From The Library

The Cause of an Ice Age, by Sir Robert Ball (Kegan Paul, Trench, Trübner, & Co.), 1891. Pp. 180, 20 × 13 cm. Price about £9 for a used copy from an on-line bookseller (hardbound; no ISBN).

A popular theory for explaining the ice ages involves the periodic changes in the Earth's orbit and the precession of the equinoxes. This theory is known as 'Milanković cycles' after the Serbian scientist Milutin Milanković (1879–1958), who wrote about this in the 1920s. However, similar theories had been around for some decades before the 1920s.

An earlier version of this theory was proposed by the Irish astronomer Sir Robert Ball (1840–1913), a prolific author of popular books and Royal Astronomer of Ireland (1874–1892), in this book. It was the first volume in a series, *Popular Science*, edited by Sir John Lubbock (1834–1913, later the first Lord Avebury). Ball's writing skill is evident in this highly readable and easy-to-follow little book. He makes a very strong case for the validity of this theory. He demonstrates that if the year is divided into two seasons, summer from vernal to autumnal equinox, then winter from autumnal to vernal equinox in the northern hemisphere, 63% of the Sun's annual supply of heat to that hemisphere is received in summer and only 37% in winter, whatever the condition of the Earth's orbit and axis. (He points out that Sir John Herschel wrongly states that the share is 50% in each season.)

The maximum possible difference between the length of summer and winter is 33 days, so one season is 199 days and the other is 166 days (page 97). When summer is much longer than winter, the 63% is stretched out and the 37% is compressed into a shorter period. He argues that the resultant warm but not hot summers and mild winters must lead to a "beneficent climate" (page 99). Conversely, when winter is much longer than summer, the 37% is stretched out and the 63% is compressed into a shorter period. This means that there are short, hot summers and long, cold winters. "This is the condition required for the development of glaciation. During the rigours of the winter the ice and snow accumulate, while the succeeding brief summer is not able to thaw as much water as has been solidified during the winter" (pages 106–107).

Whatever the merits or demerits of the theory that this book presents, it is an excellent model of how to present a scientific theory to the general public. — Lisa Budd.

ASTRONOMICAL CENTENARIES FOR 2025

Compiled by Kenelm England

The following is a list of astronomical events, whose centenaries fall in 2025. Births and deaths of individual astronomers are taken from *Biographical Encyclopedia of Astronomers* (Springer, 2007) and the on-line Obituary Notes of Astronomers and Obituary List of RAS Fellows. For events before 1600 the main source has been Barry Hetherington's *A Chronicle of Pre-Telescopic Astronomy* (Wiley, 1996). For the 17th to 20th Centuries lists of astronomical events came from Wikipedia and other on-line sources, supplemented by

astronomical texts made available through the NASA Astrophysics Data System. Discoveries of comets, asteroids, novae, and other objects for 1925 appeared in the February issue of *Monthly Notices of the Royal Astronomical Society* in the following year. There were also references from *Popular Astronomy*, *Journal of the British Astronomical Association*, and *Publications of the Astronomical Society of the Pacific*. Professional discoveries and observations were followed up in *Philosophical Transactions of the Royal Society of London*, *Astronomische Nachrichten*, *Astronomical Journal,* and *Monthly Notices of the Royal Astronomical Society*. Gary Kronk's *Cometography* Volumes 1–3 (CUP, 1999–2007) provided details on all the comets. Details on meteorites can be found in the Meteoritical Society's Bulletin Database. Finally, NASA's Five Millennium Canons of Eclipses and planetary tables were consulted for information on eclipses and planetary events.

1925

January 1: Greenwich Mean Time for astronomers changed so that days began at midnight, not at noon.

January 1: The International Astronomical Union changed the system of temporary designations for asteroids, dividing the year into 24 half-months. This allowed for designations of asteroids on archive photographs and is still used today.

January 1: Cecilia Helena Payne (Ratcliffe College and Cambridge) completed her PhD thesis 'Stellar Atmospheres: A Contribution to the Observational Study of High Temperature in the Reversing Layers of Stars,' providing evidence that stars are almost entirely made up of hydrogen and helium.

January 12: Death of Gideon Turner Davis. Born in 1843, he was a British amateur astronomer, founder member of the BAA, who observed the Sun, Moon, planets, comets, the colours of stars, and supernova SN 1885A in the Andromeda Galaxy; author of *Astronomical Sketches*.

January 24: A total solar eclipse was visible over the eastern United States. Several observatories were close to the central track and could provide permanent facilities for a large number of eclipse expeditions, both professional and amateur. Although some sites were clouded out, many photographs were obtained of the solar corona during totality. Maximum duration 2 min. 32 sec. [Saros 120].

January 31: Birth of John Marsh Wilcox, an American astronomer, Professor of Applied Physics and Director of the Stamford Solar Observatory, who wrote papers on interplanetary magnetic fields; FRAS 1966; died 1983.

February 3: Death of Oliver Heaviside. Born in 1850, he was a British mathematician and physicist, studying electromagnetism; proposed the existence of the Earth's ionosphere; FRS 1891.

February 8: A partial lunar eclipse was visible from the Americas, Europe, Africa, the Middle East, Asia, and Australia [Saros 132].

February 18: Birth of Alois Purgathofer, an Austrian professional astronomer at the Vienna Observatory (1954–84), working on the photometry of Galactic star clusters and a detailed study of asteroid (51) Nemausa; died 1984.

February 21: Death of the Reverend Joel Hastings Metcalf. Born in 1866, he was an American Protestant minister and amateur astronomer, who discovered

41 asteroids and seven new variable stars. He was most famous for his discovery of comets 97P/1906 V2 (Metcalf-Brewington), C/1910 P1 (Metcalf), C/1913 R1 (Metcalf), C/1919 Q2 (Metcalf), and the recovery of 23P/1919 Q1 (Brorsen-Metcalf), discovered in 1847.

March 1: Death of John Adelbert Parkhurst. Born in 1861, he was an American astronomer at the Yerkes Observatory, observing variable stars; observed the total solar eclipses of 1918, 1923, and 1925; FRAS 1905.

March 2: Birth of Sergey Ivanovich Syrovatskii, a Soviet astrophysicist at the Lebedev Physical Institute, Moscow, whose main field of study was magnetohydrodynamics of the solar corona; died 1979.

March 2: Birth of Bertrand John Harris, a British astronomer at the Royal Observatory, Greenwich (1946–57), and the Perth Observatory, Western Australia (1957–74); involved in several international co-operations; observed proper motions of stars and cometary positions; FRAS 1951; died 1974.

March 7: Death of Sir William Peck. Born in 1862, he was an amateur astronomer, lecturer, and writer; Director of the Edinburgh City Observatory (1889–1925); FRSE 1889; knighted 1917.

March 22: Grigory Abramovich Shajn (Simeis Observatory, Crimea) began his first night of observations for asteroids and found a diffuse object of magnitude 11. The following night Josep Comas Sola (Fabry Observatory, Barcelona) also found the comet. It was a very distant object, closest to the Earth on March 25 (3·4159 AU) and moved very slowly away. It was last seen on June 17, when it was magnitude 14. The comet reached perihelion on September 6 ($q = 4{\cdot}1808$ AU) and was recovered after solar conjunction on October 16. The comet was followed by large telescopes until 1926 March 9 and again from 1926 October 15 until 1927 March 4 [Comet C/1925 F1 (Shajn-Comas Sola)].

March 24: William Reid (Rondebosch, South Africa) discovered an 8th-magnitude comet in Virgo, while searching for comets. It was confirmed by professional observatories and remained consistently magnitude 8, although a short tail began to appear. The comet was closest to the Earth on May 18 (1·0505 AU) and moved south, brightening slightly to magnitude 7. After perihelion on July 29 ($q = 1{\cdot}6332$ AU), it moved north and faded, until it was lost in the Sun's glare on 1926 January 12. The comet was observed again from 1926 July 17 to December 31, when it had faded to magnitude 17. The orbital period is about 6000 years [Comet C/1925 F2 (Reid)].

March 27: Death of Carl Gottfried Neumann. Born in 1832, he was a German mathematician and physicist, working on Newtonian mechanics.

April 3: Lucien Orkisz (Mount Lysina, near Cracow, Poland) discovered this 9th-magnitude comet two days after perihelion ($q = 1{\cdot}1095$), as it came out of the Sun's glare. It brightened slightly to magnitude 8 during most of April and was closest to the Earth on May 6 (1·4759 AU). A large number of observations were made from European observatories. The comet began to fade to magnitude 9 in mid-June and magnitude 11 in mid-July. It was followed during the rest of the year and was last observed on 1926 May 12. The orbit is distinctly hyperbolic, and the comet will never return [Comet C/1925 G1 (Orkisz)].

April 15: Death of Willem Henri Julius. Born in 1860, he was a Dutch professional astronomer at the University of Utrecht, studying solar spectra at the Heliophysical Observatory.

April 22: Birth of John Edward Geake, a British planetary scientist at UMIST (1957 – 92), studying the surfaces of the Moon and the satellites of Jupiter and Saturn; FRAS 1953; died 1998.

April 30: At about 8.15 pm a bright light was seen in the sky and detonations were heard, as three stones fell at Queen's Mercy, near Malatiele, South Africa (now Lesotho). Several masses totalling about 7 kg were recovered, although some had been broken up by a medicine man. It is an H6 chondrite [Queen's Mercy Meteorite].

May 2: Death of Johann Palisa. Born in 1848, he was an Austrian astronomer at the Austrian Naval Observatory in Pola, where he discovered 28 asteroids, and at the Vienna Observatory, discovering another 94 asteroids; searched for intra-Mercurian asteroids during the total solar eclipse of May 1883; prepared photographic plates for the *Palisa-Wolf Sternkarten* star atlas.

May 3: At midday a meteorite landed in the village of Vilarelho da Raia, 8 km north of Chaves, Portugal. Two very strong explosions were heard, followed by a sound resembling cannon fire. Three pieces, weighing 2·95 kg, were recovered, showing a brown-black crust around grey rock. The meteorite is a howardite, a type found on a body such as (4) Vesta [Chaves Meteorite].

May 14: Periodic Comet Schorr, discovered in 1918, returned to perihelion ($q = 1{\cdot}8307$ AU) but was not recovered despite several photographic searches. The comet remains lost [Comet D/1918 W1 (Schorr)].

May 16: Birth of Nancy Grace Roman, an American astronomer, working on stellar spectroscopy at the Yerkes Observatory, and radio astronomy at the Naval Research Laboratory (1954–9); Chief of Astronomy at NASA (1959–79), on orbital astronomical satellites leading to the *Hubble Space Telescope*; died 2018.

May 16: Death of the Reverend Aloysius Laurence Cortie SJ. Born in 1859, he was a Jesuit priest and mathematics teacher at Stonyhurst College; FRAS 1891; observed the total solar eclipses of 1905, 1911, and 1914; delegate at the International Union for Co-operation in Solar Research; Director of the Stonyhurst Observatory (1919–25).

May 25: Robert Watson (Beaufort West, Cape Province, South Africa), an amateur astronomer, was walking to work shortly before sunrise (5.50 am), when he noticed a star in line with α Crucis and β Carinae. On checking *Norton's Star Atlas*, he recognized it was a nova (mag. 2·3). As he was a telegraphist, he immediately sent a message to the Royal Observatory, Cape Town, which confirmed the discovery.

The nova continued to brighten to magnitude 1·2 on June 9. Observatories in the Southern Hemisphere began taking spectra, showing a hot (Class F) continuum but hydrogen emission lines soon appeared. The nova faded to magnitude 4 on July 4 but brightened again to magnitude 1·9 on August 9. Fading resumed, but the star remained a naked-eye object until the end of the year. It faded very slowly to mag. 6·5 in 1927, 7·5 in 1928, and 9·5 in 1934. In February 1928 Bernhard Hildebrandt Dawson (La Plata Observatory, Argentina) discovered a nebula around the star. It is now at minimum (mag. 11·9) [RR Pictoris].

May 29: Death of Vitold Karlovich Tserasky. Born in 1849, he was a Russian astronomer, Director of the Moscow University Observatory (1890–1916); worked on the photometry of variable stars with his wife Lydia Petrovna Tseraskaya (1855–1931) and created a reference library of photographic plates.

June 3: Death of Nicolas Camille Flammarion. Born in 1842, he was a French amateur astronomer who became famous for his books on astronomy, particularly Mars; founder and first president of the Société Astronomique de France and its journal *l'Astronomie* in 1887.

June 11: Predictions were made for this very favourable return of Periodic Comet Tempel 2, which allowed Joachim Otto Stobbe (Hamburg Observatory) to recover the comet at magnitude 12. The comet steadily brightened and was closest to the Earth on July 26 (0·3202 AU). It was about magnitude 6·5 and had a short, fan-shaped tail. Then the comet faded fairly quickly to magnitude 12 on November 18 and magnitude 16 when last seen on December 13. Several spectra were obtained showing absorption bands due to C_2 and cyanogen [Comet 10P/Tempel 2].

June 25: A meteorite landed at Renca, San Luis in Argentina. About 300 g of this L5 chondrite was recovered [Renca Meteorite].

July 4: Death of Colonel Ernest Elliott Markwick. Born in 1853, he was a British army officer and amateur astronomer, FRAS 1879; founder member of the BAA and President (1912–14); variable-star observer, discovering the variables T Centauri and RY Sagittarii; Director of the BAA VSS (1899–1909).

July 7: Death of Karl Hermann Gustav Müller. Born in 1851, he was a German astronomer at the Astrophysical Observatory, Potsdam (1877–1921), studying the solar spectrum and the photometry of planets and asteroids; compiled the *Potsdam Durchmusterung* star catalogue; observed the transit of Venus in 1882 and the total solar eclipses of 1887 and 1900; Secretary of the Astronomische Gesellschaft (1896–1924).

July 8: Birth of Marat Usmanovich Sagitov, a Soviet physicist, studying gravity fields of the Earth, Moon, and Mars' moon Phobos; died 1988.

July 13: Micha Kamienski predicted the return of Periodic Comet Wolf, which was recovered by Wilhelm Heinrich Walter Baade (Hamburg Observatory) when only magnitude 15. The comet barely brightened during August and was closest to the Earth on September 21 (1·5137 AU). After perihelion on November 8 ($q = 2{\cdot}4347$ AU), it slowly faded and was last seen on December 19 [Comet 14P/Wolf].

July 14–22: A meeting of the International Astronomical Union was held at Cambridge, England, where there was controversy over still excluding delegates from the defeated Central Powers. It was decided to continue starting the Julian Day at noon.

July 20: An annular solar eclipse was only visible from the South Pacific [Saros 125].

July 23: King George V and Queen Mary visited the Royal Observatory, Greenwich, as part of the 250th anniversary celebrations.

July: A nova was recorded in the Triangulum Galaxy (Messier 33).

July: Nine pieces of iron were found by brick workers at the Lundwall Brickworks in Opava, Czechoslovakia. They formed a 20-m circle in a settlement of Palaeolithic hunters dating from 16 000 BC. The 5-percent nickel and Widmanstätten patterns reveal their meteoritic nature [Opava Meteorite].

August 14: Alexandre Schaumasse (Nice, France) recovered Periodic Comet Borrelly close to the predicted position at magnitude 15. The comet gradually brightened to magnitude 11 at the end of September but had no tail. It reached perihelion on October 7 (q = 1·3882 AU) but moved towards the Earth, as it moved away from the Sun. It remained at magnitude 11 until perigee on December 14 (0·9739 AU). Then it faded at the beginning of 1926 and was last seen on May 11 [Comet 19P/Borrelly].

August 16: Birth of Umberto Dall'Olmo, an Italian history scholar at the University of Bologna, who wrote articles on medieval records of eclipses, aurorae, meteors, and comets; amateur astronomer, observing the solar eclipse of 1961; died 1980.

August 21: Grigory Abramovich Shajn (Simeis Observatory, Crimea) discovered asteroid 1925 QD on a photographic plate, which was also imaged on August 24. No orbit could be calculated. In 1988 Syuichi Nakano announced that these were pre-discovery observations of Periodic Comet Whipple, discovered in 1933. The comet was closest to the Earth on September 6 (1·6695 AU) and reached perihelion on 1926 February 4 (q = 2·4837 AU) [Comet 36P/1925 QD (Whipple)].

August 28: Ms. M. Wolfert (Terneuzen, Zeeland, the Netherlands) observed a bright fireball across the sky at about 11.30 am, describing it as "a golden egg with a golden arrow." The meteor broke into three pieces and landed 45 km north, near the village of Ellemeet, "with a loud noise, so loud that horses and cows took fright." The main mass of 970 g broke into four pieces. Most were sent to the Sonnenborgh Observatory, Utrecht, for analysis. A second piece turned up in 1927 but had been exposed during the winter and was heavily weathered. The meteorite is a diogenite, probably from the asteroid (4) Vesta [Ellemeet Meteorite].

August 28: In the early evening a fireball nearly as bright as the Full Moon was seen above the town of Lanzenkirchen, Austria. After loud detonations, two stones fell. One weighing 5 kg was recovered the next day. A second 2-kg mass was found five weeks later. The meteorite is an L4 chondrite [Lanzenkirchen Meteorite].

September 4: At about 4 pm two stones were seen to fall near the town of Numakai, Hokkaido, Japan. M. Tanaka found one piece. It is an H4 chondrite [Numakai Meteorite].

September 9: Periodic Comet Brooks 2 had been missed in 1910 and 1918, so there was some uncertainty in its position. Grigory Abramovich Shajn (Simeis Observatory, Crimea) found images of the comet on a pair of photographic plates on September 21, when it was closest to the Earth (0·8985 AU) and magnitude 12·5. Then he found it on a pair taken on September 9. The comet was magnitude 13 during October and reached perihelion on November 1 (q = 1·8617 AU). Then it faded and was last seen on 1926 January 8 [Comet 16P/Brooks 2].

September 14: Max Wolf (Heidelberg Observatory) discovered a nova (mag. 8·6) in Aquila on photographic plates, which he confirmed on September 19. A check on previous photographs showed no star at the position. Annie Jump Cannon (Harvard College Observatory) examined 130 plates from 1899 to 1925 and found no object until September 8, when it was mag. 9·8, and 9·2 on September 23. The star was still about magnitude 9 in October and November.

Several spectra were obtained, as the nova continued to fade very slowly to magnitude 10·6 in 1927, 11·7 in 1928, and 14·8 in 1934. It is now at minimum (mag. 16·5) [DO Aquilae].

September 15: Death of Henry Curwen Lord. Born in 1866, he was an American astronomer at the Ohio State University, observing radial velocities and the spectrum of the solar eclipse in May 1900; FRAS 1897.

September 16: Death of Aleksander Aleksandrovich Friedmann. Born in 1888, he was a Russian mathematician and physicist, who wrote papers on the expansion of the Universe and the curvature of space from 1922 to 1924; Director of the Geophysical Observatory, Leningrad, 1925, and reaching 7400 m in a balloon flight.

September 20: Frank Elmore Ross (Yerkes Observatory) discovered what appeared to be a nova (mag. 9·1) in Aquarius, recorded on an archive plate taken on 1907 August 12. Ida Elizabeth Woods (Harvard College Observatory) checked 677 plates taken from 1890 to 1925 and found that the star was fainter than magnitude 12 on 1907 July 16 but 8·4 on August 8. It faded from 9·7 on August 14 to 12·6 on August 27. The star was at minimum (mag. 17·5) until 1962, when it underwent another outburst. At first designated a recurrent nova, it is now an SU UMa dwarf nova [VY Aquarii].

October 20: Periodic Comet Faye reached perihelion on August 7 ($q = 1{\cdot}6180$ AU). Wilhelm Heinrich Walter Baade (Hamburg Observatory) recovered the comet close to the predicted position. Later Joachim Otto Stobbe (Hamburg Observatory) found further images taken on August 29 and September 11. The comet remained about magnitude 14 during the rest of the year with a well defined coma and a faint tail. After being closest to the Earth on 1926 January 2 (1·2812 AU), it steadily faded and was last seen on March 14 [Comet 4P/Faye].

November 13: Leslie Copus Peltier (Delphos, Ohio) discovered a comet in Bootes, while searching for comets. He described it as magnitude 8–9 and moving rapidly south. The Harvard and Yerkes Observatories were not able to confirm the discovery. On November 19 Antoni Wilk (Cracow, Poland) discovered an 8th-magnitude comet well to the southwest of Peltier's discovery, so it took some time to confirm the comets were identical, its motion exaggerated by a close perigee on November 17 (0·5743 AU). The comet was well observed at the end of November, as it reached perihelion on December 7 ($q = 0{\cdot}7636$ AU). Then the comet began to fade to magnitude 10 by the last observation on December 31, as it slipped over the horizon [Comet C/1925 V1 (Wilk-Peltier)].

November 17: While making observations of the several comets recently discovered, George van Biesbroeck (Yerkes Observatory) found another much brighter comet in Ursa Major. Having reached perihelion on October 2 ($q = 1{\cdot}5662$ AU), it was magnitude 8 and had a distinct tail. The brightness remained, as the comet approached the Earth and was at perigee on 1926 January 29 (1·3512 AU). Then it began to fade and was last seen on June 10. The comet had been bright enough for spectra showing C_2 and cyanogen absorption bands [Comet C/1925 W1 (Van Biesbroeck)].

November 28: Death of Jean-Baptiste Alfred Pérot. Born in 1863, he was a French physicist, who developed with Charles Fabry the Fabry-Pérot interferometer, used in spectroscopy; awarded the Janssen Medal (1912) and the Rutherford Medal (1918).

December 13: George Edmund Ensor (Pretoria, South Africa) discovered the eleventh comet of the year in Reticulum, while observing variable stars. It was magnitude 8 with a tail 15 arcminutes long. The comet was observed from South Africa until 1926 January 22, when it entered the Sun's glare. Perihelion came on February 11 ($q = 0{\cdot}3226$ AU) and perigee on March 12 (0·8750 AU). The comet was spotted by observers from a balloon on February 23. Very faint images were recorded on March 10 and 16, with the final observation on April 13 [Comet C/1925 X1 (Ensor)].

December 14: Death of John Browning. Born in 1835, he joined his father's business in London, making nautical instruments, optics, and spectroscopes; wrote *How to Work with the Spectroscope* (1878); FRAS 1865.

December: A nova was recorded in the Triangulum Galaxy (Messier 33).

Willem Jacob Luyten (Harvard College Observatory) analysed photographs of Proxima Centauri from 1889 to 1902 and concluded that it was very slightly closer to the Earth than α Centauri.

Nineteen novae were recorded in the Andromeda Galaxy (Messier 31).

Charles Pollard Olivier published *Meteors*.

A small piece of iron meteorite (33 g) was found at Murchison Downs, Western Australia. Its mineral content is identical to the impactor at the Dalgaranga meteorite crater 200 km to the southwest. It is likely to have been carried there by Aboriginal Australians as a ritual trophy [Murchison Downs Meteorite].

Ford Howard Story (Glenormiston Station, Queensland) found an iron meteorite 40·8 kg in weight 8 km west of his house. He sold it to the University of Queensland in 1926 [Glenormiston Meteorite].

Hanns Walter Kornblum and Ernst Krieger released *Wunder der Schöpfung* (*Wonder of the Creation*), a documentary film on astronomy and space.

The Museum of the History of Science opened in Oxford, containing many early astronomical instruments.

1825

March 1: Birth of Henry Martyn Parkhurst, an American stenographer at the US Senate, an amateur astronomer, observing the Great Comet C/1843 D1 and a programme of Mira variable stars from 1883 to 1907; died 1908.

March 10: Death of Karl Brandan Mollweide. Born in 1774, he was a German mathematician and astronomer at the Pleissenburg Observatory and the University of Leipzig.

March 23 & 24: Captain Henry Kater (Regent's Park, London) made detailed observations of the asteroid (2) Pallas, which improved the asteroid's orbit.

May 1: Birth of Johann Jakob Balmer, a Swiss schoolteacher and mathematician, discovered a formula for calculating wavelengths of spectral lines, noted in the Balmer series; died 1898.

May 9: Birth of George Davidson, an American scientist at the US Coast Survey (1845–95), surveying the Pacific coastline, extended to Alaska; Professor of Geography at the University of California; made astronomical and magnetic

observations, including the total solar eclipses of 1869 and 1880 and the transits of Venus in 1874 and 1882; died 1911.

May 19: Jean Félix Adolphe Gambart (Marseilles, France) discovered a tailless comet about 2 arcminutes across in Cassiopeia. It developed a distinct tail by the end of the month. The comet was at perihelion on May 31 ($q = 0{\cdot}8890$ AU). On June 10 it was about magnitude 6 when closest to the Earth (0·7808 AU) before fading, and was last observed on July 15 [Comet C/1825 K1 (Gambart)].

May 20: Birth of George Phillips Bond, an American astronomer, son of William Cranch Bond, succeeded his father as Director of the Harvard College Observatory (1859–65); discovered Saturn's moon Hyperion in 1848 and Comet C/1850 Q1 (Bond); died 1865.

June 21: Death of Johann Carl Burckhardt. Born in 1773, he was a German astronomer at the Gotha Observatory and the Observatoire de l'École Militaire in Paris; calculated orbits of asteroids and comets.

June 27: Death of Edward Pigott. Born in 1753, he was the son of the British astronomer Nathaniel Pigott; observed the transit of Venus in 1769 and the transit of Mercury in 1786; discovered a nebula (the Black Eye Galaxy, Messier 64) in Coma Berenices in 1779, short-period comet 226P/Pigott-LINEAR-Kowalski in 1783, the first Cepheid variable η Aquilae in 1784, and the variables R Scuti and R Coronae Borealis in 1795.

July 13: Johann Franz Encke calculated a new orbit for Encke's Comet in June 1825 and found that it was very unfavourably placed on the far side of the Sun. Jean Élix Benjamin Valz (Nîmes, France) suspected a comet near the predicted position, but his next observation was only on the 25th. Encke's Comet did brighten during August and was observed by a number of European astronomers. It was last seen on September 7 and reached perihelion on September 16 ($q = 0{\cdot}3448$ AU) [Comet 2P/Encke].

July 15: Jean Louis Pons (La Marlia, Italy) found a faint comet in Taurus, while searching for Encke's Comet. It was also discovered by Wilhelm von Biela (Josephstadt, Austria) on the 20th and James Dunlop (Paramatta, New South Wales) on the 21st. In August the comet brightened and developed a tail 1·5 degrees long. It became a naked-eye object in September and could be seen in bright moonlight. The comet was closest to the Earth on October 12 (0·6177 AU), when the curved tail was 14 degrees long. By now it was only visible from the Southern Hemisphere and put on a spectacular show. The comet reached perihelion on December 11 ($q = 1{\cdot}2408$ AU) and was lost in the Sun's glare. A single observation was made by Lieutenant George Peard on board HMS *Blossom* at Buenos Aires on 1826 February 7. The comet was recovered by European observers in April and last seen on July 8 [Comet C/1825 N1 (Pons)].

August 9: Jean Louis Pons (Florence, Italy) discovered a faint comet in Auriga, which was observed from Europe until August 27. It remained faint and reached perihelion on August 19 ($q = 0{\cdot}8835$ AU) [Comet C/1825 P1 (Pons)].

September 27: Russian captain Otto von Kotsebue, commanding the sloop *Predpiyatiye* (*Enterprise*), was in Honolulu harbour, when he recorded a meteorite landing. According to his ship's log "while the heavens were quite clear, a thick black cloud formed itself over the island . . . The wind was perfectly calm, until all of a sudden, a violent gust blew from the northeast, and at the same time a crashing noise proceeded from the cloud as if many ships were firing their

guns." Two stones fell into a street and broke into several pieces. About 2·4 kg of this L5 chondrite was recovered [Honolulu Meteorite].

October 26: Birth of Johann Friedrich Julius Schmidt, a German professional astronomer at the Bonn and Olmütz Observatories, making numerous drawings and measurements of lunar features; Director of the Athens Observatory (1854–84), completing a 2-metre map of the lunar nearside in 1874; observed T Coronae Borealis four hours before its outburst in 1866; died 1884.

November 7: Jean Louis Pons (Florence, Italy) discovered yet another comet near γ Eridani, when it was round and lacked a tail. It was at perigee on December 3 (1·8343 AU) and remained a faint object, difficult to observe during December. Observations continued at the beginning of 1826, and the comet was last seen on April 10. It remained a distant object and was at perihelion on 1826 April 22 ($q = 2{\cdot}0077$ AU) [Comet C/1825 V1 (Pons)].

Aristides Franklin Mornay recognized that an iron mass being used as an anvil in the village of Yanhuitlan, Oaxaca, Mexico, was a meteorite. This IVA iron meteorite weighed 421 kg, rather weathered by exposure for 20 000 to 30 000 years and affected by heating during metalwork [Yanhuitlan Meteorite].

Joseph Johann von Littrow published *Populäre Astronomie* (*Popular Astronomy*).

Montgomery Robert Bartlett published *Young Ladies' Astronomy*.

1725

April 13: A partial solar eclipse was visible only from the South Pacific [Saros 105].

April 27: A total lunar eclipse was visible from East Asia, the Pacific, and the Americas [Saros 117].

May 12: A partial solar eclipse was visible from northern North America and the Arctic [Saros 143].

June 19: An eclipse of Jupiter's moon Io was observed from Rome.

July 3: A meteor was observed to fall near Mixbury, Oxfordshire. An object weighing 9 kg was retrieved, but it is doubtful that it was the meteorite [Mixbury Meteorite].

July 7: Ignatius Kögler (Peking, China) observed an eclipse of Jupiter's moon Io.

July 21: Samuel Molyneux (London) observed an eclipse of Jupiter's moon Io. It was also observed from Rome.

July 28: James Bradley (Wanstead, near London) began a series of observations on the eclipses of Jupiter's moon Io. Observations were also made from Rome and Lisbon in order to calculate the relative longitudes.

August 16: Giuseppe Campani (Rome) made a detailed observation of the lunar crater Plato.

September 11: Birth of Guillaume-Joseph-Hyacinthe Jean-Baptiste LeGentil de la Galaisière, a French astronomer, who questioned whether transits of Mercury and Venus could be measured accurately to calculate planetary distances but spent eleven years attempting to observe the transits of Venus in 1761 and 1769 without success; died 1792.

September 24–26: Arthur Dobbs (Trinity College, Dublin) observed bright auroral displays.

October 21: John Burroughs (Bristol, England) observed a lunar eclipse and recorded timings. The eclipse was total from Europe, Africa, the Middle East, and Asia [Saros 122].

November 4: A partial solar eclipse was visible only from the Southern Ocean and Antarctica [Saros 148].

November 10: William Derham (Windsor, Berkshire) observed an eclipse of Jupiter's moon Europa.

December 8: William Derham (Windsor, Berkshire) observed an eclipse of Jupiter's moon Io.

December: Samuel Molyneux (London) and James Bradley (Wanstead, near London) began a series of accurate observations of the star γ Draconis to look for parallax in the star. Instead they discovered the aberration of light.

George Lynn (Northampton) observed eclipses of Jupiter's moons.

John Flamsteed's widow Margaret Flamsteed and his assistants Joseph Crosthwait and Abraham Sharp published Flamsteed's star catalogue *Historia Coelestis Britannica*.

Eustachio Manfredi published ephemerides for the planets from 1726 to 1750.

1625

January 26: Wilhelm Schickard (Tübingen, Württemburg) discovered a comet in the evening sky, describing it as a "long hair extending west to east, slightly upwards." On February 11 the comet's tail extended 45 degrees from Eridanus to Lepus. On the 12th Schickard found the comet had moved westward and its tail stretched from Eridanus to Lepus and past Sirius, fully 60 degrees long. This was the last observation.

March 8: A total solar eclipse was visible across Mexico and the Caribbean [Saros 114]. Maximum totality lasted 3 min. 50 sec.

June 8: Birth of Giovanni Domenico Cassini, an Italian-French astronomer, observed the planets, establishing the rotation periods of Mars and Jupiter, discovered Saturn's moons Iapetus, Rhea, Tethys, and Dione and the main division in Saturn's rings; established the Cassini family of astronomers in Paris; died 1712.

August 13: Birth of Erasmus Bartholin, a Danish doctor and astronomer, professor at the University of Copenhagen, edited Tycho Brahe's works, and observed comet C/1665 F1; died 1698.

December 16: Birth of Erhard Weigel, a German mathematician, who attempted to rename all the constellations using European heraldry; died 1699.

Johannes Kepler published *Tychonis Brahei Dani hyperaspistes adversus Scipionis Ciaramontii* (*Defender of Tycho Brahe the Dane against Scipio Ciaramonti*) on Tycho's observations of the comet of 1577.

Death of Johann Bayer. Born in Bavaria in 1572, his star atlas *Uranometria* introduced Greek letters for stars and 12 new constellations for the southern sky.

1525

January 6: Birth of Caspar Peucer, a German astronomer, Professor at the University of Wittenberg, who wrote on astronomy and observed the supernova of 1572; defended the practice of astrology; died 1602.

December 1: Birth of Tadeas Hajek (Thaddaeus Hagecius), a Bohemian doctor, mathematician and leading astronomer, who wrote numerous astronomical books; observed the bright comets C/1556 D1, C/1577 V1, and C/1580 T1 and the supernova of 1572; died 1600.

Death of Mahmud ibn Qutb al-Din Muhammad Mirim Celebi. Born in about 1475 he was an Ottoman official and astronomer, who wrote on astronomy, astrology, optics, and history.

A meteorite was seen to fall near Milan, Italy; an uncertain object [Milan Meteorite].

1425

(about) Ibn al-Attar at Cairo was completing a treatise on building various kinds of quadrants.

1325

May 22: A very bright meteor was seen from Florence, Italy, recorded by Johannes Villanus in his *Historia Universalis*.

Roger of Stoke completed an elaborate astronomical clock at Norwich Cathedral.

(about) Birth of Henry of Langenstein, a German astronomer, who observed comet C/1368 E1 and wrote a number of books on astronomy; very critical of French court astrologers; died 1397.

(about) Ibn al-Sarraj in Aleppo, Syria, was constructing two kinds of astrolabe.

(about) Al-Bakhaniqi in Cairo compiled a table of co-ordinates for constructing astrolabes used at different latitudes.

1225

March 29: Japanese astronomers observed a comet, according to *Nihon Temmon Shiryo*. It was also seen on March 31 and April 2. In Russia the *Nikonian Chronicle* recorded that "a star appeared called 'the Lance', which extended from east to west in the form of a lance, and thus it remained for seventeen days." The report would be consistent with a comet having a long, straight tail and appearing in the morning sky before sunrise.

Qaisar ibn Abi-l-Qasim (al-Hanafi) constructed a celestial globe with horizon and meridian circles.

(about) Birth of Thomas Aquinas an Italian Catholic theologian, who united Aristotle's cosmology with Church doctrine; died 1274.

(about) Alexandre de Villedieu wrote *De Sphaera*.

1125

A very bright meteor was seen to fall from the sky, recorded by Honorius of Autun in his *Imago Mundi* (*Image of the World*).

925

April 11: An eclipse of the Moon was observed from Baghdad. The total lunar eclipse was visible from the Middle East and Asia [Saros 85].

July 22 & 23: The Chinese saw that "many stars flew west at midnight; small stars flew southwest," recorded in *Ssu-tien-k'ao*.

October 30: The Chinese observed a comet in the southwest with its tail pointing southeast, recorded in *Hou Han Shu*.

An aurora was seen from Egypt.

(about) Abu Ali al-Husayn ibn Muhammad al-Adami, an Arab astronomer and instrument maker in Baghdad, wrote a handbook on sundials *Techniques, Walls, and the Making of Sundials*.

825

April 27: The Chinese observed Mars cross through the star cluster Praesepe in Cancer.

(about) Al-Hasan, an Arab astronomer at Baghdad, built an astronomical observatory in his house and wrote his *Book on the Movement of the Sphere*.

725

February 11: The Japanese observed a comet in Cassiopeia, recorded in *Dainihonshi*.

625

The Chinese astronomer Wang Hs'iao-t'ung completed *Jigu Suanjing* (*Continuation of Ancient Mathematics*), including astronomical constructions and was working on the revision of the Chinese calendar.

525

Dionysius Exiguus published a table calculating the date of Easter, using the Christian Era for the first time.

325

June 19–August 25: The Roman emperor Constantine I held the Council of Nicaea on Christian theology and fixing the date of Easter as the first Sunday after the first Full Moon following the Vernal Equinox.

225

December 9: Chinese astronomers discovered a 'sparkling star' in Leo Minor with a tail stretching across the Head of Leo, recorded in *Sung Shu* and *Chin Shu*. The comet was in the morning sky before dawn.

125

April 5: An eclipse of the Moon was observed by Ptolemy at Alexandria, where one-sixth of the disc was eclipsed. The partial lunar eclipse was visible from Europe, Africa, the Middle East, and Asia [Saros 53].

December–January (*126*): The Chinese discovered a 'guest star' between α Herculis and α Ophiuchi, probably a bright nova, recorded in *Hou Han Shu*.

Zhang Heng designed and constructed a hydraulic-powered armillary sphere.

(about) Death of Plutarch. Born in about AD 45, he was a Roman historian writing in Greek on ancient lives; also wrote *De facie in orbe lunae apparet* (*On the Moon's Face*) on the features seen on the surface of the Moon and a description of a total solar eclipse.

76 BC

May: The Chinese discovered a 'guest star' in Pisces, recorded in *Han Shu* and *T'ung K'ao*. Although generally regarded as a nova, it is more likely to have been a tailless comet.

Pliny the Elder wrote in his *Natural History* that "a spark was seen to fall down from a star and increase in size as it approached the Earth, and after becoming as large as the Moon it diffused a sort of cloudy daylight, and then returning to the sky changed into a torch." This could describe a comet or an exceptionally bright fireball.

176 BC

August: Livy recorded that "at Tusculum a torch was seen in the sky." This may have been a comet or, more likely, a bright meteor.

276 BC

(about) Birth of Eratosthenes of Cyrene, a Greek mathematician, astronomer, poet, and scholar, Chief Librarian at the Library of Alexandria, founded early chronology, estimated the Earth's circumference as 252000 *stadia* (about 47 880 km); died about 195 BC.

676 BC

April 15: There was an eclipse of the Sun observed from China, recorded in *Chun Tsew*. The eclipse was total from Central India, Southeast Asia, and China [Saros 47].

776 BC

July 19–23: The 1st Olympic Games were held at Olympia, Greece, when Coroebus of Elis won the stadion running race. The Olympic *stadion* (190 m) became a standard unit of length for Greek mathematicians and astronomers.

976 BC

Pliny the Elder wrote in his *Natural History* that "a terrible comet was seen by the people of Ethiopia and Egypt, to which Typhon the king of that period gave his name, it had a fiery appearance and was twisted like a coil, and it was very grim to behold: it was not really a star so much as what might be called a ball of fire." The chronology of the time was very uncertain.

7176 BC

A very strong solar flare struck the Earth, recorded in carbon-14 levels in the tree rings of European Oaks and Eastern Alpine Conifers corroborated by enhanced beryllium-10 and chlorine-36 levels in Greenland ice cores. The event was comparable to the AD 774 record and much stronger than the Carrington Event of September 1859 [Miyake Event 7176 BC].

OBITUARY

Reverend Robert Owen Evans (*1937–2022*)

The late Robert (Bob) Evans OAM was an extraordinary visual astronomer. His work in supernova discovery is unparallelled, having discovered 42 supernovae visually, and another five from photographs, a record that is unlikely ever to be surpassed.

Bob Evans took up supernova hunting around 1955, but his first adequate instrument, a 10-inch Newtonian telescope, was assembled only in about 1968. He made his first official supernova (SN) discovery in 1981. By 1986, of the 13 SNe discovered visually, 11 were found by Bob. At that time Bob noted one advantage of visual observing was the possibility of immediate notification of discoveries — as is true today. Many of his detections were made before maximum light, where time is very much 'of the essence', to give professional observatories a chance to do their best research.

While living in Coonabarabran, New South Wales, he used his own 16-inch (40-cm) telescope. From early 1995 to mid-1997 he also had limited access to the 40-inch telescope at Siding Spring Observatory, resulting in about 10 000 galaxy observations, another three visual supernovae discoveries, and an additional four supernovae spotted on photographs made at the observatory. For an amateur astronomer, being granted access to professional telescopes is a rare honour, but Bob was a rare and gifted amateur. Some have said that he possessed preternatural observing skills; in reality he worked very hard studying and memorizing photographs of hundreds of galaxies and spent hours every night observing. He became extremely good at it.

By 2001, he had made 33 visual discoveries and by the end of 2005, despite the increasing competition from automated telescopes, the total number had already increased to 40 visual supernova discoveries plus one comet. In 2005, Evans relied almost exclusively on his 31-cm Dobsonian. He reported 6814 galaxy observations in a period of 107 hours and 30 minutes, spread out over 77 nights. During that time, he found four supernovae; three had already been discovered by others, the fourth was SN 2005df, which was Evan's third supernova discovery in NGC 1559 (after SN 1984J and SN 1986L) and his 40th visual discovery. Supernova 1983N, spotted by Evans in 1983 in the galaxy M 83 long before it reached its peak, turned out to be the first discovery of a new type of supernova, later named Type 1b.

Bob Evans also featured prominently in Bill Bryson's book *A Short History of Nearly Everything* which quotes him as saying "There's something satisfying, I think, about the idea of light travelling for millions of years through space and