

Murray [*née* Clarke], Joan Elisabeth Lowther

(1917–1996)

- Ralph Erskine
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Murray [*née* Clarke], Joan Elisabeth Lowther (1917–1996), cryptanalyst and numismatist, was born at 45 Idmiston Road, West Norwood, London, on 24 June 1917, the youngest child (there were three sons, and another daughter) of William Kemp Lowther Clarke, a Church of England clergyman, and his wife, Dorothy Elizabeth Fulford. She was educated at Dulwich high school and at Newnham College, Cambridge, where she obtained a double first in mathematics and was a wrangler. While still an undergraduate, she was recruited by Gordon Welchman for the Government Code and Cypher School (GCCS) at Bletchley Park, the British code-breaking centre during the Second World War. When she joined GCCS in June 1940, she was assigned to Hut 8, which was responsible for the solution of naval Enigma ciphers. These were among the most difficult GCCS had to attack, partly because the naval Enigma machine, M3, was issued with eight rotors, compared with five for army and air force Enigma. She worked in a small inner room as a cryptanalyst with Alan Turing, Peter Twinn, and Tony Kendrick. Her initial task was to use the first British bombe (a high-speed key-finding aid invented by Alan Turing), which had entered service on 18 March 1940, against documents captured from the patrol boat *Schiff 26*. These enabled her and her co-workers to break about six days of April traffic over a period of three months.

Clarke helped to test Banburismus, a highly ingenious procedure invented by Turing, which used Bayesian probability theory to reduce the number of M3 rotor combinations to be tested by the bombes from 336 to between 6 and 126. She became very adept at Banburismus, which she greatly enjoyed. Without it, the solving of naval Enigma would have been much slower, since bombes were in very short supply until mid-1943.

Hut 8 could not make further progress until Enigma keys and indicator books were captured in February and May 1941. Its cryptanalysts therefore sometimes worked on other Enigma ciphers. When the outstandingly versatile Colonel John Tiltman recovered the plain text of signals enciphered on railway Enigma (a rewired version, codenamed Rocket by GCCS, of commercial Enigma) in July 1940, Clarke helped to recover the wiring of its rotors, and to solve Rocket traffic in early 1941. She returned to naval Enigma in March 1941, when GCCS received Enigma key lists taken from an armed trawler, *Krebs*. She worked on material recovered from a patrol boat, *München*, which, with other captures, led to the speedy breaking of the main naval Enigma key, Heimisch (known to GCCS as Dolphin) from August 1941 onwards; keys were captured for June and July. One of her important contributions accelerated the solution of naval *Offizier* signals, which were extremely difficult to break, since they were re-enciphered with a second set of plugboard settings (which interchanged ten pairs of letters), adding 150,000,000,000,000 further possible settings to a key.

Clarke became engaged to Turing in the spring of 1941, although the engagement was kept secret, and she did not wear her ring in Hut 8. The engagement was broken off by mutual consent in the late summer because of Turing's homosexuality. She remained friends with Turing for the rest of his life.

In mid-December 1942, after a blackout of almost 11 months, Hut 8 broke into the critically important four-rotor Enigma key, Triton (codenamed Shark by GCCS), which was used by the Atlantic U-boats. However, in early March GCCS had to warn the Admiralty that Shark and its vital intelligence might again be lost, possibly for months. Clarke helped to ensure that naval intelligence's worst fear was not realized. Hut 8 was forced to use extremely short extracts (sometimes of only four letters) from short 'sighting' signals from the U-boats to program the three-rotor bombes until four-rotor bombes entered service in June 1943.

At the end of 1943 US Navy code-breakers in OP-20-G were allotted responsibility for breaking Shark, because US Navy four-rotor bombes were much more reliable and plentiful than the British model. Clarke remained in Hut 8 as a highly capable member of a small team which initially concentrated on M3 ciphers, such as Dolphin, although it continued to break some Shark keys until early 1945.

After the war Clarke worked in GCHQ, as GCCS became, until her marriage in 1952. Her husband was Lieutenant-Colonel John Kenneth Ronald (Jock) Murray, a retired army officer in India, who also worked at GCHQ. They had no children. She rejoined GCHQ in 1962 and retired in 1977. After her retirement she helped Sir Harry Hinsley on appendix 30 to volume 3/2 of *British Intelligence in the Second World War*, which was a substantially revised assessment of the Polish, French, and British work in breaking Enigma.

Murray was a gifted numismatist whose research was recognized by the award of the prestigious Sanford Saltus medal in 1987; this was for a 'magisterial paper' which established 'the sequence of the gold unicorns and heavy groats of James III and James IV [of Scotland], an extremely complex series which had caused great difficulty for previous students' (*Numismatic Circular*, 405).

Joan Murray was unique as the only female cryptanalyst to work in Hut 8. She was also its longest-serving member. Her acute intelligence enabled her fully to hold her own with her co-workers in Hut 8, and to make a significant contribution to its work in helping the allies to win the battle of the Atlantic, among other successes. She was also known as one of the really good cryptanalysts in GCHQ. Although very shy and retiring, she was an enthusiastic and encouraging colleague, and was much liked and admired by all who worked with her at GCCS and GCHQ. She was appointed MBE in 1947.

Murray died on 4 September 1996 at her home, 7 Larkfields, Headington, Oxford. She was predeceased by her husband.

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Wealth at Death

£756,694: probate, 20 Dec 1996, *CGPLA Eng. & Wales*