

Century Timeline

Appendix A: Key Cosmic Times Events

(organized by Cosmic Times themes)

Expansion of the Universe/Nature of the Universe

- 1915 – General Relativity published
- 1926 – Albert Einstein predicts bending of light
- 1919 – Solar eclipse confirms Einstein’s Theory of Gravity
- 1917 – Einstein’s Cosmological Constant
- 1912 – Vesto Slipher measures spectral lines in spiral nebulae to be redshifted.
- Theories of expanding Universe based on Einstein’s General Relativity by
 - 1932– DeSitter
 - 1922–Friedman
 - 1927–Lamaitre
- 1929 – Edwin Hubble shows universe is expanding; Einstein’s Cosmological Constant thrown out.
- 1949 – Ralph Alpher and Robert Herman rework George Gamow’s ideas of early universe and predict relic a primordial radiation in microwave range (later known as the cosmic microwave background, CMB).
- 1950 – Fred Hoyle scoffs at evolutionary theory of universe and calls it a “Big Bang”
- 1961 – Edward Ohm finds microwave remnant, does not recognize it as important
- 1965 – Arno Penzias and Robert Wilson discover CMB
- 1967 – astrophysicists Martin Rees and Dennis Sciama predict deviations in CMB
- 1967 – Integrated Sachs-Wolfe effect described
- 1970 – Vera Rubin makes a case for dark matter
- 1981 – Alan Guth proposes cosmic inflation to solve isotropy/smoothness problem in Big Bang
- 1989 – Cosmic Background Explorer (COBE) launched
- 1990 – ROSAT launched
- 1990 – COBE measures CMB Spectrum as blackbody
- 1992 – COBE measures fluctuations and anisotropy in the CMB
- 1993 – ROSAT mission detects dark matter that is 30 times more prevalent than visible matter
- 1998 – detection of gravity-defying dark energy

Size of the Universe

- 1912 – Henrietta Leavitt describes the Cepheid variable period-luminosity relationship
- 1912 – Discovery of redshift of galaxies by Vesto Slipher
- 1918 and 1919 – Harlow Shapley estimates Milky Way at 300 000 light years, using Leavitt’s discoveries
- 1920 – Harlow Shapley and Heber Curtis debate the nature of the “spiral nebulae”
- 1929 – Furthest galaxy detected is 70 million light years away, making universe at least 140 million light years in size

- 1952 – Walter Baade discovers there are two populations of Cepheids so he recalculates distance to Andromeda and finds it is twice as far away as thought, or 1.8 billion l.y.
- 1955 – Furthest galaxies detected are 2-4 billion light years away, making universe 4-8 billion light years in size
- 1960's – Discovery of quasars doubles size of universe
 - 1960 – found 3C 48
 - 1963 – found 3C 273
- 1965 – Furthest quasars are about 13 billion light years away, making universe about 25 billion light years in size
- 1993 – Most distant radio galaxy is about 15 billion light years away, making the universe about 30 billion light years in size
- 2006 – Farthest galaxies now indicate the size of the universe at about 90 billion light years.

Nature of Supernova

- 1934 – Walter Baade and Fritz Zwicky coin the term “super-nova”
- 1941 – Rudolph Minkowski finds difference between Type I and Type II supernova
- 1993 – M. Phillips proposes Type Ia Supernovae as standard candles
- 1998 – Type Ia supernova measure acceleration of expansion of the universe and conclude a dark energy component to universe
- 2013 – prospective launch date for the Joint Dark Energy Mission

Miscellaneous

- 1908 – 60-inch Hale telescope at Mount Wilson.
- Early 1900's – “Pickering's Harem” of Women computers at Harvard College Observatory
- 1917 – 10- inch Hooker Reflector at Mount Wilson
- 1929 – Milton Humason teams with Edwin Hubble
- 1948 – 200-inch telescope at Mount Palomar
- 1952 – Radio source discovered in the constellation Cygnus
- 1955 – Einstein's death
- 1974 – Princeton University astronomers Russell A. Hulse and Joseph H. Taylor locate pulsar 1913 +16
- 1993 – Hulse and Taylor win Nobel Prize for binary pulsar
- 2003 – WMAP confirms dark matter and dark energy
- 2006 – Astrophysicists John Mather and George Smoot awarded the Nobel Prize in Physics