## A Brief History of the Computer

The history of the computer can be divided into six generations each of which was marked by critical conceptual advances.

## The Mechanical Era (1623-1945)

The idea of using machines to solve mathematical problems can be traced at least as far back as the early 17th century, to mathematicians who designed and implemented calculators that were capable of addition, subtraction, multiplication, and division. Among the earliest of these was Gottfried Wilhelm Leibniz (1646-1716), German philosopher and co-founder (with Newton) of the calculus. Leibniz proposed the idea that mechanical calculators (as opposed to humans doing arithmetic) would function fastest and most accurately using a base-two, that is, binary system.

Leibniz actually built a digital calculator and presented it to the scientific authorities in Paris and London in 1673. His other great contribution to the development of the modern computer was the insight that any proposition that could be expressed logically could also be expressed as a calculation, "a general method by which all the truths of the reason would be reduced to a kind of calculation" (Goldstine 1972).

Inherent in the argument is the principle that binary arithmetic and logic mere in some sense indistinguishable: zeroes and ones could as well be male as represent positive and negative or true and false. In modern times this world's sub in the understanding that computers were at the same time calculators and logic machines.

The first multi-purpose, i.e. **FO** number able, computing device was probably Charles Babbage's Difference Engine, which was begin in 1823 but never completed. A more ambitions in come was the Analytical orgine. It was designed in 1842, but antormately it also was only pureatly completed by Babbage.

That the modern computer was actually capable of doing something other than numerical calculations is probably to the credit of George Boole (1815-1864), to whom Babbage, and his successors, were in deep debt. By showing that formal logic could be reduced to an equation whose results could only be zero or one, he made it possible for binary calculators to function as logic machines (Goldstine 1972).

## **First Generation Electronic Computers (1937--1953)**

Three machines have been promoted at various times as the first electronic computers. These machines used electronic switches, in the form of vacuum tubes, instead of electromechanical relays. Electronic components had one major benefit, however: they could "open" and "close" about 1,000 times faster than mechanical switches.

A second early electronic machine was Colossus, designed by Alan Turing for the British military in 1943. This machine played an important role in breaking codes used by the German army in World War II. Turing's main contribution to the field of computer science was the idea of the "Turing machine," a mathematical formalism, indebted to George Boole, concerning computable functions.

The machine could be envisioned as a binary calculator with a read/write head inscribing the equivalent of zeroes and ones on a movable and indefinitely long tape.