Dynamic Chiropractic

PHILOSOPHY

Forgotten Heroes of the Computer Age

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This month's article was originally intended to review a number of government websites. In the process of developing that article, I happened to discover three very important events in the history of personal computers that occurred during the month of September, all within about a decade of each other. Upon further research, I realized the impact these events had on computing and the Internet today, and thought it might be interesting to share their stories with our readers.

While the devices and discoveries made by these pioneers of the computing age are significant, their names are rarely mentioned in today's society. In a way, the careers of Grace Murray Hopper, Jack Kilby and Reynold Johnson can be likened to some of the early, anonymous leaders of chiropractic in that their accomplishments, while often overlooked, were nevertheless quite important to the development of the their profession as it exists today.

The World's First Real Computer Bug

Anyone who's ever booted up a computer is familiar with the term "bug," and despite what you may think, it has nothing to do with the software designed by Bill Gates and his imperialistic cronies at Microsoft (although millions of users of Windows 98 would be willing to swear otherwise). The words "bug" and "debug" as they relate to computers are derived from an incident that occurred at Harvard University a week after the end of World War II.

In 1944, the Mark I, the nation's first large-scale, automatic, general-purpose electromechanical calculator, was moved from Endicott, New York to a temporary building on the Harvard campus. The machine was the brainchild of Harvard mathematician Howard Aiken, who designed and built the machine with the help of IBM and the U.S. Navy.

Like most early American calculating devices, the Mark I was not designed to complete on-time computations for the solution of scientific problems. Its intent was to produce mathematical and navigational tables and ballistics calculations that could be used as tracking and aiming devices for field and naval artillery.

In June 1944, Grace Murray Hopper, a mathematics professor turned naval lieutenant, went to work for Aiken and helped program the Mark I and its successor the Mark II, one of the world's first completely electronic computers. It was while working on the Mark II a year later that Hopper recorded the first official use of the word "bug" associated with a computer problem.

On September 9th, 1945, Hopper was working on a set of calculations when the Mark II suddenly jammed. Hopper turned off the machine and searched for the source of the problem. There, wedged between the keys of a relay, was a real computer "bug" - a moth had worked its way into the machine, gotten smashed by the relay's keys and shut down the computer.

Perhaps sensing the significance of the moment, Hopper decided to keep the bug and taped it into her logbook. From that day on, whenever a problem would arise that made the Mark II stop working, Hopper and her associates would tell Dr. Aiken that they were busy "debugging" the computer. And thus a pair of new computer terms were born.

Grace Hopper was an outstanding mathematician. She was the first woman to be awarded a PhD in mathematics from Yale University. In 1949, she developed the first compiler (a compiler is a program that translates human-readable language into machine language that can be understood by a computer), which provided the foundations for the COBOL computer language. In 1985, she became the first woman in Navy history to achieve the rank of rear admiral. And when she retired from service the following year, she received the Defense Distinguished Service Medal, the highest award given by the Department of Defense. The bug that Ms. Hopper found, by the way, is on display at the Smithsonian Institution.

The Chip That Changed the World

It was the summer of 1958, and an electrical engineer named Jack Kilby had joined the electronics firm Texas Instruments. His assignment: to find the answer to a problem that had been plaguing scientists and inventors for decades.

For the first half of the 20th century, vacuum tube technology dominated the electronics industry, but the tubes had some severe limitations. They were fragile, bulky, consumed a good deal of electricity and produced a considerable amount of heat.

It wasn't until 1947 that the vacuum tube problem was solved with the invention of the transistor by scientists at Bell Laboratories. Transistors were tiny, more reliable, longer lasting, produced less heat and consumed less power. With its introduction, engineers began designing more complex electronic circuits that contained hundreds (or thousands) of components such as transistors, diodes and capacitors.

The problem was that every component needed to be interconnected to create a circuit. The job of soldering thousands of components to thousands of bits of wire was done by hand, so not only was the job expensive and time-consuming, it was unreliable; every soldered joint was a potential source of trouble. The challenge, therefore, was to find cost-effective, reliable ways of producing these components and interconnecting them.

Kilby came up with what became known as the "monolithic idea": circuit elements (resistors, capacitors and transistors) made of the same material and incorporated on the same piece of semiconductor material. Kilby further believed that those components "could also be made in situ interconnected to form a complete circuit," without having to wire everything together or worry about faulty connections.

By September, Kilby was ready to demonstrate a working integrated circuit. On September 12th, he introduced his invention to a group of Texas Instruments executives. It was a piece of germanium about half the size of a paper clip with five components linked by wires and glued to a glass slide. It was a rough-looking device, but when Kilby flipped a switch, an oscilloscope attached to it displayed an unending sine curve - indicating a functioning circuit.

Within three years, chips based on Kilby's designs were being used by the Air Force in computers and missile systems. In 1965, the chips gained commercial success when they were used to construct the first pocket calculator, of which Kilby was a co-inventor. By the end of the decade, integrated circuits were being used in everything from portable radios and cash registers to communications satellites.

The impact of the integrated circuit on today's society has been enormous. Many of the electronics products of today could not have been developed without it. Kilby's chip virtually created the modern computer industry, and in just over four decades, it has had profound effects in the areas

of communication, education, health care, transportation, manufacturing and entertainment.

The Father of the Hard Drive

Dr. Reynold Johnson, who died last September at age 92, was the inventor of the modern computer hard drive.

"Rey was always looking for new ideas, new concepts and, because he was a creative person himself, to throw in a few ideas of his own," said Jack Kuehler, former IBM president. "You always felt he could do your job better than you could, and he challenged you to climb the ladder of concept and creativity."

In the summer of 1956, Dr. Johnson and his team of researchers at IBM developed the Random Access Method of Accounting and Control (RAMAC) disk file, the first working hard drive. It was introduced in September of that year. The device consisted of a vertical spindle with 50 24-inch platters; stood approximately eight feet tall; occupied the space of two refrigerators; weighed more than 2,000 pounds; and required a massive air conditioning system pumping through it at all times to avoid melting the entire structure.

The RAMAC was not for sale, but could be leased through IBM for $35,000 per year. The drive held a whopping (for that time) five megabytes of information - a cost of $5,000 per megabyte.
By comparison, a local computer store is currently running an ad for a 16.3 gigabyte hard drive. The hard drive is one inch high, five inches wide and weighs about as much as a standard VCR cassette. It costs about $150 after the manufacturer's mail-in rebate.

How times have changed.

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