

The Most Mind-boggling Equations That Changed The World Forever

Equations are the language of the universe. They provide scientists, mathematicians, and innovators with the tools to understand the fundamental laws of nature and shape the course of human history. In this article, we will explore several equations that have had a profound impact on our understanding of the world and continue to push the boundaries of human knowledge. Get ready to have your mind blown!

1. $E=mc^2$: The Mass-energy Equivalence Equation

Arguably the most famous equation ever written, Albert Einstein's $E=mc^2$ revolutionized our understanding of the relationship between mass and energy. This equation, derived in 1905, demonstrates that mass and energy are interchangeable and can be converted into one another. It laid the foundation for the development of nuclear energy and the atomic bomb, ushering humanity into the atomic age.

A few important equations of Albert Einstein's:

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Time dilation and space contraction:

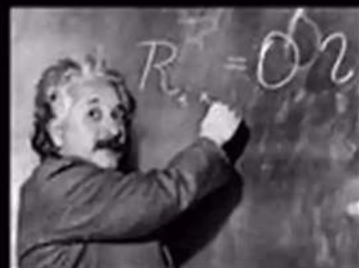
$$\Delta t = \frac{\Delta t_0}{\sqrt{1 - \frac{v^2}{c^2}}}, \quad L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

Mass-energy equation:

$$E = mc^2$$

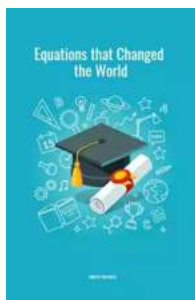
Photoelectric equation:

$$E = K_{max} + \varphi, \quad \varphi = hf = \frac{hc}{\lambda}$$



Field equation with the cosmological constant Λ :

$$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R + g_{\mu\nu}\Lambda = \frac{8\pi G}{c^4}T_{\mu\nu}$$



Equations that changed the world

by Alberto Carretero (Kindle Edition)

★★★★★ 4 out of 5

Language	: English
File size	: 1156 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
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The implications of $E=mc^2$ continue to shape our world today. It is a crucial component of particle physics and helps us decipher the mysteries of the cosmos, explaining the workings of stars, black holes, and even the origin of the universe.

2. The Laws of Motion: $F=ma$

Isaac Newton's three laws of motion, described by the equation $F=ma$, are the cornerstone of classical mechanics. This equation elegantly represents the relationship between force, mass, and acceleration, providing a mathematical framework to explain the motion of objects.

Newton's laws of motion fundamentally transformed our understanding of the physical world. They enabled scientists to predict and explain the movement of celestial bodies, laying the groundwork for space exploration and the groundbreaking technological advancements we enjoy today.

Calculus

$$\lim_{h \rightarrow 0} \frac{f(a + h) - f(a)}{h}$$

The 'discovery' of calculus is commonly attributed to Isaac Newton, exemplified by the often-repeated story of an apple falling onto his head, leading the young genius to develop theories of planetary motion and inventing calculus as a by product.

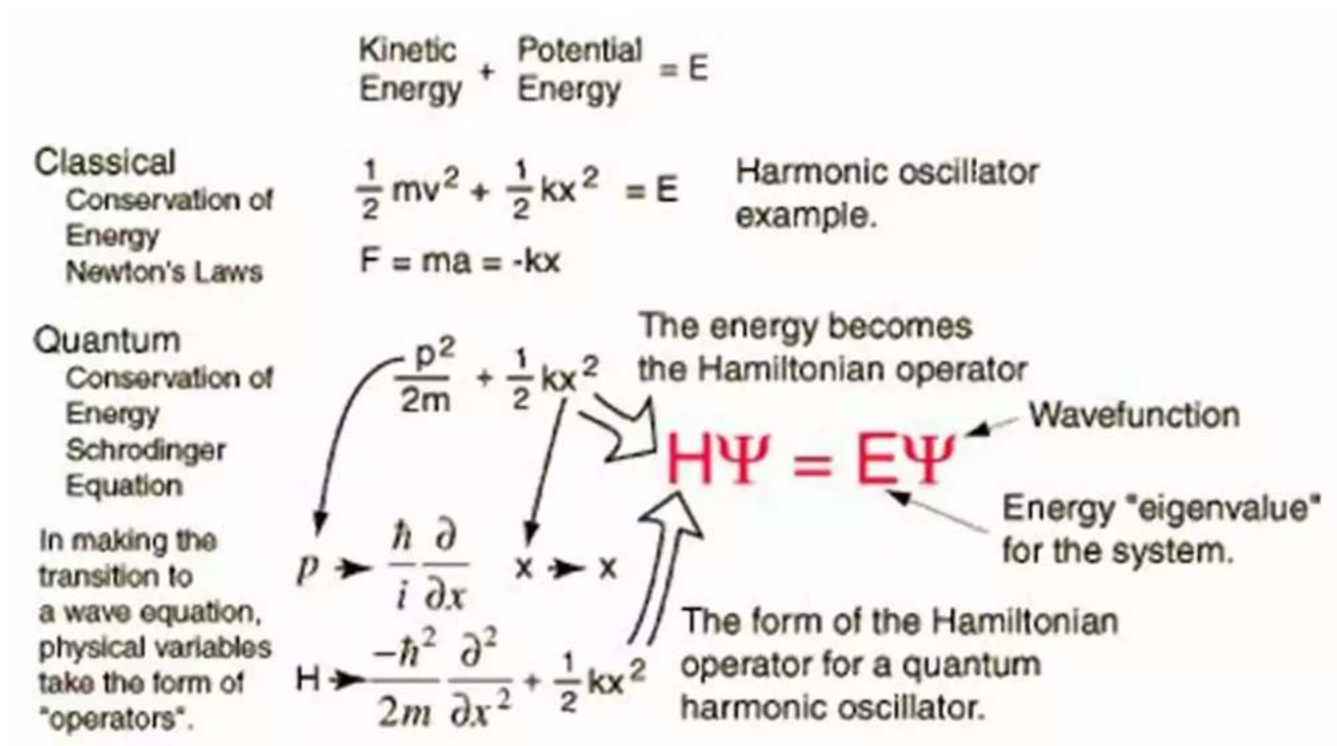
Today, calculus is a fundamental subject taught in schools around the world.

@MathsOfTheUniverse

3. Schrödinger's Equation: Understanding Quantum Mechanics

In 1925, Erwin Schrödinger formulated a wave equation that revolutionized our understanding of the microscopic world. Schrödinger's equation explains the behavior of quantum particles, such as electrons, by describing them as waves of probabilities.

This equation, denoted as $\Psi(x, t)$, enabled physicists to accurately predict the behavior of subatomic particles and opened the door to countless technological breakthroughs. Quantum mechanics has paved the way for the development of transistors, lasers, and other modern electronic devices that power our daily lives.



4. The Law of Universal Gravitation: $F=G(m_1*m_2)/r^2$

First enunciated by Isaac Newton, the law of universal gravitation describes the gravitational force between two objects. Expressed as $F=G(m_1*m_2)/r^2$, this equation quantifies the force that attracts any two objects in the universe, based on their masses and the distance between them.

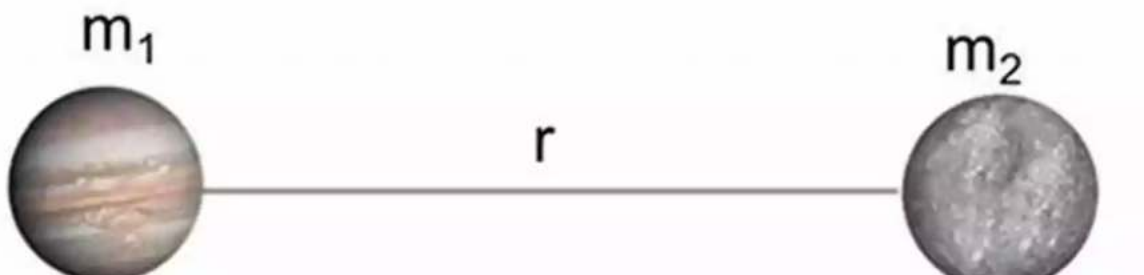
The law of universal gravitation united celestial mechanics and terrestrial physics, allowing us to comprehend the motions of planets, moons, and other astronomical bodies. It laid the groundwork for space exploration and

accurately predicted the existence and location of celestial bodies, leading to groundbreaking missions like the moon landing.

force Gravitational constant mass

$$F = G \frac{m_1 m_2}{r^2}$$

distance

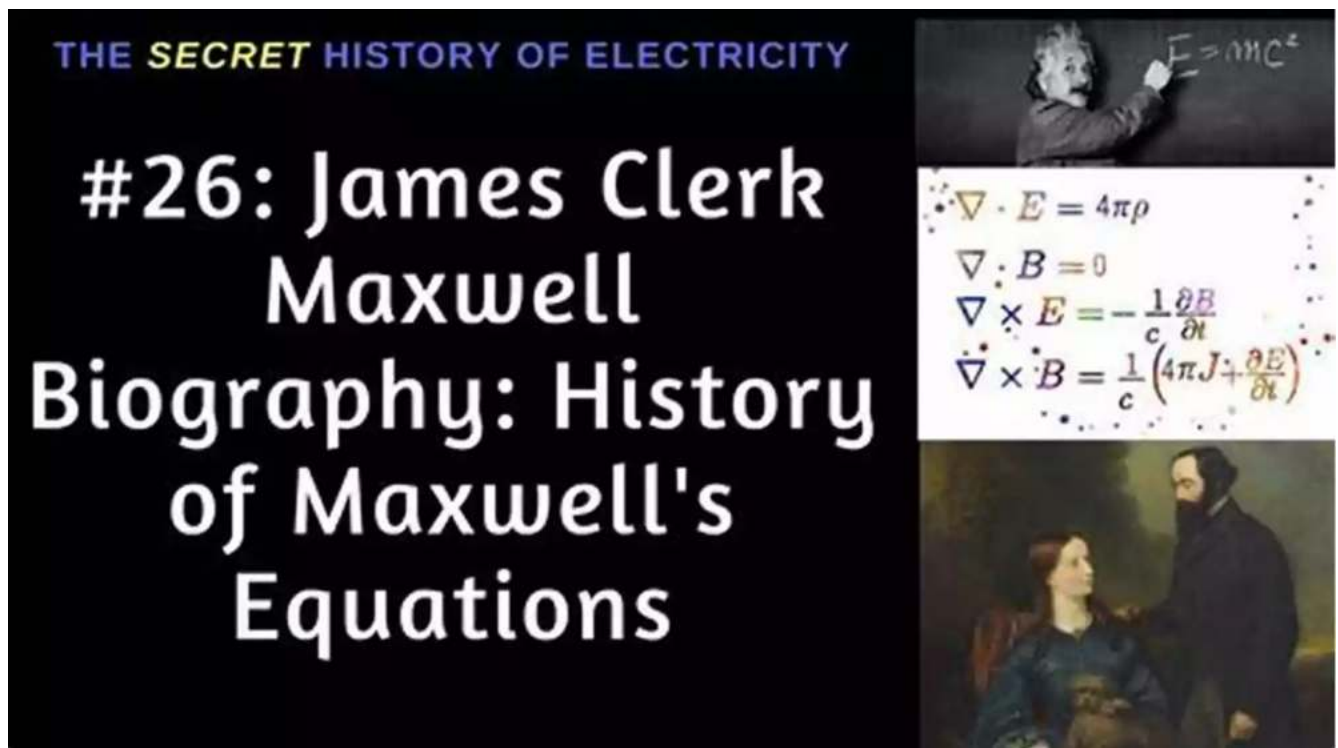


The diagram illustrates Newton's Law of Universal Gravitation. It features the equation $F = G \frac{m_1 m_2}{r^2}$ with handwritten labels and arrows identifying each term: 'force' points to F , 'Gravitational constant' points to G , 'mass' points to m_1 and m_2 , and 'distance' points to r^2 . Below the equation, a visual representation shows two celestial bodies, labeled m_1 and m_2 , connected by a horizontal line representing the distance r . The body on the left is depicted as Jupiter, and the body on the right is depicted as the Moon.

5. Maxwell's Equations: Electromagnetic Wave Theory

In the 19th century, James Clerk Maxwell developed four fundamental equations that unite electricity, magnetism, and light into a single consistent theory. These equations, known as Maxwell's equations, describe the behavior of electric and magnetic fields and paved the way for the understanding of electromagnetic waves.

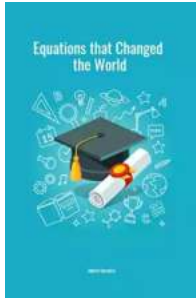
Maxwell's equations revolutionized communication, enabling the development of radio waves, televisions, and other wireless technologies that define our modern world. They also laid the groundwork for the development of quantum electrodynamics, a crucial aspect of quantum field theory.



Equations have the power to transform our understanding of the world, open new frontiers of knowledge, and drive technological advancements that shape our lives. From the mass-energy equivalence equation to Maxwell's equations, each of these formulas represents a brilliant mind's attempt to unravel the mysteries surrounding us.

By delving deeper into the equations that changed the world, we gain a profound appreciation for the brilliance of these mathematical expressions. They guide our exploration of the universe and have the potential to reshape our future.

So next time you encounter an equation, take a moment to marvel at the profound impact it may have had and the doors it continues to open for humanity's endless pursuit of knowledge.



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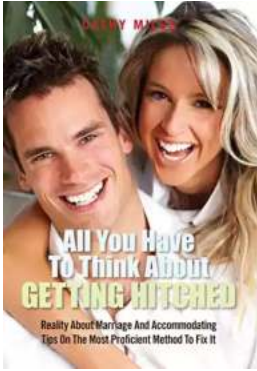
The brightest minds in history used mathematics to form the foundations, as we measured and understood our universe.

Several times they proved that it took only one formula, even if simple, to change the courses of humanity.

These equations present the formulas that explain the universe from its conception and the relationship between universal quantities.

A short but valuable eBook, written objectively for you who cares about it, so do not waste time and good reading, as Galileo Galilei has said:

"Mathematics is the alphabet with which God wrote the Universe."



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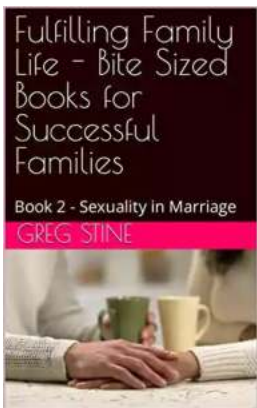
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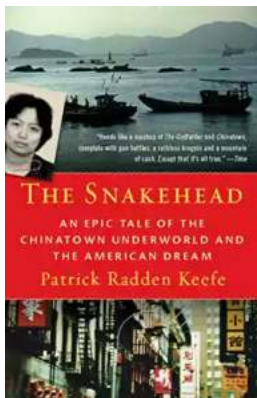
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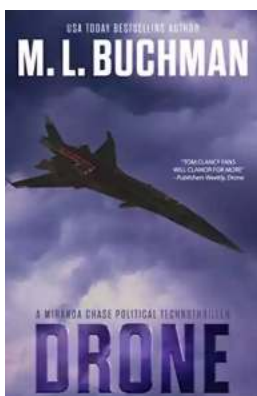
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