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THE HISTORY OF ASTRONOMY

by Ray Yeager

1947

The US sent up the first animals in space although not in orbit, through a V-2 rocket launched from White Sands Missile Range, New Mexico. The animals were fruit flies.

1944

A team of German scientists led by Wernher von Braun develops the V-2, the first rocket-powered ballistic missile. Scientists and engineers from Braun's team were captured at the end of World War II and drafted into the American and Soviet rocket programs.

1938

German physicist Hans Bethe explains how stars generate energy. He outlines a series of nuclear fusion reactions that turns hydrogen into helium and release enormous amounts of energy in a star's core. These reactions use the stars hydrogen very slowly, allowing it to burn for billions of years.

1932

Karl jansky detects the first radio waves coming from space. In 1942, radio waves from the sun are detected. Seven years later radio astronomers identify the first distant source, the Crab Nebula, and the galaxies Centaurus A and M87.

1930

By applying new ideas from subatomic physics, Subrahmanyam Chandrasekhar predicts that the atoms in a white dwarf star of more than 1.44 solar masses will disintegrate, causing the star to collapse violently. Walter Baade and Fritz Zwicky describe the neutron star that results from this collapse causing a super nova explosion.

1929

Edwin Hubble discovers that the universe is expanding and that the further away a galaxy is, the faster it is moving away from us. Two years later, Georges Lemaitre suggests that the expansion can be traced to an initial "Big Bang".

1926

Robert Goddard launches the first rocket powered by liquid fuel. He also demonstrates that a rocket can work in a vacuum. His later rockets break the sound barrier for the first time.

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1923

Edwin Hubble discovers a Cepheid variable star in the "Andromeda Nebula" and proves that Andromeda and other nebula are galaxies far beyond our own. By 1925, he produces a classification system for galaxies.

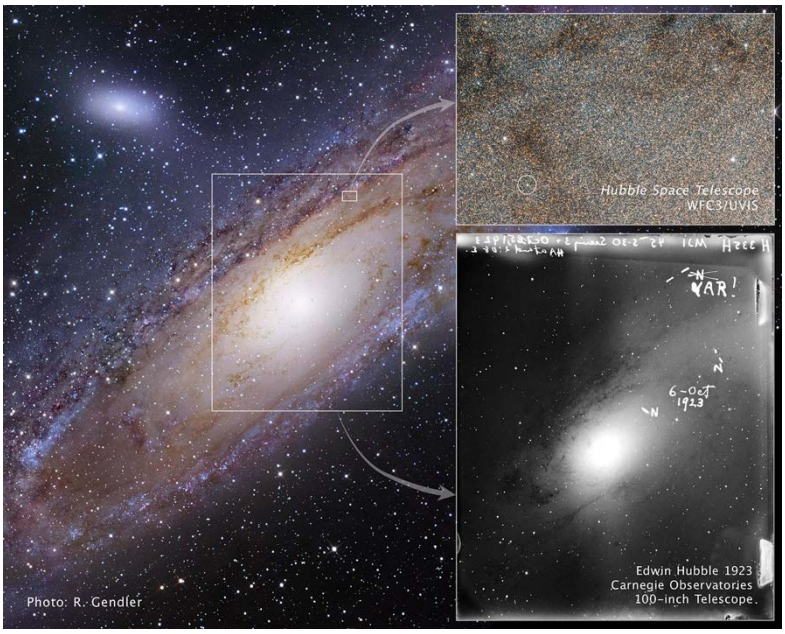

Photo: 1: Cepheid variable V1, the star that changed the Universe. NASA

1916

German physicist Karl Schwarzschild uses Albert Einstein's theory of general relativity to lay the groundwork for black hole theory. He suggests that if any star collapse to a certain size or smaller, its gravity will be so strong that no form of radiation will escape from it

1912

Henrietta Swan Leavitt discovers the period-luminosity relation for Cepheid variables, whereas the brightness of a star is proportional to its luminosity oscillation period. It opens a whole new branch of possibilities of measuring distances on the universe, and this discovery was the basis for the work done by Edwin Hubble on extragalactic astronomy.

1910

Williamina Fleming publishes her discovery of white dwarf stars.

1901

A comprehensive survey of stars, The "Henry Draper Catalogue" is published. In the catalogue Annie Jump Cannon proposes a sequence of classifying stars by the absorption lines in their spectra, which is still used today.

1895

Konstantin Tsiolkovsky publishes his first article on the possibility of space flight. His greatest discover is that a rocket, unlike other forms of propulsion, will work in a vacuum. He also outlines the principle of a multistage vehicle.

1872

An American astronomer Henry Draper takes a photograph of the spectrum of a star (Vega) showing absorption lines that reveal its chemical makeup. Astronomers begin to see that spectroscopy is the key to understanding how stars evolve. William Huggins uses absorption lines to measure the redshifts of stars, which give the first indication of how fast stars are moving.

1846

A new planet, Neptune, is identified by German astronomer Johann Gottfried while searching in the position suggested by Urbain Le Verrier. Le Verrier has calculated the position and the size of the planet from the effects of the gravitational pull of the orbit of Uranus. English Mathematician John Crouch Adams also made a similar calculation a year earlier.

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Irish astronomer William Parsons, 3rd Earl of Rosse completes the first of the world's great telescopes – with a 70-inch mirror. He uses it to study and draw the structure of nebulas, and within a few months discovers the spiral structure of the Whirlpool galaxy (M51) in Canes Venatici

1838

Joseph Bessel successfully uses the method of stellar parallax, the effect of Earth's annual movement around the Sun, to calculate the distance to 61 Cygni, the first star other from the Sun to have the distance from Earth measured. Bessel's is a truly accurate measurement of stellar positions, and the parallax technique establishes a framework for measuring the scale of the universe.

1801

Italian astronomer Giuseppe Piazzi discovers what appears to be a new planet orbiting between Mars and Jupiter, and names it Ceres. Herschel proves it is a very object, calculating it to be only 320 km in diameter. He proposes the name asteroid, and soon other similar bodies are being found. We now know that Ceres is 932 km in diameter and is now considered to be a dwarf planet.

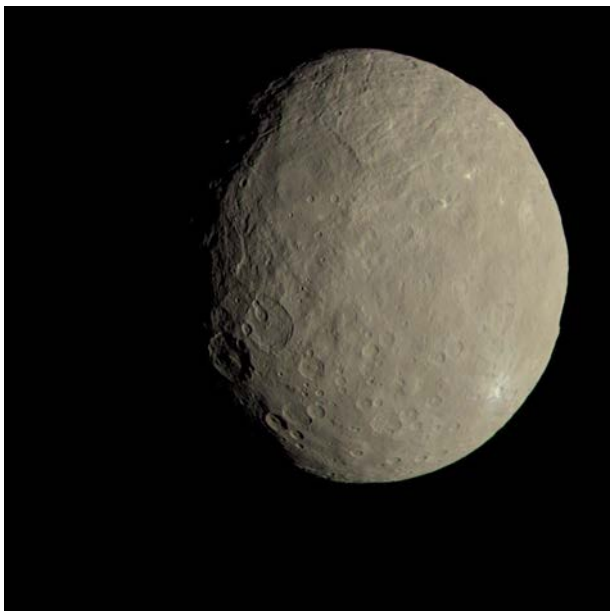

Photo: 2 Dwarf planet Ceres. NASA

1800

William Herschel splits sunlight through a prism and with a thermometer, measures the energy given out by different colors. He notices a sudden increase in energy beyond the red end of the spectrum, discovering invisible infrared and laying the foundations of spectroscopy.

1784

Charles Messier publishes his catalog of star clusters and nebulas. Messier draws up the list to prevent these objects from being identified as comets. However, it soon becomes a standard reference for the study of star clusters and nebulas and is still used today.

1705

Edmond Halley calculates that the comets recorded at 76-year intervals from 1456 to 1682 are one and the same. He predicts that the comet will return in 1758. When it reappears as expected, the comet is named in his honor.

1687

Isaac Newton publishes his first copy of the book "Philosophiae Naturalis Principia Mathematica" establishing the theory of gravitation and the laws of motion. The Principia explains Kepler's law of planetary motion and allows astronomers to understand the forces acting between the Sun, the planets, and their moons.

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1610

Galileo Galilei publishes "Sidereus Nuncius" describing the findings of his observations with the new telescope he built. These include spots on the Sun. craters on the Moon, and four satellites of Jupiter. Proving that not everything orbits Earth, he promotes the Copernican view of a Sun-centered universe.


RECENS HABITAE.

Vnum quoque obliuioni minimè tradam, quod nõ nisi aliquot cum admiratione adnotaui: medium quasi Lunæ locum attingere quædam occupatum esse reliquis omnibus maiori, ac figura perfectæ rotunditatis hanc prope quadrantem ambas conspexi eandemque in locandis supra positis figuris quantum licuit imitatus sum. Eiusdem quo ad obumbrationem, & illuminationem facit aspectus, ac fecerit in terris regio confinalis Borex, & nonnullus altissimis, inque peripheriam perfecti circuli dispositis occidentalis vndique; in Lunæ enim ideò clarissimi ingiti vallatur, vt extrema huius tenebrosæ Lunæ parti confermina Solis lumine perfusa spectetur, priusquam lucis vmbræque termonus ad medium ipsius figuræ diametrum perueniat. De more autem reliquarum macularum, vmbrosa illius pars Solem respicit, luminosa verò versus tenebras Lunæ conflituitur, quod semper libenter obseruandum admonco, tanquam firmissimum argumentum, asperitatum, inæqualitatumque per totam Lunæ claricrem plagam dispersarum; quarum quidem macularum semper nigriores sunt illæ, quæ confinio luminis, & tenebrarum conterminæ sunt, remotiores verò tum minores, tum obscuræ minus apparent, ita vt tandem cum Luna in oppositione totum impleuerit orbem, modico, admodumque tenui discrimine, cuiuscum opacitas ab eminentiarum candore discernitur.

Hæc quæ recensuimus in clarioribus Lunæ regionibus obtinuntur, verum in magnis maculis rarius conspicitur lacunarum, eminentiarumque differentia, quam necessariò constituere cogimur in parte lucidiori, ob mutationem figurarum ex alia, atque alia illuminatione radiorum Solis, prout multiplici positu Lunam respicit, vt in magnis maculis cuiusmodi quidem

Photo: 3 Galileo's book "Sidereus Nuncius"

1609

Johannes Kepler publishes his "New Astronomy." In this and later works, he announces his three laws of planetary motion, replacing the circular orbits of Plato with elliptical ones. Almanacs based on his laws proves to be highly accurate.

1608

Dutch eyeglass maker Hans Lippershey tries to patent a refracting telescope (the first historical record of one). The invention spreads rapidly across Europe, as scientists make their own instruments. Their discoveries begin a revolution in astronomy.

1572

A brilliant supernova (SN 1572- thought at the time to be a comet) is observed by Tycho Brahe, who proves that it is traveling beyond Earth's atmosphere and therefore provides the first evidence that the heavens can change.

1543

Nicolaus Copernicus publishes "De revolutionibus oebium coelestium containing his theory that Earth travels around the Sun. However, he complicates his theory by retaining Plato's perfect circular. orbits of the planets.

Indian mathematician-astronomer Brahmagupta, in his Brahma-Sphula-Siddhanta, first recognizes gravity as a force of attraction, and briefly describes gravitation which is almost like the second law of Newton's law of universal gravitation. He gives methods for calculations of the motions and places of various planets, their rising and, conjunctions, and calculations of the solar and lunar eclipses.

Indian mathematician-astronomer Aryabbata, in his Aryabhata, first identifies the force of gravity to explain why objects do not fall when the Earth rotates, propounds a geocentric Solar System of gravitation, and an eccentric elliptical model of the planets, where the planets spin on their axis and follow elliptical orbits. The Sun and Moon revolve around the Earth in epicycles. He also writes that the planets and the Moon do not have their own light of their own but reflect the light of the Sun and that the Earth rotates on its axis causing day and night and that the Sun rotates around the Earth causing years.

400

The Hindu cosmological time cycles explained in the Surya Siddhanta give the average length of the sidereal year (the length of the Earth's revolution around the Sun) as 365.2563627 days, which is only 1.4 seconds longer than the modern value of 356. 256363004 days. This remains the most accurate estimate for the length of the sidereal year anywhere in the world for over a thousand years.

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270 BC

Aristarchus of Samos proposes heliocentrism as an alternative to the Earth-centered universe. His heliocentric model places the Sun at its center, with the Earth as just one planet orbiting it. However, there were only a few people who took the theory seriously.

Plato, a Greek philosopher, founds a school (Platonic Academy) that will influence the next 2000 years. It promotes the idea that everything in the universe moves in harmony and the Sun, Moon and the planets move around the Earth in perfect circles.

400 BC

Around this date, Babylonians use the zodiac to divide the heavens into twelve equal segments of thirty degrees each, better to record and communicate information about the position of celestial bodies.

467 BC

Anaxagoras produced a correct explanation for eclipses and then described the Sun as a fiery mass larger than the Peloponnese, as well as attempting to explain rainbows and meteors. He was the first to explain that the Moon shines due to reflected light from the Sun.

750 BC

Mayan astronomers discovered an 18.7- year cycle in the rising and setting of the Moon. From this they created the first almanacs - tables of the movements of the sun, Moon, and planets for use of Astrology.