



## Block calendar/Éphéméride

## William Lawrence Bragg: Forerunner to modern crystallography

William Lawrence Bragg was an Australian–British physicist and crystallographer who was defined by a high code of honor based on sacrifice and work. William Lawrence Bragg, who won the Nobel Prize in Physics in 1915, is most famous for his law on the diffraction of X-rays by crystals, a theory that makes it possible to calculate the positions for all dispositions of a crystal. He presented his theory to the Cambridge Philosophical Society on 11th November 1912. William Lawrence Bragg, with his encyclopedic spirit, discovered that sodium chloride crystals are not made of molecules at all, but are rather patterns of sodium and chloride ions. This early experiment served as the foundation for the science of X-ray crystallography. Because of William Lawrence Bragg, crystallography became an important tool for chemists and mineralogists. Bragg's Law is fundamental to the determination of the molecular structure of materials. Bragg's work has had an enormous impact across modern science and its applications, in medicine, physics, chemistry and the biological sciences, including determining the structures of proteins and the DNA genetic structure. Their techniques are routinely used in many industries, including the development of new drugs and chemicals, and in the mineral industry.

This year, the French Academy of Sciences is celebrating its 350th anniversary, which is the perfect occasion to remember William Lawrence Bragg, as he was also a member of the French Academy of Sciences.

**The life of Bragg: *O sancta simplicitas!***

In the year in which Benz invented the accelerator (to allow drivers to control speed), a Benz automobile was started with a spark ignition, Branly launched wireless telegraphy, and the central automatic telephone was invented, William Lawrence Bragg was born. When William Lawrence Bragg was born, a great artist, Vincent Van Gogh, disappeared from the Earth. Life and death, the Sky and the Earth! *Pretium doloris*: the tragedy of Van Gogh's death and the joy of Bragg's birth. William Lawrence Bragg was born five years before Röntgen discovered X-rays (1895).

William Lawrence Bragg, the eldest child of William Henry and Gwendoline, was born in Adelaide, South Australia, on 31 March 1890. He had a brother and a sister. His father was the Professor of Mathematics and Physics at the University of Adelaide. He received his early education at St. Peter's College, located at his birthplace. He was a very able student, and from the age of 11, he studied at this college. He was an impressionable boy and showed an early interest in science. In 1904, at age 15, William Lawrence Bragg entered Adelaide University to study mathematics, chemistry, and physics. He graduated in 1908, at the age of 18. In the same year, his father accepted the Chair of Physics at Leeds University and brought the family back to England. William Lawrence Bragg entered Trinity College, Cambridge, and received a major scholarship in mathematics. After initially excelling in mathematics, he transferred to the physics course in the later years of his studies. In Trinity College, Cambridge, he obtained first class honors in the Natural Science Tripos in 1912. After finishing his studies, he stayed on to work at the Cavendish Laboratory. From 1912 to 1914, he worked with his father, and in 1914, he was appointed as a fellow and lecturer in Natural Sciences at Trinity College and began his research under the supervision of Thomson. The First World War interrupted his work. Bragg was commissioned as a 2nd Lieutenant in the Leicester Royal Horse Artillery, and in August 1915, he began working on sound-ranging methods for locating enemy's guns. In the autumn of 1915, Bragg's brother Robert was killed in the War. He supervised the work on enemy gun location, between 1917 and 1919, rising to the rank of Major. In 1919, William Lawrence Bragg was appointed to succeed Rutherford at Manchester University, where he held the Langworthy Chair, which was, at that time, arguably the second most important position in Britain after the Cambridge Chair, where Rutherford succeeded Thomson. He held this post until 1937. However, he was elected the Fellow of the Royal Society in 1921. In 1937, Bragg moved to the National Physical Laboratory as a director for a year, but after Rutherford's premature death, he was invited to Cambridge as the Cavendish Professor of Experimental Physics. He was

the Cavendish Professor of Experimental Physics, Cambridge, from 1938 to 1953. He moved to the Royal Institution, London, as the Fulleren Professor of Chemistry between 1954 and 1966 and as director of the Davy–Faraday Research Laboratory – a post once held by his father. In 1941, he was knighted as ‘Sir Lawrence’ and spent 6 months as a Scientific Liaison Officer in Canada. Between 1939 and 1943, he was the President of the Institute of Physics. He was the Emeritus Professor from 1966 to 1971.

William Lawrence Bragg was awarded the Barnard Medal in 1914, the Nobel Prize in Physics for his work on X-ray crystallography in 1915, the Hughes Medal of the Royal Society in 1931, the Royal Medal of the same Society in 1946, and the Roebling Medal of the Mineral Society of America in 1948. He was awarded the Copley Medal by the Royal Society for contributions to the development of structural determination methods by X-ray diffraction in 1966 and was appointed to the Order of the Companion of Honor in 1967.

He was the Chairman of the Frequency Advisory Committee from 1958 to 1960. Knighted in 1941, Sir Lawrence held the degrees of M.A. (Cambridge), Honorary D.Sc. (Dublin, Leeds, Manchester, Lisbon, Paris, Brussels, Liege, and Durham), honorary Ph.D. (Cologne), and honorary LL.D. (St. Andrews). He received many honorary fellowships and was an honorary or foreign member of the French, American, Chinese, Swedish, Dutch, and Belgian Scientific Academies.

In 1921, he married the charming Alice Hopkinson, a historian from Cambridge, with whom he had four children: two sons (Stephen and David) and two daughters (Margaret and Patience). Stephen became the third generation of Bragg's to study mathematics at Cambridge University.

### Research activities or *dignitas dignitatum*

William Lawrence Bragg started his first important work as a result of the claim made in 1912 by Friedrich Knipping, and Laue that they had observed the diffraction of X-rays by a crystal. Over the summer of 1912, William Lawrence Bragg had many conversations about X-rays and crystals with his father and began investigating von Laue X-ray patterns. Laue used a crystal to create a diffraction pattern, proving that X-rays were transverse (crosswise) electromagnetic waves, similar to light. William Lawrence Bragg, believing that Laue's explanation was incorrect in detail, carried out a series of ingenious, original experiments that led to a sudden and brilliant inspiration that ultimately solved the riddle. William Lawrence Bragg suggested that ZnS should be seen as face-centered cubic rather than as simple cubic. He was then able to show that, as a result, the diffraction pattern was entirely explicable as having arisen from the diffraction of white X-radiation through a three-dimensional grating. Laue had calculated the conditions for the diffracted intensity maxima for the simple cubic system, where the incident beam was parallel to one side of the cell. William Lawrence Bragg discovered how to use X-rays to determine the molecular structure of crystals. William Lawrence Bragg also posited Bragg's law,  $n\lambda = 2d \sin\theta$ , the equation that links the wavelength of X-rays to the distance between two crystal planes and the angle of incidence. William Lawrence Bragg identified that X-rays were explained, in part, as waves and also as particles, and from this insight, he developed Bragg's

law. The Bragg's showed that crystals of substances such as sodium chloride contain no actual NaCl molecules, but are simply sodium and chloride ions arranged with geometric regularity. This discovery revolutionized theoretical chemistry. William Lawrence Bragg analyzed the arrangements of atoms within the crystals, while his father designed an X-ray spectrometer and further explored X-ray radiation. Together, they created the new science of X-ray crystallography. In the case of KCl, the atoms are of approximately equal scattering power, which is reflected in the simple cubic lattice to which both, as it were, contribute. This is not the case for KBr, where the lattice is defined by the heavier Br atom. NaCl is an intermediate case, reflecting the greater but not predominant scattering power of the Cl atom. In July 1913, the Bragg's published the structure of diamond, showing the carbon atoms to be tetrahedral. William Lawrence Bragg showed that the further quantitative study of intensities could be used to determine the position of those atoms, which are not fixed with reference to symmetry considerations. In this paper, he solved the structures of FeS and CaCO<sub>3</sub>, both with a single such parameter and the first of such structures to be solved. This work jointly earned William Lawrence Bragg and his father the Nobel Prize for Physics in 1915, “for their services in the analysis of crystal structure by means of X-rays”. At twenty-five, William Lawrence Bragg was the youngest ever Nobel Laureate.

After the War, the close collaboration between father and son ended, but it was natural that their work would continue to overlap. To prevent a *casus belli* between father and son, they decided to divide up the available work and agreed to stick to separate areas of X-ray crystallography. William Lawrence Bragg was to focus on inorganic compounds, metals and silicates, while his father was to focus on organic compounds.

In 1948, Bragg became interested in the structure of proteins. After the war, William Lawrence Bragg established a unit for the study of the molecular structure of biological systems at the Cavendish Laboratory, with funding from the Medical Research Council. In 1953, Francis Crick and James Watson determined the double helical structure of DNA and were awarded the Nobel Prize in Physiology or Medicine in 1962. Max Perutz and John Kendrew, working at both the Royal Institution and the Cavendish Laboratory, determined the structures of hemoglobin and myoglobin, for which they won the Nobel Prize in Chemistry in 1962. Working with William Lawrence Bragg during the 1960s at the Royal Institution, David Phillips determined the structure of an enzyme, lysozyme, for the first time.

In his career he published 257 papers and 13 books, many of which were translated into several languages, none more so than the write-up of his Royal Institution Christmas Lectures entitled “Electricity” in 1936, which was also published in Swedish (1937), Polish (1939), Czech (1940), Hungarian (1948), Finnish (1950), German (1951), Japanese (1951), and Italian (1953). Even after his retirement as a Director there in 1966, he composed many fine popular articles such as “The Art of Talking about Science”, “The Spirit of Science”, and “What Makes a Scientist”, as well as his famous foreword to *The Double Helix* by Watson. In it he said that Watson “writes with a Pepys-like frankness. Those who figure in the book must read it in a very forgiving spirit.”

After the Second World War he helped organize the International Union of Crystallography, and was its inaugural President.

His lifelong interests were the popularization and teaching of science, including the history of science. Among his hobbies, he was interested in astronomy, collecting shells, and rose gardening.

At his elegant retirement in September of 1966, Bragg transferred power to his successor George Porter at the Royal Institution. Bragg died at a hospital near his home at Waldringfield five years later, on July 1, 1971.

William Lawrence Bragg remains associated with the entire history and development of X-ray crystallography. The successful study of silicates not only revolutionized the basis of mineralogy but also was used by Pauling in his work on structural chemistry. The impact of the Bragg's work has been far reaching. Because of William Lawrence Bragg, crystallography became an important tool for chemists and mineralogists.

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MARCH	MEMBERS OF THE FRENCH ACADEMY OF SCIENCES
1	<p><b>Valincour, Jean-Baptiste Henri du Troussel de</b> (1 March 1653–4 January 1730), French man of letters.</p> <p><b>Günz, Justus Gottfried</b> (1 March 1714–23 June 1754), German biologist.</p> <p><b>Cornette, Claude Melchior</b> (1 March 1744–11 May 1794), French chemist and medical doctor.</p> <p><b>Boyer, Alexis</b> (1 March 1757–25 November 1833), French anatomist.</p> <p><b>Ventenat, Étienne-Pierre</b> (1 March 1757–13 August 1808), French botanist.</p> <p><b>Marescot, Armand-Samuel</b> (1 March 1758–5 November 1832), French general.</p> <p><b>Boyer, Alexis</b> (1 March 1760–25 November 1833), French anatomist.</p> <p><b>Verschaffel, Aloys</b> (1 March 1850–24 January 1933), French priest of Belgian origin.</p> <p><b>Choquet, Gustave</b> (1 March 1915–14 November 2006), French mathematician.</p> <p><b>Goldman, Maurice</b> (1 March 1933), French physicist.</p>
2	<p><b>Müller, Otto Friedrich</b> (2 March 1730–26 December 1784), Danish naturalist.</p> <p><b>Rigaut, Louis François</b> (2 March 1732–1785), French scientist.</p> <p><b>Mulsant, Étienne</b> (2 March 1797–4 November 1880), French entomologist and ornithologist.</p> <p><b>Pàris, François Edmond</b> (2 March 1806–8 April 1893), French admiral.</p> <p><b>Ledieu, Alfred Constant Hector</b> (2 March 1830–17 April 1891), French engineer.</p> <p><b>Barbier, François Antoine Philippe</b> (2 March 1848–18 September 1922), French chemist.</p> <p><b>Leblanc, Charles Léonard Armand Maurice</b> (2 March 1857–22 October 1923), French engineer.</p> <p><b>De Haas, Wander Johannes</b> (2 March 1878–26 April 1960), Dutch physicist and mathematician.</p> <p><b>Thuloup, Émile-Adrien-Albert</b> (2 March 1878–11 March 1959), French engineer.</p> <p><b>Roubaud, Émile Charles Camille</b> (2 March 1882–30 September 1962), French biologist.</p> <p><b>Buckingham, Margaret</b> (2 March 1945), French biologist of British origin.</p>
3	<p><b>Marggraf, Andreas Sigismund</b> (3 March 1709–7 August 1782), German chemist.</p> <p><b>Yvart, Jean Augustin Victor</b> (3 March 1763–19 June 1831), French agronomist.</p> <p><b>Houzeau, Auguste</b> (3 March 1829–17 February 1911), French chemist.</p> <p><b>Hill, George William</b> (3 March 1838–16 April 1914), American astronomer.</p> <p><b>Guillain, Georges Charles</b> (3 March 1876–29 June 1961), French neurologist.</p> <p><b>Beauchamp, Charles Alfred Paul Marais de</b> (3 March 1883–30 January 1977), French biologist.</p>

**Herlant, Marc** (3 March 1907–1 February 1986), Belgian biologist.  
**Cazenave, Anny Paulette Marguerite** (3 March 1944), French scientist.

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- 4** **Ortega, Casimir Gomez** (4 March 1741–28 August 1818), Spanish botanist.  
**Vincendon-Dumoulin, Clément Adrien** (4 March 1811–12 May 1858), French engineer.  
**Lissajous, Jules Antoine** (4 March 1822–24 June 1880), French physicist.  
**Cornet, Jules** (4 March 1865–17 May 1929), Belgian geologist.  
**Gravier, Charles Joseph** (4 March 1865–15 November 1937), French zoologist.  
**Cosserat, Eugène Maurice Pierre** (4 March 1866–31 May 1931), French astronomer.  
**Voisin, Claire** (4 March 1962), French mathematician.
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- 5** **Caumont, Henri Jacques Nompard de** (5 March 1675–20 July 1726), French memoirist.  
**Béraud, Laurent** (5 March 1702–26 June 1777), French astronomer.  
**Babinet, Jacques** (5 March 1794–21 October 1872), French mathematician and astronomer.  
**Marey, Étienne Jules** (5 March 1830–15 May 1904), French medical doctor.  
**Van Beneden, Édouard** (5 March 1846–28 April 1910), Belgian embryologist.  
**Schwartz, Laurent** (5 March 1915–4 July 2002), French mathematician.
- 
- 6** **Bouillet, Jean** (6 March 1690–13 August 1777), French medical doctor.  
**Comte d'Andréossy, Antoine François** (6 March 1761–10 September 1828), French-Italian diplomat.  
**Desmarest, Anselme Gaëtan** (6 March 1784–4 June 1838), French zoologist.  
**Blanchard, Charles Émile** (6 March 1819–11 February 1900), French zoologist.  
**Du Moncel, Théodose Achille Louis** (6 March 1821–16 February 1884), French scientist.  
**Cornu, Marie Alfred** (6 March 1841–12 April 1902), French physicist.  
**Bernstein, Serge Natanovitch** (6 March 1880–26 October 1965), Russian mathematician.  
**Davier, Michel** (6 March 1942), French physicist.  
**Courtilot, Vincent** (6 March 1948), French geophysicist.
- 
- 7** **Löwenstein-Wertheim-Rochefort, Charles, Thomas de** (7 March 1714–6 June 1789), Austrian Prince.  
**Le Tonnelier, Louis Charles Auguste baron de Breteuil** (7 March 1730–2 November 1807), French diplomat.  
**Dicquemare, Jacques François** (7 March 1733–29 March 1789), French zoologist.  
**Michaux, André** (7 March 1746–11 October 1803), French botanist.  
**Lefèvre-Gineau, Louis** (7 March 1751–3 February 1829), French chemist.  
**Becquerel, Antoine César** (7 March 1788–18 January 1878), French physicist.  
**Herschel, John Frederick William** (7 March 1792–11 May 1871), English chemist, astronomer and mathematician.  
**Bonafous, Matthieu** (7 March 1793–30 March 1852), French botanist.  
**Rayer, Pierre François Olive** (7 March 1793–10 September 1867), French medical doctor.  
**Decaisne, Joseph** (7 March 1807–8 February 1882), French botanist of Belgian origin.  
**Mauvais, Félix Victor** (7 March 1809–22 March 1854), French astronomer.  
**Wagner, Paul** (7 March 1843–25 August 1930), German chemist.  
**Haller, Albin** (7 March 1849–29 April (1 May) 1925), French chemist.  
**Lallemand, Charles Jean-Pierre** (7 March 1857–1 February 1938), French geophysicist.  
**Massart, Jean** (7 March 1865–16 August 1925), Belgian botanist.  
**Taylor, Sir Geoffrey Ingram** (7 March 1886–27 June 1975), British physicist.  
**Courtot, Charles Hippolyte** (7 March 1888–25 February 1955), French chemist.  
**Baltimore, David** (7 March 1938), American biologist and Nobel laureate (1975).  
**Fert, Albert** (7 March 1938), French physicist and Nobel laureate (2007).  
**Puget, Jean-Loup** (7 March 1947), French astrophysicist.
- 
- 8** **Steenstrup, Johannes Japetus Smith** (8 March 1813–20 June 1897), Danish zoologist.  
**Vessiot, Ernest** (8 March 1865–17 October 1952), French mathematician.  
**Charpak, Georges** (8 March 1924–29 September 2010), Polish-French physicist and Nobel laureate (1992).
- 
- 9** **Chardon de Courcelles, Étienne** (9 March 1705–5 July 1775), French doctor.  
**Bergman, Torbern Olof** (9 March (20 March) 1735–8 July 1784), Swedish chemist.  
**Grand'Eury, François Cyrille** (9 March 1839–22 July 1917), French engineer.  
**Pfeffer, Wilhelm Friedrich Philipp** (9 March 1845–31 January 1920), German botanist.  
**Widal, Fernand Georges Isidore** (9 March 1862–14 January 1929), French physicist.  
**Keilin, David** (9 March 1887–27 February 1963), British entomologist of Russian origin.  
**Glowinski, Roland** (9 March 1937), French mathematician.
- 
- 10** **Fouchy, Jean-Paul Grandjean de** (10 March 1707–15 April 1788), French astronomer.  
**Perroncito, Edoardo** (10 March 1847–4 November 1936), Italian parasitologist.  
**Barthélemy, René** (10 March 1889–12 February 1954), French engineer.  
**Merrill, John Putman** (10 March 1917–4 April 1984), American physicist.
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- 11** **Bory, Gabriel de** (11 March 1720–8 October 1801), French officer.  
**Turpin, Pierre Jean François** (11 March 1775–1 May 1840), French botanist.  
**Double, François-Joseph** (11 March 1776–12 June 1842), French doctor.  
**Le Verrier, Urbain Jean Joseph** (11 March 1811–23 September 1877), French astronomer and mathematician.  
**Sainte-Claire Deville, Henri Etienne** (11 March 1818–1 July 1881), French chemist.  
**Bertrand, Joseph Louis François** (11 March 1822–3 April 1900), French mathematician.  
**Durand-Viel, Georges Edmond Just** (11 March 1875–8 October 1959), French officer.  
**Bloembergen, Nicolaas** (11 March 1920), Dutch-American physicist and Nobel laureate (1981).  
**Dercourt, Jean** (11 March 1935), French geologist.  
**Deheuvels, Paul** (11 March 1948), French statistician.
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- 12** **Boyer, Jean-François** (12 March 1675–20 August 1755), French bishop.  
**Desaguliers, Jean Théophile** (12 March 1683–29 February 1744), British-French philosopher and engineer.

**Buckland, William** (12 March 1784–14 August 1856), English theologian and geologist.  
**Prestwich, Joseph** (12 March 1812–23 June 1896), British geologist.  
**Kirchhoff, Gustav Robert** (12 March 1824–17 October 1887), German physicist.  
**Friedel, Charles** (12 March 1832–20 April 1899), French chemist and mineralogist.  
**Newcomb, Simon** (12 March 1835–11 July 1909), Canadian-American astronomer.  
**Lesbre, François Xavier** (12 March 1858–26 January 1942), French anatomist.  
**Chararas, Constantin** (12 March 1922–18 November 1998), French engineer.  
**Joliot, Pierre** (12 March 1932), French biologist.  
**Angelier, Jacques François Olivier** (12 March 1947–31 January 2010), French geologist.  
**Lagrange, Anne-Marie** (12 March 1962), French astrophysicist.

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- 13** **Petit, Jean-Louis** (13 March 1674–20 April 1750), French anatomist.  
**Richelieu, Louis-François-Armand Duplessis de** (13 March 1696–8 August 1788), French diplomat.  
**Bonnet, Charles** (13 March 1720–20 May 1793), Swiss naturalist.  
**Priestley, Joseph** (13 (24) March 1733–6 April 1804), British chemist.  
**Littrow, Joseph Johann von** (13 March 1781–30 November 1840), Austrian astronomer.  
**Boussinesq, Joseph Valentin** (13 March 1842–19 February 1929), French mathematician and physicist.  
**Drach, Jules** (13 March 1871–7 March 1949), French mathematician.  
**Van Vleck, John Hasbrouck** (13 March 1899–27 October 1980), American physicist and Nobel laureate (1977).  
**Tate, John Torrence Jr.** (13 March 1925), American mathematician.  
**Villain, Jacques** (13 March 1934), French physicist.  
**Fontaine, Jean-Marc** (13 March 1944), French mathematician.
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- 14** **Musschenbroek, Petrus** (14 March 1692–19 September 1761), Dutch scientist.  
**Deschamps, Joseph-François-Louis** (14 March 1740–8 December 1824), French medical doctor.  
**Leudet, Théodore Emile** (14 March 1825–5 March 1887), French medical doctor.  
**Schiaparelli, Giovanni Virginio** (14 March 1835–4 July 1910), Italian astronomer.  
**André, Charles Louis François** (14 March 1842–6 June 1912), French astronomer.  
**Einstein, Albert** (14 March 1879–18 April 1955), Swiss-American scientist of German origin and Nobel laureate (1921).  
**Sierpinski, Waclaw** (14 March 1882–21 October 1969), Polish mathematician.  
**Lelong, Pierre** (14 March 1912–12 October 2011), French mathematician.
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- 15** **La Caille, Nicolas-Louis de** (15 March 1713–21 March 1762), French astronomer.  
**Kuhner, Robert** (15 March 1903–28 February 1996), French mycologist.  
**Bordé, Christian** (15 March 1943), French physicist.
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- 16** **Richet, Didier Dominique Alfred** (16 March 1816–30 December 1891), French anatomist.  
**Mittag-Leffler, Magnus Gösta** (16 March 1846–7 July 1927), Swedish mathematician.  
**Viguié, Antoine François Camille** (16 March 1850–17 February 1930), French anatomist.  
**Besairie, Henri Michel Édouard** (16 March 1898–22 May 1978), French geologist.  
**Boudet, Alain-Michel** (16 March 1940), French biologist.
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- 17** **Marchetti, Alessandro** (17 March 1633–6 September 1714), Italian mathematician.  
**Templeman, Peter** (17 March 1711–23 August 1769), English physicist.  
**Odier, Louis** (17 March 1748–13 April 1817), Swiss medical doctor.  
**Simmons, Samuel Foart** (17 March 1750–23 April 1813), British physicist.  
**Costaz, Louis de** (17 March 1767–15 February 1842), French scientist.  
**Maclear, Sir Thomas** (17 March 1794–14 July 1879), Irish-South African astronomer.  
**Esclangon, Ernest** (17 March 1876–28 January 1954), French astronomer and mathematician.
- 
- 18** **La Hire, Philippe de** (18 March 1640–21 April 1718), French mathematician and astronomer.  
**Valincourt, Jean-Baptiste-Henry du Troussel de** (18 March 1653–4 January 1730), French historian.  
**Berthoud, Ferdinand** (18 March 1727–20 June 1807), French scientist.  
**Gilbert, François-Hilaire** (18 March 1757–6 September 1800), French veterinarian.  
**Steiner, Jacob** (18 March 1796–1 April 1863), Swiss mathematician.  
**Rose, Gustav** (18 March 1798–15 July 1873), German mineralogist.  
**Gay, Claude** (18 March 1800–29 November 1873), French botanist.  
**Henneguy, Louis Félix** (18 March 1850–26 January 1928), French zoologist.  
**Deflandre, Georges Victor** (18 March 1897–17 June 1973), French naturalist.  
**Carleson, Lennart Axel Edvard** (18 March 1928), Swedish mathematician.  
**Bui, Huy Duong** (18 March 1937–29 May 2013), Vietnamese-French scientist.
- 
- 19** **Soares de Barros e Vasconcellos, José Joaquim** (19 March 1721–2 November 1793), Portuguese scientist.  
**Frank, Johann Peter** (19 March 1745–24 April 1821), German physicist.  
**Moreau de Jonnés, Alexandre** (19 March 1778–28 March 1870), French military and official.  
**Burdin, Claude** (19 March 1788–12 November 1873), French engineer.  
**Bonnet, Amédée** (19 March 1809–2 December 1858), French medical doctor.  
**Abria, Jérémie Joseph Benoît** (19 March 1811–4 April 1892), French physicist.  
**Livingstone, David** (19 March 1813–1 May 1873), French medical doctor.  
**Delannoy, Émile Florent** (19 March 1892–28 June 1971), French medical doctor.  
**Joliot, Jean Frédéric** (19 March 1900–14 August 1958), French physicist/chemist and Nobel laureate (1935).  
**Brachet, Jean Louis Auguste** (19 March 1909–10 August 1988), Belgian biochemist.  
**Pullman, Bernard** (19 March 1919–9 June 1996), French chemist and biochemist.  
**Flahaut, Jean** (19 March 1922–5 October 2015), French chemist and pharmacist.
- 
- 20** **Chomel, Antoine** (20 March 1668–8 May 1702), Dutch astronomer.  
**Van Marum, Martijn** (20 March 1750–26 December 1837), Dutch scientist.  
**Lesson, René-Primevère** (20 March 1794–28 April 1849), French zoologist.  
**Vernejoul, Robert de** (20 March 1890–14 October 1992), French medical doctor.

**Limasset, Pierre René** (20 March 1911–14 March 1988), French agronomist.

**Gehring, Walter Jakob** (20 March 1939–29 May 2014), Swiss biologist.

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- 21** **Bidloo, Govert** (21 March 1649–30 April 1713), Dutch anatomist and physicist.  
**Deyeux, Nicolas** (21 March 1745–27 April 1837), French chemist.  
**Fourier, Jean Joseph** (21 March 1768–16 May 1830), French mathematician and physicist.  
**Planchon, Jules-Émile** (21 March 1823–1 April 1888), French botanist.  
**Birkhoff, George David** (21 March 1884–12 November 1944), American mathematician.  
**Cossart, Pascale** (21 March 1948), French scientist.
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- 22** **Sedgwick, Adam** (22 March 1785–27 January 1873), British geologist.  
**Didion, Isidore** (22 March 1798–4 July 1878), French mathematician.  
**Argelander, Friedrich Wilhelm August** (22 March 1799–17 February 1875), German astronomer.  
**Bussy, Marie Anne Louis de** (22 March 1822–24 April 1903), French engineer.  
**Fowler, Alfred** (22 March 1868–24 June 1940), English astronomer.  
**Millikan, Robert Andrews** (22 March 1868–20 December 1953), American physicist and Nobel laureate (1923).
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- 23** **Monti, Filippo Maria** (23 March 1675–17 January 1754), Italian cardinal.  
**Chappe d'Auteroche, Jean-Baptiste** (23 March 1728–1 August 1769), French astronomer.  
**Laplace, Pierre-Simon de** (23 March 1749–5 March 1827), French mathematician and physicist.  
**Bertin, Louis Émile** (23 March 1840–22 October 1924), French naval engineer.  
**Sergent, Étienne Louis Marie Edmond** (23 March 1876–20 August 1969), French biologist.  
**Staudinger, Hermann** (23 March 1881–8 September 1965), German chemist.  
**Valensi, Jacques** (23 March 1903–21 June 1992), French scientist.  
**Bovet, Daniel** (23 March 1907–8 April 1992), Swiss-Italian pharmacologist and Nobel laureate (1957).  
**Whitney, Hassler** (23 March 1907–10 May 1989), American mathematician.  
**Durant, Henri** (23 March 1926–9 April 2015), French agronomist.  
**Postaire, Éric** (23 March 1957), French pharmacist.
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- 24** **Sauveur, Joseph** (24 March 1653–9 July 1716), French physicist and mathematician.  
**Bertin, Henri Léonard Jean Baptiste** (24 March 1720–16 September 1792), French Comptroller General of Finance.  
**Lafosse, Philippe Estienne** (24 March 1738–13 May 1820), French veterinarian.  
**Liouville, Joseph** (24 March 1809–8 September 1882), French mathematician.  
**Becquerel, Alexandre Edmond** (24 March 1820–11 May 1891), French physicist.  
**Heckel, Édouard Marie** (24 March 1843–20 January 1916), French botanist.  
**Tannery, Jules** (24 March 1848–11 November 1910), French mathematician.  
**Bosler, Jean** (24 March 1878–25 September 1973), French astronomer.  
**Morse, Marston Harold** (24 March 1892–22 June 1977), American mathematician.  
**Butenandt, Adolf** (24 March 1903–18 January 1995), German biochemist and Nobel laureate (1939).  
**Genzel, Reinhard** (24 March 1952), German astronomer.
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- 25** **Onsenbray, Louis-Léon Pajot de** (25 March 1678–22 February 1754), French scientist.  
**Dechen, Ernst Heinrich Carl von** (25 March 1800–15 February 1889), German geologist.  
**Godron, Dominique Alexandre** (25 March 1807–16 August 1880), French botanist and medical doctor.  
**Engler, Heinrich Gustav Adolph** (25 March 1844–10 October 1930), German botanist.  
**Berloty, Camille Marie Antoine Bonaventure** (25 March 1856–10 October 1934), French astronomer.  
**Leclerc du Sablon, Albert Mathieu** (25 March 1859–18 March 1944), French botanist.  
**Ocagne, Philibert Maurice d'** (25 March 1862–23 September 1938), French mathematician.  
**Flexner, Simon** (25 March 1863–2 May 1946), American scientist.  
**Weiss, Pierre** (25 March 1865–24 October 1940), French physicist.  
**Tubiana, Maurice** (25 March 1920–24 September 2013), French biologist of Algerian origin.  
**Ichbiah, Jean David** (25 March 1940–26 January 2007), French computer scientist.
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- 26** **Hartsoëker, Nicolaus** (26 March 1656–10 December 1725), Dutch mathematician and physicist.  
**Rumford, Benjamin Thompson de** (26 March 1753–21 August 1814), British-American physicist.  
**Cayeux, Lucien** (26 March 1864–1 November 1944), French geologist.  
**Theiler, Sir Arnold** (26 March 1867–24 July 1936), Swiss veterinarian.  
**Ouirissen, Guy Henry** (26 March 1926–4 November 2006), French chemist.
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- 27** **Brisseau de Mirbel, Charles François** (27 March 1776–12 September 1854), French botanist.  
**Hittorf, Johann Wilhelm** (27 March 1824–28 November 1914), German physicist.  
**Landouzy, Théophile Joseph Louis** (27 March 1845–10 May 1917), French medical doctor.  
**Leprince-Ringuet, Louis Marie Edmond** (27 March 1901–23 December 2000), French engineer and physicist.  
**Spitz, Erich** (27 March 1931), French scientist.
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- 28** **Ruysch, Frédéric** (28 March 1638–22 February 1731), Dutch botanist.  
**Seebeck, Thomas Johann** (28 March 1770–10 December 1831), Estonian-German physicist.  
**Bazy, Pierre Jean Baptiste** (28 March 1853–22 January 1934), French medical doctor.  
**Heymans, Corneille Jean-François** (28 March 1892–18 July 1968), Belgian physiologist and Nobel laureate (1938).  
**Maier-Leibnitz, Heinz Hermann** (28 March 1911–22 December 2000), German physicist.  
**Jacob, Maurice** (28 March 1933–2 May 2007), French physicist.
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- 29** **Vacher, Gilles** (29 March 1693–18 October 1760), French medical doctor.  
**Béhal, Auguste** (29 March 1859–2 February 1941), French chemist.  
**Levi-Civita, Tullio** (29 March 1873–29 December 1941), Italian mathematician.  
**Spencer-Jones, Harold** (29 March 1890–3 November 1960), British astronomer.  
**Gautheret, Roger Jean** (29 March 1910–28 April 1997), French biologist.  
**Dejours, Pierre** (29 March 1922–10 January 2009), French medical doctor.
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- 30** **Vidal, Jacques** (30 March 1747–2 January 1819), French astronomer.  
**Bunsen, Robert Wilhelm** (30 (31) March 1811–16 August 1899), German chemist.

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**Favre, Jean Alphonse** (30 March 1815–11 July 1890), Swiss geologist.

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**Chenaud, Jacques** (31 March 1654–5 February 1741), Swiss medical doctor.

**Spielmann, Jacob-Reinbold** (31 March 1722–9 September 1783), French scientist.

**Bézout, Étienne** (31 March 1730–27 September 1783), French mathematician.

**Latour, Charles Cagniard de** (31 March 1777–5 July 1859), French physicist.

**Cordier, Pierre Louis Antoine** (31 March 1777–30 March 1861), French mineralogist and geologist.

**Cagniard de Latour, Charles** (31 March 1777–5 July 1859), French engineer and physicist.

**Temminck, Cœnraad Jacobus** (31 March 1778–30 January 1858), Dutch scientist.

**Vicat, Louis Joseph** (31 March 1786–10 April 1861), French engineer.

**Walcott, Charles Doolittle** (31 March 1850–9 February 1927), American paleontologist.

**Pope, William Jackson** (31 March 1870–17 October 1939), English chemist.

**Bragg, William Lawrence** (31 March 1890–1 July 1971), Australian English physicist and Nobel laureate (1915).

**Allègre, Claude Jean** (31 March 1937), French geochemist.

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