A Brief History of Computing - Complete Timeline
http://www.ox.compsoc.net/~swhite/history/timeline.html

500 B.C.	The abacus was first used by the Babylonians as an aid to simple arithmetic at sometime around this date. The abacus in the form we are most familiar with was first used in China in around 1300 A.D.
1614	Scotsman John Napier (1550-1617) published a paper outlining his discovery of the logarithm. Napier also invented an ingenious system of moveable rods (referred to as Napier's Rods or Napier's bones). These allowed the operator to multiply, divide and calculate square and calculate cube roots by moving the rods around and placing them in specially constructed boards.
1623	Wilhelm Schickard (1592-1635), of Tuebingen, Wuerttemberg (now in Germany), made a "Calculating Clock". This mechanical machine was capable of adding and subtracting up to 6 digit numbers, and warned of an overflow by ringing a bell. Operations were carried out by wheels, and a complete revolution of the units wheel incremented the tens wheel in much the same way counters on old cassette deck worked. The machine and plans were lost and forgotten in the war that was going on, then rediscovered in 1935, only to be lost in war again, and then finally rediscovered in 1956 by the same man (Franz Hammer)! The machine was reconstructed in 1960, and found to be workable. Schickard was a friend of the astronomer Johannes Kepler since they met in the winter of 1617.
1625	William Oughtred (1575-1660) invented the slide rule.
1642	French mathematician, Blaise Pascal built a mechanical adding machine (the "Pascaline"). Despite being more limited than Schickard's 'Calculating Clock' (see 1623), Pascal's machine became far more well known. He was able to sell around a dozen of his machines in various forms, coping with up to 8 digits.
1668	Sir Samuel Morland (1625-1695), of England, produces a non decimal adding machine, suitable for use with English money. Instead of a carry mechanism, it registers carries on auxiliary dials, from which the user must re-enter them as addends.
1671	German mathematician, Gottfried Leibniz designed a machine to carry out multiplication, the 'Stepped Reckoner'. It can multiple number of up to 5 and 12 digits to give a 16 digit operand. The machine was later lost in an attic until 1879. Leibniz was also the co-inventor of calculus.
1775	Charles, the third Earl Stanhope, of England, makes a successful multiplying calculator similar to Leibniz's.
1776	Mathieus Hahn, somewhere in what will be Germany, also makes a successful multiplying calculator that he started in 1770.
1786	J. H. Mueller, of the Hessian army, conceives the idea of what came to be called a "difference engine". That's a special purpose calculator for tabulating values of a polynomial, given the differences between certain values so that the polynomial is uniquely specified; it's useful for any function that can be approximated by a polynomial over suitable intervals. Mueller's attempt to raise funds fails and the project is forgotten.
1801	Joseph-Maire Jacuard developed an automatic loom controlled by punched cards.
1820	Charles Xavier Thomas de Colmar (1785-1870), of France, makes his "Arithmometer", the first mass-produced calculator. It does multiplication using the same general approach as Leibniz's calculator; with assistance from the user it can also do division. It is also the most reliable calculator yet. Machines of this general design, large enough to occupy most of a desktop, continue to be sold for about 90 years.
1822	Charles Babbage (1792-1871) designed his first mechanical computer, the first prototype for the difference engine. Babbage invented 2 machines the Analytical Engine (a general purpose mathematical device, see 1834) and the Difference Engine (a re-invention of Mueller's 1786 machine for solving polynomials), both machines were too complicated to be built (although attempt was made in 1832) - but the theories worked. The analytical engine (outlined in 1833) involved many processes similar to the early electronic computers - notably the use of punched cards for input.
1832	Babbage and Joseph Clement produce a prototype segment of his difference engine, which operates on 6-digit numbers and 2nd-order differences (i.e. can tabulate quadratic polynomials). The complete engine, which would be room-sized, is planned to be able to operate both on 6th-order differences with numbers of about 20 digits, and on 3rd-order differences with numbers of 30 digits. Each addition would be done in two phases, the second one taking care of any carries generated in the first. The output digits would be punched into a soft metal plate, from which a plate for a printing press could be made. But there are various difficulties, and no more than this prototype piece is ever assembled.
1834	George Scheutz, of Stockholm, produces a small difference engine in wood, after reading a brief description of Babbage's project.
1834	Babbage conceives, and begins to design, his "Analytical Engine". The program was stored on read-only memory, specifically in the form of punch cards. Babbage continues to work on the design for years, though after about 1840 the changes are minor. The machine would operate on 40-digit numbers; the "mill" (CPU) would have 2 main accumulators and some auxiliary ones for specific purposes, while the "store" (memory) would hold perhaps 100 more numbers. There would be several punch card readers, for both programs and data; the cards would be chained and the motion of each chain could be reversed. The machine would be able to perform conditional jumps. There would also be a form of microcoding: the meaning of instructions would

	depend on the positioning of metal studs in a slotted barrel, called the "control barrel". The machine would do an addition in 3 seconds and a multiplication or division in 2-4 minutes.
1842	Babbage's difference engine project is officially cancelled. (The cost overruns have been considerable, and Babbage is spending too much time on redesigning the Analytical Engine.)
1843	Scheutz and his son Edvard Scheutz produce a 3rd-order difference engine with printer, and the Swedish government agrees to fund their next development.
1847	Babbage designs an improved, simpler difference engine, a project which took 2 years. The machine could operate on 7th-order differences and 31-digit numbers, but nobody is interested in paying to have it built. (In 1989-91, however, a team at London's Science Museum will do just that. They will use components of modern construction, but with tolerances no better than Clement could have provided... and, after a bit of tinkering and detail-debugging, they will find that the machine does indeed work.)
1848	British Mathematician George Boole devised binary algebra (Boolean algebra) paving the way for the development of a binary computer almost a century later. See 1939.
1853	To Babbage's delight, the Scheutzes complete the first full-scale difference engine, which they call a Tabulating Machine. It operates on 15-digit numbers and 4th-order differences, and produces printed output as Babbage's would have. A second machine is later built to the same design by the firm of Brian Donkin of London.
1858	The first Tabulating Machine (see 1853) is bought by the Dudley Observatory in Albany, New York, and the second one by the British government. The Albany machine is used to produce a set of astronomical tables; but the observatory's director is then fired for this extravagant purchase, and the machine is never seriously used again, eventually ending up in a museum. The second machine, however, has a long and useful life.
1871	Babbage produces a prototype section of the Analytical Engine's mill and printer.
1878	Ramon Verea, living in New York City, invents a calculator with an internal multiplication table; this is much faster than the shifting carriage or other digital methods. He isn't interested in putting it into production; he just wants to show that a Spaniard can invent as well as an American.
1879	A committee investigates the feasibility of completing the Analytical Engine and concludes that it is impossible now that Babbage is dead. The project is then largely forgotten, though Howard Aiken is a notable exception.
1885	A multiplying calculator more compact than the Arithmometer enters mass production. The design is the independent, and more or less simultaneous, invention of Frank S. Baldwin, of the United States, and T. Odhner, a Swede living in Russia. The fluted drums are replaced by a "variable-toothed gear" design: a disk with radial pegs that can be made to protrude or retract from it.
1886	Dorr E. Felt (1862-1930), of Chicago, makes his "Comptometer". This is the first calculator where the operands are entered merely by pressing keys rather than having to be, for example, dialled in. It is feasible because of Felt's invention of a carry mechanism fast enough to act while the keys return from being pressed.
1889	Felt invents the first printing desk calculator.
1890	1890 U.S. census. The 1880 census took 7 years to complete since all processing was done by hand off of journal sheets. The increasing population suggested that by the 1890 census the data processing would take longer than the 10 years before the next census - so a competition was held to try to find a better method. This was won by a Census Department employee, Herman Hollerith - who went on to found the Tabulating Machine Company (see 1911), later to become IBM. Herman borrowed Babbage's idea of using the punched cards (see 1801) from the textile industry for the data storage. This method was used in the 1890 census, the result (62,622,250 people) was released in just 6 weeks! This storage allowed much more in-depth analysis of the data and so, despite being more efficient, the 1890 census cost about double (actually 198%) that of the 1880 census.
1892	William S. Burroughs (1857-1898), of St. Louis, invents a machine similar to Felt's (see 1886) but more robust, and this is the one that really starts the mechanical office calculator industry.
1896	IBM founded (as the Tabulating Machine Company), see 1924. Founded by Herman Hollerith (1860-1929, see also 1890).
1899	"Everything that can be invented has already been invented.", Charles H. Duell, director of the U.S. Patent Office
1906	Henry Babbage, Charles's son, with the help of the firm of R. W. Munro, completes the mill of his father's Analytical Engine, just to show that it would have worked. It does. The complete machine is never produced.
1906	Electronic Tube (or Electronic Valve) developed by Lee De Forest in America. Before this it would have been impossible to make digital electronic computers.
1911	Merger of companies, including Herman Hollerith's Tabulating Machine Company, to Computing - Tabulating - Recording Company - which became IBM in 1924.
1919	W. H. Eccles and F. W. Jordan publish the first flip-flop circuit design.
1924 - February	International Business Machines (IBM corporation) formed after more mergers involving the Computing - Tabulating - Recording Company - see 1911. By 1990 IBM had an income of around $69 Billion (and 373,816 employees), although in 1992 recession caused a cut in stock dividends (for the first time in the company's history) and the sacking of 40,000 employees.
1931-1932	E. Wynn-Williams, at Cambridge, England, uses thyratron tubes to construct a binary digital counter for use in

	connection with physics experiments.
1935	International Business Machines introduces the "IBM 601", a punch card machine with an arithmetic unit based on relays and capable of doing a multiplication in 1 second. The machine becomes important both in scientific and commercial computation, and about 1500 of them are eventually made.
1937	Alan M. Turing (1912-1954), of Cambridge University, England, publishes a paper on "computable numbers" - the mathematical theory of computation. This paper solves a mathematical problem, but the solution is achieved by reasoning (as a mathematical device) about the theoretical simplified computer known today as a Turing machine.
1937	George Stibitz (c.1910-) of the Bell Telephone Laboratories (Bell Labs), New York City, constructs a demonstration 1-bit binary adder using relays. This is one of the first binary computers, although at this stage it was only a demonstration machine improvements continued leading to the 'complex number calculator' of Jan. 1940.
1938	Claude E. Shannon (1916-) publishes a paper on the implementation of symbolic logic using relays.
1938	Konrad Zuse (1910-1995) of Berlin, with some assistance from Helmut Schreyer, completes a prototype mechanical binary programmable calculator, the first binary calculator it is based on Boolean Algebra (see 1848). Originally called the "V1" but retroactively renamed "Z1" after the war. It works with floating point numbers having a 7-bit exponent, 16-bit mantissa, and a sign bit. The memory uses sliding metal parts to store 16 such numbers, and works well; but the arithmetic unit is less successful. The program is read from punched tape -- not paper tape, but discarded 35 mm movie film. Data values can be entered from a numeric keyboard, and outputs are displayed on electric lamps.
1939 - January 1	Hewlett-Packard formed by David Hewlett and William Packard in a garage in California. A coin toss decided the name.
1939 - November	John V. Atanasoff (1903-) and graduate student Clifford Berry (?-1963), of Iowa State College (now the Iowa State University), Ames, Iowa, complete a prototype 16-bit adder. This is the first machine to calculate using vacuum tubes.
1939	Start of WWII. This spurred many improvements in technology - and led to the development of machines such as the Colossus (see 1943).
1939	Zuse and Schreyer begin work on the "V2" (later "Z2"), which will marry the Z1's existing mechanical memory unit to a new arithmetic unit using relay logic. The project is interrupted for a year when Zuse is drafted, but then released. (Zuse is a friend of Wernher von Braun, who will later develop the *other* "V2", and after that, play a key role in the US space program.)
1939/1940	Schreyer completes a prototype 10-bit adder using vacuum tubes, and a prototype memory using neon lamps.
1940 - January	At Bell Labs, Samuel Williams and Stibitz complete a calculator which can operate on complex numbers, and give it the imaginative name of the "Complex Number Calculator"; it is later known as the "Model I Relay Calculator". It uses telephone switching parts for logic: 450 relays and 10 crossbar switches. Numbers are represented in "plus 3 BCD"; that is, for each decimal digit, 0 is represented by binary 0011, 1 by 0100, and so on up to 1100 for 9; this scheme requires fewer relays than straight BCD. Rather than requiring users to come to the machine to use it, the calculator is provided with three remote keyboards, at various places in the building, in the form of teletypes. Only one can be used at a time, and the output is automatically displayed on the same one. In September 1940, a teletype is set up at a mathematical conference in Hanover, New Hampshire, with a connection to New York, and those attending the conference can use the machine remotely.
1941 - Summer	Atanasoff and Berry complete a special-purpose calculator for solving systems of simultaneous linear equations, later called the "ABC" ("Atanasoff-Berry Computer"). This has 60 50-bit words of memory in the form of capacitors (with refresh circuits -- the first regenerative memory) mounted on two revolving drums. The clock speed is 60 Hz, and an addition takes 1 second. For secondary memory it uses punch cards, moved around by the user. The holes are not actually punched in the cards, but burned. The punch card system's error rate is never reduced beyond 0.001%, and this isn't really good enough. (Atanasoff will leave Iowa State after the US enters the war, and this will end his work on digital computing machines.)
1941 - December	Now working with limited backing from the DVL (German Aero- nautical Research Institute), Zuse completes the "V3" (later "Z3"): the first operational programmable calculator. It works with floating point numbers having a 7-bit exponent, 14-bit mantissa (with a "1" bit automatically prefixed unless the number is 0), and a sign bit. The memory holds 64 of these words and therefore requires over 1400 relays; there are 1200 more in the arithmetic and control units. The program, input, and output are implemented as described above for the Z1. Conditional jumps are not available. The machine can do 3-4 additions per second, and takes 3-5 seconds for a multiplication. It is a marginal decision whether to call the Z3 a prototype; with its small memory it is certainly not very useful on the equation- solving problems that the DVL was mostly interested in.
1943	Computers between 1943 and 1959 (or thereabouts - some say this era did not start until UNIVAC-1 in 1951) usually regarded as 'first generation' and are based on valves and wire circuits. The are characterised by the use of punched cards and vacuum valves. All programming was done in machine code. A typical machine of the era was UNIVAC, see 1951.
1943	"I think there is a world market for maybe five computers.", Thomas Watson, chairman of IBM.
1943 - January	The Harvard Mark I (originally ASCC Mark I, Harvard-IBM Automatic Sequence Controlled Calculator) was

	built at Harvard University by Howard H. Aiken (1900-1973) and his team, partly financed by IBM - it became the first program controlled calculator. The whole machine is 51 feet long, weighs 5 tons, and incorporates 750,000 parts. It used 3304 electromechanical relays as on-off switches, had 72 accumulators (each with it's own arithmetic unit) as well as mechanical register with a capacity of 23 digits plus sign. The arithmetic is fixed-point, with a plugboard setting determining the number of decimal places. I/O facilities include card readers, a card punch, paper tape readers, and typewriters. There are 60 sets of rotary switches, each of which can be used as a constant register - sort of mechanical read-only memory. The program is read from one paper tape; data can be read from the other tapes, or the card readers, or from the constant registers. Conditional jumps are not available. However, in later years the machine is modified to support multiple paper tape readers for the program, with the transfer from one to another being conditional, sort of like a conditional subroutine call. Another addition allows the provision of plugboard-wired subroutines callable from the tape. Used to create ballistics tables for the US Navy.
1943 - April	Max Newman, Wynn-Williams, and their team (including Alan Turing) at the secret Government Code and Cypher School ('Station X'), Bletchley Park, Bletchley, England, complete the "Heath Robinson". This is a specialized machine for cipher-breaking, not a general-purpose calculator or computer but some sort of logic device, using a combination of electronics and relay logic. It reads data optically at 2000 characters per second from 2 closed loops of paper tape, each typically about 1000 characters long. It was significant since it was the fore-runner of Colossus, see December 1943. Newman knew Turing from Cambridge (Turing was a student of Newman's.), and had been the first person to see a draft of Turing's 1937 paper. Heath Robinson is the name of a British cartoonist known for drawings of comical machines, like the American Rube Goldberg. Two later machines in the series will be named after London stores with "Robinson" in their names.
1943 - September	Williams and Stibitz complete the "Relay Interpolator", later called the "Model II Relay Calculator". This is a programmable calculator; again, the program and data are read from paper tapes. An innovative feature is that, for greater reliability, numbers are represented in a biquinary format using 7 relays for each digit, of which exactly 2 should be "on": 01 00001 for 0, 01 00010 for 1, and so on up to 10 10000 for 9. Some of the later machines in this series will use the biquinary notation for the digits of floating-point numbers.)
1943 - December	The earliest Programmable Electronic Computer first ran (in Britain), it contained 2400 Vacuum tubes for logic, and was called the Colossus. It was built, by Dr Thomas Flowers at The Post Office Research Laboratories in London, to crack the German Lorenz (SZ42) Cipher used by the 'Enigma' machines. Colossus was used at Bletchly Park during WWII - as a successor to April's 'Robinson's. It translated an amazing 5000 characters a second, and used punched tape for input. Although 10 were eventually built, unfortunately they were destroyed immediately after they had finished their work - it was so advanced that there was to be no possibility of it's design falling into the wrong hands (presumably the Russians). One of the early engineers wrote an emulation on an early Pentium - that ran at 1/2 the rate!
1946	ENIAC (Electronic Numerical Integrator and Computer): One of the first totally electronic, valve driven, digital, computers. Development started in 1943 and finished in 1946, at the Ballistic Research Laboratory, USA, by John W. Mauchly and J. Presper Eckert. It weighed 30 tonnes and contained 18,000 Electronic Valves, consuming around 25kW of electrical power - widely recognised as the first Universal Electronic Computer. It could do around 100,000 calculations a second. It was used for calculating Ballistic trajectories and testing theories behind the Hydrogen bomb.
1947 - end	Invention of Transistor at The Bell Laboratories, USA, by William B. Shockley, John Bardeen and Walter H. Brattain.
1948 - June 21	SSEM, Small Scale Experimental Machine or 'Baby' was built at Manchester University (UK), It ran it's first program on this date. Based on ideas from Jon von Neumann (a Hungarian Mathematician) about stored program computers, it was the first computer to store both it's programs and data in RAM, as modern computers so. By 1949 the 'Baby' had grown, and aquired a magentic drum for more perminant storage, and it became the Manchester Mark I. The Ferranti MArk I was basically the same as the Manchester Mark I but faster and made for commmercial sale.
1949 - May 6	Wilkes and a team at Cambridge University build a stored program computer - EDSAC. It used paper tape I/O, and was the first stored-program computer to operate a regular computing service.
1949	EDVAC (electronic discrete variable computer) - First computer to use Magnetic Tape. This was a breakthrough as previous computers had to be re-programmed by re-wiring them whereas EDVAC could have new programs loaded off of the tape. Proposed by John von Neumann, it was completed in 1952 at the Institute for Advance Study, Princeton, USA.
1949	"Computers in the future may weigh no more than 1.5 tons.", Popular Mechanics, forecasting the relentless march of science.
1950	Floppy Disk invented at the Imperial University in Tokyo by Doctor Yoshiro Nakamats, the sales license for the disk was granted to IBM.
1950	The British mathematician and computer pioneer Alan Turing declared that one day there would be a machine

	that could duplicate human intelligence in every way and prove it by passing a specialized test. In this test, a computer and a human hidden from view would be asked random identical questions. If the computer were successful, the questioner would be unable to distinguish the machine from the person by the answers.
1951	High level language compiler invented by Grace Murray Hopper.
1951	Whirlwind, the first real-time computer was built for the US Air Defence System.
1951	UNIVAC-1. The first commercially sucessful electronic computer, UNIVAC I, was also the first general purpose computer - designed to handle both numeric and textual information. Designed by J. Presper Eckert and John Mauchly, whose corporation subsequently passed to Remington Rand. The implementation of this machine marked the real beginning of the computer era. Remington Rand delivered the first UNIVAC machine to the U.S. Bureau of Census in 1951. This machine used magentic tape for input.
1952	EDVAC (Electronic Discrete Variable Computer) completed at the Institute for Advanced Study, Princeton, USA (by Von Neumann and others).
1953	Estimate that there are 100 computers in the world.
1953	Magnetic Core Memory developed.
1954	FORTRAN (FORmula TRANslation) development started by John Backus and his team at IBM - continuing until 1957. FORTRAN is a programming language, used for Scientific programming.
1956	First conference on Artificial Intelligence held at Dartmouth College in New Hampshire.
1956	Edsger Dijkstra invented an efficient algorithm for shortest paths in graphs as a demonstration of the abilities of the ARMAC computer. Although this is the main thing many people will remember Dijkstra for, he also made important contributions to many areas of computing - imparticular he should be remembered for his work on problems relating to concurrency, such as the invention of the `semaphore'.
1957	First Dot Matrix printer marketed by IBM.
1957	FORTRAN development finished. See 1954.
1957	"I have travelled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year." The editor in charge of business books for Prentice Hall.
1958	LISP (interpreted language) developed, Finished in 1960. LISP stands for 'LISt Processing', but some call it 'Lots of Irritating and Stupid Parenthesis' due to the huge number of confusing nested brackets used in LISP programs. Used in A.I. development. Developed by John McCarthy at Massachusetts Institute of Technology.
1958 - September 12	The integrated circuit invented by Jack St Clair Kilby at Texas Instruments. Robert Noyce, who later set up Intel, also worked separately on the invention. Intel later went on to invent perfect the microprocessor. The patent was applied for in 1959 and granted in 1964. This patent wasn't accepted by Japan so Japanese businesses could avoid paying any fees, but in 1989 - after a 30 year legal battle - Japan granted the patent; so all Japanese companies paid fees up until the year 2001 - long after the patent became obsolete in the rest of the World!
1959	Computers built between 1959 and 1964 are often regarded as 'Second Generation' computers, based on transistors and printed circuits - resulting in much smaller computers. More powerful, the second generation of computers could handle interpreters such as FORTRAN (for science) or COBOL (for business), that accepting English-like commands, and so were much more flexible in their applications.
1959	COBOL (COmmon Business-Orientated Language) was developed, the initial specifications being released in April 1960.
1960	ALGOL - first structured, procedural, language to be released.
1960	Tandy Corporation founded by Charles Tandy.
1961	APL programming language released by Kenneth Iverson at IBM.
1964	Computers built between 1964 and 1972 are often regarded as 'Third Generation' computers, they are based on the first integrated circuits - creating even smaller machines. Typical of such machines was the IBM 360 series mainframe, while smaller minicomputers began to open up computing to smaller businesses.
1964	Programming language PL/1 released by IBM.
1964	Launch of IBM 360 - the first series of compatible computers.
1964	DEC PDP-8 Mini Computer. The First Minicomputer, built by Digital EquipmentCost (DEC) it cost $16,000 to buy.
1965	Moore's law published by Gordon Moore in the 35th Anniversary edition of Electronics magazine. Originally suggesting processor complexity every year the law was revised in 1975 to suggest a doubling in complexity every two years.
1965	Fuzzy Logic designed by Lofti Zadeh (University of Berkeley, California), it is used to process approximate data - such as 'about 100'.
1965	BASIC (Beginners All Purpose Symbolic Instruction Code) developed at Dartmouth College, USA, by Thomas E. Kurtz and John Kemeny. Not implemented on microcomputers until 1975. It is often used in education to teach programming, and also at home by beginners.
1965	Mouse conceived by Douglas Englebart, not to become popular until 1983 with the Apple computers and not adopted by IBM until 1987 - although compatible computers such as the Amstrad PC 1512 were fitted with mice before this date.

1965	The first supercomputer, the Control Data CD6600, was developed.
1967	Development on PASCAL started, to be finished in 1971. Based on ALGOL. Developed by Niklaus Wirth. It's use exploded after the introduction of Turbo Pascal, by Borland, in 1984 - a high speed and low cost compiler. It is used for a wide variety of tasks, it contains many features, is well structured and easy to learn. Borland Pascal v7.0 included an implementation of Object-Orientated programming (similar to C++).
1968	Intel founded by Robert Noyce and a few friends.
1968	LOGO programming language developed by Seymour Papert and team at MIT.
1968	"But what ... is it good for?" Engineer at the Advanced Computing Systems Division of IBM commenting on the microchip.
1969	ARPANET Started by the US Dept. of Defence for research into networking. It is the original basis for what now forms the Internet. It was opened to non-military users later in the 1970s and many universities and large businesses went on-line. US Vice-president Al-Gore was the first to call it the Information superhighway.
1969 - April 7	The first RFC, RFC0001 published. The RFCs (network working group, Request For Comment) are a series of papers which are used to develop and define protocols for networking, originally the basis for ARPANET there are now thousands of them applying to all aspects of the Internet. Collectively they document everything about the way the Internet and computers on it should behave, whether it's TCP/IP networking or how email headers should be written there will be a set of RFCs describing it.
1969	Introduction of RS-232 (serial interface) standard by EIA (Electronic Industries Association).
1970	First RAM chip introduced by Intel. It was called to 1103 and had a capacity of 1 K-bit, 1024 bits.
1970	Development of UNIX operating system started. It was later released as C source code to aid portability, and subsequently versions are obtainable for many different computers, including the IBM PC. It and it's clones (such as Linux) are still widely used on network and Internet servers. Originally developed by Ken Thomson and Dennis Ritchie.
1970	'Forth' programming language developed.
1970 - June	Steve Geller, Ray Holt and a team from AiResearch and American Microsystems completed development of a flight data processor for the US Navy's F14A \`TomCat' fighter jet. This processor used LSI chips to produce a fast and powerfull programmable computer that fitted into the very tight space restrictions of the aircraft.
1971 - November 15	First microprocessor, the 4004, developed by Marcian E. Hoff for Intel, was released. It contains the equivalent of 2300 transistors and was a 4 bit processor. It is capable of around 60,000 Interactions per second (0.06 MIPs), running at a clock rate of 108KHz.
1971	Development of PASCAL finished - see 1967.
1972	Atari founded (as Syzygy) by Nolan Bushnell, who designed pong (see also 1972).
1972	Pong released - widely recognised as the first popular arcade video game. It was invented by Atari's founder, Nolan Bushnell, and briefly became reasonably popular. However it's lack of excitement or variation meant it never captivated players like Space Invaders (1978) or other arcade games of the 1980s.
1972	Computers built after 1972 are often called 'fourth generation' computers, based on LSI (Large Scale Integration) of circuits (such as microprocessors) - typically 500 or more components on a chip. Later developments include VLSI (Very Large Scale Integration) of integrated circuits 5 years later - typically 10,000 components. Modern circuits may now contain millions of components. This has led to very small, yet incredibly powerful computers. The fourth generation is generally viewed as running right up until the present, since although computing power has increased the basic technology has remained virtually the same. By the late 1990s many people began to suspect that this technology was reaching its limit, further miniaturisation could only achieve so much. 64 megabit RAM chips have circuitry so small that it can be measured in atoms, circuits this small pose many technical problems - notably the heat created but they are also very susceptible to influence by temperature or radiation. It has been argued fifth generation computers are based on parallel processing and VLSI integration - but are still being developed and I'd be wary of writing the history books until the history has actually occured! Besides computers need to be massively parallel before they give a significant enough advantage to warrent a new generation of computing.
1972	C programming language developed at The Bell Laboratories in the USA by Dennis Ritche (one of the inventors of the UNIX operating system), it's predecessor was the B programming language - also from The Bell Laboratories. It is a very popular language, especially for systems programming - as it is flexible and fast. C++, allowing for Object-Orientated Programming, was introduced in early 1980s.
1972	First Handheld scientific calculator released by Hewlett-Packard, the engineer's slide rule is at last obsolete.
1972 - April 1	8008 Processor released by Intel.
1972	The first international connections to ARPANET are established. ARPANET later became the basis for what we now call the internet.
1973	Prolog developed at the University of Luminy-Marseilles in France by Alain Colmerauer. It is often used for AI programming.
1973	Ethernet developed, this became a vero popular way of connecting PCs and other computers together - to enable them to share data, and devices such as printers. A group of machines connected together in this way is known as a LAN.
1974	CLIP-4, the first computer with a parallel architecture.

1974 - April 1	Introduction of 8080. An 8 Bit Microprocessor from Intel.
1974 - December	MITS Altair 8800, the first personal computer to be available commercially released, by Micro Instrumentation Telemetry Systems. In December 1974 an article in 'Popular Electronics' inviting people to order kits for the computer, based on the Intel 8080 they cost just $397 each and despite the limited memory (256 bytes) and limited processing power around 200 were ordered on the first day.
1975	First implementation of BASIC by Bill Gates and Paul Allen, it was written for the MITS Altair - the first personal computer - this led to the formation of Microsoft later in the year.
1975	Unix marketed (see 1970).
1975	Formation of Microsoft by Bill Gates and Paul Allen. It is now one of the most powerful and successful computing companies, a distinct improvement on the pair's original company, Traf-O-Data, which made car counters for highway departments. In just 3 years it achieved revenues of $500,000 and employed 15 people. By 1992 this had increased to revenues of 2.8 billion (50% of which are from exports), and over 10,000 employees - a fantastic feat for a company less than 20 years old. Microsoft's big break was when they were asked to write the operating system for the I.B.M. PC, released in 1981. Although financially not as large as IBM, Microsoft has a huge amount of influence in the Computing Industry.
1975	IBM 5100 released.
1976	Apple Computer, Inc. founded, to Market Apple I computer. Designed by Stephen Wozniak and Stephen Jobs.
1976	First laser printer introduced by IBM - the IBM 3800. The first colour versions came onto the market in 1988.
1976?	Introduction of 8085.
1976	Z80 released by Zilog, and the basis for the computer boom in the early 1980s. It was an 8 bit microprocessor. CP/M was written for the Z80 as well as software like Wordstar and dBase II - and it formed the basis for the Sinclair Spectrum of 1982.
1976	6502, 8 bit microprocessor developed and later chosen to equip the Apple II computer. Also fitted in the original Acorn machine, BBC Micro, Commodore 64 and Commodore PET.
1976	Cray 1, the first commercially developed Supercomputer, it contained 200,000 integrated circuits and was freon-cooled. It could perform 150 million floating point operations per second - it is now the basis of an informal measurement of the power Supercomputers, by the mid-1990s these had reached the 1000-'cray' mark! Supercomputers are also measured by the number of floating point operations they can do in a second, but this figure can be misleading as the definition of a floating point operation is open to some debate - but these operations are far more complicated than integer operations normally handled by Microcomputers. In 1992 the fastest Computer was the Cray-2, which can do around 250 million floating point operations per seconds. Cray have continued to develop even more powerful computers, such as the Cray Y-MP/832. Such Supercomputers are used for weather forecasting, complex maths and physics problems, and animation in modern films.
1977	"There is no reason anyone would want a computer in their home." Ken Olson, president, chairman and founder of Digital Equipment Corp..
1977	Historically Arpanet computers had communicated via a 'Network Control Protocol' but this protocol was inadequate and had serious problems, especially when dealing with busier networks. TCP was first outlined in a paper by Bob Kahn (from Standford) and Vinton Cerf (from DARPA) in 1974. In 1978 the IP header was split off from TCP, allowing network routers to deal with just the (much simpler) IP protocol. On January 1 1983 the internet is defined as the collection of computers communicating via TCP/IP.
1977 - May	Apple II computer introduced.
1978 - June 8	Introduction of 8086 by Intel, the first commercially successful 16 bit processor. It was too expensive to implement in early computers, so an 8 bit version was developed (the 8088), which was chosen by IBM for the first IBM PC. This ensured the success of the x86 family of processors that succeeded the 8086 since they and their clones are used in every IBM PC compatible computer. The available clock frequencies are 4.77, 8 and 10 MHz. It has an instruction set of about 300 operations. At introduction the fastest processor was the 8 MHz version which achieved 0.8 MIPs and contained 29,000 transistors.
1978	Arcade Video game 'Space Invaders' released, starting a video game craze that has continued ever since. In 1979 Atari's Asteroids proved incredibly popular - one notable improvement over Space Invaders was that it allowed the players to record hi-scores, for other players to spend hours trying to beat. By 1982 many of the 'classics' had been released, defender and pac-man, to name a few. The industry was worth $5 billion a year - more than the U.S. movie industry. Although Pong, of 1973, and similar games had been around for several years none were really interesting enough to capture the public - Space Invaders, however, had everything, in a fast action game that pitted you against the computer.
1979	Language Ada introduced by Jean Ichbiah and team at Honeywell.
1979 - June 1	Introduction of 8088, a step down from the 8086 as it contains just an 8 bit data bus - but this makes it cheaper to implement in computers.
1979	Commodore PET released. Based on a 1 MHz 6502 processor it displayed monochrome text on a 9" monitor and had just 8 Kb of RAM. Programs were loaded from audio cassette. Priced £569. For £776 you could

	purchase a version with 16 Kb of RAM, while for £914 you could get a 32 Kb of RAM.
1979	compact disk was invented.
1979	The 68000 Microprocessor launched by Motorola. Used by Apple for the Macintosh and by Atari for the ST series. Later versions of the processor include the 68020 used in the Macintosh II.
1979	IBM saw it's computer market dominance being eaten into by the new personal computers, such as the Apple and the Commodore PET. IBM therefore started work on their own P.C. This computer had to be a state-of-the-art machine in order to compete, but had to be produced very quickly due to the amazing growth of competitors. It was therefore decided to use many third party parts to reduce development time, and Microsoft were commissioned to write the Operating System (see October 1980). When finished this computer was released as the IBM PC. on 12 August 1981
1980	"DOS addresses only 1 Megabyte of RAM because we cannot imagine any applications needing more." Microsoft on the development of DOS.
1980 - October	Development of MS-DOS/PC-DOS began. Microsoft (known mainly for their programming languages) were commissioned to write the Operating System for the PC, Digital Research failed to get the contract (there is much legend as to the real reason for this). DR's Operating System, CP/M-86 was later shipped but it was actually easier to adapter programs to DOS rather than CP/M-86, and CP/M-86 cost $495. As Microsoft didn't have an operating system to sell they bought Seattle Computer Product's 86-DOS which had been written by Tim Paterson earlier that year (86-DOS was also know as Q-DOS, Quick & Dirty Operating System, it was a more-or-less 16bit version of CP/M). The rights were actually bought in July 1981. It is reputed that IBM found over 300 bugs in the code when they subjected the operating system and re-wrote much of the code. Tim Paterson's DOS 1.0 was 4000 lines of assembler.
1980 - Early	Sinclair ZX80 was released for under £100.
1981	The Xerox 8010 ('Star') System, the first system to use a WIMP (Windows, Icons, Menus and Pointing Devices) graphic user interface - from which all modern WIMP and Windowing systems have evolved. Apple used these concepts when designing the interface for the Apple Macintosh (see January 1984). Apple later alleged that Microsoft copied them when designing Windows.
1981	"640k ought to be enough for anybody.", Bill Gates
1981	Sinclair ZX81 was released, for a similar price to the ZX80 (see 1980).
1981?	Introduction of 80186/80188. These are rarely used on PCs as they incorporate a built in DMA and timer chip - and thus have register addresses incompatible with other IBM PCs.
1981 - August 12	IBM Announced PC, the standard model was sold for $2880. This had 64Kb of RAM, a mono display and the cassette drive was an optional extra. Two 160Kb single sided floppy drives could be added. The machines success was largely due to the openness of it's specification, anyone could produce new and improved parts or models of the computer - the original IBM PC usually had an INTEL processor, Tandon disk drives and an operating system from Microsoft. 100,000 orders were taken by Christmas. The first one sold in the U.K. cost £2080. An option of operating systems was actually available, but IBM/Microsoft's PC-DOS was by far the cheapest at $39.95.
1981 - August 12	MDA (Mono Display Adapter, text only) introduced with IBM PC.
1981 - August 12	MS-DOS 1.0., PC-DOS 1.0. Microsoft (known mainly for their programming languages) were commissioned by IBM to write the operating system, they bought a program called 86-DOS from Tim Paterson which was loosely based on CP/M 80. The final program from Microsoft was marketed by IBM as PC-DOS and by Microsoft as MS-DOS, collaboration on subsequent versions continued until version 5.0 in 1991. Compared to modern versions of DOS version 1 was very basic, the most notable difference was the presence of just 1 directory, the root directory, on each disk. Subdirectories were not supported until version 2.0 (March, 1983). MS-DOS (and PC-DOS) was the main operating system for all IBM-PC compatible computers until 1995 when Windows '95 began to take over the market, and Microsoft turned its back on MS-DOS (leaving MS-DOS 6.22 from 1993 as the last version written - although the DOS Shell in Windows '95 calls itself MS-DOS version 7.0, and has some improved features like long filename support). According to Microsoft, in 1994, MS-DOS was running on some 100 million computers world-wide.
1981	Pacman was written. Originally it was going to be called Puckman, but the name was changed to reduce the damage that could be done by changing the P to an F with a black marker.
1982	The TCP/IP Protocol established, this is the protocol that carries most of the information across the Internet.
1982	Introduction of BBC Micro. Based on the 6502 processor it was a very popular computer for British schools up to the development of the Acorn Archimedes (in 1987). In 1984 the government offered to pay half the cost of such computers in an attempt to promote their use in secondary education.
1982 - January	Commodore 64 released, costing just $595.
1982 - February 1	80286 Released. It supports clock frequencies of up to 20 MHz and implements a new mode of operation, protected mode - allowing access to more memory (up to 16 Mbytes compared to 1 MB for the 8086. The virtual address space can appear to be up to 1 GB through the use of virtual memory). It includes an extended instruction set to cope with this new mode of operation.

	At introduction the fastest version ran at 12.5 MHz, achieved 2.7 MIPs and contained 134,000 transistors.
1982	Compaq released their IBM PC compatible Compaq Portable.
1982	MIDI, Musical Instrument Digital Interface, (pronounced "middy") published by International MIDI Association (IMA). The MIDI standard allows computers to be connected to instruments like keyboards.
1982	Red Book on Audio CDs was introduced by Sony and Phillips. This was the beginning of the Compact Disk, it was released in Japan and then in Europe and America a year later.
1982 - March	MS-DOS 1.25, PC-DOS 1.1
1982 - April	The Sinclair ZX Spectrum was announced, released later in the year. It is based on the Z80 chip from Zilog, it ran at 3.5 MHz and had an 8 colour graphics display. You could by a 16 Kb version for £125 or a 48 Kb version for £175 - remarkable prices when compared to the £1000+ IBM PC.
1982 - May	IBM launch the double-sided 320K floppy disk drives.
1982 - December	IBM buy 12% of Intel.
1983 - January	IBM PC gets European launch at Which Computer Show.
1983	Borland Formed.
1983 - Spring	IBM XT released, it was fitted with the 8086 (which could be replaced with an NEC V20 or V30) and had room for an 8087 maths co-processor to be installed. It also had a 10Mb hard disk, 128K of RAM, one floppy drive, mono monitor and a printer, all for $5000.
1983 - March	MS-DOS 2.0, PC-DOS 2.0 Introduced with the IBM XT this version included a UNIX style hierarchical sub-directory structure, and altered the way in which programs could load and access files on the disk.
1983 - May	MS-DOS 2.01
1983 - October	IBM released PC Junior in an attempt to get further into the home market, it cost just $699. Cheaper alternatives from other companies were more preferable to the home buyer, but businesses continued to buy IBM. However this meant that the PC Jr. was not a great sucess.
1983 - October	PC-DOS 2.1 (for PC Jr). Like the PC Jr this was not a great success and quickly disappeared from the market.
1983 - October	MS-DOS 2.11
1984	DNS (Domain Name Server) introduced to the Internet, which then consisted of about 1000 hosts.
1984	Turbo Pascal Introduced by Borland (see PASCAL, 1967).
1984	Hewlett-Packard release the immensely popular Laserjet printer, by 1993 they had sold over 10 million Laserjet printers and over 20 million printers overall. HP were also pioneering inkjet technology.
1984 - January	Apple Macintosh Released. Based on the 8 MHz version of the Motorola 68000 processor. The 68000 can address 16 Mb of RAM, a noticeable improvement over Intel's 8088/8086 family. The Apple achieved 0.7 MIPs and originally came with just 128Kb of RAM. It was fitted with a monochrome video adapter.
1984	IBM AT released. This incorporates a larger (16-bit) bus for expansion slots. Unfortunately it wasn't well specified, the ISA standard was eventually made (in 1991) to cope with this - but not until some ATs had been produced with buses that run far quicker the 8.33 MHz laid down in the ISA standard. Some AT compatible systems designed before the standard was introduced ran the bus at 12.5 MHz which causes some expansion cards to run hot, therefore becoming less efficient and slower therefore eventually 'tripping over' and violently crashing the computer.
1984 - August	MS-DOS 3.0, PC-DOS 3.0 Released for the IBM AT, it supported larger hard disks as well as High Density (1.2 MB) 5¼" floppy disks.
1984 - September	Apple released a 512KB version of the Macintosh - but there were no other major enhancements over the original (see Jan. 1984).
1984 - October	Sinclair ZX Spectrum+ released. Similar specifications to the 48 Kb version of the original ZX (see April 1982) it cost £179.
1984 - End	Compaq started the development of the IDE interface (see also 1989). IDE = Intelligent Drive Electronics. This standard was designed specially for the IBM PC and can achieve high data transfer rates through a 1:1 interleave factor and caching by the actual disk controller - the bottleneck is often the old AT bus and the drive may read data far quicker than the bus can accept it, so the cache is used as a buffer. Theoretically 1MB/s is possible but 700KB/s is perhaps more typical of such drives. This standard has been adopted by many other models of computer, such the Acorn Archimedes A4000 and above. A later improvement was EIDE, laid down in 1989, which also removed the maximum drive size of 528MB and increased data transfer rates.
1985 - January	Postscript introduced by Adobe Systems, used in the Apple Laserwriter printer. Adopted by IBM for their use in March 1987.
1985	Tetris was written by Russian Alexey Pazhitnov. It was later released for various western games machines, the jewel in the crown being it's inclusion with Nintendo's Gameboy in 1989. Alexey made nothing from the game, since under the Communist Regime it was owned by the people - although after the collapse of Communism he was able to move to the USA where he now works for Microsoft.
1985	CD-ROM, invented by Phillips, produced in collaboration with Sony.
1985	EGA released.
1985 - March	MS-DOS 3.1, PC-DOS 3.1 This was the first version of DOS to provide network support, and provides some new functions to handle

	networking.
1985 - May	Sinclair ZX Spectrum 128 announced, released in February 1986. See Feb. 1986.
1985 - October 17	80386 DX released. It supports clock frequencies of up to 33 MHz and can address up to 4 GB of memory and virtual memory of up to 64 TERABYTES! It also includes a bigger instruction set than the 80286. At the date of release the fastest version ran at 20 MHz and achieved 6.0 MIPs. It contained 275,000 transistors.
1985 - October	Version 2.25 included support for foreign character sets, and was marketed in the Far East.
1985 - November	Microsoft Windows Launched. Not really widely used until version 3, released in 1990, Windows required DOS to run and so was not a complete operating system (until Windows '95, released on August 21, 1995). It merely provided a G.U.I. similar to that of the Macintosh., in fact so similar that Apple tried to sue Microsoft for copying the 'look and feel' of their operating system. This court case was not dropped until August 1997.
1985 - December	MS-DOS 3.2, PC-DOS 3.2 This version was the first to support 3½" disks, although only the 720KB ones. Version 3.2 remained the standard version until 1987 when version 3.3 was released with the IBM PS/2.
1985 - End	LIM EMS (memory standard) introduced by Lotus, Intel and Microsoft. The first version introduced was version 3.2!
1986 - January	Apple released another enhanced version of the Macintosh (the Macintosh Plus) - this one could cope with 4 Mb of RAM and had a SCSI adapter.
1986 - February	Sinclair ZX Spectrum 128 released. It had 128 Kb of RAM, but little other improvement over the original ZX (except improved sound capabilities). Later models were produced by Amstrad - but they showed no major advances in technology.
1986 - April	Apple released another version of the Macintosh (the Macintosh 512Ke) which was basically the same as the 512K of Sept. 1984.
1986 - September	Amstrad Announced Amstrad PC 1512, a cheap and powerful PC. Cost was just under £1000, it included a slightly enhanced CGA graphics adapter, 512Kb RAM (upgradable to 640Kb), 8086 processor (upgradable to NEC V30) and a 20Mb harddisk (optional). Amstrad had previous success with the PCW. To ensure the computer was accessible they made sure the manuals could be read by everyone, and also included DR's GEM desktop (a WIMP system) and a mouse to try to make to machine more user friendly. It was sold in many high street shops and was a complete success, being bought by Business and Home users alike. N.B. This was the author's family's first Home computer, with a Monochrome monitor and harddisk it cost just under £1000.
1987?	Introduction of Acorn Archimedes.
1987	Connection Machine, an interesting supercomputer which instead of integration of circuits operates up to 64,000 fairly ordinary microprocessors - using parallel architecture - at the same time, in its most powerful form it can do somewhere in the region of 2 billion operations per second.
1987	Microsoft Windows 2 released. It was more popular than the original version but it was nothing special mind you, Windows 3 (see 1990) was the first really useful version.
1987	Fractal Image Compression Algorithm calculated by English mathematician Michael F. Barnsley, allowing digital images to be compressed and stored using fractal codes rather than normal image data. In theory this allows more efficient storage of the images.
1987 - March 2	Macintosh II & Macintosh SE released. The SE was still based on the 68000, but could cope with 4 Mb of RAM and had a SCSI adapter, similar specifications to the Macintosh Plus of Jan. 1986. The Macintosh II was based on the newer Motorola 68020, that ran at 16 MHz and achieved a much more respectable 2.6 MIPs (comparable to an 80286). It too had a SCSI adapter but was also fitted with a colour video adapter.
1987 - April 2	PS/2 Systems introduced by IBM. The first models were released on this date. The PS/2 Model 30 based on an 8086 processor and an old XT bus, Models 50 and 60 based on the 80286 processor and the Model 80 based on the 80386 processor. These used the 3 1/2" 'microfloppies', storing 1.44Mb on each (although the Model 30 could only use the low 720Kb density). These systems (except the Model 30) included a completely new bus, the MCA (Micro Channel Architecture) bus, which did not catch on as it did not provide support for old-style 16-Bit AT bus expansion cards. The MCA bus did show many improvements in design and speed over the ISA bus most PCs used, and IBM (if no-one else) still use it in some of their machines. The PS/2 series were very successful - selling well over 2 million machines in less than 2 years.
1987	VGA released (designed for the PS/2) by IBM.
1987	MCGA released (only for low end PS/2s, i.e. the Model 30) by IBM.
1987	The 8514/A introduced by IBM. This was a graphics card that included it's own processor to speed up the drawing of common objects, to take the load othe main CPU.
1987 - April	MS-DOS 3.3, PC-DOS 3.3 Released with the IBM PS/2 this version included support for the High Density (1.44MB) 3½" disks. It also supported hard disk partitions, splitting a hard disk into 2 or more logical drives.
1987 - April	OS/2 Launched by Microsoft and IBM. A later enhancement, OS/2 Warp provided many of the 32-bit enhancements boasted by Windows '95 - but several years earlier, yet the product failed to dominate the

	market in the way Windows '95 did 8 year later.
1987 - August	AD-LIB soundcard released. Not widely supported until a software company, Taito, released several games fully supporting AD-LIB - the word then spread how much the special sound effects and music enhanced the games. Adlib, a Canadian Company, had a virtual monopoly until 1989 when the SoundBlaster card was released.
1987 - October/November	Compaq DOS (CPQ-DOS) v3.31 released to cope with disk partitions >32MB. Used by some other OEMs, but not distributed by Microsoft.
1987 - End	LIM EMS v4.0
1988	First optical chip developed, it uses light instead of electricity to increase processing speed.
1988	XMS (memory standard) introduced.
1988	EISA Bus standard introduced.
1988	WORM (Write Once Read Many times) - disks marketed for first time by IBM.
1988 - June 16	80386 SX released as a cheaper alternative -to the 80386 DX. It had a narrower (16 bit) time multiplexed bus. This reduction in pins, and the easier integration with 16 bit devices made the cost savings.
1988 - July/August?	PC-DOS 4.0, MS-DOS 4.0 Version 3.4 - 4.x are confusing due to lack of correlation between IBM & Microsoft and also the USA & Europe. Several 'Internal Use only' versions were also produced. This version reflected increases in hardware capabilities, it supported hard drives greater than 32 MB (up to 2 GB) and also EMS memory. This version was not properly tested and was bug ridden, causing system crashes and loss of data. The original release was IBM's, but Microsoft's version 4.0 (in October) was no better and version 4.01 was released (in November) to correct this, then version 4.01a (in April 1989) as a further improvement. However many people could not trust this and reverted to version 3.3 while they waited for the complete re-write (version 5 - 3 years later). Beta's of Microsoft's version 4.0 were apparently shipped as early as '86 & '87.
1988 - September	IBM PS/2 Model 30 286 released, based on an 80286 processor and the old AT bus - IBM abandoned the MCA bus, released less than 18 months earlier! Other IBM machines continued to use the MCA bus.
1988 - October	Common Access Method committee (CAM) formed. They published the ATA standard on the 1st of April 1989 (IDE/ATA disks had been around for a while but wasn't previously standardised), along with enhancements to allow for larger disks that before.
1988 - October	Macintosh IIx released. It was based on a new processor, the Motorola 68030. It still ran at 16 MHz but now achieved 3.9 MIPs. It could now cope with 128 MB of RAM.
1988 - November	MS-DOS 4.01, PC-DOS 4.01 This corrected many of the bugs seen in version 4.0, but many users simply switched back to version 3.3 and waited for a properly re-written and fully tested version - which did not come until version 5 in June 1991. Support for disk partitions >32Mb.
1989	World Wide Web, invented by Tim Berners-Lee who saw the need for a global information exchange that would allow physicists to collaborate on research (he was working at CERN, the European Particle Physics Laboratory in Switzerland, at the time). The Web was a result of the integration of hypertext and the Internet. The hyperlinked pages not only provided information but provide transparent access to older Internet facilities such as ftp, telnet, Gopher, WAIS and USENET. He was awarded the Institute of Physics' 1997 Duddell Medal for this contribution to the advancement of knowledge. The Web started as a text-only interface, but NCSA Mosaic later presented a graphical interface for it and it's popularity exploded as it became accessible to the novice user. This explosion started in ernest during 1993, a year in which web traffic over the Internet increased by 300,000%.
1989	CD-I released by Phillips and Sony.
1989 - January	Macintosh SE/30 released. Like the SE of March 1987 it only had a monochrome display adapter but was fitted with the newer 68030 processor.
1989 - April 1	Command set for E-IDE drives was defined by CAM (formed Oct. 1988). This supports drives over 528MB in size. Early controllers often imposed a limit of 2.1GB, then later ones 8.4GB. Newer controllers support much higher capacities. Drives greater in size than 2.1GB must be partitioned under DOS since the drive structure (laid down in MS-DOS 4) used by DOS and even Windows '95 prevents partitions bigger than 2.1GB. EIDE controllers also support the ATAPI interface that is used by most CD-ROM drives produced after it's introduction. Newer implementations to EIDE, designed for the PCI bus, can achieve data transfer at up to 16.67 MB/s. A later enhancement, called UDMA, allows transfer rates of up to 33.3 MB/s.
1989 - March	The Macintosh IIcx released, with the same basic capabilities of the IIx.
1989 - April 10	80486 DX released by Intel. It contains the equivalent of about 1.2 million transistors. At the time of release the fastest version ran at 25 MHz and achieved up to 20 MIPs. Later versions, such as the DX/2 and DX/4 versions achieved internal clock rates of up to 100 MHz.
1989 - September	Macintosh IIci released based on a faster version of the 68030 - now running at 25 MHz, and achieved 6.3 MIPs. Macintosh also released the portable - which went back to the original 68000 processor (but now ran it at 16 MHz to achieve 1.3 MIPs). It had a monochrome display.
1989 - November	Release of Sound Blaster Card, by Creative Labs, its success was ensured by maintaining compatibility with

	the widely supported AD-LIB soundcard of 1987.
1990	Consortium of major SVGA card manufactures (called Video Electronic Standard Association, VESA) was formed and then introduced VESA SVGA Standard.
1990 - March	Macintosh IIfx released. Based on a 40 MHz version of the 68030 it achieved 10 MIPs. It also featured a faster SCSI adapter, which could transfer 3.0 Mb/sec.
1990 - May 22	Introduction of Windows 3.0 by Bill Gates & Microsoft. It is true multitasking (or pretends to be on computers less than an 80386, by operating in 'Real' mode) system. It maintained compatibility with MS-DOS, on an 80386 it even allows such programs to multitask - which they were not designed to do. This created a real threat to the Macintosh and despite a similar product, IBM's OS/2, it was very successful. Various improvements were made, versions 3.1, 3.11 - but the next major step did not come until Windows '95 in 1995 which relied much more heavily on the features of the 80386 and provided support for 32 bit applications.
1990 - October	Macintosh Classic released, an identical replacement to the Macintosh Plus of January 1986. Also came the Macintosh IIsi which ran a 68030 processor at 20 MHz to achieve 5.0 MIPs, and also a 256 colour video adapter.
1990 - November	Macintosh LC released. This ran a 68020 processor at 16 MHz to achieve 2.6 MIPs, it had a slightly improved SCSI adapter and a 256 colour video adapter.
1990 - November	MPC (Multimedia PC) Level 1 specification published by a council of companies including Microsoft and Creative Labs. This specified the minimum standards for a Multimedia IBM PC. The MPC level 1 specification originally required a 80286/12 MHz PC, but this was later increased to a 80386SX/16 MHz computer as an 80286 was realised to be inadequate. It also required a CD-ROM drive capable of 150 KB/sec (single speed) and also of Audio CD output. Companies can, after paying a fee, use the MPC logo on their products.
1990 - November	ATA spec. final proposal submitted to ANSI.
1991	Introduction of ISA standard, although it was simply called the AT bus until after competing standards were launched that needed differentiating. Although the the AT bus had been used for many years it hadn't been properly standardised, causing all sorts of problems as newer PCs clocked the bus at ever faster speeds.
1991	Borland took over Ashton-Tate Corporation & the Dbase program used by many businesses and individuals.
1991 - April 22	80486 SX released as cheaper alternative to 80486 DX - the key difference being the lack of an integrated F.P.U.
1991 - May	Introduction of Sound Blaster Pro.
1991 - June	MS-DOS 5.0, PC-DOS 5.0 In order to promote OS/2 Bill Gates took every opportunity after it's release to say 'DOS is dead', however the development of DOS 5.0 lead to the permanent dropping of OS/2 development. This version, after the mess of version 4, was properly tested through the distribution of Beta versions to over 7,500 users. This version included the ability to load device drivers and TSR programs above the 640KB boundary (into UMBs and the HMA), freeing more RAM for programs. This version marked the end of collaboration between Microsoft and IBM on DOS.
1991 - August	Linux is born with the following post to the Usenet Newsgroup comp.os.minix: Hello everybody out there using minix- I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. The post was by a Finnish college student, Linus Torvalds, and this hobby grew from these humble beginnings into one of the most widely used UNIX-like operating systems in the world today. It now runs on many different types of computer, including the Sun SPARC and the Compaq Alpha, as well as many ARM, MIPS, PowerPC and Motorola 68000 based computers. In 1992, the GNU project (http://www.gnu.org/) adopted the Linux kernel for use on GNU systems while they waited for the development of their own (Hurd) kernel to be completed. The GNU project's aim is to provide a complete and free UNIX like operating system, combining the Linux or Hurd platform with the a complete suite of free software to run on it. In order to allow it to carry the GNU name, the Linux kernel copyright was changed to the GNU Public License Agreement (http://www.gnu.org/copyleft/gpl.html) on the 1st of February 1992.
1992	"Windows NT addresses 2 Gigabytes of RAM which is more than any application will ever need". Microsoft on the development of Windows NT
1992	Introduction of CD-I launched by Phillips.
1992 - April	Introduction of Windows 3.1
1992 - May	Wolfenstein 3D released by Id Software Inc.
1992 - June	Sound Blaster 16 ASP Introduced.
1993	Commercial providers were allowed to sell internet connections to individuals. Its use exploded, especially with the new interface provided by the World-Wide Web (see 1989) and NCSA Mosaic.
1993	Doom was released by Id Software Inc. The PC began to be considered as a serious games playing machine. This was reinforced by another release in 1993 - "Sam and Max Hit the Road".
1993	Novell purchased Digital Research, DR-DOS became Novell DOS.
1993 - March 22	Intel Pentium released. At the time it was only available in 60 & 66 MHz versions which achieved up to 100 MIPs, with over 3.1 million transistors.

1993 - May	MPC Level 2 specification introduced (see November 1990). This was designed to allow playback of a 15 fps video in a window 320x240 pixels. The key difference is the requirement of a CD-ROM drive capable of 300KB/sec (double speed). Also with Level 2 is the requirement for products to be tested by the MPC council, making MPC Level 2 compatibility a stamp of certification.
1993 - December	MS-DOS 6.0. This included a Hard-Disk compression program called DoubleSpace, but a small computing company called 'Stac' claimed that DoubleSpace was partly a copy of their Compression Program, Stacker. After paying damages Microsoft withdrew DoubleSpace from MS-DOS 6.2, releasing a new program - DriveSpace - with MS-DOS version 6.22. In operation and programming interface DriveSpace remains virtually identical to DoubleSpace. MS-DOS 6.22 remains the last version of MS-DOS released, since Microsoft turned its efforts to Windows '95. Windows '95 (and later) DOS shell reports itself as DOS 7 - and includes a few enhancements, e.g. support for long filenames.
1994 - March 7	Intel Release the 90 & 100 MHz versions of the Pentium Processor.
1994 - March 14	Linus Torvalds released version 1.0 of the Linux Kernel.
1994 - September	PC-DOS 6.3 Basically the same as version 5.0 this release by IBM included more bundled software, such as Stacker (the program that caused Microsoft so much embarrassment) and anti-virus software.
1994 - October 10	Intel Release the 75 MHz version of the Pentium Processor.
1994	Doom II released. This reflected the rapidly increasing quality of games available for the PC - an opinion supported by other major releases in 1994, such as "Alone in the Dark 2", "Theme Park", "Magic Carpet" and "Little Big Adventure" which also helped demonstrate the diversity of games available on the platform. This success of the PC as a games platform was partly due to and partly a cause of significantly increased PC ownership among the 'general public' during the early/mid 1990s.
1994	Netscape 1.0 was written as an alternative browser to NCSA Mosaic.
1994	Command & Conquer released. Other (less significant releases) for the PC included Star Trek 'The Next Generation', Full Throttle, Descent and Terminal Velocity. The advent of 3D graphics cards from Videologic and 3Dfx helped the platform's games status further.
1995 - March	Linus released Linux Kernel v1.2.0 (Linux'95).
1995 - March 27	Intel release the 120 MHz version of the Pentium processor.
1995 - June 1	Intel release the 133 MHz version of the Pentium processor.
1995 - August 21 [poss. 23]	Windows '95 was launched by Bill Gates & Microsoft. Unlike previous versions of Windows, Windows '95 is an entire operating system - it does not rely on MS-DOS (although some remnants of the old operating system still exist). Windows '95 was written specially for the 80386 and compatible computers to make 'full' use of its 32 bit processing and multitasking capabilities, and thus is much more similar to Windows NT than Windows 3.x. Windows 95 and NT 4 are almost indistinguishable in many respects - such as User Interface and API. Unfortunately, in order to maintain backwards compatibility, Windows 95 doesn't impose the same memory protection and security measures that NT does and so suffers from much worse reliability. Despite being remarkable similar in function to OS/2 Warp (produced by IBM and Microsoft several years earlier, but marketed by IBM), Windows '95 has proved very popular.
1995 - November 1	Pentium Pro released. At introduction it achieved a clock speed of up to 200 MHz (there were also 150, 166 and 180 MHz variants released on the same date), but is basically the same as the Pentium in terms of instruction set and capabilities. It achieves 440 MIPs and contains 5.5 million transistors - this is nearly 2400 times as many as the first microprocessor, the 4004 - and capable of 70,000 times as many instructions per second.
1995 - December 28	CompuServe blocked access to over 200 sexually explicit sites, partly to avoid confrontation with the German Government. Access to all but 5 was restored on Feb. 13 1996.
1995 - December	JavaScript development announced by Netscape.
1996	Quake released - representing the dramatic increases in both software and hardware technology since Doom, of 3 years previous. Other notable releases included "Civilization 2", "Command & Conquer - Red Alert", "Grand Prix 2" and "Tomb Raider". On the more controversial front "Battle Cruiser 3000" was also released, but it's advertising had to be censored.
1996 - January	Netscape Navigator 2.0 released. First browser to support JavaScript.
1996 - January 4	Intel release the 150 & 166 MHz versions of the Pentium Processor. They contain the equivalent of over 3.3 million transistors.
1996	Windows '95 OSR2 (OEM System Release 2) was released - partly to fix bugs found in release 1 - but only to computer retailers for sale with new systems. There were actually two separated releases of Windows 95 OSR2 before the introduction of Windows '98, the second of which contained both USB and FAT32 support - the main selling points of Windows '98. FAT32 is a new filing system that provides support for disk paritions bigger than 2.1GB and is better at coping with large disks (especially in terms of wasted space).
1996 - June 9	Linux 2.0 released. 2.0 was a significant improvement over the earlier versions: it was the first to support multiple architectures (originally developed for the Intel 386 processor, it now supported the Digital Alpha and would very soon support Sun SPARC many others). It was also the first stable kernel to support SMP, kernel modules, and much more.
1996 - October 6	Intel release the 200 Mhz version of the Pentium Processor.

1997	Tim Berners-Lee awarded the Institute of Physics' 1997 Duddell Medal for inventing the World Wide Web (see 1989).
1997	"Grand Theft Auto", "Quake 2" and "Blade Runner" were all released while Lara Croft returned in "Tomb Raider 2". As the standards for graphics kept increasing, 3d graphics cards were beginning to become mandatory for games players.
1997 - January 8	Intel released Pentium MMX (originally 166 and 200 Mhz versions), for games and multimedia enhancement. To most people MMX is simply another 3-letter acronym and people wearing coloured suits on Intel ads, and to programmers in meant an even further expanded instruction set that provides, amongst other functions, enhanced 64-bit support - but software needs to be specially written to work with the new functions. A major rival clone, the AMD-K6-MMX containing a similar instruction set, caused a legal challenge from Intel on the right to use the trademarked name MMX - it was not upheld.
1997 - May 11	IBM's Deep Blue, the first computer to beat a reigning World Chess Champion, Gary Kasparov, in a full chess match. The computer had played him previously - loosing 5/6 games in February 1996.
1997 - May 7	Intel Release their Pentium II processor (233, 266 and 300 Mhz versions). It featured, as well as an increased instruction set, a much larger on-chip cache.
1997 - June 2	Intel release the 233 MHz Pentium MMX.
1997 - August 6	After 18 months of losses Apple were in serious financial trouble. Microsoft invested in Apple, buying 100,000 non-voting shares worth $150 million - a decision not approved of by many Apple owners! One of the conditions was that Apple were to drop their long running court case - attempting to sue Microsoft for copying the look and feel of their operating system when designing Windows. There is some contention as to whether Apple were justified in sueing Microsoft, given that they themselves used some of the ideas from the XEROX 'Star' system when desiging their G.U.I. - however the similarities between MacOS and Windows are much more pronouced than those between the XEROX system and the Mac.
1998 - February	Intel released of 333 MHz Pentium II processor. Code-named Deschutes these processors use the new 0.25 micro manufacturing process to run faster and generate less heat than before.
1998 - April	A U.S. court has finally banned the long-running game of buying domain names relating to trademarks and then at selling them for extortionate prices to the companies who own the trademark. The case was based around a man from Illinois who bought www.panavision.com in 1995 and has just tried to sell it for $13,000. The current going commercial rate for domain name registration is around $100.
1998 - June 25	Microsoft released Windows '98. Some U.S. attorneys tried to block it's release since the new O/S interfaces closely with other programs such as Microsoft Internet Explorer and so effectively closes the market of such software to other companies. Microsoft fought back with a letter to the White House suggesting that 26 of it's industry allies said that a delay in the release of the new O/S could damage the U.S. economy. The main selling points of Windows '98 were it's support for USB and it's support for disk paritions greater than 2.1GB.
1999 - Jan 25	Linux Kernel 2.2.0 Released. The number of people running Linux is estimated at over 10million, making it an not only important operating system in the Unix world, but an increasingly important one in the PC world.
1999 - Feb 22	AMD release K6-III 400MHz version, 450 to OEMS. In some tests it outperforms soon-to-be released Intel P-III. It contains approximately 23 million transistors, and is based on 100Mhz super socket 7 motherboards, an improvement on the 66MHz buses their previous chips were based on. This helps it's performance when compared to Intel's Pentium II - which also uses a 100MHz bus speed.
1999 - Aug 31	Apple release the PowerMac G4. It's powered by the PowerPC G4 chip from Apple, Motorola and IBM. Available in 400MHz, 450MHz and 500MHz versions it's claimed to be the first personal computer to be capable of over one billion floating-point operations per second.
1999 - Nov 29	AMD release Athlon 750MHz version.
2000 - Jan 14	US Government announce restrictions on exporting Cryptography are relaxed (although not removed). This allows many US Companies to stop the long running, and rather ridiculous process of having to create US and International copies of their software.
2000 - Jan 19	Transmeta launch their new 'Crusoe' chips. Designed for laptops these prvoide comparible performance to the mid-range Pentium II chips, but consume a tiny fraction of the power. They are a new and exciting competitor to Intel in the x86 market.
2000 - Feb 17	Offical Launch of Windows 2000 - Microsoft's replacement for Windows 95/98 and Windows NT. Claimed to be faster and more reliable than previous versions of Windows. It is actually a descendant of the NT series, and so the trade-off for increased reliability is that it won't run some old DOS-based games. To keep the home market happy Microsoft have also released Windows ME, the newest member of the 95/98 series.
2000 - March 6	AMD Release the Athlon 1GHz.
2000 - March 8	Intel release very limited supplies of the 1GHz Pentium III chip.
2000 - June 20	British Telecom (BT) claim the rights to hyperlinks on the basis of a US patent granted in 1989. Similar patents in the rest of the world have now expired. Their claim is widely believed to be absurd since Ted Nelson wrote about hyperlinks in 1965, and this is where Tim Berners Lee says he got the ideas for the World Wide Web from. This is just another in the line of similar incredulous cases - for example amazon.com's claim to have patented '1-click ordering'. Even more absurb was the claim made in March 2002 by a 'til then unheard of

	company "Maz Technologies" that they had, in 1998, obtained a fairly generic patent covering encrypted storage of documents. BT's claim was finally rejected by a judge in the US on 23 August 2002.
2000 - Sept 6	RSA Security Inc. released their RSA algorithm into the public domain, in advance of the US patent (#4,405,829) expiring on the 20th Sept. of the same year. Following the relaxation of the US government restrictions earlier in the year (Jan. 14) this removed one of the last barriers to the world-wide distribution of much software based on cryptographic systems. It should be noted that the IDEA algorithm is still under patent and also that government restrictions still apply in some places.
2001 - Jan 4	Linux kernel 2.4.0 released.
2001 - March 24	Apple released MacOS X. At it's heart is `Darwin', an Open Source kernel based on FreeBSD. Using this MacOS X finally gives Mac users the stabilty benifits of a protected memory architecture along many other enhancements, such as preemptive multitasking. The BSD base also makes porting UNIX applications to MacOS easier and gives Mac users a fully featured command line interface alongside their GUI.
2001 - October 25	Microsoft released Windows XP - the latest version of their Windows operating system. Based on the NT series kernel, it is intended to bring together both the NT/2000 series and the Windows 95/98/ME series into one product. Of, course, it was originally hoped that this would happen with Windows 2000 ... so only time will tell if Microsoft have suceeded with Windows XP.
2001 - November 15	Release of the `X' Box - Microsoft's games console. It cost $299 (or £299 - there's fairness), and will include the ability to connect to the internet for multiplayer gaming. The Japanese launch was the 22nd February 2000, and the European launch wasn't until March 14th 2002.