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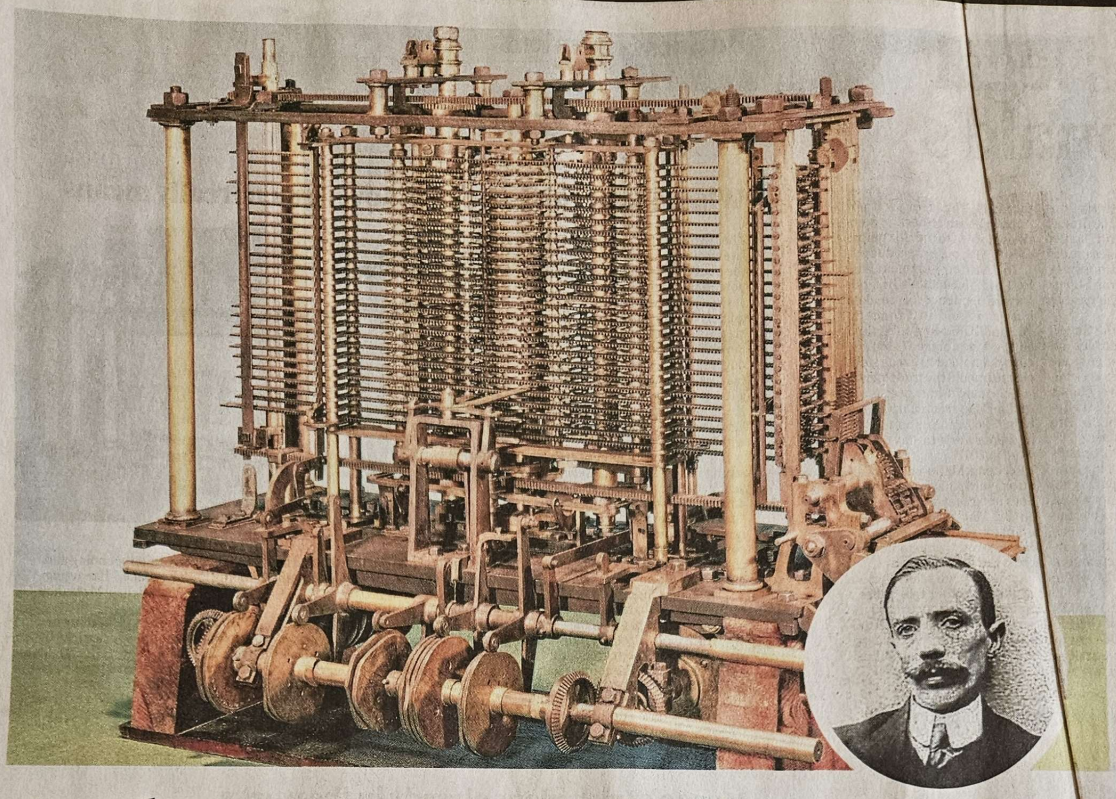


Cork genius who influenced the history of computing

Chris Horn

Percy Ludgate's 1909 paper on mechanical computing played a crucial role in refuting a broad patent from pioneering computer scientist Konrad Zuse

The Corkman Percy Ludgate was an extraordinary genius.

In a 1909 paper to the Royal Dublin Society, he described the world's second general purpose mechanical computer. He worked unaware of Charles Babbage's proposal for the world's first such computer, the analytical engine of 1834. I have previously written about Ludgate, recorded a podcast and reviewed a book about his inventions and life.

Now further investigative work by Brian Coghlan (Trinity College Dublin), Brian Randell (Newcastle University) and Ralf Bülow (Heinz Nixdorf MuseumsForum) has reinforced how influential Ludgate's work was on the history of computing.

In 1960, a German patent lawyer working on behalf of IBM successfully relied on Ludgate's 1909 paper to defeat an important patent application by the pioneering computer scientist Konrad Zuse. Had the patent been approved, Zuse would have controlled intellectual property for a crucial technique that all computers now use.

Zuse began experimenting with constructing a computer in 1935. Working independently and unaware of Babbage's or Ludgate's prior designs, he completed his Z1 mechanical calculator in 1938. However, it was unreliable due to wear of its metal components.

Zuse followed with his Z2, replacing the mechanisms in the arithmetic core of the Z1 by electromechanical relays. His Z3 in 1943 added a relay-based memory. The machine was extensively used by the Nazi aircraft industry to solve challenges in handling vibration and stress, including for glide bombs. The Z3 was general purpose, unlike the more restricted British Colossus computer developed by Alan Turing in utmost secrecy for encryption breaking in 1943. The Z3 also used software code, as do modern computers, while the Colossus was controlled by manual plug boards and switches.

Zuse's Z4 was intended as the first ready-made commercial computer. However, the aerial bombing of Berlin in 1945 forced him to evacuate the tonne-weight machine ultimately to Hinterstein, a small Bavarian village.

His experiences in controlling the Z4 by low-level machine code inspired Zuse to invent the world's first programming language, called Plankalkül. Using it, he wrote the world's first chess program. Zuse submitted Plankalkül as his PhD thesis to the University of Augsburg but it was rejected as he had not paid the degree enrolment fee.

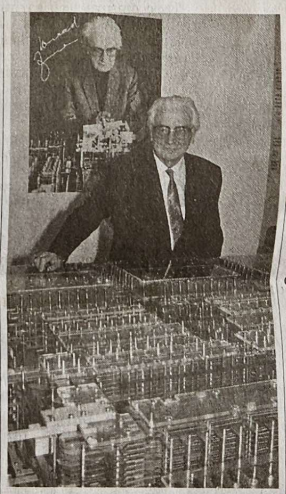
Zuse's autobiography, Mein Lebenswerk, details his attempts to register a number of patents for his innovations. In mid-1941, he filed his most important patent. It was not until 1952 that a reorganised German Patent Office published the patent. However Triumph-Werke, a motorcycle and accounting machine company in Nuremberg, actively petitioned against the patent. Zuse made a number of amendments to overcome these objections, resubmitting in 1958.

In July 1959, the patent office in Munich confirmed it had found no merit in Triumph-Werke's objections, and intended to approve Zuse's amended patent. By early January 1960 – a full 19 years after Zuse's initial submission – the patent was ready to grant. However, on the 12th January, the patent office received a further objection from a newly-appointed lawyer for Triumph-Werke, Gerhard Hagen.

Hagen included a 10-page summary of Ludgate's 1909 paper, which had never previously been brought to the attention of Zuse nor the patent office. Zuse's patent lawyer worried that a whole new situation arose because of Ludgate's prior work. In March 1960, Zuse revised his patent application yet again but Hagen's objections were successful. In 1962, the patent office finally rejected Zuse's patent.

Zuse appealed to the new Federal Patent Office, but it rejected his appeal in 1967.

Zuse believed that IBM had in fact sponsored Hagen's abrupt intervention in 1960, rather than Triumph-Werke alone. In 1966, Hagen eventually provided clear evidence in a letter to the Federal Patent Office that this had in fact been the case.



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Model of an analytical engine calculating machine invented in 1837 by Charles Babbage: Corkman Percy Ludgate (inset) described a similar device in his work.
Left: Inventor Konrad Zuse with a replica of his Z1 machine at the German Museum of Technology in Berlin.
PHOTOGRAPHS: DEAGOSTINI/GETT, WIKIPEDIA, GÜNTER PETERS/ULLSTEIN BILD/GETTY

Generous payment

Why had IBM interjected?

During 1947-48, IBM negotiated with Zuse to acquire his patents, offering what Zuse considered a generous payment in the new deutschemark currency. However, it became clear that IBM only wanted Zuse's intellectual property and considered further work on the Z4 by Zuse as "perfectly foolish". Zuse was faced with a difficult decision of accepting the payment, or of rejecting it but being able to continue further development of his computers. He decided on the latter, turning IBM down and worked on growing his new company.

The core of Zuse's 1941 patent was an explanation of how software code, as a stream of instructions represented as numbers, can be decoded and interpreted by a control unit in a computer, thus orchestrating the arithmetic and memory units by performing each machine instruction in turn. Hagen used Ludgate's 1909 paper as prior art to refute Zuse's claim. Had Zuse been awarded his patent, his control over a critical feature would have changed his career and could well have altered the course of the computer industry. Ludgate, who died in 1922 aged just 39, perhaps never imagined how significant his work would turn out to be.