Introduction

Astronomical unit: distance btwn sun & earth 149,597,870.7km
Speed of light: 300,000km/s

Light year: $9,5x10^{12}$ km
megaparsec: 3.26 mil ly or $3x10^{19}$ km

Local galactic group: our galaxy if part of a small cosmic village - *local group* which is part of a larger super galaxy cluster called *Virgo Supercluster*

Each gal contains 100bil stars and there are about 100bil observable gals

Obserbable uni is a sphere centered on us (bc of how light reached us) with radius of 14bil years

Bigbang→birth of first stars and gals (400 mil yrs)→recycling of material through stars→formation of other stars&planets

Speed at equator: 1,670km/hr at lat30: 1,275km/hr at lat90: 0km/hr

Degree of ecliptic plane: 23 1/2 = reason for seasons

The sun is in motion, circling the center of milkyway tipped at angle of 60° about 2/3 from centre and wobbles up and down

Local galaxies move in random motion and can colllide due to gravitational pulls

Signature of expansion: the farther they are, the faster they are receding

Don't know if uni has edges or centres: raisin bread vs ballon model

Introduction (cont)

Earth rotates (~1000km/h)→-earth orbits sun (100,000km/h-r)→solar system moves relative to nearby stars (70,00-0km/hr)→milkyway rotates once every 230 mil yrs (800,000km/h-r)→galaxy moves relative to others in local group (300,000k-m/hr)→uni expands at speed of light

On small scale, gravity is stronger, on large scale dark energy is stronger = expansion

Astronomy as Science

Modern scientific method has its roots in Greece

Used shadows in Alexandria in 240bc to measure circum-ference of earth: knew distance between two cities and used angle of shadow - angle/360 = distance/circum. of earth

400 BC: geocentric model of uni-thought space must be mathem-atically perfect, sun&stars appeared to be moving around earth, no perceptible motion of earth

Ptolomy's model: planets don't follow same path as stars, can have retrograde motion, cant be explained by geocentric model

This lead to Hipparchus multiple levels of epicycles (no longer perfect) which lead to copernican rev.

Nicholas Copernicus: 1473-rein-troduced helocentricmodel, published book on his deathbed, his calculations were wrong but he was right, rock on dude

Astronomy as Science (cont)

Tycho Brahe: 1546- compiled 30 yrs of data improving astron-omical data, super accurate observational astronomer

Johannes Kepler (my boy): 1571- fit mathematical models to Tycho's data, reformation of ellipitcal orbits (imperfect)

3 Laws of planetary motion-1 planets orbit sun (in centre) in ellipitcal path 2- planet covers the same area of space in the same amount of time no matter where it is in its orbit-3 a planet's orbital period is propor-tional to the size of its orbit $P^2=a^3$ (p=time a=distance) (semi-major axis)

Planets move faster when closer to the sun, close in planets move faster

Galileo: 1564- first to experimen-tally show newton's first law of motion (things in motion stay in motion), made observations with telescope, showed milky was made of many stars and very far away (no parallax needed)

Stellar parallax: apparent shift of position (parallax) of any nearby star against the background of distant stars

Light

Info from uni comes from light through emission, scattering and absorption

Also receive info in form of grav waves (2015) and neutrinos (1960s)

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