

Annotated Timeline

Dates extend to 2005; those marked "c." are approximate.

Dates in red are from the basic timeline of events related to "From Stargazers to Starships".

Dates in black are from the history of society and technology, and are meant to provide a broader context for the dates of the basic list.

For an extensive [list of links](#) on the history of physics and astronomy, see the [AIP Center for the History of Physics](#)

For a timeline of the exploration of the **magnetic environment** of the Earth, Sun and Planets, see [here](#).

To quickly navigate this timeline, click a date below (return using "back" button)

- 500	- 46	1054	1608	1704	1798	1820	1851	1864
1892	1905	1916	1939	1949	1957	1962	1969	1986

- 13000-11000 BC---Estimated arrival of humans in America (probably aided by clothing and fire, if they came via Alaska).
- 10000 BC---approximate end of last ice age.
- 3000 BC--beginning of the bronze age, named for the first useful metal alloy.
- 2700-2300 BC---Pyramids built in Egypt. First large states and cultures thrive in the river valleys of the Nile, Euphrates and Indus.
Egyptians invent hieroglyph writing, use papyrus (crude paper).
Euphrates cultures write on wet clay (afterwards dried), using marks from the end of a dowel.
- 1400 BC (approx)---Iron first produced by Hittites, in what is now Turkey.
- 1200 BC (approx)---Trojan war. "Iliad" and "Odyssey" probably written in the century that followed.
- 1000-586 BC---Biblical kingdom of Judah

- **c. 500 BC [Pythagoras](#) formulates his theorem**
- **432 BC---[Meton](#) introduces his calendar in Athens.**

- 431-404 BC---Peloponnesian war between the Greek city-states of Athens and Sparta, and their allies. Extensive battles involving long-range oar-driven warships.
- 333 BC---Alexander the Great, of northern Greece, defeats Persia's army at Issus, goes on to conquer the lands from Egypt to India. He founds numerous cities named Alexandria, including one in Egypt (still existing) which becomes a great center of learning and site of a large library.

- **c. 270 BC---[Aristarchus of Samos](#) estimates the distance and size of the Sun, proposes Earth goes around it.**
- **c. 250 BC---[Eratosthenes](#) (276-192 BC) estimates size of the Earth.**

- 200 BC (approx)---Parchment developed in the city of Pergamum (now in Turkey), a superior writing material made of animal skin. Pergamum's library rivals Alexandria's.
- 146 BC---Rome defeats and razes its main rival, Carthago (near today's Tunis). It then begins building an empire which ultimately covers much of Europe and North Africa. Roman culture spreads and extends Greek culture,

Romans (or rather, their slaves) build water conduits, bridges and thousands of miles of paved roads, causing cities to flourish.

- c. 135 BC---[Hipparchus](#) discovers precession of the equinoxes, estimates distance of the Moon.
 - 48 BC---Julius Caesar seizes control of Rome. After him Rome is ruled by a long line of emperors.
- 46 BC---[Julius Caesar](#) reforms the Roman Calendar
 - 30 to 36---estimated date of the crucifixion.
- c. 140 ---[Claudius Ptolmaeus \(Ptolemy\)](#) writes "He Mathematike Syntaxis" (known 1000 years later as "Almagest"), proposing his world system.
 - 313---The Roman Emperor Constantinus adops Christianity; in 330 he builds new capital and names it Constantinople (now Istanbul, Turkey). Roman empire gradually divides into western and eastern parts ("Byzantine Empire"), with capitals at Rome and Constantinople.
 - 410---Alaric, leader of the Visigoths, captures and sacks Rome. Decline of Rome: Attila king of the Huns devastates much of its empire, reaches the gates of Constantinople and later (452) of Rome. Beginning of Europe's "dark ages" which continue to the Renaissance (see below): cities decay, trade, shipping, literacy, scholarship and life expectancy all decline.
 - 622---Mohammed flees to the city of Medina, marking the beginning of Islam (and the starting date of the Moslem calendar). His followers conquer the Near East, North Africa and Spain.
- c. 820 ---[Caliph Al Ma'mun](#) establishes "House of Wisdom" in Baghdad (see link below).
- c. 780-850---[Al Khorezmi](#). (c. 780-850)
 - 1000-1400 Age of **feudal lords** in Europe: castles, knights, religious fervor, only very rudimentary science and technology. Also age of **Vikings**, some of whom sailed as far as Greenland and America. **Mongols** overrun and subjugate southern **Russia**.
- 1054--[A supernova](#) appears in the constellation of the Crab, and is observed by Chinese astronomers, who call it the "guest star."
 - 1095-1291 **Crusades**
 - 1460 Johann Gutenberg invents the **printing press** with movable type. Combined with **paper** (a Chinese invention which gradually reached Europe and displaced parchment), the printed book is the major force behind a cultural and technical growth spurt, the **Renaissance** (French for "rebirth").
- 1492 [Columbus](#) discovers **America**, followed by Spanish (and some Portugese) explorers. The main powers in Europe are **Spain, France, England, Turkey** and a confederation of **German** princes ("Holy Roman Empire.")
 - 1543---[Nicholaus Copernicus](#) (1473-1543) publishes his theory of the solar system.
- 1572---[Tycho Brahe](#) (1546-1601) observes a "new star." (See also [here](#).)
- 1582---[Pope Gregory the 13th](#) reforms the calendar.

1588 The "**Spanish Armada**," a fleet attacking Britain, is destroyed by the

British navy and by storms. For the first time Britain is able to claim part of the American continent.

- Europe and Asia are introduced to American crops--potatoes, tomatoes, corn. Europe's diet is also gradually enriched by sugar, oranges and pepper, originating in India.
- 1609---[Hans Lipperhey](#), a Dutch lens grinder, combines two lenses to create the first telescope.
- 1609---[Galileo Galilei](#) (1564-1642) builds the first astronomical telescope and observes for the first time craters on the Moon, satellites around Jupiter, and (in 1610) the way Venus goes through phases like the Moon (crescent, etc.) .
- 1610 (approx) [Sunspots](#) and their rotation with the Sun were discovered independently by Galileo Galilei, Johann Fabricius (Holland) and Christopher Scheiner. All used the recently-invented telescope, and Scheiner apparently introduced the safe method of projecting the Sun's image on a flat surface.
- ---[Johann Kepler](#) (1571-1630), using Tycho's observations, formulates his first two laws of planetary motion (3rd law in 1619).
 - After a failed attempt (1586) to establish a colony on Roanoke Island, Virginia (now part of N. Carolina), Jamestown is founded in Virginia in 1607, and the first English settlers land in Massachusetts Bay in 1620 (the "**Pilgrims**").
 - 1618-1648---The 30 years' war. A century after Martin Luther broke away from the Roman church, a great religious war sweeps Europe, devastates Germany and establishes Sweden as a major military power. In the civil war in England, parliament suspends monarchy 1645-1660, king beheaded 1649.
- ---1672 [Jean Richer](#), a French astronomer, derives the [parallax](#) of Mars, and uses Kepler's 3rd law to obtain the first modern estimate of the astronomical unit, within about 30%.
- ---1676 [Ole Roemer](#), a Danish astronomer working in Paris, a French astronomer, tabulates the eclipses of Jupiter's innermost moon Io. His observations suggest that [light has a great but finite velocity](#).
- 1683---The **Turkish** army reaches Vienna but is repelled; among the booty the victors discover **coffee**, develop a taste for it. Englishmen begin smoking tobacco, an American plant.
- 1668---[Isaac Newton](#) (1642-1727) builds the first successful reflecting telescope; two years later he presents an improved model to the Royal Society.
- 1686---[Isaac Newton](#) publishes "Philosophie Naturalis Principia Mathematica," outlining laws of mechanics and [law of gravity](#).
- 1704--Isaac Newton publishes his "Opticks" describing (among other things) his work with [prisms](#).
 - 1708---Abraham Darby begins extensive iron production in England, based on roasted coal (coke). As firewood gets scarce, **coal** becomes England's choice fuel and coke replaces charcoal in iron production. To run the pumps that keep coal mines dry, Newcomen in 1712 invents a crude steam engine.
 - 1712---Russia's king (czar) Peter the Great "opens a window to the West" by founding a new capital, which he names **St. Petersburg** and which becomes Russia's main port on the Baltic sea.

- 1769---[James Watt](#) (1736-1819) devises the modern steam engine.
- **1775-83---US War of Independence. Britain's colonies in America** achieve a growing degree of self-sufficiency. Benjamin Franklin prints books in Philadelphia, also demonstrates (1749) that lightning is an electrical phenomenon. Later (1775-1783) the colonies rebel against Britain, win their independence and form a confederation. In 1787 they write a constitution and form a federal republic.
- 1781---**William Herschel**, a German musician settled in Britain, discovers the [planet Uranus](#), using a mirror telescope he had constructed.
 - 1783---The Montgolfière brothers in France, owners of a paper factory, build the first **hot air balloons**; balloons lifted by hydrogen follow.
 - 1789---The **French Revolution**: France rebels against its king, who is later deposed and executed. The French follow the US example and set up a republic, but a military officer, Napoleon Bonaparte, gradually gains power. From 1798 to 1815 France under Napoleon fights a series of wars and for a while rules or controls most of the European continent.
 - 1793---Alexander Mackenzie **crosses Canada** from coast to coast.
 - 1796---Edward Jenner in Britain introduces **vaccination** against smallpox.
- 1798---[Henry Cavendish](#) (1731-1810) first measures the force of gravity between two objects in his laboratory.
- 1801, 1 January [Giuseppe Piazzi](#) discovers **Ceres**, the first known asteroid.
 - 1803---US purchases **Louisiana** from Napoleon. To explore the new lands and the mountains beyond, **Meriwether Lewis** and **William Clark** cross the continent from St. Louis to the mouth of the Columbia River.
- 1806---[William Congreve](#) devises military rockets; used 13 September 1814 in British attack on Baltimore.
 - 1803---John Dalton, a chemist, argues that observations in chemistry require matter to be composed of **atoms**.
 - 1807---Robert Fulton uses steam to run the first commercial paddlewheeler on the Hudson river;
- 1807--[Humphrey Davy](#) isolates a new metal, sodium, by the action of an electric current
- 1811--[Amadeo Avogadro](#) links the laws of gases and chemistry, providing a vital confirmation of the atomic nature of matter. His work was widely recognized only after 1860.
 - 1811---Simón Bolivar begins a series of wars to liberate Spain's colonies in South America, leading to the independence of Venezuela, Bolivia, Ecuador and Peru.
- 1820-- [Hans Christian Oersted](#) observes the magnetic effect of electric currents.
- 1820--[Andre-Marie Ampere](#) describes magnetism as the force between electric currents (see link above).
 - The Industrial revolution: George Stephenson in Britain (1825) and Peter Cooper in the US (1830) found successful railroads, run by steam. Mass

- production of fabric and paper. Henry Bessemer in 1856 finds a way to mass-produce steel.
- 1826---crude **photography** by L.J.M. Daguerre, greatly improved in the decades that follow.
 - 1829--Joseph Ressel (a Czech forester employed by the Austrian Navy in Trieste) builds and tries out a simple **ship's propeller**. Later in 1836 John Ericsson patents the propeller and develops it further.
- 1833--[Michael Faraday](#) derives the laws of electrical separation of compounds (as used by Davy in 1807), suggesting that atoms contain electrical charges.
 - 1835---[Gaspard Coriolis](#) (1792-1843) publishes the laws of mechanics in rotating frame, including an extra force on **moving** objects.
 - 1837--Samuel Morse invents his **telegraph**; in 1844 first commercial telegraph line opens, by 1866 undersea telegraph cables link Europe and America.
 - 1838---[Friedrich Bessel](#) and others first measure the distance to the star 61 Cygni, using the diameter of the Earth's orbit as baseline.
 - 1840--- [Louis Agassiz](#) (1807-1873) publishes "Etudes sur les glaciers", proposes that giant glaciers once covered central Europe.
 - 1842---[Christian Doppler](#) in Austria deduces the "Doppler effect," the change of observed wavelength when observer or source move.
 - 1843---[James Prescott Joule](#) (1818-89) measures the "exchange rate" between mechanical energy and heat.
 - 1846, 23 September--- **Galle** at the Berlin observatory discovers [Neptune](#) , near the position predicted by UrbainLe Verier; John Couch Adams also predicted approximate positions of the planet.
 - 1846---**Anesthesia** by ether is introduced by William T. Morton in Boston.
 - 1849---California **gold rush**.
 - 1851--The 11-year sunspot cycle (observed in 1843 by [Heinrich Schwabe](#)) is generally recognized.
 - 1852---[Radanath Sikhdar](#) (1813-70) identifies the highest peak on Earth, later named for Sir George Everest (1790-1866).
 - 1854--[Hermann von Helmholtz](#) proposes that the Sun derives its energy from gravitational shrinkage.
 - 1855--[James Clerk Maxwell](#) extends the 3-color theory of vision, following earlier work by Thomas Young.
 - 1856---Commodore Perry and a US fleet open up **Japan** to western culture and technology; rapid modernization follows, enabling Japan to defeat Russia in war less than 50 years later.
 - 1857--- [Christophorus Henricus Didericus Buys Ballot](#) (1817-90) proposes the rule for the swirl direction of large storms and hurricanes.
 - 1859---Charles **Darwin** publishes "Origin of the Species"

- 1859---Edwin Drake extracts **petroleum** from an oil well in Titusville, Pennsylvania. Beginning of a world-wide effort to find and extract oil, refine it and use its constituents for light, heat and later to run gasoline and diesel engines.
 - 1861---**Italy** unified under the king of Piedmont; 1850-70, **Germany** unified under Prussian leadership.
 - 1860-65---US Civil War
- 1864--[James Clerk Maxwell](#) proposes his equations of electromagnetism and suggests that light is an electromagnetic wave.
- 1865---Joseph Lister introduces antiseptics to surgery, cutting its risks.
- 1869--[Norman Lockyer](#) finds that a yellow spectral line observed in the Sun's spectrum during the 1868 eclipse must belong to a new element (later named helium)
- The **Industrial revolution** continues: bicycles are introduced (high-wheelers, then "safety models"), mass production of fabrics, also Brooklyn Bridge (1883), Statue of Liberty (1886), Eiffel Tower (1889).
 - 1870---**Suez Canal** opens, a shortcut between Europe and Asia. Age of exploration and colonization in Africa.
 - 1870---**Railroad across the US**. In 1891-1905, the trans-Siberian railroad is built.
 - 1876---**Telephone** invented
 - 1879---Edison invents the electric **lightbulb**, initially using a fragile carbon filament.
 - 1882---**Electric power stations** in London and New York. Large scale refrigeration.
 - 1885-1900---After the introduction of electric train engines, the construction of **subways** begins in the major cities of Europe (starting with London, then Budapest) and the US (starting with Boston, then New York).
- 1883---[Ernst Mach](#) (1838-1916) publishes a critical study of Newtonian mechanics.
- 1884---Charles Parsons invents his **steam turbine**, which ultimately becomes the preferred power plant of electric power stations and ships. Diesel engine introduced in 1897 by Rudolf Diesel.
- 1885--[Johann Balmer](#) discovers a simple formula which characterizes the atomic spectrum of hydrogen, an early clue to quantum physics.
- 1886--[Heinrich Hertz](#) produces and detects electromagnetic waves, of what is later called "radio."
- The beginning of **automobiles** (Marcus 1864 in Austria; Benz, 1887 in Germany; Duryea, 1893 in the US).
 - 1890---Nitrocellulose photographic **film** introduced (George Eastman of Kodak, Rochester NY), making possible the first "movies."
- 1892--[George Ellery Hale](#) devises the "spectroheliograph" taking pictures of the Sun in the light of a single spectral color.
- 1895--William Ramsay extracts helium from a terrestrial mineral.
 - 1895--Wilhelm Röntgen discovers X-rays.
 - 1895--Henri Becquerel discovers radioactivity.

- 1896--[Svante Arrhenius](#) credits carbon dioxide with the "greenhouse effect" warming the Earth.
- 1897--[J.J. Thompson](#) discovers the electron.
- 1899, 19 October---[Robert Goddard](#) (1882-1945) climbs cherry tree, resolves to pursue his dream of spaceflight.
- 1900--[Max Planck](#) explains the way hot objects radiate light by postulating that light energy can only be emitted in discrete packets, later called "photons"
- 1903, 17 December---First successful flight by the [Wright](#) brothers at Kitty Hawk, North Carolina.
- 1905--[Einstein](#) shows that the way light knocks electrons out of metals suggests it can only transmit energy in "photons" that depend on its wavelength.
 - 1906---Lee De Forest invents the **triode**--the vacuum-tube device (based on the Edison effect) by which weak electric signals can be greatly amplified. It makes possible radio, sound films, loudspeakers and later a whole generation of electronic devices.
- 1908--[George Ellery Hale](#) finds that sunspots must be intensely magnetic.
 - 1909---L.H.Baekeland introduces "bakelite", first mass-produced **plastic** material. It is widely used as electrical insulator.
 - 1904-1914---**Panama canal** is built.
- 1911---Andre Bing in Belgium patents multistage rocket.
- 1911--[Ernest Rutherford](#) conducts his experiments with the scattering of alpha particles off atoms, concludes that the atom's mass and positive charge are concentrated in a tiny nucleus.
 - 1911---Amundsen reaches **South Pole**.
 - 1912---Emperor overthrown in **China**, republic proclaimed.
- 1914 --[Niels Bohr](#) devises a model of the **hydrogen atom**, based on somewhat arbitrary quantum rules but giving correct values for emitted wavelengths.
 - 1914-1918---**World War I**. The main opponents are Germany, Austria and Turkey, lined up against Russia, France, Britain, Italy. In 1917 Russia withdrew, defeated, and the Czar was overthrown by Communist workers (Russian Revolution) but the US entered to help Britain, whose side prevailed. A very large, destructive war, the first in which technology played a major role, including airplanes, tanks, machine guns, submarines and poison gas.
- 1916---[Goddard](#) tests rockets with De-Laval nozzles.
- 1926, 16 March---[Goddard](#) launches his first liquid-fuel rocket.
- 1926 ---[Erwin Schrödinger](#) devises the "quantum wave theory" of the atom, with related efforts by Werner Heisenberg, Niels Bohr, Max Born and Paul Dirac.
 - 1922 to 1925---**Fascism**, the creed of a strong, all-controlling government, gains power in Italy under Benito Mussolini.
 - 1924---In Russia, Communist leader V.I. Lenin, dies; after that Joseph **Stalin** gradually gains power, kills or exiles all his rivals and institutes a reign of terror.

- 1927, 5 July---[German "Society for Space Travel"](#) founded.
 - 1927---**Charles Lindbergh** flies solo from the US to Paris.
 - 1929---The New York stock market crashes, beginning a long economic **depression**, in the US and across the world.
 - 1929---Edwin Hubble concludes from astronomical observations that distant galaxies recede from us in all directions, and that therefore the **universe is expanding**.
 - 1927-1930---**Talking films** (black and white). "The Wizard of Oz" (1939) pioneers color movies, but more than 10 years pass before color films become prevalent.
- 1930, 18 February---[Clyde Tombaugh](#) at the Lowell observatory discovers Pluto.
 - 1930---In Germany, hard-hit by the economic hardships following WW-I and by the world-wide depression, the Fascist **Nazi party** under Adolph Hitler comes 2nd in the polls in 1930, takes power 1933.
- 1932---1 November--[Wernher Von Braun](#) (1912-1977) starts conducting rocket research for the German army.
- 1932--[James Chadwick](#) discovers the neutron.
 - 1932---Sulfa drugs, first new anti-bacterial weapon. Penicillin follows during World War II, and other **antibiotics** are developed after the war.
 - 1933---While scanning tracks of fragments from cosmic ray collision with matter in the laboratory, **Carl Anderson** discovers the **positron**--a positive analog of the electron, earlier predicted by Dirac.
- 1936---[Theodore von Karman](#) starts the Guggenheim Aeronautical Lab at the California Institute of Technology, later leading to JPL.
 - 1936---The **DC-3**, the first modern airliner, can reach 210 mph with 21 passengers.
- 1938--[Hans Bethe](#) proposes a nuclear fusion reaction for releasing energy in stars
- 1939--[Nuclear fission](#) discovered by Hahn, Meitner and Strassmann: when a uranium nucleus absorbs a neutron, it can be shaken up to the point that it splits in two fragments of comparable size, releasing a great amount of energy.
 - 1939-1945 **World War II**. A world-wide conflict is started by Hitler's Germany, whose army annexed Austria and Czechoslovakia, then attacked Poland. Germany was allied with Italy and after December 1941 with Japan, which launched its own war of expansion (it had invaded China years before that). A war with unsurpassed destruction and cruelty, including Hitler's attempt to exterminate the Jewish people, of whom about 6 million were killed in a deliberate plan. Technology played an even greater role than in World War I, including long-range bombing raids, improved submarines, jet engines, radar and towards the end, large military rockets and nuclear bombs. Opposing Hitler were France (which fell to the Germans), Britain, Russia and after 1941, the United States: 1941-3 the Germans became bogged down in brutal winter fighting in Russia, in 1943 the US and its allies invaded Italy and forced its surrender, then in 1944 they invaded France and in 1945 first Germany and then Japan surrendered. In 1945 in San Francisco, the victors formed the "United Nations", an international union whose major role was to ensure peace and arbitrate conflicts.

- 1942, 2 December--The first nuclear reactor, designed by Enrico Fermi, is successfully operated in Chicago.
 - 1943---Oswald Avery at the Rockefeller Institute in New York proves that **DNA**, a hitherto unexplained substance in all nuclei of living cells, carries the genetic information.
- 1944, 8 September---[V2 rockets](#) begin falling on Britain
- 1945--The [nuclear \("atomic"\) bomb](#) is perfected in the US, tested in New Mexico, 16 July, dropped on the Japanese cities Hiroshima and Nagasaki (August 6 and 9), leading to Japan's surrender.
- 1947, 14 October---[X-1 rocket plane](#) piloted by Chuck Yeager breaks sound barrier.
 - 1947---**Transistor** invented, compact solid-state device that replaces the triode and is much more durable. In 1956 Bardeen, Brattain and Shockley are awarded the Nobel prize for this.
 - 1947---**India** becomes independent, along with a great number of colonies (especially in Africa), as Britain and France dismantle most of their empires. **Indonesia** is established in 1949.
 - 1948-1949---The start of the "**cold war**" between the western allies (Britain, France and the US) and the Soviet Union, with a blockade of Berlin by the Soviets, who try to force out the western allies. Contact is maintained by a massive airlift.
- 1949, 24 February---["Bumper"](#) 2-stage rocket reaches altitude of 393 km.
 - 1949---A million **TV** receivers (black-and-white) in the US; two years later the number reaches 10 million.
 - 1949--Britain puts the first **jet airliner** into service, the Comet. The original model was later withdrawn because of structural faults, but by 1958 the French Caravelle and the larger Boeing 707 jets enter service. Gradually jets begin dominating air transport, while travel by ocean liners declines sharply.
 - 1950---The "**Marshall Plan**" led by US general George C. Marshall revitalizes the European economy by providing extensive but judicious aid.
 - 1950---**North Korea** invades South Korea. The US army stops the invasion and after a while enters North Korea, but a major intervention by China's army forces a stalemate.
 - 1951--UNIVAC, first large electronic **computer**, built by Sperry-Rand.
 - 1952---United States explodes "Mike", the first **hydrogen** bomb, perhaps 500 times more powerful than the nuclear "atomic" bomb.
 - 1953---Edmund Hillary and Tenzing reach the top of **Mt. Everest**.
 - 1954---Following a supreme court ruling, the US government **outlaws Black/White segregation** in public schools.
- 1955--[Radio emissions from Jupiter](#) are detected, mystify observers. They later turn out to come from the planet's radiation belt.
- 1955---Jonas **Salk** develops vaccine against [polyomyelitis](#) followed (1960) by Albert Sabin's oral vaccine; the disease is effectively eradicated.
- 1953-1958---**Watson and Crick** show that DNA is a **double helix** and its mode of replication is established. Previously (1946) **Oswald Avery** identified that molecule as the carrier of genetic information. By 1966 the "genetic code" is revealed, directing the living cell to produce specific proteins. The beginning of modern molecular biology.

- 1956--Soviet army crushes attempt of **Hungary** to break away from Communist block.
- 1956, 27 August---First large commercial **nuclear power** station, at Calder Hall, opens in Britain. A year later the first US commercial reactor is built in Shippingport, Pennsylvania.
- 1957-8---The [International Geophysical Year](#) (extended to 18 months).
- 1957---4 October, Soviet Union launches [Sputnik 1](#).
 - ---3 November---Launch of Sputnik 2, carrying a dog named Laika.
 - ---5 December---Vanguard disaster.
- 1958---31 January--Launch of [Explorer 1](#).
 - ---26 March---Launch of Explorer 3.
 - ---1 May---US National Academy receives from James Van Allen a report on the discovery of the radiation belt.
- 1958--[Eugene Parker](#) proposes the existence of a "solar wind."
 - 1958---**Interstate highway** network in the US started.
 - 1958---**NASA** established by US President Eisenhower.
- 1958-9---"[Project Orion](#)" to design nuclear-powered spaceships.
- 1959, 2 January---Luna 1 launched by Soviet Union, comes within 6000 km of Moon;
- [Luna 3](#) (October) takes picture of Moon's far side.
- 1961, 12 April---Yuri Gagarin becomes first human to orbit Earth.
 - ---5 May---Allan Shepard becomes first American in space, completes 15-minute suborbital hop.
 - ---25 May---US president J.F. Kennedy announces project to land human on Moon within decade.
- 1962, 20 February---[John Glenn](#) becomes first American in orbit.
 - ---14 December--Mariner 2 (launched August 27) passes by planet Venus.
 - 1962---The placing of Soviet Missiles on **Cuba** produces international crisis, which ends when the missiles are withdrawn.
 - 1963---President J.F. **Kennedy** assassinated in Dallas, Texas.
 - 1963---Nuclear **test ban** treaty
- 1965---[HARP](#) cannon operated on Barbados.
 - ---23 March---first Gemini flight, carrying 2 US astronauts together.
 - ---14 July---Mariner 4 passes above Mars, returns first pictures.
- 1968--Pulsars discovered by Anthony Hewish and Jocelyn Bell, very regularly pulsating radio stars identified as neutron star remnants of supernovas.
 - 1968, 21-7 December---Apollo 8 with three astronauts loops around the Moon, returns to Earth.
- 1969, 20 July---[Apollo 11](#) astronauts land on the Moon.

- 1970, 11 February---First launch of a Japanese spacecraft, by Lambda 4S rocket.
 - ---11-17 April---Apollo 13 astronauts narrowly escape failed spacecraft.
 - ---24 April---First launch of a Chinese satellite, by the Long March 1 rocket.
 - ---17 November---Soviet Russia lands remotely controlled vehicle (Lunokhod) on the surface of the Moon.
 - Russia also lands Venera 7 on the surface of Venus, its first successful landing.
- **Vera Rubin** uses the Doppler effect to deduce the rotation speed distribution of the great M31 galaxy in Andromeda, an early suggestion of unaccounted **dark mass** in the universe.
- The **Arecibo radar** on Puerto Rico bounces signals off Venus, observing surface features
- 1971, 2 December---Soviet Mars 3 entered orbit around Mars, lands capsule which transmitted for 20 seconds.
- 1973, 2 March (5 April)--- Pioneer 10 (11) launched towards Jupiter, arrives 4 December 1973 (5 December 1974; Saturn, 1 September 1979)
 - ---1973, 14 May---**Skylab space station** launched. Astronauts follow later, observe "coronal holes."
- 1974, 29 March---Mariner 10 (launched 3 November 1973) flies past the planet Mercury.
- 1975, 8 June---Soviet Venera 9 lands on Venus, returns pictures
 - 11 June---Venera 11 also lands, takes pictures.
 - 1975---**Viet Nam** war ends.
 - 1975---Steve Jobs and Stephen Wozniak create the first **personal computer**, the "Apple"
- 1976, 20 July---NASA's **Viking 1** soft-lands on Mars, takes pictures, searches for life.
- 1977, 5 September (*August 20*) ---**Voyager 1 (2)** launched towards Jupiter. arriving 5 March (*9 July*) 1979, continuing to encounter Saturn 12 November 1980 (*26 August 1981*) . Voyager 2 continued to Uranus (*25 January 1985*) and Neptune (*25 August 1989*).
- 1977, August 23--- The "Gossamer Condor," a human-powered airplane designed by Paul MacCready, completes a prescribed circuit and wins a trophy.
- 1978, August 12--- ISEE 3 placed at the **L1 point**.
 - 1979-88---Soviet armed intervention in Afghanistan ends in withdrawal Govt. collapses in 1992, extremist Moslems ("Taliban") take over in 1996.
- 1979, 24 December---First flight of Europe's Ariane rocket.
- 1981, 12 April---First flight of the Space Shuttle.
 - 1981---**AIDS** begins spreading in the US.
- 1982, 5 March ---Russia's **Venera 14** returns pictures of Venus surface.

- 1986, January 28---Space shuttle **Challenger** lost with all its crew, exploding shortly after launch from Cape Canaveral
- 1986, February 20---Soviet space station "Mir" launched; reentered the atmosphere 23 March 2001.
- 1986, 6 March---Russia's [Vega 1](#) flies past Comet Halley, after dropping French balloon experiment on Venus.
- 1986, 14 March---Europe's Giotto flies past Comet Halley.
 - 1986, 14 December---"[Voyager](#)" airplane, designed by Burt Rutan and flown by his brother Dick and by Jeanna Yaeger, circles the Earth nonstop, without refueling.
- 1987, 24 February, supernova observed in the larger Magellanic Cloud. This was the most prominent supernova observed since the early 1600s and simultaneous observations deep underground of neutrinos produced there [confirmed](#) the accepted theory of such explosions.
- 1988, 15 November---Soviet space shuttle "Buran" conducts its first (unmanned) flight
- 1990, 2 April---"[Hubble](#)" telescope deployed in Earth orbit
- NASA's [Magellan](#) spacecraft enters orbit around Venus. For next 5 years, its radar altimeter maps most of the surface.
 - 1990, 2 August---First Gulf War, after Iraq's army overruns Kuwait. Cease fire, 3 March 1991.
 - 1991, June--Croatia declares independence, leading to the break-up of Yugoslavia and civil war between its provinces. Bosnia hit hard, its capital Sarajevo under siege from early 1994 to 15 Sept. 1995. With NATO and US pressure, Dayton agreement ends war, 21 Nov. 1995.
 - 7 Feb 1992, Treaty of European Union signed at Maastricht, sets initial timetable for the European Common Market...1 January 1999, a common currency, the "Euro," is introduced, replaces national currencies in 3 years.
- 1992, 30 August--David Jewitt and Janet Luu discover [1992 QB1](#), the first observed Kuiper belt object after Pluto.
- 1994 14-22 July--Fragments of Comet Shoemaker-Levy plunge into Jupiter's atmosphere.
 - 1995, 18-30 December---Long time exposure by the Hubble telescope ("[Deep Field](#)") reveals the most distant galaxies.
 - 1995, 7 December---"Galileo" spacecraft reaches Jupiter, helped by "[gravity assist](#)" maneuvers involving Venus and (twice) Earth.
- 1997, May 11---"Deep Blue", an IBM computer, narrowly beats world chess champion Gary Kasparov in a series of 6 games (2 wins, 1 loss, 3 draws).
- 1997, 4 July--"Mars Pathfinder" lands on Mars, releases rover "[Sojourner](#)".
- 1999, 23 July---"[Chandra](#)" X-ray telescope launched. Its first image (of Cassiopeia A) is shown on August 27. It later images the remnant in Cassiopeia of the [supernova observed by Tycho](#) in 1572.
- 12 October 1999--World population estimated to have reached 6 billion. By the same estimate, it reached 1 bil. in 1800. 2 bil. in 1927, 3 bil. in 1960, 4 bil. in 1974 and 5 bil. in 1987.

- 2001, 11 September---Arab extremists of "Al Qaeda" with bases in Afghanistan hijack four civilian airliners in a suicide plot. Two crash into the twin World Trade Center towers in New York, causing both to collapse, with thousands dead. One hits the Pentagon, one hits the ground in Pennsylvania after passengers (apparently) fight hijackers. Widespread anger leads to US invasion of Afghanistan, ousting of Taliban; Hamed Karzai new Afghan president, 22 December 2001.
- 2002, 17 October---Following strong early hints of a black hole at the center of our galaxy, [observations are reported](#) on a star's orbit around it, suggesting the black hole has the mass of 3.7 million suns.
- 2002, November--SARS (Severe Acute Respiratory Syndrome) emerges in southern China. Previously unreported, very infectious with high mortality, SARS apparently jumped to humans from civets kept for food. Hundreds die in China, Hong-Kong and also in Canada, to where SARS was carried by air travelers in May 2003. Strict quarantines contained SARS and ended the epidemic.
- 2003, 1 February--Space shuttle "Columbia" disintegrates above Texas, during re-entry.
- 2003, March 20--US troops invade Iraq, suspecting that country is developing weapons of mass destruction and supporting Al-Qaeda. Baghdad taken April 9, Iraq dictator Saddam Hussein hides, is later captured.
- 2003, 15 October---Yang Liwei, China's first astronaut, launched into 14 orbits, returns safely.
- 2003, November 24---Small icy planet (diameter ~1500 km) discovered beyond Pluto, on a long elliptical orbit near its closest approach to the Sun. Named [Sedna](#), after the Inuit sea goddess. See also [here](#).
- 2004, January---NASA successfully lands two remotely controlled rovers on the surface of Mars, more sophisticated than "Sojourner" landed in 1997. "Spirit" lands on the 4th (launch June 10, 2003) and "Opportunity" lands on the 24th (launch July 7, 2003).
- 2004--the [HESS telescope array](#) in Namibia maps a circular source of high-energy gamma rays, evidence for the origin of cosmic rays in supernovas.
- 16 December 2004--Voyager 1 apparently crosses the [termination shock](#) of the solar wind, at which it slows down below the Alfvén speed (magnetic equivalent to sound velocity). That was the first sign of resistance to the solar wind by the interstellar plasma.
Voyager 2 crosses the shock 30 August 2007, and its still operating plasma detector finds higher density than expected.
- 27 December 2004--a [powerful gamma ray burst](#) arrives, apparently from a "magnetar" in our own galaxy.
- January 2005--a [new planet](#) discovered in our solar system by Brown, Trujillo and Rabinowitz (from images taken in 2003), at a distance of 97 AU, apparently larger than Pluto. It is given the name **Eris**. See [here](#) and [here](#).
- 14 January 2008--The [Messenger](#) spacecraft, launched 2004, skims above the surface of the planet **Mercury**.

- 10 February 2009--800 km above Siberia, the [iridium 33](#) communication spacecraft (1200 lb, 1997) collides with Russia's **Cosmos 2251** (2000 lb, 1991), producing a cloud of thousands of dangerous fragments.
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