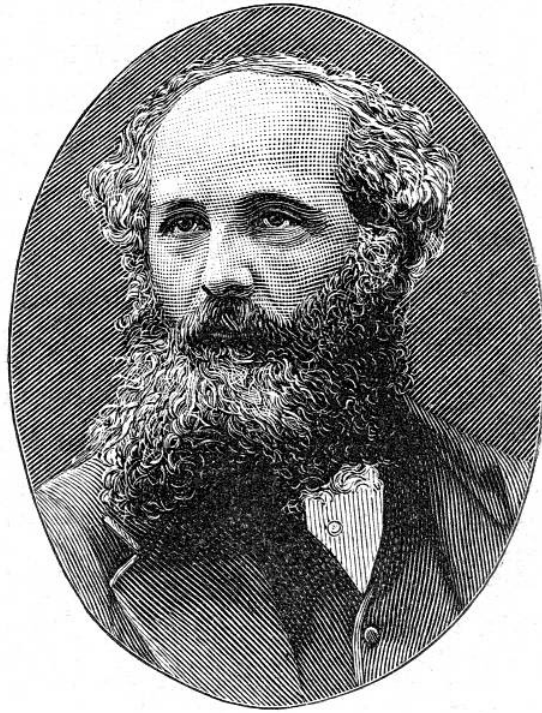


Badass equations



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1 Let there be light!

1. Gauss's Law: $\nabla \cdot \mathbf{D} = \rho_f$
2. Gauss's law for magnetism: $\nabla \cdot \mathbf{B} = 0$
3. Faraday's law of induction: $\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$
4. Ampère's circuital law : $\nabla \times \mathbf{H} = \mathbf{J}_f + \frac{\partial \mathbf{D}}{\partial t}$

1.1 First Badass

James Clerk Maxwell (13 June 1831 – 5 November 1879) was a Scottish scientist in the field of mathematical physics. His most notable achievement was to formulate the classical theory of electromagnetic radiation, bringing together for the first time electricity, magnetism, and light as different manifestations of the same phenomenon. Maxwell's equations for electromagnetism have been called the "second great unification in physics" after the first one realised by Isaac Newton.

With the publication of "A Dynamical Theory of the Electromagnetic Field" in 1865, Maxwell demonstrated that electric and magnetic fields travel through space as waves moving at the speed of light. Maxwell proposed that light is an undulation in the same medium that is the cause of electric and magnetic phenomena. The unification of light and electrical phenomena led to the prediction of the existence of radio waves.

Maxwell helped develop the Maxwell–Boltzmann distribution, a statistical means of describing aspects of the kinetic theory of gases. He is also known for presenting the first durable colour photograph in 1861 and for his foundational work on analysing the rigidity of rod-and-joint frameworks (trusses) like those in many bridges.

His discoveries helped usher in the era of modern physics, laying the foundation for such fields as special relativity and quantum mechanics. Many physicists regard Maxwell as the 19th-century scientist having the greatest influence on 20th-century physics. His contributions to the science are considered by many to be of the same magnitude as those of Isaac Newton and Albert Einstein. In the millennium poll – a survey of the 100 most prominent physicists – Maxwell was voted the third greatest physicist of all time, behind only Newton and Einstein. On the centenary of Maxwell's birthday, Einstein described Maxwell's work as the "most profound and the most fruitful that physics has experienced since the time of Newton".

2 Let there be relativity!

- Einstein's Field Equations: $R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}$

2.1 Second Badass, or first?

Albert Einstein (14 March 1879 – 18 April 1955) was a German-born theoretical physicist who developed the theory of relativity, one of the two pillars of modern physics (alongside quantum mechanics). His work is also known for its influence on the philosophy of science. He is best known by the general public for his mass–energy equivalence formula $E = mc^2$ (which has been dubbed "the world's most famous equation"). He received the 1921 Nobel Prize in Physics "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect", a pivotal step in the evolution of quantum theory.

Near the beginning of his career, Einstein thought that Newtonian mechanics was no longer enough to reconcile the laws of classical mechanics with the laws of the electromagnetic field. This led him to develop his special theory of relativity during his time at the Swiss Patent Office in Bern (1902–1909), Switzerland. However, he realized that the principle of relativity could also be extended to gravitational fields and—with his subsequent theory of gravitation in 1916—he published a paper on general relativity. He continued to deal with problems of statistical mechanics and quantum theory, which led to his explanations of particle theory and the motion of molecules. He also investigated the thermal properties of light which laid the foundation of the photon theory of light. In 1917, he applied the general theory of relativity to model the large-scale structure of the universe.

Between 1895 and 1914, he lived in Switzerland (except for one year in Prague, 1911–12), where he received his academic diploma from the Swiss Federal Polytechnic in Zürich (later the Eidgenössische Technische Hochschule, ETH) in 1900. He later taught at that institute as a professor of theoretical physics between 1912 and 1914 before he left for Berlin. In 1901, after being stateless for more than five years, he acquired Swiss citizenship, which he kept for the rest of his life. In 1905, he was awarded a PhD by the University of Zürich. The same year, his *annus mirabilis* (miracle year), he published four groundbreaking papers, which were to bring him to the notice of the academic world, at the age of 26.

He was visiting the United States when Adolf Hitler came to power in 1933 and—being Jewish—did not go back to Germany, where he had been a professor at the Berlin Academy of Sciences. He settled in the United States, becoming an American citizen in 1940. On the eve of World War II, he endorsed a letter to President Franklin D. Roosevelt alerting him to the potential development of "extremely powerful bombs of a new type" and recommending that the U.S. begin similar research. This eventually led to what would become the Manhattan Project. Einstein supported defending the Allied forces, but generally denounced the idea of using the newly discovered nuclear fission as

a weapon. Later, with the British philosopher Bertrand Russell, he signed the Russell–Einstein Manifesto, which highlighted the danger of nuclear weapons. He was affiliated with the Institute for Advanced Study in Princeton, New Jersey, until his death in 1955.

Einstein published more than 300 scientific papers along with over 150 non-scientific works. His intellectual achievements and originality have made the word "Einstein" synonymous with "genius".

3 Quotes to reflect upon

"Only a life lived for others is a life worthwhile." -Albert Einstein

"The important thing is not to stop questioning. Curiosity has its own reason for existing." -Albert Einstein

"Physics is like sex: sure, it may give some practical results, but that's not why we do it." - R. Feynman

"Nobody ever figures out what life is all about, and it doesn't matter. Explore the world. Nearly everything is really interesting if you go into it deeply enough." - R. Feynman

"The highest forms of understanding we can achieve are laughter and human compassion." - R. Feynman