



Alan Turing: A retrospective - Audio

Alan Turing: Code breaker

Introduction

On the centenary of Alan Turing's birth, Professor Timothy Chappell from The Open University reflects on the mathematician's approaches to problem solving and how he applied his skills to the war effort to help decipher the Enigma machine codes.

Timothy Chappell

Confront Turing with an Enigma in mathematics or logic and he would operationalize it, that is to say he would find a procedure for solving that enigma. This was his approach to all mathematical problems, most famously it was his approach to a problem which was known in formal mathematics as the Entscheidungsproblem the problem of deciding whether problems were decidable. Whereas other mathematicians would scribble on bits of paper or on blackboards Turing's approach to problems like the Entscheidungsproblem was to imagine a machine, to build a machine which would solve the problem or not solve it, or show that it could not be solved or prove that there was know way of deciding whether it could be solved or not. This kind of machine of machine is what we know call a Turing Machine, Turing invented such machines as a mechanical way of operationalizing a solution to a classic problem in formal logic, But the Turing machine although it existed for Turing, only in his imagination was already by the end of his life in 1954 was beginning to emerge as the basis for what we now call the computer.

The coming of the Second World War brought an opportunity which seemed perfectly shaped for Turing's abilities. At Bletchley Park in Buckinghamshire in 1940, large numbers of academics were seconded from British universities to work on cracking the codes that the Germans were using in their war effort. Alan Turing was among them and in Hut 30 with other workers he set to work trying to decipher the results of the German enigma machine. This machine produced a whole variety of different codes and the problem was just not to decipher what was being said on any particular day, but also to decipher the settings of the enigma machine that set the particular code for that particular day. The German's thought that it would take hundreds of years and hundreds of workers for this problem to be solved by British intelligence they were therefore remarkably free and easy in the use of their enigma codes. Alan Turing and his co-workers made substantial progress on cracking the enigma codes within a matter of months, and within a matter of months they were able to relay it back to the British admiralty and to the British government a wide variety of militarily crucial kinds of information. Alan Turing brought to the decoding of enigma not only a powerful training in formal logic and mathematics but also an almost unique ability to think in creative and lateral

ways. Decoding's of what was produced by the enigma machine would often produce still hundreds of possible readings of the messages that were coming out. Alan Turing devised the idea of eliminating all those options that were still left as decoding's that generated an inconsistency thus he was able to use the strictly formal logical notion of logical inconsistency as a way of cracking messages about the position of U-boats in the north sea.

Alan Turing proved himself an engaging colleague to those who worked with him, at Bletchley during the war, he was widely regarded even within this community of mad professors, this community of boffins as the most boffinish, and mad professorish of them all. Problems that other people would solve in conventional ways Turing solved in direct, forceful, neat, elegant and simple ways that other people simply wouldn't have thought of. All people in the war in Britain had a gas mask, many people in the war as they are now are allergic to pollen, Turing quite characteristically simply put these problems together and produced a solution by combining them. When afflicted by the pollen he would simply cycle wearing a gas mask this may be unconventional but it works. Confronted with the common office problem of losing your mug to someone else or to forces unknown Turing solved it simply by padlocking the mug to the radiator nearest to his workstation where it still is if you visit Bletchley Park.