

SCIE1121 Our Universe Notes

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Definitions and concepts:

A

Appending/Append: Putting 7 zeros to the right of a number, multiplying the number by a factor of 10.

Ancient Astronomy: Astrolabe (Measures assention) mostly to tell time and navigation. Quadrant. Wait for planet to move over head then find it. Assention.

Asteroids: Rocky, icy bodies that orbit the Sun. Most part of the asteroid belt between Mars and Jupiter.

Australian History: Sun female, Moon male. Warkal: Water snake. Left a track as he went up the hill.

Azimuth: Angle between north, and the point where the line from the zenith to the horizon passes through the star.

B

Big Bang Theory: Start of the universe in an extremely, dense, hot, rapidly expanding state. Theory supported by the cosmic microwave background. Gravity formed clumped which formed stars. Fusion, elements to Iron. Supernovae, form all other elements and eject into space. Form clouds of hydrogen and helium gas, enriched by more massive elements, more stars form. Disks of dust and gas surround these new stars. Disks clump into planets orbiting stars on a plane.

Biochemical Evolution: Conditions (composition, temp, pressure) good for complex molecules to form. Most stable molecules last the longest. On Earth molecules were able to replicate itself (split into several smaller parts, complementing the original molecule. Origin of all life. Original from subject to biological evolution (random mutations, natural selection).

C

Closed universe: ours. Theory of inflation. Spherical. Universe looks flat in all our calculations but likely spherical due to the rapid expansion of universe.

Computer Based Methods: of calculating pi. Over 1 billion digits in 1989. 1 trillion in 2002, 10 trillion in 2011. 39 digits of pi are sufficient to calculate the volume of the observable universe to the precision of 1 atom.

Coplaner: All planets lie nearly in the Earths orbital plane (the ecliptic)

Cosmic Web: Galaxy clusters joined by thin filaments of galaxies. Structure of cosmic web naturally results from the structured gas present only 400,000 years after the Big Bang.

Cosmological Principle: The universe is homogeneous. This means there is no preferred observing position in the universe. The universe is also isotropic. (having a physical property which has the same value when measured in different directions)

Cultural Evolution: (evolution of memes) Humans appeared 100,000 years ago. Sophisticated language, replication of ideas analogous to replication of genes. Ideas mutate and only some survive. New words can appear and old can change meaning, some are lost, also same for behaviours, methods, tools, reason for evolution of humans without significant genetic change.

E

Ecliptic: plane containing the apparent path of the sun.

Elevation: angle from horizon to star

F

Frame Dragging: Earth drags space time around with it. Sent satellite gravity probe B with telescope and gyroscope. Polar orbit. Will see dragged space-time then undragged space-time. Build over successive orbits. Gyroscope stays aligned with the space-time. Will start pointing off the direction of the star, trying to stay aligned with space-time.

Frequency locked/Tidal locked: Moon spins once around its own axis while orbiting once around the Earth. Consequence of the tidal forces experienced by the Moon. Earth is also tidal locked; it slows the Earth's rotation by 2×10^{-5} s per year (20s per million years). Distance between Earth and Moon increases.

G

Gravity: Main force in the physical evolution of the universe. Responsible for forming dense clumps in early universe that turned into stars and star clusters.

Gravity waves: Gravitational waves are ripples in the curvature of space-time that propagate as waves, generated in certain gravitational interactions and travelling outward from their source. Space-time can be deformed and can therefore carry gravity waves. Hard to spot because tiny. 1 part in 10^{24} . Gravity waves pass through galaxy, unlike light. Tell more about universe from them than light.

Gravitational Lensing: Light from blue galaxy behind larger yellow galaxy deflecting in an Einstein ring back towards Earth.