This article is about the scientist. For the agriculturist, see Isaac Newton (agriculturist).

Sir Isaac Newton (25 December 1642 – 20 March 1727) was an English physicist and mathematician (described in his own day as a “natural philosopher”) who is widely recognised as one of the most influential scientists of all time and as a key figure in the scientific revolution. His book Philosophiae Naturalis Principia Mathematica (“Mathematical Principles of Natural Philosophy”), first published in 1687, laid the foundations for classical mechanics. Newton made seminal contributions to optics, and he shares credit with Gottfried Leibniz for the development of calculus.

Newton’s Principia formulated the laws of motion and universal gravitation, which dominated scientists’ view of the physical universe for the next three centuries. By deriving Kepler’s laws of planetary motion from his mathematical description of gravity, and then using the same principles to account for the trajectories of comets, the tides, the precession of the equinoxes, and other phenomena, Newton removed the last doubts about the validity of the heliocentric model of the Solar System.

This work also demonstrated that the motion of objects on Earth and of celestial bodies could be described by the same principles. His prediction that Earth should be shaped as an oblate spheroid was later vindicated by the measurements of Maupertuis, La Condamine, and others, which helped convince most Continental European scientists of the superiority of Newtonian mechanics over the earlier system of Descartes.

Newton built the first practical reflecting telescope and developed a theory of colour based on the observation that a prism decomposes white light into the many colours of the visible spectrum. He formulated an empirical law of cooling, studied the speed of sound, and introduced the notion of a Newtonian fluid. In addition to his work on calculus, as a mathematician Newton contributed to the study of power series, generalised the binomial theorem to non-integer exponents, developed a method for approximating the roots of a function, and classified most of the cubic plane curves.

Newton was a fellow of Trinity College and the second Lucasian Professor of Mathematics at the University of Cambridge. He was a devout but unorthodox Christian, and, unusually for a member of the Cambridge faculty of the day, he refused to take holy orders in the Church of England, perhaps because he privately rejected the doctrine of the Trinity. Beyond his work on the mathematical sciences, Newton dedicated much of his time to the study of biblical chronology and alchemy, but most of his work in those areas remained unpublished until long after his death. In his later life, Newton became president of the Royal Society. Newton served the British government as Warden and Master of the Royal Mint.

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Life

Early life
Main article: Early life of Isaac Newton

Isaac Newton was born according to the Julian calendar (in use in England at the time) on Christmas Day, 25 December 1642 (NS 4 January 1643[1]), at Woolsthorpe Manor in Woolsthorpe-by-Colsterworth, a hamlet in the county of Lincolnshire. He was born three months after the death of his father, a prosperous farmer also named Isaac Newton. Born prematurely, he was a small child; his mother Hannah Ayscough reportedly said that he could have fit inside a muff.

When Newton was three, his mother remarried and went to live with her new husband, the Reverend Barnabas Smith, leaving her son in the care of his maternal grandmother, Margery Ayscough. The young Isaac disliked his stepfather and maintained some enmity towards his mother for mangling him, as revealed by this entry in a list of sins committed up to the age of 19: “Threatening my father and mother Smith to burn them and the house over them.”[2] Newton’s mother had three children from her second marriage.[3] Although it was claimed that he was once engaged,[4] Newton never married.

From the age of about twelve until he was seventeen, Newton was educated at The King’s School, Grantham which taught him Latin but no mathematics. He was removed from school, and by October 1659, he was to be found at Woolsthorpe-by-Colsterworth, where his mother, widowed for a second time, attempted to make a farmer of him. Newton hated farming.[5] Henry Stoke, master at the King’s School, persuaded his mother to send him back to school so that he might complete his education. Motivated partly by a desire for revenge against a schoolyard bully, he became the top-ranked student,[6] distinguishing himself mainly by building sundials and models of windmills.

In June 1661, he was admitted to Trinity College, Cambridge, on the recommendation of his uncle Rev William Ayscough. He started as a subajor—paying his way by performing valid’s duties—until he was awarded a scholarship in 1664, which guaranteed him four more years until he would get his M.A. At that time, the college’s teachings were based on those of Aristotle, whom Newton supplemented with modern philosophers such as Descartes, and astronomers such as Galileo and Thomas Streat, through whom he learned of Kepler’s work. He sat down in his notebook a series of ‘Questions’ about mechanical philosophy as he found it. In 1665, he discovered the generalised binomial theorem and began to develop a mathematical theory that later became calculus. Soon after Newton had obtained his B.A. degree in August 1665, the university temporarily suspended its examinations because of the Great Plague.[7] Newton’s private studies at his home in Woolsthorpe over the subsequent two years saw the development of his theories on calculus.[8] Optics, and the law of gravitation.

In April 1667, he returned to Cambridge and in October was elected as a fellow of Trinity. Fellowso were required to become ordained priests, although this was not obligatory. He was, however, the first to be ordained in the college[9] and, unsuited for the clergy, he found himself in the care of the Master of Trinity, who made no demands on him.

He studied with the Lucasian professor, Isaac Barrow, who was more anxious to develop his own religious and administrative potential (he became master of Trinity two years later), and in 1669, Newton succeeded him, only one year after he received his M.A. He was elected a Fellow of the Royal Society (FRS) in 1672.[10]

Middle years

Mathematics

Newton’s work has been said to “distinctly advance every branch of mathematics then studied.”[11] His work on the subject usually referred to as fluxions or calculus, seen in a manuscript of October 1666, is now published among Newton’s mathematical papers.[12] The author of the manuscript De analysi per aequationes numero terminorum infinitas, sent by Isaac Barrow to John Collins in June 1669, was identified by Barrow in a letter sent to Collins in August of that year as[24]

Mr Newton, a fellow of our Collage, and very young... but of an extraordinary genius and proficiency in these things.

Newton later became involved in a dispute with Leibniz over priority in the development of calculus (the Leibniz–Newton calculus controversy). Most modern historians believe that Newton and Leibniz developed calculus independently, although with very different notations. Occasionally it has been suggested that Newton published almost nothing about it until 1693, and did not give a full account until 1704, while Leibniz began publishing a full account of his methods in 1684. (Leibniz’s notation and “differential Method”, nowadays recognised as much more convenient notations, were adopted by continental European mathematicians, see also).

Isaac Newton
and after 1820, also by British mathematicians. Such a suggestion, however, fails to notice the content of calculus which critics of Newton's time and modern times have pointed out in Book 1 of Newton's Principia itself (published 1687) and in his forerunner manuscripts, such as De motu corporum in gyro ("On the motion of bodies in orbit"), published in 1684. The Principia is not written in the language of geometry either as we know it or as Newton's (then) notion would have been; it is written in geometric form based on limiting values of ratios of vanishing small quantities. In the Principia, Newton gave demonstration of this under the name of "the method of first and last ratios" and explained why he put his expositions in this form, remarking also that "neither the same thing is performed as is by the method of indivisibles. Because of this, the Principia has been called a "book dense with the theory and application of the infinitesimal calculus" in modern times and "equal est praestare tot de calculo" ("neither all of it is of this calculus") in Newton's time. Use of methods involving "one or more orders of the infinitesimally small" is present in his De motu corporum in gyro published in 1684 and in his paper "On the motion of bodies in orbit" during the two decades preceding 1684.

Newton was reluctant to publish his calculus because he feared controversy and criticism. He was close to the Swiss mathematician Nicolas Fatio de Duillier. In 1691, Duillier wrote to a new version of Newton's Principia, and corresponded with Leibniz. In 1693, the relationship between Duillier and Newton deteriorated and the book was never completed.

Starting in 1699, other members of the Royal Society (of which Newton was a member) accused Leibniz of plagiarism. The dispute then broke out in full force in 1711 when the Royal Society proclaimed in a study that it was Newton who had published the work later found that Newton himself wrote the study's concluding remarks on Leibniz. Thus began the bitter controversy which marred the lives of both Newton and Leibniz until the latter's death in 1716. Newton was generally credited with the generalized modern binomial theorem, valid for any exponent. He discovered Newton's identities, Newton's method, classified cubic plane curves (polynomials of degree three in two variables), made substantial contributions to the theory of finite differences, and was the first to use fractional indices and to employ complex quantities to derive solutions to Diophantine equations. He approximated partial sums of the harmonic series in infinite sums, and was the first to use power series with confidence and to reject power series.

Optics

In 1666, Newton observed that the spectrum of colours a prism in the position of minimum deviation is oblong, even when the light entering the prism is circular, which is to say, the prism reflects different colours by different angles. This led him to conclude that colour is a property intrinsic to light—a point which had been debated in prior years. From 1670 to 1672, Newton lectured on optics. During this period he investigated the refraction of light, demonstrating that the multi-coloured spectrum produced by a prism could be recomposed into white light by a lens and a second prism. Modern scholarship has revealed that Newton's analysis and nomenclature of white light owes a debt to corpuscular theory.

He showed that coloured light does not change its properties by separating out a coloured beam and shining it on various objects. Newton noted that regardless of whether it was reflected, scattered, or transmitted, it remained the same colour. Thus, he observed that colour is the result of objects interacting with already-coloured light rather than objects generating the colour themselves. This is known as Newton's theory of colour.

From this work, he concluded that the lens of any refracting telescope would suffer from the dispersion of light into colours (chromatic aberration). As a proof of the concept, he constructed a telescope using a mirror as the objective to bypass these problems. Building the design, he first known functionally working Newtonian telescope, involved solving the problem of a suitable mirror material and shaping technique. Newton ground his own mirrors out of a custom composition of highly reflective speculum metal, using Newton's rings to judge the quality of the optics for his telescopes. In late 1668 he was able to demonstrate to the Royal Society in 1671, the Royal Society asked for a demonstration of his reflecting telescope. Their interest encouraged him to publish his notes, Of Colours, which he later expanded into the work Opticks. When Robert Hooke criticised some of Newton's ideas, Newton was so offended that he withdrew from public debate. Newton and Hooke had brief exchanges in 1679-80, and managed the Royal Society correspondence intended to elicit contributions from Newton to Royal Society transactions, which had the effect of stimulating Newton to work out a proof that the elliptical form of planetary orbits would result from a centripetal force inversely proportional to the square of the radius vector: Newton's law of universal gravitation – History and De motu corporum in gyro. But the two men generally on poor terms until Hooke's death.

Newton argued that light is composed of particles or corpuscles, which were reflected by a crystal into a denser medium. He argued on sound waves to explain refraction and reflection of light through the law of reflection by the time Opticks. The role of this lens was to be reflected or transmitted (Props. 13). However, later physicists favoured a purely wavelike explanation of light to account for the phenomenon of reflection or transmission (Props. 14). Newton's identities, classified cubic plane curves (polynomials of degree three in two variables), made substantial contributions to the theory of finite differences, and was the first to use fractional indices and to employ complex quantities to derive solutions to Diophantine equations. He approximated partial sums of the harmonic series in infinite sums, and was the first to use power series with confidence and to reject power series.

In his Hypothesis of Light of 1675, Newton posited the existence of the ether to transmit forces between particles. The contact with the theologian Henry More, revived his interest in alchemy. He replaced the ether with occult forces based on Hermetic ideas of attraction and repulsion between particles. John Maynard Keynes, who examined many of Newton's writings on alchemy, stated that "Newton was not the first of the age of reason: He was the last of the magicians." Newton's interest in alchemy is not isolated from his contributions to science. This was at a time when there was no clear distinction between alchemy and science. He had not relied on the occult idea of action at a distance, across a vacuum, he might not have developed his theory of gravity. (See also Isaac Newton's occult studies.)

In 1704, Newton published Opticks, in which he expanded his corpuscular theory of light. He considered light to be made up of extremely subtle corpuscles, that ordinary matter was made of grosser corpuscles and speculated that through a kind of alchemical transmutation "are not gross Bodies and Light convertible into one another, ... and may Bodies receive much of their Activity from the Particles of Light which enter their Composition?" Newton also constructed a primitive form of a frictional electrostatic generator, using a glass globe.

In an article entitled "Newton, prisms, and the 'opticks' of tunable lasers" (DEG) it is indicated that Newton in his book Opticks was the first to show a diagram using a prism as a beam expander. In the same book he describes, via diagrams, the use of multiple-prism arrays. Some 278 years after Newton's discussion, multiple-prism beam expanders became central to the development of narrow-wavelength tunable lasers. Also, the use of these prismatic beam expanders led to the multiple-prism dispersion theory. Subsequent to Newton, much has been amended. Young and Fresnel combined Newton's particle theory with Huygens' wave theory to show that colour is the visible manifestation of light's wavelength. Science also slowly came to realise the difference between perception of colour and mathematical optics. The German poet and scientist, Goethe, could not shake the Newtonian foundation but "one hole Goethe did find in Newton's armour..." Newton had committed himself to the doctrine that refraction without colour was impossible. He therefore thought that the object-glasses of telescopes must for ever remain imperfect, achromatism and refraction being incompatible. This inference was proved by Dollond to be wrong.

Mechanics and gravitation

Further information: Wringing of Principia Mathematica

In 1679, Newton returned to his work on Celestial Mechanics by considering gravitation and its effect on the orbits of planets with reference to Kepler's laws of planetary motion. This followed assimilation by a brief exchange of letters in 1679–80 with Hooke, who had been appointed to manage the Royal Society's correspondence, and who opened a correspondence intended to elicit contributions from Newton to Royal Society transactions. Newton's reawakening interest in astronomical matters received further stimulus by the appearance of a comet in the winter of 1680–1681, on which he corresponded with John Flamsteed. After the exchanges with Hooke, Newton worked out proofs that the elliptical form of planetary orbits would result from a centripetal force inversely proportional to the square of the radius vector (see Newton's law of universal gravitation – History and De motu corporum in gyro). Newton communicated his results to Edmond Halley and to the Royal Society in De motu corporum in gyro, in a tract written on about nine sheets which was copied into the Royal Society's Register Book on 13 December 1684. This tract contained the nucleus that Newton developed and expanded to form the Principia.

The Principia was published on 5 July 1687 with encouragement and financial help from Edmond Halley. In this work, Newton stated the three universal laws of motion. Together, these laws describe the relationship between any object, the forces acting upon it and the resulting motion, laying the foundation for classical mechanics. The laws are stated in a number of advances during the Industrial Revolution which soon followed and were improved upon for more than 200 years. Many of these advances continue to be the underpinnings of non-relativistic technologies in the modern world. He used the Latin word gravitas (weight) for the effect that would become known as gravity, and defined the law of universal gravitation.

In the same work, Newton presented a calculus-like method of geometrical analysis using 'first and last ratios', gave the first analytical determination (based on Boyle’s law) of the speed of sound in air, inferred the oblateness of Earth’s spheroidal figure, accounted for the precession of the equinoxes as a result of the Moon's gravitational attraction on the Earth’s oblateness, initiated the gravitational study of the inequalities in the mutual motion of the Sun and the other planets by writing the famous question asking what they could be situated on Earth but not the “common centre of gravity of the Earth, the Sun and the Planets to be at the Centre of the World", and this centre of gravity "either is at rest or moves uniformly forward in a right line" (Newton adopted the "at rest" alternative in view of common consent that the centre, wherever it was, was
Newton's postulate of an invisible force able to act over vast distances led to him being criticized for introducing " occult" agencies into science. Later, in the second edition of the Principia (1713), Newton firmly rejected such criticisms in a concluding General Scholium, writing that it was enough that the phenomena implied a gravitational attraction, as they did; but they did not so far indicate its cause, and it was both unnecessary and improper to frame hypotheses of things that were not implied by the phenomena. (Here Newton used what became his famous expression "hypotheses non fingo".)

With the Principia, Newton became internationally renowned. He acquired a circle of admirers, including the Swiss-born mathematician Nicolas Fatio de Duillier, with whom he formed an intense relationship. This abruptly ended in 1693, and at the same time Newton suffered a nervous breakdown.

**Classification of cubics and beyond**

Descartes was the most important early influence on Newton the mathematician. Descartes hewed plane curves from the Greek and Macedonian limitation to conic sections, and Newton followed his lead by classifying the cubic curves in the plane. He found 72 of the 78 species of cubics. He also divided them into four types, satisfying different equations, and in 1717 Hering, probably with Newton's help, proved that every cubic was one of these four types. Newton also claimed that the four types could be projected from plane one from them, and this was proved in 1731.

According to Tom Whiteside (1933–2008), who published 8 volumes of Newton's mathematical papers, it is no exaggeration to say that Newton mapped out the development of mathematics for the next 200 years, and that Euler and others largely carried out his plan.

**Later life**

**Main article: Later life of Isaac Newton**

In the 1690s, Newton wrote a number of religious tracts dealing with the physical and symbolic interpretation of the Bible. A manuscript Newton sent to John Locke in which he disputed the Trinity of 1 John 5:7 and its fidelity to the original manuscripts of the New Testament, remained unpublished until 1786. Even though a number of authors have claimed that the work might have been an indication that Newton disputed the belief in Trinity, others assure that Newton did question the passage but never denied Trinity as such. His biographer, scientist Sir David Brewster, who compiled his manuscripts for over 20 years, wrote about the controversy in well-known book Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton, where he explains that Newton questioned the veracity of those passages, but he never denied the doctrine of Trinity as such. Brewster states that Newton was never known as an Ariist during his lifetime, it was that William Whiston (an Ariist) who argued that "Sir Isaac Newton was so nearly heary for the Baptists, as well as for the Eusebians or Ariists, that he sometimes suspected these two were the two witnesses in the Revelations," while other like Hopton Haynes (a Minit employee and Humanitarian), "mentioned to Richard Baron, that Newton held the same doctrine as himself!"

Later works—The Chronology of Ancient Kingdoms Amended (1728) and Observations Upon the Prophecies of Daniel and the Apocalypse of St. John (1733)—were published after his death. He also devoted a great deal of time to alchemy (see above).

Newton was also a member of the Parliament of England for Cambridge University in 1689–90 and 1701–2, but according to some accounts his only comments were to complain about a cold draught in the chamber and request that the window be closed.

Newton moved to London to take up the post of warden of the Royal Mint in 1696, a position that he had obtained through the patronage of Charles Montagu, 1st Earl of Halifax, then Chancellor of the Exchequer. He took charge of England's great recoinage, somewhat treading on the toes of Lord Lovel, Governor of the Tower (and securing the job of deputy commissor of the temporary Chester branch for Edmond Halley). Newton became perhaps the best-known Master of the Mint upon the death of Thomas Neale in 1699, a position Newton held for the last 20 years of his life. These appointments were intended as sinecures, but Newton took them seriously, retiring from his Cambridge duties in 1701, and exercising his power to reform the currency and punish counterfeiters and counterfeeters.

As Warden, and afterwards Master, of the Royal Mint, Newton estimated that 20 percent of the coins taken in during the Great Recoinage of 1696 were counterfeit. Counterfeiting was high treason, punishable by the felon being hanged, drawn and quartered. Despite this, convicting even the most flagrant criminals could be extremely difficult. However, Newton proved equal to the task.

Disguised as a haberdash of bars and taverns, he gathered evidence of his own counsel.

For all the barriers placed to prossecution, and separating the branches of government, English law still had ancient and formidable customs of authority. Newton had himself made a justice of the peace in all the counties thereunto—such a draft of this matter he has inspected in a case of the first person in his life. His Philosophae Naturalis Principia Mathematica he must have been amending at the time.

Then he conducted more than 100 cross-examinations of witnesses, informers, and suspects between June 1698 and Christmas 1699. Newton successfully prosecuted 28 coiners.

As a result of a report written by Newton on 21 September 1717 to the Lords Commissioners of His Majesty's Treasury; the bimetallic relationship between gold and silver coins was changed by Royal proclamation on 22 December 1717, forbidding the exchange of gold guineas for more than $21 silver shillings. This inadvertently resulted in a silver shortage as silver coins were used to pay for imports, while exports were paid for in gold, effectively moving Britain from the silver standard to its first gold standard. It is a matter of debate as to whether he intended to do this or not. It has been argued that he had seen Newton conceived of his work at the Mint as a continuation of his alchemical work.

Newton was made President of the Royal Society in 1703 and an associate of the French Académie des Sciences. In his position at the Royal Society, Newton made an enemy of John Flamsteed, the Astronomer Royal, by prematurely publishing Flamsteed's Histoire Coelestis Britannica which Newton had used in his studies.

In April 1705, Queen Anne knighted Newton during a royal visit to Trinity College, Cambridge. The knighthood is likely to have been motivated by political considerations connected with the Parliamentary election in May 1705, rather than any recognition of Newton's scientific work or services as Master of the Mint. Newton was the second scientist to be knighted, after Sir Francis Bacon (1679).

Newton was one of many people who lost heavily when the South Sea Company collapsed. Their most significant trade was slaves, and according to his niece, he lost around £20,000 (then £2,000,000). He acquired a circle of admirers, including the Swiss-born mathematician Nicolas Fatio de Duillier, then Chancellor of the Exchequer. He took charge of England's great recoinage, somewhat treading on the toes of Lord Lovel, Governor of the Tower (and securing the job of deputy commissor of the temporary Chester branch for Edmond Halley). Newton became perhaps the best-known Master of the Mint upon the death of Thomas Neale in 1699, a position Newton held for the last 20 years of his life. These appointments were intended as sinecures, but Newton took them seriously, retiring from his Cambridge duties in 1701, and exercising his power to reform the currency and punish counterfeiters.

Towards the end of his life, Newton took up residence at Cranbury Park, near Winchester with his niece and her husband, until his death in 1727. His half-niece, Catherine Barton Conduitt, served as his hostess in social affairs at his house on Jersey Street in London; he was her "very loving Uncle," according to his letter to her when she was recovering from a miscarriage.

Newton died in his sleep on 20 March 1727 (OS 20 March 1726; NS 31 March 1727) and was buried in Westminster Abbey. Votivea may have been present at his funeral. A bachelor, he had divested much of his estate to relatives during his last years, and died intestate. After his death, Newton's hair was examined and found to contain mercury, probably resulting from his alchemist trials. Mercury poisoning could explain Newton's eccentricity in late life.

Newton never married. The French writer and philosopher Voltaire, who was in London at the time of Newton's funeral, said that he "was never sensitive to any passion, was not subject to the common failings of mankind, nor had any commerce with women—a circumstance which was assured me by the physician and surgeon who attended him in his last moments." The widespread belief that he had died a virgin has been commented on by writers such as mathematician Charles Hutton, economist John Maynard Keynes, and physicist Carl Sagan.

Newton did have a close friendship with the Swiss mathematician Nicolas Fatio de Duillier, whom he met in London around 1699. Their friendship came to an unexplained end in 1699. Some of their correspondence has survived.

In September of that year, Newton had a nervous breakdown which included sending wild accusatory letters to his friends Samuel Pepys and John Locke. His note to the latter included the charge that Locke "endeavoured to embroil me with women." He recovered.

**After death**

**Fame**

The mathematician Joseph-Louis Lagrange often said that Newton was the greatest genius who ever lived, and once stated that he was also "the most formidable, for we cannot find more than one object in the world to establish." English poet Alexander Pope was moved by Newton's accomplishments to write the famous epitaph:

> Nature and nature's laws lay hid in night; God said, "Let Newton be," and all was light.

God said "Let Newton be" and all was light.

Newton himself had been rather more modest of his own achievements, famously writing in a letter to Robert Hooke in February 1676:

> If I have discovered anything further it is by standing on the shoulders of giants.

Two writers think that the above quotation, written at a time when Newton and Hooke were in dispute over optical discoveries, was an oblique attack on Hooke (said to have been short and hunchbacked), rather than—or in addition to—a statement of modesty. On the other hand, the widely known proverb about standing on the shoulders of giants, published among others by seventeenth-century poet George Herbert (as a former master of the University of Cambridge and fellow of Trinity College) in his Jacula Prudentum (1651), has as its main point that "a dwarf on a giant's shoulders sees farther than the two," and so as its effect as an analogy would place Newton himself rather than Hooke as the "ladder".

In a later memoir, Newton wrote:

> I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.

In 1816, a tooth said to have belonged to Newton was sold for £730 ($US5,633) in London to an aristocrat who had it set in a ring. The Guiness World Records 2002 classified it as the most valuable tooth, which would be valued approximately £25,000 ($US35,700) in late 2001.

Albert Einstein kept a picture of Newton on his study wall alongside ones of Michael Faraday and James Clerk Maxwell. Newton remains influential to today's scientists, as demonstrated by a 2005 survey of members of Britain's Royal Society (formerly headed by Newton) asking who had had the greater effect on the history of science, Newton or Einstein. Royal Society scientists deemed Newton to have made the greater overall contribution.

In 1999, an opinion poll of 100 of today's leading physicists voted Einstein the "greatest physicist ever," with Newton the runner-up, while a parallel survey of rank-and-file physicists by the altiPhysicsWeb gave the top spot to Newton.
Commemorations

Newton's monument (1731) can be seen in Westminster Abbey, at the north of the entrance to the choir against the choir screen, near his tomb. It was executed by the sculptor Michael Rysbrack (1694–1770) in white and grey marble with design by the architect William Kent. The monument features a figure of Newton reclining on top of a sarcophagus, his right elbow resting on several of his great books and his left hand pointing to a scroll with a mathematical design. Above him is a pyramid and a celestial globe showing the signs of the Zodiac and the path of the comet of 1680. A relief panel depicts putti using instruments such as a telescope and prism.[141] The Latin inscription on the base translates as:

Here is buried Isaac Newton, Knight, who by a strength of mind almost divine, and mathematical principles peculiarly his own, explored the course and figures of the planets, the paths of comets, the tides of the sea, the disarrangements in rays of light, and, what no other scholar has previously imagined, the properties of the colours thus produced. Diligent, sagacious and faithful, in his expositions of nature, antiquity and the holy Scriptures, he vindicated by his philosophy the majesty of God mighty and good, and expressed the simplicity of the Gospel in his manners. Mortals rejoice that there has existed such and so great an ornament of the human race! He was born on 25 December 1642, and died on 20 March 1726[7].—Translation from G.L. Smyth, The Monuments and Genii of St. Paul's Cathedral, and of Westminster Abbey (1826), I, 703—7.[142]

From 1979 until 1988, an image of Newton designed by Harry Ecclestone appeared on Series D £1 banknotes issued by the Bank of England (the last £1 notes to be issued by the Bank of England). Newton was shown on the £1 notes in three different poses:

- In popular culture

  Main article: Isaac Newton in popular culture

  Religious views

  Main article: Religious views of Isaac Newton

Although born into an Anglican family, by his thirties Newton held a Christian faith that, had it been made public, would not have been considered orthodox by mainstream Christianity.[14] In recent times he has been described as a heretic.[15] By 1672 he had started to record his theological researches in notebooks which he showed to no one and which have only recently been examined. They display an extensive knowledge of early church writings and show that in the conflict between Athanasius and Arius which defined the Church, he took the side of Arius, the loser, who rejected the conventional view of the Trinity. Newton "recognized Christ as a divinity mediator between God and man, who was subordinate to the Father who created him."[146] He was especially interested in prophecy, but for him, "the great sospexy was trinitarianism."[147]

Newton tried unsuccessfully to obtain one of the two fellowships that exempted the holder from the ordination requirement. At the last moment in 1675 he received a dispensation from the government that excused him and all future holders of the Lucasian chair.[148]

In Newton's view, worshipping Christ as God was idolatry, to him the fundamental sin.[149] Historian Stephen D. Snobelen says of Newton, "Isaac was a heretic. But ... he never made a public declaration of his private faith—which the orthodox would have deemed extremely radical. He hid his faith so well that scholars are still unravelling his personal beliefs.[144] Snobelen concludes that Newton at least was a Socinian sympathiser (he owned and had thoroughly read at least eight Socinian books), possibly an Arian and almost certainly an anti-trinitarian.[141]

In a minority view, T.C. Pildain argues that Newton held the Eastern Orthodoxy view on the Trinity.[145] However, this type of view has lost support of late with the availability of Newton's theological papers.[141] Among the notes found a book and accompanied by a telescope, a prism and a map of the Solar System.[141]

Although the laws of motion and universal gravitation became Newton's best-known discoveries, he warned against using them to view the Universe as a mere machine, as if he knew God's mind. He believed in a rationally conceived and proportionate system of the world: "Such a wonderful uniformity in the planetary system must be allowed the effect of choice". But Newton insisted that divine intervention would eventually be required to reform the system, due to the Corruptions of Scripture and the need for a final act of grace to reconcile the sin of humanity. He said, "Gravity explains the motions of the planets, but it cannot explain who set the planets in motion. God governs all things and knows all that is or can be done."[140]

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Effect on religious thought

Newton and Robert Boyle's approach to the mechanical philosophy was promoted by rationalist pamphleterists as a viable alternative to the pantheists and enthusiasts, and was accepted hesitantly by orthodox preachers as well as dissident preachers like the latitudinarians[238] The clarity and simplicity of science was seen as a way to combat the emotional and mystical elements of Christianity, were given their foundation with Boyle's mechanical conception of the Universe. Newton gave Boyle's ideas their completion through his philosophy of natural law, and perhaps more importantly, was very successful in popularising them.[239]

Newton saw God as the master creator whose existence could not be denied in the face of the grandeur of all creation.[238][240][241] The attacks made against pre-Enlightenment 'magical thinking', and the mystical elements of Christianity, were given their foundation with Boyle's mechanical conception of the Universe. Newton gave Boyle's ideas their completion through his philosophy of natural law, and perhaps more importantly, was very successful in popularising them.[239]

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Occult

See also: Isaac Newton's occult studies and eschatology

In a manuscript he wrote in 1704 in which he describes his attempts to extract scientific information from the Bible, he estimated that the world would end no earlier than 3 April, AD 33, which agrees with one traditionally accepted date.[144]

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Occult

Newton found the world of magic and alchemy fascinating and spent a great deal of time investigating it. He wrote extensively on the subject of alchemy and published several works on the subject. He was the author of the famous correspondence of Newton and Robert Boyle, which is considered one of the most important documents in the history of science. Newton was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a supporter of the natural sciences, and he believed that by understanding the natural world, humans could gain a better understanding of the divine. He was also a suppor
should it not go sideways, or upwards? but constantly to the earths center? assuredly, the reason is, that the earth draws it. there must be a drawing power in matter. & the sum of the drawing power in the quantity. therefore the apple draws the earth, as well as the earth draws the apple.

John Conduit, Newton's assistant at the Royal Mint and husband of Newton's niece, also described the event when he wrote about Newton's life:

"Thought. Why not as high as the Moon said he to himself & if so, that must influence her motion & perhaps retain her in her orbit, whereupon he fell a calculating what would be the effect of this, as to the sum of the other orbital motions, and hence named it "universal gravitation".

It is known from his notebooks that Newton was grappling in the late 1660s with the idea that terrestrial gravity extends, in an inverse-square proportion, to the Moon; however it took him two decades to develop the full-fledged theory.[13]

The question was not whether gravity existed, but whether it extended so far from Earth that it could also be the force holding the Moon to its orbit. Newton showed that if the force decreased as the inverse square of the distance, one could indeed calculate the Moon's orbital period, and get good agreement. He guessed the same force was responsible for other orbital motions, and hence named it "universal gravitation".

Various trees are claimed to be "the" apple tree which Newton describes. The King's School, Grantham, claims that the tree was purchased by the school, uprooted and transported to the headmaster's garden some years later. The staff of the [now] National Trust-owned Woolsthorpe Manor dispute the claim, and claim that a tree present in their gardens is the one described by Newton. A descendant of the original tree[14] can be seen growing outside the main gate of Trinity College, Cambridge, beside the room Newton lived in when he studied there. The National Fruit Collection at Brogdal[15] can supply grafts from that tree, which appears identical to Flower of Kent, a coerce-flushed cooking variety.[16]"
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- Works by Isaac Newton at Project Gutenberg
- Works by Isaac Newton at LibriVox (public domain audiobooks)
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Academic offices

Preceded by Isaac Barrow

Lucasian Professor of Mathematics at the University of Cambridge 1669–1702

Preceded by The Lord Somers

President of the Royal Society 1702–1727

Succeeded by William Whiston

Parliament of England

Preceded by Robert Brady

Member of Parliament for Cambridge University 1696–1690

Succeeded by Sir Hans Sloane, Bt.

Preceded by Anthony Hammond

Member of Parliament for Cambridge University 1701–1702

Succeeded by George Parker

Government offices

Preceded by Benjamin Overton

Warden of the Mint 1696–1700

Succeeded by Sir John Stanley, Bt.

Preceded by Thomas Neale

Master of the Mint 1700–1727

Succeeded by John Conduit

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De analysi per aequationes numero terminorum infinitas (1669, published 1711) – Method of Fluxions (1671) – De motu corporum in gyrum (1684) – Philosophiae Naturalis Principia Mathematica (1687) (General Scholium (1712)) – Opticks (1704) – The Quarterly (1704) – Arithmetica Universalis (1729)

Other writings

Notes on the Jewish Temple – Newton’s views on space, time, and motion – Newton’s Castle – Newton’s Dark Secrets

Newtonianism


Life


Friends and family


Discoveries and inventions


Phrases

"Hypothesis non fingi", “Standing on the shoulders of giants”

Theory concepts

Keplers’s laws of planetary motion – Problem of Apollonius – Related


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Scientists whose names are used as SI units

Base units

André-Marie Ampère – William Thomson, 1st Baron Kelvin

Derived units


See also

Scientists whose names are used as non-SI units – Scientists whose names are used in physical constants

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Presidents of the Royal Society


Complete roster: 1660s – 1700s – 1790s – 1900s – 2000s

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