

## Appendix A

# *Inventions and Discoveries in the last century and other goodies*

**1900** Bayer began producing Aspirin in tablet form.

**1901** G. Marconi, who believed radio waves could follow Earth's contours, sends first transatlantic morse code message. First commercial radio station. Satori Kato invents instant coffee. Joshua Lionel Cowen markets the 200 Electric Express, the first Lionel toy train. Pronouncement of the term hormones.

**1902** First photo fax sent by German inventor A. Korn (4 years later his equipment made the application available for newspapers between Berlin and Munich). Blickensderfer Electric is the first successful electric typewriter in the U.S. Trans-Siberian Railway across Europe and Asia is completed.

**1903** The Wright brothers make first powered flight, max speed: 30 mph. First fully automatic bottle making machine. Pennsylvania Station tunnel through the wide Hudson R, connection to Manhattan completed. Mary Anderson invents windshield wipers.

**1905** Albert Einstein constructs his Special Theory of Relativity,  $E=mc^2$ , where mass could become energy. Pre-Columbian city of Caral, Peru, discovered by Max Uhle, the oldest city ever found in the America's, dated to 2600 B.C., the same time the pyramids at Giza believed to be constructed. The first movie houses make the American scene.

**1906** First voice is carried by electromagnetic radiation energy waves over the radio. Triode vacuum radio tube invented by Lee De Forest of Iowa. Frederick Hopkins discovers the body's need for micronutrients, ie vitamins. The 12.4 mile Simplon Tunnel in Switzerland, the world's longest railroad tunnel, opens.

**1907** L. Baekland invents synthetic plastic, resistant to heat, electricity, and chemical action. Vacuum tubes, photocopiers, and electric washing machines were first used. Tower refiner for gasoline and petrol production developed. Fritz Haber invents way to make ammonia, paving the way for fertilizing.

**1908** Gabriel Lippman produced the first color photo plate. Eugene Laos is the first man to produce sound on film strip.

**1909** Explorer Robert E. Peary is the first man to reach the North Pole.

**1910** Pronouncement of the term vitamins by Polish-American Casimir Funk. Incandescent bulbs last 1,000 hours. Union Pacific RR debuts use of radio; radio waves travel at 186,00 miles per second.

**1911** Stainless steel is patented by German scientist P. Monnartzers. Gyrocompass invented by Elmer A. Sperry. Explorer Roald Amundsen, of Norway, is the first man to reach the South Pole. Hiram Bingham discovers the lost city of the Incas, Machu Picchu.

**1912** The first 35mm camera is invented by Guy Smith.

**1913** A sliding fastener called the zip makes its debut. Mass-production assembly-line of the Model T began, one every 10 seconds. Geiger Counter developed by Johannes Geiger. Dr. Alexis Carrel transplants a kidney from one cat to another, the first such scientific endeavor.

**1914** The construction of the Lincoln Highway from NY to San Francisco began. First radio broadcast from an airplane. England utilizes first biological safe treatment of public sewage.

**1918** The toaster is invented.

**1919** A British R34 airship first 2-way-cross of Atlantic Ocean.

**1920** Tree ring dating as an archeological tool is perfected by Andrew E. Douglass. Era of modern radio transmission commences with Westinghouse. The first automobile, a Duesenberg, equipped with hydraulic brakes. First Johnson and Johnson Band-Aid.

**1921** Insulin which promotes uptake of nutrients is isolated by Dr. Frederick Banting, Toronto, Canada. Liver extract developed. Joe Block invents whistling kettle. The first drive-in restaurant: in Dallas, Texas.

**1922** St. Louis Missouri unveils first shopping mall. Howard Carter discovers the Egyptian treasures of Tutankamen, the most stunning archeological find of all time.

**1923** Juan de la Cierva of Spain invents Autogiro. Garrell A. Morgan invents traffic light. Roy Chapman Andrews discovers rare intact dinosaur eggs in the Gobi Desert of Mongolia.

**1924** Super heterodyne radio receiver developed by Edwin Armstrong. Professors William F. Albright and Melvin Kyle discover Bab-Edh-Dhra, the fabled Biblical ruins of Sodom near the Red Sea. A 2.6 million year old skull with an intact fossilized brain discovered in Tong, Kalihari Desert, S. Africa (the Rosetta Stone of human civilization.) Edward Appleton and Samuel Barnett discover ionosphere. Thyroid-stimulating hormone discovered that triggers activity and growth of thyroid gland. Kleenex invented.

**1925** To locate objects at a distance, radio detecting and ranging (radar) was invented. Commercial airmail debuts in the U.S.

**1926** Massachusetts professor Robert Goddard launches the first successful liquid-propelled rocket, 41 ft. high into the air. B. F. Goodrich discovers vinyl. Mechanical devise television systems developed in the United States and Britain. The 35mm camera format introduced.

**1927** Charles Lindbergh makes the first nonstop transatlantic flight, from NY to Paris. First successful talking picture, The Jazz Singer. Trans-Atlantic phone service links London with New York. Formica plastic laminate is created.

**1928** British researcher Sir Alexander Fleming discovers penicillin. Scotsman John L. Baird invents the vinyl video disk although it will not become popular until 50 years later when Japanese electronic firms equip video cassette recorders with cameras. First 16mm color film is created. Double Bubble gum premieres. The engineering wonder 6-

mile Moffat Tunnel through the Rockies links Denver with Salt Lake City.

**1929** Phoebus Levene discovers two kinds of units in the cell nucleus: RNA and DNA. Camera flashbulb introduced commercially. Discovery of ancient Peri Reis Seafaring Map in Turkey shows extraordinary features of a pre-ice Antarctica.

**1930** The first tape recorders using magnetic plastic tape are introduced in Germany. The invention of the cyclotron (-atom splitter) particle accelerator by E.O. Lawrence. Freon discovered by Thomas Midgley, Jr, a Du Pont chemist as a replacement for ammonia and methyl chloride in refrigerators, which were flammable (40 years later freon and other chlorofluorocarbons were deemed dangerously destructive to the ozone layer.) W. J. Kroll of Luxembourg initiates research into the world of metal titanium. The French astronomer Bernard Lyot develops a new type of telescope that can see the Sun's corona in full sunlight. 13.7 million American homes own a radio. I. G. Farben discovers polystyrene. First round-the-world radio broadcast.

**1931** Hugh Herndon and Clyde Pangborn make the first nonstop flight between Japan and the U.S. First electric razor. Electron microscope, Germany. The *Columbian* of the Baltimore and Ohio RR is the first all air-conditioned passenger train in the world.

**1932** The first Earth-crossing asteroids discovered. Neutron discovered by Chadwick, England. John Cockcroft and Ernest Walton devise particle accelerator. First woman to fly Transatlantic solo: Amelia Earhardt. First automobile radio. First V-8 Ford.

**1933** First GE room air-conditioner premieres. First drive-in movie premieres in Camden, NJ. Edwin Armstrong of RCA perfects wide-band modulation, FM radio. U.S. astronomer Karl Jansky invents the science of radio astronomy, permitting Earth to see deep into space. The first diesel train is introduced in Nazi Germany. First lightweight aluminum RR passenger car built in the U.S. Chocolate Chip cookies invented. Union Pacific's M-10000 is the first North American aerodynamic aluminum train. Col. Earl J.W. Ragsdale perfects Shotwelding manufacturing process.

**1934** *The Burlington Zephyr* all air-conditioned stainless steel train

ushers in the radical design streamlined era; max speed 112 mph. First stereo multi-channel sound transmission over phone lines introduced by Bell Lab scientist A.C. Keller and Leopold Stakowsky and the Philadelphia Orchestra. Physics student Wernher von Braun shoots an oxygen-alcohol rocket 7,900 ft. into the air. J.F. Cantrell opens the first coin laundromat in Fort Worth, Texas.

**1935** Carl and Gerty Cori discover the chemical basis of how glycogen works as fuel for human cells. *Hiawatha* sets a new RR world record of 128 mph. British and German scientists introduce the world to crystal-clear plastic. Pan American Airways flies the first passenger route over the Pacific. Captains A. Stevens and O. Anderson reach a record of 72,395 ft. (almost 14 miles) in a stratosphere balloon sponsored by National Geographic and the USAAC. I. G. Farben invents magnetic tape. The first in the world regular television broadcast, using Vladimir Zworykin's TV camera, is watched in Berlin, Nazi Germany. Parking meters introduced in the United States. (OK)

**1936** Kodak introduces Kodachrome color film. First television broadcast of an Olympics, during the Berlin Olympics. Square D circuit breaker invented. Erwin W. Muller invents the field-emission microscope. The streamlined DC-3 airplane enters passenger service, max speed: 198 mph.

**1937** Xerography (forerunner to Xerox copier technology) invented by Chester Carlson. The shopping cart invented by Sylvan N. Goldman. Colchicine, a chemical that artificially doubles chromosomes in plants discovered by Al Blakeslee, Amos Avery and Bernard Nebel. Nylon developed by DuPont. Insulated window glass premieres. The importance of Niacin is identified. Railroad welded track is first employed on heavy-duty service, in upstate New York.

**1938** Hungarian Lazlo Biro invents the ball-point pen utilizing a quick-drying ink. Kodak introduces the first camera with a built-in photo-electric exposure meter. Chemist Otto Hahn in Nazi Germany splits atoms of uranium producing a reaction of 200 million electric volts of energy (nuclear fusion). German Dr. Wilhelm Koenig discovers a 2,000 year old electric battery in an archaeological dig at Khujut Rabu'a, Iraq. American James Wyld designs an engine that uses fuel instead of water or air to cool itself. First contact lens is made. World record for a

steam locomotive: 126 mph in UK. The first E-type diesel electric *Super Chief* runs between Chicago and Los Angeles, providing fast 39½ hour service. Airborne radar development in Britain is practical.

Macklanburg-Duncan tube caulk invented. American Dr. Matthew W. Sterling discovers an archeological site in the remote jungles of southern Mexico that lead to the discovery of the Olmec civilization, pre-dating Columbus by 2,500 years. Fluorescent bulbs last 1,500 hours.

**1939** Nazi Germany produces the first jet, powered by a gas-turbine engine. Pan Am conducts first transatlantic travel between the U.S. and Europe. Owens Corning fiberglass insulation premieres. The biggest streamlined steam engine in the world, the Pennsylvania 6-4-4-6, debuts in N.Y. The Santa Fe, Southern Pacific, and Union Pacific build the finest streamlined passenger train station in the West, in Los Angeles. The *Silver Meteor* offers the first deluxe reclining seat-equipped service between New York and Florida, bringing the list of luxury streamliners in America to 82. Pre-cooked frozen food debuts. The revolving Sawyer View-Master 3-D (stereo) viewer and reels, invented by William B. Gruber, commercially introduced. Oxford chemists Howard Florey and Ernst Chain create a method for making penicillin practical. Nylon, built from synthetic rubber compounds, invented by DuPont scientist Wallace Carothers of Harvard, is sold commercially. Silk stockings replaced by Nylon.

**1940** Walt Disney's *Fantasia* debuts, first commercial use of stereophonic sound in a movie. An Oldsmobile is the first car with an automatic transmission.

**1941** Aerosol spray developed. Enriched white flour standards first enacted, as a war measure food program. Streamlined *Electroliners* initiate service (Chicago-Milwaukee), the finest interurbans ever built. Nazi Germany builds the first successful rocket-propelled combat aircraft. Initial synthesis and identification of the transuranium elements. First push-button phone produced. The largest freight locomotive in the world at 560 tons, the Union Pacific Big Boy (132 feet) 4-8-8-4, debuts.

**1942** World's first atomic chain reaction test, led by Enrico Fermi. Rocket A4 (also known as V-2) rises 52 miles from Peenemunde, Nazi Germany, world's first spaceship; Age of Supersonic Flight begins.

Maxwell House Instant coffee debuts. U.S. Department of Agriculture achieves a way to extensively employ penicillin, the most important antibiotic of the century. Jacques-Yves Cousteau and Emile Gagnan invent scuba-diving Aqua-Lung. J.S. Hey discovers solar radio emission.

**1943** Chemist Selman Waksman and Albert Schatz discover a way to combat tuberculosis, meningitis, and infections of the lung. The world's first operational atomic reactor was built at Oak Ridge, Tennessee. World's first programmable computer, a top-secret code breaking machine, Colossus, invented by Briton Tommy H. Flowers, a telephone engineer at the Post Office research station in London, uses vacuum-tube technology, hundreds of times faster than any experimental computer using electromagnetic relays. U.S. Army Air Force conducts first intentional scientific flight into an eye of a hurricane to collect science data, near Houston, Texas.

**1944** Scientific researchers Oswald T. Avery, Colin MacLeod, and Maclyn McCarty discover that DNA carries genetic information (what the molecule looked like and its code would not be known for nine more years.) Dr. Ernest Charlton, GE scientist, announces x-ray machine that can take pictures through a foot of steel. Navy Comdr. Howard Aiken in collaboration with IBM and Harvard developed an automatic calculator computer, the Mark I, with some 2,000 electronic tubes and 500 miles of wire. The X-4 built by Nazi Germany is the first remote-controlled radio-guided missile. Also built by Nazi Germany, the Wasserfall is the first rocket with an infrared homing system.

**1945** First Atomic bombs produced, made of plutonium and uranium. First time 650 billion units of penicillium produced a month. Edwin L. Peterson invents answering machine. First Vista Dome, allowing a 360-degree view, passenger railroad car built in the world by Budd Co. DuPont vinyl flooring debuts.

**1946** First generation mobile cellular telephone service instituted by AT & T; very limited & expensive. The first all-electronic 160,000 watt computer, using 18,000 triode vacuum tubes, (ENIAC) goes into operation at the University of Pennsylvania. A new lens that could take normal, wide angle and telephoto camera pictures is released by Zoomar. U.S. Navy rear admiral, computer wizard Grace Murray Hopper develops COBOL computer language. Transcontinental passenger

service between NY and Bournemouth/London and Rio de Janeiro instituted on TWA. Sherwin Williams latex paint debuts.

**1947** Tide synthetic detergent premieres. The first microwave and instant Polaroid camera is sold commercially. Chuck Yeager breaks the sound barrier (Mach 1: 761 mph at sea level) in X-1 jet, the first manned supersonic flight by a rocket-powered craft. Holography is invented by Dennis Gabor. The first transistor, short for transfer resistor, that switches and controls electronic currents was developed at Bell Telephone Laboratories. Offshore oil drilling commences. Discovery of ancient Dead Sea Scrolls in Qumran announced.

**1948** Long-playing vinyl record invented by Dr. Peter Goldmark. The antibiotic Aureomycin developed. The first junction transistor, a microscopically thin silicon sandwich of n-type and p-type silicon, devised by physicist William Shockley of Bell Telephone Laboratories.

**1949** An unprecedented 7-year long project by the National Geographic Society and Palomar Observatory at California Institute of Technology to map the universe to a depth of one billion light-years taking 1,758 astronomical photographs commences. Discovery of cortisone, a hormone that reduces inflammation and decreases allergy symptoms.

**1950** Earl John Hilton invents the credit card. Chrysler announces low-priced automatic transmission. The Taylor Aerocar appears, a car that converts into an airplane, range 300 miles, at 105 mph.

**1952** Sony of Japan markets the first pocket-sized transistor radio. Super Dome passenger service is inaugurated on the Milwaukee Road *Olympian Hiawatha*. First rabbit ears TV antenna debuts. British de Havilland *Comet*, the world's first jet passenger airliner, max speed: 526 mph, completes London-Rome-Beirut-Khartoum-Entebbe-Livingstone-Johannesburg-route, in 24 hours.

**1953** Secrets of *DNA* uncovered, at Cambridge University by James Watson and Francis Crick. DNA is the human genetic code shaped like a twisted staircase called the double helix. Polio vaccine developed by Dr. Jonas Salk. TWA institutes first non-stop transcontinental service, between Los Angeles and NY. Sir Edmund Hillary scales the world's

highest peak: Mt. Everest at 29,028 ft. IBM unveils the 701 computer.

**1954** Texas Instruments invents the silicon transistor. TV dinner debuts. The first H-bomb, a thermonuclear fusion reaction, vaporizes the entire island of Bikini, a TNT equivalent 1000 times more powerful than the A-bomb of Hisoshima and more powerful than the combined power of all the weapons fired in all the wars of history. Nuclear submarine *Nautilus* launched.

**1955** Low-temperature field-ion microscope that can view individual atoms developed by Erwin W. Muller.

**1956** Alexander M. Poniatoff completes a machine that videotapes a live television image. First IBM portable electric typewriter. Wernher von Braun launches a Redstone rocket 682 miles into the air. Czech inventor O. Wichterle creates process to make soft contact lenses. Crest fluoride toothpaste debuts. First Zenith TV remote control.

**1957** Two hundred miles above the Earth, Soviet Sputnik I is released, the first object built by humans to orbit Earth. Stereo debuts on a mass market scale and transforms the reality of sound. Dr. William Kolff creates the first artificial heart. Velcro developed. Corning Glass Ware develops a ceramic harder than steel, lighter than aluminum, stronger than glass: Pyroceran. Char-Glo gas barbecue grill invented. Robert Howard invents the dot matrix printer.

**1958** NASA launches its first satellite, the TRW-built Explorer I. Van Allen belts discovered. Two hormones discovered: one affects rhythm of sleep and wakefulness (melatonin) the other influences rate of growth (human growth hormone.) The first tiny integrated computer circuit devised by Jack Kilby of Texas Instruments; a refinement design by Robert Noyce of Fairchild gave both men credit for the invention, but this change to 3rd generation hardware did not take hold until the mid-nineteen sixties with IBM's 360's.

**1959** Silicon chips are made. Bonanza is the first television series to air in color. X-15 conducts first powered flight. National Geographic publishes first color photos of deep outer space, including the Andromeda constellation.

**1960** Laser pulse beams come into existence when Theodore Maiman

concentrates photons at Hughes Research Labs, Malibu, CA. Xerox copy machines become practical. Luther Simjian invents ATM. Echo I became the first communications satellite to relay radio signals to Earth. Lawyer, novelist Norwegian explorer Helge Ingstad discovers thousand-year old ancient Viking village in Newfoundland. There are 78,000 aircraft in the world. The first electric leaf blower is invented.

**1961** The first light-emitting diode (LED) is invented by Nick Holonyak, Jr. Soviet cosmonaut Yuri Gagarin becomes the first man in space to survive. Astronaut Alan Shepard is the first American in space. TWA is the first airline to screen in-flight movies. Physicist Ali Javan produces the first stream of continuous laser; lasers are now used for surgery, surveying, cutting and measurements. Professor Kenan T. Erim finds great treasure at Aphrodisias, ancient Greco-Roman city in sw Turkey. A gigantic engineering rescue mission that saves ancient architectural treasures on the Nubian Nile from destruction, including Abu Simbel, in cooperation with UNESCO and the Egyptian Antiquities Organization, commences. Black and Decker cordless drill, IBM Selectric typewriter, Pampers disposable diapers, DuPont/Teflon cookware and GE Toaster oven debut.

**1962** Telstar launched by AT & T becomes the first satellite to relay live TV across the ocean. First hovercraft air-cushioned vehicles for ferry service built by Vickers-Armstrongs of Great Britain. First modem is introduced in the U.S. commercially: Bell 103 modem. First American to orbit the Earth: John H. Glenn. Holographic pictures become greatly improved with the application of laser.

**1963** The cassette tape is unveiled by the Dutch firm Philips. Quasars discovered; centers of extremely remote galaxies.

**1964** Second generation cellular telephone introduced with a 152-158 mhz band and about 11 non-digital channels available per geographic location. A new age of high-speed passenger trains debuts with the operation of the Shinkansen Bullet trains in Japan; at 131 mph. Permanent Press fabric debuts. Xerox introduces fax machine. SR-71 U.S. spy-plane hits the air. First lung transplant. Torpedo-shaped jet powered car, Spirit of America, driven by Craig Breedlove breaks land speed record at 539 mph.

**1965** The first commercial satellites to regularly relay both TV and

phone calls between the U.S. and Europe hit the atmosphere over the equator. The first nuclear power plants use Watlow high watt density cartridge pressurizer heaters. A new method in print production developed by Max Matthews to store typefaces in digital form within a computer replaces glass and film. The PDP-8 created by Digital Equipment Corporation of the U.S. marks the first true minicomputer; \$18,000 for 4K data storage. Sony introduces portable video recorders for consumers. DuPont chemist Stephanie Kwolek discovers Kevlar, 5x stronger than steel; perfect for bullet proof vests.

**1966** Texas Instruments unveils first handheld calculator. Luna X first spacecraft to orbit moon. NORAD Command Center fully operational. Ray Dolby invents a complex circuit that reduces static on recordings, known as Dolby Noise reduction; very expensive. Nick B. Clinch leads the American Antarctic Mountaineering Expedition to the top of Antarctica's highest peak at 16,067 ft. Surveyor I spacecraft lands on the moon and begins transmitting the first of 10,338 pictures.

**1967** Dr. Christiaan Barnard of South Africa performs the first human heart transplant. The first supermarket laser device, a retail bar-code scanner, is installed in Cincinnati. Discovery of pulsar stars. A United Aircraft TurboTrain attains 170.8 mph between New Brunswick and Princeton Junction, breaking the U.S. record. The world's fastest typesetting machine, the Linotron which sets type at 1,000 characters per second, is placed in operation in the U.S. Government Printing Office.

**1968** Birth of the computer & peripheral industries after IBM antitrust lawsuit. Tupolev TU-144 unveiled as the first supersonic jetliner, built in the Soviet Union. 2001: A Space Odyssey the first major Hollywood film to link the camera with the technical wizardry of computers for special effects.

**1969** Neil Armstrong, Apollo 11 astronaut, becomes the first man to walk on the moon. Gore-Tex fabric debuts. The Department of Defense establishes Advance Projects Agency computer Network at: UCLA, Stanford Research Institute, UC Santa Barbara, University of Utah. Chemical Bank, New York, is the first to install an ATM. The Boeing 747 debuts. Science identifies the beginning and end of a single gene, a subsection of a chromosome.

**1970** Glass & plastic fiber optics began to be used to carry laser sig-

nals; flashes of lasers travel considerably faster than electrons down a wire. EPA, the Clean Air Act and Earth Day instituted. The first catalytic converters begin going on new vehicles, 18 years after Cal Tech scientists showed auto emissions contributed to smog. IBM creates computer floppy disk.

**1971** The first microprocessor computer chip, a versatile "computer on a chip" is designed by Marcian "Ted" E. Hoff, Jr, introduced by Intel. Ray Tomlinson invents e-mail program. First passenger flight of a supersonic Concorde jetliner, max speed: 1,354 mph; USA to Europe in less than 3hrs; passengers can see the curvature of the Earth from 12 miles up. Godfrey Hounsfield, a music engineer in England, demonstrates the first working CAT using crude computerized tomography; this CAT scanning x-ray detected a tumor and saved the life of a patient.

**1972** The first luggage with wheels rolls into history, designed by Bernard Sadow. Automatic coffeemaker "Mr Coffee" debuts. First Daisy Wheel printer, by Diablo Systems.

**1973** Skylab, first space lab, launched. Micral, first commercial nonkit microcomputer system, developed by Truong Trong Thi from France. Herbert Boyer and Stanley Cohen splice together DNA to create new genes that alter nature.

**1974** Internet is coined.

**1975** Microsoft is created by Bill Gates. The first liquid-crystal displays. First plain-paper fax machine is introduced.

**1976** Spacecraft Viking Landers reach Mars. Lockheed SR-71 Blackbird sets a horizontal altitude of 85,069 ft. and a speed record of 2,193.64 mph. Commodore Business Machines announces the PET, the first fully assembled microcomputer; this Personal Electronic Transactor had 4K to 32K of RAM and only a b & W 9-inch screen. Queen Elizabeth II sends an e-mail by computer. Supersonic Concorde commercial debut. The first Supercomputer in the world goes online, can process 80 million instructions per second, created by Cray Research; within 6 years there existed at least 50, price: \$9-11 million.

**1977** Japanese auto makers utilize 7,000 robots to replace human

workers in automobile plants. Burning fuel at a ton per second, the space shuttle Columbia is launched into space, ushering a new era of reusable spacecraft. British and Australian scientists register Supernova Vela X. MRI scanners (magnetic resonance imaging) first used in medicine. The first all-woman American team to conquer Mt Annapurna at 26,509 ft, two colleagues are killed. DEC announces first 32-bit computer in the world, the VAX-11/780 with 8K cache. Star Wars premieres, the first major picture to use multi-channel surround sound in Dolby Stereo.

**1978** Mercedes Benz pioneers anti-locking brakes. First test tube baby: Louise J. Brown. First test flight of the F/A-18 Hornet fighter jet, max speed: Mach 1.8.

**1979** Spacecraft Voyager I reaches Jupiter. Sony introduces the Walkman. British, Soviet and U.S. scientists aboard Glomar Challenger, using magnetic, acoustical and electronical devices, discover evidence of actual magnetic polar reversals. First successful flight of improved F-15C Eagle fighter jet; max speed: 1,650 mph. IBM begins production of 8088 microprocessor, equivalent to the power of 29,000 transistors. Westin Peachtree Plaza is the first hotel to use new technology key-card. Amtrak debuts double-deck full-domed luxury Superliners, on the Chicago-Seattle *Empire Builder*.

**1980** At least 3,500 Industrial Robot Systems in place worldwide. Scitex introduces the first color electronic prepress.

**1981** Internet goes on line officially. First intercity **TGV** high-speed trains in France go on line at 236.2 mph. Supersecret Stealth Fighter (F-117A Nighthawk) composed of radar-absorbent material successfully takes to the air, max speed: 593 mph. IBM enters the personal computer market with a 256K RAM 16-bit 8088 microprocessor. Hewlett-Packard unveils production of a silicon chip equivalent to the power of 450,000 transistors.

**1982** Barney Clark is the first recipient of a permanently attached artificial (mechanical) heart; he survives for 112 days. CD's are unveiled. The FBI recovers \$3.2 million worth of stolen computer chips, largest theft in Silicon Valley history. About 2,000 laptop computers exist in the world, called briefcase portables.

**1983** First flight simulator. Apple introduces the 16-bit desktop Lisa, with a palm-size pointer, known as a mouse, intended for office use. At least 8000 Industrial Robot Systems exist, mainly to replace human jobs. It cost \$1.75 to \$4.77 per hour to maintain a robotic system, as opposed to \$11 to \$15 for skilled labor.

**1984** Public use of the internet on a limited basis commenced. First laser printer: Canon LBP-CX. Apple introduces the Macintosh Computer. Alec Jeffreys invents DNA fingerprinting.

**1985** First time lasers are used to clear blocked arteries. World's most powerful laser is built in California. Philips/Sony compact discs and CD players sold commercially. Expensive mobile telephones available for the masses. First trans-continental fiber optic cable is laid. PostScript language first used.

**1986** Forerunner to the use of liquid nitrogen, J. Georg Bednorz and Alex Muller discover a whole new class of superconducting materials at IBM's Swiss Laboratory; the University of Houston under Professor Ching-Wu "Paul" Chu followed with the history making scientific discovery of cooling superconductors to -283 degrees F, 123° lower than the Swiss team, making computer superconducting practical. First stereo-sound TV. Embedding an electronic dictionary in a handheld device, the Franklin company creates the first e-book. High-Speed rail **TGV**-service is inaugurated between Paris, France, and Geneva, Switzerland. Dick and Burt Rutnam invent first plane to circle the globe nonstop. Reinhold Messner ascends Mt. Lhotse, the 4th highest mountain in the world, and becomes the first man in history to reach all 14 world's tallest mountains.

**1987** First nurse contracted Aids accidentally while on duty in a hospital. Arthur Walker of Stanford University produces first detailed pictures of the Sun's corona. The huge Human Genome Project is instituted with the aim to decode 3.1 billion chemical letters of human DNA (the public project) established with \$3 billion, eventually leading into an international multibillion dollar project lubricated by over 80 robots that ran 24 hours a day, 7 days a week nonstop, to decode all the 100,000 genes on our 23 pairs of chromosomes and read the sequence of life. [In AD 2000, in connection with Celera Genomics, some 97%

was announced as sequenced.]

**1988** Giant magnetoresistance discovered, forerunner technology to spintronics and the M-RAM, spin-based computer random access memory, dramatically reducing the need for electricity. Watlow manufactures advanced heater technology that assists in hospital patient pre- and post-operation. 1.6 million cellular phone customers. The Petronas Twin Towers are built in Kuala Lumpur, Malaysia, the tallest building in the world at 451.9 meters. The longest rail bore tunnel in the Western Hemisphere is completed, when the Canadian Pacific opens Mount Macdonald Tunnel in British Columbia.

**1989** Digital photography skip the developing phase. The most expensive warplane ever built, at \$570,000,000 each, the first of the 20 black stealthy B-2 Spirit's flies out of Palmdale, California. Discovery of cold fusion, transmitting the hydrogen from water into clean energy is announced by Doctors Martin Fleischmann and Stanley Pons. Apple introduces the first 1.4 MB floppy drive for the MAC platform. There are 340,000 personal computers with CD-Rom drives, no PC is equipped with off-the-shelf recording. Fluorescent bulbs last 24,000 hours.

**1990** Huge global survey using the most modern instruments begun by the World Oceanic Circulation Experiment project. France's **TGV Atlantique** becomes the fastest train in the world at 322 mph. Stealthy superjet, Lockheed F-22 prototype, debuts using the most advanced fighterjet avionics system ever conceived cruising at 1,180 mph plus. Apple computer unveils MACS for the masses, including the Classic at \$999 with 1 MB of RAM, 40 MB hard disk. Adobe Photoshop premieres. Full-motion desktop video and stereo sound announcement by Intel with the introduction of the i750 microchip. A hardcopy digital proof called Matchprint II, introduced by 3M, enters the publishing-pressroom scene. The TravelMate 2000 portable laptop by Texas Instruments, another new generation of computer, with a 20 MB drive, 1 MB of RAM, powered by a 12 MHz processor. Lockheed SR-71 Blackbird performs speed of 2,124 mph; max ceiling estimated at 101,400 feet; estimated cost to fly per hour: \$200,000.

**1991** The smallest and lightest missile to date developed for the U.S. Army is tested: the rocket engine weighs 1/10th of an ounce, has a 4.2 million-instructions-per-second computer, and is less than 1 inch long.

Sound Retrieval System (SRS) developed by Hughes, revolutionary system of the future enabling listeners to enjoy an effect recreating the dynamic range of the original performance. A tiny chip containing 97,600 infrared detector elements, the hybrid Schottky platinum silicide focal plane array, allows the study of sunspots better. Improved method for processing Gallium Arsenide Microwave/Millimeter Wave Monolithic Integrated circuits (MIMIC). A tiny robot, built by German Rudolph Gantenbrink, discovers a secret stone door in an air-starshaft passage inside the Great Pyramid of Giza, Cairo, Egypt. The special method to save and manipulate images using TIFF files is formed in desktop publishing officially: TIFF/IT. Toshiba America introduces the 3x zoom lens MC200 digital camera which saves pictures on a 2MB card, for only \$12,500.

**1992** Jean Armour Polly invents "Surfing the Internet." Ushering a new era in high-speed trainsets, the Swedish-built X2000 conducts tests in the United States. Birth of digital cellular telephone service. Birth of the 70" raised-roof double bunk sleeper diesel cab, the Freightliner, provides unsurpassed style, comfort and efficiency for long-haul truck drivers. Cancer-fighting compound is discovered in broccoli, cauliflower and brussel sprouts.

**1993** Significant astronomical tool of all time, the Earth orbiting Hubble telescope with a great 12-ton reflector, has optical systems fine-tuned and improved. Heidelberg GTO-DI Press with PEARL laser-imaging revolutionizes color printing, with its direct-to-plate imaging technology, eliminating the four film conventional film process. Significant release of the first computer Pentium processor, equivalent to the power of over three million transistors. The White House is tied to the world wide web. Argentinosaurus, the largest dinosaur known to have walked the Earth, is discovered in South America. A significant super energy saver invented by Shuji Nakamura of Japan: a mass-produceable tiny blue light-emitting diode that boosts clarity on anything from traffic lights to big-screen televisions, which also increases capacity on digital video discs.

**1994** Spectacular pictures of Comet Shoemaker-Levi slamming into Jupiter. Shopping malls on the internet become real. First Virtual is the first bank on the internet. A 12,500 year-old fossil woolly mammoth discovered by John Hebior, would eventually lead to evidence that

PaleoIndians hunted the huge beasts; this finding in Wisconsin becomes one of the most important Ice Age discoveries in North America. Stretching across 8,000 miles of the Pacific, the first El Niño warning system of some 70 scientific transmitter buoy's in place. Eurostar train crosses the English Channel under a tunnel linking the capital cities of Paris and Brussels to London; Eurostar operates at 188 mph. Lionel Trains introduces a wireless remote control to power toy trains. Zip drive instituted by Iomega.

**1995** RealAudio, an internet audio streaming technology allows users to real time sound via computer. The first national DNA database used to apprehend convicts debuts in England. Photovoltaic cells power an automobile. Plasma television with a flat screen is introduced. Commercial 24 hour internet-only radio stations begin broadcasting, the first is Radio HK. Timekeeper and GPS, Global Positioning Satellites, 24 satellite navigation system established. SOHO satellite launched, a solar and heliosphere observatory built in Europe, with instruments provided by U.S. and European scientists. Southwest Airlines is the first major carrier offering system-wide ticketless-travel. Less than one-half of 1 percent of all counterfeit money is created by computer.

**1996** Four billion people watch the summer Olympics. Sleek double-deck CityNightLine debuts, first economic all-sleeping "hotel train" service in Europe. The first High Definition television is introduced by Zenith. Major change in U.S. currency. Dolby the sheep secretly cloned.

**1997** Unmanned explorer Pathfinder lands on the planet Mars. Scientists accomplish quantum teleportation beam in Innsbruck and Rome. Motorola launches first 17,500 mph low-Earth satellites that provide internet and telecommunications anywhere in the world. Art Bell conducts transmission of first interactive live show on both radio and internet. The speed of modems reaches 56 Kbps. Sony Mavica digital camera debuts. Paleontologist Luis Chiappe discovers thousands of dinosaur eggs in Argentina, including at least six rare fully preserved unhatched titansaur detailing anatomy and skin texture. Jet powered car, Thrust SSC, driven by Andy Green of Great Britain breaks land speed record at 763.035 mph.

**1998** High Definition TV (HDTV) debuts (regular analog TV broadcasting expected to stop in AD 2006). First time an American airline has more

passengers buying electronic tickets than paper tickets, United Airlines. The Intel Pentium II silicon-crystal-wafer-like gallium arsenide chip unveils commercially: smaller, lighter chips that consume less energy. Survival hand-crank radios go on sale to the public in mass-production. In a special pressurized capsule, the Breitling Orbiter 3 is the first balloon in the world to circumnavigate the globe. The intensity of the magnetic field of Earth discovered to be twice as high as normal according to Scripps Oceanography. Heathrow Express linking London with Heathrow Airport debuts. The iMac computer sells commercially. Microsoft surpasses General Electric as the world's most valuable company; \$345 billion vs \$324 billion. U.S. Army selects a new rifle that can shoot ammunition around corners. Sixty million cellular phone customers. FBI opens a national DNA database of convicts. In a secret scientific experiment in Ohio, surgeons switch the heads of three monkeys and keep them alive with oxygenated blood for a week-monkey experiments in Beaverton, Oregon, produces a monkey that glows in the dark within 3 years. The PearlGold processless thermal printing plate introduced by Presstek. The Kodak DC 260 digital camera with 8MB storage card, 1.5 megapixel range and 3x zoom lens, voted one of the year's greatest achievements in science and technology by *Popular Science*, makes a commercial hit at under \$1000. Japan launches first Mars probe. First hand transplant amazes the world. Deep Space rocketship launched, first time a solar-powered ion-propulsion engine was primary device, reaching speeds of 62,000 mph. (yes, sixty two thousand)

**1999** Eureka robot vacuum cleaner debuts. NASA's *AXAF* (Advanced X-Ray Astrophysics Facility) \$1.2 billion high elliptical solar-panel satellite, after 20 years of research and design, begins to conduct special x-ray universe observations. Amtrak unveils High-Speed Acela Express that tilts. United Solar and Solar Design Associates develop a new type of photo-voltaic panel to create heat and electricity from sunlight, called the Phototherm. Hughes Space Communications introduces DirectTV 1-R, the first satellite launched from the sea. Largest passenger ship in the world, Royal Caribbean's 3,838 passenger cruise ship, *Voyager of the Seas*, a 142,000 ton behemoth of the seas, is launched. Intel unveils the Pentium III chip. A new generation of imaging satellites is launched (Ikonos), capable of 1-meter resolution. Terra Satellite, flagship of the Earth Observing System (EOS), launched by NASA in hope of utilizing five state-of-the-art sensors to diagnose the Earth's

climate, capable of 15-meters resolution. Women's Soccer World Cup match seen by over a billion people, the U.S. becomes world champions defeating China. New corneal implants give nearsighted persons 20/20 without glasses or contact lenses. Number of electronic tickets issued for air travel exceeds paper tickets. Number of cell phones in America exceeds 85 million. The Leechulator first molecular biological computer, built at MIT, forerunner to computer transistors on an atomic level. First hydrogen fuel station opens. Frigidaire Concept Refrigerator with bar code scanner invented. Apple Computer introduces the AirPort, the world's first wireless network invention. Nikon Coolpix digital camera breaks the 2 megapixel barrier. World's smallest transistor: a 50-nanometer transistor, about 1/2000 the width of a human hair. Close to 45 percent of all counterfeit money is created by computer. Cadillac automobile utilizes thermal-imaging night vision. Incandescent bulbs last 1,500 hours. Fluorescent bulbs last 100,000 hours. Kyocera VP-210 Visual phone goes on sale commercially, in Japan, world's first full color video cellular phone invention, with a miniature camera and a 2-inch window for transmitting real-time audio-video and video answering machine. Number of people who use web for gambling 56 million; 100 gambling companies on the web.