
French mathematician who pioneered in analysis and the theory of substitution groups (groups whose elements are ordered sequences of a set of things). He was one of the greatest of modern mathematicians.

At the onset of the Reign of Terror (1793-94) during the French Revolution, Cauchy’s family fled from Paris to the village of Arcueil, where Cauchy first became acquainted with the mathematician Pierre-Simon Laplace and the chemist Claude-Louis Berthollet.

Cauchy became a military engineer and in 1810 went to Cherbourg to work on the harbours and fortifications for Napoleon’s English invasion fleet. In spite of his work load he produced several mathematical papers of note, including the solution of a problem sent to him by Joseph-Louis Lagrange that established a relationship between the number of edges, the number of vertices, and the number of faces of a convex polyhedron, and the solution of Pierre de Fermat’s problem on polygonal numbers.

Cauchy returned to Paris in 1813, and Lagrange and Laplace persuaded him to devote himself entirely to mathematics. The following year he published the memoir on definite integrals that became the basis of the theory of complex functions. From 1816 he held professorships in the Faculty of Sciences, the Collège de France, and the École Polytechnique, all in Paris. When Gaspard Monge was expelled for political reasons from the Academy of Sciences (1816), Cauchy was appointed to fill the vacancy. The same year he won the grand prize of the Institute of France for a paper on wave propagation, now accepted as a classic in hydrodynamics. In 1822 he laid the foundations of the mathematical theory of elasticity.

Cauchy’s greatest contributions to mathematics, characterized by the clear and rigorous methods that he introduced, are embodied predominantly in his three great treatises: Cours d’analyse de l’École Royale Polytechnique (1821; “Courses on Analysis from the École Royale Polytechnique”); Résumé des leçons sur le calcul infinitésimal (1823; “Résumé of Lessons on Infinitesimal Calculus”); and Leçons sur les applications du calcul infinitésimal à la géométrie (1826-28; “Lessons on the Applications of Infinitesimal Calculus to Geometry”).

The first phase of modern rigour in mathematics originated in his lectures and researches in analysis during the 1820s. He clarified the principles of calculus and put them on a satisfactory basis by developing them with the aid of limits and continuity, concepts now considered vital to analysis. To the same period belongs his development of the theory of functions of a complex variable (a variable involving a multiple of the square root of minus one), today indispensable in applied mathematics from physics to aeronautics.

Although acting only from the highest motives, Cauchy often offended his colleagues by his self-righteous obstinacy and aggressive religious bigotry. Upon the exile of Charles X in 1830 and the ascension of Louis-Philippe to the throne, Cauchy went into exile, too, rather than take the oath of allegiance. A chair of mathematical physics was created for him at the University of Turin, but in 1833 he left to tutor the Duke de Bordeaux, grandson of Charles X. In 1838, with the suspension of the oath, he returned to France, resuming his chair at the École Polytechnique.

Cauchy made substantial contributions to the theory of numbers and wrote three important papers on error theory. His work in optics provided a mathematical basis for the workable but somewhat unsatisfactory theory of the properties of the ether, a hypothetical, omnipresent medium once thought to be the conductor of light. His collected works, Oeuvres complètes d’Augustin Cauchy (1882-1970), were published in 27 volumes.

Louis Poinsot, b. 3 Jan 1777 in Paris, d. 5 Dec 1859 in Paris.

Louis Poinsot was a student at the École Polytechnique and then went to the Université de France in 1809. From 1839 until his death he worked at the Bureau des Longitudes.

His research in geometry, statics and dynamics is important. He was the inventor of geometrical mechanics, investigating how a system of forces acting on a rigid body could be resolved into a single force and a couple. He wrote an important work on polyhedra in 1809, discovering four new regular polyhedra, two of which appear in Kepler’s work of 1619 but Poinsot was unaware of this. In 1810 Cauchy proved that, with this definition of regular, the enumeration of regular polyhedra is complete. A mistake was discovered in Poinsot’s (and hence Cauchy’s) definition in 1990 when an internal inconsistency became apparent.


French mathematician and astronomer whose theory of lunar motion advanced the development of planetary-motion theories.

Delaunay was educated as an engineer at the École des Mines from 1836, becoming an engineer in 1843 and chief engineer in 1858. He studied mathematics and astronomy with Jean-Baptiste Biot at the Sorbonne (1841-48). He taught mechanics at the École Polytechnique from 1850 and also later taught at the École des Mines. He was made a member of the Académie des Sciences in 1855; and in 1870 he succeeded U.-J.-J. Le Verrier as director of the Paris Observatory.


Arthur Morin was a student at the Ecole Polytechnique and took up a military career, becoming professor at Metz. Then, in 1839, he became professor at Conservatoire des Arts et Métiers, becoming its director in 1849. Morin was an applied mathematician and he wrote on friction and hydraulics, in particular writing on turbines and water-wheels.

Siméon-Denis Poisson, b. June 21, 1781, Pithiviers, d. April 25, 1840, Sceaux.

French mathematician known for his work on definite integrals, electromagnetic theory, and probability.

His family coerced him into studying medicine, which he abandoned in 1798 in favour of mathematics, studying at the École Polytechnique, Paris, under the mathematicians Pierre-Simon Laplace and Joseph-Louis Lagrange, who became his lifelong friends. His life was almost entirely engaged in mathematical research and in teaching. He became a deputy professor at the École Polytechnique in
1802 and a full professor in 1806. In 1808 he was made astronomer at the Bureau des Longitudes, and, when the Faculté des Sciences was instituted in 1809, he was appointed professor of pure mathematics.

Poisson’s most important work concerned the application of mathematics to electricity and magnetism, mechanics, and other parts of physics. His Traité de mécanique (1811 and 1833; “Treatise on Mechanics”) was the standard work in mechanics for many years. One of his publications (1812) contained many of the most useful laws of electrostatics and his theory that electricity is made up of two fluids, in which like elements repel and unlike attract.

Poisson contributed to celestial mechanics by extending the work of Lagrange and Laplace on the stability of planetary orbits and by calculating the gravitational attraction exerted by spheroidal and ellipsoidal bodies. His expression for the force of gravity in terms of the distribution of mass within a planet has been used in the late 20th century for deducing details of the shape of the Earth from accurate measurements of the paths of orbiting satellites.

Poisson’s other works include Théorie nouvelle de l’action capillaire (1831; “A New Theory of Capillary Action”) and Théorie mathématique de la chaleur (1835; “Mathematical Theory of Heat”). In Recherches sur la probabilité des jugements . . . (1837; “Researches on the Probability of Opinions . . .”), an important work on probability, the Poisson distribution, or Poisson law of large numbers, first appeared. Although originally derived as merely an approximation to Bernoulli’s binomial law, it is now fundamental in the analysis of problems concerning radioactivity, traffic, and the random occurrence of events in time or space.

In pure mathematics his most important works were a series of papers on definite integrals and his advances in Fourier’s series, which paved the way for the researches of Peter Dirichlet and Bernhard Riemann on the same subject.

Gaspard Monge, Comte de Péluse

French mathematician who invented descriptive geometry and pioneered the development of analytical geometry, both of which have since become part of projective geometry. He was a prominent figure during the French Revolution, helping to establish the metric system and the École Polytechnique. He was made a count in 1808 by Napoleon I.

Monge was educated at the college of the Oratorians at Beaune and at their college at Lyon, where for a time at age 16 he was a physics teacher. During a vacation visit to Beaune in 1762, he made a large-scale plan of the town, devising methods of observation and constructing the necessary surveying instruments. Impressed with the plan, a military officer recommended him to the commandant of the aristocratic École Militaire de Mézières, where he was accepted but as a draftsman only; because his father was an itinerant peddler, he could not be admitted to the commission program.

A further opportunity to display his skill as a draftsman occurred when he was required to compute from data the proper locations of gun emplacements for a proposed fortress. At that time such an operation could be performed only by a long arithmetic process, but Monge, substituting for this a geometrical method, obtained the result so quickly that the commandant at first refused to receive it. On careful examination, Monge’s plan was considered of sufficient value that it was guarded as a military secret until 1795, when he was finally allowed to describe it in his lectures. Continuing his researches at Mézières, Monge developed his general method of applying geometry to problems of construction; this subject later became known as descriptive geometry.

Between 1768 and 1783 Monge taught physics and mathematics at Mézières; in 1777 he married the widow Madame Horbou, and in 1780 he was appointed to a chair of hydraulics, held concurrently, at the Louvre in Paris. The same year he was elected an associate of the Académie des Sciences. In a paper discussing the problem of earthworks in 1781, “Sur la théorie des déblais et des remblais” (“On the Theory of Excavation and Emplacements”), he used calculus to determine the curvature of a surface. His memoir stated the ordinary differential equation of curvature and established the general theory.

Leaving Mézières permanently about 1783, Monge became increasingly active in public affairs in Paris. Between 1783 and about 1789 he was an examiner of naval cadets; he served on the committee of weights and measures that established the metric system in 1791; from 1792 to 1793 he was minister for the Navy and colonies and had occasion to welcome the young artillery officer who became the emperor Napoleon; and in 1795 he participated in the founding of the Institut National de France. Although at times during the Revolution his position was precarious, Monge continued to be influential. When an appeal was made to scientists to assist in producing materials for national defense, he supervised foundry operation and wrote factory handbooks, Description de l’art de fabriquer les canons (The Art of Manufacturing Cannon) and Avis aux ouvriers en fer sur la fabrication de l’acier (Advice to Iron Workers in Steel Production). In 1794-95 he taught at the short-lived École Normale, where he was given permission for the first time to lecture on the principles of descriptive geometry that he had developed at Mézières. (See French Revolution.)

Particularly important for mathematics was his substantial role in the founding in 1795 of the École Polytechnique, originally for training engineers; he was an administrator and an esteemed teacher of descriptive, analytical, and differential geometry. Since no texts were available, his lectures were edited and published for student use. Among them were two important texts in 1799: in his Géométrie descriptive (Descriptive Geometry), based on his lectures at the École Normale, he developed his descriptive method for representing a solid in three-dimensional space on a two-dimensional plane, by drawing the projections—known as plans, elevations, and traces—of the solid on a sheet of paper; his text Feuilles d’analyse appliquée à la géométrie ("Analysis Applied to Geometry") established the algebraic methods of three-dimensional geometry. Engineering design was revolutionized by his new procedures. Moreover, mathematics education was significantly advanced by his successful texts and popular lectures.

In 1796 Monge officially met Napoleon and henceforth became his confidant and one of his closest friends. Napoleon sent him on a commission to Italy to choose the paintings and statues that were taken to help finance his military campaigns; many of these works of art went to the Louvre. From 1798 to 1801 he accompanied Napoleon to Egypt and in Cairo helped to establish in 1798 the Institut d’Égypte, the cultural organization that was patterned after the Institut de France.

With the fall from power of Napoleon in 1814, the Bourbons deprived Monge, as a Bonapartist, of all his honours and excluded him in 1816 from the list of members of the reconstituted Institut.