

Sir Isaac Newton

*„Men build too many walls
and not enough bridges.“*

Isaac Newton

- Was born on December 25, 1642.
- He was an English mathematician, physicist, astronomer, theologian, and author who is widely recognised as one of the most influential scientists of all time, and a key figure in the scientific revolution.

Early life

His father, also named Isaac Newton, had died three months before.

Born prematurely, Newton was a small child; his mother Hannah Ayscough reportedly said that he could have fit inside a quart mug.

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.

Newton disliked his stepfather and maintained some enmity towards his mother for marrying him, as revealed by this entry in a list of sins committed up to the age of 19

Early life

From the age of about twelve until he was seventeen, Newton was educated at The King's School, Grantham, which taught Latin and Greek and probably imparted a significant foundation of mathematics.



Middle years

He composed *Principia Mathematica* during 1685 and 1686, and it was published in a first edition on 5 July 1687. Widely regarded as one of the most important works in both the science of physics and in applied mathematics during the Scientific Revolution, the work underlies much of the technological and scientific advances from the Industrial Revolution which it helped to create.

NO 16-266

PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA.

^{Autore} ^{anno} J. S. NEWTON ^{Equite f. uato,} Trin. Coll. Cantab. Soc. Matheseos
Professore ^{Lucasiano,} & Societatis Regiæ Sodali.

~~et Societatis Regiæ Societatis~~ *præside.*

IMPRIMATUR.
S. PEPY S, Reg. Soc. PRÆSES.

Julii 5. 1686.

LONDINI,

Jussu Societatis Regiæ ac Typis Josephi Streater. Prostat apud
plures Bibliopolas. Anno MDCLXXXVII.

Mechanics and gravitation

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](#).

They contributed to many advances during the Industrial Revolution which soon followed and were not improved upon for more than 200 years.

Many of these advancements 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.

Classical mechanics

Classical mechanics describes the motion of macroscopic objects, from projectiles to parts of machinery, and astronomical objects, such as spacecraft, planets, stars and galaxies.



**If I have seen further than
others, it is by standing upon
the shoulders of giants.**



NEWTON'S LAW

And forces, vectors, gravity,
momentum, impulse and moments

Newton published his three laws in 1687 in his *Principia Mathematica*.

The laws are quite intuitive (although it seems a bit strange to attach the adjective “intuitive” to a set of statements that took millennia for humans to write down). They may be formulated as follows (although there are other possible variations).

Newton's First Law

Law of inertia

A body moves with constant velocity (which may be zero) unless acted on by a force.

Objects at rest remain at rest

Objects in motion remain in motion

UNTIL YOU APPLY A FORCE

Newton's Second Law

The time rate of change of the momentum of a body equals the force acting on the body.

$$\mathbf{F} = m \cdot \mathbf{a}$$

What forces are important in sports?

Newton's Third Law

The forces two bodies apply to each other are equal in magnitude and opposite in direction.

For every action there is an equal and opposite reaction. But do they act on the same body?

Newton unit

1 N = force that accelerates 1kg mass by 1ms^{-2}

How he discovered the law of gravity?

Sir Isaac Newton was asked how he discovered the law of gravity.

He replied,

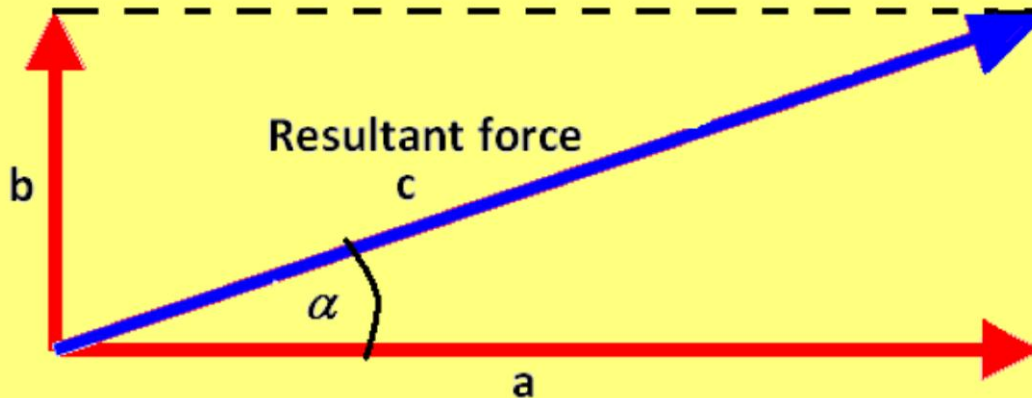
"By thinking about it all the time."

Non-parallel forces

Can add vectors in different directions:

$$c^2 = a^2 + b^2$$

$$\alpha = \tan^{-1} \frac{a}{b}$$



Vectors

The resultant forces is not a new force.
It is a sum of the 2 components.
Use either the resultant or component in
any calculation, not both!

Death

Newton died in his sleep in London on 20 March 1727

His body was buried in Westminster Abbey.

Voltaire 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.

His papers went to John Conduitt and Catherine Barton.

After his death, Newton's hair was examined and found to contain mercury, probably resulting from his alchemical pursuits. Mercury poisoning could explain Newton's eccentricity in late life.

Westminster Abbey

Sir Isaac Newton's Tomb



The Latin inscription on Newton's tomb, despite its bombastic language, is thus fully justified in proclaiming, "Mortals! rejoice at so great an ornament to the human race!"

Quotes

If I have seen further than others, it is by standing upon the shoulders of giants.

*What we know is a drop,
what we don't know is an ocean.*