The Computer Revolution

BY MICHAEL NORTON

One of the distinguishing features of Oklahoma is the relative absence of reminders of the past. The United States east of the Mississippi is replete with historic buildings; the Western U.S. has Spanish missions, ancient Indian ruins and, of course, the venerable redwoods. In Oklahoma it is rare to see anything that existed a 100 years ago — even the dirt got blown away. In many ways Oklahoma is very similar to the computer industry in this regard. It is strange to think about it, but none of us would have been doing what we do for a living just 50 years ago.

MECHANICAL DINOSAURS

In 1996 the ENIAC computer celebrated its 50th anniversary (see Figure 1). While there is no shortage of debate whether the ENIAC was the first computer, there is no dispute that it legitimized the endeavor of constructing a general purpose, electronic computing machine, thus instigating the computer revolution. The Harvard Mark I, built at IBM's Development Laboratories, was completed in August 1944, but was based on mechanical principles, utilizing rotating shafts and electromagnetic clutches to perform calculations. Ironically it was mechanical problems with the "Heath Robinson" machines in Britain's Bletchley Park, designed to crack German ciphers, that prompted an engineer named T.H. Flowers to suggest a new approach. He proposed building a machine with 1,500 vacuum tubes — almost three times the number of tubes in any existing machine. The Colossus, placed in operation two years before the ENIAC, was the first large-scale machine to employ the principle of electronic as opposed to mechanical comparisons that is the foundation of modern computers. Although mechanical calculating machines continued to be designed and manufactured for many years, the Colossus and ENIAC represented the beginning of the end of the storied genealogy of mechanical computational devices.

THE BIRTH OF ELECTRONIC COMPUTING

Although because of their size the Colossus and ENIAC were more influential, they were not the first electrical computing machines. In 1938 John Atanasoff, an associate professor of Mathematics and Physics at Iowa State College, and his graduate assistant Clifford Berry began working on a machine to solve linear equations. In April 1942 Atanasoff issued a press release announcing the ABC (Atanasoff-Berry Computer), which he claimed would replace 100 "computers with calculators" (yes, computers were once human). He also noted that the project was being delayed by Iowa State College for reasons of national defense but that the machine would be completed and tested by summer.

Although the arithmetic unit had been successfully constructed on a breadboard and tested by 1939, the input/output mechanisms were never completed — perhaps because that was the "easy" part. Consider that the mechanical computational devices were outgrowths of the punch tape technology that was already well advanced at the time. Atanasoff's press release suggests another possible reason: interference from the government.

GUNS, BUTTER AND COMPUTERS

In August 1940,Atanasoff detailed his design in a manuscript in sufficient detail to allow, as a court would determine later, any one with "ordinary skill in electronics" to build and operate the ABC. This manuscript was used to obtain a $1,000 grant from the

Research Corporation to build the ABC. Although Pearl Harbor was still more than a year in the future, the U.S. Government was already gearing up for war. The University of Pennsylvania's Moore School of Electrical Engineering was assigned a contract to provide a 10-week course on Electrical Engineering for Defense industries. A physics professor from small Ursinus College near Philadelphia enrolled in the course and was offered a teaching position upon graduation. His name was John W. Mauchly.

Shortly after completing his manuscript,Atanasoff met Mauchly at a meeting of the American Association for the Advancement of Science in Philadelphia. Atanasoff described his machine to Mauchly, who had developed an interest in electronic computing circuitry, and allowed him to read his manuscript. The following summer Mauchly visited Atanasoff and examined the ABC. Before another year had passed America was plunged into war and the Moore School and Mauchly were up to their eyebrows in calculations, including firing tables for U.S. Army Ordnance Department's Ballistics Research Laboratory (BRL) and antenna radiation patterns for radar use. The Moore School had also been awarded a contract just prior to Mauchly's arrival to build a mechanical analog differential calculating machine by the BRL. In the summer of 1942 Mauchly drafted an internal memo advocating a project to build an electronic computing device to aid the Moore School in fulfilling its contractual obligations to calculate ballistic tables for the BRL, an endeavor that was falling hopelessly behind. The memo outlined the basic design of the modern electronic general purpose computer, but was buried for almost a year until Lt. Herman Goldstine of the BRL recognized its merit and encouraged the Moore School to submit an official proposal, which it did in April 1943. The result was Project PX, a half million dollars, and the ENIAC computer.

SCIENCE AND MEDICINE

Answers by Eny

All-Electronic Super Calculator Is a Whiz at Super Problems

Fifty-Foot Brain

Tomatoes to Ringworm

Two Many Sick Friends Stymied Medics in Paris

VICTORY!

The ENIAC was a huge public relations success for the War Department, and was featured in popular magazines and newspapers (see Figure 2). At its unveiling in February 1946 it amazingly calculated the trajectory of a 16 inch naval shell in less than the time it would take the shell to reach its destination. Meanwhile, Atanasoff had faded into oblivion. His press release in 1942 reads like a self-promotional piece written by a man not given to self-promotion, the byline like a supermarket tabloid: "Biggest, Fastest Calculator Built by ISC Physicist." Not long after he was summoned to Washington D.C. to work for the Navy. Iowa State College held the rights to his work and was not interested in a patent, although Atanasoff tried to interest Remington Rand, who eventually acquired the ENIAC. In 1973 a federal judge voided Sperry Rand's patent on the ENIAC and proclaimed Atanasoff the inventor of the "electronic digital computer."

A SLIGHT CASE OF MYOPIA

Atanasoff was a supremely talented technician who apparently didn't foresee the revolution the electrical digital computer would spawn. His obituary in *The Washington Post* notes that he once observed that "If I had known the things I had in my machine, I would have kept going on it." It is difficult for us to grasp Atanasoff's short-sightedness because we do not think very often about the fact that just 50 years ago none of this existed.

ACKNOWLEDGMENTS

Thank you to Nancy Shawcross, curator of manuscripts at the University of Pennsylvania Library, for the use of the photos presented in Figures 1 and 2. These images are from the John W. Mauchly website, which is maintained by the University of Pennsylvania Library.

Michael Norton is the network administrator at SofTouch Systems, Oklahoma City, Okla., which provides both mainframe and PC software solutions. He has written mainframe manuals in addition to articles for a number of publications. Michael can be contacted at norton@softouch.com.