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Written by

Christopher Lloyd & Patrick Skipworth

Illustrated by

Andy Forshaw

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Rocket train kills MP

BY OUR ENGINEERING EDITOR,
Liverpool, 16 September 1830

FORMER CABINET MINISTER and Member of Parliament for Liverpool William Huskisson died yesterday when he was run over by a steam locomotive during the opening ceremony of a 35-mile-long railway connecting Liverpool and Manchester.

The accident happened at Parkside station – about halfway along the line – after the engine he was travelling on stopped to take on water. Mr Huskisson was one of a number of dignitaries who disobeyed officials and crossed the lines to approach another waiting train which had been laid on especially for the Duke of Wellington.

It is thought Mr Huskisson, who is known to have fallen out politically with the Duke, was hoping for a rapprochement by going over to the Duke's carriage to greet him. But as he approached the Duke's train, he failed to notice an oncoming engine and, despite a desperate attempt to clamber inside the Duke's compartment, he fell onto the tracks and one of his legs was horribly crushed. He died in hospital a few hours later.

High-pressure steam technology was pioneered by Richard Trevithick, a mining engineer from Cornwall, almost thirty years ago when he first demonstrated how the power of steam can be harnessed to provide a new means of transport.

The dangers of steam technology were clear even then, when Mr Trevithick's prototype road engine, the *Puffing Devil*, was destroyed after boiling dry and overheating.

The Cornishman blamed the incident on the negligence of the engine's operators, who had retired to a nearby pub for drinks and a meal.

Even before this latest incident resulting in Mr Huskisson's death, people up and down the country have been divided about the pros and cons of steam railways. Many are worried about the noise and pollution of the countryside, while others foresee economic benefits.

The engine by which Mr Huskisson was fatally injured, the *Rocket*, was constructed by Britain's premier steam engineer, George Stephenson.

Last year the *Rocket* became famous after winning a series of trials held at Rainhill, Lancashire, to determine which design of steam engine should be used on the new Liverpool to Manchester railway.

Elementary idea solves order of chemicals

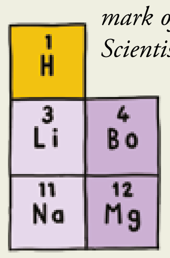
BY OUR RUSSIA STAFF,
St Petersburg, 7 March 1869

A SIBERIAN CHEMIST last night unveiled an ingenious new way to order the chemical elements, by placing them in a table that makes sense of their properties.

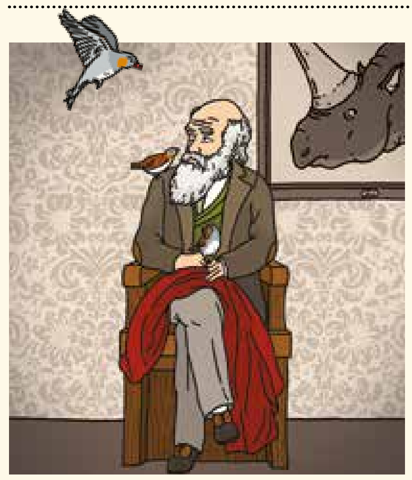
Dmitri Mendeleev was amazed to notice a series of recurring patterns within the sixty-three known elements while writing a new textbook called Principles of Chemistry. *He is said to have made his discovery while playing patience with a pack of cards.*

He realised that by ordering all the elements by increasing atomic weight, a pattern emerged in which every seventh element lined up into a group with other elements that shared similar characteristics. Gaps in the table suggest the existence of various new elements that have yet to be discovered.

By looking at the places where the gaps occur, Mr Mendeleev believes it may be possible to predict the properties and reactivity of the missing elements. Mr Mendeleev says his greatest inspiration has been gained from hard work. "Pleasures flit by, they are only for yourself," he says. "Work leaves a mark of long-lasting joy." Scientists predict that this Periodic System – as Mr Mendeleev has called it – will underpin a new understanding of the elements.



People are apes, says Kent natural scientist



BY OUR NATURE EDITOR,
Downe, Kent, 1859

A NEW BOOK claiming to reveal the inner workings of life on Earth has been published by Charles Darwin, a naturalist living in Downe, Kent.

The book makes the astonishing claim that all forms of life share a common ancestor – including humans, whose most recent biological relatives are, he says, prehistoric apes!

Mr Darwin's book, *On the Origin of Species by Means of Natural Selection*, proposes that life evolves over many generations through a process in which those living things best adapted to environmental conditions thrive, while those less well adapted suffer, eventually becoming extinct. "From so simple a beginning," he writes, "endless forms most beautiful and most wonderful have been, and are being, evolved."

The book is causing uproar among religious leaders, who refuse to accept that people are descended from apes, as the Bible clearly states that humans are made in the image of God. They also argue that since – according to the Bible – the world is only 5,000 years old, there is not enough time for Mr Darwin's 'evolution' to have occurred.

Bell rings for long-distance telephones

BY OUR US BUREAU, 11 March 1876

LONG-DISTANCE VOICE communications between people all over the world may soon become a reality thanks to the efforts of Scottish-born inventor Alexander Graham Bell.

A patent granted by the United States Patent Office describes a device that allows a person to speak into a machine at one end of a telegraph line and another person to hear their words at the other end of the line.

Yesterday, in Boston, Mr Bell was able to make his device work for the first time, relaying a message to his assistant in an adjoining room. "I shouted into M [the mouthpiece] the following sentence: 'Mr Watson, come here, I want to see you!' To my delight he came and declared that he had heard and understood what I said."

Meanwhile, a row has broken out between Mr Bell and Elisha Gray, an American engineer from Barnesville, Ohio, who claims that Mr Bell stole a design for a water-based variable resistor mechanism used to turn sound waves into electromagnetic signals.

Lawyers representing both parties are now arguing over the validity of Mr Bell's claim to have invented the telephone.

Prolific inventor makes light work

"I have not failed, I have found ten thousand ways that do not work," said electric pioneer

BY OUR TECHNOLOGY EDITOR,
New York, 5 September 1882

THE RELENTLESS determination of American inventor Thomas Edison paid off yesterday when he announced what may be his biggest achievement yet – a privately owned electricity transmission network connecting fifty-nine households in Pearl Street, New York City.

"At last the era of fumbling around in the dark to find matches to light candles is coming to an end," said one happy customer last night.

Thanks to earlier work carried out by Mr Edison, electric light bulbs connected to the new network can be used by customers to replace candles and gas lamps. Mr Edison publicly demonstrated this revolutionary technology three years ago at his world-leading research centre at Menlo Park in New Jersey.

Mr Edison has a huge reputation as one of our most persistent inventors. Once, when a journalist challenged him as to why he had failed to invent a light bulb that didn't explode every time it was attached to an electrical circuit, Mr Edison is said to have exclaimed, "I have not failed, I have found ten thousand ways that do not work!"

It is to such persistence that many attribute Mr Edison's numerous achievements to date. These include the quadruplex telegraph (allowing more than one signal to be sent over a telegraph wire at a time), the carbon microphone (for use in telephones), a durable, reusable incandescent electric light bulb (using a filament made of carbonised bamboo), the phonograph (for recording and playing back sounds), and ticker tape (for transmitting the prices of stocks and shares over telegraph lines).

Four years ago Mr Edison created the Edison Electric Light Company, which now owns his many patents. Funding from powerful US businessmen such as J.P. Morgan and the Vanderbilt family has allowed Mr Edison and his team to follow their dreams of developing electrical transmission.

"We will make electricity so cheap that only the rich will burn candles," the inventor has said. With such ambition, Mr Edison and his engineers look set to light up the world.

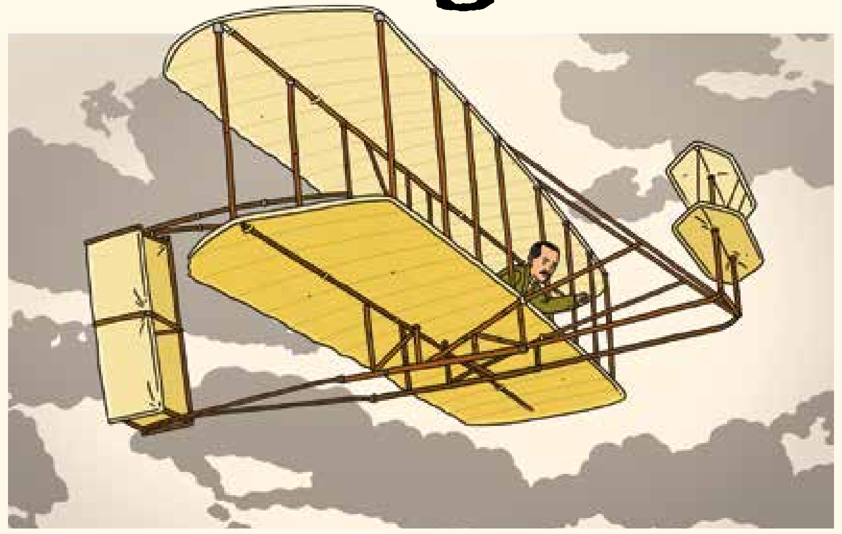
Aviators take Wright turn

BY OUR AVIATION EDITOR,
Kitty Hawk, 18 December 1903

A PAIR OF BICYCLE shop owners from Dayton, Ohio, yesterday demonstrated the first-ever machine-powered, heavier-than-air human flight. They made two sorties, lasting 12 seconds and 59 seconds, in an experimental aircraft called the *Flyer*, which took off and landed safely at Kitty Hawk in North Carolina.

Five onlookers witnessed the remarkable propeller-powered plane take to the air. Its innovative lightweight engine was designed and built by the Wrights' bicycle workshop mechanic, Charlie Taylor.

Wilbur and Orville Wright have spent the last four years in their bicycle workshop trying to discover how to power and control an aircraft that can carry a human being. They even drew inspiration from the celebrated Renaissance artist Leonardo da Vinci, who is famous for having drawn detailed sketches of futuristic flying machines.



To stabilise their aircraft, the Wright brothers have devised a 'wing-warping' control mechanism that mimics how birds change direction in flight by angling the ends of their wings. A system of cables pulls the ends of the aircraft's wings in opposite directions so the plane can bank more easily when changing direction, increasing its stability.

For the last three years, the Wright brothers have been conducting secret test flights with a series of homemade gliders at Kitty Hawk. US officials are now said to be interested in the technology's military potential.

663 – Scottish mathematician
ames Gregory proposes a better
method for calculating the distance
between the Earth and the Sun
(known as the astronomical unit)
by observing the transit of Venus
across the Sun from different
positions around the Earth

1669 – Isaac Newton writes a letter to The Royal Society mentioning a new type of telescope he has developed that uses mirrors instead of lenses to focus light. His reflecting telescope avoids the problem of light dispersing and distorting images

1705 – English astronomer Edmond Halley determines the periodicity of a short-period comet clearly visible from the Earth (it returns every 75–76 years). Ten years later he predicts the path of the Moon's shadow over the Earth during a solar eclipse to within an accuracy of four minutes

1710 – Abraham Darby I, a Quaker from Staffordshire, pioneers a new blast furnace at Coalbrookdale in Shropshire that can turn iron ore into pig iron using coke (a form of charred coal) in place of charcoal (made from wood). When melted or poured, pig iron turns into cast iron, an essential material for bridges, steam engines and many of the inventions of the Industrial Revolution

662 – Blaise
ascal devises
he first horse-
rawn public bus
ervice in Paris,
with fixed
chedules,
outes and
ares

1691 – Edmond Halley designs and builds a diving bell, complete with an external window for underwater exploration. He plunges it 18 metres deep into the River Thames, and remains inside (with five friends) for more than 90 minutes

1712 – Thomas Newcomen, a Devon ironmonger, invents the first practical steam engine. Newcomen markets his engine under the auspices of Savery's patent, which covers all machines powered by fire. It is used for pumping water out of tin mines

1735 – British meteorologist George Hadley proposes that trade winds blow eastwards when moving away from the equator and westwards when moving [illegible]

[illegible] mathematician and [illegible] Bernoulli writes [illegible] in which he outlines [illegible] theory of gases, stating how [illegible] is reduced when velocity [illegible], such as when air passes over an aerofoil wing

1662 – An academy of English scientists is given a royal charter by King Charles II and becomes known as The Royal Society. English polymath Robert Hooke becomes its first curator of experiments. The society's motto is nullius in verba (take nobody's word for it)

1676 – Dutch scientist and microscope maker Antonie van Leeuwenhoek discovers bacteria, sperm, protozoa, muscle fibres and other microscopic life forms and calls them 'animalcules'. He even draws sperm in his notebook, thinking they are miniature people

1698 – Thomas Savery, a military engineer from Devon, lodges a patent for a basic piston-less steam engine designed to pump out water from mines

1669 – Nicolaus Steno, a bishop from Denmark, explains the formation of sedimentary rocks beneath the sea, now known as stratigraphy. He proposes that the position of fossils in different rock layers represents a chronology of life on Earth. His ideas lay the foundations of modern natural history

1690 – French inventor Denis Papin builds a model of a piston steam engine

1738 – French clockwork engineer Jacques de Vaucanson makes a series of ingenious automatons, including androids that can serve dinner and a flute player with a repertoire of 12 songs. His masterpiece, called The Digesting Duck, is a clockwork bird with 400 moving parts in each wing that can flap its wings, drink water, digest and excrete

1733 – John Kay invents the flying shuttle, making mass production of broadcloth textiles more efficient

1740 – Benjamin Huntsman, a Quaker from near Sheffield, produces cast steel in clay ingots or 'crucibles'. Cast steel can be forged into highly demanding products, such as springs. The steelmaking method transforms Sheffield into one of Europe's leading industrial towns

1727 – In Vegetable Staticks, English botanist Stephen Hales describes a process in plants known as transpiration – as water evaporates out of a plant's leaves, water is absorbed through its roots

1701 – Jethro Tull, an English farmer, wins several competitions with his horse-drawn seed drill that plants crops in rows, making them easier to weed and harvest. His invention ushers in an age of agricultural innovation

ysicist from Lincolnshire, England, shines a beam of white light
t it is made up of all the colours in a rainbow. Newton's book
ty and three laws of motion that account for the movement of
apple falling from a tree to the orbits of the planets.
e is considered by many to be the greatest and most
ntial scientist ever, and his discoveries help trigger
ge of rational discovery known as
'The Enlightenment'

1730s – Charles 'Turnip' Townshend popularises the practice of crop rotation to help maintain soil fertility

1665 – Robert Hooke writes Micrographia, the Western world's first bestselling popular science book, after studying living things through a microscope. Fold-out plates reveal the intricate design of a fly's eyes, a flea's body and a plant's 'cells' – the basic units from which all living things are made

1668 – John Mayow, a chemist and physician from Cornwall, argues that special particles in the air, 'spiritus igneo-aereus' as he calls them, are responsible for combustion. He suggests such particles are essential for life and pass from the air through the lungs and into the blood

1697 – German physician Georg Stahl proposes the existence of a fire-like element called phlogiston that is given off when things burn. The phlogiston theory is widely accepted for at least 50 years until scientists discover that materials gain weight when they burn (oxidation) – proving it false

1731 – English mathematician John Hadley makes a reflecting octant (originally designed by Isaac Newton) – a device for measuring the angle of the Sun and stars allowing accurate time-keeping and navigation at sea

1659 – Anglo-Irish chemist Robert Boyle constructs one of the first vacuum pumps. He puts a live lark in the jar and deprives it of air 'to observe the deadly effect of suffocation on living things'. His experiments also lead him to conclude that light travels through a vacuum, although sound does not, and that air is necessary for combustion

1686 – The Royal Society is unable to publish Isaac Newton's book Principia after exhausting available funds by producing a book about the history of fish. Newton's book is published with private funding donated by his friend Edmond Halley

1714 – Daniel Fahrenheit invents a scale for measuring temperature in which water freezes at 32°F and boils at 212°F

1738 – Abraham de Moivre, a French mathematician, publishes the second edition of his book The Doctrine of Chances, in which he describes a pattern of probability later called 'normal distribution', represented graphically by a bell curve

1678 – Robert Hooke outlines the principles of elasticity. Hooke's Law states that an extension of a spring is in direct proportion to the load applied to it – until it reaches its 'elastic limit'

$$\int f(x)\,dx = g(x) + c$$

1675 – German mathematician Gottfried Leibniz develops calculus independently of Isaac Newton. His system of notation is eventually adopted worldwide

1662 – Robert Boyle proposes a new universal law, subsequently called Boyle's Law, which states that if the volume of a gas halves, its pressure will double – and vice versa – provided its temperature is constant. Boyle's book, The Sceptical Chymist, helps establish chemistry as its own branch of science

1665 – Pascal's Treatise on Arithmetical Triangles is published posthumously. It shows how a sequence of numbers can be organised in a triangle (now known as Pascal's triangle) to solve problems in probability theory

1732 – Laura Bassi, a home-educated Italian physicist, is the first woman to be appointed as a professor at a European university. Teaching at the University of Bologna, she introduces Newtonian physics to Italy

1745 – A foil-lined glass jar capable of storing static electricity is invented independently by two scientists working in the Dutch city of Leyden. Ewald Georg von Kleist and Pieter van Musschenbroek's Leyden jars permit the first practical experiments with electricity to take place. It becomes fashionable in some quarters to give electric shocks to servants and children as a form of punishment

1747 – Scottish physician James Lind demonstrates a treatment for scurvy by getting sailors to eat citrus fruits

1742 – Swedish astronomer Anders Celsius proposes the creation of an international temperature scale based on water freezing at 0°C and boiling at 100°C

1761 & 1769 – international scientists collaborate on a series of expeditions to observe the transit of Venus in an attempt to calculate the distance of the Sun from the Earth. The explorers include Captain James Cook who, after observing the transit from Tahiti, goes on to map the coastlines of New Zealand and Australia. Results show the distance to be 153 million kilometres

1750 – French astronomer Nicolas de Lacaille sails to the southern oceans and compiles a catalogue of more than 10,000 stars in the southern skies – the first detailed mapping of the heavens of the southern hemisphere

1756 – English civil and mechanical engineer John Smeaton rediscovers how to make cement, a process forgotten in the West since the collapse of the Roman Empire. His quick-setting concrete, made from limestone and clay, is used to build the foundations of the Eddystone Lighthouse

1769 – Nicolas-Joseph Cugnot demonstrates a 'steam wagon', a precursor to the first automobile

1769 – Scottish engineer James Watt realises that steam engines can be made up to 75% more efficient by using a separate chamber as a condenser. His double-action engine lets in steam at both ends of the cylinder and transforms steam engines by allowing the attachment of a flywheel for driving machinery and mills

1775 – Scotsman Alexander Cummings patents a design for the flushing toilet, complete with S-bend to remove bad smells

1769 – Bolton barber Richard Arkwright invents a spinning frame adapted to use water power, revolutionising the production of cotton into cloth

1779 – Samuel Crompton invents the spinning mule, allowing just one operator to supervise the spinning of up to 1,000 reels of fine yarn. The invention helps make Britain the world epicentre for fabric production

1764 – James Hargreaves invents a multi-spool spinning frame. His 'Spinning Jenny' means fewer workers are needed to produce yarn, beginning the process of mass production of cotton products

1761 – Italian anatomist Giovanni Morgagni publishes a treatise based on 646 dissections of people who had died of various diseases. His work establishes pathology as a distinct science

1754 – Scottish chemist Joseph Black measures the weight of materials before and after chemical reactions and concludes that carbon dioxide (called 'fixed air') is given off when limestone is heated. He discovers the same gas is emitted by animals and forms part of the atmosphere. His experiments prove that air is not an element – as the ancients believed – but a mixture of gases

1752 – American polymath Benjamin Franklin flies a kite in a thunderstorm that conducts electric charge into a Leyden jar. His invention of the lightning conductor remains almost unchanged today

1759 – English watchmaker John Harrison, from Yorkshire, invents the marine chronometer. The device accurately measures time at sea, allowing sailors to calculate their longitude by comparing their home port time (shown by the chronometer) with the local time (shown by the Sun). It takes Harrison 31 years to perfect

1776 – Scotsman Adam Smith publishes An Inquiry into the Nature and Causes of the Wealth of Nations, considered to be the first work of a branch of science now called economics

1735 – Swiss mathematician Leonhard Euler transforms mathematics by introducing the concept of a function f(x) and notation such as Σ for summation and i for the imaginary unit

1774 – Joseph Priestley, an English chemist, focuses the Sun's rays on a sample of mercury oxide and discovers a new gas – later called oxygen – which he calls 'dephlogisticated air'. He demonstrates his experiment to French chemist Antoine Lavoisier

1775 – British scientist John Mervin Nooth invents the first fizzy drinks machine. Sulphuric acid and soda lime are mixed to produce carbon dioxide (then called 'fixed air') which dissolves in water to make it fizzy. Joseph Priestley proposes that fizzy water has medicinal qualities as it mimics natural springs

1780 – Italian scientist Luigi Galvani notices that the legs of a dead frog twitch when touched by an iron wire. His experiments lead him to conclude that a form of 'animal electricity' is responsible for making muscles move

1779 – Dutch botanist Jan Ingenhousz discovers the ingredients required for plant photosynthesis: sunlight, water and carbon dioxide. He also identifies that the gas oxygen is given off during the process

1781 – French astronomer Charles Messier publishes an astronomical catalogue listing 103 deep space objects, including comets, nebulae and galaxies

1781 – German-born British astronomer William Herschel identifies a planet never before observed from Earth. Initially it is called the 'Georgian star' in honour of King George III, but is later renamed Uranus

1783 – French engineers Joseph-Michel and Jacques-Étienne Montgolfier build a hot-air balloon carrying a sheep, a duck and a rooster to see if they can survive at high altitude. The flight reaches 450 metres and lasts 8 minutes

1787 – American inventor John Fitch and clockmaker Henry Voigt demonstrate the first steam boat using oars powered by a steam engine

1791 – John Barber receives British patent no. 1833 for A Method of Rising Inflammable Air for the Purposes of Procuring Motion, and Facilitating Metallurgical Operations, in which he describes a working turbine

1785 – Joseph Bramah invents the hydraulic pump, used to draw up beer from a tavern cellar. He later invents a hydraulic press for shaping metal

1794 – American inventor Eli Whitney patents the cotton gin, which automates the separation of cotton seed from short-staple cotton fibre

1791 – A grand Ordnance Survey project to map Great Britain starts with a 5-mile baseline on Hounslow Heath in London

1788 – Scottish naturalist James Hutton suggests the land, formed from layers of deposition and cycles of uplift, is made up of three types of rock: igneous, sedimentary and metamorphic. He is regarded as the father of geology

1783 – Henry Cavendish discovers that water is composed of hydrogen and oxygen

1793 – Christian Sprengel, a German naturalist, discovers sexual reproduction in plants. Scientists reject Sprengel's theory, dismissing the idea that flowers could have anything to do with sex as ridiculous

1794 – French nobleman and chemist Antoine Lavoisier is executed by revolutionaries after being charged with selling adulterated tobacco. It ends the life of a remarkable scientist who lays the foundations for modern chemistry, names oxygen and hydrogen, and puts together the first detailed list of elements

1785 – French physicist Charles-Augustin de Coulomb uses a torsion balance to study the interaction between charged particles. He discovers there is an inverse relationship between the strength of force between two electric charges and the square of their distance. Coulomb's law underpins the theory of electromagnetism

1782 – English potter Josiah Wedgwood (grandfather of Charles Darwin) invents the pyrometer, a gauge for measuring the temperature of kilns using clay blocks that shrink as they get hotter

1787 – The theodolite, an instrument for measuring angles, is perfected by scientific toolmaker Jesse Ramsden from Yorkshire. It is first used to measure distances between observatories in Greenwich and Paris for astronomical calculations, but it eventually helps to lay the foundations for the Ordnance Survey of Great Britain

1796 – French astronomer Pierre-Simon Laplace proposes that the planets in our solar system originally formed from a nebulous ring of material that orbited the Sun. He also suggests that stars may sometimes collapse through intense gravity to form what we now call black holes

1804 – Frenchman Joseph Gay-Lussac discovers that the composition of the air does not change with increasing altitude (decreasing pressure)

1801 – Richard Trevithick, a mining engineer from Cornwall, builds the first high-pressure steam engine. He fires up his Puffing Devil, a road locomotive, on Christmas Eve, carrying several men from Camborne in Cornwall to the nearby village of Beacon

1809 – German astronomer and mathematician Carl Friedrich Gauss develops a gravitational constant to calculate the precise movement of the planets around the Sun

1816 – The first workable telegraph is set up by Francis Ronalds using an electrostatic generator applied to eight miles of wire arranged around his garden in London. He offers it to the British Royal Navy but they see no practical use for the technology

1820s – Scottish engineer and architect Thomas Telford is elected as the first president of the Institution of Civil Engineers after a lifetime overseeing the construction of so many canals, viaducts, aqueducts, roads and bridges that he becomes known as The Colossus of Roads. In 1968 a new town built in Shropshire is named after him

1822 – George Stephenson, a mechanical engineer from Northumberland, builds the world's first railway powered without animals on an eight-mile stretch from Hetton Colliery in County Durham to Sunderland

1804 – Joseph Marie Jacquard perfects the Jacquard Loom. Through the use of punched cards, the loom is able to weave complex designs. It later provides inspiration for computer programmers

1807 – German inventor Friedrich Winzer patents gas lighting and lights up one side of Pall Mall in London

1818 – German Baron Karl von Drais patents the first commercially successful two-wheeled human-propelled machine which he calls the Laufmaschine

1816 – John McAdam, a Scottish engineer, pioneers a new concept for building roads by layering crushed stone and gravel on top of a base of large stones, and introducing a camber so rainwater drains easily to the sides. His construction method – known as 'macadamisation' – is first used on the Bristol turnpike but rapidly spreads around the world

1824 – Sadi Carnot, a French engineer, says that the proportion of heat a steam engine converts into work can never be 100% and depends on the difference in temperature between its hottest and coldest parts. His observations help create the science of thermodynamics, which explains why energy can be transferred in some directions but not others

1815 – The miner's safety lamp is invented by Humphry Davy

1804 – Swiss botanist Nicolas-Théodore de Saussure reveals the role of chlorophyll in photosynthesis

1797 – English scientist Henry Cavendish measures the force of gravitational attraction between large globes. He uses his results to estimate the Earth's weight as 6,000 million million million tons

1824 – French mathematician J
suggests that some atmospher
infrared radiation, making the
warmer than it would otherwis
It's now called the Greenhouse

1830 – Bri
Charles Ly
Principles
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1796 – Edward Jenner, a doctor from Gloucestershire, transfers blister fluid from a milkmaid with cowpox to both arms of James Phipps, an eight-year-old boy. He then infects the boy with smallpox but, as Jenner predicts, the boy shows no signs of infection – because he has been vaccinated

1805 – Friedrich Sertürner discovers how to make a painkiller from opium, a narcotic produced from the seeds of the poppy plant. He names the drug morphine, after Morpheus, the Greek god of sleep and dreams

1816 – René Laënnec, a French physician working at the Hôpital Necker in Paris, invents the stethoscope for diagnosing chest infections. It looks like an ear-trumpet

1804 – Japanese surgeon Seishu Hanaoka uses atropine and scopolamine from plant extracts in the first recorded general anaesthetic. Similar chemicals are used in anaesthetics today

1819 – French chemist Henri Braconnot produces the first synthetic polymer – xyloidine – a highly explosive substance used in varnish. His process becomes known as hydrolysis, derived from the Greek word lysis, meaning 'to split'

1826 – French inventor Nicéphore Niépce produces the world's oldest surviving photograph, formed by exposing bitumen to light and then fixing the image by washing away the less exposed areas with lavender oil

1800 – William Herschel passes sunlight through a prism and is surprised to find that the temperature just beyond the red end of the visible spectrum is higher than the ambient temperature in the room. It leads him to conclude that there must be an invisible form of light, now known as infrared radiation

1820 – Hans Christian Ørsted discovers that an electric current produces a magnetic field after the needle of his compass is deflected by a nearby wire. He calls it electromagnetism

1808 – Jöns Berzelius, a Swedish chemist, designs a system of chemical symbols that is still in use today

1800 – Italian physicist Alessandro Volta invents a battery capable of producing a steady flow of electricity around a circuit. His voltaic pile comprises a stack of disks made from brine-soaked paper, zinc and copper

1820s – English physicist Michael Faraday shows how an electric current can rotate a wire around a magnet and how electricity can be induced by moving a wire through a magnetic field. His experiments pave the way for the development of the dynamo, the transformer and electric motor

1803 – English teacher John Dalton proposes that an element is a substance that cannot be broken down into constituent parts and that compounds comprise the atoms of two or more elements bound together. He devises symbols for the atoms of 36 different elements and calculates their atomic weights compared with hydrogen, the lightest element

1820 – Félix Savart and Jean-Baptiste Biot develop the work of André-Marie Ampère, a French mathematician, showing how the strength of an electromagnetic field is inversely proportional to the square of its distance from a conductor

1828 – Friedrich W
German chemist,
synthesises urea,
the idea that all li
things contain some
physical element
spirit. His discov
ushers in a br
science called
chemistry, in w
natural, organic
substances can
artificially synthe

1812 – Friedrich Mohs devises a hardness scale based on how scratchable a solid substance is. It is still used by geologists today

1822 – Mathematician Charles Babbage, assisted by Ada Lovelace, designs and partly builds a mechanical computer to improve significantly the computation of logarithmic tables. His improved design (The Difference Engine No. 2) is eventually built by the Science Museum in London in 19