



Konrad Zuse

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1910-1995

BY MANFRED SCHROEDER

KONRAD ZUSE, German computer pioneer, died on December 18, 1995, in Hünefeld near Bad Hersfeld (Hessia). Zuse is widely credited with the creation of the first functioning, freely programmable, and fully automatic digital computer. He also created, before 1946, the programming language Plankalkül, which anticipated essential aspects of modern programming languages. His concept of Rechnender Raum (literally: computing space) foretold computation by means of cellular automata.

Zuse was twenty-eight when, in 1938, he built his first sizeable computer, the Z1, occupying a large portion of his parent's living room. The Z1 was programmed by punched tape, stored sixty-four characters, and took three seconds for a multiplication. In the late 1930s, the German inventor built a functional computer, years before inventors in the United States and Great Britain would unveil similar machines. World War II restrained Zuse from claiming patents and seeking industry backing; it also left him in virtual obscurity.

“Zuse suffered from being in the wrong country at the wrong time,” says Maurice Wilkes, the British inventor whose work led to the first business computer, the LEO. “If he had been in the U.K. or the U.S., he may have had a much more prominent impact,” adds Gene Amdahl, chief architect of IBM's 360 mainframe.

During the war, Zuse tried to get support from the German government for a two-year project to develop a large new computer to help improve anti-aircraft defenses. “And just how long do you think it will take us to win the war?” he was asked when the project was rejected.

Only weeks before the Third Reich fell, he moved his only remaining computer, the Z4 to Göttingen in central Germany to protect it from advancing Soviet troops. His first three computers were demolished in bombing raids, but he rebuilt the Z1 from memory (no pun) more than forty years later.

“Fifty years ago, as a student of civil engineering, I was struck by the immense calculations that had to be performed in the construction of buildings,” Zuse said.

“I became convinced that machines should be doing these calculations, but at the time I understood nothing about computers. I was not even aware of Babbage's work and of diverse parallel developments in other countries such as the United States.

“Deciding to try new ways, I built my own computer with the following features: calculation of long programs controlled by a sequence of orders punched on tape (I started by using punched strips of film); use of the binary number system; introduction of floating point arithmetic.

“I began with a strong preference for mechanical systems, but I did not succeed and was forced to switch to electromechanical technology. Finally in 1941, in my parent's Berlin apartment, I completed the Z3—the first computer of its kind. My work was based mostly on private initiative, with assistance from some friends. Only after 1940 had I received sponsorship from the DVL [Deutsche Versuchsanstalt für Luftfahrt] so that numerical problems, especially for aerodynamic applications, could be solved.

“During these developments, further aspects of computing became apparent. My friend Helmut Schreyer proposed the use of tubes in place of relays. The development of the switching algebra led to a connection with mathematical logic. These new ideas extended the concept of calculation beyond numbers and gave rise to the concept of artificial intelligence.”

Zuse says his life has been marked by what he terms the curse of being ahead of his time. Indeed, while later iterations of Zuse's computer attracted the attention of IBM's Thomas Watson in 1947, Big Blue rejected Zuse's work. Other instances of the curse are detailed in his autobiography, *My Life—The Computer*. The English-language version was published in 1993 by Springer-Verlag in New York. But instead of frustration and bitterness, what emerges in the book is a remarkable story of a young pioneer who, against all odds, succeeded in realizing his dream.

Born on June 22, 1910, in Berlin, the son of a postmaster, Zuse grew up in Braunsberg in East Prussia not far from the shores of the Baltic Sea and the Masurian lake country. In his youth he was drawn to painting and building. He later studied engineering at Berlin's Technical University. Upon graduation, he was employed by the Henschel Aircraft Company in Berlin as a structural engineer. The mathematics of the job, Zuse recalls, was "torture." He decided only a "computing machine" could rid him of the tedium. A few months later, Zuse quit his position at Henschel and announced, to his parents' horror, that he would construct a computer in their living room. It was 1935—seven years before John Mauchly and John Eckert got approval to build the Eniac.

The Z4, the final versions of Zuse's original machine, contained features found in today's microprocessors, such as the retrieval of computer instructions before use and a cache memory.

Zuse received many, if belated, honors. Between 1956 and 1992 he was awarded honorary doctorates, from Reykjavik (Iceland), Zürich (Switzerland), Siena (Italy) as well as four German universities. In 1966 Göttingen University appointed him an "Honorarprofessor." Among his many medals are the Wernervon-Siemens Ring (1964), the Diesel Medal (1969), the newly created Konrad Zuse Medal (1981), Bavaria's Order of Maximilian (1984), the Golden Honor Ring of the German Museum (1984), and the Philip Morris Prize (1987). In 1972 Zuse was decorated by Federal President Richard von Weizsäcker with Germany's highest civilian order, the Grosses Verdienstkreuz mit Stern.

Zuse was honorary member of the Leopoldina, the oldest German Scientific Academy. A number of streets and buildings were named for him, as well as a research center in Berlin and a scholarship program of the German government to support foreign guest professors. In 1981 Zuse was elected a foreign associate of the National Academy of Engineering.

Zuse loved hiking in his native country along the shores of the Baltic. He was an accomplished amateur painter and excelled at linoleum carving. Several of his works of art are reproduced in his autobiography. All his life he combined engineering insight with artistic vision.

APPENDIX

Members	Elected	Born	Deceased
Giovanni Astarita	1994	October 7, 1933	April 28, 1997
J. Leland Atwood	1974	October 26, 1904	March 05, 1999
Philip Barkan	1980	March 29, 1925	June 21, 1996
Marcel Louis J. Barrère	1984	August 19, 1920	August 25, 1996
Robert Bromberg	1969	August 6, 1921	January 25, 1999
G. Edwin Burks	1978	April 10, 1901	March 16, 1994
Paul F. Chenea	1969	May 17, 1918	March 24, 1996
Jerome B. Cohen	1993	July 16, 1932	November 7, 1999
Neville G. W. Cook	1988	January 29, 1938	March 3, 1998
Wallace Henry Coulter	1998	February 17, 1913	August 13, 1998
Sidney Darlington	1975	July 18, 1906	October 31, 1997
Rolf Eliassen	1971	February 22, 1911	March 14, 1997
Richard S. Engelbrecht	1976	March 11, 1926	September 1, 1996
Michael Ference, Jr.	1971	November 6, 1911	July 24, 1996
Donald Glen Fink	1969	November 8, 1911	May 3, 1996
John C. Geyer	1970	August 11, 1906	May 2, 1995
Martin Goland	1967	July 12, 1919	October 29, 1997
James P. Gould	1988	October 9, 1923	December 25, 1998
Meredith C. Gourdine	1991	September 26, 1929	November 20, 1998
Robert Herman	1978	August 29, 1914	February 13, 1997
Eivind Hognestad	1973	July 17, 1921	February 16, 2000
Joe Estes House	1995	September 28, 1923	May 1, 1998
George J. Huebner	1975	September 8, 1910	September 4, 1995
Lawrence E. Jenkins	1984	March 12, 1933	April 5, 1996
Reynold B. Johnson	1981	July 16, 1906	September 15, 1998
Robert T. Jones	1973	May 28, 1910	August 11, 1999
Jerry R. Junkins	1988	December 9, 1937	May 9, 1966
Robert M. Kenedi	1976	March 19, 1921	November 15, 1998
John R. Kiely	1967	November 8, 1906	January 10, 1996
Koji Kobayashi	1977	February 17, 1907	November 30, 1996
Walter F. Kosonocky	1992	December 15, 1931	November 2, 1996
Jai Krishna	1979	February 14, 1912	July 27, 1999
Rolf Landauer	1978	February 4, 1927	April 27, 1999
Clarence Edward Larson	1973	September 20, 1909	February 14, 1999
Gerald A. Leonards	1988	April 29, 1921	February 1, 1997
Fritz Leonhardt	1983	July 11, 1909	December 20, 1999
Arthur Lubinski	1986	March 30, 1910	May 3, 1996
Robert E. McIntosh	1997	January 19, 1940	July 10, 1998
David Packard	1971	September 7, 1912	March 26, 1996
Earl Randall Parker	1969	November 22, 1912	May 9, 1999
Donald William Pritchard	1993	October 20, 1922	April 23, 1999

Members	Elected	Born	Deceased
Wilbur L. Pritchard	1995	May 31, 1923	March 18, 1999
Eberhard F.M. Rees	1973	April 28, 1909	April 2, 1998
Eric Reissner	1976	January 5, 1913	November 1, 1996
Rudolf Schulten	1978	August 16, 1923	April 27, 1996
Henry E. Singleton	1979	November 27, 1916	August 31, 1999
Richard Skalak	1988	February 5, 1923	August 17, 1997
Gregory Eugene Stillman	1985	February 15, 1936	July 30, 1999
James R. Wait	1977	January 23, 1924	October 1, 1998
Robert H. Wentorf, Jr.	1979	May 28, 1926	April 03, 1997
Harold Alden Wheeler	1986	May 10, 1903	April 25, 1996
Basil Wright Wilson	1984	June 16, 1909	February 9, 1996
Carlos C. Wood	1967	June 19, 1913	May 14, 1997
Aaron D. Wyner	1994	March 17, 1939	September 29, 1997
Konrad Zuse	1967	June 22, 1910	December 18, 1995