Here's the LIFE magazine list of the Top 100 Events of the last Millennium. The events are in order of importatance, with number 1 having had the most impact on the lives of people in the last 1000 years.

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| **100  Fixing the Calendar 1582**   CALENDARS, perhaps man's most ambitious attempt to control time, are predicated on three astronomical certainties: the earth spinning on its axis (a day); the time it takes for the moon to circle the earth (a month), and the approximate time it takes the earth to revolve around the sun (a year). In 46 B.C., Emperor Julius Caesar borrowed from Egyptian and Jewish calendars by instituting a solar year of a dozen 30-day months, with five days left over and a leap year every four years.  But Caesar miscalculated, and over time the 11-minute annual discrepancy between his calendar and the solar year had accumulated a debit of 10 days. By the 16th century, the spring equinox--and Easter, a centerpiece of the Christian religion, which was linked to it--had begun to drift backward from its March mooring into winter. In 1582, Pope Gregory XIII assembled a committee, including the influential Jesuit mathematician Christopher Clavius, and issued a Papal Bull, creating our present-day Christian calendar. New Year's Day was restored to January 1 after more than 1,000 years of being celebrated in late March. There would be no leap years in centesimal years, except those divisible by 400. And, in his most extraordinary move, to anchor Easter, Gregory scissored 10 days off the Julian calendar.  On the night of October 4, 1582, people went to bed as usual; they awoke to find it was October 15--11 days later. While Roman Catholic countries adopted the modifications at once, Protestant England and the Colonies only came around in 1752. A footnote: The Gregorian calendar, one of 40 active calendars in the world, is still not entirely accurate. It runs 26 seconds fast a year, leaving a margin of error of six days every 10,000 years. So don't look back--the next millennium is gaining on us.  **99  The World Rocks 1954**   THE INGREDIENTS had been added to the melting pot of American pop: base of blues, hint of jazz, some c&w, dash of gospel, pinch of swing. Cleveland deejay Alan Freed named the stew "rock'n'roll." Sam Phillips, owner of Memphis's tiny Sun Records, sighed his soon-to-be-famous sigh: "If I could find a white man with the Negro sound and the Negro feel, I could make a billion dollars." Heaven-sent, Elvis Presley came knockin' on Phillips's door, and on July 5, 1954, the shy but swaggering truck driver covered Big Boy Crudup's "That's All Right Mama." "History should record that Elvis was unquestionably the first rock'n'roll performer," says Phillips.  Elvis conquered the world. Along with him went Bill Haley, Little Richard, Buddy Holly, Chuck Berry; in their wake came the Beatles, the Stones, Dylan, the Boss, Beck. Today, rock'n'roll is a gazillion-dollar industry with a hall of fame and a global video network pushing what was already a massive cultural colonization. Rock has initiated countless trends in fashion. It has ruptured our notions of proper social behavior, promoting new attitudes toward drug use and--as Elvis-haters once warned--sex. It has given Great Britain its first r'n'r knight (Sir Paul McCartney) and the United States its first r'n'r President (Mr. Bill Clinton). Rock rules. Roll over, E.P., and tell Bill Haley the news.  **98 Stone Code 1799**   ONE OF HISTORY'S GREAT intellectual adventures began on a summer day in 1799 when, near the Egyptian city of Rosetta, soldiers in Napoleon's ranks found a slab of black basalt engraved in three languages. The stone's scripts--Greek, demotic (a simplified Egyptian script) and hieroglyphics--seemed to render the same message. If linguists could match the hieroglyphs to the Greek, all of Egyptian literature would be theirs.  It took until 1822 for Jean-Francois Champollion to discover that hieroglyphics mixed phonetic and symbolic meanings; that some texts should be read right to left, others left to right or top to bottom; and that some symbols had two different meanings. This breakthrough, and the translations it produced, led to revelations both humbling and exhilarating: The Egyptians knew medicine, astronomy, geometry. They used weights and measures and had an organized system of government. They were passionate, too: "Your voice is like pomegranate wine," ran one poem.      The Rosetta Stone, along with discoveries at Herculaneum and Lascaux, taught us that each age, including our own, occupies but a small space in the continuum of time.  **97 Re-igniting the Eternal Flame 1896**   THE ANCIENT Greek Olympics were a tribute to the gods, a show of humanity's capacity for grace, speed and strength. They lasted from at least 776 B.C. to 393 A.D., when Emperor Theodosius banned the games, which had devolved into a crude carnival rife with pro athletes, betting, bribery, all manner of cheating.  Determined to rekindle the original ethic, a Parisian aristocrat named Baron Pierre de Coubertin founded the modern Olympic movement in 1896. His tournament has since grown into a mammoth quadrennial exhibition of money, power and sport that stands as the world's most grandiose entertainment spectacle. Even as one of de Coubertin's most wild-eyed ideals has been realized--that of uniting the world's countries, if only briefly--the Olympics' growing importance has made it a target of abuse. Hitler sought to portray the 1936 Games as proof of Aryan superiority; terrorists used the '72 Munich Games as their stage in the massacre of Israeli athletes; President Carter called a boycott of the '80 Moscow Olympics after the U.S.S.R. invaded Afghanistan, and Moscow replied in kind four years later when L.A. hosted. Just last year a murderous pipe-bomber, motive unclear, terrorized Atlanta. Great leaders and craven criminals realize that nothing focuses world attention like the Olympics.  Why? Because sometimes we glimpse the transcendent. Kerri Strug, Michael Johnson, Oksana Baiul (just to name a few from recent Games): You see them in their glory, and you smile. Little kids smile. De Coubertin smiles. The gods themselves smile (Nike, not least).  **96  Man of La Mancha 1605**   MIGUEL DE CERVANTES Saavedra's comic-romantic tale Don Quixote de la Mancha is said to have been translated into more languages than any book other than the Bible. Considered by many to be the first modern novel and the prototype for much of the world's fiction, the story of the deranged Don Quixote acting out the literary ideals of chivalry and romance has captured the imaginations of readers since it was published in 1605. Cervantes, born in 1547, the son of a poor doctor, received a limited education and served as a soldier in Italy. He was wounded in the battle of Lepanto, captured on his way back to Spain in 1575, enslaved in Algiers and finally ransomed in 1580. Over the next 20 years he wrote a number of plays and a novel--all unsuccessful. But in 1605, the first part of Don Quixote was published, gaining an immediate popularity that has never waned. Like Malory, Chaucer, even Milton, Cervantes captured the essence of his time; but his language and his vision need little interpretation to be understood by modern readers.  **95  The Good, The Bad, The Beautiful 1683**   In the 16th and 17th centuries, European collectors of art and artifacts housed their exhibits--a picture made of feathers, the head of an ape, the "hand of a mermaid"--in "cabinets of curiosities" or "wonder rooms." But the museum as we know it got its start in England, in 1659, when John Tradescant, a gardener to royalty, deeded his family's treasures--fish, weapons, birds, even a stuffed dodo--to fellow collector Elias Ashmole. When Ashmole donated the collection to Oxford University, he stipulated that a separate building be constructed for it. Oxford complied, and the Ashmolean, the first public museum founded to present the feats and phenomena of man and nature, opened in 1683.  **94  Rule Britannia 1588**   AS THE SPANISH ARMADA cruised into the English Channel, it looked like a fearsome city under sail. The mission of the most heavily armed fleet the world's greatest naval power had ever put to sea was simple: meet the British navy and crush it. Then King Philip II's ally, the Duke of Parma, would sail north from Dunkirk and invade England. His troops, Philip assumed, would be embraced by English Catholics, who would rise in rebellion and hurl the Protestant Queen Elizabeth I from her throne.  But on July 29, 1588, an English fleet of substantially smaller ships began destroying the armada. Many of these ships were of a radical new design: low, streamlined, nimble. To exploit their advantage, the English unveiled a completely new method of naval combat, making no attempt to board the enemy ships, relying instead on their long-range cannon. Only half of the Spanish ships made it home.  The armada's defeat was a portent of much to come. True, the Spanish empire declined gradually, and it would be a century before Britannia ruled the waves. But the British Lion had roared.  **93  Surgery Without Pain 1846**   STRAPPED INTO A CHAIR, a pale young man with a tumor in his jaw awaited his fate without showing a twinge of fear; he said he even felt "confident." Surprising remark, considering he was about to undergo surgery at a time when screams accompanied incisions and whisky was often the best way to dull the pain. But on October 16, 1846, at Massachusetts General Hospital in Boston, dentist William Morton administered ether before the surgery, and the patient felt no pain. Morton did not discover ether. Valerius Cordus did, in the 16th century. Nor was he the first to use it during a surgical procedure. Georgia physician C.W. Long excised a tumor from a patient using ether in 1842--for a $2 fee. As for coming up with the word anesthesia, Oliver Wendell Holmes gets the credit. But because Morton was the first to spread the news to the scientific community--an account of the operation appeared in the Boston Medical and Surgical Journal--he is remembered as the man who opened a new era for surgeons around the globe.  **92  The Rise of the Ottoman Empire 1453**   MEHMED II KHAN Gazi was only 21 when he captured Constantinople from the Christians in 1453. The battle marked the collapse of the Byzantine Empire and the ascendancy of the Ottoman Empire, which would thrive through half the millennium, spreading its influence across much of Europe and the Arab world.  "Inspiring of fear rather than reverence," as one Venetian visitor said of Mehmed, he nonetheless transformed Constantinople from a decrepit city into a whirling hub of trade and creativity. It became a magnet for Islam's most ambitious and talented scholars, poets, artists and architects, who wrote some of the era's finest literature and built spectacular mosques.  But the Ottoman influence was not all benign. Straddling the Bosporus between Asia and Europe, Constantinople was a perfect springboard for the empire's military conquests as far west as Morocco, north into Hungary and east to Damascus, Baghdad and the holy cities of Mecca and Medina. The occupation of Constantinople also forced Christian Europe to look for new trade routes to East Asia by circumnavigating Africa. The empire eventually collapsed after World War I, when Mustafa Kemal Atatuerk founded the modern republic of Turkey and renamed the old imperial capital Istanbul.      **91  Haiti Gets Its Freedom 1804**   THEY HAD SIMPLY had enough. By 1791, half a million black men and women toiled in the coffee, indigo and sugarcane fields on this French colonial island. When Boukman Dutty, a Jamaican-born voodoo priest, charged a gathering that August to "throw away the thoughts of the Whitegod who thirsts for our tears," the masses listened. Armed with machetes and vengeance, they torched plantations and took lives by the thousands as they fought for their freedom. A self-educated former slave named Franççois-Dominique Toussaint-L'Ouverture organized an army that stood down France's attempts to reestablish control until 1802, when he surrendered to Napolééon Bonaparte's troops. But the insurrection so impeded Bonaparte that he sold the Louisiana Territory to the United States the next year, ending France's quest for domination in the Western Hemisphere. Toussaint didn't live to see his dream realized, but on New Year's Day, 1804, the rebels finally got their wish: Haiti became the world's first free black republic. The ripple effects were felt as far away as England and America, where news of the revolt cheered abolitionists.  **90  As If On Cue: Plastics 1907**   NOBODY WAS HAPPIER to learn of the invention of plastic than the world's elephants. For centuries, ivory had been the standard for everything from knife handles to billiard balls. In the 1880s, a dwindling supply of tusks and a billiard boom conjoined to create a crisis. The country's largest maker of balls, Phelan and Collender, anxiously offered $10,000 in gold--"a handsome fortune"--to any "inventive genius" who came up with a synthetic substitute for ivory. Pachyderms everywhere held their breath.  And held it and held it, for it wasn't until 1907 that Leo Baekeland, a Belgian-born inventor who'd made a bundle on quick-action photo paper, hit upon the right combo of phenols and formaldehyde. This first entirely synthetic plastic, Bakelite, was impervious to heat, electricity and acid. It was therefore a plus for pool, but also for the nascent auto and electronics industries. One great asset of plastic was versatility, and it came to be used in everything from telephones to toilets, ashtrays to airplane parts. By 1968 a young graduate looking for a surefire field was being urged to listen to "just one word--plastics"; 30 years later the miracle material has turned into a $260 billion industry that employs 1,381,000 worldwide. It's a plastic world we live in, and that's not always bad.  **89  Across the Sahara 1324**   Fourteenth century Africans would be astonished to discover that Mali is now one of the world's poorest countries. In its day, Mali's empire was one of the largest in the world, ruled by an emperor whose lavish adventure helped spread Islam across West Africa and literally put sub-Saharan Africa on the map in Europe and the Middle East.  Mansa Musa embarked on a holy pilgrimage to Mecca in 1324 with such opulent flourish that awestruck Egyptian writers were still recounting it 200 years later. Legend has it that Musa traveled across the Sahara with about 60,000 men, including 12,000 slaves. He brought 80 camels loaded with 300 pounds of gold each, which he gave away so freely in Cairo that it took years for the price of gold to recover. Architects and poets he brought back with him from Arabia built distinctive mosques, some of which survived for centuries, and helped establish Timbuktu as a center of Islamic schooling. But Musa's brazen advertisement of riches made Africa's interior a more desirable target for European exploration and conquest.  **88  Japan Opens Its Doors 1868**   FOR 250 YEARS the shoguns, Japan's military rulers, had kept their country closed to the world. Then, in 1853, U.S. Commodore Matthew Perry arrived in Tokyo Bay with four gunships, demanding that Japan open its ports to trade. Some of the country's leaders realized they had no choice. By 1868, power had shifted back from the shoguns to the emperor--the 15-year-old Mutsuhito--and the imperial seat moved from Kyoto to Tokyo. Known as the Meiji Restoration (Meiji, or "Enlightened Rule," was the reign name of Mutsuhito), this period saw the transformation of Japan from an inward-looking, agrarian, feudal kingdom to a world power. Mutsuhito's chief counselor, Prince Ito Hirobumi, sent emissaries to Europe and the United States and brought back technology, medical and scientific knowledge, constitutional models and military and naval expertise.  Sufficiently confident to challenge larger players on the world stage, Japan went to war with China in 1894 and won Taiwan, the Pescadores, southern Manchuria and free access to Korea. It went on to sink the Russian navy in 1905, annex Korea in 1910 and join the Allies against Germany in 1914. The country's successes inspired nationalist uprisings in India, Iran and Turkey during and after World War I but stirred resentment and fear in the 1930s when Japan waged bloody campaigns in China. Its military expansionism, which peaked during World War II, was stopped only by two atomic bombs.  A prolonged period of recovery, increasing productivity, prosperity and steady economic expansion have made Japan the only Asian nation counted among the world's richest industrialized powers--just 130 years after the boy emperor ascended the throne.  **87  A New Way Of Seeing 1880**   IN THE SHADOW of a pile of limestone in the south of France called Mont Sainte-Victoire, art turned and faced the 20th century. There, Paul Céézanne painstakingly replaced conventional systems of light, shade, line and perspective with a new visual vocabulary. The mountain was his favorite subject, and he painted it more than 60 times. In works from 1880 on, the near and the far merge, transforming spatial voids into animate planes, transforming static reality into a network of visual energy. Céézanne substituted the perspective created by line with a backward-forward pulsation of color that made the two-dimensional canvas vibrate with the three-dimensional fullness of nature. The surface of a painting would henceforth no longer be merely a window through which reality could be observed. Céézanne would make it a reality unto itself, one he saw as both classic and transcendent. Artists would now be free to develop new modes of expression. As Pablo Picasso later observed, he was "the father of us all."  **86  The End Of The Raj 1947**   "THE JEWEL in the crown," the British called their most prized possession, to which they first traveled for spices and silks 300 years ago. And once it was no longer theirs, in 1947, the world's most powerful empire began to unravel.  Colonial rule of the vast South Asian subcontinent didn't officially begin until 1857, after Indian soldiers led an unsuccessful revolt against the British East India Company, which had effectively controlled the country. But India's Western-style schools only fired the nationalist movement, creating a middle class that questioned its dependent, "racially inferior" status. In 1930, Mohandas Gandhi, who preached nonviolent resistance, led thousands of followers on a 200-mile march to the sea, where they made salt in defiance of British tax laws. By the mid-1940s, Britain's resources had been sapped by World War II, and the country's slogan, "The sun never sets on the British Empire," had lost its moral certainty. After India gained its independence, there was little to stop the dominoes from toppling: Palestine in 1948; Ghana, the first of Britain's African colonies to go, in 1957; and in 1997, its last significant outpost, Hong Kong.  Fifty years after winning their independence, more than 900 million Indians--many still mired in poverty--make up the world's largest parliamentary democracy.  **85  Saving Aristotle 1169**   IBN-RUSHD, Muslim philosopher and scientist, was a translator not only of books but also of civilizations. Cordoba was his laboratory, the works of Aristotle the materials he used for his experiments. The result: a 12th century European renaissance.  Since the 6th century, the Catholic Church had neglected, ignored or locked up classical scholarship behind the bars of Holy Writ. Centers of Islamic learning, however, preserved the works of philosophers of antiquity, giving pride of place to Aristotle. In 1169, Ibn-Rushd, a polymath also known as Averroes, began translating and commenting on Aristotle's works. His surroundings were perfect for the task. For several centuries, Spain had been controlled by Muslims, whose literary and artistic culture far surpassed that of medieval Europe. Cordoba's library contained over 400,000 volumes--more, it is said, than all the other libraries of Europe combined.  For 26 years, Ibn-Rushd put his mind to bringing Aristotle back to life, translating from Greek to Arabic to Latin, then into the bloodstream of European intellectual life. Philosophy was transformed, East to West, from arid dogmatism to a robust new synthesis of reason and faith.  **84  Checking Accounts 1407**   COINS AS CURRENCY have been traced back to the 7th century B.C. Paper money was printed in China as early as the 11th century. But no economic institution has shaped the world like the bank. (The word stems from the Italian banco, or bench, from which money changers did business at medieval fairs.) Before the first public banks appeared--Casa di San Giorgio, founded in Genoa in 1407, was the most prominent--merchants conducted business using bills of exchange that functioned as IOUs; banks, operated by wealthy families, often went bankrupt when distant kings reneged on loans. Casa di San Giorgio lasted only 37 years, but its innovations led all the way to the credit card. The bank served as the model for public banks that "cleared," or transferred, balances between accounts. And it established an unprecedented trust because the government had an incentive to repay its debts so as to have a continuing source of funds. These developments gave rise to the modern clearing bank--Amsterdam's Wisselbank was the first, in 1609--which made it possible to use bills of exchange like money. Today we can move millions across continents with the touch of a keyboard.  **83  The First Novel 1008**   THE TALE OF GENJI, one of the masterpieces of Japanese literature, is the world's first extended fictional narrative. Its author, Murasaki Shikibu, lived much of her life in the royal court in Kyoto, where she was the center of a group of bril- liant women who competed for status through their literary skills. Her novel, finished sometime around 1008, concerns the colorful life of the court, with its many political and romantic intrigues. Hundreds of characters fill the book, but at its center is an elegant prince known as "the shining Genji." The novel's powerful feminine vision, its sympathy with the plight of women at court, its subtlety of language and penetrating psychological insights--all were unprecedented. The Tale of Genji remains a surprisingly modern work; it has recently been translated and recognized outside Japan as one of the great contributions to world literature. Its influence has been broad, not just in Japan, where it remains a principal source of stories for Noh drama, the Kabuki stage and contemporary cinema, but throughout the Western world. Any serious discussion of the structures, forms and intentions of the novel--the most significant new literary genre of the millennium--must take into account Murasaki's stunning achievement.  **82  Selling The World A Coke 1886**   TWO THIRDS of the earth is covered by water; the rest is covered by Coke. If the French are known for wine and the Germans for beer, America achieved Global Beverage Dominance with fizzy water and caramel color. But Coca-Cola's success has less to do with ingredients than promotion. The coca leaf and kola nut blend cooked up by Atlanta druggist John Pemberton in 1886 was released into a market saturated with self-medications. He positioned his nonalcoholic tonic as the Great National Temperance Drink, and soon folks were buying Coke just for the taste of it.  Asa Candler bought the company for $2,300 and retooled the drink's secret formula. He spent lavishly on advertising--as much as a quarter of the company's revenue. When Robert Woodruff took the helm, he vowed to put a Coke "within an arm's reach of desire." Feeling that he'd like to buy the world a Coke, he established a foreign department in 1926. After Pearl Harbor, the U.S. military footed much of the bill for Coke's bottling plants at the front lines. (At home, Pepsi was subject to sugar rationing.) Not coincidentally, millions of people in nearly 200 countries have been introduced to the pause that refreshes.  Today, 606 million Cokes (including diet, caffeine-free and other versions) are consumed daily. A rich man can buy a better wine or beer than a peasant, but not a better Coke. The fact that they both want to is a testament to the power of advertising, and perhaps that secret formula.  **81  Heigh-Ho, Silver! 1545**   LONG BEFORE California's gold rush, the discovery of silver in the Andes mountains in 1545 sparked an explosion of wealth for Spain. Entrepreneurs flooded Potosi, then part of Peru, drafting Indians to unearth the precious ore. (To numb themselves against hunger and fatigue, they chewed on as many as 95,000 baskets of coca leaves in one year alone.) Between 1550 and 1650, Potosi's mines provided up to 60 percent of the world's silver, opening up trade between Latin America, Europe and Asia, particularly China, where silver was worth twice its value elsewhere. By 1640 silver's value in China had bottomed out--hastening the demise of the Ming dynasty and the decline of the Spanish empire. Potosíí's mountain is now mined primarily for tin. |

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| **80  A 6,000 Mile Shortcut 1869**   WHEN THE SUEZ CANAL opened in 1869--after a decade of excavation by 1.5 million men, thousands of whom died--it was hailed as the Eighth Wonder of the World. About 100 miles long, it shortened the sea route from Europe to India by 6,000 miles. Vessels no longer had to circumnavigate Africa, and the wealth of nations soon passed through it. Oddly, the British left development to a Franco-Egyptian consortium before realizing the canal's importance and buying out Egypt's shares. An Anglo-French commission then ran the canal until 1956, when Egypt's President Gamal Abdel Nasser expropriated it.  **79  The Rise of the Welfare State 1601**   Before England adopted a formal antipoverty program, the destitute relied on begging, thievery and the Catholic Church's ample coffers for survival. But by the late 16th century, the Church, stripped of its holdings by Henry VIII, was no longer in a position to help. The rising demand for wool, then England's leading export, further inflated poverty rolls as greedy landlords forced tenants off their property in favor of more profitable sheep. It was left to the government to lend a hand. As codified in the Poor Law of 1601, though, it was not to be a handout. In exchange for financial assistance, the able-bodied were obligated to labor in workhouses. Children were assigned to apprenticeships. Even the sick and infirm, in almshouses, had to do piecework. Those who did not work were whipped, imprisoned and, in some cases, put to death. The meager earnings these institutional safety nets provided were not enough to pull people out of despair. But the premise behind the law--that a government has a responsibility to its poor--and the resulting public policies affected the future of social welfare. Bismarck's national insurance against illness and old age in the early 1880s, Britain's public-housing policies of the early 1900s and America's Social Security Act of 1935 were all descendants of the Poor Law. Yet, as recent reforms of the American welfare system illustrate, the public's ambivalence toward the poor continues to this day.  **78  A Coffee pot Percolates in Yemen c.1450**   ALTHOUGH LEGEND has it that an Ethiopian goatherd, whose animals became hyper from eating the berries, first noticed coffee's stimulating effects, 15th century Sufis in Yemen were the first to drink it. The Muslim mystics valued coffee's ability to keep them alert during nighttime worship. From their communal services, coffee drinking evolved as a group activity, a trait that carried over to the general Muslim population, which shunned alcohol. Where coffee brewed, so did radical thought. Presaging the Beat caféés of the 1950s, early coffeehouses were magnets for artists and writers and served as hubs of information. Eventually, the political nature of coffee klatches made Muslim clerics nervous, leading them to ban coffee in Mecca in 1511. But the bean survived and, in the next century, caught on in Europe. By 1700 there were 2,000 cafes in London, one of which, Lloyd's, became the giant insurance brokerage. Later, in Paris, Marat and Robespierre saw the first stirrings of the French Revolution over a couple of cups of joe. Between 1880 and 1980--before Starbucks was on every corner--coffee was second only to oil as the world's most traded commodity.  **77  Going Up 1854**   IN A TOP hat and with a beard trimmed level as a ruler, an unsuccessful 42-year-old mechanic stood on a platform that, by means of a rope coiling around a power-driven drum, was hoisted high above a mass of on-lookers at an 1854 New York City fair. Suddenly, Elisha Graves Otis ordered the rope slashed. The crowd gasped. The platform fell a few inches, then stopped. Otis doffed his hat and cried: "All safe, gentlemen, all safe!" And the city as we know it was born.   Elevators had existed before Otis. But by designing a spring that set two iron teeth into notches in the guide rails when tension in the rope failed, Otis created the world's first safe elevator. A pity he died seven years later, $3,000 in debt, before seeing his invention alter the urban landscape. Its ultimate symbol: the Empire State Building, which, with 10 million bricks, 6,400 windows and 102 stories, can be seen 50 miles out to sea--and ascended in just a few minutes.  **76  Unraveling the Double Helix 1953**   THE OUTER EDGE of a vast, largely unmapped frontier looks a lot like a field in Scotland. The frontier is the human genome, and browsing in that field is a sheep who, for all she can tell, is like any other. The truth is she's exactly like another sheep--the one who provided the mammary cells from which she was cloned--and that's what makes Dolly different. She was created in a lab supported by a biotechnology company that plans to manufacture animals able to secrete drugs in their milk. Is this what James Watson and Francis Crick had in mind?  Before even a rough topography existed, the presence of deoxyribonucleic acid in the nucleus of every living cell had been confirmed in 1869 by Swiss physician Friedrich Miescher. But science believed protein, not DNA, controlled heredity until Martha Chase and Alfred Hershey proved otherwise in 1952, setting off a race to say how DNA functions, to know what makes us who we are.  Crick and Watson, who never experimented with DNA themselves, began building models of what they thought was the acid's molecular structure. On February 21, 1953, Watson, then 24, noticed the similar shape of the two complementary pairs of basic molecules that make up DNA, requiring two helices to wrap around its core, a revelation that also suggested how DNA might replicate itself. Knowing DNA's design would eventually lead to the identification of specific genes and their functions.  **75  Raising the Roofs At Chartres 1260**   AMONG THE GREAT cathedrals of Europe, none more purely set the tone for High Gothic architectural style than the Cathedral at Chartres. And while its competitors--Amiens, Reims, Notre-Dame--take the breath away, none is more beautiful. Chartres was the quintessential expression of the idea of a cathedral during the 12th and 13th centuries, a time in Europe when faith and money came together to erect structures such as the world had never seen. More stone was quarried in France alone, between 1050 and 1350, it is said, than in all of ancient Egypt.   The very location of Chartres is holy, an early center for the cult of Mary and the site of at least four other churches. But this cathedral, dedicated in 1260, is transcendent, a soaring feat of architecture in which church builders literally raised the roof: The vaults are 116 feet high. Chartres's stained glass windows are considered the most magnificent in Europe, and the play of sapphire light across the sacred spaces and towering walls of stone makes the cathedral preeminent among those places on earth where, as T.S. Eliot put it, "prayer has been valid."  **74  El Libertador 1821**   LIKE MANY A WEALTHY KID before and after him, Venezuelan coffee scion Simóón Bolíívar took a trip to Europe. There, in 1799, inspired by Voltaire, Locke and Rousseau, the young idealist determined to liberate his homeland from 300 years of Spanish rule. His dream? A "society of brother nations . . . powerful to resist the aggressions of the foreigner." Spurred by Napolééon's invasion of Spain in 1810, Bolíívar--who would soon become known as the liberator of northern South America--embarked on a series of bloody campaigns. In 1821 he freed Venezuela and over the next four years banished the Spaniards from Ecuador, Peru, Colombia and Bolivia. Though his united "Gran Colombia" did not last--civil war erupted and Venezuela seceded in 1829--El Libertador left an indelible mark on the region and set a precedent (albeit sporadically followed) for modern Latin American democracies.  **73  Fashion Comes Forward c.1350**   BEFORE THE Middle Ages, attire was a matter of national costume, consisting of creatively draped, baglike garments. Fashion--which links clothing more closely to time than to place--began reinventing itself annually by 1350. "To be a good tailor yesterday is of no use today," lamented a craftsman in 1380. "Cut and fashions alter too quickly."  The change was the result of several factors. One was the return of Crusading soldiers with a novel item: the button, which they had seen used by Turks and Mongols. Court tailors used buttons to fasten clothes tightly, accentuating the differences in men's and women's bodies. (Fashion's first scandal followed, as the Catholic Church raised an eyebrow. One gown, wrote a naysayer, was "nothing other than the devil's snare.") For knights, plate armor imitating (however optimistically) the musculature of the wearer replaced droopy chain mail. Another factor--the rise of mercantile capitalism--allowed a new moneyed class to dress like nobility. The rate at which styles became obsolete was a measure of royalty's desire to stay ahead of the bourgeoisie.   But no trend or invention explains the wild enthusiasm for early fads like severely pointed shoes, sleeves that grazed the floor or tunics that failed to cover a gentleman's private parts. Dressing moved from a form of group identification to one of self-expression; clothing wasn't simply functional or ritually significant--it was fun. Today, people alter their appearances with Wonderbras and shoulder pads. Now, Armani is our armor.  **72  Solidarity Forever 1838**   LABOR UNIONS are almost as old as factories. One of the first, organized by craft workers, was the London Working Men's Association, which held its first national convention in August 1838. The rank and file passed a People's Charter, promoting voting rights for unlanded workers. Though the British Parliament rejected the Charter, it eventually acted on some of its ideas, sparing England the violent class warfare that gripped Paris, Rome, Vienna and Berlin in 1848. In time the Chartists were weakened by arrests and internal power struggles, but not before they had influenced a generation of immigrant English workers. Children from Chartist homes later became important players in the U.S. labor movement, most notably cigarmaker Samuel Gompers, founder of the American Federation of Labor.  The changes unions have brought--the eight-hour workday, reforms in occupational safety, the minimum wage, child labor laws--have not come without pain, violence and dissent. But cries of "Solidarity" are still heard around the world.  **71  Heaven On Earth c.1150**   Almost 900 years ago a man named Suryavarman II tried to construct heaven on earth. He did not succeed. But the temple-mountain that his people built in what is now Cambodia is nothing short of miraculous. It would be an architectural feat even today to erect a seamless edifice with stones weighing as much as 8,000 pounds apiece. Angkor Wat, the largest religious monument in the world, completed around 1150, was built without the use of mortar; it is held together by weight and friction. The complex is a sculpture of roughly a square mile. Its sandstone relief carvings--of Hindu legends and Khmer battle scenes--are among the world's finest. Perhaps its artistic influence would have been greater had the Khmer Empire, which once controlled much of Southeast Asia, not been weakened by its building frenzy and invaded by Thai forces in 1431. But Angkor Wat, now a Buddhist temple, still has as much power to transfix as a landing on Mars.  **70   Saving the Planet 1962**   RACHEL CARSON'S 1962 best-seller, Silent Spring, which jump-started the modern environmental movement, almost didn't happen. The self-effacing marine biologist wanted someone else to write about the dangers of pesticides. No one would, so Carson began the four-year project that Vice President Al Gore has said "changed the course of history."   The success of DDT during World War II prompted an American love affair with the pesticide. But its application killed fish and birds and put humans at risk of illness. "Every human being," Carson warned, "is now subjected to contact with dangerous chemicals, from the moment of conception until death." Her book, a passionate, meticulously researched argument for pesticide control, enlightened the public and toppled America's blind faith in science and industry. Change came quickly: 1970--the EPA, Earth Day, the Clean Air Act; 1972--the Clean Water Act, a ban on DDT; 1987--the first global environmental agreement to stop producing ozone-depleting chemicals. In 1992 the U.S. joined a U.N.-sponsored alliance to slow global warming. If not for Carson's descriptions of springs "without voices," we might still be ignoring the fact that "man, too, is part of this balance."  **69  The Anatomy Lesson 1543**   As a boy, Andreas Vesalius dissected cadavers of stray dogs and cats he found on the streets of Brussels. Eventually, his passion for anatomy became a compulsion to dissect the human body in order to present exact descriptions of all its parts. At the University of Padua, where he taught surgery, he realized that many prevalent theories about anatomy--most of them handed down from the Greek physician Galen--were wrong. As he sliced muscle from bone, Vesalius learned that the jaw is one bone, not two; that the thigh bone is not curved like a canine's; that men and women possess the same number of ribs. The 29-year-old doctor, in collaboration with artist Jan Calcar, created an astonishingly detailed, seven-volume work called On the Structure of the Human Body, published in 1543. It marked the beginning of the modern science of anatomy. But it also created a furor. His views came under attack by the Catholic Church, his colleagues and society at large. Stung by the criticism, Vesalius burned his notes. He went to work as court physician to Emperor Charles V and didn't perform any dissections for 20 years. After he resumed cutting open bodies--including, as one legend has it, the body of a nobleman whose heart was still beating--the emperor sent him on a pilgrimage to the Holy Land. Shipwrecked, he starved to death on the island of Zante.  **68   Pentacostalism Catches Fire 1906**   THE FLAME of Pentecostalism was first lighted when Charles Fox Parham declared in 1901 that speaking in tongues was a sign of baptism in the Holy Spirit. It might have sputtered if not for William Joseph Seymour, a black preacher who listened to Parham through an open door in his Houston Bible school. Soon, Seymour set out for Los Angeles, where his own baptism in the Spirit in 1906 brought him an enthusiastic following. Within two years of founding a mission in an abandoned church on Azusa Street, his multicultural ministry sent missionaries to 25 countries.   Pentecostalism is a religion of the heart. Since a personal experience of God is as important as doctrine, it is an adaptable faith; by the end of the 1960s, Protestants and Catholics had both begun to embrace the gifts of the Spirit in Charismatic renewal movements. Worship services may feature speaking in tongues, shouting and swaying, and spiritual healing. Today about a half billion people call themselves Pentecostal or Charismatic, and Pentecostals alone outnumber Anglicans, Baptists, Lutherans and Presbyterians combined. The Yoido Full Gospel Church in Seoul, South Korea, is now, at 700,000 strong, the largest Christian congregation on earth.  **67 A Stitch in Half the Time 1851**   THE SEWING MACHINE suited up the armies of the U.S. Civil War in record time and stitched the wings on the Wright brothers' plane. But in 1830, when French tailor Barthéélemy Thimonnier patented the first one, few of his colleagues foresaw any benefit. Rather, they felt they would be rendered obsolete: This new device made 200 stitches per minute, while a man made only 30. In 1841 they ransacked Thimonnier's Paris shop. The credit for automating the garment industry would instead go to the son of a German immigrant to America, Isaac Merritt Singer, who in 1851 improved on an earlier design by Elias Howe. Then, in 1856, Singer made sewing machines affordable by offering the first layaway plan. For five bucks down, one could take home a $125 machine and pay off the rest in monthly installments with interest.  The "iron seamstress" also led to ready-made clothing: A woman could walk down Fifth Avenue and--horrors!--run into someone wearing an identical garment. But even as ready-to-wear liberated those with spending power, it enslaved immigrant women and children in sweatshops. Despite the formation in 1900 of the International Ladies' Garment Workers' Union, clothing today is available thanks not only to Singer but to the people around the world operating his machines for little pay.  **66   Splendor of Tenochtitláán 1325**   THE MOST SOPHISTICATED city in the pre-Conquest Western Hemisphere was founded in 1325 by a warlike people who had nowhere left to go. The Aztecs had wandered for generations, skirmishing with neighbors, until they found themselves marooned on a marshy island in Mexico's Lake Texcoco. Within little more than a century, Tenochtitláán, population 250,000, rivaled any capital of its time. Built without the help of beasts of burden or the wheel, it boasted palaces, pyramids, grand plazas and a superb network of canals, dikes and bridges. While Europe's city streets were meandering cow paths, Tenochtitláán's were a rational grid and--because of efficient drainage, garbage barges and an army of sweepers--far cleaner than their counterparts. When the conquistadors arrived in 1519, they were astounded, as Hernáán Cortéés wrote, by "the strange and marvelous things of this great city." But the Spaniards regarded the Aztecs, whose religion involved human sacrifice, as heathens. After slaughtering Tenochtitláán's inhabitants, pillaging its riches and razing its buildings, they erected their own capital on the ruins. Today it is called Mexico City--the second-largest metropolis in the world.  **65   A Fresh Point of View 1413**   ALL HE DID was invent infinity. Or at least the illusion of infinity that exists in a painting. Before Filippo Brunelleschi's 1413 painting of the Baptistery in Florence, artists placed their subjects in a world of theoretical space on the surface of a wall or a canvas. Buildings and figures and trees and saints danced laterally on a flat plane, free of the laws of physics or optics. But by harnessing his relentless powers of observation to a precise set of mathematical calculations, the Florentine architect-sculptor-engineer codified the way objects appear smaller as they recede in space. Brunelleschi's ideas transformed the contrivance of a painting into a window onto the wondrous world of the Renaissance. At the same time, his work focused attention on the religious and intellectual issues of the time. The notion that all reality converges at some focused end point in space may be as much an expression of the belief in an omnipotent Creator as it is an exercise in optical mathematics. The rules of perspective also made the viewer of the scene--in his case, Renaissance man--a participant in the process of perception. The eye of the beholder becomes the center of the visible world, a world that exists to be experienced by people just discovering their power to experience it.  **64   The Long March 1934**   IN 1934, MAO ZEDONG fled the Kuomintang's forces in southern China with 100,000 soldiers and headed north. For 12 months they marched across 18 mountain ranges and 24 rivers, turning a 6,000-mile trek into the longest political workshop on record. In remote villages they drew lessons in the dirt with twigs, exhorting peasants to organize against landlords. When he got to Shaanxi province, Mao had 8,000 soldiers left, but the march was a badge of honor for its survivors. They helped lead Mao to victory in 1949, when the People's Republic of China brought one fifth of mankind under communism. Mao touched millions across Asia, Africa and Latin America who had seen peasants extinguish centuries of imperial rule.  **63   Ka-Boom! 1863**   IT MIGHT HAVE TAKEN CENTURIES to dig the 92 miles of tunnels feeding water to Los Angeles had Alfred Nobel not invented dynamite in 1867. It took just seven years. With dynamite, dams, railways and roads were built, the Panama Canal was dug, and the earth cracked open to yield mineral riches. Nobel's invention--mixing nitroglycerine, an explosive liquid, with an absorbent sand and molding that into sticks--made it possible to ship the explosive safely to war fronts and building sites everywhere. Suddenly man could remap his environment, then obliterate his handiwork. The ironies were not lost on Nobel, whose brother died in an accidental blast at their Swedish factory. Called by some "the merchant of death," Nobel left his fortune to establish the prizes that bear his name. Too late for comfort: He died sad and alone, taking nitroglycerine for an ailing heart.  **62  A Blast Of Oxygen 1854**   CIVILIZATIONS CAN be traced through steel--those who made it won the wars. The Arabs had their legendary Damascus swords, tempered in blacksmiths' forges. The Swedes had been making small amounts of steel since the 13th century by melting iron ore in crucibles. But it was not until 1854, when English inventor Henry Bessemer set out to build a better cannon for French Emperor Napolééon III, that anyone figured out how to produce steel strong enough to withstand an explosion or hold up a bridge. The problem was impurities. Bessemer's method used a blast of oxygen to burn off excess carbon in molten iron ore, and from that moment the Steel Age was in gear. (An American, William Kelly, made the same discovery at roughly the same time but didn't hurry fast enough to the patent office.)  Soon steel framed tall buildings and stenciled skylines. It supported bridges over rivers, laid railroad tracks around the world and put America on wheels. And steel built fortunes as well as cities. By the turn of the century, American mills were rolling out 8.5 million tons of steel a year. Space-age alloys have tarnished steel's luster, and cars are now made of plastic. But the demand for steel remains enormous--a billion tons worldwide last year--even if it is delivered on aluminum trucks.  **61   Shadows Inside Us 1895**   AS WITH so many scientific breakthroughs, the discovery of X rays happened by accident. A German physicist named Wilhelm Rööentgen was investigating the properties of electricity. On November 8, 1895, he learned more than he bargained for. He placed a vacuum tube with a wire attached to either end inside a black box, switched off the lights in his lab and turned on the electrical current. A mysterious fluorescence began emanating--not from the tube in the box but from a cardboard screen nearby that had been treated with barium. Rööentgen could see that the screen was glowing in response to something coming from the tube. It was not cathode rays or any other emissions he knew of. Experimenting further, he discovered that these rays of unknown origin--"X rays"--could penetrate thick books and blocks of wood. Holding up his hand before a screen, he became the first person to see the shadow of bones.  Rööentgen announcement of his discovery two months later caused an immediate sensation. Magazines published poems about X rays. Stores in Victorian London advertised X-ray-proof clothing. Within months physicians were using the new technology to look at broken bones and bullets in wounded soldiers. Eventually, improved technology lessened side effects--burns to the skin and hair loss. By the 1970s xeroradiography reduced exposure time and cancer risk. And related technologies, from CAT scans to MRIs, have opened a window into the structure of matter and the workings of the body.  **60   A Royal Flush 1596**   WE'RE NOT EAGER TO TALK about toilets--our euphemisms are many, including the throne, thunder box, privy and head--but as the title of one surprisingly popular children's book puts it, Everyone Poops. Which is why it's not at all surprising that rudimentary toilets date back to 2000 B.C., in the Minoan palace at Knossos on Crete. But until 1596, when British nobleman John Harington invented the first prac- tical "water closet"--a wooden seat with a cistern and a valve for flushing--waste disposal hadn't begun to move into the modern age. Before the WC, the most common place to go was the nearest tree, hole or river. (In outhouses in America, still in use among 10 percent of the population, at least one gets a seat.) Indoors, the top choice was the chamber pot, which city folk emptied out their windows onto the street. The French warning that accompanied the dumping--"Gare l'eau" ("Watch out for the water")--may have inspired another favorite euphemism, "the loo."  Though Harington's WC was installed in Richmond Palace, inadequate sewage systems prevented its widespread use, and 265 years passed before British plumber Thomas Crapper made his name marketing an advanced watersaving flush system. By the 1920s the toilet had become a standard fixture in most newly built homes--though in developing nations, a staggering 2.9 billion people still don't have access to one.  **59   Getting The News 1609**   AMONG THE ITEMS appearing in Issue 47 of Relation, the first regularly printed newspaper in history, was this understated news flash: "Signor Gallileo [sic] . . . found a rule and visual measure, by which one can . . . look at places 30 miles away, as if they were close by." That year's papers would also include reports of a ne'er-do-well lieutenant general and two men prohibited from playing ninepins, demonstrating the mix of groundbreaking and trivial that still defines a newspaper. The weekly, four-page Relation, first published in Strassburg, Germany, in 1609, wasn't much to look at--no headlines, no ads, no catchy graphics. It attracted a readership consisting mostly of the wealthy, powerful and well educated. But by the mid-17th century, the first print daily was being published in Leipzig; and the "penny press," debuting in the U.S. in 1833, would later transport news to the general public. Then as now, the free press filled an important role: campaigning for reform, focusing public attention on political and social problems, and stirring up trouble when trouble was needed.  **58   The Accidental Vulcan 1839**   Who can examine it," asked Charles Goodyear of rubber, his lifelong obsession, "without glorifying God?" Whether or not we share the 19th century inventor's fanaticism, the object of his passion--the basis for some 40,000 products, including electrical casings, tennis balls, condoms, erasers and, most of all, tires--is indispensable in our modern lives. Made from latex, a gum originally found in South American trees, the substance had been around at least since Columbus watched natives bounce rubber balls in Hispaniola. But by the early 1800s, when a small industry developed, consisting mostly of boots and life preservers, it became clear the stuff did not hold up: In the winter it would harden like rock and in heat ooze into a sticky mess.  A Connecticut native not known for his financial prowess, Goodyear was determined to make rubber commercially viable. While incarcerated in debtors' prison, he began mixing raw rubber with everything from witch hazel to cream cheese. In 1839 he accidentally spilled a drop of rubber and sulfur on his burning stove. He had discovered the process of vulcanization, named for the Roman god of fire, and set the stage for the business boom spurred by the advent of cars. But Goodyear failed to secure the rights to his discovery. When he died, he left behind scores of suggestions for rubber's applications--the inflatable tire, alas, not one of them--and a $200,000 debt.  **57   A Woman's Choice 1914**   BIRTH CONTROL was a taboo subject in the early 20th century. But that didn't stop Margaret Sanger. As a nurse, and as the sixth of 11 children, she had seen the strains childbearing put on women, particularly the poor. So in March 1914 she defiantly published The Woman Rebel, an exhortation for women to challenge the pro-conception climate. Facing an obscenity charge (later dropped) for her audacious act, Sanger fled to Europe. Upon her return in 1916, she was more determined than ever to spread the gospel of voluntary motherhood. Her first effort, a Brooklyn-based birth control clinic, was raided by the police after only nine days. Undeterred, she founded the Birth Control Clinical Research Bureau in 1923, the first doctor-staffed birth control clinic in America, where contraceptives and advice were disseminated. By the time of her death in 1966, the birth control pill--one of whose developers, Dr. Gregory Pincus, dedicated his research to her "pioneering resoluteness"--had become an accepted (and openly discussed) method of contraception.  **56   Four-Star Dining 1120**   LONG AGO, inns sold food and drink to travelers far from their home kitchens. Cookshops offered take-out food, and banquets were showy affairs for special occasions. But nowhere before 1120 is there evidence of what we think of as restaurants, places to purchase a sit-down meal primarily for social and gustatory pleasure.  The journal of 12th century Chinese bureaucrat Meng Yuanlao--arguably the first restaurant reviewer--offers a meticulous account of an emerging restaurant culture in Kaifeng, the capital during the Northern Song dynasty (960-1126). The city of one million had plenty of adventurous eaters. Laborers slurped noodles in humble shops, shopkeepers frequented dumpling houses, and according to Meng's journal, begun around 1120, night markets served tripe with blood pasta, fried liver and goose pears to people on the late shift. In Small Sweetwater Alley many establishments specialized in southern Chinese foods, one of the first regional cuisines. The people of Kaifeng also demanded attentive service. "Even the slightest mistake," noted Meng, "was reported to the head of the restaurant, who would curse the waiter or dock his salary or, in extreme cases, drive him from the place."  **55   The Invention of Childhood 1633**   You know more than you think you do." With these eight words, Benjamin Spock opened his Baby and Child Care--and turned attitudes toward parenting upside down. But Spock has to take a revolutionary backseat to Moravian bishop Johan Amos Comenius, who lived 300 years earlier. When he advised in The School of Infancy that babies should have their spirits stirred up "by kisses and embraces," Comenius was moving into new territory (at least for Europe), a place where affectionate behavior was seen as important to a child's well-being. And when he wrote that kids need to play to learn, he was giving voice to the unimaginable.  Picture the Europe of 1633. The Thirty Years' War was devastating villages; food was scarce; Protestants like Comenius were running for their lives. It was a difficult world, and children worked hard and died young. But Comenius was a utopian who believed the pathway to an earthly Eden was education. If children were not loved, not educated early and well, their souls could be lost.  After Comenius's death much of his work was forgotten. Then, 100 years later, Jean-Jacques Rousseau advised parents to let children savor nature. Soon Swiss reformer Johann Heinrich Pestalozzi was running the first infants' school. By 1837, Friedrich Froebel had opened a kindergarten in Germany. Attitudes toward childrearing swing through history like a drunken pendulum, but these days we hope children are treated as children.  **54   Tobacco Catches Fire 1535**   When French explorer Jacques Cartier first partook of the mysterious weed he had observed the Iroquoians smoking along the St. Lawrence River, he could not have anticipated the impact tobacco would have in centuries to come. "When we tried to use the smoke," Cartier wrote in 1535, "we found it bit our tongues like pepper." Cartier's description is the most definitive early account of a European experimenting with tobacco in the New World. For thousands of years the native people of the Americas had used tobacco for medicinal and spiritual purposes. Explorers brought the plant back to Europe, where it was promoted as a panacea for everything from gonorrhea to flatulence. It was even used as a dentifrice to whiten teeth. By the beginning of the 17th century, rising demand enabled England's struggling settlement in Jamestown to grow the Colonies' first successful crop. Tobacco use spread across the globe, becoming an important part of every culture it touched. But only after cigarettes became popular in the mid-1800s and rolling machines enabled mass production in the 1880s were health concerns raised. In 1964 the U.S. Surgeon General established that cigarette smoking is a cause of cancer and other diseases. Today, about three million people a year die of tobacco-related illnesses.  **53   The Coolest Invention 1834**   HUMANS HAVE BEEN KEEPING themselves and their food cool for eons. The Chinese placed ice in cellars as early as 1000 B.C. An 8th century Baghdad caliph packed imported snow between the walls of his summer home. But it wasn't until Jacob Perkins, a 68-year-old Massachusetts inventor living in London, received a patent for a compressor in 1834 that anyone figured out how to make ice artificially. Perkins's machine used the same principles found in household refrigerators today: A compressed fluid--ether in his case, later ammonia and Freon--was evaporated to produce a cooling effect, then condensed again.  It was 17 years before the first commercial refrigerators were installed in an Australian brewery. By the end of the century they were being used to ship beef around the world, chill wine in Paris restaurants and build skating rinks. In 1902, Willis Carrier installed the first air conditioner in a Brooklyn printing plant--it not only cooled but also controlled humidity--and before long his machines were showing up in department stores and movie theaters. The first household refrigerators appeared in the early 1920s. Less than 1 percent of the homes in America are now without one, and most contain frozen foods--thanks to a process developed by Clarence Birdseye--another marvel of the Cool Age.  **52  Tick, Tock 1656**   FOR CENTURIES, sundials and water clocks--none too accurate--told us all we needed to know about time. Mechanical clocks, using deadweight-powered gears, started appearing on towers in Italy in the 14th century, but their timekeeping was less impressive than their looks, wandering up to 15 minutes a day. By the 17th century a who's who of geniuses, including Galileo and Pascal, had theorized about, but failed to build, better timepieces. Then, in 1656, Dutch astronomer Christiaan Huygens constructed the first pendulum clock, revolutionizing timekeeping. The precision of Huygens's clock allowed scientists to use it for their physics experiments, shopkeepers to open and close at fixed hours and workers to be paid by the hour. Time discipline permeated private life, too: Punctuality became a virtue. In 1761, Englishman John Harrison perfected a clock that worked at sea and put accurate time--and thus longitude--in a navigator's pocket. At last man knew where he was.  **51   Liberty For All 1865**   THE U.S. CIVIL WAR, which ended in 1865, not only transformed the lives of millions of black Americans, it also fixed the nation on a new course. The wealthiest and most powerful slaveholding class in the world was destroyed, and an agricultural slave society was crushed by a rising industrial and capitalist North. But the crucial moment in the four-year struggle that claimed 600,000 lives had really come two years earlier, when President Lincoln issued the Emancipation Proclamation, officially turning a war for the restoration of the Union into a war of liberation.   Abolitionists had encouraged Lincoln to issue such a document from the start of the war. In fact, ever since a handful of English Quakers launched a public campaign against the slave trade in 1787, abolitionists there had kept the slavery question in public view. Women boycotted sugar produced by slave labor, thousands signed petitions to Parliament, and in the United States such well-known figures as Elizabeth Cady Stanton, Lucretia Mott and William Lloyd Garrison vigorously insisted that the conscience of the nation could find rest only with the abolition of slavery.  While slaves would celebrate January 1, 1863, as the Day of Jubilee, their actions had long been instrumental in advancing emancipation. They worked as spies and laborers and volunteered their lives to fight in the Union Army. By the end of the war, 179,000 African American men had served in the U.S. military, constituting almost 10 percent of the Northern armed forces. For the nation's 3.5 million slaves, for its abolitionists and for some of its politicians, the crucible of civil war would allow the U.S. to live up to its best traditions, expressed in the Declaration of Independence, as a land of liberty and equality for all. The foundation was laid for the emergence of the United States as a great world power.  **50   A University Education 1088**   THE MODERN university is a sanctuary for the learned, a place where the wise can pass on knowledge to the next generation. It is also a zoo, full of loudmouths and know-it-alls. And it was ever thus: The first university was founded not only for students but also by them.   There have always been centers of learning--schools of philosophy in Greece, medicine in India, literature and art in China. But the university as we know it today--a secular degree-granting institution with at least one professional school attached--began in Bologna, Italy, in 1088. First came the law school: Scholars pored over Roman law, adapting it to contemporary needs--a vital contribution to the organization of European society. Next came recognition of the institution itself: When Bolognese landlords threatened to raise scholars' rents, student protests led Emperor Frederick Barbarossa to award them protection from exploitation in 1158. Students also made professors sign contracts to deliver lectures on particular subjects--and promise to remain at the school until the end of the term. Soon professors needed a license to teach (the earliest academic degree), and a real university was born.  Those 12th century campus hotheads could never have imagined what they were building. By the end of that century, the University of Paris had taken root, and not long after, Oxford was up and running. Today, throughout the world, universities are places where each generation can dis- cover their callings, and themselves.  **49   The Circulation of Blood 1628**   IT TOOK ROUGHLY 2,000 years of medical sleuthing to unlock the secrets of the circulatory system. Aristotle started the search, hypothesizing that the liver was the source of blood. But it wasn't until the 16th century that physicians began uncovering enough clues about arteries, veins and the heart to propose new theories and to challenge professional doctrine. Ignoring the threat of ostracism, British physician William Harvey spent 20 years researching the circulatory system and writing An Anatomical Study of the Motion of the Heart and of the Blood in Animals, published in 1628. For the first time, he demonstrated that the heart controls circulation. His conclusions were met with scorn. But his description of how blood flows away from the heart in arteries, then back through veins--still valid nearly 400 years later--remains one of the most significant medical discoveries of the millennium, a testament to observation, accurate description and mathematical proof.  **48   Store Food? Yes, we can 1812**   THE FIRST canned foods appeared in 1812, the first can opener in 1885. Hard as cans were to open initially, they were culinary time capsules providing the bounty of summer in the dead of winter. Napolééon reportedly offered a reward to anyone who could supply his troops with food that would keep. In 1795, French brewer Nicolas Appert, without understanding the principle of sterilization, preserved foods in jars by heating them to kill bacteria, then sealing them airtight. By 1809 his factory was supplying the ports of France. The London company of Donkin, Hall and Gamble applied his methods to tin cans, which became the preferred method of storage.  **47   Striking Oil 1859**   THE STORY OF oil has always been one of high-risk wildcatting, boom-or-bust land deals, robber barons and international intrigue. People had known of the combustible properties of surface oil for centuries, but it wasn't until 1859 that a band of American entrepreneurs, led by retired railroad conductor Edwin Drake, stumbled on a way to pump it from a shallow well in Titusville, Pa. They didn't even want oil--it was a derivative, kerosene, they were after. By the end of the Civil War, 3.6 million barrels a year were being pumped from around Titusville, and derricks were going up all over the U.S. Then the bottom fell out of the market. Enter John D. Rockefeller. Starting with one kerosene refinery, he gobbled up his competitors and integrated his company, Standard Oil, with storage facilities and a transportation network. Oil fueled Rockefeller's fortune and--with the invention of gasoline-powered internal combustion engines--the machines that made the world run.  **46   Water Purification 1829**   A PERSON consumes 16,000 gallons of water in a lifetime. But before 1829, when the Chelsea Water Works of London installed its landmark slow-sand filter on the Thames River, no one had effectively cleaned it. Even after 1829, most drinking water remained unfiltered and epidemics of cholera and typhoid made sanitation an urgent issue. Finally, in 1854, physician John Snow, though ignorant of bacteria carried in water, traced an outbreak of cholera to a pump near a sewer. The filtration of drinking water (plus the use of chlorine) is probably the most significant public health advance of the millennium.  **45   Red Star Over Russia 1917**   THE FIRST COUNTRY to pursue Karl Marx's dream of a workers' state was a poor land where peasants vastly outnumbered proletarians. Battered by the military disasters and food shortages of World War I, Russia exploded in February 1917. Rebels seized the capital, St. Petersburg, and the Duma (the Senate) deposed the inept and repressive Czar Nicholas II. But the new government, headed by socialist Aleksandr Kerensky, refused to pull Russia out of the war. In October it was overthrown by the militant Bolsheviks. Their leader, Vladimir Lenin, quickly made peace with Germany. He moved the capital to Moscow, abolished private property, suppressed the Church. His forces murdered Nicholas and his family. By 1920, after three years of civil war, the communist monopoly on power was complete.  The Soviet Union (as the new nation was known) modernized with terrific speed. The masses got free education and medical care. But the price was staggering: millions dead in botched economic experiments and purges; gulags full of political prisoners; a culture shackled by totalitarian ideology. The country's rivalry with the United States dominated global politics, triggered countless hot wars and threatened nuclear Armageddon. It ended in 1989, when the Soviet bloc collapsed--done in, as Marx had predicted capitalism would be, by its own "internal contradictions."  **44  A New World in a Drop of Water 1674**   IT WAS ONLY A TINY LENS, smaller than a postage stamp. It was not the first microscope, nor the most powerful. Its creator, Antonie van Leeuwenhoek, a Dutch linen merchant, had heard that by grinding a lens out of clear glass, one could see things bigger than with the naked eye. First he used it to peer at the stinger of a honeybee, the leg of a louse, the brain of a fly. Soon he was grinding more-powerful lenses, using diamond dust scooped from the floors of local spectacles makers. With these he became the first person to see bacteria and spermatozoa. In August 1674, while examining a drop of lake water, Leeuwenhoek saw "animalcules" with tiny heads, limbs and fins, one-celled animals later called protozoa. On that day the science of microbiology was born. Leeuwenhoek's work unlocked doors for Pasteur, Fleming, Darwin and others. Today, microscopes, which can magnify to the millionth power, are essential not only to medicine but also to fields as diverse as criminology, metallurgy and archaeology--all because of a curious shopkeeper.  **43  Bach's Well-Tempered Scale 1722**   JOHANN SEBASTIAN BACH wrote in every known musical genre except opera. But it was a collection of keyboard pieces, written when the German composer was 37, that marked a watershed in Western music. By publishing Book I of The Well-Tempered Clavier, with a prelude and fugue in each of the 12 major and 12 minor keys, Bach threw the weight of his genius behind what eventually became equal temperament, the dividing up of the scale into 12 equal semitones. Bach's system enabled musicians to explore the full harmonic range of the keyboard. Until then they had been restricted to a limited number of keys in order that important intervals, such as the third and the fifth, could stay perfectly in tune.  Bach was not the first to rework the keyboard's possibilities, but he did it best: His music is gorgeous. And even though he never wrote for the piano, he opened the door to the rich tapestry of sound we associate with that instrument. By the 19th century it was a dominant force in Western music and an essential element of evening entertainment in living rooms across Europe and America. The stage was set for the pyrotechnics of Chopin and Liszt, for the crashing fortissimos and feather-soft pianissimos of Tchaikovsky--and for millions of humbler piano recitals.  **42  The Laws of Heredity 1866**   GREGOR MENDEL, an Austrian monk who spent a decade crossbreeding pea plants in his monastery garden, aired his discovery of the basic laws of heredity in 1866. He gave up his research two years later when he became abbot, and his work, though published, was largely ignored. Rediscovered in 1900, it helped propel America's interest in agricultural reform.   Mendel's thesis--that traits handed down from parent plants to offspring were mathematically predictable--led to the "hybrid vigor" theory, which transformed commercial agriculture. By crossing two inbred seeds, farmers could produce progeny that outperformed either parent, resulting in healthier and fuller crops. Corn, now bred entirely this way, has been called the greatest success story of modern genetics. In the 1960s, agronomist Norman Borlaug saved millions of lives in famine-stricken India and Pakistan by introducing a shortened, high-yielding dwarf wheat--a green revolution that had its roots in Mendel's garden.  **41  The Telegraph Goes Online 1844**   NO OTHER INVENTION has shrunk the world so dramatically as the electric telegraph, capable of moving messages across land and sea at 16,000 miles per second. No wonder that when Samuel F.B. Morse inaugurated his first telegraph line (between Washington, D.C., and Baltimore), on May 24, 1844, he tapped out an exclamation from the Bible: "What hath God wrought!"  Morse's telegraph, unveiled in 1838, was not the first such device--Englishmen William Cooke and Charles Wheatstone beat him by a year with a model that used needles to spell out words--but it was by far the most practical. The sender simply pressed a key in a pattern of dots and dashes, which were automatically marked on paper at the other end. Morse's machine and code became the international standard.  The telegraph spurred the growth of multinational corporations and transcontinental railways. It helped change the pace and scope of warfare. And it gave a boost to the news media. In 1848, six newspapers formed what would become the Associated Press to collect and distribute reports by telegraph. Soon news from anywhere could reach people everywhere the very day it happened. |

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| **40  Women Demand the Vote 1848**   MANY WOMEN STILL lead lives of dependence and submission, but if one considers that women didn't publicly demand suffrage until 1848, the advances made in the recent flicker of history's eye seem remarkable. The Declaration of Sentiments, written by Elizabeth Cady Stanton and signed at the Women's Rights Convention in Seneca Falls, N.Y., was not the first expression of feminism. But the 12 resolutions adopted there provided an agenda broad enough to terrify many. Its defenders were pelted with rotten fruit, insulted by the press, ignored. By the end of the century, suffragists had taken to the streets, expressing a different kind of anger: "Men, their rights and nothing more; women, their rights and nothing less!" Still, it took until 1920 for American women to win national suffrage. In the 1960s women marched again, to argue for equal pay for equal work and freedom of reproductive choice. Those arguments continue, but women can now speak with their ballots, not just their voices.  **39  The Crop That Grew Europe 1537**   CULTIVATED BY PERUVIANS since 8000 B.C., potatoes were encountered by Spanish explorer Gonzalo Jiméénez de Quesada in 1537. Easy to grow (no tools required), they became, in one historian's estimation, "the difference between having one child and having five." And a lower infant mortality rate meant some children could leave the farm to work in factories. First, however, grain-fed Europe had to develop a taste for the potato. Confusing it with deadly nightshade, some thought it poisonous or, at least, the cause of flatulence or leprosy. But at the urging of scientists, leaders promoted the tuber; Marie Antoinette wore potato flowers in her hair in 1785. The Irish immediately welcomed the addition to their diet, consuming eight pounds per person per day by the 19th century. The country's population doubled but was ravaged by a potato blight beginning in 1845. As many as one million died; another 1.25 million emigrated to the U.S., eventually giving rise to the Kennedy dynasty and all that came with it. The potato's uses are legion: Potato-based alcohol powered German planes in WWII, potato acids are found in detergents, and potato starch is used as an adhesive in stamps and as an absorbing agent in disposable diapers.  **38  Marx Meets Engles 1844**   INDUSTRIAL CAPITALISM unleashed unprecedented productivity but plunged millions into misery. The socialist movement offered visions of a workers' paradise, ranging from anarchism to state-centered communism, but no one could explain how to get there. Then, in 1844, Karl Marx teamed up with Friedrich Engels. Marx, 26, was in Paris, hashing out his own communist philosophy; Engels, 24, was a theorist he admired. When Engels passed through town on a business trip--he ran the British branch of his family's textile firm--the two Germans spent 10 days talking. And a 39-year partnership had begun.  Their first great collaboration, the Communist Manifesto (1848), opened with the words, "A specter is haunting Europe." The specter was communism--and the authors made its victory seem inevitable. All history, they declared, was driven by class struggle. The bourgeoisie had superseded the nobility and called the proletariat into existence. Since capitalists exploited workers with ever-increasing ferocity, proletarians would one day realize they had "nothing to lose but their chains" and overthrow the bourgeoisie. The revolution would communalize property and production, eliminating classes. When that was done, the state--along with oppression and want--would disappear.  Within a hundred years or so, a third of humanity was living under governments that called themselves communist. But oppression and want persisted; a few decades later revolutions drove most of those regimes from power. Today, Marxism is a theory relegated mainly to intellectual debate.  **37  Fixing An Image 1826**   SURELY THERE HAVE been windows more legendary. Rapunzel's. Juliet's. Hitchcock's rear one. But in 1826 a window swung open wider than any before, revealing a new way of seeing. The window was an attic perch on an estate in Burgundy. And it was from this pastoral vantage point that Joseph-Nicééphore Niéépce took the world's first photograph--a ghostly picture of a courtyard and a granary, framed by a pigeon house and a bread oven's chimney. Niéépce, who would soon join forces with brilliant promoter Louis Jacques Mandéé Daguerre, was the first man to fix an image, subtly rendering its essential light and shadow in permanent form. Using a primitive camera, a pewter plate and light-sensitive chemicals, he took a daylong exposure of the view, creating what he called a heliograph. From these humble beginnings, photography changed our perspective on the world: It helped elect Lincoln (Mathew Brady's campaign portrait), offered tangible proof of the horrors of war (journalists began carrying cameras into battle) and brought us to the nuclear brink (spy planes). Most important, Niéépce's invention has allowed us to fix our own images of faraway places and familiar faces--and share them with friends, strangers and future generations.  **36  E=MC2 1905**   IT MIGHT have been easy to dismiss Albert Einstein's September 1905 paper as an afterthought, a minor coda to an extraordinary year. After all, in 12 months, Einstein had produced five revolutionary physics tracts, covering the special theory of relativity, the quantum theory of light, and more. Any one of the young patent clerk's after-hours efforts would have been enough to promote him to the highest levels of achievement in physics.  But the September paper, a three-page examination of one consequence of special relativity, had the power to change the world. Einstein's "thought experiment" delved into the underlying connection between matter and energy, the two basic components of the universe.   Within the principles of special relativity--nothing in the universe can travel faster than light in a vacuum, and the speed of light remains constant to all observers regardless of their own motion--Einstein found that he had imagined a strange universe where objects changed size and mass depending on how fast they traveled. These effects, unimaginably small at ordinary speeds, would become evident only as velocities neared that of light. However, if the energy of motion could change mass, Einstein concluded, mass itself could become energy. He published his famous equation E=MC2 (Energy = mass x speed of light squared) and noted, almost in passing, "It is not impossible that . . . the theory may be successfully put to the test."  Within 40 years, research in radioactivity and physics, fueled by the desperation of a ghastly world conflict, led to the development of nuclear energy and the atomic bomb--dramatic realizations of Einstein's straightforward assertion. Einstein, a lifelong pacifist, deplored the destructive use of his ideas and regretted encouraging President Franklin D. Roosevelt to push development of nuclear weapons. Einstein was disappointed, and the world was changed inalterably.  **35   To Be, Or Not 1603**   ALEXANDRE DUMAS said Shakespeare was the poet who, after God, created the most. By the time he was 37 he had already written 21 plays and created a sonnet form. He was a prosperous landowner and part owner of the Globe Theatre. His works were regularly performed for Queen Elizabeth I. But in The Tragedy of Hamlet, Prince of Denmark, first published in 1603, Shakespeare surpassed himself, taking an ancient Scandinavian story of fratricide and revenge and turning it into a dark tale about the human condition that has been translated nearly a thousand times and rarely been out of production. Sarah Bernhardt, John Gielgud, Laurence Olivier, John Barrymore and Kenneth Branagh have all sought to understand the melancholy Dane.   In the conflicted prince, Shakespeare created an intellectual hero whose impulse for revenge is paralyzed by indecision, a bitterly disillusioned observer of political and moral corruption, a consummate wordsmith. The play is full of questions, but it is through the poetry of its language that Hamlet captured the conscience of the world.  **34  Off With Their Heads 1789**   THE FRENCH Revolution was the world's first social revolution, forging not only a new government but a new society. Ordinary Frenchmen had long chafed under high-living, heavy-handed kings. Philosophes--Voltaire, Rousseau, Montesquieu--called for a social order based on law and reason rather than royal privilege. The revolt began in 1789 when middle-class delegates broke from a legislature rigged to favor the nobility and clergy, forming their own National Assembly. Then thousands stormed Paris's Bastille prison. In the ensuing civil war, the guillotine claimed 17,000 heads--including those of Louis XVI; his queen, Marie Antoinette; and countless revolutionaries whose factions lost out in power struggles.  In 1814 the monarchy was temporarily restored. But the Revolution's legacy endured. Peasants and women gained equality before the law. The nobility lost power. The ideas of socialism and nationalism were among the insurrection's exports, as were its egalitarian legal system and its Declaration of the Rights of Man and Citizen. Even its tricolor flag became a model--hoisted, in various hues, by new republics throughout the world.  **33  One Small Step for Man 1969**   ARE WE ALONE? Earthlings have asked this question ever since we first weighed the riddle of the stars, and a giant leap was taken toward realizing an answer when Neil Armstrong hopped from a flimsy lunar module onto the surface of the moon. It was July 20, 1969, only a century after Jules Verne wrote a novel about going there, From the Earth to the Moon.  The Space Age began in earnest on October 4, 1957, with the Soviet launch of Sputnik I, the world's first artificial satellite to achieve orbit. The U.S. followed a few months later with Explorer I, and the race was on. An ardent commitment to exploration by President Kennedy and an equally zealous Soviet program led to a high-wire one-upmanship in the 1960s that spawned stunning technological advances, culminating in the Apollo 11 moon walk. Televisions carried the fuzzy images, the history in the making, and a global community basked in this wondrous human conquest. Fittingly, it was satellites themselves that made the broadcast possible, and the world a little smaller. Since that first trip to the moon, there have been deeper probes--Discovery, Endeavour, Galileo--into our solar system. But as space engineer Wernher von Braun observed, the journeys to the moon were like steps in human evolution, akin to the moment life emerged from the sea to establish itself on land.  **32  The First Picture Show 1895**   IN THE BEGINNING there was nonfiction ("I was chased by a pterodactyl . . .") and fiction (". . . and killed it in one blow"). People told stories, wrote them in words or pictures or acted them out. From cavemen until 1895, that was about it. Then 33 people met in a cafe for the only new storytelling form of this millennium: They watched a movie.  George Eastman introduced roll film in 1889, which Thomas Edison used to show movies to one person at a time with his Kinetoscope. In France two brothers, Auguste and Louis Lumiere, worked on projecting moving pictures to a group. On December 28, 1895, they premiered 10 films. At a later showing of The Arrival of a Train at La Ciotat Station, startled viewers ducked from the locomotive.  With the technology in place, the grammar of movies rapidly developed. Audiences kept up, though many found closeups of intimate acts like kissing to be unnerving. Edison replaced an actor with a dummy to simulate the beheading of Mary, Queen of Scots, and sci-fi pioneer Georges Méélièès made film magic in A Trip to the Moon (1902). Not so many years later, German expressionists would use weather to convey a character's mood and Orson Welles would sum up Charles Foster Kane's disintegrating marriage by elongating a breakfast table before the viewer's eyes. In the U.S., movies became a giant industry; never before had so few people influenced the culture of so many. The nature of film, as opposed to, say, theater, means that the same images are banked in the consciousness of generations past, future and worldwide--people who would otherwise have little culture in common. After seeing Jurassic Park, kids from Beverly Hills to Bombay could suffer the same nightmare that they, too, were being chased by a pterodactyl.  **31  The Interpretations of Dreams 1900**   FIVE YEARS AFTER the discovery of X rays let us see inside our bodies, Viennese neurologist Sigmund Freud opened up our minds. The Interpretation of Dreams, published in 1900, changed the psychological and cultural landscape of the modern world.  In it and later works, Freud claimed that dreams were ordered clues to our unconscious self--the part of our mind containing repressed wishes, traumas and desires too frightening to acknowledge. Though Nietzsche and others had hypothesized about the unconscious, Freud pioneered a systematic way to access it. He saw the human psyche as a battleground for the primitive, aggressive, sexually driven beast and the socialized adult self within us. (Children were complicated beings with urges--including sexual ones--at predictable stages.) Through a "talking cure," a patient could gain insight into and control over his unconscious drives.  Today, those practicing quicker therapies and psychopharmacology outnumber psychoanalysts, but Dr. Freud is indisputably with us, informing the very way we think about being human.  **30  The Transistor Age Begins 1947**   NO CABLE TELEVISION. No space travel. No CD players or faxes. Computers as big as refrigerators. Without the transistor, the past 50 years take on a decidedly retro look.  The triode vacuum tube, the original electronic amplifier, powered the development of radio, TV and early digital computers. But tubes were bulky and power-hungry, a drag on the development of complicated electronic machines; engineers needed a reliable, small, cheap device. The likely building blocks? Semiconductors, crystals of nearly pure germanium or silicon that could selectively allow or deny the transmission of electricity. A team of scientists at Bell Labs in New Jersey demonstrated the first semiconductor amplifier, a primitive transistor, on December 23, 1947. First used in telephone equipment and hearing aids, the devices found their way into everything with a plug or battery. Integrated circuits--a silicon chip etched with microscopic transistors--were developed in the late 1950s; chip-based computers invaded the kitchen, the car, the office, the den. Today, most Americans are usually within a few feet of one.  **29  Genghis Khan Builds an Empire 1211**   THE GREATEST JOY is to conquer one's enemies," proclaimed Genghis Khan, "to pursue them, to seize their property, to see their families in tears, to ride their horses and to possess their daughters and wives." Unfortunately for most of Asia and much of eastern Europe, Genghis Khan had a thoroughly enjoyable life.  In 1175, at the age of 13, he became chief of a small tribe of Mongol herdsmen. He used his position to unite a constellation of tribes under his rule, then converted those tribesmen into an army so formidable none could stand against it. The Mongols rode in hordes, sweeping away everything in their path. In 1211 they began their conquest of China. Later, they overran Persia and the Arab civilization of present-day Iraq to the west, and parts of Korea, Burma and Vietnam to the east and south. Nearly all of Russia fell before them too. Everywhere they rode, the Mongols left devastation, sometimes slaughtering entire cities. After Genghis's death in 1227, his successor, Ogadai, stormed through Poland and Hungary, reaching the banks of the Danube River.  The Mongols subdued more territory than anyone in history. Their influence on human development was overwhelmingly destructive, though as a result of their depredations, East met West. Mongols--in particular, Genghis's grandson Kublai Khan, who completed the conquest of China in 1279--brought foreigners into their realm to serve as administrators over vanquished masses. An Italian named Marco Polo later astounded Europe with news of such Asian innovations as money made of paper and a stone called "coal" that could be used for fuel.   The size of the empire was ultimately its undoing, and within a few decades it began to fragment. In China the finishing blow came in 1368, delivered by Zhu Yuanzhang, a peasant whose talents for military and political organization rivaled those of Genghis Khan himself.  **28  The Drink That Launched a Thousand Ships 1610**   EVER SINCE 1610, when the Dutch East India Company first brought tea to Europe from the island of Hirado, off the coast of Japan, tea has had few rivals as a catalyst for world events.   By the middle of the 18th century, tea had become Great Britain's signature quaff. Tea-drinking stimulated workers, leading to increased productivity, accelerating the industrial revolution. But the English were importing so much tea by the end of the century that they decided to sell opium to China to correct the trade imbalance. In 1839 the Qing government, concerned about China's social and economic disintegration, destroyed opium stored in Canton, provoking the first of two Opium Wars. Chinese junks proved no match for British Congreve rockets; at the war's end, China ceded control of Hong Kong.  On the other side of the world, American colonists refused to pay a threepence-a-pound tax on tea imports "without representation." They seized control of three British tea-bearing vessels docked at Boston Harbor on December 16, 1773, and hurled the contents of 342 chests overboard. Similar protests in Charleston, S.C., Philadelphia and other cities fomented the American Revolution.  **27  The Wright Stuff 1903**   ON DECEMBER 17, 1903, on a stretch of sand near Kitty Hawk, N.C., two bicycle mechanics achieved one of humanity's maddest dreams: For 12 seconds they were possessed of true flight. Before the sun had set, Orville and Wilbur Wright would keep their wood-wire-and-cloth Flyer aloft for 59 seconds. Few newspapers deigned to comment on the event because the notion that human beings would take to the air, like some contemporary Daedalus and Icarus, was deemed absurd by most sober citizens. Now, of course, some of our greatest heroes--Lindbergh, Earhart, Yeager--have been fashioned out of the wild blue yonder. While it had taken almost forever to get airborne, once there, the advances came fast and furious. Indeed, a mere 15 years later nearly all the elements of the modern airplane had been imagined, if not realized.  **26  The War to End All Wars 1914**   IT IS EASY to record how the Great War began: The assassination of Archduke Ferdinand, heir to the throne of Austria-Hungary, set off a disastrous chain reaction of demands and counterdemands among the great powers of Europe. But it is almost impossible to comprehend why, for the scale of the slaughter was out of all proportion to the grievances of either side.   Nearly nine million soldiers were killed between 1914 and 1918--an average of 5,600 each day. And yet, it wasn't just the number killed that made the war a historical watershed, it was also the way they died. World War I was the first modern war, the first to make wide use of some of the ghastly weapons of destruction we know today. "I saw trees as large round as a man's thigh literally cut down by the stream of lead," gasped one witness, describing the effects of a machine gun, which could fire 500 bullets per minute. The HMS Pathfinder became the first warship ever torpedoed by a submarine. The world's first tanks rumbled across a French battlefield. And, it was discovered, havoc and death could be wreaked from the air. But for millions, the war was defined by trenches--wide enough for two men to walk abreast, filled with mud, rats, lice and suffering. Clouds of mustard and chlorine gas drifted into them, bringing excruciating deaths.  The war's ill effects resonated for decades: Russia's sufferings led to the triumph of communism, Germany's helped produce Nazism. In two decades the embers of conflict would ignite a second world war that--incomprehensible as it seems--would prove more horrible still.  **25  The Wireless 1901**   AT THE START of the 20th century, few people imagined that an electromagnetic wave could travel without wires or cables over any significant distance. How could a radio signal possibly bend along the curvature of the earth? Surely it would shoot right off the horizon in a straight line. But Guglielmo Marconi believed that radio waves, if given the chance, would follow the earth's contours. In 1895, in his native Italy, he transmitted a radio signal about a mile and a half; six years later, on December 12, 1901, Marconi raised the stakes. Affixing antennas to high-flying kites, Marconi, only 27, arranged for one signal--the Morse code letter S--to cross the Atlantic, some 2,000 miles. The signal was sent from the town of Poldhu, in Cornwall, England; in a fraction of a second, at a receiving station in St. John's, Newfoundland, Marconi heard three faint clicks. It was the sound of the communications industry being hatched, the first wave of an electronic age that would include radio broadcasts, television and cellular telephones--a discovery that would open up our imaginations.  **24  The Iron Racehorse 1830**   FOR MOST OF human history, all land transport depended on a single mode of propulsion--feet. Whether the traveler relied on his own extremities or those of another creature, the drawbacks were the same: low cruising speed, vulnerability to weather, the need to stop for food and rest. But on September 15, 1830, foot power began its long slide toward obsolescence. As brass bands played, a million Britons gathered between Liverpool and Manchester to witness the inauguration of the world's first fully steam-driven railway.  Other rail lines existed at the time, but all used horse-drawn cars along parts of their routes. And none could sustain the 30-mph clip of the Liverpool & Manchester's engines. Those machines, and the roadway they ran on, were designed by George Stephenson--a former coal-mine mechanic who hadn't learned to read until he was 18--and his university-educated son, Robert. The older man was already known for innovations that had transformed the locomotive (introduced by Englishman Richard Trevithick in 1804) from a balky contraption into a long-distance workhorse. Now, with Robert's help, he had created an iron racehorse.  Despite the death of a member of Parliament who was run down at the opening ceremony, the Liverpool & Manchester inspired a rash of track-laying around the world. The railroads sent the industrial revolution into overdrive, stimulated trade, built cities from Chicago to Nairobi. In the U.S. they ferried settlers westward, uprooted Native Americans and attracted thousands of Chinese and Irish laborers who stayed on after the spikes were driven. Wherever the engines ran, they brought their lonesome whistle, the distillation in sound of that most modern of blessings and curses--mobility.  **23  Heavy Thinking 1666**   ISAAC NEWTON, one of the brainiest men who ever lived, was also one of the quirkiest. He used his power as president of London's Royal Society to harass rival scientists. He labored over equations up to 22 hours a day. And, most curious in a man exalted as the father of modern science, he had a mania for alchemy.  But his eccentricities pale next to the grandeur of his great discovery, the law of gravitation. For decades, Europe's best minds had been trying to explain the force that held celestial bodies in orbit. In 1666 inspiration struck the 23-year-old Newton when he saw an apple fall from a tree in his mother's yard. The same force pulling the apple earthward, he realized, was also tugging steadily at the moon.  Newton figured out the mathematical formula defining the gravitational pull between two objects. But there were other discoveries as well that would have secured his undying fame. His three basic laws of motion created a foundation for modern physics. He was the first to prove that white light is a mixture of all colors. And calculus, an advanced form of mathematics Newton invented to make calculations of change, is now an essential tool in fields as diverse as economics and space exploration.  **22  The Mold That Saved Millions 1928**   FROM ORDINARY MOLD! proclaimed the ad in the August 14, 1944, issue of LIFE. The Greatest Healing Agent of This War! As infection fighters, molds had been used for 2,500 years, although their effects were unpredictable, puzzling and sometimes toxic. Until 1928, that is, when Scottish physician Alexander Fleming noticed that a small amount of mold growing on a staphylococcus culture had destroyed the bacteria. He later named an extract of the mold penicillin. It wasn't until the early 1940s, after other scientists had refined the potent antibiotic, that drug companies began mass-producing it. Fleming's chance discovery revolutionized the treatment of infections previously considered incurable--pneumonia, rheumatic and scarlet fevers, syphilis, tetanus, gangrene. But penicillin's "miracle" status led to overuse. Recently, invulnerable classes of "superbugs" have sprung up--a phenomenon Fleming warned of in 1945.  **21  The Black Plague 1348**   PERHAPS IT'S preposterous to suggest that man would not have stepped on the moon had it not been for the Black Plague. But the disease, which killed a third of Europe's inhabitants in the middle of the 14th century, took the world down many intricate pathways. Also called the bubonic plague--for the buboes, or boils, that form on the neck, underarm and groin areas--the disease was transmitted by fleas carried by rodents on ships from Asia. Europe's labor force was crippled, half the clergy in England and Germany perished, and scholars were left wondering how anyone survived. Those who did not come in contact with the plague or who developed immunities began to see the world differently. Men who had lived in virtual slavery left their lords to work the land of the highest bidder, and many even came to rent their own plots. Because people had no idea where the disease came from, it was seen as God's punishment for sinners. But when priests took sick, the Catholic Church's grip was weakened. The door to Protestantism was opened. Doctors discarded dogma and began dissecting human bodies, leading to the rise of the scientific method. This new spirit of adventure emboldened Gutenberg to develop the printing press; it would push Columbus across the Atlantic in the next century. And it would touch all that came after.  **20  Talking Down a Two-Way Street 1876**   THE FIRST TELEPHONE transmission, on March 10, 1876, was a one-way message--"Mr. Watson! Come here! I want you!" But Alexander Graham Bell's invention would change two-way communication forever. A professor of vocal physiology at Boston University, the Scottish-born Bell, 29, had dreamed for a decade of sending speech through wires. He was trying to invent an improved telegraph when he discovered the phenomenon that would make the telephone possible: Sound vibrations caught in a drumlike membrane could be translated into electromagnetic waves. Aided by technical assistant Thomas Watson, Bell found a way to transmit those waves to a receiver and turn them back into sound. The company he cofounded, Bell Telephone, morphed into AT&T, one of the largest corporations anywhere.  For businesses, governments and ordinary people, the telephone represented a quantum leap in efficiency. Instead of composing a letter or telegram and waiting for a reply, one had only to get on the horn. But the phone altered human relations on a deeper level, too. Millions isolated by circumstance could reach out and touch someone, if only figuratively. No longer requiring physical proximity, intimacy became both easier and less intimate.  Today, there are some 750 million telephone subscribers worldwide. Computers, including 10.7 million Internet hosts, share the circuits. And letter-writing is staging a surprise comeback--this time over the phone lines, via E-mail.  **19  Seeds of Democracy 1215**   KING JOHN OF ENGLAND was a knave. He waged costly wars, sold legal judgments, imposed crushing taxes, seized hostages from his barons' households. Then in 1215 the barons rose against him, forcing John to sign the Magna Carta--and securing the unsavory king a place in the annals of human freedom.  Most of the document simply held the monarch to his feudal obligations. But it also contained seeds of democracy. No free man was to be imprisoned without "the lawful judgment of his peers." Justice was not to be sold or impeded. No property was to be seized without compensation. Should the king renege on the charter, the barons had the right to revolt. John reneged, and died fighting in 1216. The Magna Carta lived on. Its promise of due process came to cover all social classes. Its requirement that the king consult the barons on decisions was used to justify parliamentary limits on the monarchy. It influenced Locke and Rousseau, who preached that governments must protect citizens' rights or perish--a notion central to the American and French revolutions. Its echoes persist in many constitutions. And when the U.N. adopted the Universal Declaration of Human Rights in 1948, coauthor Eleanor Roosevelt called it the "Magna Carta of all mankind."  **18  The Crusaders Were Here 1095**   THE 200-YEAR Christian campaign to reclaim Jerusalem from Muslim rule brought Europe's greatest military and commercial expansion since the fall of Rome. It inspired a wealth of art and literature--most notably Chaucer's Canterbury Tales. It was also a bloody episode, a portent of ethnic strife to come.  Purported relics from the era of Jesus, unearthed in Jerusalem (the Holy Lance, John the Baptist's remains), proved to Western Christians that the city belonged to them. Almost from the moment Pope Urban II launched the First Crusade in 1095, zealots plundered their way toward Palestine, slaughtering unbelievers--including thousands of European Jews.  In 1099 the Christians took Jerusalem. But battles continued there and throughout the Middle East, and in 1244 the Muslims regained the city. Still, Europe won much from the Crusades. They helped revive mining and manufacturing. New trade routes opened, conduits for Eastern imports that enriched the West: silk, spices, gunpowder, algebra. A less popular novelty was the income tax--instituted to help pay for the holy wars.  **17  Ford Rolls Out the Model T 1908**   THE AUTOMOTIVE AGE BEGAN in 1908 when Henry Ford unveiled his "car for the great multitude." At $850, the tough and homely Model T was the first car that could fit a farmer's budget. Prices fell still further after Ford introduced a revolutionary system of manufacture--the moving assembly line, which eventually spewed out a Tin Lizzie every 24 seconds. As other automakers adopted Ford's methods, cars altered the face of the planet. Industries arose to serve a flood of travelers. The economics of petroleum decided the fate of nations. Traffic deaths mounted (43,700 fatalities last year in the U.S. alone). Smog spread inexorably. And so did another by-product of the assembly line: the culture of mass consumption.  **16  The Day That Time Stood Still 1945**   IT TOOK A BLITZKRIEG to start World War II, but only two bombs to end it. The first, on August 6, 1945, leveled most of Hiroshima, annihilating some 80,000 people in a blinding flash. The second hit Nagasaki three days later, killing 40,000. After three years of top-secret work, the Manhattan Project had translated Einstein's theory of relativity into devastating reality: a weapon that harnessed the energy released by the splitting of the atom. The A-bombs' effects were as eerie as they were deadly. Those closest to the blasts were vaporized, leaving bright silhouettes on blackened ground. Others perished slowly, radiation flaying them and devouring their organs. Cancer added to the toll, which eventually approached 200,000 in Hiroshima. Whether or not the atomic attacks were militarily necessary (a question that still stirs debate), one thing was clear from the moment the Enola Gay released its payload: Human beings now had the means to exterminate humanity. The mushroom cloud would shadow politics and culture--and the nightmares of millions--forever after.  **15  How Did We Get Here 1859**   HE WAS THE first scientist to come up with a compelling alternative to the biblical account of creation. Observing plants and animals during a five-year voyage around the world, Charles Darwin concluded that evolution explains the diversity of living things. In Origin of Species (1859), the English naturalist posited that random mutations may help an organism--a Galáápagos finch, say--adapt to its environment. Better equipped for survival, it would also be more likely to pass advantages on to its offspring. Over generations, this process of "natural selection" might give rise to whole new species. Indeed, all life might be descended from a few primitive organisms. Darwin was denounced as a heretic, especially for hinting at an ancestral link between humans and apes. But his theory's elegance--its ability to explain so many phenomena that had seemed whims of nature--prevailed. Today evolution is as basic to most people's world view as the idea that the earth circles the sun.  **14 Live From Schenectady 1928**   AS A TELEVISION show, it had a somewhat limited appeal. Live from General Electric's radio laboratories in Schenectady, New York, it's . . . a guy removing his glasses. And then putting them on again. Then blowing a smoke ring. So went the world's first television broadcast--into three homes. And yet on that January afternoon in 1928, GE's brilliant Swedish-born engineer, Ernst F.W. Alexanderson, laid the crude foundation of one of the most powerful, influential media in history.  Ever since the launch of radio broadcasting in the early 1920s, the race had been on to combine and transmit sound with moving images. Two years before Alexanderson's demonstration, Scotsman John Logie Baird used a mechanical scanner to transmit a flickering image of a human head. But GE surpassed Baird's efforts. Four months after Alexanderson's transmission, the company was broadcasting images three times a week, and the basic elements of television were in place. Then in 1937 an electronic system employing the more sophisticated cathode-ray tube was adopted by the BBC in England. The broadcast of the 1947 World Series clinched television's growing importance. By the end of the 1950s, nearly 90 percent of U.S. homes could boast at least one TV set. The world no longer needed to be imagined--now it could be seen and heard. America had a new communal fireplace.  **13  A Shot in the Arm 1796**   THE ERADICATION OF one of the worst plagues ever can be traced to a cow. Smallpox caused scarring and blindness and at its peak in the 18th century killed 60 million Europeans, most of them children. Variolation, a 2,000-year-old practice of inoculating patients using strains of a disease, was often so bizarre--and deadly--as to be worse than the disease itself. In China doctors crumpled smallpox scabs and blew them up the nostrils of otherwise healthy patients, leaving them vulnerable to the risk of other infections.  Enter Edward Jenner, a general practitioner from rural England. Trusting in the popular belief that cowpox built one's immunity to smallpox, Jenner extracted cowpox-infected lymph from pustules on a Gloucestershire milkmaid on May 14, 1796, and inserted a small amount into an 8-year-old boy. Seven weeks later, Jenner injected the boy with smallpox. His immune system held its ground; the science of immunology had become a possibility. Vaccinations for hepatitis, diphtheria, polio and measles revolutionized public health--and created one of the first battle wounds of childhood, a word derived from the Latin vaccinus, meaning "of the cow," a nod to an anonymous English animal to whose stature Mrs. O'Leary's can only aspire.  **12  Of Human Bondage 1509**   SLAVERY WAS WITH US long before the second millennium began. Ancient, medieval, Asian, European, African--almost every society practiced it in some form. But from the 16th through the 19th centuries, the transatlantic slave trade transformed four continents, as Europeans shipped 10 to 15 million African slaves across an ocean and into the horrors of perpetual servitude.   The largest forced migration in world history started slowly and followed the expansion of European trade and conquest. The earliest African slaves arrived in the New World in 1509, but their numbers remained small until 1530 when Portugal, the first European nation to trade with the kingdoms of West Africa, began sending slaves to work on sugar plantations in Brazil, then in the West Indies. The suffering during the Middle Passage was enormous. Uprooted from family, shackled and marched to Africa's coast to be placed in pens before shipping, the slaves knew no end of degradation. For weeks or months, they stayed chained together in hulls of ships, packed in rows, shoulder-to-shoulder, next to the sick and dying, not knowing their destination or their fate.  **11  The Wizard of Menlo Park 1876**   HE TAMED both lightning and thunder in a tiny lab in New Jersey. Born in small-town Ohio in 1847, Thomas Alva Edison parlayed an early fascination with chemistry and telegraphy into a string of business successes that enabled him in 1876 to build a boxy, two-story building in Menlo Park. It was the first factory in the world designed to produce nothing but inventions. The next year he and a colleague created a machine that translated recorded vibrations into a representation of sound--the phonograph. Then, in November 1879, the Menlo Park team tested a carbonized cardboard filament that could glow for days on end. After more than 1,000 trials, Edison had done it: He had given birth to a useful incandescent lamp. His goal had not been to invent electric light--that had been done decades earlier--but to create a lightbulb that would be long-lasting and inexpensive, along with a system, from power station to screw-in socket, that would render it viable on a large scale. Before Edison, the artificial light that people had to live in was harsh, flickering, ephemeral and dangerous.  In 1903 Edison produced an important early motion picture, The Great Train Robbery, to accompany his many other advances, such as his telephone transmitter, stock ticker, fluoroscope, storage battery and the "Edison effect" lamp (it would lead to the tubes used in radio and television). In all, he held more than 2,000 patents, many of them from Menlo Park. It is difficult to overestimate their significance. The can-do intelligence in that little lab let us see and let us hear.  **10  The Compass Goes to Sea 1117**   IT WAS LITTLE MORE than a magnet floating in a bowl of water, but without the nautical compass the millennium's great voyages of discovery could never have occurred. First used in feng shui (the Taoist system of environmental design), compasses appeared in China in the 4th century B.C. Lodestone pointers were replaced by flat slivers of iron, and then by needles, which arrived in the 6th century A.D. But the first account of seagoing compasses doesn't come until 1117, from Zhu Yu's P'ingchow Table Talk: "In dark weather, sailors look at the south-pointing needle." The compass reached Europe around 1190, almost certainly from China. (Its powers were so little understood that captains forbade their crews to eat onions, which were thought to destroy magnetism.) For Mediterranean sailors, used to long periods when overcast skies made navigation difficult, the device meant liberation. By the 15th century, they were ready to venture be- yond familiar seas.  **9  Hitler Comes to Power 1933**   IN ANY ACCOUNTING of the millennium's monsters, first place must go to the ruler who made genocide a multinational industry--Adolf Hitler. The scale of the enterprise boggles the mind: freight trains carrying Jews to human stockyards from across Nazi-occupied Europe; victims worked to death, shot or gassed; corpses incinerated or processed into soap; gold teeth harvested for the coffers of the Reich. Hitler's megalomania sparked the Holocaust and history's most destructive war. The preparation for both began the moment he became Germany's chancellor in January 1933.  Promising salvation from the chaos of the Depression, Hitler swept aside German democracy. A hypnotic orator, he preached a sort of crank Darwinism: At evolution's pinnacle were the so-called Aryans (Germans and other Nordic peoples), destined to subdue or destroy all "inferior" races--particularly the Jews, whom Hitler blamed for most of humanity's ills. Linking ancient prejudice to wild dreams of glory, this mad ideology galvanized the nation. Herded into lockstep by the propaganda and police forces of a totalitarian state, Germans prepared to conquer the earth.  World War II began in 1939. Six years later, the Axis countries were vanquished; some 17 million combatants and 60 million civilians were dead. And within that horror lay a new benchmark of evil: six million Jews and nearly as many other "undesirables" (Gypsies, homosexuals, leftists, Slavs) systematically slaughtered.  **8  A Declaration to the World 1776**   WE HOLD these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights. . . ." Today most governments at least pay lip service to those truths. But before July 4, 1776, when the Continental Congress adopted "The unanimous Declaration of the thirteen united States of America," no nation had been founded on such principles.  Penned by 33-year-old Virginia delegate Thomas Jefferson, the Declaration was meant to explain, after a year of war, the American colonies' break with Britain. The document listed the offenses of King George III, ranging from restriction of trade to the use of foreign mercenaries. (A passage denouncing the king's promotion of slavery was cut to placate some delegates.) More important, it laid out the concept of natural rights--borrowed largely from British philosopher John Locke--that would form, in the words of Congress president John Hancock (one of 56 signatories), "the Ground & Foundation" of the U.S. government.  The Declaration was more than just one country's manifesto. It spurred Latin Americans to sever ties with Spain and the French to overthrow a king. Vietnam's Ho Chi Minh paraphrased it when he defied France. And its avowal that all men are born equal moved more than males: When the U.S. women's suffrage movement was launched in 1848, its founders modeled their declaration on Jefferson's.  **7  China Develops Gunpowder Weapons c.1100**   CHINESE ALCHEMISTS discovered the recipe for gunpowder--saltpeter, sulfur and charcoal--in the 9th century. But the great development of gunpowder weapons began in the early 1100s when the Song dynasty was besieged by the Jurchen Jin Tatars. Over the next 200 years, as the Jin conquered northern China and were in turn overrun by the Mongols, an arms race raged between defenders and invaders. Bamboo flamethrowers evolved into metal-barreled guns. Paper incendiary grenades gave way to iron bombs that shattered stone walls. When gunpowder technology reached Europe--it was first used at the siege of Metz, now in France, in 1324--the effect was explosive. Since only kings could afford large numbers of muskets and cannons, the nobility's power declined. Centralized states, backed by standing armies, replaced feudal fiefdoms. Guns gave colonizers a big advantage over native peoples. But the spread of such weapons eventually leveled the field--making possible an age of revolutions, world wars, guerrilla conflicts and terrorist bombings.  **6  The Germ Theory of Disease 1882**   DISEASE WAS ONCE thought to be caused by evil spirits. The connection between sickness and germs remained a mystery until the mid-19th century when experiments revealed that infectious agents can multiply within the human body. By 1864, French scientist Louis Pasteur had concluded that microorganisms were also present in the air. He isolated microbes responsible for fermentation and silkworm diseases, but it wasn't until 1876 that Robert Koch, a German scientist, showed that a specific bacillus caused a specific disease. Koch's work with anthrax and tuberculosis established the germ theory of disease and had immediate implications for diagnosis and treatment. The 1882 report of his discovery of the microbe that causes TB proved the disease's infectiousness and also outlined his famous postulates, still used today, that link a given organism to a specific illness. The work of Pasteur and Koch ushered in the science of microbiology and led to advances in immunology, sanitation and hygiene that have done more to increase the life span of humans than any other scientific advance of the past 1,000 years.  **5  Galileo Sees the Moons of Jupiter and The Earth Moves 1610**   THE TENSION between religion and science can be symbolized by one man: Galileo Galilei. He did not originate the theory that the earth revolved around the sun. Nor did he invent the telescope. But Galileo's skill as a mechanic enabled him to improve the telescope so that he saw the moons of Jupiter in 1610. He used the sightings to support the idea that Jupiter and Earth revolve around the sun. And at least when he published his arguments, he possessed a spine stiff enough to stand up to the Catholic Church, which saw the earth as the center of the universe.   The textbook version of Galileo's life calls him the father of modern mechanics because of his work on the laws of motion. Born in Pisa in 1564, he became a math professor and developed the law of falling bodies--that falling objects accelerate at the same rate regardless of their mass.   The breathing, pulsing Galileo was a complicated character whose sense of self-importance knew few bounds. He abandoned his mistress and stashed his two daughters in convents. He used political connections to impede competing inventors. His arrogance ultimately helped cause the quake within the Church that a more diplomatic scientist might have avoided.  With its armies facing Protestant forces to the north, the Catholic Church was in no mood to accept any questioning of its authority. Pope Urban VIII, convinced that Galileo had mocked him, felt compelled to call the astronomer before the Inquisition. Under threat of torture, at the age of 69, Galileo recanted and was placed under house arrest until his death nine years later. To this day, the world remembers him for an exchange that may in fact be fiction. After recant- ing, Galileo is said to have muttered, "And yet it [the earth] does move." Whether true or not, it took more than 300 years for the Church, under Pope John Paul II, to do its own recanting.  **4  The Machine Age Gears Up 1796**   A COLUMN OF black smoke splits the millennium. People who lived before the Industrial Revolution could not have imagined what the world would someday look like, just as those living in its wake can scarcely envision a time without its conveniences and ills.  A mathematical instrument maker at Glasgow University triggered the change by tinkering with a model of the Newcomen steam engine, built in 1712 to pump water out of mines. James Watt patented a version in 1769 that saved 75 percent in fuel costs. Soon his superior engines powered coal mines and textile mills, plus the railroads and ships that carried the new technologies to the Continent and the New World. Before, Britons had been agrarian; by 1870, 70 percent of them had moved to cities, living mostly in slums, where overcrowding, poor sanitation and outbreaks of typhus, cholera and dysentery were common. Factories producing iron belched smoke. Mines and quarries scarred the earth.  The landscape of the postrevolution family also changed. Women and children as young as six were exploited by factory bosses. For the upper classes, the result was an elevated quality of life. Rapidly expanding prosperity, combined with the new cost-efficiency of machines, gave bankers, entrepreneurs and merchants wealth on an unprecedented scale. A middle class of managers grew more educated, enjoying better health, more leisure time and greater mobility. Even the lower class could afford better, cheaper products. Despite Luddite attacks on machinery, the revolution kept gathering steam.  **3  Luther Knocks Down the Door 1517**   MARTIN LUTHER was tortured by anxiety about his own sinfulness. How, he wondered, could the Vatican promise forgiveness of sins in exchange for donations? Didn't the powers of mercy and redemption belong to God? Finally, on October 31, 1517, unable to contain his skepticism, Luther nailed "Ninety-Five Theses" to the door of the All Saints Church in Wittenberg, Germany. A criticism of papal policy, particularly the selling of "indulgences," the document stressed the inward, spiritual character of the Christian faith. It denounced those who would pay fees to avoid having to embrace the cross and share privately in the suffering of Christ, and it rejected the notion that Church doctrine and canon law have authority approaching that of Scripture. The Vatican quickly moved against Luther for heresy; in 1521 it formally excommunicated him. "Here I stand," Luther said. "I can do no other." Unless convinced of his error through Scripture or evident reason, he would not contradict his own conscience, which was bound by the word of God.  When the Edict of Worms declared Luther a political outlaw, his anticlerical message was taken up by others. As the laity moved against monasteries and their landholdings; as priests began to marry; as princes and other powers allied against the Holy Roman Empire; and as bishops came to be appointed by secular authorities, the Reformation was begun in earnest. Political authority would never again be fully subject to the dictates of a distant clergy, and the map of Europe would be determined by the nationalism that still dominates world politics today.  **2  A Global Civilization 1492**   CHRISTOPHER COLUMBUS died a magnificent failure. Four times he tried to find a route to Asia by sailing west across the Atlantic. When his quest ran aground against another continent, he simply insisted Cuba was part of China.  Columbus lifted sail in August 1492--and got lost. Only shouts of "Tierra,tierra!" on October 12 ended threats of mutiny. The island the natives called Guanahani, and renamed San Salvador by Columbus, is believed to have been his first landfall. He thought the native people simple and naturally good, "easy to conquer," until they resisted. Then things got ugly. His governorship of Hispaniola was the low point, an outburst of gold fever accompanied by the enslavement and slaughter of the native people. In December 1500, Columbus was arrested for his mismanagement and sent home in chains. Ideas, goods, deadly microbes and African slaves followed in the wake of his crossing. He may have stumbled on a "new world," but his adventurous spirit played no small role in creating a new, global, civilization.  **1  Gutenberg Prints the Bible 1455**   OF ALL THE millennium's technological revolutions, the most far-reaching started just before the era's midpoint. Throughout history, the ability to read and write had been confined mostly to tiny elites of nobles, priests and scribes. But in the 15th century a literate middle class arose in Europe. Its hunger for knowledge led inventors to seek a way to mass-produce the written word. And when German goldsmith Johann Gutenberg succeeded--creating his masterpiece, a run of 200 gorgeously typeset Bibles, in 1455--he unleashed an information epidemic that rages to this day.      To appreciate Gutenberg's achievement, it is necessary to understand what he did not do. He didn't invent printing: The craft emerged in 8th century China, using multiple characters carved on a single woodblock. He didn't invent movable type (letters rearranged for each new page): Chinese printer Pi Sheng did, around 1040. Gutenberg didn't even invent movable metal type: The Koreans did, in the 14th century. But wood-block printing of text reached Europe only in the early 1400s, and it appears that no one on the continent knew of Asia's more advanced techniques. Movable type had not, in fact, caught on widely in China or Korea, where writing involved 10,000 characters. In Europe, however, such technology seemed full of promise. What Gutenberg devised was the first Western movable-type system that worked--so well that it remained virtually unchanged for 350 years.  Gutenberg designed a new kind of press, based on those used to squeeze olives. He came up with an alloy of lead, tin and antimony, and a precisely calibrated type-mold to pour it into. He concocted a smudge-resistant ink of lampblack, turpentine and linseed oil. Each page of his Bible probably took a worker a day to set, but once the type was in place, the rest was relatively easy.   Gutenberg's methods spread with stunning rapidity. By 1500, an estimated half a million printed books were in circulation: religious works, Greek and Roman classics, scientific texts, Columbus's report from the New World. An acceleration of the Renaissance was only the first by-product of the Gutenberg press. Without it, the Protestant movement might have been stillborn, as well as the industrial and political revolutions of the succeeding centuries. Gutenberg, however, got none of the glory. His brainchild bankrupted him; in 1455 a creditor took over his business. Little more is known of the inventor--in part because he never put his own name into print. |