ISAAC NEWTON

PHYSICS, GRAVITY & LAWS OF MOTION

Born
January 4, 1643
Lincolnshire, England

Died
March 31, 1727
London, England

By Cynthia Stokes Brown, adapted by Newsela
Sir Isaac Newton developed the three basic laws of motion and the theory of universal gravity, which together laid the foundation for our current understanding of physics and the Universe.
Isaac Newton was born prematurely on January 4, 1643. He grew up with his grandparents on a farm after his father died and his mother moved away.

As a child he had few playmates. He amused himself by thinking about the world around him. At school, Newton didn’t play much with the other boys. Instead, he made wooden models, kites, sundials, and even a water clock.

When he was 15, his mother took him out of school to become a farmer. But the director of his school recognized the boy’s talents and convinced his mother to let him return to school.

Newton went Cambridge University from 1661 to 1665. The university temporarily closed soon after he got his degree because people in European cities were dying from the plague.

Early discoveries

Newton moved back to his grandparents’ farm for two years. During this time, he proved that “white” light was composed of all colors and started to figure out calculus and universal gravitation. He did all this before he was 24 years old.

Newton was on his grandparents’ farm when he sat under the famous apple tree and watched an apple fall to the ground.

He wondered if the force that pulled the apple to the ground could extend out to the Moon and keep it in its orbit around Earth. Perhaps that force extended throughout the whole Universe.

After the plague abated, Newton returned to Cambridge. He earned his master’s degree and became a professor of mathematics there.

His lectures bored many of his students, but he continued his own thinking and experiments. Later, he became the president of the Royal Society of London for Improving Natural Knowledge — the top organization of scientists in England.
Laws of motion and gravity

Newton’s most important book was written in Latin; its English title was Mathematical Principles of Natural Philosophy and was published in 1687.

It proved to be one of the most influential works in the history of science. The book explained Newton’s three Laws of Motion and the Law of Universal Gravitation.

Newton used advanced math and observation of the heavens to develop his laws. To track the stars and planets, he used a new type of telescope that he designed and built himself.

Newton’s three Laws of Motion

01 An object at rest will stay at rest unless a force is applied to it. An object in motion will stay in motion along a straight line unless an external force is applied to it.

02 An object will accelerate if force is applied to it. The acceleration will happen in the direction of the force. The acceleration will be less as the object gets bigger.

03 For every action there is always an equal and opposite reaction.

Putting these laws together, Newton was able to state the Law of Universal Gravitation: the gravitational pull between two objects decreases as the objects get farther apart.

Newton’s Universe was a powerful idea because it said that all objects move according to rational principles.

Everything, from apples to planets, obeys the same unchanging laws. By combining physics, mathematics, and astronomy, Newton made a giant leap in human understanding of Earth and the cosmos.

Calculus

Newton came up with a new mathematical method for dealing with changing quantities. It is now called calculus. Newton didn’t publish his method, he used it to solve problems.

Later, the German scientist Gottfried Wilhelm von Leibniz also worked out calculus. His system was easier to use.

Newton accused Leibniz of stealing his ideas, but historians now believe that each invented calculus independently.
Timeline of Newton’s life

- **1640**: Blaise Pascal invents the first mechanical calculator
- **1651**: First bus line (horse-drawn) in Paris
- **1654–1661**: Attends King’s School at Grantham
- **1660**: Graduate studies at Cambridge
- **1661–1665**: Attends Cambridge University
- **1665–1666**: Retreats to Woolsthorpe Manor; plague and fire in London
- **1666–1668**: Professor of Mathematics at Cambridge (the prestigious Lucasian Chair)
- **1667**: Publication of *Mathematical Principles of Natural Philosophy*
- **1669**: Professor of Mathematics at Cambridge (the prestigious Lucasian Chair)
- **1670**: Académie des Sciences founded in France by Louis XIV
- **1680**: Dutch biologist Antonie Van Leeuwenhoek uses a microscope to view one-celled animals
- **1680**: Mughal Emperor Aurangzeb begins a 49-year rule of India
- **1681**: Royal Society for Improving Natural Knowledge founded in London
- **1687**: Represents Cambridge University in the parliament that passes the Bill of Rights, limiting the powers of William III and Mary II
- **1696**: Moves to London as Warden of the Mint, later Master of the Mint

During the time of Newton:
Newton was made a knight by Queen Anne in 1705. At his death in 1727, he was buried in London’s Westminster Abbey. Shortly before he died, Newton remarked:

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 seashore and diverting myself in now and then finding a smoother pebble or prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me.