made on Day 4 on ClockG arrives here on Day 4 on ClockE

Like flying from Amsterdam at noon and arriving in Seattle at noon on the same day. Return trip = 20 hours.

In ESC, galaxies were created billions of years ago, successively in shells, so that their light first reaches us all at once on Day 4.

Both are equally valid.

Anisotropic Light-speed Convention

Problem:

Gen.1:3: “And God said, “Let there be light”, and there was light.” (Day 1)

Gen.1:16-17: “God made the stars, and set them in the expanse to give light on the earth”. (Day 4)

Ex.20: “In six days God made heaven and earth, and all that is in them.”

These texts entail that galaxies were not created before Day 1 (light) and Day 2 (expanse = space). So this works only if Days 1 & 2 lasted billions of years.

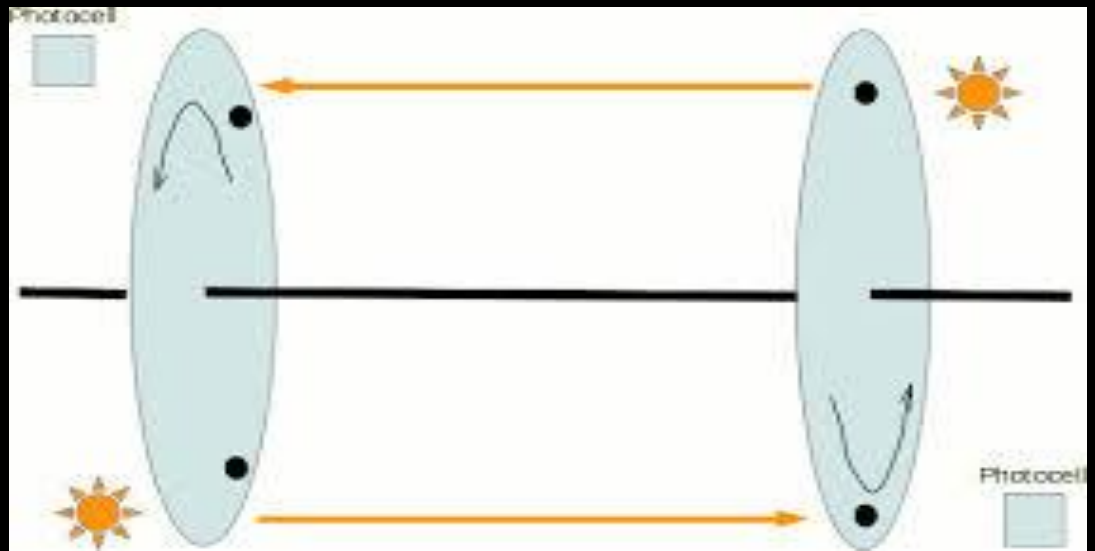
Note: If stars only became visible from Earth on Day 4, why not simply postulate a dense atmosphere until Day 4? (Hugh Ross)

Anisotropic Light-speed Convention

Reality: Light really moves at infinite speed towards earth.
All galaxies were created mature on Day 4.

Problems

Implausible: Why c should depend on direction to Earth?
Testable? Most physicists think not.
Do neutrinos from Supernova 1987a have infinite speed?
Charged particles in cyclotron? Conservation of energy?



Anisotropic Light-speed Convention

Problems

CMI is sceptical.
Sarfati (May 2012) http://creation.com/asc-cosmology

- Constant c makes physical sense (Maxwell e-m waves)
- Anisotropic speed lacks physical foundation, ad hoc
- CMI prefers time-dilation models (Humphreys, Hartnett)
- But Hartnett prefers Lisle to his own model.

Summary so far

Models	Status	Mature Creation	First star visible
Curved space	testable	universe	4 years
CDK	complex	universe?	Day 6
White-Hole	abandoned	Galaxy	4 years
Timeless zone	incomplete	Galaxy	4 years
Time bubble	miracle	none	Day 6
Hartnett- 5D	abandoned?	Galaxy	4 years
Lisle convention	testable?	Universe	Day 6

Favored model:

CMI – Humphreys, Harnett

Harnett - Lisle

Favored models all involve some mature creation.

Mature Creation

Most of the previous creationist cosmologies still need some degree of mature creation – for Earth, Sun, nearby stars, our Galaxy….

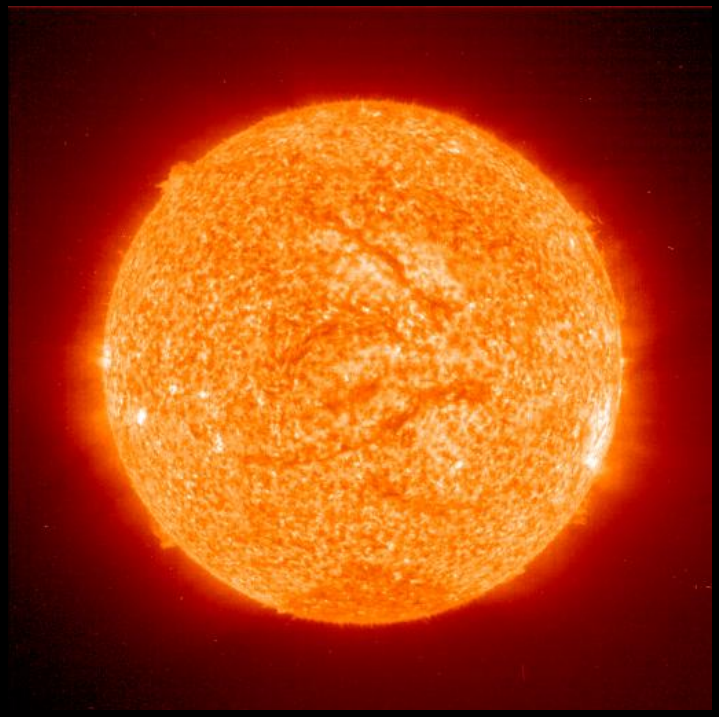
So, if we need mature creation anyway, why not simply postulate mature creation for the entire universe?

CMI, Hartnett, Lisle reject the notion of light created en route, since this gives a fictional history. Then Supernova 1987a never really happened. They argue that God does not deceive, but has given us reliable senses.

But stars and their light rays need be in mature form only by the end of Day 4. Creation may involve miraculous, speeded-up processes (e.g, Jonah's vine). [Faulkner]

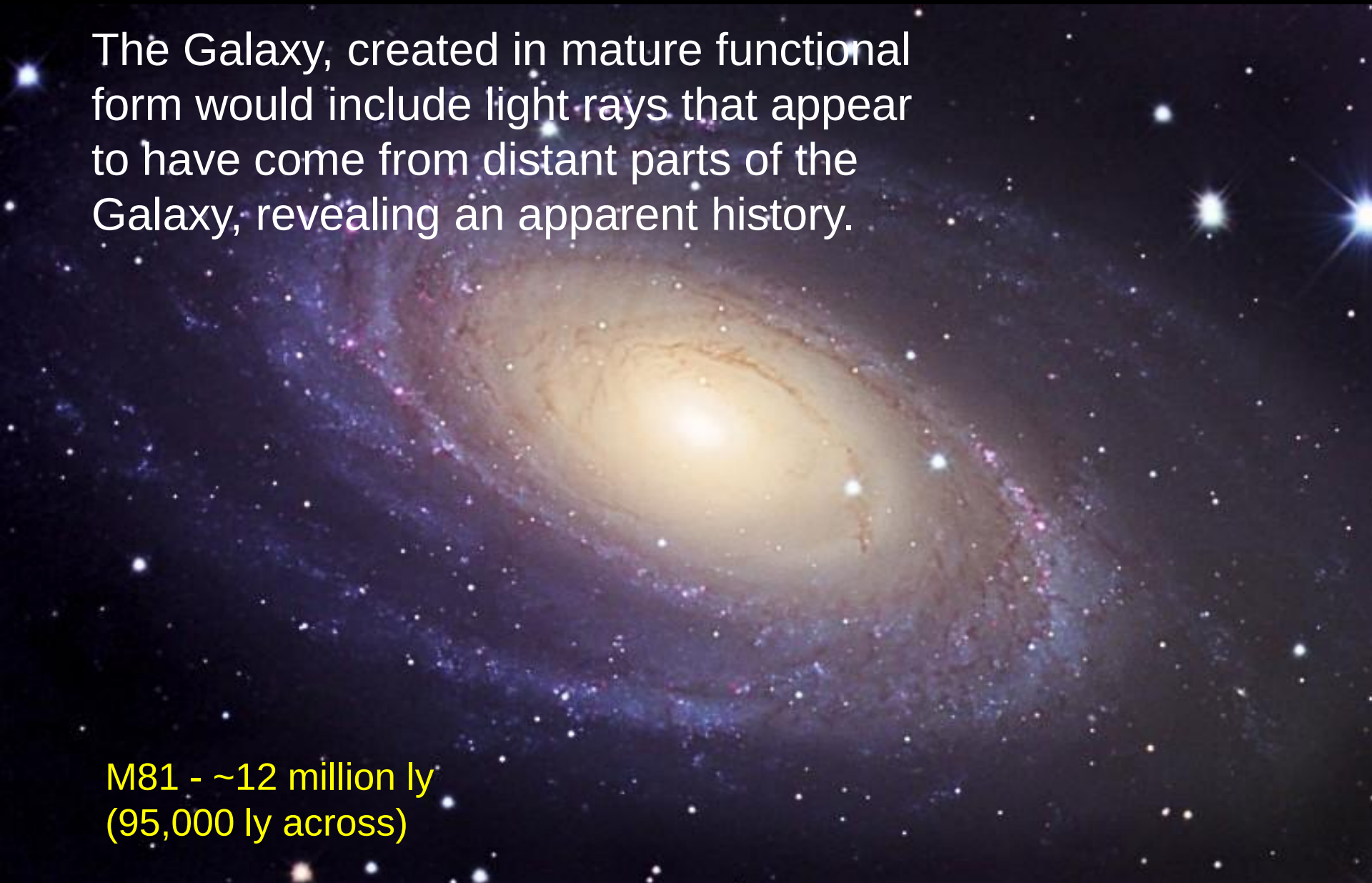
Mature Creation – The Sun

The Sun created in mature, fully functioning form, would include photons at its surface that would appear to have a 100,000 year history behind them.



Mature Creation - The Galaxy

The Galaxy, created in mature functional form would include light rays that appear to have come from distant parts of the Galaxy, revealing an apparent history.



M81 - ~12 million ly
(95,000 ly across)

Mature Creation – A Cluster of Galaxies

A cluster of galaxies, created in mature functional form would include gravitons and light rays apparently coming from distant parts of the cluster.

Hence, it is natural that the universe, created in mature form, would include light rays that appear to reveal a long history.

The Coma Cluster
321 million ly away

Mature Creation and Science

Cosmologist George Ellis:

A modern cosmologist who is also a theologian with strict fundamentalist views could construct a universe model which began 6000 years ago and whose edge was at distance of 6000 light years…

A benevolent God could easily arrange the creation so that suitable radiation was travelling toward us from the edge of the universe to give the impression of a vastly older universe.

It would be impossible for any scientist on earth to refute this world picture experimentally or observationally;
all he could do would be to disagree with the author's cosmological premises

Mature Creation and Science

Physicist Herbert Dingle:

The theory is free from self-contradiction and is consistent with all the facts of experience we have to explain;

It does not multiply hypotheses beyond necessity since it invokes only one; and it is certainly beyond future refutation.

If we are to ask of our concepts nothing more than that they should correlate our present experience economically, we must accept it in preference to any other.

Nevertheless, it is doubtful if a single person does so.

Would God Deceive Us?

Don Stoner (*A New Look at an Old Earth*, 1997, 87):
"Either God's creation testifies that it is much older than 10,000 years or God has deceived us in his creation".

Note:

1. The history of an object cannot be directly deduced, but depends on various naturalist assumptions about past processes and events. Those assumptions could be mistaken.

2. Stoner does not consider the converse: If God does not deceive, shouldn't we accept His testimony: "The Lord said, 'in six days the Lord made heaven and earth' " (Ex.31).

Would God Deceive Us?

Rene Descartes (1596-1650) (*Meditations on First Philosophy*, III-IV):

God is perfect, hence God cannot deceive. So God would not permit me to be deceived concerning the truth of those propositions that seem entirely clear to me, hence these propositions must be true.

Would God Deceive Us?

Scripture does say that God cannot lie (Titus 1:2, Heb.6:18), but these remarks occur in an explicitly covenantal context meaning that he cannot lie to believers because he has promised not to.

Scripture specifically says that God deceives those who are not believers (Ez.14:9, 2 Thes.2:11).

“Therefore God sends them a strong delusion, so that they may believe what is false, in order that all may be condemned who did not believe the truth…” (2 Thes. 2:11)

Ultimately all religious deception is traceable to Satan, “the serpent of old . . . who deceives the whole world” (Rev.12:9).

Illusory History--Multiple Black Holes

Cosmologist Frank Tipler

"It is thought to be impossible to construct a falsifiable theory consistent with the thousands of observations indicating an age of billions of years, but which holds that the Universe is only a few thousand years old…

I consider such a view to be a slur on the ingenuity of theoretical physicists: *we can construct a falsifiable theory with any characteristics you care to name."*

("How to Construct a Falsifiable Theory in Which the Universe Came into Being Several Thousand Years Ago")

A few thousand years ago the universe was dense with black holes, causing illusory histories.

Making Models Fit Reality

Any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system.

The Duhem-Quine Thesis

We can construct a model with any given feature, if we make drastic enough changes elsewhere in the model.

Naturalism and illusionary History

1.Materialism

If humans evolved from matter then our brains are controlled by physical laws. So all our beliefs are illusions (Francis Crick, "The Astonishing Hypothesis). Thus evolutionary history is an illusion.

Thomas Nagel "Mind and Cosmos" (2012)

Darwinian materialism cannot account for undeniable features of human existence: consciousness, reason, meaning, and moral values. All attempts to explain the mental and the moral in terms of the physical have been unsuccessful, and will continue to be. What is needed is not a novel Darwinian materialist solution, but rather a wholesale rejection of that paradigm in favor of a non-materialist (but non-super-naturalist) paradigm.

Naturalism and illusionary History

2. Quantum Mechanics - Consciousness creates reality
Physicist Andrew Truscott : “At the quantum level, reality does not exist if you are not looking at it” (May 2015)

http://www.sciencealert.com/re.....t-confirms
“we all have fun ridiculing the creationists who think the world sprang into existence on October 23, 4004 BC…light from distant stars heading toward us, etc. But if we accept the usual picture of quantum mechanics, then in a certain sense the situation is far worse: the world (as you experience it) might as well not have existed 10^{-43} seconds ago!”

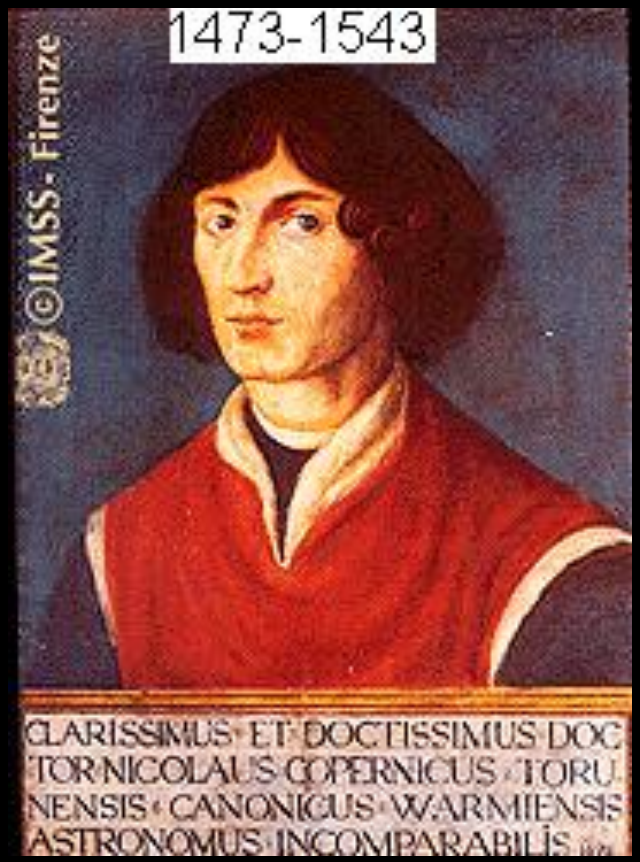
Naturalism and illusionary History

3. Is reality a simulation?

Multiverse theory: If all possible universes exist, some must have intelligent civilizations with enough computing power to simulate entire fake worlds. Simulated universes are easier to make than the real thing, and so the number of fake universes would proliferate and vastly outnumber the real ones. So we are overwhelmingly likely to find ourselves in a fake universe, not a real one.

Then our apparent history is just a simulated illusion.

Copernicus' Model



Is a model a useful fiction or a representation of reality?


NICOLAI COPERNICI

net, in quo terram cum orbe lunari tanquam epicyclo contineri diximus. Quinto loco Venus nono mense reducitur. Sextum denique locum Mercurius tenet, octuaginta dierum spacio circumcurrens. In medio uero omnium residet Sol. Quis enim in hoc

pulcherimo templo lampadem hanc in alio uel meliori loco ponaret, quàm unde totum simul possit illuminare? Siquidem non inepte quidam lucernam mundi, alij mentem, alij rectorem uocant. Trimegistus uisibilem Deum, Sophocles Electra intuentē omnia. Ita profecto tanquam in solio regali Sol residens circumagentem gubernat Astrorum familiam. Tellus quoq; minime fraudatur lunari ministerio, sed ut Aristoteles de animalibus ait, maximā Luna cū terra cognationē habet. Concipit interea à Sole terra, & impregnatur annuo partu. Inuenimus igitur sub hac

Realism versus Instrumentalism

- Plato – theories are *mathematical* models that "save the hypothesis". Need not be *physically* true
- Aristotle – theories should conform to reality
- Ptolemy – theories are useful fictions for predictions

- Hawking – The Grand Design (2010):

Model-dependent realism - it is pointless to ask whether a model is real, only whether it agrees with observation.
If there are two models that both agree with observation ... then one cannot say that one is more real than another. One can use whichever model is more convenient in the situation under consideration."

- Gordon Clark – scientific theories are useful but never true.

Instrumentalism

Is Scientific History Real or Useful Fiction?

Dr. Adrian Keister:

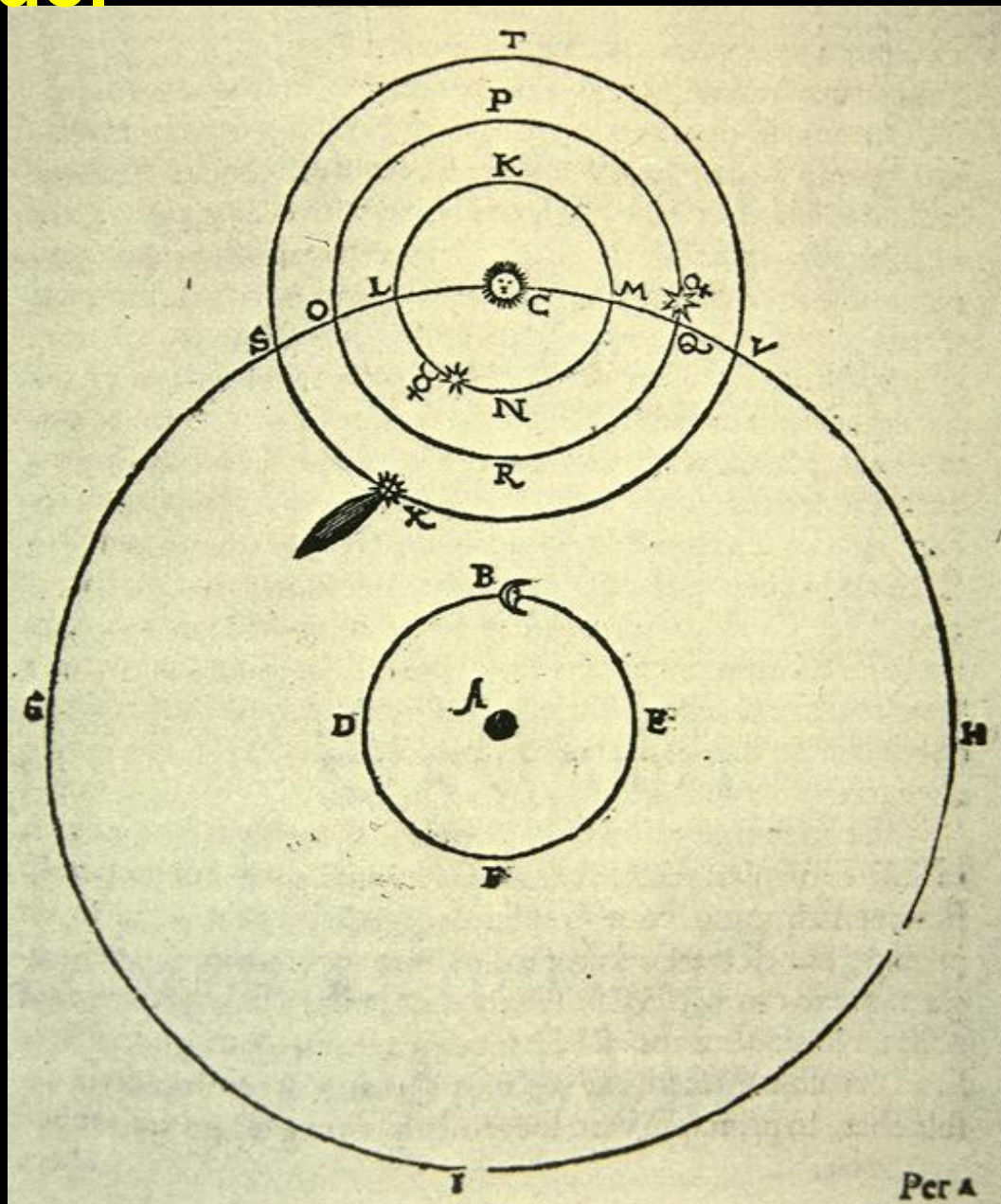
Gordon Clark:“Science is a collection of useful falsehoods.”

Since science is based on the inductive method, which is a fallacy, it can really only make probabilistic statements. Science can never arrive at the truth.

Questions about origins are not within the domain of science. There are no repeatable experiments to reproduce what actually happened. Therefore, science simply cannot contradict the Bible. The Bible says something about origins, and science cannot.

Tycho Brahe's Model

Both models are observationally equivalent.
Which is the true one?



Modeling Reality

Copernicus' model was not widely accepted until tied to plausible physics after 1650 (Descartes, Newton).

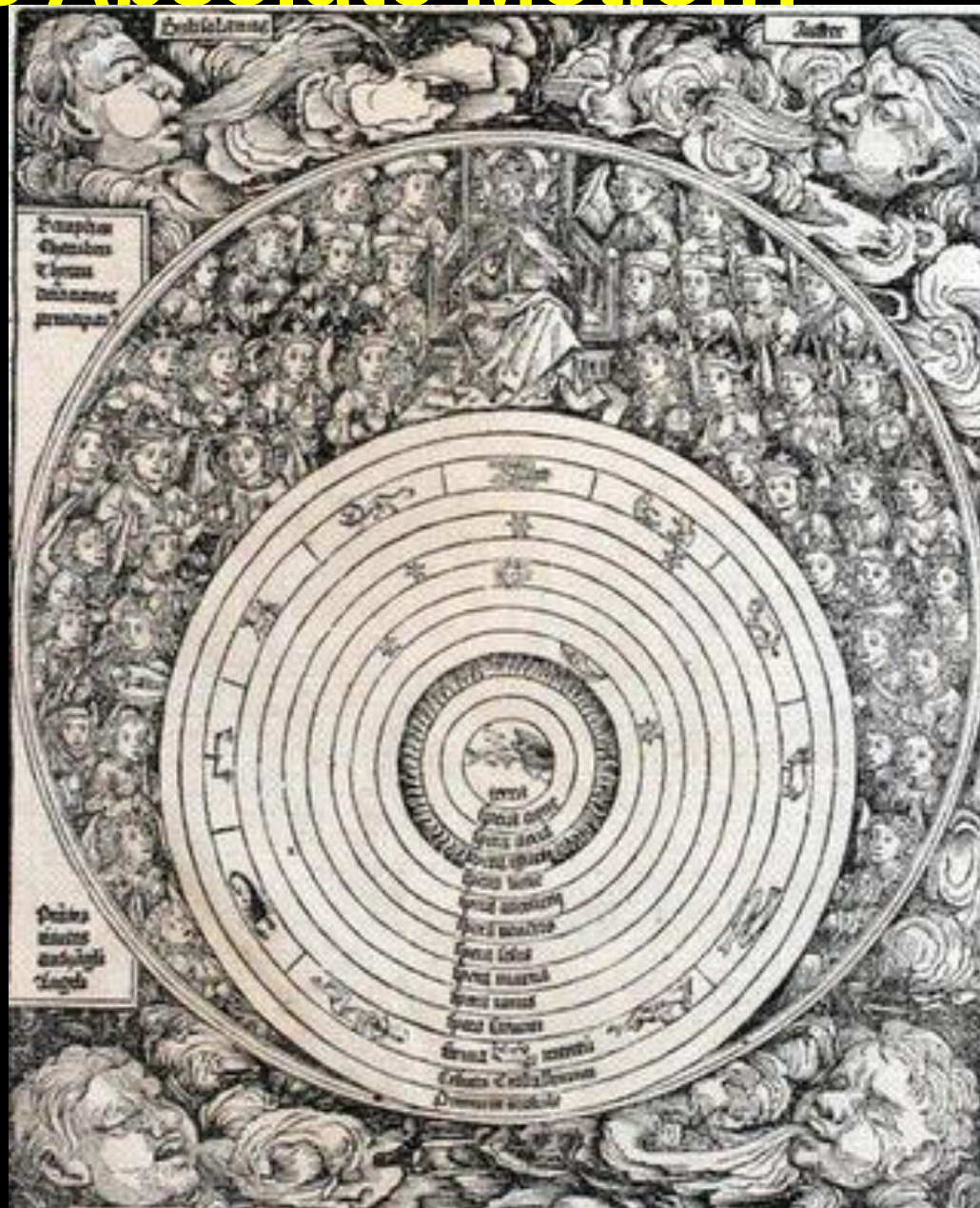
So how do we choose?
What does absolute motion mean?

General relativity: Copernicus and Tycho are equal.
Einstein (The Evolution of Physics [1938], p.248:)
The two sentences, 'the sun is at rest and the earth moves,' or 'the sun moves and the earth is at rest,' would simply mean two different conventions concerning two different coordinate systems.

What Determines Absolute Motion?

Should the Absolute determine absolute motion?

In medieval cosmology the earth was fixed with respect to God's heavenly throne.

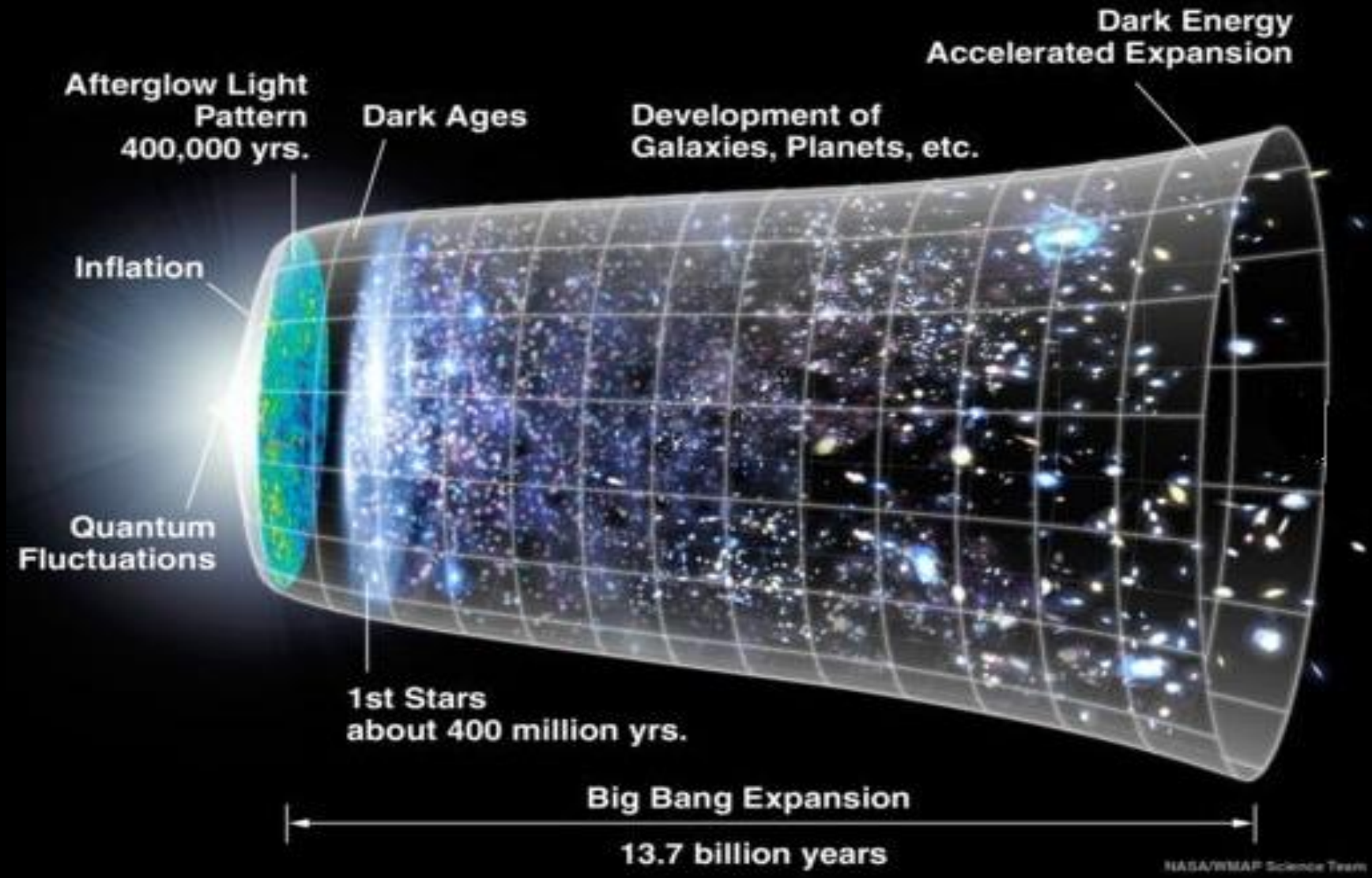


Reality is More than the Observed

The universe is more than matter

- Spiritual reality – God, angels, demons- can have physical effects
- Present Heaven – a physical place, nearby, yet normally not seen by us
- Cosmology applies only to the observed world, a thin shadow of full reality

Naturalist Origins – The Big Bang



Observational Support for Big Bang

1. Galactic red-shifts

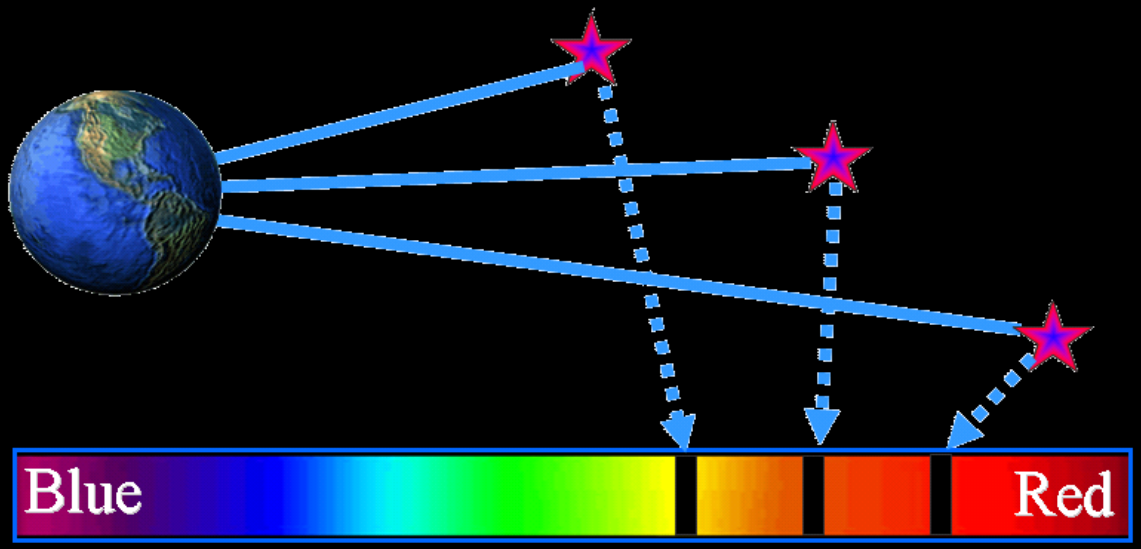
2. Relative abundances (75% H, 24% He)

3. Micro-wave background radiation

Observational Fact - Red Shifts of Galaxies

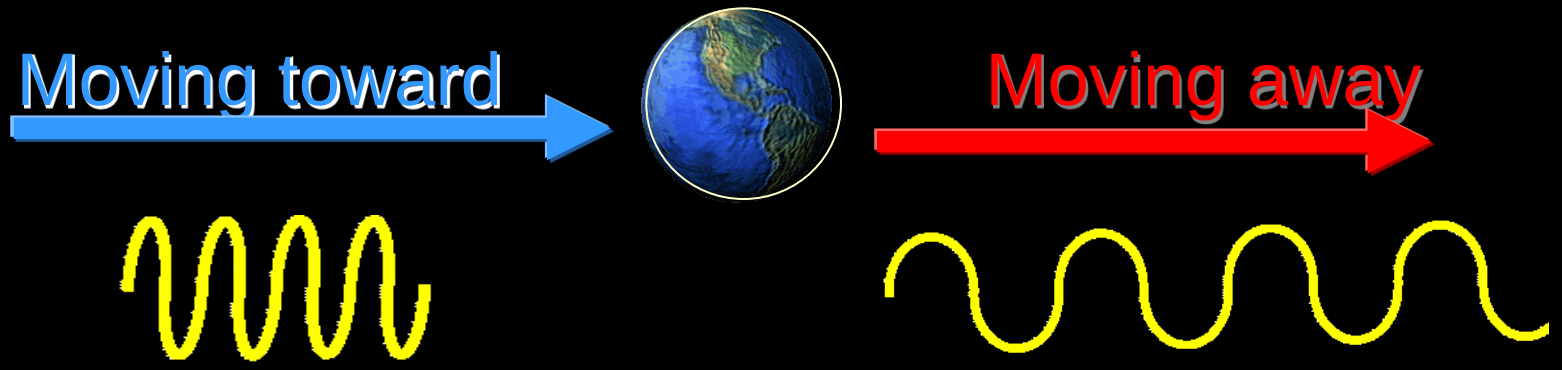
- Lines in light spectra from galaxies are shifted to the red

- The amount of red shift is proportional to distance



Do Red shifts Support the Big Bang?

- Red shifts would be expected if galaxies are moving away from us



- Red shifts are interpreted as being caused by the expansion of space

Data Under-determine Theory

Galactic red-shifts could be due to:

- expanding space (big bang)
- motion through space
- gravity
- decreasing speed of light
- shrinking atoms
- increasing mass of particles
- tired light

Difficulties with Cosmology

- Only one universe – can't compare with similar objects
- Can observe only from one position at one time
- Can observe only emitted radiation
- Distant objects are hard to distinguish from background
- Distances are hard to measure
- Conditions in early universe can't be reproduced in laboratories

Assumptions in Big Bang Cosmology

- Local laws of physics hold universally
- General Relativity
- Theoretical high energy particle physics
- Materialism – *everything* is derived from matter
- No non-material causes

Problems of Verification

- Untestability of First Kind (*inherently* untestable)
  - Can't observe anything before 300,000 yr after BB
  - Can't observe extra dimensions
  - Can't reproduce high energy to confirm hypothetical entities in particle physics

- Untestability of Second Kind (*effectively* untestable)
  - standard model of particle physics has more than 20 adjustable parameters, etc.

Big Bang Problems

- Mature galaxies at high red-shifts
- No time to form huge structures of galaxies
- Horizon problem – uniform radiation implies mixing
- Some primordial stars have much heavy metal
- According to some cosmologists, energy is not conserved

"The conclusion, whether we like it or not, is obvious: energy in the universe is not conserved. The conservation of energy principle serves us well in all sciences except cosmology. "
(Harrison, *Cosmology*)

- Cosmological constant should be much larger than observed (off by 10^{120})
- Anomalous & quantized red-shifts
- Mysterious missing mass & dark energy

Saving the Theory

● To save big bang cosmology from falsification (the horizon problem) *inflation* was invented.

● But the observed mass of the universe is only a few percent of that predicted by inflation.

● To save inflation, the missing mass was postulated to be unobservable “dark matter”.

● But nucleo-synthesis can’t produce much more normal matter than is observed.

● To save “dark matter” esoteric new forms of matter are postulated, none as yet observed...
● And so on...

How Do You Explain…?

If the Bible is true how do you light from distant stars, etc.?

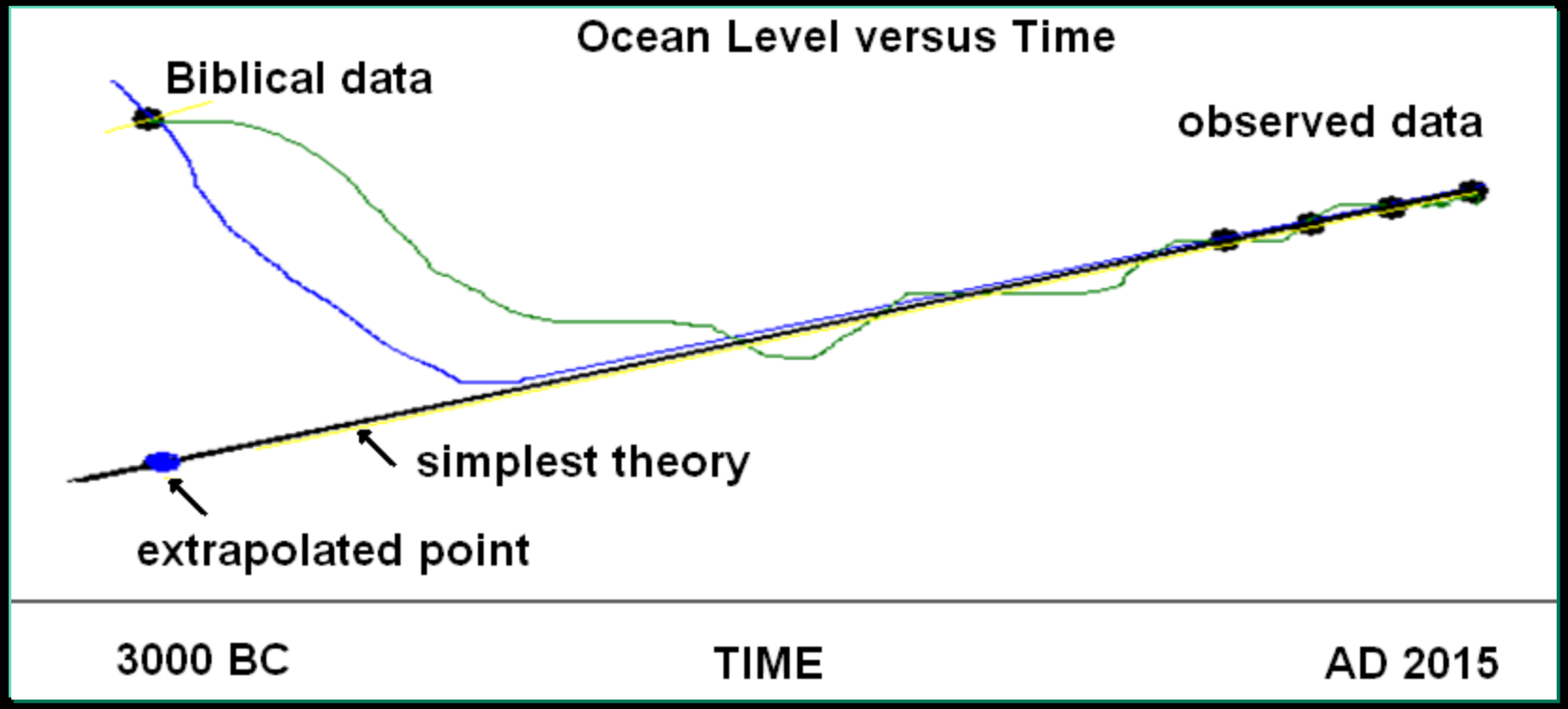
- It is always possible to construct theories consistent with the observations and the biblical givens, particularly if we allow for the possibility of miracles.

- The truth of the Bible should not rest on our ability to explain it scientifically.

- If science cannot easily explain (Biblical) facts, this just shows the limitations of human science, particularly regarding origins.

An Illustration

Fitting a theory to a set of observations is much like fitting a curve through a set of data points.



For example, was there enough water on the earth's surface for the Flood to cover the mountains?

Assessing Creationist Models

Advantages

- Based on Biblical truth
- Show consistency between Bible and observations

Limits

- Many Biblical models are possible – which one is true?
- Mature creation doesn't *explain* observational details
- Limited apologetic value –assessment & choice depend on worldview beliefs.
- Don't tie Bible to any particular scientific theory

However

- We must consider *comprehensive* explanatory power
- Worldviews come as *package deals*

Conclusions

1. There is a huge gap between cosmological data and theory

2. Cosmology needs presuppositions; many are unverifiable

3. The same data can be explained by many cosmologies

4. Any favored cosmology can be saved by ad hoc devices

5. Cosmologies are assessed in terms of one's worldview

6. Materialist & Biblical cosmology differ on origins, future, nature of reality.

7. Biblical cosmology gives meaning to reality, purpose to our life and hope for our future