Our Place in the Universe

History of Astronomy

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Session 1, 28 January, 2016
Schedule

Session 1, January 28: History of Astronomy--setting the stage, Mitzi Adams

Session 2, February 4: The Structure and Activity of Our Closest Star, Dr. Laurel Rachmeler

Session 3, February 11: From One End of the Solar System to the Other: Mercury and Saturn, Dr. Todd Bradley

Session 4, February 18: Toward Radiation-Smart Structures and Designs, Dr. Nasser Barghouty

Session 5, February 25: Great Science with the Chandra X-ray Observatory, Dr. Martin Weisskopf

Session 6, March 3: From Dust to Stars and Back Again: Stellar Evolution, Dr. Doug Swartz

Session 7, March 10: Gamma-Ray Bursts: Monsters in Our Back Yard, Dr. Rob Preece
Our Place in the Universe
Session 1: History of Astronomy

We often ask ourselves
Who am I?
Why am I here?
How did I get here?
Let's go back to the beginning of history.

This session includes a very broad overview of a couple of the major ideas of astronomy, along with demonstrations of Earth's motions that
-- give rise to the seasons,
-- show us the "faces" of Venus (and the Moon)
-- result in retrograde motion of the outer planets
Putting it into Context
Major Ideas

Claudius Ptolemy: Famous for geocentric view of the universe, author of the Almagest. c. 150 CE

Hypatia: “And in those days there appeared in Alexandria a female philosopher, a pagan named Hypatia, and she was devoted at all times to magic, astrolabes, and instruments of music…” (died: 415 CE)

John, Bishop of Nikiu, The Chronicle (LXXXIV.87-88, 100-103)
Copernicus (1543) -- Kepler & Brahe (c. 1615): Developed heliocentric view of the universe. What happened c. 1608?
Annie Cannon, Henrietta Leavitt, Georges Lemaître, Edwin Hubble: The Big Bang view of the universe that says, the universe (space and time) began from a “singularity”. Initially, the universe was extremely hot and dense, but it has gradually cooled as it has expanded over 13.8 billion years.  c. 1927 CE
Olber's Paradox -- Newton - The universe is static and infinite with a random scattering of stars.

**The paradox** - If the universe is infinite with a random scattering of stars, then everywhere we look we must see a star. The sky should be as bright as day!

Occam's Razor -- The most simple explanation is often the correct one.

Kepler's Laws --

Einstein

Cosmological Principle -- Universe is homogeneous - every region is the same as every other region, i.e. it doesn’t matter where we make measurements from.

Universe is isotropic - universe looks the same in every direction, i.e. no one region has significantly more matter than any other.
Terms

Opposition -- For Mars every 26 months (1 Martian year)

Retrograde Motion
Terms

Conjunction and Opposition

- Outer Planet
- Orbit of Earth
- Inner Planet
- Maximum Eastward Elongation
- Superior Conjunction
- Conjunction
- Opposition
- Maximum Westward Elongation
- Inferior Conjunction
Coordinate Systems -- The Geocentric Universe
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- North celestial pole
- Polaris
- Celestial sphere
- Apparent rotation of the celestial sphere
- Cassiopeia
- Dipper
- Gemini
- Lyra
- Virgo
- Sagittarius
- Orion
- Southern Cross
- Equator
- South Pole
- North Pole
- Celestial equator
- Right Ascension (RA = 0°) or prime meridian
- Declination
- Observer's ground plane
- Horizon
- Zenith
- Nadir
- Direction of rotation of the celestial vault
- To the Pole Star
Sun’s Apparent Path

As Earth moves around the Sun, the Sun appears “in front” of the constellations of the ecliptic (Zodiac)
Let's Demonstrate What We Mean
But Wait! The ecliptic passes through Ophiuchus!!
Your “Real” Sign

Capricorn - Jan 20 to Feb 16
Aquarius - Feb 16 to Mar 11
Pisces - Mar 11 to Apr 18
Aries - Apr 18 to May 13
Taurus - May 13 to Jun 21
Gemini - Jun 21 to Jul 20
Cancer - Jul 20 to Aug 10
Leo - Aug 10 to Sep 16
Virgo - Sep 16 to Oct 30
Libra - Oct 30 to Nov 23
Scorpius - Nov 23 to Nov 29
Ophiuchus - Nov 29 to Dec 17
Sagittarius - Dec 17 to Jan 20
Phases of Venus

13/4/04  1/5/04  7/5/04  11/5/04  16/5/04
19/5/04  25/5/04  30/5/04  8/6/04

Statis Kalyvas - VT-2004 programme