Scientist – Theory - Discovery

عالم – نظرية علميه – إكتشاف علمي

Isaac Newton إسحق نيوتن

Laws of Motion قوانين الحركة

NEWTON'S LAWS OF MOTION

In his landmark work, *Philosophiae naturalis principia mathematica,* Isaac Newton outlined three laws of motion and a universal law of gravitation.

The first law of motion, the inertial law, is more commonly known by the phrase the conservation of momentum. This law states that a body will continue at rest or in uniform motion in a straight line unless acted upon by some other force. In other words, an object will keep doing what it is doing unless an outside force compels it to change.

The second law of motion, the force law, says that the momentum of an object can change only if an outside action influences it. The amount and direction of that change is directly proportional to the outside force and inversely proportional to the object's mass: force equals mass times acceleration ($F = ma$).

Colliding billiard balls illustrate many of Newton's concepts of motion.

The third law, the reaction law, states that for every action there is an equal and opposite reaction. This theory implies that all forces occur in pairs that are mutually equal to and opposite each other. Newton used these laws, together with the laws of planetary motion discovered by Johannes Kepler, to analyze planetary orbits.

Finally, Newton's universal law of gravity states that all objects universally attract one another, and that the amount of gravitational force exerted is proportional to an object's mass and inversely proportional to the square of the distance between the two objects of attraction.

This theory is expressed in the equation $F = Gm_1m_2/r^2$, where F is the force of gravitational attraction between two spherical bodies, m_1 and m_2, whose centers are separated by a distance, r, and where G represents the gravitational constant.

ISAAC NEWTON

The great English physicist

1642
Born on December 25 at Woolsthorpe Manor in Lincolnshire, England.

1661
Matriculates at Trinity College, Cambridge; exposed to philosophy and ideas, he begins to question the physics and mechanics of the world around him.

1665
Moves back to Woolsthorpe, when the plague hits Europe; Trinity College closes temporarily, .

1666
At Woolsthorpe, works out groundbreaking ideas in three areas: calculus, light and optics, and universal gravitation.

1672
Elected fellow of the Royal Society of London.

1672
Sends Henry Oldenburg, secretary of the Royal Society, his first "Letter on Light and Colors," which is read to society members and criticized by the eminent English physicist Robert Hooke.

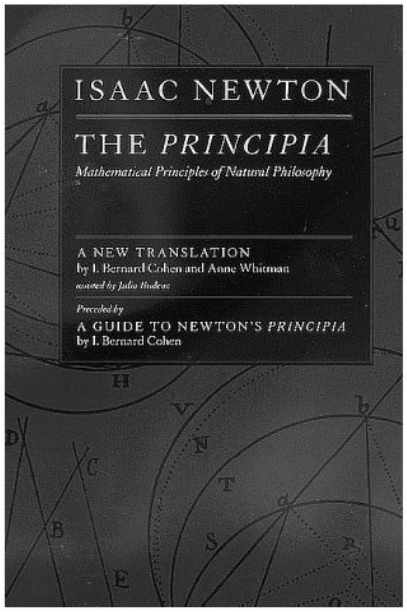
1679
Begins a correspondence with Robert Hooke on the problem of planetary motion.

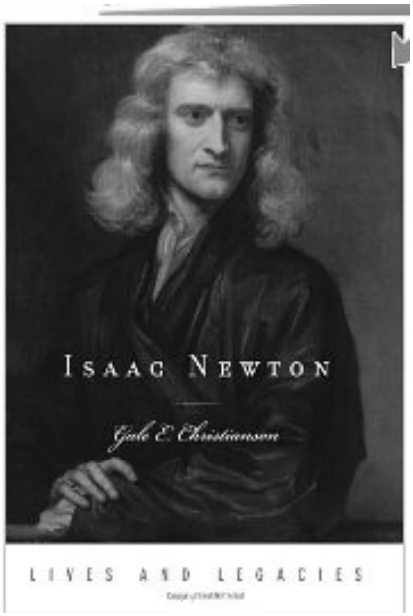
1687
Publishes his single greatest work, the *Philosophia naturalis principia mathematica,* outlining his laws of motion and the law of universal gravitation.

1703
Elected president of the Royal Society of London.

1704
Publishes *Opticks,* in which he describes experiments and discoveries concerning the nature of light.

1727
Dies on March 20 in London.


ISAAC NEWTON
THE PRINCIPIA
Mathematical Principles of Natural Philosophy
A NEW TRANSLATION
by I. Bernard Cohen and Anne Whitman
assisted by Julia Budenz
Preceded by
A GUIDE TO NEWTON'S PRINCIPIA
by I. Bernard Cohen


ISAAC NEWTON
LIVES AND LEGACIES

1687 / 1999 ed.