Science & Genesis

The deeper one penetrates into the reasons for which things in existence were made and are governed, the more he contemplates the magnificence of the Lord and, as far as lies in him, magnifies the Lord. - St Basil, Homily 16 on Psalm 33

Modern Science

* Do you think **Big Bang theory** gives the answer to the Beginning?

* Can it explain the **Christ Event** or **revelations** we find in Scripture?

* Does it represent our inner spiritual experience?

* Some think Science can attack religion based on time - age of Universe.

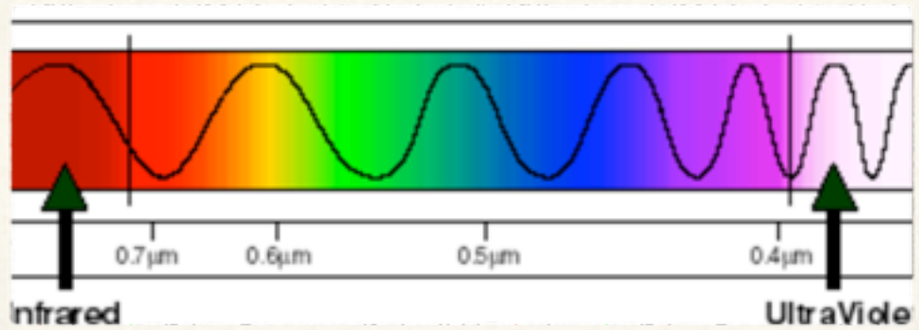
Time

How old is the Universe?

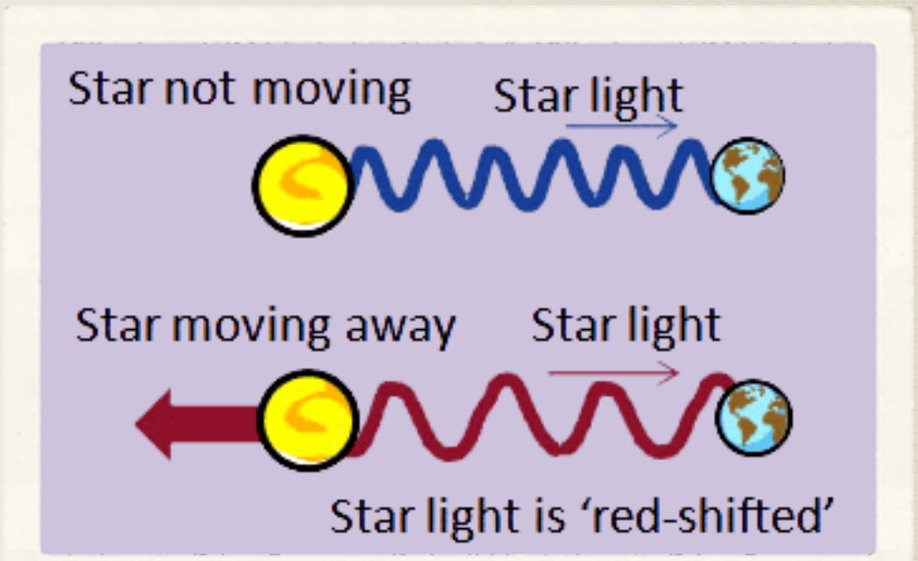
Time

* How does the Universe works as a sort of "time machine"?
  * We can see into the past simply by looking far away.
  * Light has fixed speed (700 million miles an hour).
  * 8.3 minutes from the Sun, 4.3 light years from the nearest star, and about 8500 light years from the center of the Milky Way galaxy.
  * Delay means that we don't see these objects as they are right now, but as they were when the light left.
* Scientists estimate the age of Universe in two ways:
  (a) looking for the oldest stars;
  (b) measuring the rate of expansion of Universe and extrapolating back to Big Bang.

Time



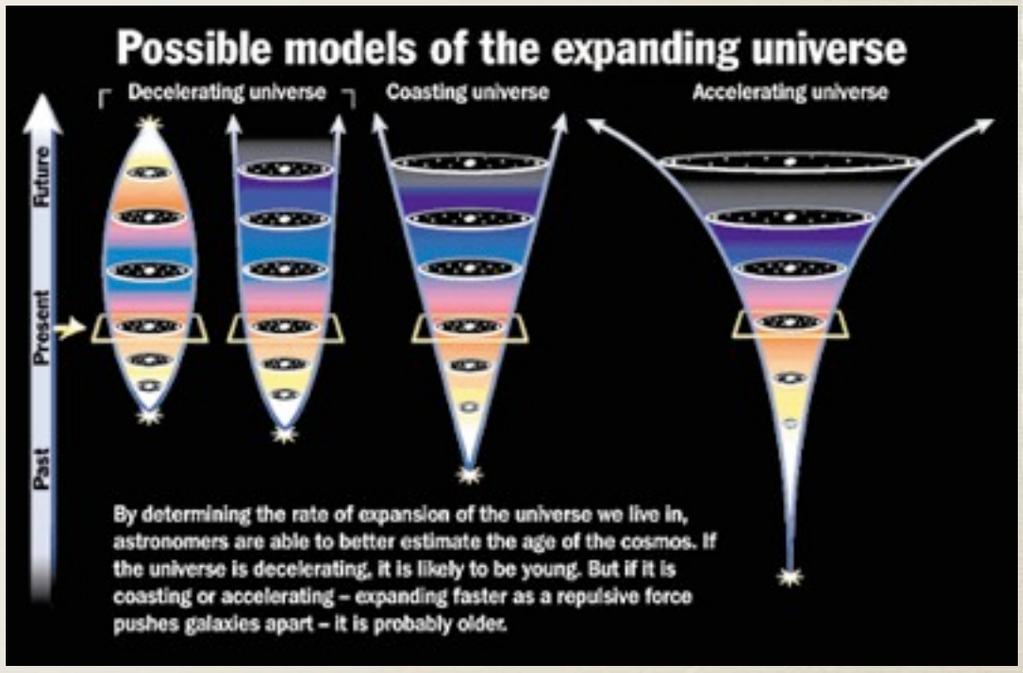
* Scientist have determined that Universe is expanding so this is most common method today.
* How do we know its expanding?
  * When a galaxy is moves away by the expansion of space, its light **waves** are **stretched out**, making it appear redder.



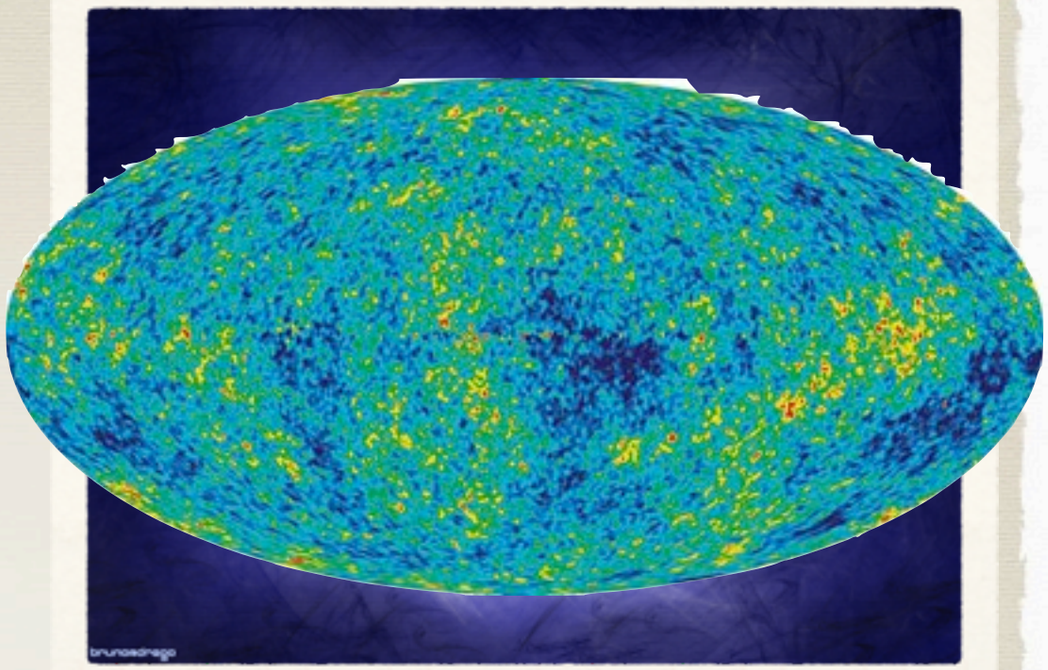
* Called the **red shift**, and can be used to calculate its velocity.
* From measurements of many galaxies, astronomers can accurately measure the expansion rate of universe as a whole.

NASA

* Mission of **Hubble Telescope** (1990).
* **"Hubble constant"** (H_0) is measure of current **expansion rate** of Universe.
* How do they get age of universe?
* **Extrapolate** back to Big Bang.
* Wendy Freedman and team at Carnegie Observatories measured distances to **24 galaxies** between 1994 & 1999 with Hubble Telescope.
* Published final result in 2001 - **13.7 billion yrs.**
* Many astronomers working hard to measure Hubble constant using a variety of techniques.

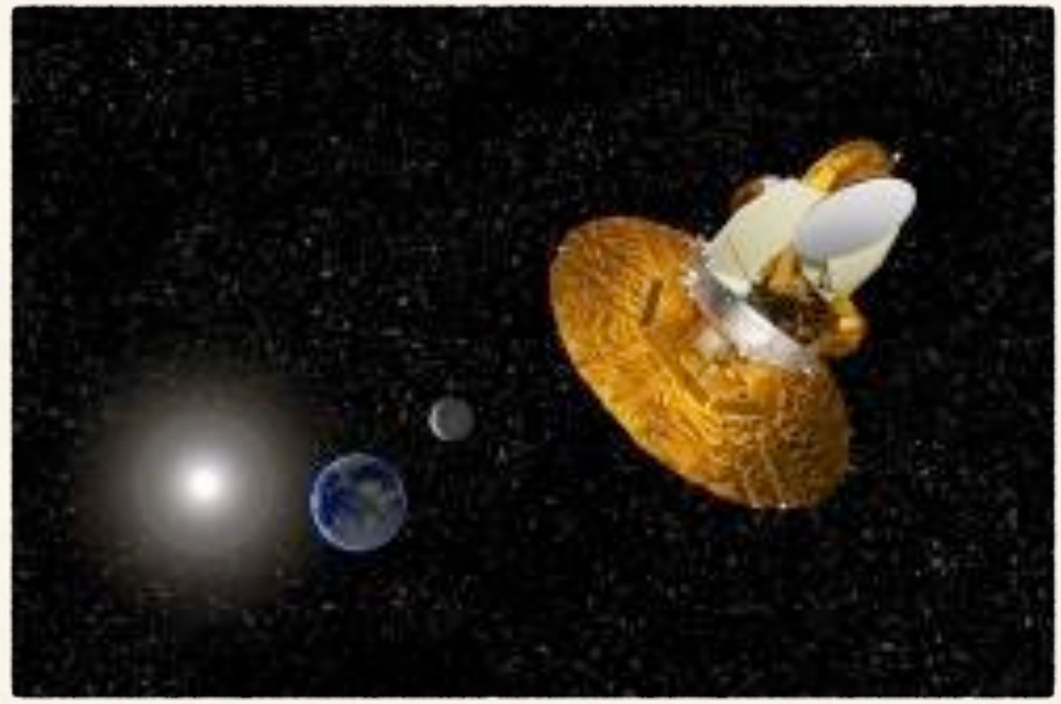


Time



* Recently refined from remnants of light as matter being formed.
* About **380,000** years after Big Bang, universe cooled enough for protons and electrons to combine into **hydrogen atoms**.
* This released a **burst of light**, which over the billions of years since has cooled to a bath of **microwaves** pervading cosmos.
* In space there is remnant glow from the infant universe

Time



* NASA satellite known as **Wilkinson Microwave Anisotropy Probe** (2001) measures cosmic microwave fluctuations over full sky using 5 yrs data.
* **Narrowed uncertainty** by tens of millions of years.

Time

* Cosmologists pretty certain Universe is ~**13.7 billion** years old.

* Why does this finding raise issues for some Christians?

    * Using complete genealogy in Scripture from Adam to Jesus. You can go through the genealogies and add up the years. You'll get a total that is just over 4,000 years.

Questions

* Is Bible complete history of generations of mankind.
  Is Genesis about age of universe?
  * No direct mention of age or ascertain of completeness of genealogy.
* Does the **age** of material universe (If we do know it) **change reality** of **Christ Event** (Incarnation) and its meaning?

Questions

* What is **purpose** of **Bible**?
  * Given by Church to guide us to unity with God.
    A **spiritual text** not a science book.
    Uses concepts (words) known at time was written.
* Who was **Moses**? Why did He compose Genesis?
  * Redirected us from the ancient myths ➛ **one God as Creator** of all things preparing for crafting & perfection of mankind.
  * Must dig out **spiritual meaning** given to us by God through Moses, the purpose of human life.
* Orthodox Theology is **apophatic** - Meaning?

Time

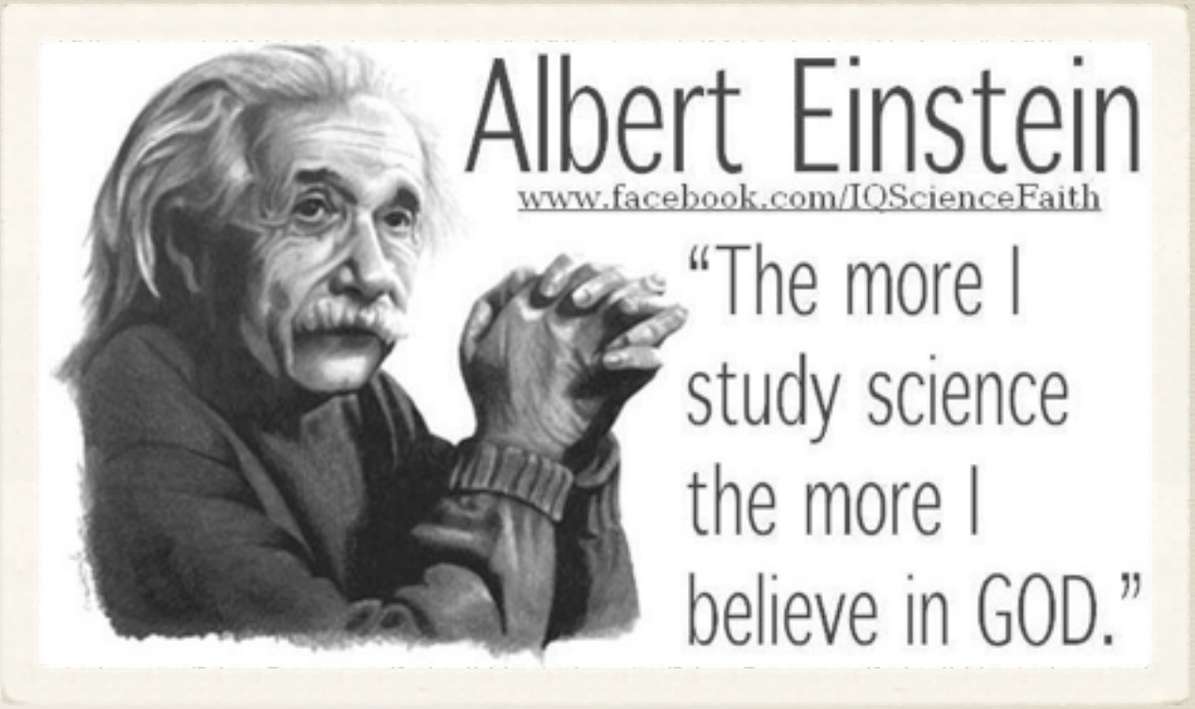
- Bible not necessarily inaccurate.
- **Since time of Adam** it seems to be pretty **accurate**.
  It's the 6 days prior that create an issue for some Christians.
  Gerald Schoeder, PhD - *Genesis and the Big Bang*
- Tuval-Cain was son of Lemach (Genesis 4:22)
  Lived about the time of Noah.
  What did he invent?

- Forged tools out of Bronze and Iron.
  This time linked with beginning of
  Bronze age (1350 years after Adam. 4400 from present.)
- Archeologists confirmed Early bronze age coincides with biblical inventor of iron tools.

Time

* Where did time come from?
* Newton said:
  "absolute, true and mathematical time, of itself, and from its own nature, flows equally ***without relation to anything external.***"
* Is this true?
  * No. Time, and space are related

Time



* **Einstein** changed everything with theories of **Special and General Relativity** (1916)
* How did Einstein change the idea of space and time?
  * Previously, time was assumed to be absolute. no connection between space and time. He showed they are related.
* Series of modern discoveries led to a dramatic change in physics.

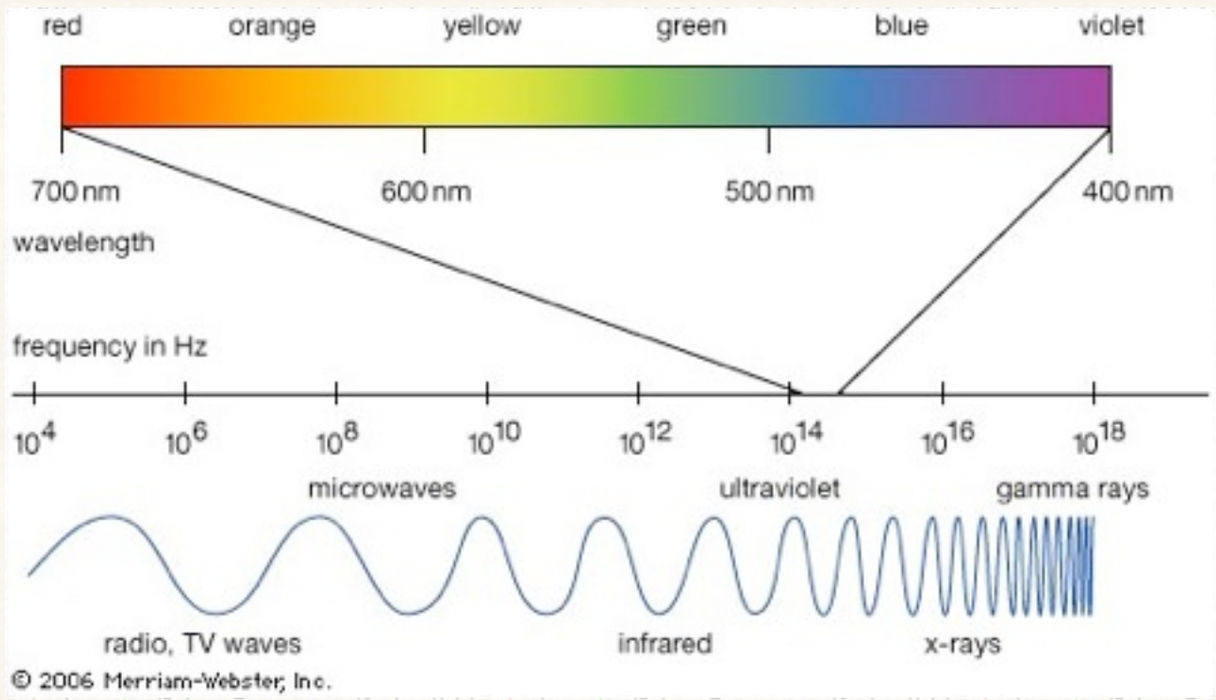
Time

* **1628** Johannes Kepler observed the **tails of comets** always **curved away** from sun.
  Coming towards the sun they have tail coming from behind but when passing the sun the tail precedes.
* Appeared that **sunshine applied a force** on comet.
* What would this imply?
  * Light had weight or **mass**.

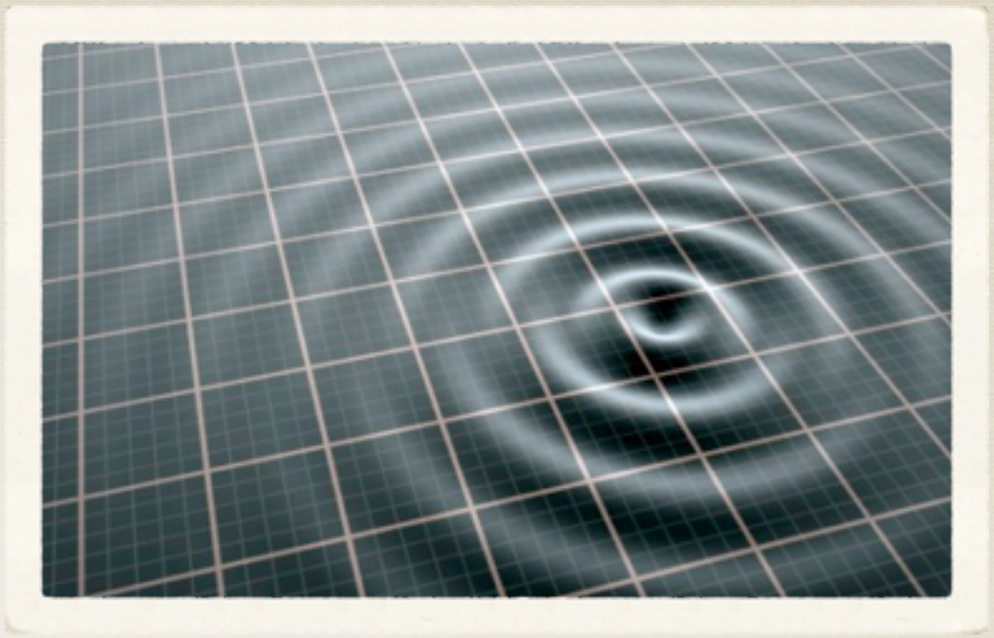
Time

- 273 years later, G. F. Hull and E. F. Nichols confirmed and **measured** this pressure in a laboratory experiment.

- **1864** James C Maxwell postulated that **light** and all other electromagnetic radiations moved as **waves** at a **fixed speed** through space.

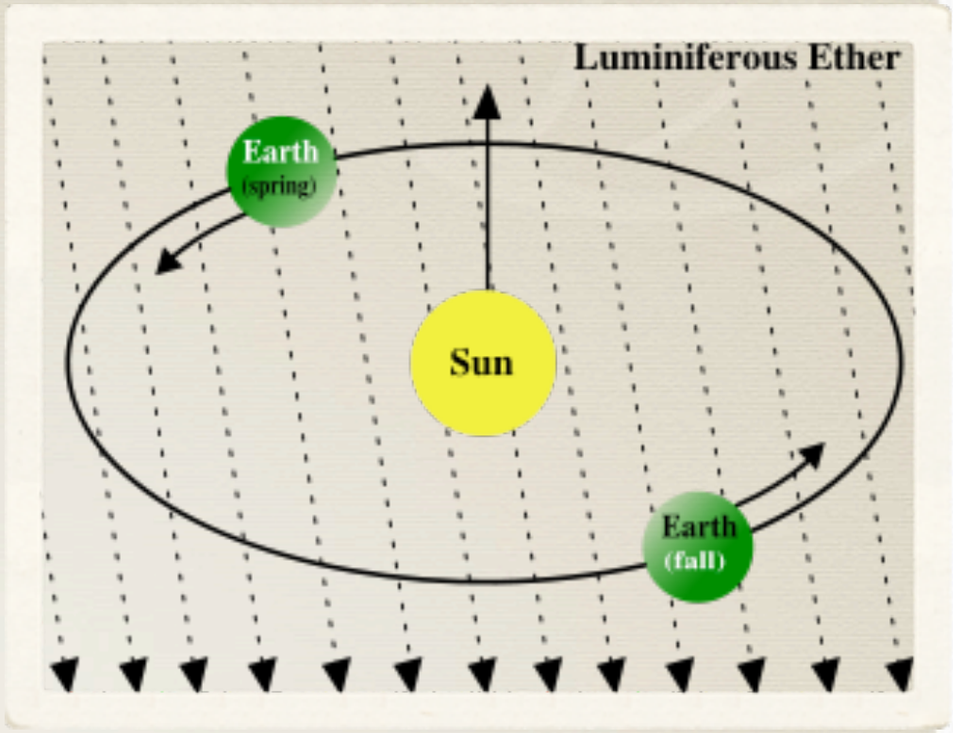


Time



* Thinking **light** was propagated by **waves**,
  ∴ must be **like sound** what then must be necessary?
  * Must be a medium for their wavelike transmission.
  * Postulated universe is permeated by **invisible**, insensible medium, called **ether**.
  * Light then would travel at a constant speed in relation to this ever present ether - independent of speed of emitter or observer.
* No one suspected this could be related to flow of **time**.

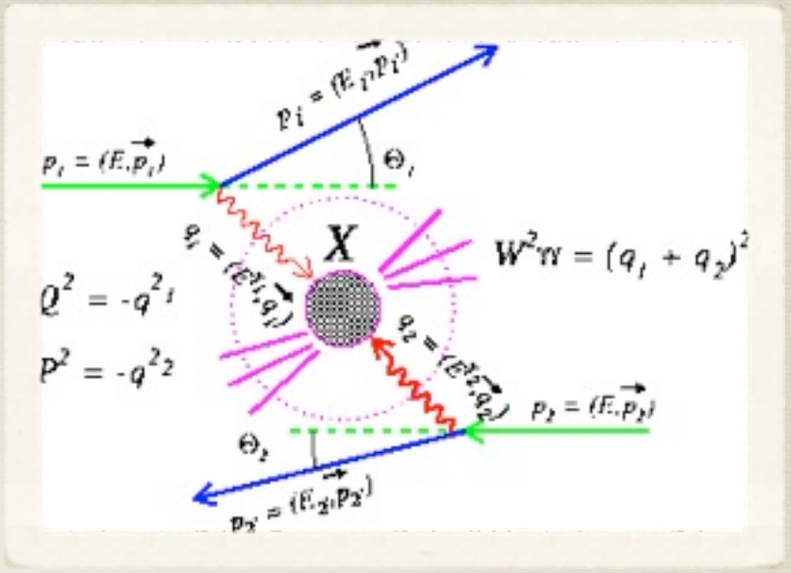
Time



* **1887** Albert Michelson and Edward Morely published results of measurement of effects of this theoretical ether.

* Used motion of earth to make measurements thinking that earth pushing through this ether would change speed of light - like sound in air. But, **found no effect** of Earth's motion on speed of light.

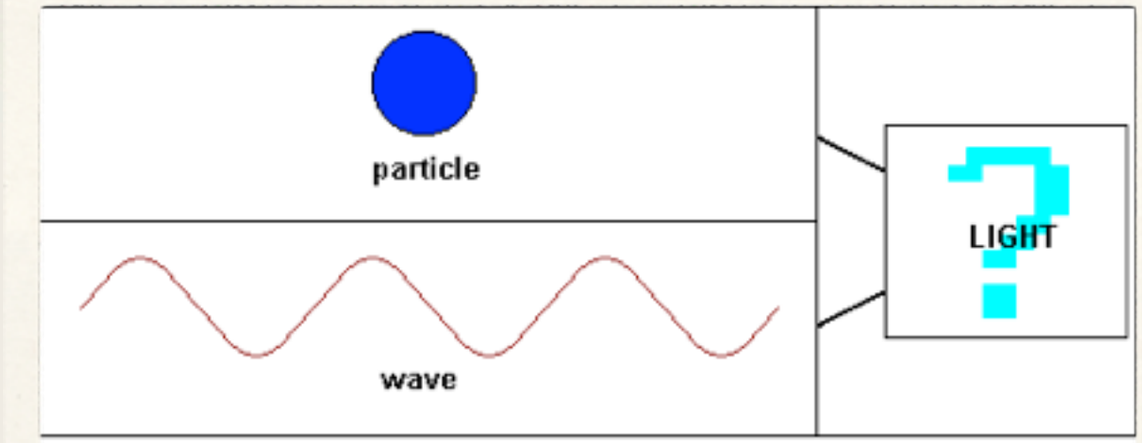
Time



- **1900 Max Plank** proposed a radical change that electromagnetic radiation was released in **discrete units**.
- Previously, warming glow of red-hot iron was assumed to be a smooth continuous process.
  Instead found really stream of hot **pellets**.
- He termed these as **quanta** giving birth to **quantum mechanics**.
- To add to confusion, found that **light beam** behaves like a **particle** when measured one way and like a **wave** when measured another.

Time

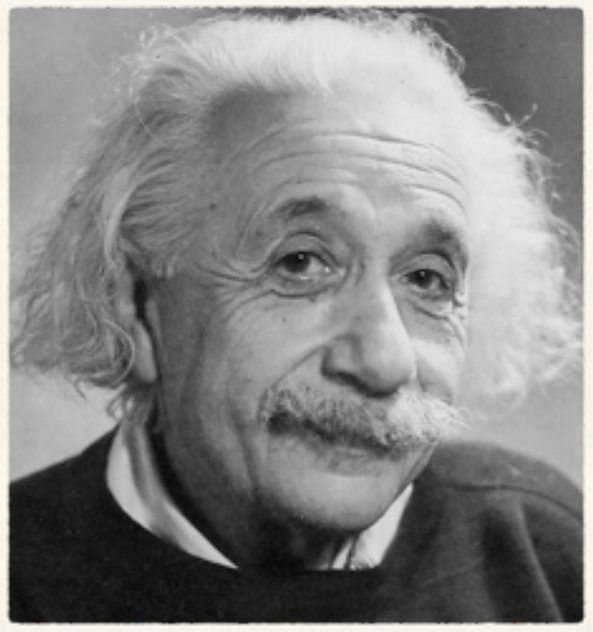
* Light was now seen as **both particles and waves** having a **constant speed** & having **mass**.



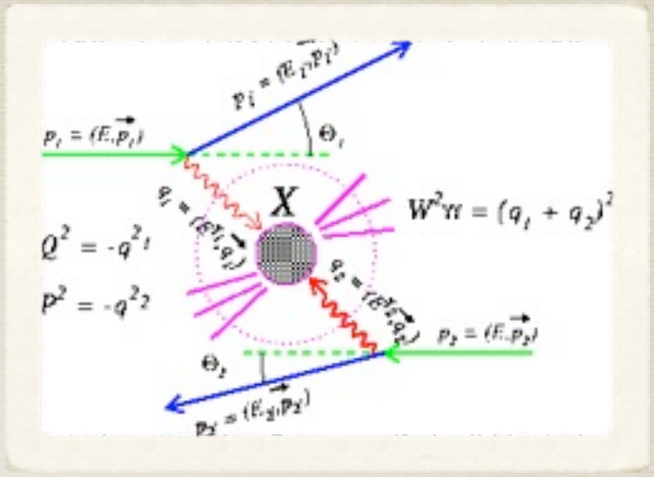
How to imagine the wave-particle duality.

* Light: Particle, Wave, Mass ?????

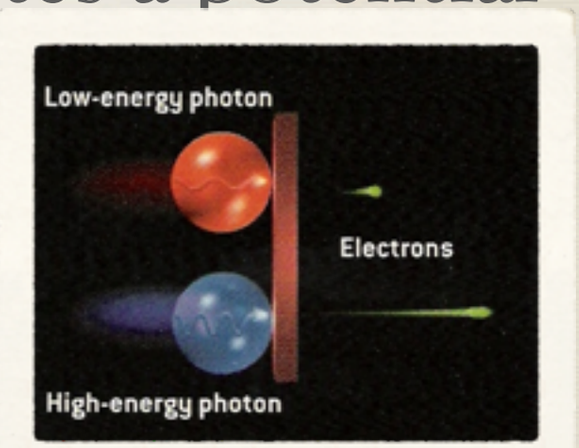
* Einstein thinks:
  What would happen if the object emitting the light were to start moving?
  Would the speed change?



Time

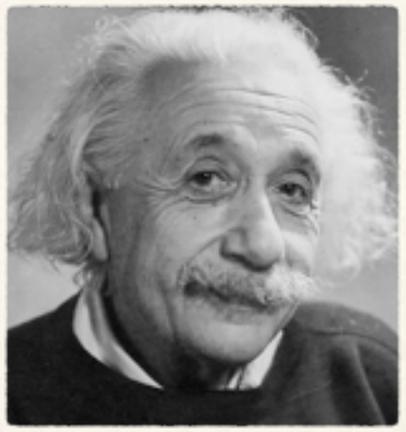


* Using Plank's theory he explained how light shining on certain metals releases electrons and creates a potential for flow of electric current.
* Proposed that photoelectric effect was result of quanta of light (**photons**) knocking electrons out of atomic orbits.



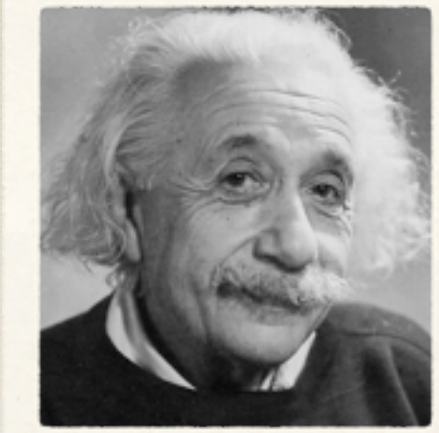
* Observed that photon has **mass while in motion** but **no mass when stopped**. Therefore properties of **both wave and particle**.
* When in motion occupied space and had mass, so as Kepler observed, it can push things around.

Time



- Concluded Matter and energy seem to be connected: E=mc2
- Mind bending idea that **when velocity of object changes**, **mass changes**.
- Implications?
  - At low speeds Newton's laws work but for galaxies its quite another story.
  - An observer moving with object cannot detect this change in mass.

Time



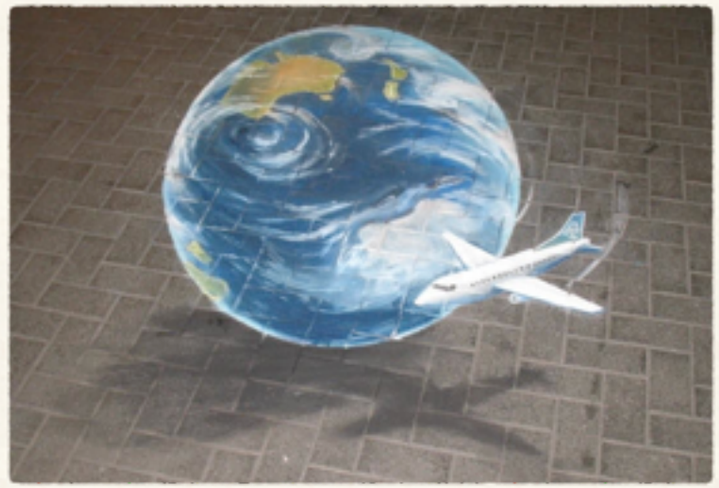
* Brings us to **theory of relativity**
* As long as we are **within** an inertial reference frame, like Earth, we can use the laws of physics to determine the frames motion,
  because that motion has **no effect** on any of the dimensions we measure **within** that **frame**.
  * Why we don't sense motion flying at high speeds in calm weather.
* But **outside** this common **frame** of reference this is **not true**.

Time

* If all parts of universe were equal and **in uniform motion**, relativity would have no implications.

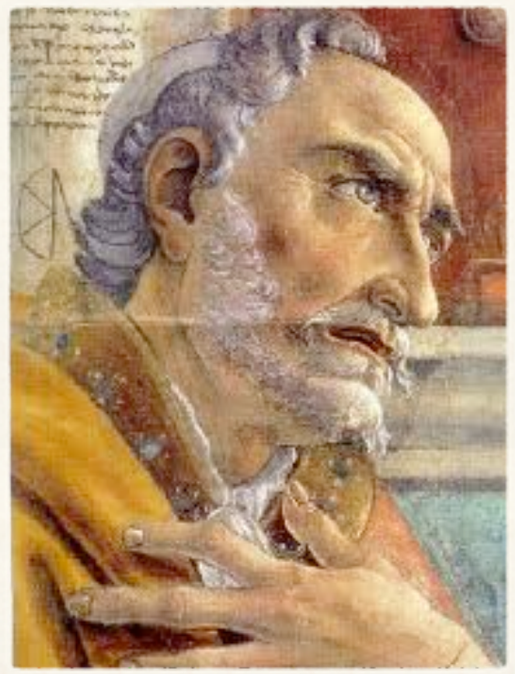
* Guess what?
  * Not the reality of the universe.
    Not equal or in uniform motion.
* Other aspect of relativity is **speed of light is constant** within all reference frames and across reference frames.
* Leads us to the fact of mass, space, and time variation. (video)

Time



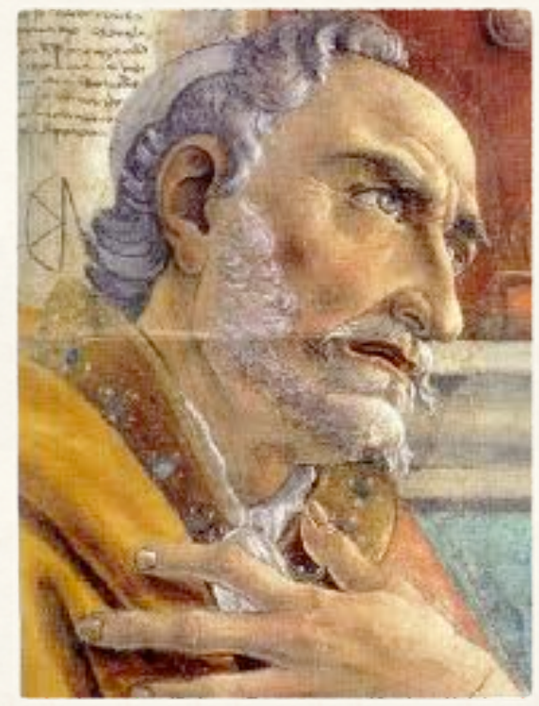
* Theory has been tested and proven.
* Hafele and Keating put cesium clocks on **two airplanes** flying in opposite directions - one going west, clocks **gained time**.
* Proved **time** depends on the **relative motion of the observers**.
* Time in one place in universe can be quite different than that in another.

St. Augustine



- Reflect on this statement from Saint Augustine:
- *For what is time? Who can easily and briefly explain it? Who even in thought can comprehend it, even to the pronouncing of a word concerning it?...* ***What, then, is time?***
- *If no one ask of me, I know; if I wish to explain to him who asks, I know not.*
- *Yet I say with confidence, that I know that if nothing passed away, there would not be past time;*
  and if nothing were coming, there would not be future time;
  and if nothing were, there would not be present time. (con)

St. Augustine



- *Those two times, therefore, past and future, how are they, when even **the past now is not**; and the **future is not as yet**?*
- *But should the present be always present, and should it not pass into time past, time truly it could not be, but eternity.*
- *If, then, **time present** — if it be time — only comes into existence because it **passes into time past**, how do we say that even this is, whose cause of being is that it shall not be — namely, so that **we cannot truly say that time is, unless because it tends not to be**?*

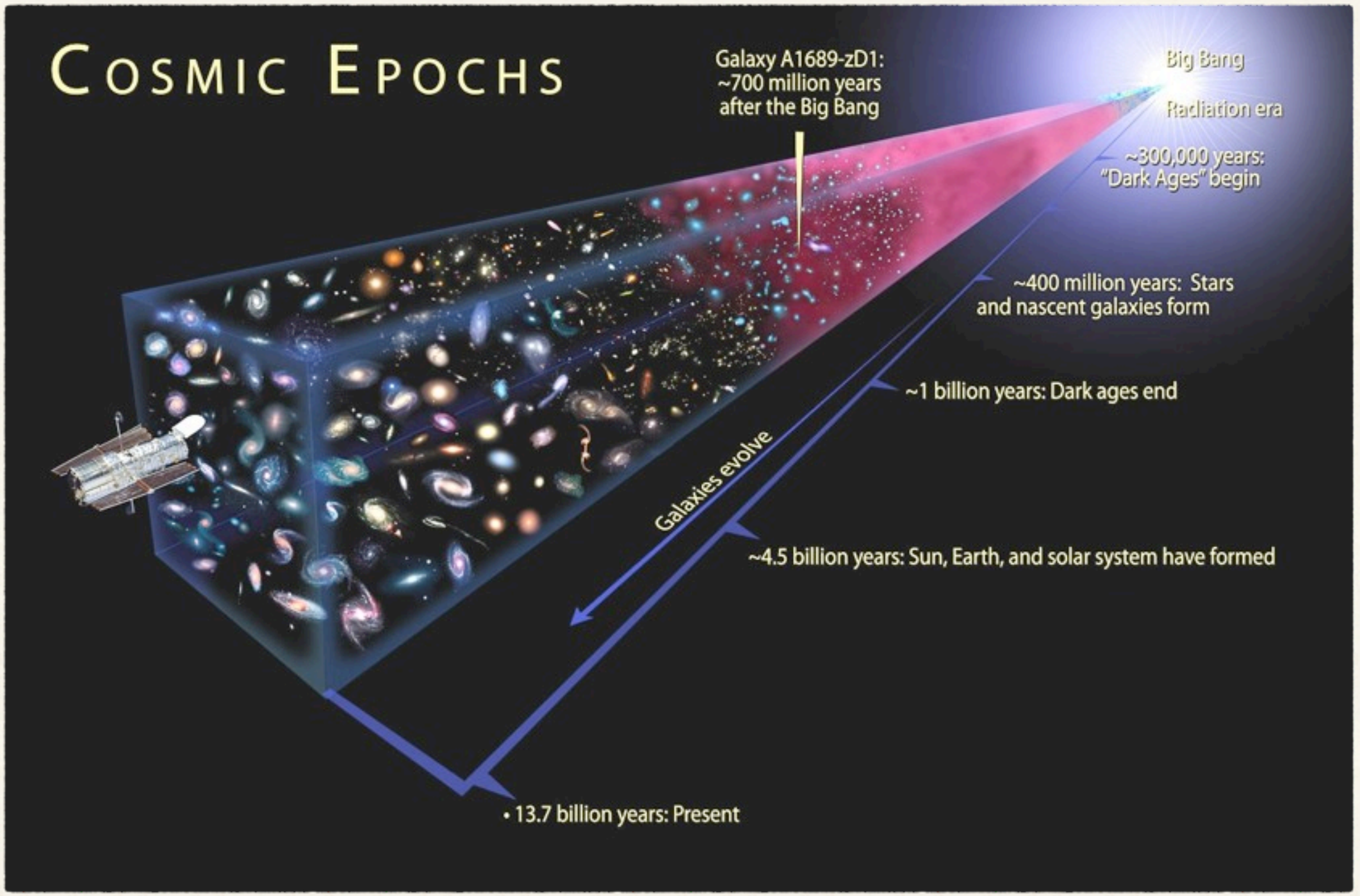
–Augustine of Hippo, Confessions lib xi, cap xiv, sec 17 (ca. 400 CE)

Time?

* Leaves question: **What is time?**
  How is it measured in the cosmos where everything is is motion?
  Implications for understanding Genesis?

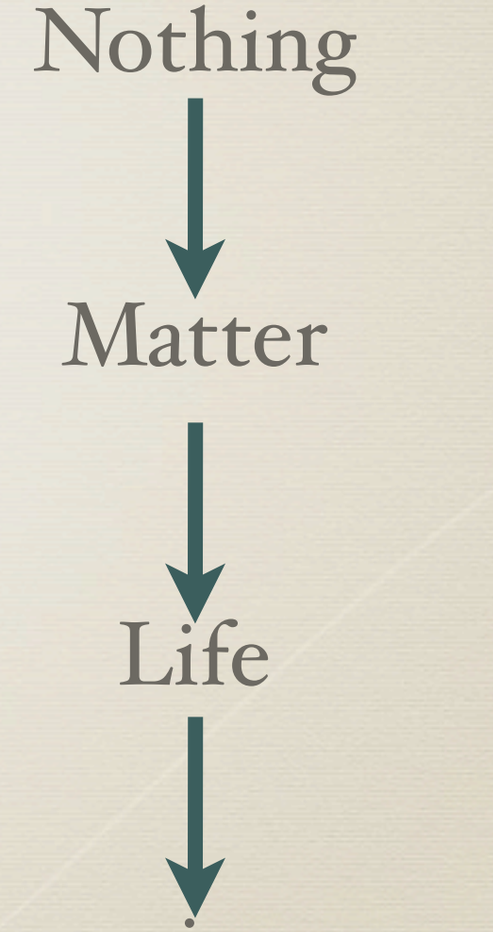
* Questions?

Big Bang Theory



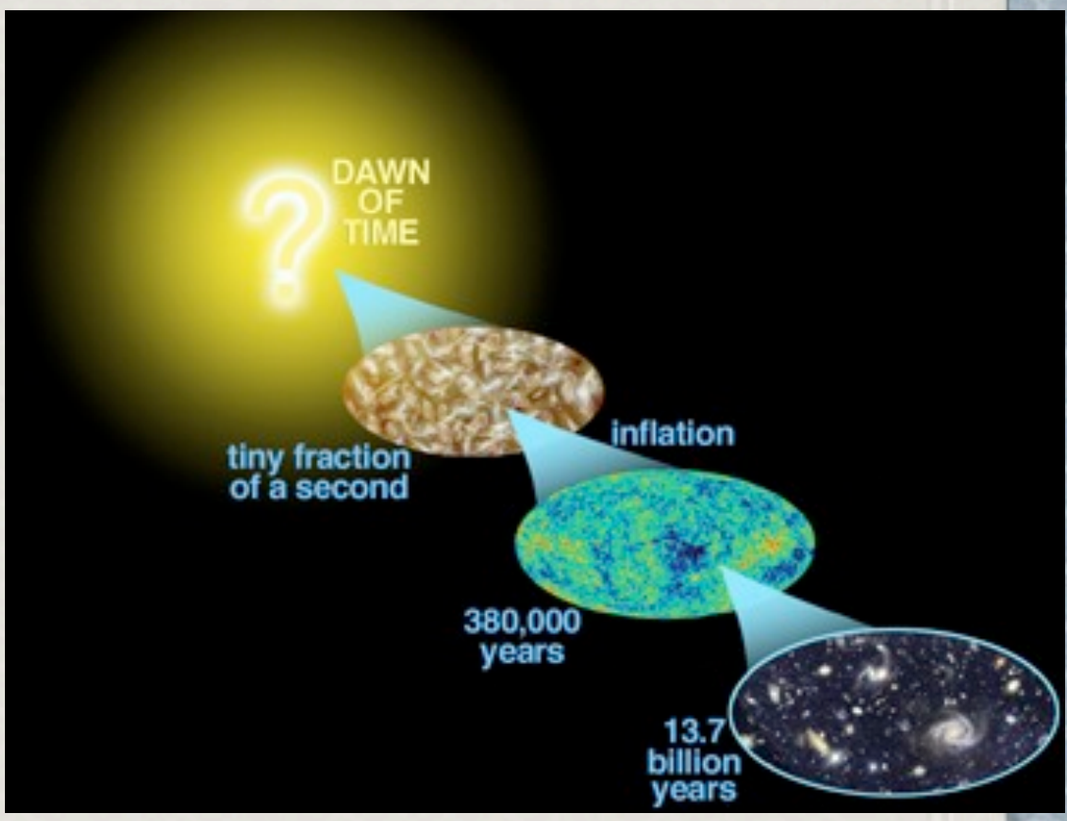
Big Bang

- **Genesis** shows: ***In the beginning God created the heavens and the earth.***
  - Shows God chose a **systematic unfolding**.
- **Physics** describes a beginning and systematic unfolding from stuff of Big Bang - **all that was necessary** to bring about **mankind** and conditions for **Christ Event**.
- Earth and all that dwell on it are **not direct products** of the Big Bang,
- but result of **many cycles** of formation of matter into materials, life, and consciousness.



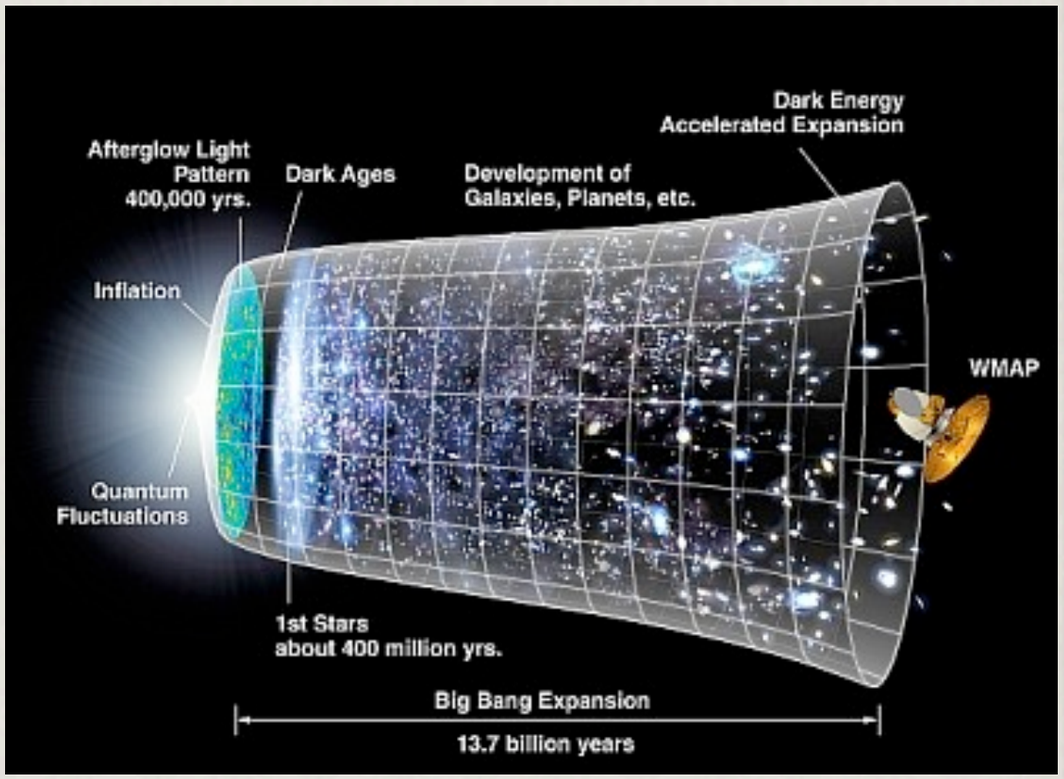
Basics of Big Bang Theory

- Beginning with an infinitely small **point** of infinite density, the universe of matter has been expanding.
- Big Bang was not an explosion **in** the universe, rather an **explosion of the universe from nothing**.



Big Bang Theory- First Light

- 13.7 billion years ago creation begins from a hot origin point.
- 300,000 years old, first atoms of hydrogen & helium form - electrons were now bound to a nucleus.
- Now photons could move about freely and there was light.
  Remnants from "first light" is strong indication that Big Bang occurred.



Big Bang

* Pressure caused fusion and nuclear furnaces ignited to create stars.
* Clouds of atoms collapse into primal galaxies due to forces of gravity.
* Stars collapse with an explosive burst of energy and spew these newly formed elements out of the hydrogen and helium such as carbon an other 89 elements - star dust.
* The universe continues to expand.
* 12 billion years ago some 100 billion galaxies are formed including our milky way.
* 4.5 billion years ago the sun is born. 4.45 the earth is formed.
* End of *"one day."*

Time

* We are literally made out of star dust.
  * This star dust occurred in a myriad of stars, concurrently and sequentially. Each with its own gravity, speed and therefore space time reference.
* It is too complex to say how many galaxies or which supernovas contributed the physical elements that make up our bodies.
  * Each may have originated in a separate stellar core with its own unique age.

Time

* There were and still are billions of cosmic clocks that all started with the Big Bang.

* From Einstein we know that each bit of matter has a different history.

* If a clock were hung in the part of the universe occupied by Earth at the time of the Big Bang, would it record 14 billion years or something else?

Time

- Time is **not absolute** in the cosmos and did not exist until after the creation.
- What can a day in Genesis refer to?
  - to units or **periods** in the creation.
- What is most significant in Genesis Ceation story?
  - **God is the Creator and Maker** of what we know today.
  - God is a **loving Craftsman**, carefully and systematically creating, providing for what is essential for our existence and our perfection.
- From science have learned we are crafted out of **star dust** that came from that very **beginning - out of nothing**.

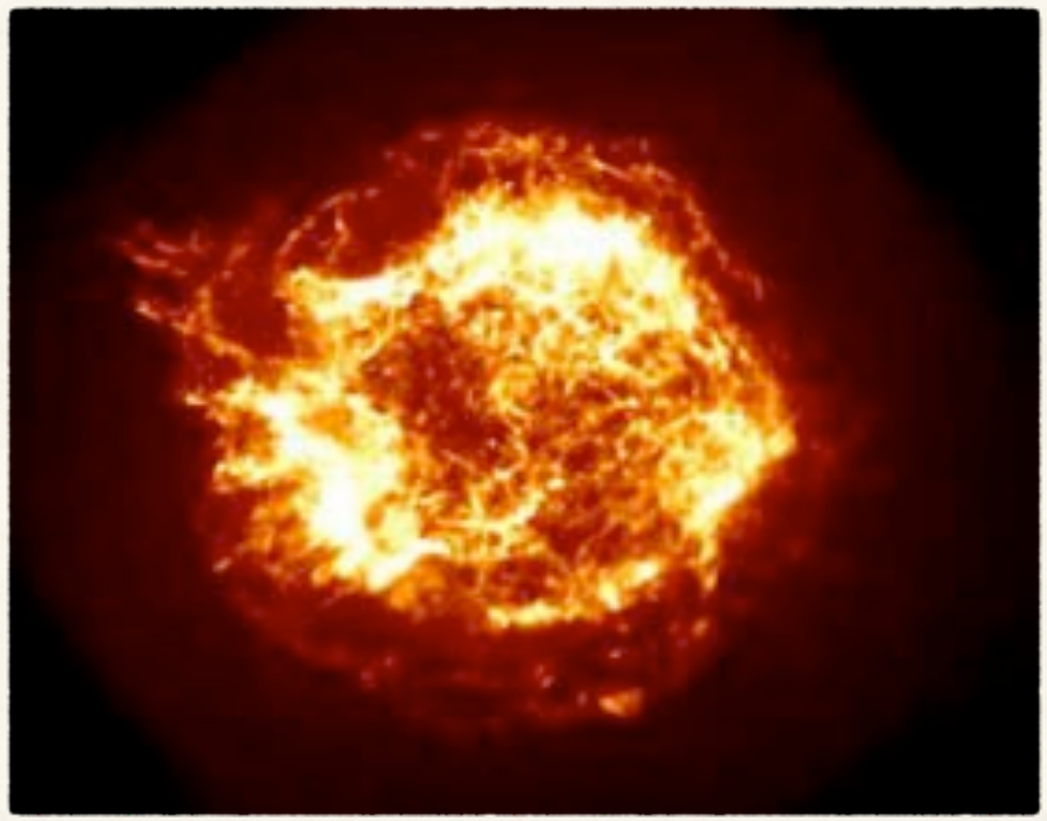
Time

- **Saint Gregory the Theologian** writes, *"To the days of creation is added a certain **firstness, secondness, and so on**...*
- *being brought into order by **unutterable laws**, but not produced in an instant...*
- *If **man** appeared in the world last, honored by the **handiwork and image of God**, this is not in the least surprising;*
- *since for him, as for a king, the royal **dwelling** had to be **prepared** and only then was the king to be led in, accompanied by all creatures.* (Oration 44)

Time

- **St Gregory of Nyssa** writes, *"Scripture informs that the Deity proceeded by a sort of* ***gradual and ordered advance*** *to the creation of man.*
- *After the foundation of the universe were laid, as the history records,* ***man did not appear on earth at once****; but the creation of the brutes preceded him, and the plants preceded them.*
- *Thereby Scripture shows that the* ***vital forces*** *[of life] blended with the world of matter according to a gradation; first, it* ***infused itself*** *into* ***insensate nature****; and then* ***ascended*** *to* ***intelligent*** *and* ***rational*** *beings....* (On the soul and resurrection, NPNF 2 5, pp 441-42)

Time



- What happened **before** the beginning?
  - **unknowable**.
    - Earliest instant we can even theorize about is when the temperatures exceeded 10 million billion billion times hotter than the center of the Sun.
- Was exotic sate of madly rapid motion. Matter was so dense collision of photons were shattering each other.
- Was a period nothing can relate to, before or after.

Creation

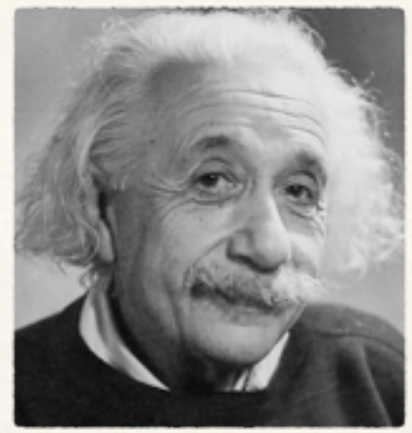
- Science and the Bible agree that earth had a beginning.
  Science says elements of earth began with a small speck of matter, like a mustard seed.
- Science says nothing about heaven.
  Does that mean it does not exist?
- Theoretical cosmologists Sean Carroll says, "*t* *to* *think science will ultimately arrive at a complete u* *e* *universe that leaves no grounds for God whatsoeve* sphere of supernatural influence will eventua
  Can science eventually explain everything?
  - Still cannot explain the Christ Event and spiritual reality of mankind.

Creation

- **Physics** as is known today **Cannot handle** the time **zero condition** of the universe. Natural Laws fall apart with time earlier that 10x-43 seconds.
- Even in Science there are many mysteries.

What are Assumptions in Science?

- Natural laws are same billions of years ago as observed now
- All of reality is reducible to a mathematical formula.
- All universe is completely knowable by scientific method.
- That simple (lab testable) subsets of phenomenon are representative of more complex systems.
- Science models are not absolute and will be replaced or amended when found invalid by some future finding.
- *"Concepts which have been proved to be useful in ordering things easily acquire such an authority over us that we forget their human origin and accept them as invariable."* Albert Einstein



Wonder - Spirit

- Science can only enhance our wonder and awe about our Creator and the nature & process of His creation. Just like we are in awe of the Miracles, the Resurrection, and all the mysteries of the Church.
- As we **explore space,** new discoveries will be made and **new theories** will emerge.
- As we explore the **inner realm of spirit**, we will rediscover old timeless truths about all created things.

"The most incomprehensible
thing about the universe
is that it is comprehensible"

ALBERT EINSTEIN

Knowing Truth

- How? What caused it all? Why did our universe begin? Why the laws of physics? Why man with capability to explore this topic? Why the Christ-event?
- Only silence and a pure heart gets us closer to truth.
- Path is to follow Christ and gain pure heart:
  The pure of heart shall see God
  - Faith
    Control of passions
    Detachment
    Surrender

- Like our Church Fathers, the Orthodox Scientists, we can know the truth of all things

Final Questions and Thoughts

Final Questions

* Is there any discovery that would change Christ event?
* Is there any reason to object to scientific exploration?
* Why do we fear a weakening of faith through science?
* Related only to our lack of spiritual growth and a sense that we have lost a relationship with God that is given to us through the revelations of God.
* Faith begins with truth of Genesis, *In the beginning God created heaven and earth*. God is creator of all.

- All was **prepared for mankind** and his perfection by our loving God.
- This is what the **Church is all about**, to help us restore this intimate relationship with our Creator. To know God through **personal encounter. Theosis**.
- The **Orthodox way of life** leads us towards, **purification, illumination and glorification** if we choose to follow it. Its the science of spirituality.

* *Modern **science**, based as it is on a rationality subordinated to non-spiritual categories, likewise can **never attain a full knowledge** of anything itself, no matter how much it concerns itself with experiment and observation or how far it carries it's function of dissection and analysis.*
* *...[Modern science] is compelled by its very premises to ignore in things those **qualities that transcend** their finite appearance and the reason's capacity for logical analysis and deduction.* (Sherrard, the Rape of Man and Nature, 84)

Phillip Sherrard


Karl Giberson,

*Just remember first of all that s**cience has changed** and has gone through many transformations. The assured results of modern science today **may** very well **not be** the assured **results** of modern science **tomorrow**. And, I can promise you, are not the assured results of science yesterday.* Karl Giberson,
The Wonder of the Universe: Hints of God in Our Fine-Tuned World

✳ *Science **cannot** solve the ultimate mystery of nature. And that is because, in the last analysis, **we** ourselves **are part of nature** and therefore part of the mystery that we are trying to solve.*

Max Plank

(originator of quantum theory and recipient of the Nobel Prize in Physics)

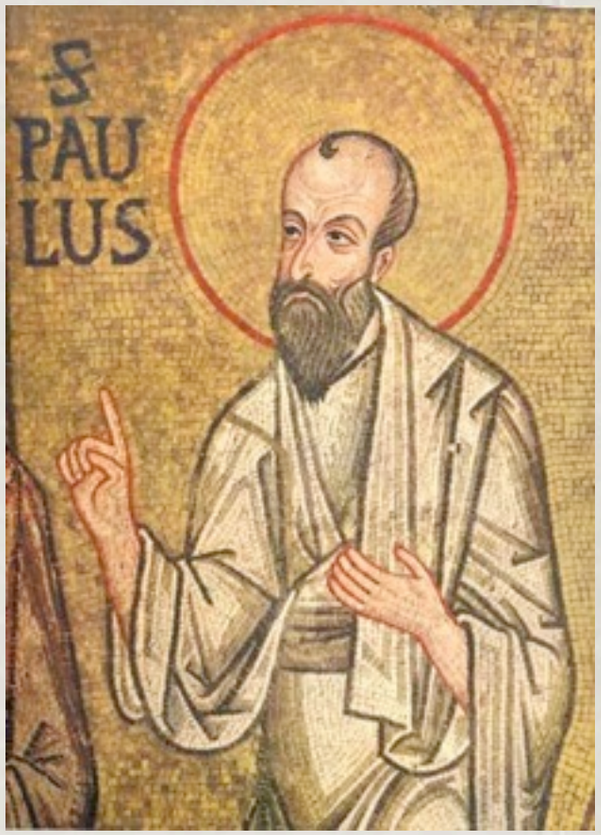
* Remember: God is always at the heart of each thing.
"while present everywhere in the world, God is not to be identified with the world." Metropolitan Kalistos Ware, Orthodox Way, 46

"There can be no greater disservice done to the Christian religion than to tie it up with scientific views which in their very nature are merely temporary...
The more one is involved with science and it's methods the more likely is one to become impervious to the experience of those realities which give religion it's meaning." (P. Sherrard, Rape of Man, 101-102)

* Science **cannot ignore** an encounter with **Christ**, the incarnation of the Logos, the basis for meaning in the world.

Science & Religion

- *"**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*



Next Week: Creation of Mankind

Evolution?