

— WRITING SAMPLE —

(public information)

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That Day in Science

Interactive kiosk exhibit for
Science World BC

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Part Two (8 pages)

Additional event dates discovered in other sources during remaining budgeted time.

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.01011801

The first asteroid, Ceres, was discovered by Giuseppe Piazzi. The asteroid belt is a large collection of loose material, ranging in size from pebbles to rocks several hundred miles across. It exists between the orbits of Mars and Jupiter. The asteroids represent a "planet that never quite made it" during the formation of the Solar System.

.02011959

By mistake, the USSR's Lunik 1 became the first man-made object in orbit around the Sun. It was the first rocket to escape from the Earth, and was supposed to reach the Moon.

.02011968

The first successful heart transplant was performed by Christian N. Barnard. It was the second attempt, and the patient lived 74 days.

.03011822

This is the birthday of Louis Pasteur, who popularized the idea that contagious diseases are caused by micro-organisms. The germ theory of disease was the most important single advance in the history of medicine. Germs had gone unrecognized until the 1860s, only a few generations ago.

.04011809

This is the birthday of Louis Braille, blind from the age of three, who invented a system of raised-point symbols that make it possible to read by touch. Called "Braille" in his honor, the system is widely used by the blind.

.05011769

The steam engine was patented by James Watt.

.06011642

Galileo Galilei, founder of experimental science, died of fever. His experiments on motion had radically overturned the common-sense conclusions of the ancient Greeks. For example, it was thought that to keep an object moving required a constant force, and so something must be pushing the planets around their orbits.

Galileo showed that without friction a constant force creates constantly increasing speed, and that the planets could keep moving forever without anything pushing them.

.07011610

Galileo Galilei, the first astronomer to use a telescope, discovered three moons orbiting Jupiter. They were the first objects ever seen that circled some object other than Earth. This disturbed the rigidly religious, who refused to look through the telescope in order to avoid seeing the moons. Later, the radical Galileo disturbed them even more.

.08011942

This is the birthday of physicist Stephen Hawking. In spite of almost total paralysis from ALS, he has produced theories about the origin and fate of the universe, and about black holes. Black holes, for example, don't continue to grow, because they are slowly evaporating.

.09011839

The distance to the nearest star, Alpha Centauri, was determined by Thomas Henderson to be 4.3 light-years. A light-year is the distance that light can travel in a whole year—about 10 trillion kilometers. This distance made the Universe suddenly much larger than astronomers till then had dreamed. The entire Solar System shrunk to a dot in space in comparison to the distance of even the nearest star.

.10011945

The distance to the Moon was measured accurately by radar. Way back in 150 B.C., Greek astronomers had already calculated the distance fairly accurately. It's about thirty times the diameter of the Earth, about 385,000 kilometers.

.11011842

This is the birthday of William James, who made psychology a natural science.

.12011859

This is the birthday of Jean-Joseph-Etienne Lenoir, the designer of the first internal

combustion engine that worked. It used coal gas and was very inefficient.

.15011934

The first artificial radioactive element was created by the physicist-couple Irene and Frederic Joliot-Curie, for which they were awarded a Nobel Prize. Irene was the daughter of Marie Curie, winner of an unprecedented two Nobel Prizes.

.16011925

Wolfgang Pauli submitted for publication his Nobel-prize-winning paper on the exclusion principle, from which the basis of the chemical elements can be understood. This is one example of the importance of quantum physics in explaining many of the mysteries of nature.

.16011939

The theory of atomic fission, the idea that atoms could be split, was first published by Lise Meitner and Otto Frisch.

.18011675

Issac Newton made his famous statement, "If I have seen further, it is by standing on the shoulders of giants." From Galileo's observations on motion, Newton had been able to deduce the way gravity operates, and had shown that it's universal—it operates between any two objects. It simply depends on the total mass of the two objects. That means that you pull on the Earth just as much the Earth pulls on you (but since you're the lighter one, you're the one that falls).

.20011945

The first plant was constructed for separating the radioactive isotope of Uranium (U-235) from its predominant non-radioactive isotope (U-238), allowing the commercial use of nuclear power a few years later.

.21011292

An annular solar eclipse, where the Sun's fiery corona can be seen as a spectacular ring around the eclipsing Moon, was witnessed in China. The prediction of eclipses has been performed

since at least 3,000 B.C. The oldest one recorded was in 763 B.C. in Babylonia.

.22011561

This is the birthday of the man who can be considered the father of science, Francis Bacon. In 1620 he first proposed a scientific method based on painstaking observation rather than simply relying on pure deduction. Although Galileo had done this thirty years before, it wasn't until Bacon's time that science began to blossom.

.23011922

Insulin was first administered to a human. It was known that a hormone produced by the pancreas was necessary to prevent diabetes. The Canadians Frederick Banting and Charles Best had succeeded in extracting this hormone, insulin, from the pancreases of dogs. They were awarded a Nobel Prize for medicine.

.24011838

Morse code was first used. In the previous year the telegraph was patented by Samuel Morse.

.25011627

This is the birthday of Robert Boyle, originator of the first scientific chemistry. He was also a founder of the first scientific society, the Royal Society in England, an undertaking that may be said to mark the true end of the long medieval period.

.26011949

The first photograph of a nebula was made by Edwin Hubble at Palomar Observatory. Earlier, when many "nebulas" turned out to be entire far-away galaxies, this term was reserved for the nearby, colorful clouds that glow from stars within. Some are the debris from the explosion of stars, while others are star "nurseries." You've probably seen photos of the Orion Nebula or the Horsehead Nebula (both in the constellation of Orion).

.27011967

This day was the first tragic disaster in the American space program. Apollo 1, the first

Moon project space craft, was performing a routine ground test at Cape Kennedy with astronauts 'Gus' Grissom, Edward White, and Roger Chaffee inside the cabin. Suddenly the cabin began to burn, and the pure oxygen air of the Life Support System fanned the fire into an intense blaze. Within minutes all three were dead. In space exploration there is not a choice between safety and danger, only a choice of dangers.

.28011878

The first commercial telephone exchange went into operation, in New Haven, Connecticut. The telephone had been invented by Alexander Graham Bell two years before.

.31011862

The first white dwarf star was discovered as a companion to the brightest star in the sky, Sirius. A white dwarf is an aging star that has used up its hydrogen and compacted down to the size of the Earth. Our Sun, when it uses up its hydrogen, will first inflate to fill half the sky, then compact down to a white dwarf. (Don't worry, it won't happen for at least a billion years.)

.31011958

The Van Allen radiation belts, which envelop the Earth, were discovered by James Van Allen from a detector on one of the earliest satellites, Explorer 1. The belt contains high concentrations of charged particles that move along the lines of force of the Earth's magnetic field, and cause the northern lights.

.03021966

The Soviet Moon probe Luna 9 made the first soft landing on the Moon, and took the first photos of the surface. A few months later the American Surveyor 1 did the same. Robotic probes were already doing the job before we sent men.

.04021902

This is the birthday of the American Charles Lindbergh, who made the first Atlantic solo flight, lasting 33.5 hours, in 1927.

.04021600

Johannes Kepler first met the great pre-telescope astronomer Tycho Brahe, who had made very accurate observations of planetary motions. Kepler used this information to work out their orbits, and realized they had to go around the Sun, and had to be ellipses, not circles. Both of these ideas were heretical. Supporters were threatened with torture or even burned alive, and the truth was not officially accepted by the Catholic church until 1922.

.05021925

The startling idea that all particles are waves and all waves are particles—the "wave-particle duality"—was confirmed by the discovery of the diffraction of electrons by Davisson and Germer. Diffraction is a property of spread-out waves, but electrons also have the properties of point-like particles.

.09021986

Halley's comet, recorded every 77 years or so since 87 B.C., last passed by us. European and Soviet space probes showed the old "dirty snowball" was far dirtier than expected, actually black. The bright tail is steam driven off by the Sun. It will return in 2061.

.11021847

This is the birthday of Thomas Edison. Besides inventing the incandescent electric lamp, he patented over 1200 other inventions, including the microphone, the phonograph, the alkaline storage battery, and the motion picture camera. He had virtually no formal education.

.12021809

This is the birthday of Charles Darwin, originator of the theory of evolution by natural selection. Many biologists in Darwin's time recognized the fact that life forms had evolved, but were puzzled about how. To avoid controversy, Darwin spent twenty years gathering evidence for his simple theory. His book, *On the Origin of Species*, created a new biology and changed the world forever.

.13021743

This is the birthday of Sir Joseph Banks, a botanist and president of the Royal Society of London, who used his independent wealth to finance much of the first experimental science ever carried out.

.14021766

This is the birthday of Thomas Malthus, who pointed out in 1798 that the food supply increases at a constant rate, while the population increases at an accelerating rate, so that the population always outstrips the food supply, until it's decimated by famine or war. So far, technological advances have managed to delay this "Malthusian consequence."

.15021564

This is the birthday of Galileo Galilei, founder of experimental science. His experiments on motion radically overturned the common-sense conclusions of the ancient Greeks. For example, it was thought that to keep an object moving required a constant force, and so something must be pushing the planets around their orbits. Galileo showed that without friction a constant force creates constantly increasing speed, and that the planets could keep moving forever without anything pushing them.

.16021822

This is the birthday of Sir Francis Galton. He was the first to point out that no two people have identical fingerprints (except, of course, identical twins). Dusting for fingerprints soon became a common part of forensic science.

.17021600

The Italian philosopher Giordano Bruno was burned alive at the stake as punishment for daring to promote the idea that the Sun is a star, that the Earth moves around it, and that other stars may have planets too.

.18021745

This is the birthday of Alessandro Volta, who produced the first steady electric current from his invention, the electric battery, in 1800. The volt, the standard unit of electrical potential, is named

after him.

.18021930

Pluto was discovered by Clyde William Tombaugh. Pluto and its moon Charon revolve around a common center and could be considered a "double planet." Pluto is the farthest planet from the Sun—most of the time. Sometimes it's inside the orbit of Neptune.

.19021473

This is the birthday of Nicolas Copernicus, who made the math for computing planetary motions easier by putting the Sun at the center of the system. This also explained a lot of strange planetary motions. His book on this, published the year he died in 1543, marked the birth of the Scientific Revolution because it dared to suggest that the ancients didn't know it all, and you could think for yourself. Unfortunately, a vocal supporter of the book was burned at the stake, and the book got banned until 1835.

.22021857

This is the birthday of Heinrich Hertz, who used the method suggested by Maxwell's theory of electromagnetism to create and to detect radio waves. The term hertz is a standard unit of designating radio frequency.

.26021980

Epimetheus, one of the seventeen known moons of Saturn, was first discovered by the Voyager space probes, along with seven others. Saturn's satellite system is the richest and most complex in the Solar System.

.27021942

At first they thought it was jamming by the Nazis, but it turned out to be the first detection of radio emission from the Sun.

.28021901

This is the birthday of Linus Pauling, who won a Nobel Prize in Chemistry for his discoveries of the nature of molecules and atomic bonding, and another Nobel Prize for Peace. You may know him as the outspoken promoter of large, daily doses of Vitamin C.

.01031896

Henri Becquerel discovered a strange radiation coming from uranium ore. Becquerel and the physicist-couple Pierre and Marie Curie determined that it was radiation emitted spontaneously from atoms, or "radioactivity."

.02031972

Pioneer 10 was launched as the first Jupiter fly-by. After travelling across the Solar System for 11 years, it became the first man-made object to leave it behind.

.03031847

This is the birthday of Alexander Graham Bell.

.04031979

Jupiter's thin, small ring was discovered by Voyager 1. Jupiter joined Saturn and Uranus in being ringed planets.

.05031616

Galileo was warned by Cardinal Bellarmine not to defend the book published by the astronomer Copernicus in 1543 that shows the Earth revolving around the Sun. Copernicus's book was banned until 1835. Eventually Galileo was forced, by the threat of being burned alive, to recant. The Catholic church continued until 1922 to officially deny that the Earth moves.

.05031656

Astronomer Christian Huygens deduced that the mysterious handles of Saturn reported by Galileo are actually rings.

.06031665

This historical day may be said to mark the true end of the Middle Ages: the publication in England of the first scientific journal, the *Philosophical Transactions of the Royal Society*. Science, at this time, was still called "natural philosophy."

.08031618

Johannes Kepler published his Third Law of Planetary Motion.

His "laws" were descriptions of the movements of the planets, which he showed were ellipses, not circles, and orbited the Sun, not the Earth. (Ideas like these were heretical, and supporters were severely persecuted.) Later, Newton used his law of gravity and Galileo's laws of motion to show why the planets move as Kepler showed they do.

.09031876

Alexander Graham Bell patented the telephone.

.09031454

This is the birthday of the man who discovered the Americas—Amerigo Vespucci. Vespucci's discovery was to recognize, after his second voyage to the New World in 1502, that North and South America are not part of Asia, as Columbus continued to believe, and so the two continents are named after him.

.09031934

This is the birthday of the first man to orbit the Earth, Yuri Alexievich Gagarin (USSR). His historic trip aboard the Vostok 1 in 1961 lasted one hour and 48 minutes.

.10031977

It was discovered that Saturn is not the only planet with rings—Uranus has them too. Later even Jupiter and Neptune would prove to have rings.

.13031781

Uranus was discovered by Sir William Herschel. At first he thought it must be a comet, because all the other planets then known, Mercury, Venus, Mars, Jupiter, and Saturn, had been known since prehistoric times, and no one imagined there might be more.

.13031855

This is the birthday of the American astronomer Percival Lowell, who predicted, on account of discrepancies in the orbit of Uranus, that there must be a ninth planet orbiting the Sun. He searched for it, but he did not live to see his 75th birthday, on which the discovery of the new planet, Pluto, was announced.

.14031879

This is the birthday of Albert Einstein. He won a Nobel Prize, but not for relativity or for "Energy equals mass times the speed of light squared." He won it for confirming and launching the field of quantum physics, now known as modern physics, while all other physics is called classical. In spite of that, Einstein has been called the Last Classical Physicist because of his refusal to believe "that God plays dice."

.16031926

The first liquid-fuel rocket was launched by Robert Goddard at Auburn, Massachusetts. The rocket reached a height of 56 meters, and a speed of 97 km per hour.

.17031905

This is the date of publication of the paper that won Einstein his Nobel Prize in Physics. He had confirmed and extended Planck's theory of the quantum. This launched the mind-boggling field of quantum physics, now known as modern physics while all other physics is called classical. In spite of that, Einstein has been called the Last Classical Physicist because of his refusal to believe "that God plays dice."

.18031965

This is the date of the first spacewalk. For twenty minutes Alexi A. Leonov floated in the vacuum outside the Voskhod 2, protected only by his space suit.

.20031727

Issac Newton, one of the greatest pioneers of science, died. From Galileo's observations on motion, Newton was able to deduce the way gravity operates, and he said the most amazing thing: that gravity operates between any two objects; it's universal. It simply depends on the total mass of the two objects. That means that you pull on the Earth just as much the Earth pulls on you (but since you're the lighter one, you're the one that falls).

.20031916

Einstein published a major expansion of his

theory of relativity. He proposed that space was curved in the presence of mass, and that gravity was merely the result of objects following the shortest path in a curved space. He predicted that gravity would bend light rays, as well as slow down time (both have been confirmed).

.22031895

The first motion picture projector was exhibited by the brothers Auguste and Louis Lumiere in Paris. Thomas Edison had invented the motion picture, but his movies had to be viewed by one person through a peephole. Developing a projector had turned out to be more difficult than expected. The Lumieres' invention was a camera, a film printer, and a projector all in one. They originated the 35mm standard, and the word "cinema."

.23031903

The Wright brothers applied for a patent for their aeroplane, which made its historic flight a few months later.

.24031882

The discovery of the tuberculosis germ was announced by Robert Koch, marking the first association of a specific germ with a specific human disease. In those days many people were dying of tuberculosis, or "consumption."

.25031655

Titan, the largest of Saturn's 17 moons, was discovered by Christian Huygens. In 1980 the Voyager space probes showed that Titan has an atmosphere like Earth's, but with methane instead of oxygen. The thick haze prevented viewing Titan's surface, but it might have lakes of liquid nitrogen. Some people speculate there might be some form of life in those lakes.

.26031846

The planet Vulcan was "discovered." The French astronomer Leverrier had found an unexplained spurt of speed during Mercury's orbit around the Sun. He thought there must be a small planet closer to the Sun whose gravitational pull was causing this. He named the planet Vulcan, but all attempts to find it

failed. The anomaly in Mercury's orbit was finally explained 70 years later by Einstein's general relativity.

.27031986

The first man to orbit the Earth, Yuri Alexievich Gagarin, died in a MiG 15 crash. His historic trip in 1961, on the Soviet Vostok 1, lasted one hour and 48 minutes.

.29031919

Arthur Eddington detected the bending of light rays by gravity. This bending of light had recently been predicted by Einstein in his theory of general relativity, which explains gravity in a mind-boggling new way. Eddington's expedition to observe a total eclipse and measure the light from stars near the Sun was the first verification of Einstein's theory.

.28031845

This is the birthday of Wilhelm Roentgen, who won a Nobel Prize for his discovery of X-rays in 1895. The existence of radio waves, longer than the infrared waves at the low end of the visible light spectrum, had already been confirmed. Now, with his discovery, waves shorter than the ultraviolet waves at the high end of the visible were confirmed. The shorter the wavelength, the higher the energy, so X-rays are a very high-energy kind of "light." Within days of the discovery, doctors were using X-rays to look inside the living human body.

.30031842

The first surgery using ether as an anesthetic was performed by Crawford Long to remove a tumor. Four years later William Morton demonstrated its use to the medical community, so he usually gets credit for the discovery. The term anesthesia means "no sensation."

PLUS (SB).31031596

This is the birthday of Rene Descartes. He's famous for combining algebra and geometry so that you can "see" mathematics. This is the familiar "x and y axis" method of graphing things, used throughout all the sciences, as well as in business.

.01041578

This is the birthday of the physician William Harvey, founder of modern physiology. In 1628 he published the true circulation of the blood. It took a long time to win acceptance. In fact, the Arabs had known it as far back as 1242. It had also been published in 1553 by Serveto, but his books had been burned by the Calvinists (along with Serveto himself).

.05041827

This is the birthday of Joseph Lister, who founded antiseptic surgery and the heat-sterilization of instruments in 1865, upon hearing of Pasteur's germ theory. Another physician had attempted to institute the same thing 17 years before, but it had been ignored until Pasteur's promotion of the germ theory of disease. Germs had gotten away with murder until only a couple of generations ago.

.06041973

Pioneer 11 was launched, the first Saturn fly-by. Saturn is one of the large, ringed, outer planets. It has a diameter nine times the diameter of the Earth, and at least 17 moons.

.07041947

Henry Ford died, willing ninety percent of his stock to the Ford Foundation. He had introduced the first true assembly line in 1913, reducing the time needed to assemble a car from 12.5 hours to 1.5 hours.

.10041790

The first patent law was established, along with the US Patent Office.

.11041970

Apollo 13 was launched. This third three-man mission to the moon, upon trying to land, suddenly lost oxygen in the main chamber. The astronauts managed to crowd into the landing module and maneuver their way back to Earth.

.12041633

Galileo was tried by the Inquisition in the most famous confrontation between science and

religion prior to the evolution controversy in the present century. On threat of torture, the 70-year-old Galileo renounced his view that the Earth moves around the Sun. He still remembered the example of Giordano Bruno, from his father's generation, who was burned alive for promoting the same idea.

.12041898

Marie Curie hypothesized the existence of elements that spontaneously emit radiation from their atoms, coining the term "radioactivity."

.14041629

This is the birthday of Christian Huygens, one of the earliest scientists. Among many other things, he designed the first pendulum clock (the "grandfather clock"). It was the first timepiece that could tell time to the minute, accurate enough to be useful to scientists.

.15041452

This is the birthday of Leonardo da Vinci, the model "Renaissance man," a master of art and science both. In fact, while the Renaissance was a time of rejuvenation for art, science hardly existed until the 17th century. Alchemy and astrology were still more important than chemistry and astronomy, and the church still had the power to censor science. It was still the "Middle Ages."

.21041961

Yuri Alexievich Gagarin (USSR) was the first man to orbit the Earth. His historic trip aboard the Vostok 1 lasted one hour and 48 minutes.

.23041858

This is the birthday of physicist Max Planck. In 1900 he originated the idea of the "quantum," the fundamental "unit of action" represented by a small number called Planck's constant, which showed that some physical processes are not continuous. Planck's constant turned up in many other guises in the development of quantum theory, the focal point of modern physics. (The word quantum, coined by Planck, means "how much?")

.24041900

This is the birthday of the modern quantum physicist Wolfgang Pauli. He won a Nobel prize for discovering the exclusion principle. It describes the behavior of electrons in atoms, from which the basis of the chemical elements can be understood. This is one example of the importance of quantum physics in explaining many of the mysteries of nature.

.25041953

James Watson and Francis Crick published their theory of the structure of DNA, the long coiled molecules in all of our cells that direct our development from a one-celled egg to an adult person, and control the complex workings of our bodies. As a result, our entire genetic code is now being painstakingly mapped out in the world-wide Human Genome Project.

.27041820

This is the birthday of the philosopher Herbert Spencer, who coined the word "evolution." Unfortunately he also turned Darwin's principle of evolution by natural selection into a moral prescription. His "Social Darwinism" supposedly justified exploitation and callousness as inevitable "survival of the fittest." Fortunately, it's no longer taken seriously.

.29041854

This is the birthday of Henri Poincare, the "father" of chaos theory, which only now is being recognized for its potential contribution to science and medicine. We live in a world of constant feedback, now called "deterministic chaos". This branch of science was neglected as quantum physics and relativity took center stage, but now the science of chaos promises to be a revolution of equal importance.

.30041897

J.J. Thompson announced his discovery of electrons. It was not realized at the time that these mysterious "corpuscles" are the constituents of all atoms and the carriers of electricity.

.01051888

Nikola Tesla patented the AC motor. Before

then, motors could only use direct current, the kind produced by batteries. But electric generators produced alternating current (AC), which goes back and forth. Once Tesla had invented the AC motor, use of direct current fell from favor, in spite of its support by Thomas Edison.

.02051800

Water molecules were broken apart using the current of an electric battery, releasing as gases the atoms hydrogen and oxygen. The name hydrogen means "water forming."

.04051825

This is the birthday of Thomas Huxley, the public defender of Darwin's theory of evolution by natural selection. In 1860 he debated the slippery Bishop "Soapy Sam" Wilberforce, saying his famous comeback that if he had to choose between an ape and a man like Wilberforce for a grandfather, he would prefer the ape. It was the first open resistance to the Church's authority on the question of human origins.

.05051925

Tennessee high school teacher John Scopes was arrested for teaching the theory of evolution. The resulting famous "Monkey Trial" pitted fundamentalist William Bryan against the liberal lawyer Clarence Darrow in a classic courtroom drama that filled the newspapers of the day and inspired books, plays, and movies.

.06051856

This is the birthday of Sigmund Freud, who first proposed the idea that there is more to our minds, feelings, and motivations than we are consciously aware of. Modern brain science has since shown that most of what the brain does is not in conscious awareness, but Freud's specific ideas about unconscious processes have not stood the test of time.

.07051911

Ernest Rutherford revealed his model of the atom. Virtually all its mass is squeezed into a tiny nucleus, only 1/100,000 the diameter of the

atom, while ephemeral electrons make up the far outer regions. For the first time, atoms were seen as being mostly empty space. Rutherford had been shooting particles of radiation through metal, and was surprised to find it was like shooting bullets into a cloud of steam and occasionally finding a bullet bouncing back.

.08051743

Chemist Antoine Lavoisier was beheaded by radicals of the French Revolution. Lavoisier, who coined the word "oxygen," had discovered, among many other things, the composition of the air, and that burning is a process of chemical bonding with oxygen.

.12051820

This is the birthday of the nurse Florence Nightingale. Although she is mainly known for her hard work during the Crimean war and her efforts to reform hospital sanitation, she also invented several innovative ways of portraying statistics visually—such as polar area charts—in order to get her message across.

.14051686

This is the birthday of Gabriel Fahrenheit, who invented the mercury thermometer. When designing his temperature scale he set the zero point as the freezing point of salted water, which is colder than pure water, in order to avoid dealing with negative numbers. That's why zero degrees Celsius, the freezing point of water, is 32 degrees Fahrenheit.

.17051974

Ken Olsen, president of Digital Equipment Corporation (DEC), the leading maker of mini-computers, is quoted to have said: "I can't see any reason that anyone would want a computer of their own." Even IBM didn't think the PC would catch on when it was introduced in 1981.

.19051971

The Mars 2 space probe was launched by the USSR. It went into orbit around Mars on November 27, fourteen days after the American Mariner 9 probe did, but it was the first man-made object ever to impact onto the surface of

Mars.

.23051707

This is the birthday of the biologist Carolus Linnaeus, the founder of modern taxonomy. Taxonomy means "naming in order." Linnaeus grouped similar species into one "genus," similar genera into one class, classes into orders, and orders into phyla. Each species has a first and last name, its genus and species, to identify it. He was the first to call human beings *Homo sapiens*.

.24051543

The pre-telescope astronomer Nicolas Copernicus died, on virtually the same day his famous book was published. He had made the math for planetary motions easier by putting the Sun at the center of the system. This marked the birth of the Scientific Revolution because it dared to suggest that the ancients didn't know it all, and you could think for yourself. Unfortunately, a vocal supporter of this view was burned at the stake, and Galileo's support in 1616 got the book banned until 1835.

.25051865

This is the birthday of the Dutch physicist Pieter Zeeman, who won a Nobel Prize for discovering the Zeeman Effect. This is an effect of magnetism on the spectrum of light given off by a light source, and it proved to be very useful in studying the structure of both atoms and stars.

.29051946

The first radio source in outer space was pinpointed and called Cygnus A. A year later the first radio source to be identified visually was the Crab Nebula. It had been known for ten years that radio waves were coming from the sky.

.04061888

This is the precise date of the extinction of the Great Auk, or arctic penguin. The last two Great Auks, hiding out in Greenland, were killed by hunters in the frenzy to get as many pelts as possible. The imminent extinction of these birds had driven up the price of carcasses

tremendously. Today, birds are going extinct at a rate of three species every two years, which is fifty times faster than the extinction of the dinosaurs.

.05061783

The first hot air balloon (unmanned) ascended in France, directed by the Montgolfier brothers. The first balloon flights made use of the fact that hot air expands and so is lighter than cold air. This is a feat that even the ancients could have pulled off if they had thought of it. Imagine how an air force in ancient times might have changed history.

.08061625

This is the birthday of the astronomer Giovanni Cassini. He discovered the polar ice caps on Mars and the breaks in the rings of Saturn. He also calculated the speed of Jupiter's spin, as well as accurate distances to all the known planets.

.10061775

Volta announced the invention of a device for storing static electricity. Later he invented something much more useful, the electric battery. The volt, the standard unit of electrical potential, is named after him.

.11061876

The first practical refrigerator, using liquid ammonia as the coolant, was patented by Karl von Linde in Germany.

.13061983

Pioneer 10, launched 12 years earlier, became the first man-made object to leave our Solar System. It's still broadcasting information. The second probe to leave the solar system, Voyager 2 in 1990, bears a gold-plated phonograph record with a message to possible extraterrestrial civilizations that might encounter the spacecraft in some distant space and time.

.16061963

Valentina Tereshkova-Nikolayeva became the first woman in space. She orbited the Earth in Vostok 6 forty-eight times in three days.

.17061800

This is the birthday of the Earl of Rosse, an astronomer who discovered several spiral-shaped nebulae with his new telescope in 1845.

Decades later it was proven that these "nebulae" are actually entire galaxies of stars, much like the one we inhabit, the Milky Way galaxy, which contains billions of stars.

.18061983

Sally Ride became the first American woman in space. She was on the first five-person crew, aboard the second US space shuttle Challenger.

.22061864

This is the birthday of the physicist Hermann Minkowski, who showed that Einstein's relativity made more sense if the universe were really four-dimensional. The three dimensions of space and the one dimension of time should be treated as a single 4-D space-time, hard to imagine but easy to deal with mathematically. This allowed Einstein to further develop relativity to explain gravity as a bending of this 4-D space.

.25061894

This is the birthday of the German rocket pioneer, Hermann Oberth, who published the first account of space research techniques, and originated the notion of escape velocity—the speed you must reach to escape being pulled back to Earth.

.26061824

This is the birthday of Lord Kelvin, who determined that an "absolute zero" temperature must exist, where there would be no heat whatsoever, and nothing could be colder. He calculated it to be -273 degrees Celsius. This is designated "zero degrees Kelvin" on the absolute-temperature or Kelvin scale.

.28061946

The idea of a computer software program was first proposed by Goldstine, Burks, and von Neumann. But software did not come to actually exist until a computer was made that could handle it, EDVAC, the world's second electronic digital computer in 1952. It had the first RAM

and CPU, and weighed many tons.

.29061922

On this day it was first predicted that the universe is expanding. The prediction was made by a Russian mathematician, Alexander Friedman, based on Einstein's general relativity equations. Seven years later it was confirmed as a fact by direct observation.

30061905

Einstein published his first theory of relativity. Because the speed of light is always the same regardless of your motion relative to the light source, he reasoned that nothing can go faster, because if you could reach the speed of light, your mass would have become infinite and your time slowed to nothing. Relativity seems to go against common sense, but in the decades since, endless tests have upheld it completely.

.01071858

Charles Darwin and Alfred Wallace presented jointly to the Royal Society their theory of the evolution of species by way of natural selection. Finally there was a theory that showed the inevitability of evolution, and facts like the fossil record could no longer be rationally denied. The theory continues to be expanded and refined. Darwin thought evolution was gradual and steady, but today it's generally accepted that it comes in "spurts," which accounts for the apparent lack of transitional forms in some places in the fossil-record "ladder."

.02071900

The first dirigible was launched, a transportation balloon that could be directed. For a century people had been flying in balloons, but they couldn't direct where they went. Ferdinand Zeppelin created a streamlined balloon with an engine and propeller, commonly known as a zeppelin.

.03071729

Electrical transmission was discovered by Stephen Gray. The first conductor was silk twine.

.04071885

Little Joseph Meister was bitten by a rabid dog. Lucky for him, Louis Pasteur was about to test an experimental rabies vaccine. Vaccination for smallpox was already possible using its milder cousin, cowpox. But other diseases had no milder cousins and Pasteur was trying to find ways to reduce a germ's virulence in order to use it as a vaccine. The vaccine saved the boy.

.05071686

Issac Newton presented to the Royal Society the first chapter of his *Principia*. In this book he spelled out the most basic and revealing laws of motion and of gravitation. The ancient, erroneous pronouncements by Aristotle, which had been upheld as unquestionable throughout the medieval period, were finally overturned.

.06071885

Pasteur injected "crippled" rabies germs into young Joseph Meister, who had been bitten by a rabid dog two days before and faced almost certain death. Vaccination for smallpox was already possible using its milder cousin, cowpox. But other diseases had no milder cousins and Pasteur was experimenting with ways to reduce a germ's virulence in order to use it as a vaccine. The vaccine saved the boy.

.07071960

The invention of the first laser was announced by T.H. Maiman. Excited molecules in a ruby cylinder were kicked into gear together, shining light rays all in the same direction with their waves in tandem. This is called coherent light, and the first demonstration produced a spot of light hotter than the surface of the sun. Today lasers are used in many different ways, including as carriers of large amounts of information.

.08071838

This is the birthday of Count Ferdinand von Zeppelin. He designed and built the first dirigible balloon, a transportation balloon that could be directed. For a century people had been flying in balloons, but they couldn't direct where they went. Ferdinand Zeppelin created a streamlined balloon with an engine and

propeller, commonly known as a zeppelin.

.10071856

This is the birthday of Nikola Tesla. In 1883 he invented the AC motor. Before then, motors could only use direct current, the kind produced by batteries. But electric generators produced alternating current (AC), which goes back and forth. The AC motor gave a big boost to the new Age of Electricity.

.11071979

Skylab 1 re-entered Earth's atmosphere, breaking into pieces and burning up harmlessly as it plunged to Earth.

.12071854

This is the birthday of George Eastman, inventor of continuous photographic film and the first camera to use it, the Kodak.

.13071954

This is the birthday of Stephenson Yang, one of the discoverers of what may be planetary systems outside our own. In 1987 Campbell, Walker, and Yang announced the discovery of planet-size bodies orbiting two nearby stars, Gamma Cephei and Epsilon Eridani. Finding a planet orbiting another star is a cherished goal of astronomers, and many of them, such as Canadian Bruce Campbell on Vancouver Island, have been finding tantalizing evidence.

.15071662

The first scientific society, the Royal Society in England, was incorporated. Science, at this time, was still called "natural philosophy." Experimental science was in its infancy, but was about to start growing up very fast with examples like Issac Newton. This historical day may be said to mark the true end of the Middle Ages

.16071945

The first atomic bomb was exploded near Alamogoro, New Mexico.

.1707709BC

A total solar eclipse was witnessed and recorded

in China. The prediction of eclipses has been performed since at least 3,000 B.C. The oldest one recorded was in 763 B.C. in Babylonia.

.17071959

Mary and Louis Leakey discovered a fossil of *Homo habilis* (handy man), the original species in our genus, *Homo*. *Homo habilis* probably killed off the other upright walking primates, our cousins in the genus *Australopithecus*, a million years ago. By 200,000 B.C., *Homo habilis* had evolved into two brainy species. *Homo neanderthalis* went extinct by 30,000 B.C., leaving *Homo sapiens*, the species with language, as the sole surviving upright primate.

.20071976

Viking 1 was the first machine to successfully make a soft landing on the planet Mars. This robot performed experiments to test for the presence of microscopic life. The results of the first experiment did indicate life, but a second experiment found no organic molecules, so the signs of life are probably just a fluke.

.20071969

The lunar module of Apollo 11, carrying Neil Armstrong and Ed Aldrin, landed on the surface of the moon at 10:20 pm Pacific Standard Time. An external television camera sent back to Earth a live broadcast of Armstrong stepping down onto the surface of the moon and saying "That's one small step for a man, one giant leap for mankind." Nine more men walked on the moon over the next three years.

.21071969

The first footprint on the moon was made by Neil Armstrong. Two years later the first automobile tire tracks on the moon were made by David Scott and James Irwin.

.21071820

One of the most important practical discoveries ever made was published by Hans Oersted. He had discovered by accident, during a classroom demonstration, that whenever he connected a battery to a circuit a nearby compass needle moved. This relation between electricity and

magnetism ("electromagnetism") was soon developed into generators and motors, and the Age of Electricity was off and running.

.22071784

This is the birthday of the astronomer Friedrich Bessel. He was the first to publish, in 1838, a determination of the distance to a star, a feat also performed by others that year because the telescopes were finally good enough. The distance to the nearest star, Alpha Centauri, is about 43 trillion kilometers. Suddenly the entire Solar System had shrunk to a dot in space in comparison to the distance of even the nearest star.

.25071930

The first solar coronagraph was made by Bernard Lyot. This allowed astronomers to study the Sun's upper atmosphere, or corona, without having to chase after rare total eclipses.

.26071875

This is the birthday of psychiatrist Carl Jung, who developed the distinction between introverts and extroverts. Introverts tend to be overlooked. But because they don't dissipate their energy in social activities or in trying to impress others, they often possess unusual knowledge or have developed some talent to well above average standards.

.27071801

This is the birthday of Sir George Airy, who was the first to design eye-glass lenses to correct astigmatism. Astigmatism means "no spot," and if the front of your eye isn't curved perfectly, a spot will look spread out.

.29071925

One of the founding fathers of quantum physics, Werner Heisenberg, submitted for publication his method of making sense of the behavior of electrons in atoms. This was the first step toward realizing that electrons were not like little planets in orbit around the nucleus. It soon became easier to visualize them as standing waves with no definite location.

.30071921

Banting and Best discovered insulin. It was known that a hormone produced by the pancreas was necessary to prevent diabetes. The Canadians Frederick Banting and Charles Best had succeeded in extracting this hormone, insulin, from the pancreases of dogs. It worked perfectly for humans, and they were awarded a Nobel Prize for medicine.

.01081924

Fossil bones of a small-brained primate that walked upright were uncovered in South Africa by Raymond Dart. Paleontologists were shocked at his claim that this walking "ape" lived at least a million years before the first humans appeared about 200,000 B.C. Later finds and modern dating techniques have pushed the date of these Australopithecene ancestors back to over 3 million years ago.

.02081932

The first anti-matter was discovered by Carl Anderson. It was an anti-electron (a positron). Antimatter and matter annihilate each other instantly, producing an explosion of energy. Apparently when the universe was very young this is just what happened, but there was a little more "regular" matter left over. Antimatter is not known to exist in large amounts anywhere.

.07081903

This is the birthday of Louis Leakey, who, with his wife Mary, discovered *Homo habilis* (handy man), the original species in our genus, *Homo*. *Homo habilis* probably killed off the other upright walking primates a million years ago. By 200,000 B.C., *Homo habilis* had evolved into two brainy species. *Homo neanderthalis* went extinct by 30,000 B.C., leaving *Homo sapiens*, the species with language, as the sole surviving upright primate.

.10081519

Magellan set sail westward to circumnavigate the Americas in search of the Far East. He discovered that the Pacific was much larger than expected, confirming what the Greeks had calculated in 240 B.C., that the circumference of

the Earth was 25,000 miles. If Christopher Columbus had believed the Greeks, he would never have made his voyage in search of the Far East.

.12081865

Disinfectant was first used in surgery by Joseph Lister after hearing of Pasteur's germ theory of disease. Another physician had attempted to institute the same thing 17 years before, but it had been ignored until Pasteur's promotion of the germ theory of disease. Germs had gotten away with murder until only a couple of generations ago.

.12081877

Asaph Hall discovered the Martian moon Deimos. Earth and Mars were in conjunction and he had taken the opportunity to make certain that Mars really had no moons. Instead he discovered and named the two smallest moons known at that time, Deimos and Phobos, Greek for "terror" and "fear," the sons of the war god Mars (Ares).

.12081981

IBM introduced the IBM PC. At that time they didn't think a personal computer would really catch on.

.13081898

The first "Earth-grazer" was discovered, an asteroid named Eros. An Earth-grazer is any natural object that regularly comes closer to us than the closest planet, Venus. Eros is fifteen miles long.

.16081898

Phoebe, Saturn's most distant moon, was discovered by William Pickering. Phoebe revolves in a backward direction, and is probably a captured asteroid. Saturn's satellite system is the richest and most complex in the Solar System.

.17081877

Asaph Hall discovered the Martian moon Phobos. Earth and Mars were in conjunction and he had taken the opportunity to make certain

that Mars really had no moons. Instead he discovered and named the two smallest moons known at that time, Deimos and Phobos, Greek for "terror" and "fear," the sons of the war god Mars (Ares).

.17081970

Venera 7 was launched by the Soviets. It reached Venus and dropped an instrument package. That was the first "soft landing" (where the object isn't destroyed) on any planet.

.18081913

Black came up 26 times in a row on a Monte Carlo roulette wheel. Although statistics show that this event has a very low probability of happening, nevertheless there is a definite chance that it will happen some time. Coincidences actually occur at a rate higher than most people commonly believe, which is why so many coincidences are believed to be "supernatural" or "paranormal."

.20081977

The Viking 1 robotic spacecraft was launched. After a year of space travel, Viking 1 landed on the planet Mars. This robot performed experiments to test for the presence of microscopic life. The results of the first experiment did indicate life, but a second experiment found no organic molecules, so those signs of life were probably just a fluke.

.20081977

Voyager 2 was launched. Twelve years later it became the first space probe to pass by Uranus and Neptune. Voyager 2 then left the solar system altogether, bearing a gold-plated phonograph record with a message to possible extraterrestrial civilizations that might encounter the spacecraft in some distant space and time.

.250889

Voyager 2 flew by Neptune, the farthest giant planet. If you imagine Earth to be a ten kilogram basketball located a hundred feet from the Sun, then Neptune would be a 200 kilogram sofa two thousand feet from the Sun. Neptune sports rings, moons, and a gigantic long-lasting storm

similar to Jupiter's great red spot (called the great dark spot).

.27081962

Mariner 2, the first successful space probe to fly by Venus, was launched. Venus is the closest planet to Earth, and about the same size. It has a surface temperature of some 470 degrees Celsius, largely due to the massive greenhouse effect of its thick atmosphere.

.28081789

Sir William Herschel discovered Enceladus, a moon of Saturn. Saturn's satellite system is the richest and most complex in the Solar System. The Voyager probes in 1981 increased the total of known moons of Saturn to 17.

.29081831

Faraday ushered in the Age of Electricity with his discovery that a moving magnet induces electricity in a wire—this is a generator. The reverse, where electricity moves a magnet, is the basis of a motor, and was also discovered by Faraday ten years earlier.

.30081871

This is the birthday of Ernest Rutherford. In 1911, after patiently bombarding sheets of matter with particles of radiation for several years, he knew what the structure of the atom must be. He had discovered that virtually all its mass is squeezed into a tiny nucleus, only 1/100,000 the diameter of the atom, while ephemeral electrons make up the far outer regions. Atoms are mostly empty space.

.31081821

This is the birthday of Hermann von Helmholtz. He published in 1847 the law of conservation of energy (first law of thermodynamics), stating that the total amount of energy in the Universe was constant; none could be created and none could be destroyed. But then why hasn't the Sun burned out long ago? Helmholtz suggested an answer, but it was wrong. Can you guess where the extra energy comes from?

.31081885

A supernova explosion was detected in the Andromeda galaxy. It's the second most recent sighting of these spectacular star explosions. The most recent one was in 1987 in our neighbor galaxy, the Large Magellanic Cloud (leaving behind a neutron star that spins around at the astonishing speed of two-thousand times a second). The last supernova explosion of a star in our own galaxy was in 1604, studied by Kepler.

.01091859

Richard Carrington first observed a solar flare and realized that sunspots indicate an "active sun."

.02091959

Lunik 2 (USSR) was launched, and after traveling through space for twelve days, became the first man-made object to strike the moon.

.03091821

Michael Faraday made his first discovery—of great practical importance—about the relationship between magnetism, electricity, and motion. This led to the "age of electricity" ten years later with his second discovery (induction) and the development of generators and motors.

.06091522

Magellan's ship completed the first circumnavigation of the world. Magellan had set sail westward to bypass the Americas in search of the Far East. He discovered that the Pacific was much larger than expected, confirming what the Greeks had calculated in 240 B.C., that the circumference of the Earth was 25,000 miles. If Christopher Columbus had believed the Greeks, he would never have made his voyage in search of the Far East.

.10091892

This is the birthday of the Nobel Prize-winning physicist Arthur Compton. Using X-rays, he confirmed Einstein's theory that all electromagnetic waves, including visible light, are also particles. They're called "photons."

.12091970

Luna 16 was launched by the USSR, the first unmanned space probe to sample the Moon and return. This was just after Americans walked on the Moon, but other robotic Moon probes had already been doing the job before we sent men.

.14091959

A man-made object struck the moon for the first time. It was Lunik 2, launched by the USSR twelve days earlier.

.15091784

The first British manned balloon ascent was conducted by Lunardi, using hydrogen, the lightest gas. Hydrogen had first been used a year before, the same year the first-ever balloon flight occurred using hot air.

.16091848

Hyperion, one of Saturn's many unusual moons, was first discovered. In 1980 the space probes Voyager 1 and 2 showed that Hyperion was the least spherical moon, measuring 90 miles by 120 miles. Saturn's satellite system is the richest and most complex in the Solar System.

.17091789

Mimas, one of Saturn's many unusual moons, was first discovered. In 1980 the space probes Voyager 1 and 2 showed that Mimas has a crater so large that the impact must have nearly shattered it. Saturn's satellite system is the richest and most complex in the Solar System.

.17091857

This is the birthday of Konstantin Tsiolkovsky, considered the father of space travel because he first published ideas about it, including the use of liquid oxygen fuel.

.18091820

Ampere discovered the relationship between electricity and magnetism. This then prompted Faraday to make the discovery that soon led to the creation of generators and motors—and the age of electricity.

.19091820

Before a crowd of three hundred thousand Paris spectators, the Montgolfier brothers' hot air balloon lifted into the air and travelled six miles, carrying the world's first aeronauts—a rooster, a duck, and a sheep.

.21091908

Hermann Minkowski first presented his space-time diagrams. Minkowski showed that Einstein's relativity made more sense if the universe were really four-dimensional. The three dimensions of space and the one dimension of time should be treated as a single 4-D "space-time," hard to imagine but easy to deal with mathematically. This allowed Einstein to further develop his theory of relativity to explain the cause of gravity as a bending of this 4-D space.

.22091791

This is the birthday of physicist Michael Faraday. Faraday ushered in the age of electricity with his discovery that a moving magnet induces electricity in a wire—this makes a generator. The reverse, where electricity moves a magnet, is the basis of a motor, and was also discovered by Faraday ten years earlier.

.24091846

Neptune was discovered by Johann Galle. Neptune is the most distant of the large planets. If you imagine Earth to be a ten kilogram basketball located a hundred feet from the Sun, then Neptune would be a 200 kilogram sofa two thousand feet from the Sun. Neptune sports rings, moons, and a gigantic long-lasting storm similar to Jupiter's great red spot (called the great dark spot).

.25091644

This is the birthday of Ole Roemer, the first person to calculate the speed of light. He did it in 1675 by observing planetary eclipses. This was the first proof that light takes time to cross space. It takes one second to go 300,000 kilometers.

.26091955

The last living Euler's Flycatcher died in Hurricane Janet in Jamaica. Today bird species

are going extinct at a rate of two species every three years. This is fifty times faster than the extinction of the dinosaurs.

.27091905

Einstein published his conclusion, based on relativity, that all mass is really an extremely highly concentrated form of energy. The amount of energy you can get from any mass is huge—it equals that mass multiplied twice over by a very large number: the speed of light. Or, in the language of math, $E = mc^2$.

.30091880

The first photograph of a nebula was taken, in the constellation of Orion. The Orion nebula turned out to be a gigantic "space cloud" of gas and dust, lit by the stars imbedded in it. Later it was shown that other so-called nebulas are actually whole galaxies far outside our own galaxy (the Milky Way).

.02101608

The German Hans Lipperty invented the telescope. At first there was an attempt to keep it secret for military advantage, but Galileo heard about it in Italy and re-invented it a year later.

.04101582

The next day following this date was ten calendar days later (Oct. 15), in the shortest year ever recorded! The reason is human tinkering. The Julian calendar, started in 46 B.C., assumed a year of 365 and a quarter days, adding leap years to make up the difference. But the year is slightly longer, so by 1582 the calendar was ten days ahead. So they skipped ten days and made a minor adjustment to the leap years so this won't happen again, calling it now the Gregorian calendar. Britain and Russia stubbornly stuck to the old calendar for several more centuries.

.04101957

The first artificial satellite, Sputnik 1, was launched by the USSR, alarming the Americans and sparking the "space race". The Space Age had begun.

.04101959

The USSR launched Lunik 3, which photographed the far side of the Moon. The far side had never before been seen because the Moon's period of rotation matches exactly its orbital period, which keeps the same side facing us.

.05101713

This is the birthday of Denis Diderot, a philosopher of the "Enlightenment." Impressed by the emergence of science in the late 1600s, where men like Newton showed that the world could be explained mechanistically, Diderot was one of the first materialists. Materialists believe everything can be explained in material terms, without resorting to deities or spirits. This is the modern scientific agenda, and this day could be said to mark the true end of the Middle Ages.

.06101923

The astronomer Edwin Hubble proved that the cloud-like Andromeda nebula is actually an entire galaxy of stars, much like the one we inhabit, the Milky Way galaxy, which contains billions of stars. This was the first realization that the universe is full of many other galaxies in a much vaster space than anyone had dreamed of.

.07101885

This is the birthday of Niels Bohr, who developed a model of the atom in 1912 that explained many things. Electrons exist at various set levels, or shells, surrounding a nucleus. When an electron moves down to a lower level it loses energy and gives off light of a corresponding color. Absorbing light of that same color pumps the electron back up to the higher level. The spectrum of colors emitted or absorbed by elements, then, can be used as "atomic fingerprints."

.08101873

This is the birthday of Ejnar Hertzsprung, who was the first to measure the distance to another galaxy outside our own Milky Way. Our nearest neighbors, the two Magellanic Cloud galaxies, were found to be 150,000 light-years away. One light-year (the distance a beam of light travels in

a year) is ten trillion kilometers.

.10101731

This is the birthday of Henry Cavendish, who discovered hydrogen. He also discovered that hydrogen and oxygen combine to make water. Hydrogen means "water former."

.11101745

Von Kliest discovered the electrical capacitor. He received such a bad electric shock from it that he never went near it again.

.12101692

This was a bright day in the history of scientific thinking, when Governor William Phips of the Colony of Massachusetts ended the infamous Salem Witch Trials by declaring that "spectral evidence"—visions and hallucinations—would no longer be admissible in court.

.19101900

Max Planck published his quantum theory. He had discovered the "graininess" of energy, represented by a small number called Planck's constant. Planck's constant turned up in many other guises in the development of quantum theory, becoming the focal point of modern physics. (The word quantum, coined by Planck, means "how much?")

.20101891

This is the birthday of the physicist Sir James Chadwick, who discovered the neutron in 1932. A neutron is a combo of a proton (positively charged) and an electron (negatively charged). Neutrons are uncharged, and they lurk around in the nucleus of atoms, giving the atoms of the same element different "flavors," called isotopes, depending on how many there are. Neutrons play a role in radioactivity, and are very good for getting nuclear reactions going.

.21101879

Thomas Edison first lighted a carbon filament lamp bulb.

.22101903

This is the birthday of biologist George Beadle,

who won a Nobel Prize for showing that the basic units of genetic information, the genes, function by directing the formation of enzymes—one enzyme from each gene—which then do all the body's work. A mutation is when a gene (made of DNA) is altered so that it can't make its normal enzyme anymore.

24101632

This is the birthday of the early microscopist Anton van Leeuwenhoek, who astonished the world when he discovered that pond water contained living organisms so small they could not be seen with the naked eye.

.25101671

Iapetus, one of Saturn's many unusual moons, was first discovered. In 1980 the space probes Voyager 1 and 2 showed that Iapetus is a two-toned moon, one side light, the other dark.

.28101831

Michael Faraday started experimenting with the first electric generator. Meanwhile, Joseph Henry was developing the flip side of the generator—the electric motor. The cheap, abundant supply of electricity that was to come from generators would have been useless without the motor to put it to work. So between the two of them, Faraday and Henry ushered in the age of electricity.

.01111772

Lavoisier reported his experiments on combustion. He showed that when a substance burns it's actually combining with some substance in the air. Later he determined that it's oxygen. This killed the theory widely believed at the time that burning was a loss of "phlogiston." Nevertheless some important chemists continued to believe in phlogiston for decades afterwards.

.01111977

Chiron, the most distant asteroid, was discovered. Chiron orbits outside the asteroid belt, between the orbits of Uranus and Saturn. Asteroids are "leftovers" that didn't quite manage to form a planet during the formation of the

Solar System.

.03111957

Laika the dog became the first animal in space, carried aboard Sputnik 2, launched by the USSR.

.06111968

A pulsar was detected at the heart of the Crab Nebula, broadcasting very rapid, very regular pulses of microwaves. Pulsars are created when stars explode as supernovas, leaving the nebula as debris. The pulsar is crushed so hard by its own gravity that all its atoms have collapsed and converted into neutrons, creating a kind of gigantic atomic nucleus ten miles across. It rotates very fast, sweeping a beam of radio waves like a super-fast lighthouse.

.07111867

This is the birthday of Marie Curie. She first hypothesized the existence of elements that spontaneously emit radiation from their atoms, coining the term "radioactivity." She and her husband Pierre were awarded a Nobel Prize for discovering the radioactive elements polonium and radium. After Pierre was accidentally killed, Marie Curie went on to achieve a second Nobel Prize for isolating radium. Later Curie's daughter also won a Nobel Prize, along with her husband.

.08111895

William Roentgen discovered X-rays. The existence of radio waves, longer than the infrared waves at the low end of the visible light spectrum, had already been confirmed. Now, with his discovery, waves shorter than the ultraviolet waves at the high end of the visible were also confirmed. The shorter the wavelength, the higher the energy, so X-rays are a very high-energy kind of "light." Within days of the discovery, doctors were using the X-rays to look inside the living human body.

.10111970

The Soviet Lunik 17 was launched, carrying the first remote-controlled lunar rover, which brought back Moon rock samples in the year after the American's first moon walks. This was

not the first robotic probe; others had been doing the job even before we sent men.

.11111572

Tycho Brahe discovered a star that had not been there before. It was brighter than Venus, but after a year it was gone. Tycho proved that it was beyond the Moon, thereby shattering the long held medieval notion, started by Aristotle, of heavenly perfection and immutability. Today we know this must have been a star going "nova" (exploding).

.12111842

This is the birthday of John Rayleigh, whose work led to the discovery of argon, the first known inert element, which makes up one percent of our atmosphere. Inert elements don't react chemically with anything at all (except under very unusual conditions).

.14111891

This is the birthday of Sir Frederick Banting. The Canadians Banting and Best were awarded a Nobel Prize for discovering insulin. It was known that a hormone produced by the pancreas was necessary to prevent diabetes, and they succeeded in extracting this hormone, insulin, from the pancreases of dogs. It worked perfectly for humans.

.1511265BC

The first recorded observation of Mercury is on this day. At about this time, Aristarchus figured out that the Sun is the center of the Solar System, and even figured out how far away it is. This information was ignored, lost, and suppressed when re-discovered, for 19 centuries until the Middle Ages ended in the seventeenth century with the true birth of science.

.16111965

The USSR launched Venera 3, the first man-made object to reach another planet. It crash-landed on Venus.

.20111889

This is the birthday of astronomer Edwin Hubble. In 1922 it was predicted that the

universe is expanding. In 1929 Hubble confirmed this as a fact, by direct observation. Judging from the rate of expansion, the Universe must have been all crammed together about 15 billion years ago.

.22111941

Chambers and Heale took the first micro-photographs of a virus, influenza type A. Viruses are not living organisms. They are small pieces of genetic material that have "escaped" and can now "commandeer" the genetic machinery of other individuals in order to reproduce, often causing disease in the process.

.24111859

Charles Darwin published *On the Origin of Species*, a book detailing the evidence for his theory of evolution by natural selection. Many biologists in Darwin's time could see that life forms had evolved, but were puzzled about how. To avoid controversy, Darwin spent twenty years gathering evidence for his simple theory. This book created a new biology and changed our view of the world forever.

.25111915

After four years of labor, Einstein completed a major extension of his theory of relativity. He proposed that space was curved in the presence of mass, and that gravity was merely the result of objects following the shortest path in a curved space. He predicted that gravity would bend light rays, and would slow down time. Both predictions have been confirmed.

.28111660

The first scientific society, the Royal Society in England, convened its first meeting. Experimental science was in its infancy, but was about to start growing up very fast with examples like Issac Newton. This historical day may be said to mark the true end of the Middle Ages. Science, at this time, was still called "natural philosophy."

.29111803

This is the birthday of Christian Doppler, known for the Doppler Effect. Doppler explained the

reason why the sound of a whistle on a passing train is higher on approach and then suddenly lower after it passes by—the sound waves are being squashed and then stretched. This same effect can be seen with light waves, and was used to show that the Universe is expanding.

.30111974

Donald Johanson discovered "Lucy," the oldest, most complete skeleton of an upright-walking primate, or "hominid." She walked upright over three million years ago, long before the development of large brains. Johanson placed her species in the genus *Australopithecus*, which may have given rise to the genus *Homo*, of which the species *Homo sapiens* is the sole survivor in the entire hominid family.

.02121942

The Atomic Age began with the first controlled nuclear chain reaction, created by Enrico Fermi's team at the University of Chicago.

.03121725

Astronomer James Bradley discovered an optical phenomenon that allowed him to prove that the Earth was moving, and to measure the speed of light.

.05121901

This is the birthday of the physicist Werner Heisenberg, who showed that measurements of two different properties always have a certain degree of uncertainty. Because of this limit, physicists choose to talk as though the world itself is fundamentally indefinite. From this has come interpretations popular with the "New Age" movement. But as to whether the world is really uncertain... we can never be certain!

.07120185

Chinese astronomers saw a bright new star suddenly appear. An exploding star, called a nova, can suddenly appear in the sky where there were none to see before. Nova means new. What the Chinese saw was a supernova, which can shine as bright as a whole galaxy. Supernovas can leave behind small super-dense objects called neutron stars, which are much like

gigantic atomic nuclei.

.11121863

This is the birthday of Annie Jump Cannon, who developed the Harvard Classification of Stars used for studying the evolution of stars.

.12121901

The first trans-Atlantic wireless message was received. It was the letter "S."

.13121920

Michelson and Pierce measured the diameter of the star Betelgeuse. It was the first measurement of a star's size, and it was three hundred times the size of the Sun. The news made the first page of the *New York Times*.

.14121900

Max Planck first announced his idea of the "quantum," which was to revolutionize physics. He stated that substances can emit light only at certain energies, which suggested that some physical processes are not continuous. He had found the fundamental "unit of action," which crops up everywhere as a small number called Planck's constant, demonstrating the "graininess" of all substance and action. Quantum means "how much?"

.17121903

The Wright brothers flew the first powered, heavier-than-air craft 120 feet in 12 seconds, staying up for 59 seconds total.

.22121938

Imagine discovering a living specimen of a species thought to have been extinct for 70 million years. That's what happened on this date when a living Coelacanth fish was discovered. What is even more amazing is that this fish is a close relative of the kind of fish species that first clambered onto land, became amphibious, and thus became our ancestor. A preserved Coelacanth is on display at the Vancouver Aquarium.

.25121642

This is the birthday of Isaac Newton. From

Galileo's observations on motion, Newton was able to deduce the way gravity operates, and he said an amazing thing: that gravity operates between any two objects; it's universal. That means that you pull on the Earth just as much the Earth pulls on you (but since you're the lighter one, you're the one that falls).

.26121792

This is the birthday of Charles Babbage, who designed the first computer. He spent the rest of his life trying to build it, but the necessary electronic switches weren't invented for another century.

.27121831

The H.M.S. Beagle, a surveying ship, left England on a five year journey around the world with Charles Darwin as the ship's naturalist. Darwin returned with his theory of evolution by natural selection. Many biologists in Darwin's time could see the fact that life forms had evolved, but they were very puzzled about how. To try to avoid controversy, Darwin spent twenty years gathering evidence for his simple theory, which created a new biology and changed the world forever.

.28121895

The first movie theatre was opened to the paying public by the brothers Auguste and Louis Lumiere in the basement of a Paris cafe. A simple scene of a train rushing toward the camera had the audience shrieking and ducking. The Lumieres had invented a machine that was a camera, a film printer, and a projector all in one. They originated the 35mm standard, and the word "cinema."

.19011963

The first spleen transplant was performed by Thomas Starzl in a hemophiliac child.

.29011983

Using a brain-like computer, Nobel-laureate Francis Crick may have answered the question of what dreams are for. Dreams may be the erasing of erroneous memories, a kind of "unlearning". A memory is distributed throughout the brain as a pattern of strengthened connections between brain cells. But other memories are also superimposed on these same cells. In Crick's computer, too many memories started producing mixed-up "hallucinations". To clear out this junk, he gave it random input with a weakening of connections. It worked. And that just may be what your dreams are: the junk you need to forget.

.08021980

"You have made certain allegations which are an insult to my integrity," wrote Elias Alsbati on this day, in a letter to the scientist who first accused him of plagiarism. Alsbati had been publishing stolen work with impunity in seldom-read scientific journals. He was building a career by churning out a long list of published papers, the basic coin of career advancement in science. In the end, his brash manner and cavalier theft of whole papers, word for word, brought his downfall.

.24021872

The con artist John Keely suckered investors into supporting his Hydro-Pneumatic-Pulsating-Vacuo-Engine, which he claimed was powered by the disintegration of matter. Ten years and \$5 million later, Keely had still not produced a product to market. Keely left the stock-holders holding the bag and proceeded to find a new mark for his next fraudulent "invention."

.29021988

For the first time in Canada, a victim of debilitating Parkinson's brain disease was treated by implanting some of his own adrenal-gland cells into his brain. Parkinson's disease is a kind of "perversion of the will". Victims may be

plagued by an impatient, restless need to move, or, instead, a bizarre internal resistance may rise up to block their will to move, a kind of "counter-will". More than 25,000 Canadians suffer from this cruel brain disease. The transplant produces the same chemical messenger that's been lost in a region of their brains.

.07031930

This is the birthday of Stanley Miller, the first person to experimentally test the origins of life on Earth. The Earth is 4.6 billion years old. Since traces of the earliest bacterial-cell fossils have been found in rocks no older than 3.5 billion years, this means that life had one billion years in which to evolve from nonliving chemicals. Miller duplicated the conditions of the early Earth and discovered that, within a week, simple organic molecules appeared—including amino acids, one of the two basic classes of building blocks of life on Earth.

.19031987

Geologist Tom Williamson announced a scientific explanation for how dowsing works. The idea that dowsers can just walk along and somehow sense underground mineral veins or flowing water seems absurd. But it may be due to a hitherto unrecognized human faculty: a sense of magnetism. Consider for yourself: Birds, whales, and fish navigate by their magnetic sense. Rock faults with minerals or water are often associated with magnetism. And finally, microscopic grains of magnetite rock have been found in human brains, looking much like the kind used by some bacteria to tell up from down.

.02041973

On the island of Madeira, frequent brilliant-white flashes were observed on various mountain tops. This is an example of an anomaly, something "contrary to rule or law". Upon scientific examination, many seeming anomalies turn out to be false alarms—misperceptions, hoaxes, and so on. But the reverse often happens: anomalistic claims ignored by science turn out to be true. This happened in the eighteenth century

when scientists refused to accept that stones fell from the sky. Museums even threw away their precious meteorite samples.

.03041804

The fourth asteroid, Vesta, was discovered by Heinrich Olbers. The asteroids represent a "planet that never quite made it" during the formation of the Solar System.

.04041966

The Soviet probe Luna 10 was the first to be placed into orbit around the Moon. A series of American probes followed, mapping the entire surface of the Moon, including the side that always faces away from us.

.16041907

This is the birthday of Canadian inventor Joseph-André Bombardier, who invented the Ski-Doo, originally called the Ski-Dog, in 1952. At the age of 15 in rural Quebec, he had already built the first very crude snowmobile, with the help of his younger brother, at a time when cars were still toys for the wealthy. In the 1930s, Bombardier's son had died of appendicitis because Bombardier could not get the boy to the hospital through the snow-blocked roads. On that day, the machines he'd been working on in his garage were all strewn around in useless, unassembled pieces.

.17041992

"Magic for Skeptics: Trickery and the Paranormal" was a seminar held on this day by the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP). Supposed "supernatural" events are usually either just plain coincidence, or simple magic tricks. The tricks fool scientists, especially physicists, who simply don't think about trickery. The famous magician James Randi is a founding member of CSICOP, and has a prestigious MacArthur Foundation "genius grant" for his work exposing psychic fraud. "It's like shoveling water uphill, but it's got to be done," he says, speaking out for rationality in what he sees as an increasingly irrational world. Members of CSICOP have included such luminaries as Carl Sagan, Isaac

Asimov, and Francis Crick.

.24041953

Three "phosphorescent wheels"—mysterious spoke-like bands of light rotating around a central hub—were reported in the Gulf of Thailand. This is an example of an anomaly, something "contrary to rule or law". Upon scientific examination, many seeming anomalies turn out to be false alarms—misperceptions, hoaxes, and so on. But the reverse often happens: anomalistic claims ignored by science turn out to be true. This happened in the eighteenth century when scientists initially refused to accept that stones fell from the sky. Museums even threw away their precious meteorite samples.

.03051836

John Whiting patented baking powder. It's a finely powdered mixture of sodium bicarbonate (baking soda) and an acid salt, which releases carbon dioxide gas when moist, causing bread to rise.

.05051989

Using a piece of brain growing in a dish, scientists at the National Institute of Child Health and Human Development in the U.S.A. showed exactly how our brains develop their capabilities and memories. The active connections are strengthened, while the inactive ones are weeded out. We actually start life with excess connections in our brains. The brain of a growing child is busy eliminating most of its connections. If this doesn't occur, the child will be retarded.

.15051629

Francisco Pelsaert discovered Australia. Australia had separated from the other continents 50 million years ago, when all the mammals were marsupials. Marsupials give birth to a premature fetus that develops in an external pouch (like the familiar kangaroo). These marsupials adapted to different habitats and took on characteristics remarkably similar to the placental mammals that dominate the rest of the world. There's marsupial mice, marsupial

wolves, marsupial flying squirrels, marsupial moles, and marsupial anteaters.

.18051988

Biologist William Thwaites publicly debated the leading "creation scientist," Dr. Duane Gish, a man with a Ph.D. in biochemistry who has managed to get the story of Genesis taught as serious science in some schools. Actually there is no creation science. Creationism is merely the belief that the Bible is the only truth, so the world must be only a few thousand years old, and all the species today were on Noah's ark. In science, if all the evidence strongly suggests a new theory, you don't stick to the old one just because you like it better. Science is a self-correcting group enterprise designed to weed out errors, delusions... and fools.

.20051969

Hester Y. had only recently been "awakened" from 20 immobile years of being "frozen in time"—but on this day she began to start moving about like crazy. Originally, the miracle drug given to her by Dr. Oliver Sacks had turned her into a normal person again—but not for long. The balance tipped too far the other way—she then became compelled by fast, convulsive movements, looking like a speeded-up film. Finally, Hester had to go off the drug and return to her frozen moment. The movie "Awakenings" is about Sacks and his patients who were all victims of a sleeping sickness epidemic.

.21051935

Hugo DeVries died. One of the more well-known stories in science involves him. In 1900 he developed, on his own, the laws of genetics that Mendel had worked out forty years earlier. Two other scientists in other countries made the same independent discovery, and each was about to publish his discovery when, upon searching the literature to write up their papers, they found that Mendel had beat them to it, but had been simply ignored at the time. In fact, Darwin had a copy of Mendel's publication, which could have aided immensely his theory of evolution by natural selection—but he never got around to looking at it. DeVries also hit on the concept of

mutations, which is now an integral part of the theory of evolution.

.06061822

Alexis St. Martin was accidentally shot in the side at close range by a shotgun. After he recovered, he still had a one-inch opening in his side, leading into his stomach. Through this opening, a frontier surgeon, William Beaumont, was able to watch changes in the stomach under different conditions, and extract gastric juice samples. This work served as a source for much early medical information about digestion, and increased interest in the field.

.07061989

Seven professional psychics appeared on a TV show starring the magician James Randi, hoping to win \$100,000 each by proving their powers under controlled conditions. These challengers had helped design the tests and had approved them. An astrologer guessed the signs of twelve different volunteers—he scored zero. A psychic's predictions, made days prior, failed. An ESP challenger guessed 250 cards—scoring exactly as predicted by chance. A "psychic surgeon" showed a film of his "medical procedure"—Randi then duplicated the bloody operation on an audience member. The famous spoon-bending Uri Geller appeared but refused to be tested, and Randi duplicated every one of his tricks. No challenger scored above chance.

.12061977

Koko the Talking Gorilla appeared on the cover of New York Times Magazine. It was reported that Koko could make sentences using American Sign Language. But soon controversy erupted when Herbert Terrence, who had taught ASL to a chimp, reversed his own earlier conclusion to report that when the chimp put words together, it had almost always been unconsciously cued by its teachers. "Experimenter effect" is the term for all the insidious ways a researcher's strong convictions can unwittingly distort data. A famous example is Clever Hans, the horse that could do arithmetic.

.14061990

A Gallup poll of 1,236 adult Americans was released. It showed that a majority believe in the Devil and demonic possession; half believe in psychic healing powers; a third believe in ghosts; a third in telepathy; and a third in astrology. Another survey two years earlier had revealed that only 6 percent of Americans know any basic scientific facts, or understand that science is a logical, self-correcting enterprise in which every new idea is repeatedly tested against new observations. In the last few generations, people have actually become less scientifically literate and more superstitious.

.27061969

Doctor Oliver Sacks first gave Miriam H. the miracle drug DOPA. Miriam had been a rigid zombie for decades. The drug brought her back to normal. But eventually the balance tipped the other way—she became impatient and demanding, making sudden, uncontrollable movements, and having paranoid fantasies. Miriam was able to live teetering on the edge of these two extremes, but other patients like her had to choose to live one way or the other—either extremely impeded, or extremely accelerated. The movie "Awakenings" is about Sacks and his patients, who were all victims of a sleeping sickness epidemic.

.24061947

Kenneth Arnold reported the first sighting of a group of "flying saucers" over Mt. Rainier. This was one year after Richard Palmer had invented flying saucers in his pulp sci-fi magazine *Amazing Stories*, including even the abduction and amnesia stories that have cropped up more recently. The famous psychiatrist Carl Jung wrote a whole book on flying saucers, calling UFOs a "living myth", and said of them, "We have here a golden opportunity to see how a legend is formed."

.14071990

On this day it was reported that firewalking on hot coals requires no special powers of mind-over-matter. A group of young, skeptical British scientists walked barefoot across a 12-foot bed of glowing embers, saying to themselves "hot

rocks, hot rocks". The reason you won't get burned doing this (as long as the fire is prepared properly) is because wood coals simply don't transfer their heat very well. You wouldn't have the same luck with a frying pan at the same temperature.

.18071853

This is the birthday of Konrad Lorenz, who established the science of ethology—the study of animal behavior in the wild. He's most famous for discovering "imprinting". A baby bird, at a critical point not long after hatching, becomes attached to the nearest moving object and follows it instinctively. In natural circumstances the object would be the mother, but if the mother isn't there, the bird will imprint on a human or even a pulled inanimate object, remaining attached, to some degree, the rest of its life.

.19071917

A supernova in a distant galaxy was observed. At the time it wasn't known what it was, but we now know that these star explosions are the driving force behind life itself. They create the heavier elements that planets and living creatures are made of. They also produce the cosmic rays that cause mutations that allow life to evolve. The eye that reads this sentence, the brain that interprets it, the evolution that brought it into being, and the planet that carries life onward—all came from the fiery furnaces of the stars.

.28071988

The curtain fell on one of the strangest tales of scientific controversy in recent times. A month before, *Nature* had published experiments by Jacques Beneviste on homeopathic medicine. This medicine is highly suspect because it uses substances diluted in water to such a degree that there's literally nothing left but water. Beneviste reported that water retained a "memory" of those molecules it once contained, a "memory" that could cause a reaction with blood cells. But the journal dispatched an unusual investigative team to Beneviste's lab—including the magician James Randi, the famous debunker of psychics and faith healers. The results turned out to be simply a delusion due to biased observations and

flawed experimentation.

.19081968

The famous physicist George Gamow died. He was one of the most important supporters of the "big bang" theory of the creation of the universe, and he was the first to conceive of the genetic code, whereby our genes store information to be translated into living processes.

.09081990

Lisa Matsuda discovered the cannabis (marijuana) receptor. All your brain cells communicate by releasing chemical substances that act on tiny receptors on other brain cells. If there's a natural receptor in our brains for the drug found in marijuana, then there's almost certainly a natural marijuana-like substance in our brains. The cannabis receptor is even found in fly brains, so it must have been retained since the early evolution of life for a very good reason. It may play a role in memory. Twenty years ago, the search for our natural "morphines" (pain killers) followed from the discovery that we have a natural morphine receptor. Soon we may find out what our natural "cannabis chemical" does.

.22081642

The first newspaper was published, the London Gazette. Gutenberg, who invented the printing press, printed the first book in 1454—300 copies of the Bible in Latin. The printing press had such a big impact on history that some people consider that it marks the end of the Middle Ages, although science as an enterprise and a way of thinking didn't really get going until after the first newspaper.

.26081749

This is the birthday of Johann von Goethe (pronounced Ger'tuh). Besides being a great literary figure, he also wrote on science topics—although he was usually wrong. His ideas were mostly based on feeling and intuition, and are largely worthless, but his intuition did bring him to recognize that today's species have evolved from earlier ancestral forms—and this was before Darwin was even born.

.04091975

A special investigative team exposed some bad science. Physicist John Taylor had described experiments with children that could bend spoons by amazing psychic powers. The trouble was, they were too shy to do it in front of anybody. The investigating team's hidden camera showed them simply bending the spoons by force, and they published this in a scientific journal on this day. Unfortunately, people hear about the outrageous claims, but not the exposures and retractions made later. Moral to the story: science is a group enterprise, weeding out the mistakes... and the fools.

.09091981

The hot, young superstar of cancer research, Mark Spector, was banished from science, in disgrace. He had forged his experimental results. His superiors had wanted results and he was a guy who just couldn't say no. It seemed odd that often the experiments would only work in Spector's hands, but pride, ambition, and reluctance to listen to bad news or to distrust a colleague kept everyone on Spector's bandwagon. Finally, lab insiders discovered the forgery, and Spector's career was over less than two years after it started.

.28091984

A court investigation declared that the prototype of the Newman Energy Machine did indeed have an energy output greater than its input. This is the most recent story of attempted "perpetual-motion machine" fraud. Although Newman managed to persuade Congress to introduce over ten bills to force the Patent Office to grant him a patent, none passed. There is only one way to get something for nothing—trickery. Over the centuries, swindlers have taken millions of dollars from gullible investors with the lure of supposed perpetual-motion machines.

.29091901

This is the birthday of the famous physicist Enrico Fermi. In 1942, he and his team produced the first sustainable nuclear chain reaction, in the first nuclear reactor. The atomic age had begun.

.01101958

NASA, the National Aeronautics and Space Agency in the U.S., was founded. This is the same year the first American satellite reached a successful orbit around the Earth. At the time of this writing, NASA is involved in establishing observatories in orbit above the atmosphere. In addition to fixing the crippled Hubble Space Telescope, they plan to launch the Advanced X-ray Astrophysics Facility, the Space Infrared Telescope Facility, and the Large Deployable Reflector.

.13101988

Three laboratories simultaneously announced their determination, by carbon-14 measurement, of the age of the famous Shroud of Turin—a linen cloth imprinted with the image of a crucified man. For 600 years, many people have believed that the Shroud is the burial cloth of Jesus, with the image produced by a miracle. It actually dates from around the fourteenth century, right around the time a medieval artist confessed to have cunningly painted it.

.14101980

Genentech went public, marking a major turning point for genetic engineering as an industry. Genentech raised \$35 million in a few hours in return for only 13 percent of its equity, as its offering sold out, then was traded wildly for the rest of the day. The stock rose from \$35 to \$89 a share before closing. At the time it was the largest single public stock offering in history.

.16101914

The first human blood transfusion took place in Britain during World War I. Isadore Colas donated blood to, and thereby saved the life of, Corporal Henri Legrain. A few years earlier the four basic blood groups had been discovered, and it was then possible to determine the compatibility of donor and recipient.

.17101958

The first successful bone marrow transplants were performed on six Yugoslavian atomic scientists who had just been accidentally

irradiated. The transplanted marrow from foreign donors saved five of the men, who were back at work four months later.

.18101911

The psychologist Alfred Binet died. He invented the intelligence quotient, or IQ, a measure of the ability to think and reason. It's intended to be independent of learning and education in any field. The average score for the human population is set at 100. A score of about 133 marks the top 2 percent of all people. If you score this high, you're eligible to join a world-wide social club of people in the top 2 percent, called Mensa. If you've often suspected that maybe you're smarter than the people you know, you might want to take the Mensa test.

.24104004BC

On this day the world was created. That's the official determination made by Archbishop Ussher in 1650, based on all the "begats" in the Old Testament. Even Bible scholars don't believe this now, but half of the population does, according to a 1982 Gallup poll. By 1986 it was even worse—a poll showed that a majority of American college students believed Adam and Eve were created as the first two people.

.17111869

The Suez Canal was formally opened. For the first time, ships could sail between Europe and the Far East without having to circumnavigate Africa. In 1875, Britain managed to buy control of the canal from a debt-ridden Egypt.

.18111898

The inventor John Keely died, leaving his investors to discover that his perpetual motion machines were all a fraud. He had swindled them out of \$5 million. To make his impossible motors appear to work, he had constructed a huge high-pressure air tank and water pump in the basement, with false ceilings and floors hiding compressed air lines and rotating power shafts, which Keely could bring into play with concealed valves and switches. The fraud was reported in the media, but believers in Keely nevertheless remain to this day.

.21111865

A mechanical dishwasher was patented, operated by a crank-driven paddle. The electric-motor dishwasher appeared in 1912, and in 1932 the discovery of a suitable detergent promoted the development of the automatic dishwasher.

.23111979

"Can an Ape Create a Sentence?" was a report published by Herbert Terrence, who had spent four years teaching Nim Chimpsky to use American Sign Language. After reviewing all the videotapes of the many sessions, he had to reluctantly conclude that when Nim put words together he was almost always being unconsciously cued by his teachers. This forced many to re-interpret previous reports on talking apes. The "experimenter effect" is the term for all the insidious ways a researcher's strong convictions can unwittingly distort data. A famous example is Clever Hans, the horse that could do arithmetic.

.26111818

Johann Encke worked out the orbit for the second comet to have its orbit established, which bears his name. It returns every three and a third years, the shortest period known to this day. Nowadays you can hardly see it because its frequent approaches to the Sun have drained it of its tail-forming material.

.15121859

Gustav Kirchhoff explained that every chemical element produced a unique "fingerprint" spectrum of light when heated. This sort of fingerprinting was used to discover new elements and to show for the first time that other bodies outside the Earth are composed of the same elements as on Earth.

.18121912

The opening of a public fossil display started one of the longest-standing mysteries in the history of science, the Piltdown Man hoax. These supposed ancient, pre-human bones were later discovered to be a fraud composed of an orangutan jaw and a modern human skull.

Recent evidence now points the finger at Sir Arthur Keith as the perpetrator. He was a major proponent of the idea that big brains came first in human evolution. Actually, upright walking and human-like teeth came long before big brains. This hoax just shows that individual scientists are as human as everybody else. But science is aimed at a single objective truth, and that's why it's designed to be self-correcting.

.19121967

Jocelyn Bell discovered the first pulsar. A pulsar is a neutron star that broadcasts a radio beam and spins rapidly, producing a pulsing radio signal detectable from Earth. When Bell's supervisor got the Nobel prize for the discovery, it was called a scandal by the eminent astronomer Fred Hoyle. But it's the norm in the science business that the lab chief trades job slots and patronage for the right to take credit for his subordinate's achievements.

.20121876

This is the birthday of astronomer Walter Adams, who discovered the first white dwarf star. He showed in 1914 that Sirius B, the companion star of the brightest star in the sky, Sirius A, was as massive and as hot as the Sun, even though it was very dim. The only explanation is that Sirius B is as small as the Earth. This means that its atoms must be squashed down in a way that never occurs on Earth. At an earlier time, this idea would have been laughed at, but it had just been proven that atoms are mostly empty space, so the idea wasn't so far fetched after all.

.23121690

John Flamsteed, the first Astronomer Royal of the Greenwich Observatory, detected Uranus for the first time. He didn't realize it's a planet, because Mercury, Venus, Mars, Jupiter, and Saturn had all been known since prehistoric times, and nobody suspected there might be others.

.31121514

This is the birthday of the early anatomist, Andreas Vesalius. He created a sensation one

day simply by showing that men and women have the same number of ribs. (Because of the Genesis story, where Eve is created from Adam's rib, medieval people believed that men have one less rib than women.) And so began the very first steps of science, when people began to actually look at things to decide what was true, instead of relying on blind faith and unjustified authority.