

The History of Computing

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Prof. Bergin

Biography Paper

Of

Herman Hollerith

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From Napier's Bones to Oughtred's slide rule to Pasacal's Pascaline, men have sought to abolish the drudgery of calculation and tabulation through the use of machinery (Evans, 1981). Nevertheless, a significant contribution to computer evolution didn't come from the study of math or science but out of a practical need to tabulate the census.

The act of census taking has been around since humans first began living in social groups. And few nations have been as adept at census taking as the United States. Since its inception in 1790, a census has been conducted in the United every ten years without fail. Originally, census data was handled by clerks who tabulated and calculated the results by hand. In the first census, it took the clerks one year to determine the count of 3,893,673 Americans. In the ensuing years, the population grew by 34.6% for each census so that by 1860 there were 31,440,000 people in the United States. With 100 questions on the census and over 31 million people to count, the census took several years to tabulate and people began to realize that the time would come when one census would be due before the previous census was completed (Shurkin, 1996). Indeed, it took over seven years to tabulate and analyze the data from the 1880 census (Rosenberg, 1969).

The first attempt to use a machine to help in processing census data was in 1870 by Col. Charles W. Seaton. While this

system worked in the short run, it was clear that it wasn't the ultimate answer. Fortunately, Seaton had a young man working for him who would develop the answer to the census data tabulation problem and would usher in the modern data processing. He was Herman Hollerith (Shurkin, 1996).

Herman Hollerith was born in Buffalo, New York to German immigrant parents on February 29, 1860. Except for a dislike for spelling which at one point compelled him to jump from a second-story window at school and run home, he had a normal childhood. He attended college at the School of Mines at Columbia University. Upon graduating in 1879, he accepted a position with one of his professors, W.P. Trowbridge, to work on a special project with the Census office (Rosenberg, 1969).

Although the invention of a tabulating machine for census data came from Hollerith, he credits the idea of the machine to Dr. John Billings who was in charge of Vital Statistics in the Census Bureau. Billings is reported to have said to Hollerith, "There ought to be a machine for doing the purely mechanical work of tabulating population and similar statistics," (Rosenberg, 1969, p. 113). Hollerith agreed and transferred to the population division of the census bureau and studied the problem of processing census data (Rosenberg, 1969).

In September of 1882, Hollerith took a leave of absence from the Census Bureau to work as an instructor at the

Massachusetts Institute of Technology (MIT). During this time, Hollerith began to experiment with a tabulating machine. He used the ideas from device invented by Joseph Jacquard that used punch cards to mechanicalize loom weaving. Hollerith took Jacquard's idea and modified it; however, it wasn't fool proof, as it would take miles of paper to count a few people in specialized groups (Rosenberg, 1969).

It was a chance encounter with a train conductor that would help Hollerith figure out the answer to his problem. The conductor would hand-punch tickets in such a way as to provide a basic description of the passengers. Hollerith figured that the same technique could be used by punching a card for each individual in the United States. "[The Conductor] punched out a description of the individual as light hair, dark eyes, large nose, etc. So you see, I only made a punch photograph of each person," (Campbell-Kelly and Aspray, 1996, p. 22).

He left teaching and returned to government work at the patent office. While he resigned shortly after, it is certain that his time there proved useful throughout his career as he eventually obtained 31 data-processing patents (Rosenberg, 1969).

After leaving the Patent Office in 1884, Hollerith devoted his time to constructing his tabulation system. The theory behind his machine was to represent the characteristics of the

population by holes punched in cards in specific locations. Fine rods would pass through the holes, dipping into mercury thus completing an electrical circuit that in turn caused a counter to advance one unit (Evans, 1981).

For the 1890 Census, the bureau requested ideas for data processing and recommended the testing of three systems: Hollerith's punch card electric system, Hunt's cards with different colored ink and Pidgin's color coded cards. While all three systems required manual punching of the data onto cards, only Hollerith's system used a machine to sort and tabulate the data from the cards (Campbell-Kelly and Aspray, 1996, and Rosenberg, 1969).

In the fall of 1889, the three competitors demonstrated their systems by processing 10,491 1880 census returns from St. Louis. The test required the competitors to transfer the data to the punch cards and then tabulate the results. Hollerith's system proved to be faster in transcribing the data to cards as well as tabulating the information. The Hollerith method took 72 hours to transcribe the census data to the cards while Hunts took 144 hours and Pidgin took 110 hours. The most significant difference in the systems was in the data tabulation. Hollerith's machine took only 5 hours as opposed to Hunts, which took 55 hours, and Pidgins, which took 44 hours. The Government not only awarded the census contract to Hollerith for his

machine's speed but it was also determined that his system would save the government nearly \$600,000 (Campbell-Kelly and Aspray, 1996, and Rosenberg, 1969).

The 1890 Census officially started on June 1st and by August 16, 1890, the population count was completed and reported at 62,622,250. Hollerith's machine completed in weeks what had taken previous census take years. Although the public was disappointed that number hadn't reached the 75 million predicted and blamed Hollerith's machine, it was clear that the tabulating machine had changed data processing (Campbell-Kelly and Aspray, 1996).

The use of Hollerith's machine in the 1890 census marked the first time a practical statistical problem was handled by machines. Further, it allowed demographers to research more complex and important aspects of the population because it allowed them to cross-tabulate questions. The benefits of such a machine were not lost on the world and many countries contracted with Hollerith for census work in their nations. Nevertheless, Hollerith wisely began to investigate the use of his machine in areas outside of census data and as a result he and his data tabulating machines radically changed how American did business (Shurkin, 1996).

Although he fully expected to contract with the government for the 1900 census, he began to approach other businesses he

felt could benefit from his data processing machine. He contacted several railway companies however only one, New York Central, was willing to try out his new-fangled machine. He made several changes to the machine and cards, to meet the needs of the railway and then installed the machines. The first trial of the machine did not go well but Hollerith believed it would work and negotiated for the company to use the machine for free for a year. The new trial at New York Central went extremely well and the railway contracted to rent tabulating machines for one year at \$5000.00 per month (Skurkin, 1996).

In 1896, Hollerith incorporated forming the Tabulating Machine Company. This provided greater stability for Hollerith and his company. The Tabulating Machine Company secured contracts with Pennsylvania Steel Company, Marshal Field the department store tycoon, and Taft-Pierce, which the Tabulating Machine Company bought out. The company also pioneered business practices still used today such as the rental of machines instead of selling them and requiring contractors to purchase their cards from the Tabulating Machine Company. The sale of cards was so profitable that Hollerith felt he might not have to charge for the machines at all (Skurkin, 1996).

Hollerith was not able to secure the contract for the 1900 census mostly because the new director, Simon Newton Dexter North believed Hollerith was over charging and had a monopoly.

It didn't seem to matter that Hollerith's monopoly was obtained and maintained honestly, North was determined to find another way to tabulate the census. He hired a young man, James Powers to create a newer and better tabulating machine. This was particularly difficult for Hollerith as his patents were about to run out. Although he did sue for patent infringement, he was not able to prevent North or Powers from creating a new machine. It seems both Hollerith and North lost out; Hollerith didn't get the contract, and North's efforts succeeded in building an inferior machine. Powers left the Census Bureau and formed a company that would compete with the Tabulating Machine Company (Rosenberg, 1969, and Shurkin, 1996).

By the time of the 1910 census, Hollerith was in his 50's and suffering from health problems. At this time Charles Ranlett Flint approached Hollerith about merging the Tabulating Machine Company with similar or complementary companies. The timing was right for Hollerith and the Tabulating Machine Company joined with the International Time Recording Company, the Computing Scale Company and Bundy Manufacturing into the Computing-Tabulating-Recording Company (CTR). While Hollerith was able to retire, he still acted in an advisory capacity. In 1914, CTR hired a successful young man from the National Cash Register Company named Thomas Watson to act as general manager. Watson treated Hollerith with respect and together they were able to

produce several new machines. In February 1924, Watson changed the name of the company to International Business Machines better known as IBM (Shurkin, 1996).

Hollerith did not live to see the incredible growth and influence IBM would have on the world. He died November 17, 1929 (Rosenberg, 1969). But the evidence of Hollerith's contributions will always remain not only because IBM remains a giant in business technology but because he was the first person to successfully use a machine to handle a practical statistical problem and thus opened the door to the future development of machine data processing.

Works Cited

Campbell-Kelly, M. and Aspray, W. *Computer: A History of the Information Machine*. New York: Basic Books, 1996.

Evans, C. *The Making of the Micro: A History of the Computer*. New York: Van Nostrand Reinhold Company, 1981.

Rosenberg, M. *The Computer Prophets*. London: The MacMillan Company, 1969.

Shurkin, J. *Engines of the Mind: The Evolution of the Computer from Main Frames to Microprocessors*. New York: W.W. Norton and Company, 1996.