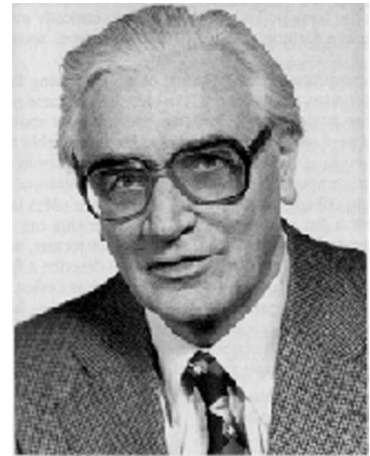


## Konrad Zuse

Another name included in the mix of those responsible for inventing the computer is German construction engineer Konrad Zuse (June 22, 1910 – December 18, 1995). Weary of the long hours of time-consuming calculations that went with the job of a civil engineer, Zuse longed for a machine that could perform any mathematical computation he needed, no matter how complex or convoluted. As no such machine existed he resolved to build one. Zuse was only remotely aware of Vannevar Bush's



electronic analog computer, was totally unaware of Babbage's Analytic Engine, and had never heard of George Boole. Yet he set out to build a general-purpose computer, which would operate on Boolean principles, that is, the use of the binary system.

Zuse was born in Berlin and brought up in Braunsberg, East Prussia, not far from the shores of the Baltic Sea. He attended the Humanistisches Gymnasium before studying civil engineering at the Technische Hochschule of Berlin-Charlottenburg in 1927. It was these studies that caused him to think about developing a mechanical calculating device. In 1934 Zuse invented a pre-WWII electro-mechanical binary computer, built in the living room of his parents' home. He first designated it as V1 (Versuchsmodell 1), but subsequently changed the name to Z1 so not to confuse it with the flying V1 bombs. Instead of a numerical approach, he began with the digital concept of yes/no positioning. The Z1, a cumbersome combination of steel plates and pins, was "programmed" by a series of holes hand punched into 35-millimeter film that was fed through the machine (similar to the pattern cards devised by Ada Byron Lovelace for Babbage's Analytical Engine), while data were inputted through a basic four-decimal-place keyboard. A board of light bulbs displayed the calculation results. In 1936 Zuse made a patent application on some of the Z1s parts, which proved his priority in developing certain

major concepts of the digital computer. The Z1 worked but was clumsy to use and not very reliable. It was destroyed during WWII bombing.

Zuse developed two improved machines, the Z2, built from telephone relays, and the Z3. Zuse made a proposal to the German government to build a “computer” to be used in anti aircraft defense, but the military authorities felt that the war would be over before the proposed two years to build the machine passed. The Z3 were destroyed in 1945 by an Allied bombing run. He smuggled his next computer, the Z4, from Germany to Switzerland in a horse-drawn cart. After the war, he set up the Z4 at the Eidgenössische Technische Hochschule (ETH) in Zurich and renamed it the Ziffernrechner (number calculator). At the time it was the only computer in Europe.

Zuse independently discovered the important relationship between “logic” and designing and programming computers. After the war he continued his experiments and built more computers. By 1961 Zuse completed the Z23 computer, which was one of the first to be designed with transistors. He formed a new company in 1950 and by 1967 had built 251 computers. Due to financial problems he was forced to sell his company to Siemens AG, but stayed on as a consultant. Besides his work on computer hardware, he formulated data processing problems. He called a program *Rechenplan*, by which he meant “computing plan.” His notational and conceptual system for expressing a *Rechenplan*, was called *Plankalkul*, the first algorithmic programming language, establishing him as a software pioneer. Although not widely used, *Plankalkul* was the basis for the next generation programming language, the widely used ALGOL.

A reproduction of Zuse’s Z1 [Figure 6.10] can be seen at Berlin’s Technology Museum. A replica of the

Z3 [Figure 6.11] and the Z4 [Figure 6.12] are on display at the Deutsches Museum in Munich. Zuse received many honors, and although belated, his unique position in the development of computers finally has been recognized. He died on December 18, 1995, in his home at Hünfeld, Germany.

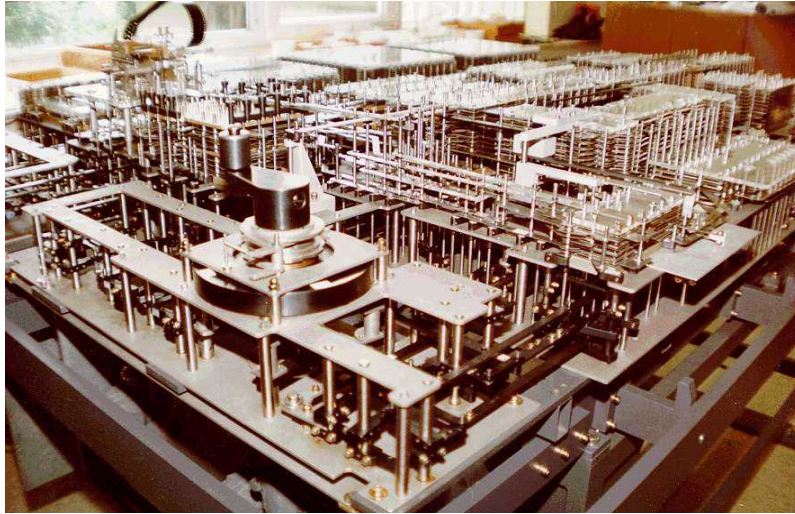


Figure 6.10

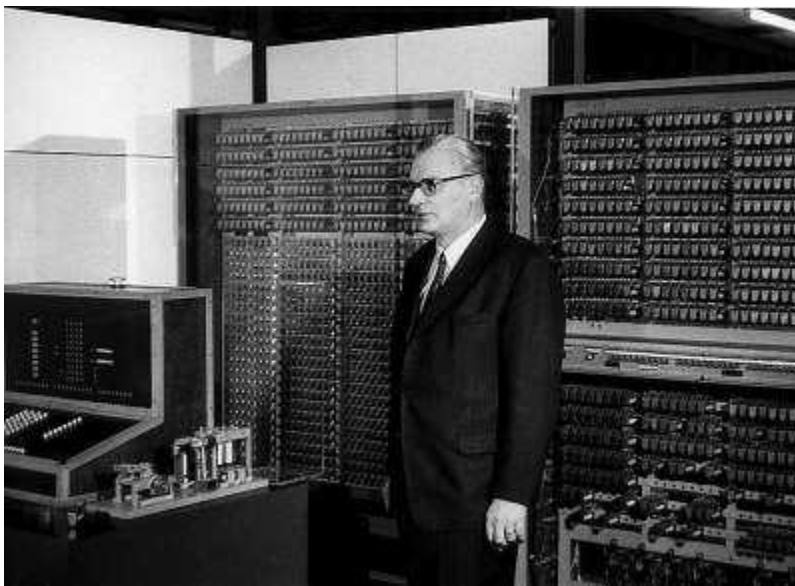


Figure 6.11



Figure 6.12

Quotation of the Day: “With this primitive type of mechanical brain it should be possible to solve all thought tasks which are ascertainable by mechanisms.” – Konrad Zuse, notebook entry from June 20, 1937.