***Science and technology in the United Kingdom***

**Science and technology in the United Kingdom** has a long history, producing many important figures and developments in the field. Major theorists from the UK include [Isaac Newton](http://en.wikipedia.org/wiki/Isaac_Newton) whose [laws of motion](http://en.wikipedia.org/wiki/Newton%27s_laws_of_motion) and illumination of [gravity](http://en.wikipedia.org/wiki/Gravitation) have been seen as a keystone of modern science and [Charles Darwin](http://en.wikipedia.org/wiki/Charles_Darwin) whose theory of evolution by [natural selection](http://en.wikipedia.org/wiki/Natural_selection) was fundamental to the development of modern biology. Major scientific discoveries include [hydrogen](http://en.wikipedia.org/wiki/Hydrogen) by [Henry Cavendish](http://en.wikipedia.org/wiki/Henry_Cavendish), [penicillin](http://en.wikipedia.org/wiki/Penicillin) by [Alexander Fleming](http://en.wikipedia.org/wiki/Alexander_Fleming), and the structure of [DNA](http://en.wikipedia.org/wiki/DNA), by [Francis Crick](http://en.wikipedia.org/wiki/Francis_Crick) and others. Major engineering projects and applications pursued by people from the UK include the [steam locomotive](http://en.wikipedia.org/wiki/Steam_locomotive) developed by [Richard Trevithick](http://en.wikipedia.org/wiki/Richard_Trevithick) and [Andrew Vivian](http://en.wikipedia.org/wiki/Andrew_Vivian), the [jet engine](http://en.wikipedia.org/wiki/Jet_engine) by [Frank Whittle](http://en.wikipedia.org/wiki/Frank_Whittle) and the [World Wide Web](http://en.wikipedia.org/wiki/World_Wide_Web) by [Tim Berners-Lee](http://en.wikipedia.org/wiki/Tim_Berners-Lee). Scientists from the UK continue to play a major role in the development of science and technology and major technological sectors include the aerospace, motor and pharmaceutical industries.

Important advances made in the UK[[edit](http://en.wikipedia.org/w/index.php?title=Science_and_technology_in_the_United_Kingdom&action=edit&section=1" \o "Edit section: Important advances made in the UK)]

England and Scotland were leading centres of the [Scientific Revolution](http://en.wikipedia.org/wiki/Scientific_Revolution) from the 17th century[[3]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-3) and the United Kingdom led the [Industrial Revolution](http://en.wikipedia.org/wiki/Industrial_Revolution) from the 18th century,[[4]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Europa-4) and has continued to produce scientists and engineers credited with important advances.[[5]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-5) Some of the major theories, discoveries and applications advanced by people from the UK are given below.

* The [laws of motion](http://en.wikipedia.org/wiki/Newton%27s_laws_of_motion) and illumination of [gravity](http://en.wikipedia.org/wiki/Gravitation), by [physicist](http://en.wikipedia.org/wiki/Physicist), [mathematician](http://en.wikipedia.org/wiki/Mathematician), [astronomer](http://en.wikipedia.org/wiki/Astronomy), [natural philosopher](http://en.wikipedia.org/wiki/Natural_philosophy), [alchemist](http://en.wikipedia.org/wiki/Alchemy) and [theologian](http://en.wikipedia.org/wiki/Theology), [Sir Isaac Newton](http://en.wikipedia.org/wiki/Isaac_Newton) (1643–1727).[[6]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-6)
* The discovery of [hydrogen](http://en.wikipedia.org/wiki/Hydrogen), by [Henry Cavendish](http://en.wikipedia.org/wiki/Henry_Cavendish) (1731–1810).[[7]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-7)
* The [steam locomotive](http://en.wikipedia.org/wiki/Steam_locomotive), by [Richard Trevithick](http://en.wikipedia.org/wiki/Richard_Trevithick) (1771–1833) and [Andrew Vivian](http://en.wikipedia.org/wiki/Andrew_Vivian) (1759–1842).[[8]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-8)
* The [electric motor](http://en.wikipedia.org/wiki/Electric_motor), by [Michael Faraday](http://en.wikipedia.org/wiki/Michael_Faraday) (1771–1867), who largely made [electricity](http://en.wikipedia.org/wiki/Electricity) viable for use in technology.[[9]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Boa2002p238-9)
* The theory of [aerodynamics](http://en.wikipedia.org/wiki/Aerodynamics), by [Sir George Cayley](http://en.wikipedia.org/wiki/George_Cayley) (1773–1857).[[10]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-ackroyd-10)
* The first public steam [railway](http://en.wikipedia.org/wiki/Railway), by [George Stephenson](http://en.wikipedia.org/wiki/George_Stephenson) (1781–1848).[[11]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Davies-11)
* The first commercial [electrical telegraph](http://en.wikipedia.org/wiki/Electrical_telegraph), co-invented by [Sir William Fothergill Cooke](http://en.wikipedia.org/wiki/William_Fothergill_Cooke) (1806–79) and [Charles Wheatstone](http://en.wikipedia.org/wiki/Charles_Wheatstone) (1802–75).[[12]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-12)[[13]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-13)
* First tunnel under a navigable river, first all iron ship and first railway to run express services, contributed to by [Isambard Kingdom Brunel](http://en.wikipedia.org/wiki/Isambard_Kingdom_Brunel" \o "Isambard Kingdom Brunel) (1806–59).[[14]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-14)
* Evolution by [natural selection](http://en.wikipedia.org/wiki/Natural_selection), by [Charles Darwin](http://en.wikipedia.org/wiki/Charles_Darwin) (1809–82).[[15]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Hatt2006p46-15)
* The invention of the [incandescent light bulb](http://en.wikipedia.org/wiki/Incandescent_light_bulb), by [Joseph Swan](http://en.wikipedia.org/wiki/Joseph_Swan) (1826–1914).[[9]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Boa2002p238-9)
* The unification of [electromagnetism](http://en.wikipedia.org/wiki/Electromagnetism), by [James Clerk Maxwell](http://en.wikipedia.org/wiki/James_Clerk_Maxwell) (1831–79).[[16]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-16)
* The first practical [telephone](http://en.wikipedia.org/wiki/Telephone), patented by [Alexander Graham Bell](http://en.wikipedia.org/wiki/Alexander_Graham_Bell) (1847–1922).[[17]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-17)
* The discovery of [penicillin](http://en.wikipedia.org/wiki/Penicillin), by [biologist](http://en.wikipedia.org/wiki/Biologist) and [pharmacologist](http://en.wikipedia.org/wiki/Pharmacology), [Sir Alexander Fleming](http://en.wikipedia.org/wiki/Alexander_Fleming) (1881–1955).[[18]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-18)
* The world's first working [television](http://en.wikipedia.org/wiki/Television) system, and [colour television](http://en.wikipedia.org/wiki/Color_television" \o "Color television), by [John Logie Baird](http://en.wikipedia.org/wiki/John_Logie_Baird) (1888–1946).[[19]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-19)[[20]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-ADP-20)
* The first meaningful synthesis of [quantum mechanics](http://en.wikipedia.org/wiki/Quantum_mechanics) with [special relativity](http://en.wikipedia.org/wiki/Special_relativity) by [Paul Dirac](http://en.wikipedia.org/wiki/Paul_Dirac) (1902–84) in [the equation named after him](http://en.wikipedia.org/wiki/Dirac_equation), and his subsequent prediction of [antimatter](http://en.wikipedia.org/wiki/Antimatter).[[21]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-nobel-21)
* The invention of the [jet engine](http://en.wikipedia.org/wiki/Jet_engine), by [Frank Whittle](http://en.wikipedia.org/wiki/Frank_Whittle) (1907–96).[[22]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Cole2011p121-22)
* The invention of the [hovercraft](http://en.wikipedia.org/wiki/Hovercraft), by [Christopher Cockerell](http://en.wikipedia.org/wiki/Christopher_Cockerell) (1910–99).[[23]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-23)
* The [colossus computer](http://en.wikipedia.org/wiki/Colossus_computer), by [Alan Turing](http://en.wikipedia.org/wiki/Alan_Turing) (1912–54), the first digital computer (a code breaker in WWII made in bleactly park) [computer](http://en.wikipedia.org/wiki/Computer).[[22]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Cole2011p121-22)
* The structure of [DNA](http://en.wikipedia.org/wiki/DNA), by [Francis Crick](http://en.wikipedia.org/wiki/Francis_Crick) (1916–2004) and others.[[24]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-24)
* The theoretical breakthrough of the Higgs mechanism to explain [electroweak symmetry breaking](http://en.wikipedia.org/wiki/Electroweak_symmetry_breaking) and why some particles have mass, by [Peter Higgs](http://en.wikipedia.org/wiki/Peter_Higgs) (1929-).[[25]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-25)
* Theories in [cosmology](http://en.wikipedia.org/wiki/Cosmology), [quantum gravity](http://en.wikipedia.org/wiki/Quantum_gravity) and [black holes](http://en.wikipedia.org/wiki/Black_holes), by [Stephen Hawking](http://en.wikipedia.org/wiki/Stephen_Hawking) (1942–).[[26]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-26)
* The invention of the [World Wide Web](http://en.wikipedia.org/wiki/World_Wide_Web), by [Tim Berners-Lee](http://en.wikipedia.org/wiki/Tim_Berners-Lee) (1955–).[[22]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-Cole2011p121-22)

Technology-based industries[[edit](http://en.wikipedia.org/w/index.php?title=Science_and_technology_in_the_United_Kingdom&action=edit&section=2)]

The UK plays a leading part in the [aerospace](http://en.wikipedia.org/wiki/Aerospace) industry, with companies including [Rolls-Royce](http://en.wikipedia.org/wiki/Rolls-Royce_plc) playing a leading role in the aero-engine market; [BAE Systems](http://en.wikipedia.org/wiki/BAE_Systems) acting as Britain's largest and the Pentagon's sixth largest defence supplier, and large companies including [GKN](http://en.wikipedia.org/wiki/GKN) acting as major suppliers to the [Airbus](http://en.wikipedia.org/wiki/Airbus) project.[[27]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-27) Two British-based companies, [GlaxoSmithKline](http://en.wikipedia.org/wiki/GlaxoSmithKline) and [AstraZeneca](http://en.wikipedia.org/wiki/AstraZeneca), ranked in the top five pharmaceutical companies in the world by sales in 2009[[28]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-28) and UK companies have discovered and developed more leading medicines than any other country apart from the US.[[29]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-29) The UK remains a leading centre of automotive design and production, particularly of engines, and has around 2,600 component manufacturers.[[30]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-30)

Scientific research

Scientific research and development remains important in British universities, with many establishing [science parks](http://en.wikipedia.org/wiki/Science_park) to facilitate production and co-operation with industry.[[31]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-31) Between 2004 and 2008 the UK produced 7% of the world's scientific research papers and had an 8% share of scientific citations, the third- and second-highest in the world (after the United States and China and the United States respectively).[[32]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-32) Scientific journals produced in the UK include [*Nature*](http://en.wikipedia.org/wiki/Nature_(journal)), the [*British Medical Journal*](http://en.wikipedia.org/wiki/BMJ) and [*The Lancet*](http://en.wikipedia.org/wiki/The_Lancet).[[33]](http://en.wikipedia.org/wiki/Science_and_technology_in_the_United_Kingdom#cite_note-33)