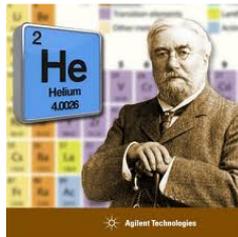


Sun – Part 2 - history of scientific understanding

Sunspots drawn by Galileo, June 1612



206 BCE – 220 CE First records of sunspots made in China during the Han dynasty.

12th century Averroes also described sunspots.

Early 17th century Galileo, Thomas Hariot and others able to observe sunspots through telescopes. Galileo posited that they were on the surface of the Sun, not small objects passing between the Sun and Earth, as had been suggested.

1653 Christiaan Huygens first to accurately measure the distance to the Sun, but with some lucky estimates.

1666 Isaac Newton discovered that a prism breaks sunlight into component colours. Used the word 'spectrum' to describe the rainbow of colours.

1672 Giovanni Cassini and Jean Richter first to accurately determine the distance to the Sun, using the method they had developed to measure Mars's distance – parallax.

1716 Edmund Halley proposed use of a transit of Venus to measure Sun-Earth distances.

1769 Halley's transit method identified a Sun-Earth distance very close to modern values.

1800 William Herschel discovered infrared radiation.

1801 Johann Ritter discovered ultraviolet radiation.

1802 William Wollaston first noted dark features in the Sun's spectrum.

1806 Alexander von Humboldt possibly the first to record a geomagnetic storm.

1814 Joseph von Fraunhofer rediscovered the Sun's spectral lines with his newly invented spectrometer.

1843 Samuel Schwabe announced the existence of a ten year cycle of sunspot numbers.

1857 Rudolph Wolf confirmed that historic data. proved the existence of a solar cycle with an average of 11 years.

1859 Robert Bunsen and Gustav Kirchhoff invented the first spectroscope and found that the Sun contains many elements, each having a unique spectrum.

1859 Richard Carrington and Richard Hodgson independently observed the first solar flare.

1859 Strongest ever recorded geomagnetic storm - the Carrington Event.

1862 Anders Ångström confirmed that Fraunhofer lines were hydrogen lines, proving the presence of hydrogen in the Sun.

1860s William and Margaret Huggins determined that stars are composed of the same elements as those found on Earth.

1866 Angelo Secchi developed the first stellar classification system.

1868 Helium discovered in the Sun independently by Pierre Janssen and Norman Lockyer.

1890 Edward Pickering published the first stellar catalogue using the early version of the Harvard stellar classification system.

1894 Edward Maunder published the first paper describing the prolonged low sunspot period now known as the Maunder Minimum.

1904 Ernest Rutherford suggested that the Sun's output could be maintained by an internal source of heat, potentially a result of radioactive decay.

- 1905** Einstein gave the essential clue to the source of S energy with his mass-energy equivalence relation $E=mc^2$.
- 1908** George Ellery Hale first to link the solar magnetic field with sunspots.
- 1914** Hertzsprung-Russell diagram published
- 1919** George Ellery Hale described the physical basis of the solar cycle.
- 1920** Arthur Eddington proposed that pressures and temperatures at the Sun's core could produce a nuclear fusion reaction that merged hydrogen into helium nuclei, resulting in energy production from the net change in mass.
- 1925** Cecilia Payne Goposchkin demonstrated that the spectral sequence in the Harvard classification was a sequence of temperatures. Also confirmed that the Sun consists mainly of hydrogen.
- 1925** George Ellery Hale proposed that the solar cycle lasts 22 years, covering two periods of increased and decreased sunspot numbers, accompanied by polar reversals of the solar magnetic field.
- 1938** Hans Bethe published details of the proton-proton chain reaction involved in stellar nuclear fusion.
- 1939** Hans Bethe published details of the carbon-nitrogen-oxygen chain reaction – the other means of fusing hydrogen into helium in stars.
- 1942** Stanley Hey first to detect radiowave emissions from the Sun.
- 1943** Morgan-Keenan stellar classification system published (an extension of the Harvard system).
- 1952** Harold and Horace Babcock develop the solar magnetograph and make the first ever measurements of the Sun's magnetic field.
- 1954** Fred Hoyle described how elements heavier than helium are produced in the Sun and other stars.
- 1959-1968** NASA's Pioneer 5, 6, 7, 8 and 9 the first satellites designed to observe the Sun from space.
- 1971** R Tousey observed the first official coronal mass ejection.
- 1995** Joint ESA and NASA Solar and Heliospheric Observatory (SOHO) satellite launched.
- 2006** NASA's Solar Terrestrial Relations Observatory (STEREO) launched.

Sources: Ridpath, I (Ed) (2012) Oxford dictionary of astronomy 2nd ed rev, www.en.wikipedia.org