

Geoff Tootill

Scientist who helped to build 'Baby', the first computer to use software

The computer that Geoff Tootill helped to build may have been called Baby, but it was a monster of a machine. Officially known as the Small-Scale Experiment Machine, Baby was constructed on post office shelving racks. It weighed a tonne, filled an entire room and had less computing power than a modern desktop calculator. Early trials were not promising, with spots on the display tube jiggling about in a merry dance — and no error code to explain what was wrong.

On June 21, 1948, in a house on Bridgeford Street, opposite the University of Manchester, Tootill and his colleagues — Freddie Williams and Tom Kilburn — set Baby the task of finding the highest proper factor of 2^{18} , which involved about 3.5 million calculations. After 52 minutes the display tube lit up with the correct answer. They repeated the exercise twice, both with the same result. The computer age had dawned.

"There had been general purpose computers, but they were driven by packs of punch cards or reels of punched paper tape," Tootill told the *Manchester Evening News* in 2010. He explained that this was the first computer to run a program that was electronically stored in its memory — it has been called the birth of software.

Tootill recalled that the team's celebrations consisted of taking lunch in the canteen rather than eating their usual homemade sandwiches. Over the next 18 months, Baby and its capacity were expanded to create the Manchester Mark 1 computer. As new models evolved, the original Baby was cannibalised until nothing was left; even the post office racks were used for later machines. Tootill's son, Stephen, said: "The team used to speculate on how the computer would be used for real work: weather forecasting, atomic research etc. They thought that only the government would need computers in the UK, maybe two or three."

Geoffrey Colin Tootill was born in Chadderton, near Oldham, in 1922, the only child of Fred Tootill, a self-taught journalist who became editor of the *Co-operative News*, and his wife, Alice (née Tetlow), who had been a school teacher. They moved to Bournville, Birmingham, where Geoff's only memory of College Road School was being bullied. He won a classics scholarship to King Edward's School, Birmingham, where he did well at maths and physics, but developed an intense dislike for history. As a teenager he built a radio and, using an alarm clock, devised a timer to switch the radio off after he had fallen asleep.

After he won a scholarship to Christ's College, Cambridge, he studied mathematics under CP Snow, but because of the Second World War he had to complete the three-year course in two. Along the way he bought a trumpet from a pawn shop, but his landlady was not enthusiastic and he made little progress with the instrument. He also had to fend off the attentions of a young Irish-language student called Cathleen, who was a vegetarian and tried to recruit him to the Communist Party. Tootill himself was sympathetic to the pacifist cause,

but was convinced that first the war had to be won.

He was directed into operational research for Fighter and Bomber Commands before being transferred in 1943 to the Telecommunications Research Establishment (TRE) at Malvern College in Worcestershire. It was there that Tootill realised that engineering was his calling, rather than theoretical mathematics. Often he would be called out to fix problems with radar equipment in night fighters. During a quiet spell he made an electric hotplate so that he could have fry-ups with a Wren petty officer to whom he had taken a shine.

He met Pamela Watson, a laboratory assistant, when they were touring Worcestershire as members of the TRE's Flying Rockets concert party; Tootill helped backstage and Watson was a singer. They were married in 1947 and had three sons: Peter, a retired civil engineer who also worked in IT; Colin, who runs a business selling membrane switches; and Stephen, who runs a software company specialising in data cleansing.

When the family were young they



Geoff Tootill with a working replica of Baby, built for its 50th anniversary

would travel around Europe with their caravan in tow. At home they became good friends with many of their neighbours and on one occasion, when living in a new house in Hawley, Hampshire, Tootill laid a cable under the road to connect a baby monitor between the houses. Pam died in 1979. Two years later Tootill married Joyce Turnbull, a retired senior nurse whom he met through a community group. She survives him with his sons.

After the war Tothill was asked by Williams to join him at the University of Manchester along with Kilburn. Tothill recalled that, in the absence of air conditioning, the city-centre laboratory's windows were left open to keep the temperature down "and in with the fresh air came the dirt".

Soon after Baby's first success Alan Turing, who was famed for his wartime work on Enigma at Bletchley Park, came to Manchester. He was working on a project at the National Physical Laboratory, at Teddington, where a rival computer was being developed, but he had grown impatient. Tootill was assigned to instruct him on the use of Baby and took the opportunity to

debug at least one of Turing's programs.

The University of Manchester soon teamed up with Ferranti, a local electronics company. Inspired by Baby, Ferranti produced the first commercial computer in 1949 and went on to create much of the UK's computing power until the mid-1960s. Williams remained head of the department until his death in 1977. Kilburn became a professor of computer science at the university and retired in 1981.

Tootill soon left Ferranti and returned to the scientific civil service. He remained in computers and lectured on digital computing at the Royal Military College of Science at Shrivenham, Oxfordshire. He also developed air traffic control systems at the Royal Aircraft Establishment at Farnborough, Hampshire, and worked for the European Space Research Organisation, now the European Space Agency, on satellite tracking stations.

In 1973 he joined the National Physical Laboratory, where he developed communications standards for the European Informatics Network, an experimental computer network that established technologies now used in the internet. He retired in 1982 when he moved to Wokingham in Berkshire, where he set up a computer group for the University of the Third Age.

In the mid-1990s Tootill and Kilburn came out of retirement to oversee the building of a replica of Baby to mark its 50th anniversary. When they saw the result Tootill realised that something was not quite right: "It was nice and clean." In front of an audience Baby once again answered its original mathematical question. It stands in the Museum of Science and Industry in Manchester, where visitors can see a demonstration. The University of Manchester has a Tom Kilburn Building, which houses the Tootill laboratories.

In retirement Tootill enjoyed working with computers and software, particularly when it involved linguistics. He developed a phonetic algorithm to match different renditions of the same English surname, such as Tootill, Toothill, Tootle, Tutil, Tootil or Tootal, which has achieved commercial success in a program developed by his son, Stephen. He did not buy his first home computer until the 1980s when he acquired an early Amstrad. "I didn't want to spend the money," Tootill said. "I didn't see what I was going to do with a computer anyway."

The team at Manchester received little credit for Baby. When Kilburn was asked why computer science textbooks tended to relate the American origins of computers, he would reply simply: "Them that need to know, do know." There was little financial reward. "We did patent our work and, because of our contracts of employment, the patents were ascribed to the Ministry of Aircraft Production at first," Tootill said. Even when the patents were licensed to American companies, he saw little benefit. "I was given one dollar per patent, and I didn't even get the bloody dollar. I got 4s 2d [about £7.48 today]."

Geoff Tootill, computer scientist, was born on March 4, 1922. He died from pneumonia on October 26, 2017, aged 95