

Abstract

This thesis shows that the history of cryptanalysis in Britain in the first half of the twentieth century has focussed on the contribution of men to the virtual exclusion of that of women, and produces evidence to prove that, from the First World War onwards, women, although in a minority, were working at the same level as their male counterparts, despite their lack of mention in the published literature which generally holds that only men worked as cryptanalysts during this period. The present research identifies that this was not the case, and that though the number of confirmed female cryptanalysts remains small and elusive, these women were nonetheless important for the role that they played.

This thesis examines published work on British cryptanalysis between 1914 and 1946, demonstrating that these accounts are almost exclusively by men and about men. The research presented uses original documentation and interviews to advance and place on record knowledge about female cryptanalysts who worked in high-level codebreaking during time both of war and peace in a gendered approach. The analysis sets out the case studies of six women - four cryptanalysts, one linguist and a decoder - who typify the roles that women held in cryptanalysis between 1914 and 1946, providing an in-depth study of their backgrounds and roles they carried out for the British Admiralty's Room 40, the War Office's MI1(b) and HushWAACs, and the Foreign Office's Government Code and Cypher School (GC&CS).

The thesis provides a detailed historiographical chronology in a gendered approach of the women's role in cryptanalysis from the beginnings of modern codebreaking in the First World War, through the interwar creation of GC&CS, to the vast cryptanalytical organisation at Bletchley Park during the Second World War, setting out the context of relevant literature and archival materials. Definitions are derived for key terms whose meanings have changed over the period, causing confusion and erroneous conclusions to be drawn, and key themes are identified which can be used in the identification of future female cryptanalysts.

This thesis clearly identifies that women were working as high-grade cryptanalysts during the period 1914 to 1946, and offers pointers and analytical tools to potential further identifications in future research.

Keywords: women, gender, codebreaking, cryptanalytic definitions, cryptanalysts, female cryptanalyst case studies, Room 40, MI1(b), HushWAAC, GC&CS, Bletchley Park.



The Role of Female Cryptanalysts from 1914 to 1946

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Acknowledgements

“Our eyes are still so dazzled by the miracle of Ultra...”

Christopher Morris¹

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This thesis is for you all.

In memory of all the female cryptanalysts who served Britain in her time of need from 1914 to 1946 and can now claim their rightful place in history.

¹ Christopher Morris, 'Ultra's Poor Relation', in *Codebreaking and Signals Intelligence* ed. by Christopher Andrew (London: Frank Cass, 1986), p. 111

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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List of Abbreviations

40OB	40 Old Building [see Room 40]
AI	Air Intelligence
ATS	Auxiliary Transport Service
BP	Bletchley Park
D/F	Direction Finding
DNI	Director of Naval Intelligence
FANY	First Aid Nursing Yeomanry
FO	Foreign Office
CBME	Combined Bureau Middle East
GC&CS	Government Code and Cypher School
GCHQ	Government Communications Headquarters
GPO	General Post Office
ID25	Intelligence Division 25 [Naval] [see Room 40]
ISK	Illicit Services Knox (or Intelligence Services Knox)
ISOS	Illicit Services Oliver Strachey (or Intelligence Services Oliver Strachey)
JA	Junior Assistant
JAA	Junior Assistant's Assistant
MI5	British Security Service (Domestic)
MI6	British Secret Intelligence Service (SIS)
MI1(b)	Military Intelligence 1(b)
NID25	Naval Intelligence Division 25 [see Room 40]

NS	Naval Section (for example NS II – Naval Section Two, NS X – Naval Section Ten)
OSA	Official Secrets Act
OTP	One Time Pad
P5	HMS Pembroke V - Naval name assigned to Bletchley Park
QMAAC	Queen Mary's Army Auxiliary Corps. Previously WAAC
RAF	Royal Air Force
RoH	Bletchley Park Roll of Honour
Room 40	Original name for WWI Naval Intelligence after their location in the Admiralty, London
SA	Senior Assistant
SIGINT	Signals Intelligence
SIS	British Secret Intelligence Service (also known as MI6)
SIXTA	Hut Six Traffic Analysis
SOE	Special Operations Executive
TA	Temporary Assistant
TJAO	Temporary Junior Assistant Officer
TNA	The National Archives, Kew
TSAO	Temporary Senior Assistant Officer
W/T	Wireless Telegraphy
WAAC	Women's Army Auxiliary Corps. Later QMAAC
WAAF	Women's Auxiliary Air Force
WRNS	Women's Royal Navy Service

Glossary

Admiralty	Head Office of the British Naval Service.
Bletchley Park	Location of the Second World War British Code-Breaking organisation.
Bombe	Electro-mechanical machine created by Turing and Welchman during WWII for use against Enigma.
Boniface	Code name given to a fictional spy to cover the intelligence provided by BP.
Cillies	Nickname given by BP to the human error of not changing the rotors from the previous day and/or using predictable codewords.
Colossus	First machine using valves/'tubes' to solve complex Lorenz cyphers. Created by Tommy Flowers with information provided by Bill Tutte.
en clair	The term given to messages that are sent uncoded.
HushWAAC	Name given to the Women's Army Auxiliary Corps who worked in St Omer on secretive 'hush hush' work.
Linguist	Foreign Office term for translators.
MI1(b)	World War One British Military Intelligence Code-Breaking organisation.
Plain text	The Second World War term given to messages that were sent uncoded.
Room 40	World War One British Naval Code-Breaking organisation.
Sigint	Signals Intelligence.
Sixta	Hut Six Traffic Analysis.
Station X	Station Ten: SIS allocation for GC&CS War Station Bletchley Park.
Typex	British cryptanalysis machine based on Enigma (also called Type X).
ULTRA	The name given to the intelligence derived from BP decrypts.

Chapter One: Introduction

“Tell Dilly we have had a great victory in the Mediterranean and it is entirely due to him and his girls”¹

Admiral Godfrey

1.1 Introduction

During the two World Wars of the first half of the twentieth century, the breaking of enemy codes aided the British and her Allies to a considerable degree. The regular reading by the British of the German Naval codes used during the First World War (1914-1918), allowing homeland defences to be alerted before Zeppelin air attacks,² is one illustration of the benefits of breaking codes. A second example was the decryption of the Zimmermann telegram,³ which brought the USA into the war on the Allied side. Decrypted messages in the Second World War (1939-1945) allowed the British to sink the German battleship *Bismarck* amongst many other warships,⁴ and to defeat the Italian fleet at the Battle of Cape Matapan.⁵ Numerous other examples include the strangulation of supply-lines from Italy to the German Army in North Africa⁶; the identification of German cruise and ballistic missile research at Peenemunde⁷, and the vital reassurance in the lead up to the D-Day invasion of Normandy (June 1944) that the Germans believed the misinformation passed to them by British-controlled double agents regarding time and place of the landings.⁸

¹ Admiral John Godfrey quoted in Mavis Batey, *Dilly; The Man Who Broke Enigmas* (London: Biteback, 2010), p. 118.

² Patrick Beesley, *Room 40* (London: Hamish Hamilton, 1982), p. 171.

³ Beesley, *Room 40*, p. 204.

⁴ John Ferris, *Behind the Enigma: The Authorised History of GCHQ* (London: Bloomsbury Publishing, 2020), p. 239.

⁵ Author's interview with Mavis Batey, 22 August 2012.

⁶ Alan J. Levine, *The War Against Rommel's Supply Lines; 1942-43* (Mechanicsburg: Stackpole Books, 2008), pp. 33-197

⁷ Constance Babington-Smith, *Air Spy – The Story of Photo Intelligence in World War II* (New York: Harper & Brothers, 1957), and *Evidence in Camera; The Story of Photographic Intelligence in World War II* (Newton Abbott: David & Charles, 1974).

⁸ Nigel West, *GCHQ: The Secret Wireless War 1900-86* (London: Weidenfeld and Nicolson. 1986), p. 210.

Two of the quoted examples, *Bismarck* and Matapan, are recognised as achievements of **female** cryptanalysts; but the role of women in the breaking of enemy codes is barely visible in the literature compared to the recognition given to their male counterparts.⁹ Despite three quarters of the almost 9,000 individuals at Bletchley Park (BP) being female, it continues to be the men who are recognised.¹⁰ This stimulates an examination of the role of women during this period from 1914 to 1946, in particular the gendering of roles and related occupations over this period, with a specific focus on women working in cryptanalysis.

This thesis sets out to examine the significance and roles of female cryptanalysts between 1914 and 1946 and seeks to address the apparent imbalance in the literature. The research supporting this thesis validates, as far as current evidence permits, the following hypothesis:

‘The history of cryptanalysis in Britain in the first half of the twentieth century has substantially focussed upon a limited number of men, and neglected the significant role played by women in codebreaking establishments from the First World War onwards.’

1.2 Contextualisation

Since the 1974 release into the public domain of the ‘story’ of Bletchley Park (BP), home of the main British codebreaking establishment, the Government’s Code and Cypher School (GC&CS), the topic of British codebreaking in World War Two, and to a lesser extent that pertaining to World War One, has come to the fore of British consciousness.

Numerous accounts have been published detailing various aspects of BP life over subsequent years. The first British author to publish was Frederick Winterbotham in 1974,¹¹ followed

⁹ The Battle of Cape Matapan – Mavis Batey née Lever; the sinking of the *Bismarck* – Jane Fawcett née Hughes.

¹⁰ Kerry Johnson and John Gallehawk, *Figuring It Out at Bletchley Park 1939-1945* (Redditch: BookTower Publishing, 2009), p. 10; total number of men 2225, total number of women 6769.

¹¹ Frederick Winterbotham, *The Ultra Secret* (New York: Dell Books, 1974).

successively by television documentaries and a book by R.V. Jones,¹² who was the wartime Assistant Director of Air Ministry Scientific Intelligence; Gordon Welchman's cryptographically detailed *Hut Six Story*;¹³ the sympathetic biography of Alan Turing by Andrew Hodges;¹⁴ the authoritative Official History series begun by Harry Hinsley;¹⁵ and accounts of the use made of Enigma decrypts by, for example, Ralph Bennett.¹⁶

As can be seen these early accounts are predominantly male authored. As an example, the sensitive accounts of Alan Turing's life have provided him with a level of exposure that has meant, in popular memory, his is often the only name recalled as a BP cryptanalyst, perhaps leading some to inform the impression that he 'single-handedly' broke every code, ran BP, and won the war. However, for this thesis it is important to note that, for 25 years, these and later works by male authors predominantly depicted *male* cryptanalysts, which, it is suggested, has led to a misinterpretation – that the absence of female cryptanalytic accounts indicates that female cryptanalysts did not exist in World War Two and, by inference, could therefore not have existed in World War One either.¹⁷

Whilst it can be acknowledged that most cryptanalysts were in fact male, it is erroneous to say that all were, or that the achievements of female cryptanalysts were of merely minor significance. That this was not so is exemplified by the significant example of female cryptanalysis, which led to the naval Battle of Cape Matapan, in which the Italian Navy suffered devastating losses.¹⁸ The result

¹² RV Jones, *Most Secret War: British Scientific Intelligence 1939-1945* (Sevenoaks: Hodder & Stoughton, 1978, repr. London: Coronet Books, 1979).

¹³ Gordon Welchman, *The Hut Six Story* (Cleobury Mortimer: M and M Baldwin, 1997).

¹⁴ Andrew Hodges, *Alan Turing: The Enigma* (London: Vintage, 2012).

¹⁵ Harry Hinsley et al., *British Intelligence in the Second World War*, 5 vols (London: HMSO, 1979-1990).

¹⁶ Ralph Bennett, *Ultra in the West* (New York: Charles Scribner's Sons, 1980).

¹⁷ Examples include Andrew Hodges, *Alan Turing*; Joel Greenberg, *Gordon Welchman: Bletchley Park's Architect of Ultra Intelligence* (London: Frontline Books, 2014) and David Leavitt, *The Man who knew too much: Alan Turing and the Invention of the Computer* (London: Phoenix, 2006).

¹⁸ Author's interview with Mavis Batey, 22 August 2012.

of that battle meant Italy ceded naval supremacy to the British Royal Navy, who recognised, as in the quote heading this chapter that their victory hinged upon codebreaking by cryptanalyst Mavis Lever and the female team of cryptanalysts headed by Dillwyn Knox.

It was not until 1990 that the first account by a woman was published, by Irene Young, and only two senior female World War Two cryptanalysts have subsequently chosen to impart details of their roles at BP.¹⁹ These two women were Mavis Lever in 2010,²⁰ who, as stated, worked in Dillwyn Knox's all-female section, and Joan Clarke in 1993²¹ who worked in Hut Eight under Alan Turing, other senior women have chosen simply to abide by the Official Secrets Act (OSA) and remained silent until their respective deaths. Post-war, several continued their cryptanalytic journey,²² working for GC&CS's successor – the Government Communications Headquarters (better known as GCHQ) – but the remainder have lapsed into obscurity, having resumed their pre-war lives as wives, mothers, or teachers.²³

There are several possible reasons why male cryptanalysts have become better known. This could, for example, be due to their senior roles providing a more inviting story, or to gendering, both of which might lead to the assumption that only men were able to carry out cryptanalysis, and therefore only men can provide detailed histories. In comparison, published accounts of the women at BP have inclined towards social narrative, describing more about their lives and environment.²⁴ Many women who worked at BP were engaged in the breaking of simpler codes,

¹⁹ Irene Young, *Enigma Variations: A Memoir of Love and War* (Edinburgh, Mainstream Publishing Company (Edinburgh) Ltd, 2000).

²⁰ Batey, *Dilly*.

²¹ Joan Murray, 'Hut 8 and naval Enigma, Part I', in *Code Breakers: the Inside Story of Bletchley Park*, ed. by Harry Hinsley and Alan Stripp (Oxford: Oxford University Press, 1993), pp. 113-118.

²² Margaret Rock: Author's interview with Charles Foster, 21 September 2013; Marie Rose Egan: Author's interview with Clare Morgan, 9 May 2019 (and details provided by nephew Michael Egan).

²³ Examples are Catherine Wallace Pope, Emily Anderson, Janet Milne, and Caroline Linehan.

²⁴ Examples include Jean Trumpington, *Coming Up Trumps* (London: Pan Macmillan, 2014) and Sarah Baring, *The Road to Station X*, (privately published 2004, repr. USA: Sapere Books, 2020), Kindle ebook.

in machine operating, in carrying out limited aspects of the breaking of more complex codes, or in the communication of results by teleprinter, tasks the women themselves considered ‘dull’ and ‘monotonous’.²⁵ Such narratives generally focus upon women’s personal lives with BP as a backdrop rather than the actual work they carried out, and are heavily dependent on their memory, or any diaries they may have kept without any cryptographic detail.

It is important to acknowledge that memory plays a key part of the BP story. Early accounts, written when archival sources were not available, tended to be weak in dates and detail. Accounts written in the 1990s onwards contain increasingly accurate detail as more archival sources were gradually released into the public domain.²⁶ As memory is such a key part of particularly the BP story in particular it will be considered in greater depth in Chapters Two and Three.

In direct contrast to Enigma and BP, much less is known by the public about the cryptanalysts who played a role in the First World War. In the period immediately prior to World War One there was no specifically designated British cryptanalysis organisation to deal with the collection of signals intelligence (Sigint), its analysis or dissemination to interested parties. At the time the best *cabinets noirs*, as they were known, were those of France and Russia.²⁷

At the onset of war, the Admiralty created ‘Room 40’, thus designated because of its location in the Admiralty Old Building, London.²⁸ It was later renamed Naval Intelligence Division 25 (NID25) or 40 Old Building (40OB) and ultimately Intelligence Division 25 (ID25), but has become best-known by its original office location, ‘Room 40’, and this is the term that will be used

²⁵ Tessa Stone ‘Creating a (gendered?) military identity: the Women’s Auxiliary Air Force in Great Britain in the second world war’, *Women’s History Review*. 8/4 (1999), 605-624.

²⁶ Examples include Richard Aldrich, *GCHQ: The Uncensored Story of Britain’s Most Secret Intelligence Agency* (London: Harper Press, 2010).

²⁷ *Codebreaking and Signals Intelligence* ed. by Christopher Andrew (London: Frank Cass, 1986), p. 2.

²⁸ Beesley, *Room 40*, p. 8.

throughout this thesis.²⁹ The War Office created an equivalent, which it named Military Intelligence 1(b), or MI1(b). In 1914 at the outbreak of war, intelligence was dealt with by M.O.5(e), in late 1915 MI1(b) was created, in February 1916 MI1(b) dealt solely with cryptanalytic messages.³⁰ Originally located in the War Office, it moved to 5 Cork Street, London in 1917.³¹

The better-known cryptanalysts from this period are male, in particular those who continued working for the organisation and made their name later at BP. Prior to Tammy Proctor's study³², little was previously written about the women who worked in intelligence, and even less about the codebreakers of either Room 40 or MI1(b), except perhaps for an occasional name with no background detail.³³ Paul Gannon wrote about these women in 2010, albeit with errors in his analysis which this research identifies.³⁴ Most recently, a more information has been published online by Dr Jim Beach on a group of women from the Women's Army Auxiliary Corps (WAAC) known as 'HushWAACs' deployed to France to decrypt the simpler German (battle-) Field Codes; these women were part of the War Office and as such will be considered later under the umbrella of MI1(b).³⁵ Archival records predominantly cover Room 40, and very little is available on MI1(b), less still on the HushWAACs. This lack of detail is reflected in published sources. In the years immediately after World War One, a limited number of contemporary individuals such as Winston

²⁹ Beesley, *Room 40*, p. 177.

³⁰ James Bruce, 'A shadowy entity': M.I.1(b) and British Communications Intelligence', 1914-1922, *Intelligence and National Security*, 32/3 (2017), 313-332 (pp. 313-332).

³¹ Bruce, *A shadowy entity*, pp. 317-18.

³² Tammy Proctor, *Female Intelligence: Women and Espionage in the First World War* (New York: New York University Press, 2003).

³³ Examples include, for the Great War, Alfred Ewing, *The Man of Room 40: The Life of Sir Alfred Ewing* (London: Hutchinson & Co (Publishers) Ltd, 1939); William James, *The Sky was Always Blue* (London, Methuen & Co, Ltd, 1951), and for the Second World War; Welchman, *The Hut Six Story*; Peter Calvocoressi, *Top Secret Ultra* (London: Cassell, 1980, repr. Cleobury Mortimer: M&M Baldwin, 2001).

³⁴ Paul Gannon, *Inside Room 40* (London: Ian Allen Publishing, 2010).

³⁵ Alice Ivy Hay, *Valiant for Truth: Malcolm Hay of Seaton* (London: Neville Spearman, 1971), and <https://www.gchq.gov.uk/information/hush-waacs> [accessed 15 November 2020].

Churchill³⁶ and Hugh Cleland Hoy³⁷ published their accounts of Room 40; histories, exemplified by Admiral William James,³⁸ Alfred Ewing³⁹ and Reginald Hall,⁴⁰ include details of Room 40, the male cryptanalysts, and the impact of the decryption of the Zimmermann Telegram.

In the First World War machine cyphers had yet to be developed, the bulk of high-level codes were ‘book’ codes like the one illustrated in Figure 1.1, but it is important to note that for the first time in history, intelligence could be derived from wireless interception.

ABA		
CODE No.	CODE WORDS	
00000	<i>Aavora</i>	Abandon.
00001	<i>Ababangay</i>	Can you abandon
00002	<i>Ababil</i>	I (we) can abandon
00003	<i>Ababras</i>	I (we) cannot abandon
00004	<i>Ababuy</i>	Will you abandon
00005	<i>Abacaena</i>	I (we) will abandon
00006	<i>Abacate</i>	I (we) will abandon—unless
00007	<i>Abacellar</i>	I (we) will not abandon
00008	<i>Abacerias</i>	Can he (they) abandon
00009	<i>Abacetes</i>	He (they) can abandon
00010	<i>Abaciales</i>	He (they) cannot abandon
00011	<i>Abaciscus</i>	Shall—may I (we) abandon
00012	<i>Abacist</i>	You may abandon
00013	<i>Abackern</i>	Do not abandon
00014	<i>Abaculus</i>	Will he (they) abandon
00015	<i>Abadavina</i>	He (they) will abandon
00016	<i>Abaddir</i>	He (they) will abandon—unless
00017	<i>Abadernar</i>	He (they) will not abandon
00018	<i>Abadiato</i>	Will ——— abandon
00019	<i>Abadite</i>	Will abandon
00020	<i>Abadiva</i>	Will not abandon
00021	<i>Abaeckzen</i>	If I (we) can abandon
00022	<i>Abaelard</i>	If I (we) cannot abandon

Figure 1.1. Example of a book code: this is the ABC telegraphic code of 1901, and the book runs to some 1,313 pages of codewords. The message resulting from its use can be sent either as codewords, e.g., ‘*abackern*’ for ‘do not abandon’, or as numbers, in this case ‘00013’. ‘Superencipherment’ is the term given to a second coding applied to the book code, for example by adding ‘12345’ to the book code ‘00013’ to yield ‘12358’ which would be meaningless or misleading to those using the codebook without stripping out the ‘additive’ 12345. Codebreaking at the superencipherment level involved finding, and stripping out, this additive, usually mathematically.⁴¹

³⁶ Winston Churchill, *The World Crisis*, 5 vols (London: Bloomsbury, 2015).

³⁷ HC Hoy, *400B or How the War Was Won* (London: Hutchinson & Co, 1932).

³⁸ William James, *The Eyes of the Navy: A Biographical Study of Admiral Sir Reginald Hall K.C.M.G., C.B., LL.D., D.C.I.* (London: Methuen & Co, Ltd, 1955).

³⁹ Ewing, *The Man of Room 40*.

⁴⁰ Reginald Hall, *A Clear Case of Genius: Room 40's Code-Breaking Pioneer: Admiral Sir Reginald 'Blinker' Hall*, with commentary by Philip Vickers (Stroud: The History Press, 2017).

⁴¹ W. Clauson-Thue FRGS, *The ABC Universal Telegraph Code*, 5th edn (London: Eden Fisher & Co., 1901), p. 1.

The British had been fortunate in capturing the three major codebooks of the German Navy and Mercantile Marine within one hundred days of the outbreak of The Great War.⁴² The requirement to work on decryption was therefore fluency in Continental languages rather than mathematical skills; some female linguists from Room 40 and in MI1(b) worked on decrypting material; ‘Linguist’ is the term the government gives to experts in foreign languages and is often gendered female. Women with fluency in German and other Continental languages came in from mainly middle- and upper-class families, where their education was likely to have included extended residency in mainland Europe.⁴³ Later higher-level encipherment (called ‘superencipherment’) of book codes, where mathematics was increasingly necessary, was an area where restrictions on education largely debarred women from these roles.⁴⁴

Post-war, in 1919, the two organisations of Room 40 and MI1(b) came together to create the Government Code and Cypher School (GC&CS).⁴⁵ In the interwar years, advances in women's education and the development of machine codes ran in parallel, so that by 1939, there were several women who could be employed on mathematical attacks on German machine codes such as Enigma, although numerically far more women were employed on the decrypted results of those attacks and their distribution; according to the Bletchley Park Roll of Honour there were 351 women working on the teleprinters and 315 women working in SIXTA, 174 in Hut Four and 262 in Hut Six.⁴⁶ Following the earlier successful decision to allow women to work as cryptanalysts alongside their male counterparts, access by women to the group of elite cryptanalysts was

⁴² Beesley, *Room 40*, pp. 3-7.

⁴³ Several women from BP were in Europe at the outbreak of World War Two including Mavis Lever and Rozanne Medhurst.

⁴⁴ Murray, ‘Hut 8 and naval Enigma, Part I’, p. 113.

⁴⁵ Ferris, *Behind the Enigma*.

⁴⁶ <https://bletchleypark.org.uk/roll-of-honour/search>. [accessed 7 April 2021].

permitted.⁴⁷ By the time of the move to BP (about 40 miles north of London and less likely to be bombed intentionally or by accident) in 1939, women were already an accepted part of solving high-grade cryptanalysis.⁴⁸

In World War Two, under the organisational umbrella of BP, the wireless interception of Axis messages was carried out by the Wireless Interception (in speech, W.I., hence 'Y') listening stations, staffed mainly by women, and sent by despatch rider to BP.⁴⁹ Here the messages for any one particular group of stations were collated and passed to the cryptanalysts, who broke the code for that day and that specific group of stations, and passed the result to a separate group, mainly women.⁵⁰ While the cryptanalysts themselves moved on to tackle another group of stations, the female group to whom they handed the result of the code break proceeded to use it to decrypt all the messages sent by that group of stations on that day. Their decrypts were then enriched by adding information from the Registry; the repository of all previous decrypts sorted by subject, and again composed of a largely female workforce – according to the BP Roll of Honour there were 28 women who worked in the Registry compared to four men.⁵¹ The consolidated result sent out to political and military leaders by teleprinter, the many teleprinter operators being almost entirely women – compare 351 female teleprinter operators (or who dealt with maintenance) to 42 men who dealt with maintenance and teleprinter cyphers in addition to acting as operators.⁵²

The cryptanalysts' initial break into the code for the day could be achieved manually for simpler codes, but more complex codes usually demanded electronic machines of increasing

⁴⁷ These women included Emily Anderson (Case Study (CS) 2), Wendy White (CS3), Marie Rose Egan (CS5) Mavis Lever (CS6), and Margaret Rock.

⁴⁸ These women included Emily Anderson (CS2), Wendy White (CS3), and Marie Rose Egan (CS5).

⁴⁹ John Johnson, *The Evolution of British Sigint: 1653-1939* (Cheltenham: The Stationary Office Ltd, 1997).

⁵⁰ Johnson, *The Evolution of British Sigint*.

⁵¹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 7 April 2021].

⁵² <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 7 April 2021].

sophistication. From 1940 the electromechanical⁵³ ‘bombe’ was used to break Enigma codes, and from 1944 the early computer Colossus to break *Geheimschreiber* codes from the Lorenz cypher machine; in both cases, bombe and Colossus, the machine operators were women - there were 1,278 women working on the bombes and 130 working on Colossus.⁵⁴ The reason for the discrepancy in numbers is because Colossus did not start to be used until much later in the war (see section 2.5.4.2).

This thesis will illustrate that the normative account of codebreaking of the first half of the twentieth century is that there were no female cryptanalysts of note and no significant achievements by female cryptanalysts. It seeks to examine the changing roles of women in cryptography between 1914 and 1946, challenging published literature, highlighting the significance of female cryptanalysts, and demonstrating that the cryptological, technological and educational developments of this period continued to increase the numbers of women employed as cryptanalysts.

1.3 Gender and cryptanalysis

In terms of situating this thesis in the relevant academic realm, this study, while incorporating elements of gender and organisational studies, is primarily concerned with British intelligence historiography.

Britain was a gendered society during the first half of the twentieth century, the term ‘gender’ here refers to the social construct independent of sex. In this society, the ‘male’ traits of logic and aggression were considered both more desirable and preferable to the ‘female’ traits of intuition, emotion, and compliance.⁵⁵ It is important to add that people were expected to stay within their

⁵³ West, *GCHQ*, p. 145.

⁵⁴ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 7 April 2021].

⁵⁵ Rosemary Toy and Christopher Smith, ‘Women in the Shadow War: Gender, Class and MI5 in the Second World War’, in *Women’s History Review*, 27/5, (2017), 688-706.

'birth-sex' defined 'male' or 'female' boundaries.⁵⁶ There was further pressure for masculine women, effeminate men, and homosexuals, to conform to these boundaries.⁵⁷ Furthermore, machines and equipment were also 'gendered'- the bombe for example was designed and created by men in 1940 and so initially gendered 'male', but due to the shortage of qualified men a test group of WRNSs were tasked with 'seeing if they could manage' the complex equipment.⁵⁸

In organisations, women and men carried out different tasks ('vertical segregation'), and held different positions in the hierarchy, with men ranking higher than women ('horizontal segregation').⁵⁹ It is important to note that, while differences in the roles may or may not have been considered gendered, a distinction in terms of hierarchy most certainly was.⁶⁰ Since the 1960s, the reasons for gender segregation have increasingly been debated observing, for example, that when men and women start with the same qualifications, men advance faster, even in cases where women do not leave to have children, meaning that a different bias must be involved.⁶¹ A gendered bias can be observed throughout the period of this thesis, and indeed earlier, in that 'women's work' was considered cheap, at best semi-skilled, and highly transferable, 'men's work' as skilled, technical, and often highly specific.⁶²

Segregation in the workplace was one aspect of gender where being male was considered greatly superior. Gender segregation reinforced gendering, making people of a specific gender more likely to apply for a task or indeed, be chosen for it. Tasks can of course be 'regendered', often leading

⁵⁶ Annie Burman, 'Gendering Decryption' (unpublished Master's Dissertation. University of Uppsala, 2013), p. 12.

⁵⁷ Burman, 'Gendering Decryption', p. 12.

⁵⁸ Machines gendered; Burman 'Gendering Decryption', p. 12. WRNSs attempting to work on the Bombe - details from the author's collection, documents from Merial Dunn, former WRN.

⁵⁹ Burman, 'Gendering Decryption' p. 2 and pp. 40-42.

⁶⁰ There are currently no women who are known to have been senior heads of departments in Room 40, MI1(b), or GC&CS. There are some deputy heads (such as Joan Clarke and Catherine Wallace Pope), and subsection heads (such as Phoebe Senyard – CS4), but no female department heads.

⁶¹ Burman 'Gendering Decryption', p. 12.

⁶² Burman 'Gendering Decryption', p. 13.

to a change in how it is valued.⁶³ For example, when a female task is mechanised, as in the case of the bombe quoted above, it may become more complex, leading to it being regendered as 'male'.⁶⁴ Femininity is constructed as non-technical - take for example the common slights against female drivers. However, when male-gendered tasks are regendered to 'female', the term applied is usually 'deskilling', the role typically going from being perceived as skilled, complex, and higher-paid to a routine job with low pay. One such example is of clerical work, in the nineteenth century a male profession, which had by the early twentieth century become a female-gendered job; badly paid, inferior, and considered not to be confused with the job that men had carried out several years earlier despite a negligible difference.

A man doing a 'woman's job' was considered to be undertaking lower tasks in the hierarchy than his gender merits; by contrast, a woman doing 'a man's job' was seen as better off, although it may be remarked that her gender is compromised.⁶⁵ Language was also significant; during the early twentieth century women were (and even today sometimes are) often known by the more derogatory term of 'girls', leading to the implication that the job is not only derogatory by gender but also by age.⁶⁶ Even today, the concept of a woman doing a man's job could be said to be an 'honorary male', namely a woman who enters a male-gendered job and starts functioning socially as a 'man' within her workgroup.⁶⁷ The status quo is maintained by awarding her the equal and unthreatening status of 'one of the lads' as happened to Joan Clarke in Hut Eight at BP.⁶⁸

⁶³ Burman 'Gendering Decryption', p. 13.

⁶⁴ Burman 'Gendering Decryption', p. 13.

⁶⁵ Burman 'Gendering Decryption', p. 13.

⁶⁶ Mavis Lever worked in ISK. The ISK group of women were known as '*Dilly's Girls*' or by the even more derogatory term '*Dilly's Fillies*'. Batey, *Dilly*, pp. 105-117.

⁶⁷ Burman 'Gendering Decryption', p. 38.

⁶⁸ Joan Murray 'Hut 8 and naval Enigma, Part I', pp. 113-118.

The Second World War is often described as a period when women proved their ability to do ‘men’s jobs’, and to demonstrate their leadership skills.⁶⁹ However, this may be misleading; Margaret and Patrice Higonnet coined the term ‘gender displacement’, which the authors used the image of a double helix as illustration, shows the two strands, male and female, as co-existing in relation to one another.⁷⁰ During both World Wars, women moved into male-dominated jobs, but it is important to observe that in many cases this occurred because men had moved out of those jobs to join the military - in wartime, the male ‘ideal’.⁷¹ Men not in this position (not only civilians but also non-combatant servicemen) were considered less ‘masculine’.⁷² In actuality, they concluded, there was no difference in the relation between the genders – it was simply that the distinction had shifted.⁷³ Furthermore, it was made very clear that women’s new jobs were only ‘for the duration’; they were expected to leave once the war was over and the men returned.⁷⁴ This need to bring women into previously male-dominated roles was called ‘dilution’, and the women workers ‘dilutees’.⁷⁵ The fact that there even were such people as dilutees was completely dependent on the absence of men - but the control over the work, in terms of technical expertise and supervision (and naturally the higher-paid jobs) was retained by men.⁷⁶ This solution, largely directed by male trade unionists, meant that in practice little changed.⁷⁷

⁶⁹ Burman ‘Gendering Decryption’, p. 14.

⁷⁰ Margaret R Higonnet and Patrice L.R. Higonnet. ‘The Double Helix’ in *Behind the Lines: Gender and the Two World Wars*, ed. by Margaret R Higonnet et al (London: Yale University Press, 1987), pp. 31-47.

⁷¹ Burman ‘Gendering Decryption’, p. 14.

⁷² Burman ‘Gendering Decryption’, p. 14.

⁷³ Higonnet and Higonnet, ‘The Double Helix’, pp. 31-47.

⁷⁴ Denise Riley, *Behind the Lines: Gender and the Two World Wars*, ed. by Margaret R Higonnet et al (London: Yale University Press, 1987, pp. 260-271 (specifically p. 261).

⁷⁵ Burman ‘Gendering Decryption’ p. 14.

⁷⁶ Burman ‘Gendering Decryption’ p. 145.

⁷⁷ Helen Jones, ‘Women Health Workers: The Case of the First Women Factory Inspectors in Britain’, *The Society for the Social History of Medicine*, 1/2, (1988), 165-181 (pp. 166-167).

Similarly, it was seen as unthinkable to incorporate women as equals into the British fighting forces – the women’s services, such as WAAF, WRNS and ATS, remained auxiliary, which again upheld gender segregation.⁷⁸ Even in a national emergency, it was unacceptable for women to cross certain boundaries. Women were recruited to the Home Guard mostly in auxiliary posts, but some were initially given weapons training.⁷⁹ Their ‘military involvement’ was eventually banned in November 1941, the status quo of male ‘protector’ and ‘helpless’ female again being restored.⁸⁰

Throughout this thesis, there will be the frequent use of the terms discussed earlier here; ‘gender segregation’, both ‘vertical’ (where women and men do different kinds of work) and ‘horizontal’ (where women do less prestigious work within the occupational hierarchy); ‘gendering’ (the assignation of gender to a role, task or object), ‘regendering’ (the act of changing the gendering of something) and the concept of the ‘honorary man’ (a woman whose task is gendered male, leading to her being treated as a man within her work-group).⁸¹

1.4 Rationale of the research

As has been described above, female cryptanalysts have been few in number, and, especially during the Second World War, constituted one component within an integrated codebreaking organisation, mainly composed of women. This covered every aspect of decryption work from interception through cryptanalysis and contextualising to distribution. The rationale for a focus upon female cryptanalysts is twofold; first, in intelligence history, to correct the misconception that the work of female cryptanalysts was marginal and trivial. The second is in the context of gender history, to illuminate a classic example of females, empowered over time by educational

⁷⁸ Stone, ‘Creating a (gendered?) military identity’, p. 606.

⁷⁹ <https://theconversation.com/mums-army-the-forgotten-role-of-women-in-the-home-guard-54194> [accessed 7 April 2021].

⁸⁰ <https://theconversation.com/mums-army-the-forgotten-role-of-women-in-the-home-guard-54194> [accessed 7 April 2021].

⁸¹ Burman ‘Gendering Decryption’.

reform and societal change, and aided by the urgent demands of war, breaking down gender barriers against their acceptance into previously all-male roles at the intellectual summit of the organisation. However, this must be considered in the context of moving back into gendered roles once the emergency is past, and finding their role belittled when histories are written – an example of gender displacement, which should serve to inform women in such roles in comparable organisations in intellectually-based high-security work in the present day.

Most of the accounts of this era of British military and intelligence history, particularly pre-1938, have been written by men about men without the results being placed in gendered history.⁸² The published accounts of World War One codebreaking from 1923 onwards tend to describe Room 40, with Malcolm Hay's work on MI1(b) published posthumously in 1971.⁸³ Furthermore, the early-published accounts of BP also focussed upon specific male cryptanalysts who have understandably become more high profile.⁸⁴

In contrast the women have only gained a presence in more recent decades which has grown in parallel with a more questioning attitude to the previously gendered approach to history. The first published mention of the HushWAACs was not until 1967 with the publication of *A Short History of Queen Mary's Army Auxiliary Corps* by Julia Cowper; despite this, they remain a little-known aspect of First World War codebreaking.⁸⁵ No women have published their accounts from this period, although HushWAACs Mabel Peel and Gwendoline Watkins have posthumously had their respective diaries made available on the internet; accordingly all details come from scant recollections by male managers and archival records, and themselves do not paint a full picture.⁸⁶

⁸² Hoy, *400B*; James, *The Eyes of the Navy*; James, *The Sky was Always Blue*; Ewing, *The Man of Room 40*.

⁸³ Churchill, *The World Crisis*, 5 vols; Hay, *Valiant for Truth*.

⁸⁴ Examples include Hodges, *Alan Turing*; Greenberg, *Gordon Welchman*; Leavitt, *The Man who knew too much*.

⁸⁵ Julia Cowper, *A Short History of Queen Mary's Army Auxiliary Corps* (Aldershot: Women's Royal Army Corps Association, 1967).

⁸⁶ Gwendoline Watkins' Diary, National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020]. Mabel Peel:

With the shifted increase in feminism, combined with the release of the BP story, several women have subsequently published their accounts of this period, and a more balanced gendered approach has been found.⁸⁷

The present research delivers several insights of historical significance, showing that women were working on a much wider range of cryptographic tasks during the wartime periods than has previously been recognised. Several women in World War One cryptography were educated to university graduate level, although as women, while being able to study at degree level with their male counterparts, they were initially unable to graduate until the Sexual Disqualification Removal Act (1919). At Oxford University, for example, it had been possible for women to matriculate from the late 1870s but until 1920, they could not officially graduate.⁸⁸ The women of that period who went on to work in cryptography were usually fluent in one or more European languages, and their contribution was vital since codebreaking in World War One was essentially language based.⁸⁹

Later, during World War Two, mathematicians were recruited to help solve the machine-based codes; Joan Clarke was one such example, being a mathematical female cryptanalyst who worked at BP, and rose to deputy head of Hut Eight by the end of World War Two.⁹⁰

<https://nla.gov.au/nla.obj-526283243/view?sectionId=nla.obj-546951830&partId=nla.obj-526343034#page/n27/mode/1up> [accessed 13 July 2021]

⁸⁷ *We Kept the Secret: Enigma Memories*, ed by Gwendolyn Page (Wymondham: Geo. R. Reeve Ltd, 2002); Charlotte Webb, *Secret Postings: Bletchley Park to the Pentagon* (Redditch: BookTower Publishing, 2014); Gwen Watkins, *Cracking the Luftwaffe Codes: The Secrets of Bletchley Park* (Barnsley: Frontline Books, 2013).

⁸⁸ Sexual Disqualification Removal Act 1919: Carol Dyhouse. *No distinction of sex? Women in British universities 1870-1939* (London: UCL Press 1995), p. 170. Oxford University matriculation: <https://www.theguardian.com/gnmeducationcentre/2019/oct/08/october-1920-women-granted-full-membership-of-oxford-university> [accessed 3 October 2020] and <https://www.bodleian.ox.ac.uk/oua/enquiries/first-woman-graduate> [accessed 3 October 2020].

⁸⁹ Ferris, *Behind the Enigma*, p. 172.

⁹⁰ <https://bletchleypark.org.uk/roll-of-honour/1768> [accessed 7 April 2021] and Anthony J. Randall, *Joan Clarke: The Biography of a Bletchley Park Enigma* (No location available: The Cloister House Press, 2019).

During the period under analysis, it was generally impossible for women to attain the same employment level as their male counterparts due to lack of opportunity and gender prejudice. However, despite such prejudice, a few of the male cryptographers (for example, Dillwyn Knox) recognised the abilities of these women and utilised their skills. A number of these women had, in peacetime, been former students of the future male cryptographers; for the first time some men could recognise their female counterparts as equals and subsequently give these women the chance to prove their abilities in the crisis of national wartime.⁹¹

The research for this thesis specifically reveals that more women were involved in high-level cryptographic work during the twentieth century period than has been previously recognised. Throughout this period, women were working on both more complex (high-level) and relatively simple (low-level) aspects of cryptographic work; note that high-level cryptographic work denotes the level of encryption to be broken, not the importance of the message. This is significant to the understanding of the history of intelligence because currently the role of women in high-grade cryptographic work has essentially been omitted from official histories, arguably due to horizontal gendering.

The research will additionally provide a more detailed analysis of cryptographic terminology through the wartime periods. The meaning of terms such as ‘codebreaker’ and ‘decoder’ has changed significantly over time; today they are generally used interchangeably to mean any role related to the breaking of codes. Understanding this period in history requires us to fully understand what was meant by the terms at the time, and how they are used now. Specific case studies, such as that of Phoebe Senyard, who was transferred from the General Post Office (GPO)

⁹¹ Joan Clarke was a student under Gordon Welchman; Murray ‘Hut 8 and naval Enigma, Part I’, pp. 113-118.

to GC&CS in the early 1920s, shed a uniquely detailed light on our understanding of this field within its historical context.⁹²

Three quarters of the 8994 people employed at BP at its peak in January 1945 were women.⁹³ In addition to women who worked as cryptanalysts in the First World War, there is irrefutable evidence that some women worked continuously as cryptographers throughout this period from at least 1917, through both World Wars and beyond.⁹⁴ This research has also uncovered some women who worked in World War One's Room 40 and then returned to GC&CS probably as cryptographers.⁹⁵ The significance of these findings is that the omission of women cryptanalysts from published literature would seem to mistakenly indicate that women working in Room 40 and MI1(b) during World War One were merely undertaking clerical duties. Furthermore, a small number of women were also working as cryptanalysts during the latter part of World War One, two of whom continued with GC&CS. As very few detailed historical accounts of women exist in the public domain, this suggests that women have taken an unappreciated part in gendered historical accounts and a correction of this omission is significant for our understanding of this crucial period in British intelligence history.

1.5 Scope of the research

This research will show that women were working on a much wider range of cryptographic tasks during the wartime periods than has previously been recognised. The HushWAACs were recruited for their German language skills (some having university language degrees) with the intention of their being taught cryptanalytic skills, and some of whom went on to work for MI1(b) and

⁹² London, The National Archives (TNA) FO366/800. *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

⁹³ Johnson and Gallehawk, *Figuring It Out*, p. 10. Total number of men 2225, total number of women 6769.

⁹⁴ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 25 November 2020].

⁹⁵ Joan Musgrave Harvey – see CS1 for more detail.

GC&CS.⁹⁶ Women working in Room 40, such as Mary Nugent, Dorothy O'Connor, Rhoda Welsford and May Jenkin, all of whom were university educated, also offer significant supporting examples.⁹⁷ As stated, the women who went on to work in cryptography in the First World War were, in the main, fluent in German and other European languages, their contribution being vital as the breaking of book codes in World War One was heavily language based.

It was generally impossible for women to attain the same employment level as their male counterparts due to lack of opportunity and at times cultural prejudice. Some of the early male cryptographers, however, such as Hay, the Head of MI1(b), did recognise the abilities of these women and certainly utilised their skills; such as Claribel Spurling (see section 4.4.1).

1.6 Research aims and objectives

The aim of this thesis is to extend the current knowledge of women in code breaking roles from 1914 to 1946, by producing a comprehensive and detailed analysis of the women who were working in cryptanalysis during this period. It is also intended to create indicators that might be used to identify other women working in high-level cryptanalysis jobs. The specific objectives were:

1. To conduct a comprehensive review of the literature
2. To conduct a detailed analysis of the role of female cryptanalysts between 1914 and 1946
3. To establish evidence of women working at the same level as men during the 1914 to 1946 period
4. To provide definitions of the key roles and show how they changed over time

⁹⁶ Gwendoline Watkins' Diary, National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

⁹⁷ Cambridge, Churchill Archives, GRB/0014/CLKE/3.

Six case studies will be used to specifically provide a detailed analysis and evidence that women were working at the same level of men. These case studies will be included within the applicable chapters for the context of the piece. The women were chosen because of both their relevance to the research and of the availability of data about them.

1.7 Structure of the thesis

This thesis is divided into five main parts apportioned into eight chapters:

The first part comprises ***Chapter One***, the Introduction, presented above, and illustrating the context, aims, objectives, scope, and rationale of the research.

The second part consists of the Literature Review which forms ***Chapter Two***. This review describes and summarises the role of women in the lead up to the First World War what has already been published about female cryptanalysts between 1914 and 1946 whilst discussing the gendered historiographical setting within which this is placed. The chapter illustrates how ideas and concepts, specifically with regards to women and the options available to them in education, employment, and prospects, changed over the 30-year period of this study. The review then considers chronologically those male cryptanalysts who are either the subject of books or published authors themselves and compares their treatment to the portrayal of their female counterparts in the literature. It will finally consider how BP is considered today, why it is still relevant, and how it continues to impact on people's imagination with specific reference to the role that women played there.

The third part, ***Chapter Three***, sets out the Research Methodology, discussing the approaches used to research this thesis, the potential pitfalls of these approaches and steps taken to alleviate those vulnerabilities. It will in particular consider the approaches, pitfalls and alleviations relevant to the testimony of close family and friends who worked for Room 40 or GC&CS, and to an

interrogation of the Bletchley Park Roll of Honour (BP RoH) which provides an additional layer of detail on many of the people who worked for GC&CS during the Second World War.

The fourth part, consisting of *Chapters Four, Five* and *Six*, comprises the field research, analysis, and results of archival sources in a chronological view of female cryptanalysts. Considering each chapter in turn:

- *Chapter Four* details Britain's World War One codebreaking facilities, namely Naval Intelligence - Room 40, and Military Intelligence - MI1(b) and HushWAACs. It will identify the women who are confirmed cryptanalysts and provide the case studies of linguist Joan Musgrave Harvey (CS1), Emily Anderson (CS2), and World War One female cryptanalyst Wendy White (CS3), who arguably can be used as a measure against which other female cryptanalysts can be potentially identified.
- *Chapter Five* considers the inter-war period, both organisationally in terms of the creation of GC&CS and the impact this had on peacetime codebreaking, and technologically, detailing those changes in technology which brought about changes in cryptanalysis. The chapter uses the case study of decoder and secretary Phoebe Senyard (CS4), as proof that women who started as decoders did not automatically later become cryptanalysts, indicating that an early 'decoder' was not working in an exclusively cryptanalytic role.
- *Chapter Six* assesses the changes brought about by the start of World War Two, describing how GC&CS moved to Bletchley and adapted to the changes in technology that necessitated the increase in individuals working for the organisation. It sets out the case studies of cryptanalysts Marie Rose Egan (CS5) and Mavis Lever (CS6), both of whom were female cryptanalysts during this period at BP, and in Marie Rose's case, also at the Combined Bureau Middle East (CBME), Cairo.

The fifth part comprises Chapters Seven and Eight.

- ***Chapter Seven*** brings together an analysis of the resulting information and offers terminological definitions. It seeks to define the changes in terms from 1914 and how this compares to the terms in use by 1939 throughout the Second World War and in modern consciousness. It will also consider potential indicators that could be used by future researchers to identify other likely female cryptanalysts.
- ***Chapter Eight*** extracts the conclusions of the thesis, highlighting the contribution to knowledge that this thesis has achieved and examining the cryptanalytic roles that were available to women showing how this arguably put these women ahead of their time and how this continues to impact today. The chapter also offers suggestions for future research.

The next chapter is the Literature Review, which will place this thesis in context of published accounts, analysis, and discourse.

Chapter Two: Literature Review

‘Intelligence does not win wars: but it does shape their course...’

John Robert Ferris¹

2.1 Introduction

Since the first mention of the Enigma secret by Gustave Bertrand in 1973², published literature on both codebreaking in the first half of the twentieth century and on gender discourse has significantly increased in volume. In terms of codebreaking, there has been a greater focus upon BP and the Second World War, studies of cryptanalysis in the First World War being, until the last decade, far fewer in number. Gender discourse, perhaps stimulated in popular literature by Germaine Greer’s ‘The Female Eunuch’,³ has also developed to consider questions of gender related to warfare. The greater emphasis having been upon gendered experiences of the Second World War rather than the First until, once again, a rebalancing in the last decade, exemplified by Susan Grayzel and Tammy Proctor’s ‘Gender and the Great War’.⁴

There have been a limited number of studies examining in detail the crossing points of cryptanalytical studies and gender discourse. The most salient being sections of Christopher Smith’s ‘The Hidden History of Bletchley Park’⁵, itself building in this area upon Annie Burman’s unpublished MA dissertation ‘Gendering Decryption – decrypting gender’⁶, both explicitly

¹ The *British Army and Signals Intelligence during the First World War*, ed by John Ferris (Stroud: Army Records Society, 1992), p. 1.

² Gustave Bertrand, *Enigma ou la plus grande énigme de la guerre 1939-1945 (Enigma: the Greatest Enigma of the War of 1939-1945)* (Paris: Librairie Plon, 1973).

³ Germaine Greer *The Female Eunuch* (London: MacGibbon & Kee, 1970, repr. London: 4th Estate, 2020), Kindle ebook.

⁴ *Gender and the Great War* ed. by Susan Grayzel and Tammy Proctor (Oxford: Oxford University Press, 2017).

⁵ Christopher Smith, *The Hidden History of Bletchley Park: A Social and Organisational History, 1939-1945* (Basingstoke: Palgrave Macmillan, 2015).

⁶ Burman ‘Gendering decryption’.

focussing upon Bletchley Park, and Tammy Proctor's 'Female Intelligence'⁷, which covers both World Wars and extends to all aspects of intelligence work. Burman's dissertation is the first work to focus entirely on BP cryptanalysis and gender but is written from secondary sources; the present thesis is the first to be written from primary sources.

This thesis considers cryptography and the role of women working in cryptanalysis over the first half of the twentieth century, a period in which encryption evolved rapidly from the book codes of the First World War and earlier, to the increasingly complex machine codes typified by the German Enigma and *Geheimschreiber* devices. In turn, each new method of encryption demanded new approaches to decryption, and consequently new skills from the cryptanalysts. However, older, simpler codes did not cease to exist, but continued in use in parallel with the newer; David Edgerton has noted this phenomenon in wider areas⁸, as Smith has noted it in reference to BP, where the mix of skills demanded became ever more complex in a very fast-moving situation⁹.

One consequence of this complexity is that an analysis of gendering and women's roles over the wider period requires an approach which allows conclusions to be clearly drawn, if it is not to become confusing in its detail. In this review, the researcher has therefore chosen to adopt a framework derived from human resources planning (previously termed 'manpower planning') which considers, on the one hand, the demand for human resources, in terms of both numbers and competencies, and on the other, the supply of human resources, both numbers and competencies, to meet that demand.¹⁰ For each of these aspects, there will be considered the impact of gendering; for example, if decryption is considered to require 'logic' as opposed to

⁷ Proctor, *Female Intelligence*.

⁸ David Edgerton, *The Shock of the Old: Technology and Global History since 1900* (Oxford: Oxford University Press, 2006).

⁹ Smith, *The Hidden History of Bletchley Park*, p. 81.

¹⁰ Peter Reilly *Human Resource Planning: An Introduction* (Brighton, Institute for Employment Studies, 1996), p. 2 and <https://www.i-admin.com/blog/key-differences-human-resources-planning-vs-manpower-planning/> [accessed 21 May 2021].

‘emotion’, and if women are deemed to make decisions ‘emotionally’, then it is likely that the outcome will be that fewer roles will be considered ‘suitable for women’. Against this reduced demand, gendering limiting the supply of suitably qualified women becomes a self-fulfilling prophecy, for example the ability to attain a university degree.

2.2 Pre-1914; role requirements and gender

2.2.1 Decryption in the UK pre-1914

Decryption is one aspect of intelligence; it is in fact an aspect of the processing of Comint, communications intelligence, which is itself one category of Sigint, signals intelligence, of which a second category is Elint, electronic intelligence, the discovery and identification of such non-verbal transmissions as radar and telemetry. There are many other ways of deriving intelligence about an enemy, and two such are Imint, image intelligence, the study of photographs and other images as may be gained from satellites, aerial, or more recently drone cameras, and Humint, human intelligence, gained by human agents. The role requirements for gaining and processing intelligence in each such category varies significantly; the attributes necessary for gaining Humint are clearly different in some respects from those for intercepting radio messages.

In the years prior to the First World War, Humint was the particular field of diplomacy, the aim being to discover the intentions of the enemy from human interaction, which might be from formal meetings or from informal and social gatherings; one obvious requirement was of course the ability to speak the language of the nation being targeted.

The British Foreign Services were heavily male-gendered, and the gaining of Humint by women was perceived as a role comparable to prostitution.¹¹ Arguably, if a woman does not have a ‘good’ image, she is automatically considered a prostitute¹² and, as espionage agents are inherently

¹¹ Proctor, *Female Intelligence*, p. 12.

¹² Proctor, *Female Intelligence*, p. 125.

unreliable and disloyal, they could therefore be considered untrustworthy. Furthermore, as Proctor explains, women could pass unnoticed in areas of private domesticity as servants, wives, and prostitutes¹³, spheres that were more accessible to a woman in contrast to the male 'James Bond-esque' stereotype.

Women as 'she-intelligencers' are not a new phenomenon. As early as the beginning of the 17th Century, Alexandrine of Rye-Varax, Countess of Taxis took control of the Holy Roman Empire's post, and therefore all the messages across the continent, following her husband's death.¹⁴ When the Stuart agent in Brussels, Baltazar Gerbier, suspected his post was being read, he assumed that it must be one of her employees rather than her, for her sex 'automatically placed her above suspicion.'¹⁵ Despite writing in cypher being treasonous, it seemed that during this period, the execution of spies for that reason was extended only to men and women for once possessed an 'advantage', if that is the correct term.¹⁶

The gaining of Comint from interception of messages has a long history. Sending messages in code did not, of course, begin with the 20th century; indeed, a variety of coding methods existed before 1900. Substitution cyphers have been in use since at least Ancient Egyptian times¹⁷ and in Ancient Greece¹⁸. Julius Caesar was known to use cyphers for military purposes, in what is known as a Caesar shift¹⁹. It is perhaps important to explain the difference between a code and a cypher: "*Technically, a code is defined as substitution at the level of words or phrases, whereas a cipher is defined as*

¹³ Proctor, *Female Intelligence*, p. 124.

¹⁴ Nadine Akkerman, *Invisible Agents: Women and Espionage in Seventeenth-Century Britain* (Oxford: Oxford University Press, 2018), Kindle ebook, p. 1.

¹⁵ Akkerman, *Invisible Agents*, p. 1.

¹⁶ Akkerman, *Invisible Agents*, pp. 3-4.

¹⁷ David Kahn, *The Code-Breakers: The Comprehensive History of Secret Communication from Ancient Times to the Internet* (New York: Scribner, 1967, repr. 1996), p. 71.

¹⁸ Simon Singh *The Code Book: The Secret History of Codes & Code-breaking* (London: Fourth Estate, 2000), p. 9.

¹⁹ <https://www.sciencedirect.com/topics/computer-science/caesar-cipher> [accessed 1 July 2021].

substitution at the level of letters”²⁰, although Simon Singh also points out that “*The system should have some built-in flexibility, known as a key*”.²¹ Today the terms are used interchangeably; breaking a cypher is known as codebreaking, and any cypher is called a code and vice versa; Morse Code for example is technically a cypher. Figure 2.1 from Singh illustrates how the sciences come together.

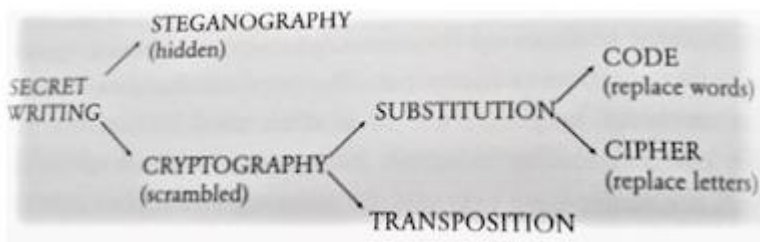


Figure 2.1 *The science of secret writing and its main branches*²²

Historically, it is important to make a distinction between the two, because at different times in history different systems were in use. The Enigma machine, predominantly in use during the Second World War is a cypher machine, whilst the First World War used codes which were accessed through books which essentially looked like a dictionary. Different types of these codes were in use for centuries before the First World War.

One of the most famous cyphers was created in the 16th century by Blaise de Vigenère. It was a ‘square’ based on the Caesar shift allowed a system of 26 by 26 letters to be used in substitution see Figure 2.2.²³ The Vigenère square allows the user a choice of 26 different encipherments to send a secret message using a pre-agreed line, or lines of the Vigenère square, it was known contemporarily as *le chiffre indéchiffrable* which literally means ‘the unbreakable cypher’.²⁴ It was more secure than the Caesar shift which only allowed one shift of letters (A-B, B-C, C-D through to Y-Z, Z-A), in other words the use of just the first line of the Vigenère square. The Vigenère square

²⁰ Singh, *The Code Book*, p. 30.

²¹ Singh, *The Code Book*, p. 382.

²² Singh, *The Code Book*, p. 30.

²³ Singh, *The Code Book*, p. 46.

²⁴ <https://www.britannica.com/topic/Vigenere-cipher> [accessed 1 July 2021].

allowed a Caesar shift plus one, Caesar shift plus two, through to 26. However, a code word, or ‘key’, formally agreed between both sender and receiver, was needed to show the starting point.²⁵ This was a feature of many later cyphers.

Plain \ Key	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
a	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
b	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a
c	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b
d	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
e	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d
f	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e
g	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f
h	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g
i	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h
j	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i
k	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j
l	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k
m	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l
n	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m
o	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n
p	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
q	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
r	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
s	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
t	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
u	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
v	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
w	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
x	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
y	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x
z	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y
a	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

Figure 2.2 A Vigenère Square²⁶

Further to the changes in cyphers, methods of transmission also expanded using humans, mammals or birds as carriers, and through flag and semaphore to heliograph, electric telegraph, and more recently to wireless using Morse code.²⁷ While intercept was possible for all such means, telegraph and wireless transmissions posed a particular challenge to security as they were particularly liable to interception either physically by wiretap for telegraphy, or wireless intercept by listening stations (‘Y’ stations, the term being derived from wireless intercept = W.I. = ‘Y’).²⁸

²⁵ Singh, *The Code Book*, pp. 48-51.

²⁶ Singh, *The Code Book*, p. 48.

²⁷ Kahn, *The Codebreakers*, p. 189.

²⁸ Johnson, *The Evolution of British Sigint*, p. 46.

In times of peace, pre-First World War, the interception of messages was not a complex process – the GPO controlled the bulk of the transatlantic cables on which most messages were passed, and copies could be provided to the Government on request.²⁹ This did not apply to the German cable system, and hence British war plans were to cut those cables as soon as possible, forcing Germany to use wireless transmission which was easily intercepted.³⁰ However, messages by cable or by wireless were rarely in plain text, which means those employed to read them needed to be language experts.

For years prior to 1914, messages with commercially valuable information were transmitted using ‘book codes’, as illustrated in Chapter One. The perfect solution to these codes was of course obtaining of the relevant codebook, without which a laborious process of ‘book-building’, piecing together the totality of a codebook from messages broken by other means, for example by comparing messages sent from the same originator using simpler codes, or from betrayal, bribery, or other compromise. Without further encryption, the requirement was for linguists to identify a message emerging from the code as received, and add the result to the book, a process known as ‘book building’ in the UK, and ‘bookmaking’ in the USA.³¹

However, the code could be made more complex by superencipherment - adding a number or numbers where the code was transmitted numerically and transmitting the result. The intended recipient would then strip off the known superencipherment and decode the message. The job requirement was therefore more complex, requiring basic mathematics and the ability to perceive where a result was being obtained by identifying the original message coding and its meaning.

²⁹ <https://atlantic-cable.com/stamps/Other/indexA.htm> [accessed 1 July 2021].

³⁰ Peter Matthews, *Sigint; The Secret History of Signals Intelligence in the World Wars* (Stroud: The History Press, 2013, repr. 2018), pp. 40-41.

³¹ Kahn, *The Code-breakers*, p. 817.

In many circumstances, particularly on a battlefield, simpler methods of coding continued in use for the thousands of messages being transmitted each day. Here the requirement was again for language specialists, and an ability for trying various known methods of breaking the simpler codes.

Absolute security was a prime requirement for a cryptanalyst and if it became known that a code had been broken, either it would be changed or, worse, used to transmit false information.³² One way that the codebreaking was protected was through the use of reconnaissance missions; ‘spotter’ planes were sent out to known locations so that Axis powers believed that was how their ship locations were known thus protecting the codes. As John Tiltman points out “*Any cipher system is a compromise between security and practicability.*”³³ Such security was likely to restrict recruitment to those thought to be ‘reliable’, in practice recruits from the families of people already working in, or well known to, the senior levels of the Civil Service.

In the relatively peaceful pre-1914 UK, there was seen to be a limited requirement for codebreaking, and the gaining of intelligence was gendered as a male role. Women were considered to be ruled by their emotions, and reliant on intuition rather than their brains (as men were deemed to be) and therefore could not be considered fundamentally secure.³⁴ Not only this, but as ‘over-emotional’ individuals, women would be susceptible to sexual desire, so the implication being that women overall would not make ‘good agents’ (that is, not as good as men).³⁵

2.2.2 Status of women

The status of women in society prior to the First World War had its legal basis in the Anglo-Norman doctrine of ‘coverture’³⁶ which persisted through much of the Victorian period, whereby

³² Ferris, *Behind the Enigma*, pp. 2-3.

³³ John F. Clabby, *Brigadier John Tiltman: A Giant among Cryptanalysts* (Fort George G. Meade: Centre for Cryptologic History, National Security Agency, 2007).

³⁴ Toy and Smith, *Women in the Shadow of War*, p. 78.

³⁵ Toy and Smith, *Women in the Shadow of War*, p. 78.

³⁶ <https://www.britannica.com/topic/coverture> [accessed 13 June 2021].

women were defined according to their marital status as either ‘feme sole’ – unmarried, and having legal existence to be able to contract and to own property³⁷ – or ‘feme covert’ - married, and, as having no legal existence, unable to contract or own property³⁸, since the male, the husband, possessed all legal rights in a married relationship. During this period and across much of British society, which was patriarchal and roles within a married relationship were heavily gendered; the man was expected to be the provider and, to that end, to go to work; the woman’s role was seen as running the household, putting meals on the table, and bearing and rearing children. At middle and upper levels of society, being ‘in charge of the family home’ might itself be a major managerial role over domestic servants, as exemplified in the works of Mrs Beeton.³⁹ In working class homes, the extra burden of the wife herself having to earn money for the household could well be necessary, and this might take the shape of working with machinery in a mill or factory, of taking in work from washing to sewing, or industrial piecework, of raising animals (not only on farms or small-holdings, but not infrequently inside the slum housing occupied by the family).⁴⁰ It was not until the passage of the four Married Women’s Property Acts of 1870, 1882, 1884 and 1893⁴¹ that women could inherit and hold property, earn money, and legally sue in their own name, thereby becoming equal in law to unmarried women – although the middle and upper classes of society still saw marriage, rather than a career, as appropriate for women, and the ‘marriage bar’ which applied in Civil Service and commercial enterprises significantly circumscribed female careers.⁴² The bar was not abolished until October 1946 for the Home Civil Service and 1973 for the Foreign

³⁷ <https://www.britannica.com/topic/feme-sole> [accessed 13 June 2021].

³⁸ <https://www.oxfordreference.com/view/10.1093/oi/authority.20110803095814272> [accessed 13 June 2021].

³⁹ Isabella Beeton, *Mrs Beeton’s Book of Household Management* (London: S.O. Beeton Publishing, 1861).

⁴⁰ <https://www.encyclopedia.com/history/news-wires-white-papers-and-books/domiciles-housing-europeans> [accessed 1 July 2021].

⁴¹ <https://www.parliament.uk/about/living-heritage/transformingsociety/private-lives/relationships/overview/propertychildren/> [accessed 13 June 2021].

⁴² Helen Glew, ‘Maiden, Whom We Never See’: Cultural Representations of the “Lady Telephonist” in Britain ca. 1880-1930 and Institutional Responses’, in *Information & Culture*, 55/1, (2020), 30-50 (p. 31).

Service,⁴³ and there were still men who disagreed when the bar was removed, bachelors showing disdain for '*babies*' and '*all that entailed*'.⁴⁴

A single woman, whether widow or unmarried 'spinster', could, of course, legally contract and therefore own and run a business, as indeed many did – some even in 'male' gendered trades, for example Hannah Shaw owning and operating the firm of Hannah Shaw & Son manufacturing magnets in Sheffield's highly 'male' steel industries⁴⁵ - but the Victorian ideal was for the woman to be in a marital relationship, and hence legally non-existent other than as her husband's chattel.

Opportunities for developing skills for work in general were therefore significantly circumscribed by gender and by social class, the more so for roles relating to intelligence in general, and for cryptanalysis in particular. Intelligence could be defined as within the purview of the Police within the UK or of the Foreign Office if overseas; or, given that intercept of messages might be concerned, within the orbit of the GPO which held the monopoly for physical post, telegraphs, and telephones. All these functions were aspects of the Civil Service and Public Service, and the advances made here in the employment of women are considered below.

More generally, the ability to intercept and to interpret intercepted messages in a foreign language would require literacy in that language, such as might be gained from formal education or, if from the middle- and upper-class, from acquiring such 'female' accomplishments as languages (French, Italian, and German) and by staying with families in Continental Europe. It should be noted also that from the later Victorian period many German emigrants developed businesses, small to large,

⁴³ <https://www.civilservant.org.uk/women-history.html> [accessed 29 June 2021].

⁴⁴ Meta Zimmeck, 'Strategies and Stratagems for the Employment of Women in the British Civil Service, 1919-1939', in *The Historical Journal*, 27/4, (1984), 901-924 (p. 904).

⁴⁵ Nina Baker, '*Magnetic Hannah; Sheffield's Magnet Makers*' in Defence Electronics History Society e-Newsletter (eDEN 99, October 2020), pp. 102-107.

in the UK and so at least some working-class people could speak German, but in wartime this was likely to be regarded with suspicion rather than as a useful skill.⁴⁶

Several roles were open to unmarried women before the outbreak of the Great War. Women could become nurses but ‘*could never become doctors*’.⁴⁷ Women were limited to the roles that were open to them, although some did carry out roles more specialised than as nursing, they were not qualified to identify themselves as such in the same way as their male counterparts; midwifery, ‘surgeonesses’, physicians and apothecaries were all roles held by women but they did so under censure.⁴⁸ It is important to add, though, that many women felt more comfortable to visit other women to discuss problems of a personal nature than see a male doctor. It was not until the Medical Act of 1858 which “*established a register of qualified practitioners and regulated the bodies allowed to examine them*”, previously women had worked “*without censure as ‘surgeonesses’, physicians, midwives and apothecaries*”⁴⁹ Furthermore, a small number of female mathematicians were employed by the Admiralty in 1917 to work on aircraft structural issues.⁵⁰ These three pioneering women were Hilda Hudson, Letitia Chitty and Beatrice Cave-Browne-Cave.⁵¹ Hilda Hudson was to “*mentor the group of women that would become an essential cog in the wheel of the Stressing Section of the Structures office*.”⁵² The women were part of the Technical Section of the Admiralty Air Department, but they were not the only women to carry out this type of work, merely the first.⁵³ This illustrates that female mathematicians did exist but they had no place working in cryptography at this time.

⁴⁶ <https://www.thehistoryoflondon.co.uk/the-german-community-in-london-during-the-19th-century/> [accessed 1 July 2021].

⁴⁷ Jane Robinson, *Ladies Can't Climb Ladders: The Pioneering Adventures of the First Professional Women* (UK, Penguin Random House, 2020, repr. London: Black Swan, 2021), Kindle ebook p. 41.

⁴⁸ Robinson, *Ladies Can't Climb Ladders*, p. 41.

⁴⁹ Robinson, *Ladies Can't Climb Ladders*, p. 41.

⁵⁰ Tony Royale, *The Flying Mathematicians of World War I* (London: McGill-Queens University Press, 2020), p. 148.

⁵¹ Royale, *The Flying Mathematicians*, p. 148.

⁵² Royale, *The Flying Mathematicians*, p. 155-156.

⁵³ Royale, *The Flying Mathematicians*, p. 148.

The female telephone operators of the late 19th century were predominantly white, lower-middle class and from urban areas.⁵⁴ The work was regarded as suitable for their sex as it was “*less important, more routine and more repetitive*”.⁵⁵ Telephony was considered a suitable role for women because they were ‘generally shielded’ from the public eye and under a patriarchal management.⁵⁶ One of the requirements for telephony work (by both the GPO and national telephone companies) was that the women had good diction, with a clear and ‘accent-less’ voice.⁵⁷ This meant that women with a strong accent were effectively barred from the work or were forced to attend classes to remove their accents, if they were so inclined. In other words, the roles were only open to middle class women with London or home county accents.⁵⁸ Known as the ‘hello girls’⁵⁹, generally those women employed were overwhelmingly white.⁶⁰ As the women were ‘unseen’, only heard, an image emerged of “*flighty, ditsy, inefficient, and gossipy*” female telephonists.⁶¹ Note the gendered description, not used to describe the male telephonists despite equal training, and the assumptions that were made solely on the basis of a woman’s voice.⁶² Furthermore, the role of telephonist was essentially gendered female from its inception⁶³, arguably leading to gendering the telephone instrument as female too. In a noteworthy parallel, some adverts emerged in the USA in 1914 promoting the ‘time and money saving’ aspect of telephones to farmers, which was clearly

⁵⁴ Glew, ‘Maiden whom we never see’, p. 31.

⁵⁵ Glew, ‘Maiden whom we never see’, p. 31.

⁵⁶ <https://ir.uiowa.edu/cgi/viewcontent.cgi?article=4960&context=palimpsest> p. 5 [accessed 1 July 2021].

⁵⁷ Glew, ‘Maiden whom we never see’, p. 33.

⁵⁸ Glew, ‘Maiden whom we never see’, p. 33.

⁵⁹ <https://www.sciencemuseum.org.uk/objects-and-stories/goodbye-hello-girls-automating-telephone-exchange> [accessed 1 July 2021].

⁶⁰ Glew, ‘Maiden whom we never see’, p. 34.

⁶¹ Glew, ‘Maiden whom we never see’, p. 36.

⁶² Glew, ‘Maiden whom we never see’, p. 36.

⁶³ Glew, ‘Maiden whom we never see’, p. 36.

encouraging use by men.⁶⁴ Men did work as telephonists but usually at night, a ‘male’ work time, and so were described in more neutral language.⁶⁵

2.2.3 University education

The steps taken in British society towards women gaining education were extremely gradual; the process began in the 1840s on the basis that if women were to educate their children, they themselves needed a solid education. In 1849 Bedford College, London, opened as the UK’s first higher education college for women,⁶⁶ and a year later, North London Collegiate School was the first school opened in England to offer girls the same educational opportunities as boys.⁶⁷ The Taunton Commission said, in the 1860s, that men and women had the same mental capacity as men⁶⁸, but an education was affordable only in certain areas and only by the more affluent.⁶⁹ By 1868, there were only 14 ‘endowed schools for secondary instruction of girls’.⁷⁰ The following year Girton College, Cambridge, opened the first residential college for women in the UK⁷¹, followed by Oxford’s Lady Margaret Hall in 1879.⁷² The first woman to receive a degree from Lady Margaret Hall College was Janet Mary Gordon in 1905, who had to journey to Trinity College, Dublin to be awarded the degree as women were not awarded Oxford degrees; Gordon became the first of several so called ‘Steam-boat Ladies’.⁷³ It was only in 1920, that a new University statute allowed women full university membership; the first graduation ceremony saw 40 women

⁶⁴ <https://ir.uiowa.edu/cgi/viewcontent.cgi?article=4960&context=palimpsest> p. 7 [accessed 1 July 2021].

⁶⁵ Glew, *Maiden whom we never see*, p. 36.

⁶⁶ Dyhouse, *No distinction of sex?* p. 38.

⁶⁷ <https://www.nlcs.org.uk/about-nlcs/history-of-the-school/history-of-the-school> [accessed 13 June 2021].

⁶⁸ <http://www.educationengland.org.uk/documents/taunton1868/taunton1.html> p. 553 [accessed 13 June 2021].

⁶⁹ <http://www.educationengland.org.uk/documents/taunton1868/taunton1.html> p. 16 [accessed 13 June 2021].

⁷⁰ <http://www.educationengland.org.uk/documents/taunton1868/taunton1.html> p. 565 [accessed 13 June 2021].

⁷¹ <https://www.girton.cam.ac.uk/pioneering-history> [accessed 13 June 2021].

⁷² <https://www.lmh.ox.ac.uk/timeline-our-history> [accessed 13 June 2021].

⁷³ <https://www.lmh.ox.ac.uk/timeline-our-history> [accessed 13 June 2021].

graduate.⁷⁴ The first woman to obtain a Scottish medical degree was Marion Gilchrist in 1894 at Queen Margaret College.⁷⁵ When Birmingham University presented the first female student on the degree day progression, to Joseph Chamberlain the records show he was met with shouts from the male undergraduates of “Go on, Sir, kiss her.”, although it is recorded that Chamberlain ‘did not oblige’, it can be said with reasonable certainty that male undergraduates would not have experienced the same level of harassment.⁷⁶

Certificates of proficiency for ‘female’ candidates were introduced at the University of London in 1867⁷⁷, and a year later a further charter ensured that women could study at university⁷⁸ – the first four women in the UK to gain BA degrees did so at the University of London in 1881⁷⁹. It is worth noting that these women were congratulated not on their academic accomplishments, “*but because they had sewn their own very attractive academic gowns, and chosen such alluring colours for the hood.*”⁸⁰ By 1878 the University of London allowed women to matriculate in most subjects including medicine.⁸¹

In 1881 women were allowed to take the Cambridge Mathematical Tripos exams (after Charlotte Scott was unofficially ranked as eighth wrangler).⁸² Scott’s omission from the official list caused a furore and led to a university vote ranking women side by side with men in 1881.⁸³ Furthermore, “*In 1885 she received her D.Sc. from the University of London, becoming one of the first British women to receive*

⁷⁴ <https://www.lmh.ox.ac.uk/timeline-our-history> [accessed 13 June 2021].

⁷⁵ Dyhouse, *No distinction of sex?* p. 17.

⁷⁶ Dyhouse, *No distinction of sex?* p. 17.

⁷⁷ <https://www.british-history.ac.uk/vch/middx/vol1/pp315-344> [accessed 13 June 2021] p. vi.

⁷⁸ <https://www.british-history.ac.uk/vch/middx/vol1/pp315-344> [accessed 13 June 2021] p. vi.

⁷⁹ Robinson, *Ladies Can’t Climb Ladders*, p. 274.

⁸⁰ Robinson, *Ladies Can’t Climb Ladders*, p. 274.

⁸¹ Robinson, *Ladies Can’t Climb Ladders*, p. 48.

⁸² <https://www.lib.cam.ac.uk/women-of-cambridge/charlotte-scott> [accessed 13 June 2021].

⁸³ <https://www.lib.cam.ac.uk/women-of-cambridge/charlotte-scott> [accessed 13 June 2021].

a *doctorate*.⁸⁴ Another noteworthy woman was Philippa Fawcett who was the first to achieve the highest mark of all candidates for Part I of the Tripos at Cambridge in 1890, only nine years after women were first considered part of the list.⁸⁵ By 1900 there were some 30 fee-paying boarding schools for women with an increasing focus on academic excellence rather than domestic accomplishments, and finally in 1908, Edith Morley became the first woman admitted to a Professorship, at Kings College, London.⁸⁶

Women begin to enter professions despite resistance from men; the ‘Edinburgh Seven’ were the first female students at any British university to matriculate as medical undergraduates in 1869 at the University of Edinburgh but were unsuccessful in their struggle to graduate and qualify as doctors - in fact, it took another 150 years before the University of Edinburgh allowed them to (posthumously) become graduates.⁸⁷

In 1874 the London School of Medicine for Women, the first medical school in Britain to train women was founded, with medical examining bodies given the right to certify women in 1876.⁸⁸ However, it was also necessary for the pioneering women to graduate and establish hospitals and nursing homes for the newer students to complete their studies, all of which took time.⁸⁹

Further to the increase in access to academic courses, it was also possible to consider for the first-time other roles which had previously been unobtainable. At a managerial level, women became factory inspectors, a post which they were excluded from until 1893.⁹⁰ Arguably these ‘middle-manager’ posts could be compared to later roles that women in cryptography attained (Lady

⁸⁴ <https://www.lib.cam.ac.uk/women-of-cambridge/charlotte-scott> [accessed 13 June 2021].

⁸⁵ <http://www.diverse.cam.ac.uk/stories/fawcett/> [accessed 13 June 2021].

⁸⁶ <https://www.kcl.ac.uk/celebrating-legacy-of-englands-first-female-professor> [accessed 13 June 2021].

⁸⁷ <https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-47814747> [accessed 13 June 2021].

⁸⁸ Robinson, *Ladies Can't Climb Ladders*, p. 32.

⁸⁹ Robinson, *Ladies Can't Climb Ladders*, p. 32.

⁹⁰ Helen Jones, ‘Women Health Workers’, p. 165.

Hambro for example, see Chapter Four). At the lower levels, women became telephonists⁹¹, joined the civil service⁹², or the military services⁹³, all professions in which women became permanent fixtures by the mid-20th century.

The women who joined the military services mostly did so as auxiliaries. This is worth further clarification; they were not considered full members of the service, but as providing supplementary support to the male services. This perspective did not change until after the Second World War. In the Army; for example, QMAAC were firmly listed as volunteers in the First World War, and the ATS were not granted full military status until April 1941.⁹⁴ The roles available for the ATS recruits were in 1938 limited to female gendered roles, cooks, clerks, orderlies, store women and drivers, but as the war developed there were over one hundred different roles filled by women, including operating anti-aircraft batteries.⁹⁵ By the end of World War Two there were approximately 250,000 women who had served in the ATS (including the future Queen Elizabeth II) and, having proven their worth, the ATS were absorbed into the Women's Royal Army Corps (WRAC) as a permanent unit in 1949.⁹⁶ In the Navy, the WRNS were reformed in April 1939 for shore-based jobs; by 1943 there were 74,000 WRNS both in the UK and overseas⁹⁷ but they were not fully integrated into the Navy until 1993⁹⁸. The WAAF were founded in June 1939 to 'free-up RAF personnel for front-line duties' and grew to 182,000 members by 1943.⁹⁹ These statistics

⁹¹ Glew, *"Maiden, Whom We Never See"*.

⁹² Zimmeck, *Strategies and Stratagems*.

⁹³ Lucy Noakes, *Women in the British Army: War and the Gentle Sex, 1907-1948* (Abingdon: Routledge, 2006).

⁹⁴ <https://www.nam.ac.uk/explore/auxiliary-territorial-service> [accessed 29 June 2021].

⁹⁵ <https://www.iwm.org.uk/history/the-vital-role-of-women-in-the-second-world-war> [accessed 29 June 2021].

⁹⁶ <https://www.nam.ac.uk/explore/auxiliary-territorial-service> [accessed 29 June 2021].

⁹⁷ <https://www.iwm.org.uk/history/the-vital-role-of-women-in-the-second-world-war> [accessed 29 June 2021].

⁹⁸ <https://wrens.org.uk/history/> [accessed 29 June 2021].

⁹⁹ <https://www.iwm.org.uk/history/the-vital-role-of-women-in-the-second-world-war> [accessed 29 June 2021].

show that there were significant numbers of women working in the forces, but they were only considered ‘temporary’, ‘for the duration of the war’.

Education was an important and necessary achievement of the women who worked in the cryptographic organisations of the British government and military in the early to mid-twentieth century. As women had shown they could be logical rather than emotional, by attaining ‘masculine’ degrees in mathematics rather than languages, which were considered more feminine. Some of the women who worked in Room 40 did have language degrees, being called ‘Lady Translators’ by William Clarke.¹⁰⁰ However, if this is comparable to other civil servant roles this is likely to be women “*graded in a special class separate from the men...*”¹⁰¹ Furthermore, women of a higher social class were considered more discreet and trustworthy and therefore more likely to be recruited to work in such secret organisations. Although it cannot be said to extend to all, several of the women in the Admiralty’s Room 40 were from a higher social class; Lady Sybil Hambro, and Joan Musgrave Harvey are two examples, and others are described in Chapter Four. Arguably the Army’s MI1(b) could be considered more middle class - Claribel Spurling for example was a teacher, and the daughter of a vicar.¹⁰² Similarly, the predominant requirement for front-line cryptanalysts being the need for multilinguists meant that the ‘HushWAACs’ who undertook the work would have come from upper- and middle-class families.¹⁰³ As the HushWAACs were close to the front line, working on behalf of the War Office, it was considered that they were protected by the uniform they wore and the existing ‘gentleman’s agreement’ on taking prisoners.

¹⁰⁰ Churchill Archives GRB/0014/CLKE/3.

¹⁰¹ Hilda Martindale C.B.E., *Women Servants of the State 1870-1938* (London: George Allen and Unwin, 1938), pp. 44-45.

¹⁰² <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁰³ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 15 November 2020].

2.2.4 Suffrage

Pioneer suffragists and their supporters had expectations of an early victory.¹⁰⁴ Following the defeat of the amended Reform Act (1867), their reliance on private members bills that lacked government backing were unfounded.¹⁰⁵ If suffrage is considered solely as a campaign for votes, historians could be correct as stating that for 35 years after 1870, there was ‘no forward movement’.¹⁰⁶ The period between 1866 and 1870 has become known as the ‘pioneering stage’ which has been subsequently categorised by ‘spirited activity’ and optimism; the campaigning focussed on the Reform Act (1867).¹⁰⁷

In 1869 the Municipal Franchise Act extended the rights of a voter “*by reducing the amount of time that a voter was required to occupy a ‘house, warehouse, counting-house, shop or other building’ in a municipal borough from three years to just one.*”¹⁰⁸ The relevance was that for the first time it covered women as well as men, giving single women ratepayers the right to vote in local elections.¹⁰⁹ A court case in 1872, however, decided this did not extend to married women, a state of affairs which did not change until 1894¹¹⁰, when property-owning women could vote in local elections¹¹¹, become Poor Law Guardians, and serve on School Boards.

¹⁰⁴ Susan Kingsley Kent, *Sex and Suffrage in Britain, 1860-1914*, (Princeton: Princeton University Press, 1987, repr. Taylor & Francis e-Library, 2005), p. 201.

¹⁰⁵ Kingsley Kent, *Sex and Suffrage*, p. 201.

¹⁰⁶ Kingsley Kent, *Sex and Suffrage*, pp. 201-202.

¹⁰⁷ Kingsley Kent, *Sex and Suffrage*, p. 191.

¹⁰⁸ <https://thehistoryofparliament.wordpress.com/2019/08/02/women-and-the-municipal-franchise/> [accessed 13 June 2021].

¹⁰⁹ <https://thehistoryofparliament.wordpress.com/2019/08/02/women-and-the-municipal-franchise/> [accessed 13 June 2021].

¹¹⁰ <https://thehistoryofparliament.wordpress.com/2019/08/02/women-and-the-municipal-franchise/> [accessed 13 June 2021].

¹¹¹ Kingsley Kent, *Sex and Suffrage*, p. 201.

Some Poor Law Guardians have become world renowned in other areas; women such as Octavia Hill (one of the original trustees of The National Trust), Mary Carpenter (pioneer of industrial schools)¹¹², and Louisa Twining (the originator of workhouse reform)¹¹³, illustrating once again the tenacity and determination of these pioneering women of the period in their mission to improve the existence of women in general.

The 'second phase' of Suffrage could be described as the ““doldrums”, when the movement became muted and diffused.”¹¹⁴ Between 1897 and 1903 suffrage societies were gradually amalgamated to become the National Union of Women's Suffrage Societies (NUWSS) and adopted the policy of 'Deeds not Words' (in 1905) under the leadership of Emmeline and Christabel Pankhurst to increase pressure on parliament for equal rights for women.¹¹⁵ In 1905, the more recognisable third phase, militant feminist suffrage became increasingly apparent.¹¹⁶ This was illustrated by public demonstrations, arrests and forced feedings¹¹⁷ culminating in the now infamous Epsom Derby Day on 31 May 1913 when Emily Davison threw herself in front of the King's horse and died¹¹⁸. Due to its militant nature and 'extreme' results, this is the most memorable period of suffrage.

In August 1907, the Qualification of Women Act was passed which allowed women to register to vote and stand for election in major local authorities.¹¹⁹ Elizabeth Garrett Anderson was the first

¹¹² <https://infed.org/mobi/mary-carpenter-reformatory-schools-and-education/> [accessed 20 June 2021].

¹¹³ Steven King, 'We Might be Trusted': Female Poor Law Guardians and the Development of the New Poor Law: The Case of Bolton, England, 1880-1906, *Internationaal Instituut voor Sociale Geschiedenis* 49 (2004), pp. 27–46, p. 29-30.

¹¹⁴ Kingsley Kent, *Sex and Suffrage*, pp. 191-192.

¹¹⁵ Kingsley Kent, *Sex and Suffrage*, pp. 204-05.

¹¹⁶ Kingsley Kent, *Sex and Suffrage*, pp. 191-192.

¹¹⁷ Kingsley Kent, *Sex and Suffrage*, pp. 205-207.

¹¹⁸ http://www.bbc.co.uk/history/historic_figures/davison_emily.shtml [accessed 1 July 2021].

¹¹⁹ [Women's suffrage timeline - The British Library \(bl.uk\)](#) [accessed 14 June 2021].

woman to be selected as mayor in 1908, (in Aldeburgh); she considered herself a suffragist – favouring non-violent protests.¹²⁰

The outbreak of the Great War in 1914 brought about a cessation in activities as the women were encouraged to support the war effort first.¹²¹ Following the successful introduction of Liberal MP David Lloyd George as Prime Minister, the Representation of the People Bill was passed in February 1918 which allowed “*women over the age of 30 and men over the age of 21 to vote. Women have to be married to, or be, a member of the Local Government Register.*”¹²² The first woman to take a seat in the Houses of Commons was Nancy Astor in November 1919, before the Representation of the People Act entitled everyone aged 21 or over to vote.¹²³

2.2.5 Concluding thoughts

In the years prior to 1914, the requirement for gaining intelligence from a foreign power by whatever means was a knowledge of the language of that power. In terms of demand, however, in peacetime there had been little if any need for intercept and decryption of wireless, mail or cable, and as diplomatic work was heavily gendered, it was assumed there was no need for women’s services. In terms of potential supply, a growing number of women were capable of providing both interception skills (as qualified by knowledge of German, or experience as telegraphists and telephonists), cryptanalytical skills (as qualified in mathematics) or intelligence sifting and assessment skills (as holding managerial and analytical roles or further educational qualifications) in peacetime, *provided that* the necessary roles could be seen as independent of gender, but given the slow progress of female development, it was likely to be a lengthy process.

¹²⁰ [Elizabeth Garrett Anderson – Aldeburgh Town Council](#) [accessed 14 June 2021].

¹²¹ [Women's suffrage timeline - The British Library \(bl.uk\)](#) [accessed 14 June 2021].

¹²² [Women's suffrage timeline - The British Library \(bl.uk\)](#) [accessed 14 June 2021].

¹²³ [Women's suffrage timeline - The British Library \(bl.uk\)](#) [accessed 14 June 2021].

While, in the words of Helen Taylor “*In the beginning... man and woman were created equals, made in the same divine image. God blessed them unitedly, and gave them conjoint dominion over the world*”¹²⁴, England, despite this view of humanity, was a patriarchal society that struggled with treating women as equals. However, there were occasional opportunities open to the ‘right’ type of women; those with money and good social standing were able to use resources for their own aims by hiding behind their sex; she-intelligencers such as Alexandrine of Rye-Varax, who, despite her treasonous activities, was never prosecuted, due directly to her sex.

Slowly, changes had taken place, for example, women were allowed to access further education before being allowed to matriculate to undergraduate level, until eventually, 27 years later, the first woman was awarded a professorship. In short, it was necessary for liberally minded men to recognise women’s qualities and support them for changes to be made, and, as attitudes changed, it would become possible for women to progress further.

2.3 The Great War

2.3.1 Intelligence

The use of intelligence during war time has been pivotal in the winning of key battles and the war itself, and during peacetime when it benefits a country to be prepared. Intelligence is described by Laqueur as relating both to the gathered information and the organisation collecting that information.¹²⁵ Regardless of the quality of intelligence, it is timing and how it is used that is the key to a successful campaign, in that intelligence is only useful when it is in time to be of use. ‘*The*

¹²⁴ Kingsley Kent, *Sex and Suffrage*, p. 200.

¹²⁵ Walter Laqueur, *A World of Secrets: The Uses and Limits of Intelligence* (New York: Basic Books, 1985), p. 8.

results of cryptanalysis are useful to intelligence for operational purposes only if they are 'current', that it to say a signal must be read shortly after it is made."¹²⁶

In the early part of the twentieth century, it was recognised that wireless brought the “*study of communications systems*” into existence, later to be called Signal Intelligence (Sigint).¹²⁷ This intelligence field was used extensively during the First World War in both Room 40 and MI1(b), and during the Second World War with which it is more associated. This is due to that war’s vast Y-Station network and women who have spoken about their work on it. Between 1939 and 1946, aided by leaps in technology, other intelligence subsets could be, and were, more fully integrated with Sigint; Human Intelligence (Humint) collected by the Special Operations Executive (SOE)¹²⁸ and the Double Cross System¹²⁹, collection of POW information, for example at Trent Park¹³⁰, and Image Intelligence (Imint) at RAF Medmenham.¹³¹ SOE was the department which was tasked with assisting local resistance fighters in occupied territory. The largest group of women working for SOE were sent to France, as they were best to be able to ‘pass unnoticed in a crowd.’¹³² The roles they held included wireless operator, courier, and organiser (which tended to be a man).¹³³

¹²⁶ Donald McLachlan, *Room 39: Naval Intelligence in Action 1939-45* (London: Weidenfeld and Nicolson, 1968), p. 391.

¹²⁷ Harry Hinsley et al, *British Intelligence in the Second World War Volume 1*, p. 20.

¹²⁸ Michael Foot, *SOE in France* (London: HMSO, 1966, repr. Abingdon: Frank Cass Publishers, 2004).

¹²⁹ FH Hinsley and CAG Simpkins, *British Intelligence in the Second World War, Volume 4, Security and Counter-Intelligence* (London: HMSO, 1990), pp. 87-106, and 217-246 and John Masterman, *The Double-Cross System: The Classic Account of World War Two Spy-Masters*. (London: Yale University, 1972), Kindle ebook.

¹³⁰ <https://www.trentparkhouse.org.uk/> [accessed 24 May 2021] and Helen Fry, *The Walls Have Ears*, (London: Yale University Press, 2019).

¹³¹ <https://rafa.org.uk/blog/2020/10/28/raf-medmenham/#:~:text=A%20museum%20display%20on%20RAF,Wyton%2C%20just%20east%20of%20Huntingdon.&text=All%20images%20copyright%20of%20Medmenham%20Association.> [accessed 24 May 2021].

¹³² Juliette Pattinson, ‘Passing unnoticed in a French crowd’: The passing performances of British SOE agents in Occupied France’, in *National Identities* 12/3 (2010), 291-308.

¹³³ Squadron Leader Beryl E. Escott, *The Heroines of SOE; F Section: Britain’s Secret Women in France* (Stour: The History Press, 2010), p. 26.

The Double Cross system (or XX System) was set up in January 1941 to catch German spies who had recently been dropped into the UK; a system that BP assisted with.¹³⁴

It is worth noting that, due directly to today's media, freedom of speech and advancing electronic technology, modern warfare can be analysed by any member of the public with access to a smartphone or electronic device in real time and with satellite imagery. The release of highly classified documents by Edward Snowden and Julian Assange has only enhanced the ability of media commentators and the public to interpret government assessments and statements, leading to occasions where the government is later held accountable for its wartime actions; a prime example is the Chilcot Inquiry following the unsuccessful search for weapons of mass destruction in Iraq.¹³⁵ This shows a significant deviation from the First and Second World War, where Government statements were given at least some measure of credibility, compared to the present day where 'armchair' experts on social media platforms regularly give alternative explanations.

The mentality of modern warfare is in direct contrast to that of the Second World War when slogans such as 'careless talk costs lives'¹³⁶ and 'be like dad, keep mum'¹³⁷ illustrate that people were actively encouraged not to speak and therefore simply did not disclose the nature of their war work. As a result, it is exceedingly difficult to compare wars in the early to mid-twentieth century with those of the twenty-first century. This is relevant to the current study because it illustrates that today's values cannot be used to compare how warfare was then perceived, and balance it with how warfare is seen now. This is important because it illustrates the importance of taking a historical study in context.

¹³⁴ *The Oxford Companion to the Second World War*, ed. by ICB Dear and Michael Foot. (Oxford: Oxford University Press, 1995), p. 1289

¹³⁵ <https://www.theguardian.com/uk-news/2016/jul/06/tony-blair-deliberately-exaggerated-threat-from-iraq-chilcot-report-war-inquiry> [accessed 5 June 2021].

¹³⁶ <https://www.iwm.org.uk/collections/item/object/9810> [accessed 24 May 2021].

¹³⁷ <https://www.iwm.org.uk/collections/item/object/22549> [accessed 24 May 2021].

2.3.2 *The Official Secrets Act*

The Official Secrets Act (OSA) is still in operation today and the current British secret service organisations amongst others (GCHQ, MI5, MI6, Royal Mail) still expect employees to sign it. As such, this means that state secrets are only permitted to be released following permission to do so by the government. There have been frequent revisions to the Official Secrets Act of 1911¹³⁸ leading to the current legislation (OSA 1989) which declares it to cover:

A person who is or has been—

(a) a member of the security and intelligence services; or

(b) a person notified that he is subject to the provisions of this subsection,

is guilty of an offence if without lawful authority he discloses any information, document or other article relating to security or intelligence which is or has been in his possession by virtue of his position as a member of any of those services or in the course of his work while the notification is or was in force.¹³⁹

The act created in 1911 was not designed to cover the full-scale war which broke out in 1914. It is arguable that the First World War was covered by an act unfit for the type of signals intelligence war that began in Europe in 1914; earlier war campaigns using Sigint were carried out considerably further afield, by the British in the Boer War (1899-1902)¹⁴⁰, and by other nations in Russo-Japanese War (1904-05)¹⁴¹ for example.

¹³⁸ <https://www.legislation.gov.uk/ukpga/Geo5/1-2/28/contents> [accessed 24 May 2021].

¹³⁹ <https://www.legislation.gov.uk/ukpga/1989/6/section/1> [accessed 24 May 2021].

¹⁴⁰ [Wireless in the Boer War - South African Military History Society \(samilitaryhistory.org\)](http://www.samilitaryhistory.org) [accessed 5 June 2021].

¹⁴¹ Graeme Gooday, 'Combative Patenting: Military entrepreneurship in First World War telecommunications', *Studies in History and Philosophy Science* (2013), 247-258 (p. 251).

The OSA was revised after the war in 1920, when it covered points such as the wearing of official uniforms without lawful authority and false representation¹⁴², communications with foreign agents¹⁴³, incitements¹⁴⁴, and the registration and regulation of persons carrying on the business of receiving postal packets¹⁴⁵, all clearly due to the impact of the 1914-18 war, and indicating that these were some of the most pressing concerns of the government at that time. The act was amended yet again in 1939, to provide police with greater powers.¹⁴⁶

Records from the First World War were compromised in 1925 when a file of over 10,000 sensitive decrypts were taken out of Britain by an American lawyer and handed over to the German Government.¹⁴⁷ The result of this was that Germany increased its encryption security.¹⁴⁸ The publishing of the Room 40 story in newspapers, followed by books authored by former incumbents, was belatedly stifled by the Admiralty, in a process which it later attempted to describe as an ‘*authorized declassification*’.¹⁴⁹ Several men involved both in Room 40 and on the periphery of the establishment published during this period, the first of which was Winston Churchill himself. His five volumes published between 1923 and 1931, detailed World War One intelligence which could only have been obtained from cryptographic methods¹⁵⁰.

¹⁴² <https://www.legislation.gov.uk/ukpga/Geo5/10-11/75/section/1> [accessed 24 May 2021].

¹⁴³ <https://www.legislation.gov.uk/ukpga/Geo5/10-11/75/section/2> [accessed 24 May 2021].

¹⁴⁴ <https://www.legislation.gov.uk/ukpga/Geo5/10-11/75/section/7> [accessed 24 May 2021].

¹⁴⁵ <https://www.legislation.gov.uk/ukpga/Geo5/10-11/75/section/5> [accessed 24 May 2021].

¹⁴⁶ <https://www.legislation.gov.uk/ukpga/Geo6/2-3/121/section/1> [accessed 24 May 2021].

¹⁴⁷ https://www.nsa.gov/Portals/70/documents/news-features/declassified-documents/nsa-60th-timeline/1960s/19600101_1960_Doc_3978516_Room40.pdf [accessed 24 May 2021] p. 2.

¹⁴⁸ https://www.nsa.gov/Portals/70/documents/news-features/declassified-documents/nsa-60th-timeline/1960s/19600101_1960_Doc_3978516_Room40.pdf [accessed 24 May 2021] p. 2.

¹⁴⁹ https://www.nsa.gov/Portals/70/documents/news-features/declassified-documents/nsa-60th-timeline/1960s/19600101_1960_Doc_3978516_Room40.pdf [accessed 24 May 2021], p. 2.

¹⁵⁰ Churchill. *The World Crisis*, Vol V. Chapter XVII: East or West.

Before 1958 a 50-year rule was in place that prohibited the release of government records to TNA “unless there were specific reasons not to do so.”¹⁵¹ This changed in 1967 as it was felt that 50-years was too long, and the period was reduced to 30 subsequently, “*the backlog of material aged between 30 and 50 years was released from 1968.*”¹⁵² According to the Institute of Electrical and Electronics Engineers (IEEE) the UK government started to declassify and release some of the photographs taken of the machines used at BP in 1975.¹⁵³ By 2010 “*GCHQ has transferred to TNA virtually all its records up to the end of the Second World War, amounting to many hundreds of thousands of papers. The few records still withheld from this period are re-reviewed regularly.*”¹⁵⁴

The 1968 record-release date would have coincided with the fiftieth anniversary of the First World War. As there had already been several books published on Room 40 by this date, it can be asserted that official records were unlikely to have been available to their authors, and so these books would have been written from memory. By the Second World War, the 30-year restrictions would have been in place, which means nothing pertaining to the Second World War should have been released until at least 1975; the year following the release of Winterbotham’s book. Memory is therefore, intrinsically linked with this thesis, and is now considered in more detail.

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<https://webarchive.nationalarchives.gov.uk/20090516124223/http://www.30yearreview.org.uk/background.htm> [accessed 27 May 2021].

¹⁵²

<https://webarchive.nationalarchives.gov.uk/20090516124223/http://www.30yearreview.org.uk/background.htm> [accessed 27 May 2021].

¹⁵³ <https://spectrum.ieee.org/tech-history/dawn-of-electronics/the-hidden-figures-behind-bletchley-parks-codebreaking-colossus> [accessed 27 May 2021].

¹⁵⁴

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/61808/nim-november2010.pdf [accessed 27 May 2021] p. 33.

2.3.3 Memory

Because many books and papers on cryptanalysis, in particular those early in the field, were written wholly or partly from memory many years later by those who were there, memory is an important factor to analyse further.

According to the Alzheimer's Association, one in six people in their 80s and over suffer with dementia, although only 44% have been diagnosed.¹⁵⁵ In the period since the end of both the First and Second World Wars, a considerable amount of literature has been published. It is necessary to consider that memories of war work may be clouded, and the possibility that intervening publications such as the memoirs of others may have been incorporated and adapted to fill an individual's memory blanks, or potentially to exaggerate accounts.

One illustration of exaggerated accounts is the late actor Sir Christopher Lee, a British actor who claimed throughout his lifetime that he was attached to the SAS, SOE and Long-Range Desert Group, respectively.¹⁵⁶ Mortimer has proved this inaccurate, or "*hammed up*" in his own words.¹⁵⁷ The existence of Second World War fantasists can lead to the questioning of everything people think they know about World War Two heroes, but Sir Christopher Lee's claims are not unique. Roger Day was convicted of "a decoration calculated to deceive" and sentenced to 60 hours of community service" after he wore medals to the 2009 Remembrance Service; medals that were purchased, not earned. These are not isolated cases.¹⁵⁸ A Facebook page has been set up to 'name and shame' people who have no basis to claim a military record; comparing them to a 'Walter Mitty

¹⁵⁵ <http://www.alzheimers.org.uk/statistics> [accessed 2 July 2015].

¹⁵⁶ <https://www.independent.co.uk/news/people/christopher-lee-untold-life-sas-soldier-who-spoke-several-languages-and-almost-died-twice-wwii-10315453.html> [accessed 6 June 2021].

¹⁵⁷ <http://www.spectator.co.uk/features/9583572/sir-christopher-lee-and-other-special-forces-fantasists/> [accessed 18 July 2015].

¹⁵⁸ <http://www.spectator.co.uk/features/9583572/sir-christopher-lee-and-other-special-forces-fantasists/> [accessed 18 July 2015].

character'.¹⁵⁹ Mortimer questions why these men act in this way, whether it is to make themselves seem more interesting or some other deep-seated desire to be seen as more than they are, or simply just fantasists. Sir Christopher Lee was included in his article as a person where people were perhaps unlikely to challenge his lies.¹⁶⁰

Francesca Cappelletto discusses 'flashbulb memories', the concept that a person remembers only a specific incident and then through reading or fabrication completes the surrounding context.¹⁶¹ This would have a detrimental effect on published data that has been collated as in the intervening years many influences could affect the veteran and 'cloud' their memories. It would be almost impossible to tell fact from fiction unless corroborating data is found in TNA; that possibility needs to be acknowledged in the context of this thesis. Such 'misremembering' could be an area for future research.

Furthermore, Kirk Simpson discusses Jürgen Habermas's definitions of truth, categorised as factual, narrative, and truthful, on a similar basis to Cappelletto's flashbulb theories.¹⁶² The concept that whereas memories can be of a 'flashbulb' or strong nature as previously discussed, other outside influences need to be considered in context; each veteran has a story to tell, but it needs to be seen in the appropriate setting. While it is likely that there is no intentional deception, it is entirely possible that memories are not recollected entirely accurately or have been heavily influenced by other accounts.

¹⁵⁹ <https://www.facebook.com/The-Walter-Mitty-Hunters-Club-HQ-501261976579581/> [Accessed 3 January 2016].

¹⁶⁰ <http://www.spectator.co.uk/features/9583572/sir-christopher-lee-and-other-special-forces-fantasists/> [accessed 18. July 2015]. Further research could be undertaken to identify these cases if the deception were intentional or unintentional; however, such research is considered beyond the scope of the present study.

¹⁶¹ Francesca Cappelletto, 'Long-Term Memory of Extreme Events: From Autobiography to History' in *Journal of the Royal Anthropological Institute*, 9/2 (2003), pp. 241-260.

¹⁶² Kirk Simpson, 'Victims of Political Violence: A Habermasian Module of Truth Recovery' in *Journal of Human Rights*, 6/3, (2007), 352-343.

As this thesis also includes details provided by interviewees who were former BP incumbents it is necessary to acknowledge the passing of time from their war time work to the present day. For some women, the work at BP represented a total of six years of their life, for many others far less. This is a relatively short period in comparison to their subsequent lives. All veterans are at least nonagenarians, based on the currently known youngest recruit being aged 14 when they started, which could have been as late as 1945; it is known that at least one 14-year-old worked at BP; Mimi Galilee.¹⁶³ In short, the time that these women served at BP could have been less than five percent of their lives. It is therefore highly likely that some of the memories are clouded or perceptually altered over time.

While unintentional memory loss is an intrinsic part of growing older, selective memory is another factor that needs to be taken into consideration. Some people remember only certain aspects of their intelligence war work; the boring parts of their jobs or the 'eureka' moments (Mavis Lever – Battle of Cape Mattapan, and Jane Hughes – *Bismarck* for example). They do not necessarily remember every intricate detail of the everyday normality, but this is to be expected considering the time gap between the wars and publishing their accounts, or indeed between the Second World War and the present day. This could affect the collated data as a full depiction which might not be given.

Furthermore, as Lucy Noakes describes

Women's memories of wartime are less likely to appear in official discourse; memories of bombardment, grief or simply coping with the wartime exigencies of family, work and shortages of food and fuel, are far less likely to be memorialized than the experiences of

¹⁶³ Sinclair McKay, *The Secret Life of Bletchley Park; The WWII Codebreaking Centre and the men and women who worked there*, (London: Aurum Press, 2010), p. 27.

male combatants. When women write or speak about these experiences, their voices often sound less confident, and quieter, than men's.¹⁶⁴

This is important to acknowledge because it shows that memories of experiences will differ between the sexes, even if men were in reserved occupations and remained in the UK.

Memory must be considered within context from an individual's point of view. Whilst a particular memory will hold truth for one person, it will not necessarily hold truth for another.¹⁶⁵ Perception is another aspect that should be considered, as Penny Summerfield points out in her own research – some husbands to whom she spoke had no idea what (if anything) their wives had done during the Second World War.¹⁶⁶ This should be considered in more detail; the fact that these men were not aware of what their wives did indicates that they probably did do something, but equally it was not deemed worthy enough for these men to give it further thought. The assumption would be that they considered only their own work as important, but conversely not that of their wives.¹⁶⁷ It might be speculated that the wartime roles that the women held were in addition to their roles as housewives, a role which in the minds of the men was arguably considered more important.

2.3.4 World War One literature published from memory

Accounts of both the First and Second World War have been published by the former incumbents. As will be seen in this section several of the books about cryptanalysis during the World Wars were published from the 1950s onwards. The first authors for both wars were all men, and, as will be seen in 2.5 below, regarding the Second World War most had a tendency towards technical books which involved the machines that were in use. It was not until the 1990s that women started to

¹⁶⁴ Noakes, *Review Article Gender, War and Memory*, p. 664.

¹⁶⁵ Penny Summerfield, *Reconstructing Women's Wartime Lives* (Manchester, Manchester University Press, 1998), pp. 2-3.

¹⁶⁶ Summerfield, *Reconstructing Women's Wartime Lives*, p. 25.

¹⁶⁷ Summerfield, *Reconstructing Women's Wartime Lives*, p. 25.

publish their stories, which concerned primarily people and social interactions. In this section, the books of men writing about World War One experiences from memory are considered against their depictions of women and women's roles.

The books published regarding First World War intelligence are predominantly authored by the men who had worked in Room 40, and, due to the OSA, were written mostly from memory. It is worth considering, where this is possible, the ages of the men when they published their First World War accounts. As several decades passed between the end of the First World War and the publishing of their memoirs (combined with OSA restrictions), it can be seen that, by the 1950's when most books were published, the authors were in or close to their retirement. A combination of available time and a 'now or never' attitude, meant that if they wanted to publish in their lifetimes, they only had a certain amount of time to do it in. A similar pattern can likewise be seen in the books about BP in the Second World War published from memory both by men and women, in particular Gordon Welchman who lost his security clearance as a direct result of publishing his account of BP.¹⁶⁸

John 'Jacky' Fisher wrote his memoirs in 1919 although these were not released for publishing until 2012.¹⁶⁹ The book contains general memories of First World War naval warfare; there is no mention of any of the individuals involved in codebreaking in Room 40, but as this was covered by the OSA this is not surprising. This was followed in 1928 by Joseph Kenworthy and George Young who published a book which, whilst generally about naval warfare, includes a short reference to Room 40 (although not by name).¹⁷⁰ Instead, it alludes to "*only one form of cypher-code*

¹⁶⁸ Welchman, *The Hut Six Story*.

¹⁶⁹ John Arbuthnot Fisher, *Memories, By Admiral of the Fleet, Lord Fisher* (London: Hodder and Stoughton, 1919, repr. Classic Reprint Series, Forgotten Books, 2012).

¹⁷⁰ The Hon J.M. Kenworthy and George Young, *Freedom of the Seas* (London: Hutchinson & Co. (Publishers) Ltd., 1928).

(that) proved insoluble, and what that was the writer has no intention of divulging.”¹⁷¹ Again there is no mention of the individuals who worked in Room 40.

Aged 67, Hugh Cleland Hoy was the first to publish a book specifically on Room 40 in 1935.¹⁷² It contains incidents that happened on the periphery of the establishment such as Roger Casement’s trial for treason in 1916¹⁷³, rather than the occupants themselves. The British Government was hesitant in allowing it to be published and so chose to censor heavily the manuscript before its publication.¹⁷⁴ The book itself therefore does not contain any ‘secrets of substance’ but is a more general view on spies and other World War One intrigue and includes little about Room 40 itself.

Four years later the son of Sir Alfred Ewing, the former head of Room 40, published a book which contained two chapters of details on the organisation; these must have been provided by Ewing’s personal memories (possibly by oral stories or in a diary).¹⁷⁵ The first chapter details his work in the Navy in the lead-up to the First World War in relationship to his life, and the second focusses upon his work with Room 40. This second chapter details how the section was set up, and the men that Ewing recruited - but there is no mention of the women working in Room 40. It is important, however, to note here that, as it was published by Ewing’s son, it is likely that he did not know any of the women. As the author did not sign the OSA, and the book seems to be partially based on personal letters and newspaper articles, it could be said that these were the reasons for the lack of specific detail.

After a period of 11 years, Francis Toye, aged 67, published his autobiography and included a short section on his work on codes and cyphers as part of his censorship work in the First World War.¹⁷⁶

¹⁷¹ Kenworthy and Young, *Freedom of the Seas*, p. 81.

¹⁷² Hoy, *40*, OB.

¹⁷³ Hoy, *40*, OB, p. 116.

¹⁷⁴ West, *GC&CS*, p. 87.

¹⁷⁵ Ewing, *The Man of Room 40*, pp. 141-208.

¹⁷⁶ Francis Toye, *For What We Have Received: An Autobiography* (London: William Heinemann Ltd, 1950), pp. 136-7.

Whilst he discusses the importance of secure codes and cyphers, he does not mention Room 40 by name, nor any of his former colleagues, male, or female.

The following year, in 1951, Admiral William ‘Bubbles’ James (James received the nickname ‘Bubbles’ as he was one of the boys used in the famous Pears Soap adverts) published a part autobiography, part historical account, and included a chapter on the work carried out by Room 40.¹⁷⁷ In the book James discusses the lead up to Room 40’s inception, several of the individuals that were involved in the set up or started soon afterwards, and the mention of “specially selected women who worked under the able control of Lady Hambro.”¹⁷⁸ Whilst Lady Hambro and several men are mentioned by name, the names of the ‘specially selected women’ are omitted.¹⁷⁹

Four years later in 1955 James then published the biography of Admiral Sir Reginald ‘Blinker’ Hall who was instrumental in the development of Room 40.¹⁸⁰ The result is a detailed account of Hall’s life, including some details on Room 40 of which James was obviously aware, as they were both working for the Admiralty at the time. The book details certain battles and the impact that the intelligence collated by Room 40 had on them. The book is not without critique as Boghardt says that James has repeated Hall’s claims of obtaining German messages through Swedish cables (known as the ‘*Swedish roundabout*’), specifically the Zimmermann Telegram, whilst Boghardt claims that this “*should be taken with a grain of salt*”¹⁸¹ - it was in fact through American cables that this

¹⁷⁷ James, *The Sky was Always Blue*, pp. 102-114. (James received the nickname ‘Bubbles’ as he was one of the boys used in the famous Sir John Millais picture from the Pears Soap adverts: HW3/6 40OB.)

¹⁷⁸ James, *The Sky was Always Blue*, p. 105.

¹⁷⁹ James, *The Sky was Always Blue*, p. 106.

¹⁸⁰ James. *The Eyes of the Navy*, pp. 102-114.

¹⁸¹ Thomas Boghardt, *The Zimmermann Telegram. Intelligence, Diplomacy, and America’s Entry into World War I* (Annapolis: Naval Institute Press, 2012), pp. 19-20.

information was obtained.¹⁸² Boghardt argues that Room 40 was in fact reading American codes and continued to do so after the end of the First World War.¹⁸³

Further to James's book, Hall's posthumous autobiography was published in 2017 with commentary by Philip Vickers. The autobiography was begun in 1926 but he was forced to abandon the document when the Admiralty intervened in 1933, which resulted in certain parts being destroyed.¹⁸⁴ This is disappointing to a future researcher as it could have provided some very noteworthy detail.

The last book based on this period, and uniquely important as being the only work published regarding the War Office's MI1(b), is part autobiographical written by Malcolm Hay,¹⁸⁵ Head of MI1(b), and part biography written and later published by his wife Alice Ivy Hay in 1971.¹⁸⁶ The book was published posthumously following Hay's death on 27 December 1962.¹⁸⁷ As the fifty-year rule for the release in documents was in 1968,¹⁸⁸ this means that Hay was unable to publish in his lifetime, indeed it describes how "*he remembered in minute detail and indeed, after that war, he had written a book about it, but he said that he should destroy it as it was still secret.*".¹⁸⁹ Clearly Hay was highly aware of the need to keep the secrets of First World War cryptanalysis.

Hay's work has especial importance for two reasons. First, Hay himself destroyed the official records of MI1(b) at the end of the war, and only those records which had been shared with the Admiralty's Room 40 are preserved, as Room 40 filed them. Second, Hay was unusually open-

¹⁸² Boghardt, *The Zimmermann Telegram*, pp. 19-20.

¹⁸³ Boghardt, *The Zimmermann Telegram*, pp. 93-4.

¹⁸⁴ Hall, *A Clear Case of Genius*, p. 10.

¹⁸⁵ Malcom Hay, *Notes on Cryptography*, pp. 71-90 in Hay, *Valiant for Truth*, (London: Neville Spearman, 1971).

¹⁸⁶ Hay, *Valiant For Truth*, pp. 1-70, pp. 89-224.

¹⁸⁷ Hay, *Valiant For Truth* p. 186.

¹⁸⁸

<https://webarchive.nationalarchives.gov.uk/20090516124223/http://www.30yearreview.org.uk/background.htm> [accessed 27 May 2021].

¹⁸⁹ Hay, *Valiant for Truth*, p. 64.

minded in treating women as equals in cryptanalysis, as will be shown in Chapter Four. Loss of the official records therefore also lost both insight into World War One Army cryptanalysis, and also – critically for this thesis – into gender studies, into Hay’s approach to and use of women to their full potential.

Hay’s papers describe the work conducted by MI1(b) cryptanalysts whom he described as “*never defeated*” and how they needed to reconstruct codebooks before they were able to decrypt messages.¹⁹⁰ One chapter details the work of MI1(b), and lists 11 ‘*distinguished*’ men who also worked in the department.¹⁹¹ Many of these distinguished men were recruited from the University of Aberdeen.¹⁹²

There is also brief mention of three women who worked in MI1(b). The first acknowledges the talent of Miss Spurling, the only person who successfully accomplished the ‘impossible’ test Malcolm Hay created to stop people wasting his time in asking for a job.¹⁹³ (See Chapter Four for more detail). The second woman is Florence Hayllar, who authored a poem given to Hay on his retirement.¹⁹⁴ No other details are listed about Florence in Hay’s book; the findings of the present research are detailed in Chapter Four.

The final woman is not mentioned by name but can be narrowed down to one of a small number of women. ‘Major G’ is described as encouraging Hay to put forward this woman for a recommendation on the Official Honour’s list, and the woman is described by Major G as having “*done excellent service in France*”.¹⁹⁵ (Major G is possibly Major Godfrey Leveson Brooke-Hunt who worked in MI1(b)¹⁹⁶). This would indicate that the woman was a former HushWAAC (Women’s

¹⁹⁰ Hay, *Valiant for Truth*, p. 78.

¹⁹¹ Hay, *Valiant for Truth*, Chapter IV, pp. 58-70.

¹⁹² Ferris, *Behind the Enigma*, p. 34.

¹⁹³ Hay, *Valiant for Truth*, pp. 61-2.

¹⁹⁴ Hay, *Valiant for Truth*, p. 89.

¹⁹⁵ Hay, *Valiant for Truth*, pp. 80-81.

¹⁹⁶ Bruce, *A Shadowy entity*, p. 319.

Army Auxiliary Corps – see section 2.2.6). Hay records his rather derogatory answer to Major G; “*I told him I would prefer to recommend the office cat.*”¹⁹⁷ It is not clear what this woman’s role was, if it can be assumed that she was a HushWAAC then she would have been breaking codes in France, but Hay explains that the officer who he put in charge of her “*reported she was very good at pouring out tea.*”¹⁹⁸ This illustrates a noteworthy point - was the woman allowed to try to break MI1(b) codes, or simply denied the opportunity to continue the role she held in France? The answer to this is unlikely to be ever known.

The remaining chapter regarding World War One was written by Malcolm Hay and concerns cryptography and includes a breakdown of how the codes could be broken and read.¹⁹⁹ It is worth noting that Hay clearly states the method of using a copied or stolen codebook was never used by MI1(b).²⁰⁰ The codes that were read in MI1(b) were from across the world, including cable messages of neutral governments.²⁰¹ Of the two methods of how codes could be broken and read Hay describes, one as “*A copy of clear text of one or more telegrams may be obtained and compared to the encoded message*” which he states as being used towards the end of the war; however, the main method employed is thus described - “*The encoded message may be read without any outside assistance. This cannot be done unless a large number of messages are available.*”²⁰² This would indicate that the messages were broken with the use of ‘depths’ (a depth is “*the correct alignment of two or more cipher texts that have been enciphered by the same key*”²⁰³).

In summary, the accounts published from memory, which are relied upon by most later authors, are written entirely by men, and all but one focus upon the Admiralty’s Room 40. They do not in

¹⁹⁷ Hay, *Valiant for Truth*, p. 81.

¹⁹⁸ Hay, *Valiant for Truth*, p. 81.

¹⁹⁹ Hay, *Valiant for Truth*, Chapter V pp. 71-89.

²⁰⁰ Hay, *Valiant for Truth*, p. 76.

²⁰¹ Gannon, *Before Bletchley Park*, p. 172.

²⁰² Hay, *Valiant for Truth*, p. 76.

²⁰³ *The Bletchley Park Codebreakers* ed. by Ralph Erskine & Michael Smith (London: Biteback Publishing Ltd. 2011), p. 472.

general even mention women in any detail, with the sole exception of Hay's work on MI1(b). This may be because of a heavily gendered viewpoint, or because the women carried out work which, while necessary, was of low skill and status. Published work making use of official records is now examined with these points in mind.

2.3.5. World War One literature published with the aid of official records

2.3.5.1 The Admiralty's Room 40

The Admiralty's cryptanalytical organisation which, it is fair to say, was initially inadequately prepared for war, was headed by Sir Alfred Ewing. Other rising personalities in Room 40 included Alistair Denniston (later head of Interwar organisation GC&CS), Nigel de Grey (best known for deciphering the Zimmermann Telegram), and classicist Alfred Dillwyn 'Dilly' Knox who stayed with the organisation until his death in 1943. It was a time when new staff were predominantly recruited through friends, family, and acquaintances, particularly through the upper echelons of British society. At the time debutantes, or 'debs' as they were known, were considered much more trustworthy than women of lower classes.²⁰⁴ As Grey notes, debs continued to be employed for their 'trustability' and 'discreetness' through the Second World War, before the organisation was forced to expand and began employing women from other social classes.²⁰⁵ Debs were also considered as coming from the 'right' family and background which added to their employability.²⁰⁶ As the majority of women were recruited by word of mouth at this time it shows some insight into the types of people working at the organisations, and more specifically their social class.

²⁰⁴ Michael Smith, *The Debs of Bletchley Park* (London: Aurum Press, 2015).

²⁰⁵ Christopher Grey, *Decoding Organisation. Bletchley Park, Codebreaking and Organization Studies* (Cambridge: Cambridge University Press, 2012), pp. 133-134.

²⁰⁶ Tammy Proctor, 'Kith and Kin: Interpersonal Relationships and Cultural Practices' in *Journal of Social History*, 39/2 (2005), 451- 466.

Patrick Beesley is generally accepted as the foremost authority on Room 40; he describes the birth of modern-day cryptanalysis with details of how the organisation began and all the key players.²⁰⁷ He has specifically written about the then head of Room 40, Alistair Denniston, who continued to run the organisation in its new guise as the Government Code and Cypher School (GC&CS). He also describes key battles and the impact Room 40 had on them, detailing the Zimmermann telegram and Nigel de Grey's contributions (see Appendix Eight for a copy of the telegram). However, it does not contain any detail about the women who worked in Room 40. It is also specific to Admiralty concerns and does not contain any information about MI1(b).

Paul Gannon is one author who does detail some of the women who worked in Room 40. As part of his research Gannon created a spreadsheet containing information about the women from both Room 40 and MI1(b) which he published on his website.²⁰⁸ Unfortunately, based on research carried out by this author, some of Gannon's published material on these women is inaccurate²⁰⁹ - for example, Gannon describes Lady Ebba Hambro when it was Lady Sybil Hambro who ran the secretariat in Room 40, which intriguingly he includes on the aforementioned list. He was not the only author to do this, so it seems likely that the error originates with David Ramsey who published his earlier book on 'Blinker Hall' in 2008.²¹⁰ Other authors who seem to have used this same incorrect reference are James Wyllie and Michael McKinley in 2016.²¹¹ This would therefore seem to be a case of poor referencing. Gannon also discusses Miss 'June' Spurling of MI1(b) despite this author's research proving that Miss Spurling's first name was Claribel, although it is not clear where this error originated. Gannon has published a second book, *Before Bletchley Park*,

²⁰⁷ Patrick Beesley, *Room 40*.

²⁰⁸ As of November 2020, this list is no longer available.

²⁰⁹ Gannon, *Inside Room 40*.

²¹⁰ David Ramsey, *Blinker Hall Spymaster: The Man who Brought American into World War I* (Stroud: Spellmount. 2009), pp. 168-9; p. 173.

²¹¹ James Wyllie and Michael McKinley, *Code Breakers: The Secret Intelligence Unit that changes the course of the First World War*. (St Ives: Ebury Press, 2016), pp. 229-30.

in which he repeated the research from *Inside Room 40* and republished the same errors outlined above.²¹²

Smith briefly describes the role of Room 40 in the prelude to his book *Station X*²¹³; yet again there are no mentions of the female workers of Room 40.²¹⁴ Andrew Boyd has written a history of British naval intelligence which includes a detailed history of naval concerns from the beginning of the First World War, through the Interwar years and World War Two.²¹⁵ It mentions ‘support’ which he concedes were ‘mostly women’, but there is no detail of these ‘support’ women.²¹⁶ Boyd thus downplays the role of the women and essentially assigns them to an ‘unworthy’ part of Room 40. As with other books, he does include the better-known (male) names of the establishment.

David Kahn also has written a chapter about Room 40, detailing key battles and the benefit of detailed intelligence allowing the Allies to make informed choices.²¹⁷ Again, whilst there is little mention of the women who worked in World War One codebreaking, there is mention of the men from MI1(b).²¹⁸

H.J. Koerver has published two volumes on Room 40, which are both amalgamations of files directly from TNA. The first volume details a small number of cryptanalysts in Room 40, specifically the ones who were directly involved in writing the archived history, and again it includes details of the First World War and how the war played out in an almost ‘blow by blow’

²¹² Paul Gannon, *Before Bletchley Park: The Codebreakers of The First World War* (Cheltenham: The History Press, 2020), p. 207.

²¹³ Michael Smith, *Station X: The Codebreakers of Bletchley Park*. (London: Pan Macmillan, 1998).

²¹⁴ Smith, *Station X*, pp. 10-11.

²¹⁵ Boyd, *British Naval Intelligence*.

²¹⁶ Boyd, *British Naval Intelligence* p. 159.

²¹⁷ Kahn, *The Code-Breakers*: pp. 266-297.

²¹⁸ Kahn, *The Code-Breakers*, p. 309.

account.²¹⁹ The second volume lists the entire German fleet including airships, submarines, supply ships and warships.²²⁰ Both volumes are publications of amalgamations of archival records brought together for the first time in an accessible format. Again, they contain some information on the role of men - but neither contains any information on the women of Room 40.

Christian Jennings provides a detailed account of the capture of enemy codebooks at the beginning of the First World War which aided the cryptanalyst in Room 40, as an introduction into German codebreaking during the Second World War.²²¹ There is no mention of the women who worked in Room 40.

The remaining text that offers a view of Room 40 is a play which Frank Birch wrote as the department was being closed at the end of the First World War. Mavis Batey and Edward Wakeling have pulled together the two incomplete versions, and in 2007 published the now complete '*Alice in I.D.25*'.²²² The play is based on '*Alice in Wonderland*' by Lewis Carroll who was a great influence on many of the Room 40 cryptanalysts, and the parody offers a whimsical view of Room 40. *Alice in ID25* also illustrates the foibles and idiosyncrasies of the individuals within the organisation and contains a brief inclusion about two of the women who worked there. It too was added to the Room 40 archive as it contained potentially sensitive material and therefore was classified. Sadly, many of the in-jokes have lost their meaning over time.

²¹⁹ *Room 40: German Naval Warfare 1914-1918. Volume I: The Fleet in Action*, 2nd ed, ed. by HJ Koerver (Berlin: Lis, 2007).

²²⁰ *Room 40: German Naval Warfare 1914-1918. Volume II: The Fleet in Being*, ed. by HJ Koerver (Berlin: Lis, 2009).

²²¹ Christian Jennings, *The Third Reich is Listening: Inside German codebreaking 1939-45*. (Oxford: Osprey Publishing, 2018), pp. 23-41.

²²² Frank Birch, *Alice in I.D.25* in *Alice in I.D.25 A code-breaking parody of Alice's Adventures in Wonderland* compiled with introductions by Mavis Batey and Edward Wakeling (London: Aznet Publishing. 2007 pp31-33). See CS6 for more detail on Mavis Batey.

2.3.5.2 *The War Office's MI1(b)*

Because of Hay's destruction of the official records, discussed above, there are, according to Peter Freeman, only three primary sources for MI1(b); Hay's book, contemporary records and a history written immediately after the war.²²³ As there is extraordinarily little primary information available for analysis, it is not unexpected that there are limited secondary sources which describe the activities of MI1(b). Authors such as Kahn do, however, describe the eminent people in cryptanalysis under Hay and the list of names includes some of the world authorities from their respective fields; John Fraser, chief assistant, who would later become Professor of Celtic (studies) and a fellow of Jesus College, Oxford and Arthur Surridge Hunt who was later Professor of Papyrology at Oxford and one of the world's eminent authorities on ancient writing are examples.²²⁴

One name of note was Oliver Strachey (brother of the well-known author Lytton Strachey) who remained in the organisation through World War Two and beyond.²²⁵ It is worth noting that Strachey's second wife was Rachel, known as Ray (née Costello) who attended Newnham College²²⁶ Ray was involved in the suffrage movement before their marriage, and when they returned from India for the birth of their first child, she resumed her work.²²⁷ Ray could, arguably, be considered a 'modern' woman; she returned to work for the NUWSS shortly after the birth of her second child²²⁸, having more in common with today's women than with early twentieth century

²²³ Peter Freeman, 'MI1(b) and the origins of British diplomatic cryptanalysis' in *Intelligence and National Security*. 22/2 (2007), 206-228.

²²⁴ Kahn, *The Code-Breakers*, p. 309.

²²⁵ Barbara Caine *Bombay to Bloomsbury: A biography of the Strachey Family* (Oxford: Oxford University Press, 2005).

²²⁶ Caine, *Bombay to Bloomsbury*, Divorce: p. 144, Newham College p. 122.

²²⁷ Caine, *Bombay to Bloomsbury*, p. 172.

²²⁸ Caine, *Bombay to Bloomsbury*, p. 172.

attitudes. Strachey was reliant on Ray throughout their married life for financial support despite their separation, another argument for Ray having more in common with today's women.²²⁹

It is unfortunate that there remain few details in the archives on MI1(b); as they would be both significant and interesting. Strachey was later to lend his name to the department he headed in the Second World War (See Chapter Six).

Sir Samuel Fay, a civilian member of the Army Council, published his book on the War Office's work, but despite its being published in 1937, he chose not to follow Churchill's lead and mentions nothing about the work in MI1(b).²³⁰

Much more recently, Bruce has written the most detailed account of MI1(b), from its early inception as M.O.5(e) before the outbreak of the First World War, through to the amalgamation with Room 40 into GC&CS.²³¹ He discusses some of the individuals, for example Major Francis Anderson, in the lead up to the outbreak of World War One and others who were involved in the set-up of the department.²³² His article also details work carried out with the French from 1912 and how the department changed following the Boer War (1899-1902).²³³

The most recent book which contains details on MI1(b) was written by John Ferris. Ferris has taken much of the historical account and combined it to create a comprehensive unified report of First World War codebreaking as a whole, to include MI1(b), Room 40 and the story of the HushWAACs.²³⁴ This account stands out as containing more information about the HushWAACs and MI1(b) than the women of Room 40 than previous published works. It does, however, include

²²⁹ Caine, *Bombay to Bloomsbury*, p. 228.

²³⁰ Sir Sam Fay, *The War Office at War* (London: Hutchinson & Co., 1937).

²³¹ Bruce, *A shadowy entity*.

²³² Bruce, *A shadowy entity*, p. 316.

²³³ Bruce, *A shadowy entity*, pp. 315-16.

²³⁴ Ferris, *Behind the Enigma*, pp. 29-65.

much of the detail of the capture of codebooks which was to help Room 40, together with details of the male staff, and brief details of the Political Section in Room 40.²³⁵

2.3.6 Roles and gender

The roles available to women in intelligence in the First World War were limited, amongst other factors, according to, the department they worked for and the men in charge of those departments, as has been seen in the pre-1914 discussion above. Women continued to be expected to work for low wages usually in domestic work but “*At the same time, educated middle-class women increasingly demanded entry into professional work from which they were excluded by law or custom.*”²³⁶

In mainly rural countries (Ireland, Austria-Hungary, Russia, Finland, Serbia, Montenegro, Turkey, Romania, Bulgaria, Greece, Italy, Portugal, France), agriculture was the main occupation in which women worked alongside their families, but “*In those countries, agricultural work fell increasingly to women as men left to fight.*”²³⁷ However, in Britain, Belgium, the Netherlands, and Germany women were already working in industry, domestic service, offices, shops and catering, amongst other roles.²³⁸ Furthermore, in the First World War, German women of this time were encouraged to work in factories, in direct contrast to the German policy of the Second World War when women were actively encouraged through financial means to stay at home and have children; the more children, the more recognition they were given.²³⁹

²³⁵ Ferris, *Behind the Enigma*, p. 37.

²³⁶ Deborah Thom, ‘Gender and Work’, in *Gender and the Great War*, ed. by Susan R. Grayzel & Tammy Proctor (Oxford: Oxford University Press, 2017), pp. 46-48, (p47).

²³⁷ Thom, *Gender and Work*, p. 47.

²³⁸ Thom, *Gender and Work*, p. 48.

²³⁹ Thom, *Gender and Work*, p. 52.

Female diplomats were not formally admitted to the Foreign Office until 1946²⁴⁰ but this did not stop them from working as ‘unofficial diplomats’ in the accepted role of diplomat’s wives.²⁴¹ According to Bertha Phillpotts who wrote to her sister in March 1917, her duties included cutting out snippets and giving them to the minister according to ‘their nature’, the term indicating a censor-like approach allowing for importance or relevance.²⁴² Furthermore, once the news article selection process was finished, Bertha would then move on to become “*a cipher-er, or else I compose small & unimportant dispatches or telegrams on the things in the paper.*”²⁴³ This shows the close links between the diplomatic service and cryptography as often the lines were blurred between the two; early diplomats were often responsible for both diplomacy and spying in their respective countries.

This period was a time of intense change as previously unavailable roles opened for women - employment such as the War Office Research Department who took on several female chemists as probationary assistant analysts at Woolwich Arsenal²⁴⁴, and munitions factory work in which there were 947,000 female workers across Britain “popularly known as ‘Munitionettes’” (many of whom had come from textile mills).²⁴⁵ These roles, which previously would have been solely held by men, can be seen as having been regendered female. The new nickname of ‘Munitionettes’ illustrates the extent to which this was accepted as women’s work. This process of ‘dilution’ of formerly highly skilled (male) roles was possible because of the simplification of the processes involved, so that semi-skilled and unskilled women could be employed.

Gradually during the First World War more roles became available in support of the British Army. Traditionally women who went with men into Europe for war in the eighteenth and nineteenth

²⁴⁰ Helen McCarthy, *Women of the World: The Rise of the Female Diplomat*, (London: Bloomsbury, 2014), p. xi.

²⁴¹ McCarthy, *Women of the World*, p. 44.

²⁴² McCarthy, *Women of the World*, p. 51.

²⁴³ McCarthy, *Women of the World*, p. 51.

²⁴⁴ Taylor Downing, *Secret Warriors: Key Scientists, Code-breakers and Propagandists of the Great War* (London: Little, Brown, 2014 repr. London: Abacus, 2015), p. 168.

²⁴⁵ Downing, *Secret Warriors*, p. 171.

centuries were known as ‘camp followers’, they stayed behind the lines and provided services, which were swiftly personified as prostitution.²⁴⁶ Whilst there have been women over the centuries who have taken up arms, including examples such as Constance Marciewicz who was Second in Command of 100 men in Dublin, in the Easter Uprising of 1916, and Maria Botchkareva who commanded the ‘Russian Women’s Battalion of Death’ in 1915, these remain the exception, not the rule, in a heavily male gendered world.²⁴⁷ The ‘Tommy’ has become the epitome of the male First World War soldier - strong, brave and masculine - even though a very small number of women did fight on the front line - women like Flora Sandes, the English woman who fought with the Serbian Army and was awarded the highest military award for her service by the Serbian government.²⁴⁸ This example shows that these women were the exception, not the rule, and that fighting was very much considered a male endeavour.

The image of Florence Nightingale working in field hospitals in the Crimea was used extensively to advertise for members of the First Aid Nursing Yeomanry (FANY) from its inception in 1907.²⁴⁹ The intention was for the women to support the British Army in the field in hospitals; advertised as ‘active’ and ‘exciting’, it was emphasised that it would be a world that women would recognise, and one in which they would find comfort as a carer, the implication being a situation of which they would have experience as women celebrating their femininity.²⁵⁰ In 1909 the Voluntary Aid Detachment (VAD) was set up by the War Office to recruit both men and women.²⁵¹ The VAD had additional expectations of their women, in addition to the requisite first aid and nursing; female VAD’s were “...expected to demonstrate competence in a range of ‘housewifery’, including home hygiene, darning,

²⁴⁶ Noakes, *Women in the British Army*, p. 2.

²⁴⁷ Noakes, *Women in the British Army*, p. 2-3

²⁴⁸ Elizabeth Shipton, *Female Tommies; The Frontline Women of the First World War* (Stroud: The History Press, 2014), pp. 138-165.

²⁴⁹ Noakes, *Women in the British Army*, p. 29.

²⁵⁰ Noakes, *Women in the British Army*, p. 31.

²⁵¹ Noakes, *Women in the British Army*, p. 35.

sewing, knitting and laundry, spending some of their training sessions sewing pillow cases and hot water bottles.”²⁵²

Despite the push for male and female members, it is unlikely that these skills were expected of the men, indicating that women were still expected to carry out their gendered tasks. Gail Braybon describes the popular stereotypes as either VAD or munitions workers.²⁵³ That women were expected to continue in their roles for the ‘duration’ (of the war), earn ‘high wages’ and then quietly go home when they were no longer required.²⁵⁴

Organisations such as the Women’s Emergency Corps (WEC) were created by the NUWSS to assist where needed both in traditional women’s roles (caregiver, cook and so on), and in more non-traditional roles such as driving motor vehicles.²⁵⁵ The WEC was later to become the Women’s Volunteer Reserve (WVR).²⁵⁶

To a certain extent the image of these women, and how their respective governments wanted to protect them could be compared to how a country is perceived. Countries tend to be gendered as female (Mother Russia, Britain’s Britannia, France’s Marianne, for example) and so when a foreign power invades (like the German Fatherland), strong words such as ‘rape’ are used to illustrate invasion. It could be argued, certainly at the time, the word rape is gendered female, itself as an action carried out by men (the invading army) on women (the country). Considering the British government’s reluctance to allow women to fight on the front line until very recently, the only roles that were available to women were either at home, or a few miles behind the front line as nurses and WAACs, amongst others, were able to do.

²⁵² Noakes, *Women in the British Army*, p. 36.

²⁵³ Gail Braybon, ‘Winners or Losers: Women’s Role in the War Story’, in *Evidence, History and the Great War; Historians and the Impact of 1914-18*, ed by Gail Braybon (Oxford: Berghahn Books, 2003), pp. 86-112.

²⁵⁴ Braybon, *Winners or Losers*, p. 88.

²⁵⁵ Noakes, *Women in the British Army*, p. 50.

²⁵⁶ Samantha Philo-Gill, *The Women’s Army Auxiliary Corps 1917-1921*. (Barnsley: Pen & Sword History, 2017), p. 1.

The WAAC's were set up in 1916²⁵⁷ and by the end of the war a total of 56,000 had served in the WAAC, 10,000 of them serving in France.²⁵⁸ The women who served in France worked as cooks, general domestics, store women, fitters, and machinists²⁵⁹, clerks and signallers, intelligence staff, ordnance survey mapmakers and printers, and gardeners.²⁶⁰ One small group of women went to France to work on codebreaking, and are known as 'HushWAACs' because the work they did was 'hush-hush'. It is worth noting that the HushWAACs were among the last to leave St Omer when the British started to withdraw as the war was coming to a close.²⁶¹ The women were recruited under the military and sent out to France to work on German field codes. Some of the women later joined MI1(b) when they returned to the UK, and one (Emily Anderson – see CS2, Chapter Four) was trained by the HushWAACs but was transferred directly to MI1(b). In 1918 the WAACs were renamed Queen Mary's Army Auxiliary Corps (QMAAC).²⁶²

Within the British intelligence sections, the women who worked in the Admiralty's Room 40 were predominantly secretarial with possibly some book-building as part of their duties. The War Office's MI1(b) had women working as codebreakers, but considerably less is known about them because of the destruction of papers by its former Head Malcolm Hay at the end of the War.²⁶³ The records that do exist are available only because they had been shared with Room 40 who subsequently archived them. To protect the department and stop unsuitable potential recruits wasting his time Hay created an 'impossible' test which was only successfully accomplished by one person, Claribel Spurling (see Chapter Four).²⁶⁴ In addition to Claribel, who clearly approached

²⁵⁷ Cowper, *A Short History*, p. 17.

²⁵⁸ Philo-Gill, *The Women's Army Auxiliary Corps*, p. 45.

²⁵⁹ Philo-Gill, *The Women's Army Auxiliary Corps*, p. 45.

²⁶⁰ Philo-Gill, *The Women's Army Auxiliary Corps*, pp. 73-81.

²⁶¹ Cowper, *A Short History* p. 49.

²⁶² Philo-Gill, *The Women's Army Auxiliary Corps*, pp. 108-109.

²⁶³ Freeman, *MI1(b)*, p. 224.

²⁶⁴ Hay, *Valiant for Truth*, p. 62.

the department herself, other women who also became MI1(b) pioneering codebreakers following work in France as HushWAACs, were Florence Hayllar, Florence Hannam, Gwendoline Watkins, Emily Anderson and Miss Marreco²⁶⁵ who is likely to be Barbara Faire-Marreco from the War Trade Intelligence Department²⁶⁶, all of whom are described in more detail in Chapter Four. Although there were several HushWAACs another three women are worth mentioning, two because they have written diaries (Mabel Peel²⁶⁷ and Gwendoline Watkins²⁶⁸) which allows an insight into the roles they carried out, and the last because she is Mary Tiltman, the elder sister of John Tiltman who became well-known as a Second World War cryptanalyst at BP.

An additional area in which a woman could work was the GPO. Women were in demand because they were cheaper labour; anyone who stayed with the organisation could expect an increase in remuneration, and if staying until retirement – a pension.²⁶⁹ Women were, however, still covered by the marriage bar and therefore had to resign on marriage. This meant that there could be a cheap regular supply of unmarried women to carry out the roles. The Royal Mail also insisted there be a demarcation between male and female roles.²⁷⁰ The GPO described itself as a pioneer of women's rights due to the thousands of women working there by the end of the Victorian era (early 20th century).²⁷¹ The women's roles were covered by two grades – the first was that of woman clerk who dealt with the routine clerical work, and the second was that of counter clerks and telegraphists who worked on the London post office counters.²⁷² When the GPO wished to

²⁶⁵ Gannon, *Inside Room 40*, p. 207.

²⁶⁶ Mary Ellen Blair, *A Life Well Led: The Biography of Barbara Friere-Marreco Aitken*, *British Anthropologist* (Santa Fe: Sunstone Press, 2008), p. 238.

²⁶⁷ <https://livesofthefirstworldwar.iwm.org.uk/lifestory/5152406> [accessed 27 June 2021].

²⁶⁸ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

²⁶⁹ M.J. Daunton, *Royal Mail; The Post Office since 1940* (London: The Athlone Press, 1985), p. 217.

²⁷⁰ Daunton, *Royal Mail*, p. 217.

²⁷¹ Duncan Campbell-Smith, *Masters of the Post: The Authorized History of the Royal Mail* (London: Penguin Books, 2011), Kindle ebook.

²⁷² Daunton, *Royal Mail*, p. 217.

employ women with a better education and higher social standing they added a foreign language exam to the interview system.²⁷³ Any women of a lower standard would be unable to complete this requirement and therefore be eliminated from the list of eligible candidates. This worked for a short while until the numbers applying dropped; as Miss de Renzi, superintendent of the female staff, remarked, ‘the intelligent, better educated girls are encouraged by the better prospects and salaries as teachers, inspectors, chemists, doctors,’ and so on.²⁷⁴ Married women were allowed to return to work to the GPO in 1946.²⁷⁵ In fact, female civil servants started to be employed as telegraph operators from 1870.²⁷⁶ In 1897, ‘there were 1,897 telegraphists (young men)’ and 751 ‘telegraphistes’ (young women)’; the only time that they were mentioned in a memoir was by F.E. Baines, who did not mention any other detail about them. However, the author points out that this was “*entirely in keeping with the usual attitude among senior officials of his day that women employees were in fact invisible.*”²⁷⁷ This attitude is worth further consideration as, if this were the generally held opinion of a senior member of civil service staff, it could be at least part of the reason little has been written about the women.

The Defence of the Realm Act 1914 (known as DORA) had a significant impact on Britain.²⁷⁸ It was intended to control communications, the nation’s ports and subject civilians to military rule, and following six amendments was used to “*ban bonfires, whistling in the street and flying kites!*”²⁷⁹ In addition to this, DORA was used to ban narcotics and censor the press, and perhaps one of the biggest impacts was the right of the government to seize factories and land in order to produce

²⁷³ Daunton, *Royal Mail*, p. 218.

²⁷⁴ Daunton, *Royal Mail*, pp. 218-19.

²⁷⁵ Daunton, *Royal Mail*, p. 219.

²⁷⁶ Martindale, *Women Servants of the State*, p. 205.

²⁷⁷ Campbell-Smith, *Masters of the Post*, (unnumbered).

²⁷⁸ <https://www.parliament.uk/about/living-heritage/transformingsociety/parliament-and-the-first-world-war/legislation-and-acts-of-war/defence-of-the-realm-act-1914/> [accessed 20 June 2021].

²⁷⁹ <https://www.parliament.uk/about/living-heritage/transformingsociety/parliament-and-the-first-world-war/legislation-and-acts-of-war/defence-of-the-realm-act-1914/> [accessed 20 June 2021].

munitions and weapons that were needed to win the war.²⁸⁰ A direct consequence was the increased need for women workers, and thus DORA implemented great social change for women.

There is documentation relating to some women working in other areas of clandestine activity. Indeed, the Great War paved the way for women to work in espionage in much more specific ways. Some were recruited specifically for the purpose and other women volunteered as it naturally paralleled the work they were already carrying out. Gertrude Bell for example, was a writer and pre-war traveller to the Middle East who during the war also worked for MI5; indeed, she was the first woman employed as a political officer.²⁸¹ Gertrude could therefore be considered a pioneer in the field of women in intelligence.

Edith Cavell was a British nurse who worked on the front line in Brussels and assisted any soldier in need but also used her position as a cover for resistance work. Edith had not specifically gone to help the escape of Allied soldiers but had fallen quite naturally into the role. Both Edith, and the spy for Germany Mata Hari, were executed for their espionage work, and both were later used by their respective governments for propaganda purposes.²⁸² Many men and women in their home countries considered it intolerable that women could be executed by the enemy even if they were spies, and propaganda on the basis was encouraged by the government to encourage army recruitment. These examples could be said to illustrate how women were represented as victims during this period and used in the media to garner support for the Allies, perhaps attempting to justify the huge human losses in the continuation of the war. Edith Cavell and Mata Hari have become the female 'faces' of the First World War and are portrayed as 'victim' (Edith) or 'prostitute' (Mata Hari). This is relevant because both cases help to show how women were

²⁸⁰ <https://www.parliament.uk/about/living-heritage/transformingsociety/parliament-and-the-first-world-war/legislation-and-acts-of-war/defence-of-the-realm-act-1914/> [accessed 20 June 2021].

²⁸¹ Proctor, *Female Intelligence*, p. 69.

²⁸² Proctor, *Female Intelligence*, pp. 100-107.

portrayed at the time in a specific way, as ‘victim’, in direct contrast to the portrayal of men as ‘soldier’ and ‘hero’.

2.3.7 Concluding thoughts

The First World War was a period of change for women. Employment that had not previously been available to women became accessible as men left to fight on the front line. The gender divide remained with defined roles for men (in the trenches) and women (caregiving, nursing, ‘munitionettes’, and so on). A very small number of women did make the transition to become an ‘honorary man’ and fought on the front line, but they were the exception not the rule.

The war left the British government in a difficult position. They needed women to work to supplement male breadwinners but deplored the idea; it meant the government had to change how it viewed women in order to encourage them, however, “*government officials and employers were then just as likely to say that women were not that good and did not do as much as men when they wanted them to leave after the war.*”²⁸³ Women found themselves in the unenviable position of first being wanted, and then surplus to requirement, within a short period.

The earliest literature of First World War cryptanalysis was written from memory by men of retirement age or older, with the outlook and prejudices of their time. These focus on the Admiralty’s Room 40, where, as will be shown in Chapter Four, the roles assigned to women were often administrative, although some did indeed carry out cryptanalytical roles because of their fluency in German and because their social background rendered them ‘secure’ and acceptable. Only much more recently, with the release of official records, has it become possible partially to overcome the catastrophic destruction of the records of the War Office’s MI1(b) by its chief, Hay, and partially to reconstruct his positive attitude to women in cryptanalytical work; it is

²⁸³ Thom, *Gender and Work*, p. 49-50.

unfortunately not possible to say how the image of World War One codebreaking would be changed if the full archival records for MI1(b) still existed.

What is known is that the War Office were the first to put women as cryptanalysts into the front line to work on battlefield codes, these being the 'HushWAACs'. These women were pioneer codebreakers using their German language skills alongside male counterparts in what could reasonably be argued as 'honorary male' roles. Chapter Four will detail, analyse, and balance the story of these women, which has previously not been considered in published literature.

2.4 Interwar Years: 1918-1939

2.4.1 The creation of the Government Code and Cypher School

In 1919 the organisations of MI1(b) and Room 40 were combined to create the Government Code and Cypher School (GC&CS).²⁸⁴ Initially GC&CS was a department under the Admiralty and provided cryptanalysis to all who needed it, a concept that was to prove invaluable through the Second World War at BP.²⁸⁵ Its administration was dealt with by the Foreign Office as it was considered too small to be independent, but no one wanted to see it fail.²⁸⁶ Regarding archival sources, the only information available about this time relates to the mechanics of the organisation coming together. Some of the records do however list both male and female employees, and discuss staff grading, pay and pensions.²⁸⁷ It is at this time that several women were brought into the GC&CS from the GPO to work in lower graded roles.²⁸⁸

²⁸⁴ Ferris, *Behind the Enigma*, p. 66.

²⁸⁵ Ferris, *Behind the Enigma*, p. 67.

²⁸⁶ Ferris, *Behind the Enigma*, pp. 73-75.

²⁸⁷ TNA, HW3/40 various documents detail the transfer of women from the GPO to GC&CS; FO366/800 *Alphabetical List of the Staff at Queen's Gate*. (unnumbered).

²⁸⁸ TNA FO366/800 *'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'* (unnumbered).

Keith Jeffery is one of a minority of authors to publish any details for this period, and this is mainly due to the official history that he has written on MI6, of which GC&CS at that time was a part.²⁸⁹ Christopher Andrew also discusses the period, concentrating on Sigint and Humint.²⁹⁰ Nigel West describes the transition from the two separate organisations, Room 40 and MI1(b), into the single and better-known GC&CS. This reorganisation had difficulties due to the strong personalities involved in both the Naval and War Office.²⁹¹

Boyd specifically tells the naval history between the wars and even describes the “*most important ID25 members joining Denniston*”.²⁹² Even though he includes all the men that would be expected, there is no mention of the women. Intriguingly, Boyd also includes an error; Oliver Strachey is on his list of most important members who moved from Room 40 to GC&CS, but Strachey in fact came from MI1(b).²⁹³

Despite the arrival of encryption machines by the end of the First World War, GC&CS did not see many changes. The codes that were broken continued to be language based and the skillset held by the codebreakers continued to be relevant. It was not until the 1930s that GC&CS started to receive messages encoded by these machines and started to consider mathematicians as an alternative to classicists.²⁹⁴ Adapted from commercial machines, they were used to create complex military cyphers which were much more difficult, but not impossible, to break by hand – Knox for example had broken one early, simple, model of Enigma in 1937.²⁹⁵ It became necessary for

²⁸⁹ Keith Jeffery, *MI6; The History of the Secret Intelligence Service 1909-1949* (London: Bloomsbury Books, 2011), pp. 210-211.

²⁹⁰ Christopher Andrew, *The Secret World: A History of Intelligence* (London: Allen Lane, 2018, repr. London: Penguin Books., 2019), pp. 573-602.

²⁹¹ West, *GCHQ*.

²⁹² Boyd, *British Naval Intelligence*, p. 258.

²⁹³ Boyd, *British Naval Intelligence*, p. 258.

²⁹⁴ Smith, *The Hidden History of Bletchley Park*, p. 164.

²⁹⁵ Grey, *Decoding Organization*, p. 45, and West, *GCHQ*, p. 102.

cryptanalysts to change their processes as the old methods no longer worked to the same level of efficiency.

The Enigma machine was the encryption method chosen by the German military and leadership.²⁹⁶ There were many different types in use during World War Two as each of the German and Italian service branches upgraded their machines. The machines themselves only carried out encryption and decryption, the messages being then transmitted by radio in Morse code to their intended recipient. The Enigma machine was effectively a device which automated complicated substitution.

Whilst the British were working successfully on many interwar codes, it was the Polish cryptographic organisation that made the greatest early progress with German Enigma codes; details of which were provided first to the French and much later the British close to the start of the Second World War.²⁹⁷ The Enigma machines became progressively more complex as the Second World War continued, partially due to the increased paranoia of the German High Command.²⁹⁸

In addition to the use of machines, One Time Pads (OTP) were also used by enemy forces.²⁹⁹ OTPs were literally a code that was only used one time, and so were much more difficult to break as depths could not be obtained from them³⁰⁰. By their very nature, the OTP was used only once³⁰¹,

²⁹⁶ Smith, *The Hidden History of Bletchley Park*, p. 164.

²⁹⁷ Hugh Sebag-Montefiore, *Enigma: The Battle for the Code* (London: Cassell Military Paperbacks. 2000), pp. 22-24; p. 36-50.

²⁹⁸ Rebecca Ratcliff, *Delusions of Intelligence: Enigma, Ultra, and the End of Secure Ciphers* (Cambridge: Cambridge University Press. 2006), pp. 2-3.

²⁹⁹ Alistair Denniston 'The Government Code and Cypher School Between the Wars' in *Codebreaking and Signals Intelligence ed. by Christopher Andrew* (London: Frank Cass. 1986).

³⁰⁰ Erskine and Smith, *The Bletchley Park Codebreakers*, ..p. 472.

³⁰¹ John Robert Ferris, *Intelligence and Strategy: Selected Essays*. (London: Routledge, 2005), pp. 138-139.

but between the wars the British became adept at reading codes from German OTPs as they “*knew her [Germany’s] method of using pads and how she made them up.*”³⁰²

2.4.2 Comint for diplomacy

Russian traffic also became important during this period following the neutralisation of Germany. Ferris argues that the Cold War started in 1917, with very ‘frosty’ relations continuing through the Interwar period; by 1926 permanent under-secretary Sir William Tyrell stated that Britain was virtually at war with Russia.³⁰³ Once again the use of Comint was invaluable to the government to know what Soviet intentions were. GC&CS greatly benefitted from the recruitment of Ernst Fetterlein, the former tsarist chief codebreaker who had been employed in 1918 by Blinker Hall.³⁰⁴ Luckily for Fetterlein, the diplomatic codes that the new Russian government used were low-grade and therefore did not pose an issue for either him, or his two ‘lady assistants’³⁰⁵ (see section 5.7). Further to the Russian situation was the Spanish Civil War (1936-1939) which allowed the British government to develop a policy.³⁰⁶ More information about the Spanish Section can be seen in Chapter Five.

Most recently Ferris has included details of the period in the official history of GCHQ. Ferris briefly summarises the role of GC&CS during the period and its purpose. He describes the sometimes-difficult relationships that GC&CS had with other countries rather than detailing any of the individuals who were involved at the time. Ferris also details the important role of intelligence during this period culminating in the situation in the lead up to the breakout of World

³⁰² Denniston ‘The Government Code and Cypher School Between the Wars’ p. 56.

³⁰³ Ferris, *Behind the Enigma*, pp. 142-143

³⁰⁴ West, *GCHQ*, p. 76.

³⁰⁵ West, *GCHQ*, p. 76.

³⁰⁶ Ferris, *Behind the Enigma*, p. 151.

War Two. His contribution is an important part of the operational story, but disappointing in lack of personnel detail.

Whilst German traffic was not read between the wars, traffic was read from Japan, the USA, Italy, France, and the USSR.³⁰⁷ The majority of this traffic was diplomatic intelligence, and the benefits to the British government would be clear but limited; any extra Comint that could be obtained was going to be merely beneficial³⁰⁸ rather than critical, as a diplomat in negotiation typically balances more factors than a general in war, Comint being only one such factor. According to Ferris, GC&CS's main task between the wars was to “*provide Comint for diplomacy*”³⁰⁹ as “*there was no service traffic was worth circulating*”³¹⁰. This was provided for the use of ‘diplomats, soldiers and politicians’.³¹¹ In 1921-1922 the Washington Conference “*addressed clashes over sea power between France, Italy, and especially Britain, Japan and the United States.*”³¹² This is noteworthy because all these powers were allies during the First World War. The main argument was related to Japan’s insistence on battleship and aircraft carrier tonnage.³¹³ Ferris also argues that the agreement here with most of Japan’s demands permitted the scheduling of the next naval conference for 1936, almost a decade later, leaving a lengthy period of peace in which Britain, France, and the USA could re-arm without damaging relations between them.³¹⁴

³⁰⁷ Ferris, *Behind the Enigma*, p. 117.

³⁰⁸ Ferris, *Behind the Enigma*, p. 118.

³⁰⁹ Ferris, *Behind the Enigma*, p.120.

³¹⁰ Robin Denniston, *Thirty Secret Years: A.G. Denniston’s working in Signals Intelligence 1914-1944* (Clifton-upon-Theme: Polperro Heritage Press, 2007), p. 94.

³¹¹ Ferris, *Behind the Enigma*, p. 120.

³¹² Ferris, *Behind the Enigma*, p. 121.

³¹³ Ferris, *Behind the Enigma*, p. 121.

³¹⁴ Ferris, *Behind the Enigma*, p. 127.

West describes the transition from the two separate organisations namely Room 40 and MI1(b) into the single and better-known GC&CS³¹⁵, and the difficulties of that reorganisation due to the strong personalities and politics involved in both the Naval and War Office.³¹⁶

Andrew Boyd also specifically details the naval history between the wars and even describes the “most important ID25 members joining Denniston”.³¹⁷ Despite including all the men that would be expected, there is no mention of the women. Intriguingly, Boyd includes an error; Oliver Strachey is on his list of most important members who moved from Room 40 to GC&CS, but Strachey came from MI1(b) and not Room 40.³¹⁸

As the likelihood of war with Germany increased, broader foreign policy became of less interest due to the changes in ‘intelligence, actors and international systems.’³¹⁹ Much intelligence was collated from China and the Balkans, but it was of little use to the British government.³²⁰ Once German intentions towards negotiations with Japan and Italy were recognised through intelligence reports, it was possible for the British government to prepare for war.³²¹ GC&CS had had some difficulty with reading Japanese traffic due to the difficulties of reading Japanese script, a problem which persisted until they recruited Ernest Hobart-Hampden, who had recently retired from 30 years diplomatic service in the Far East.³²²

Britain’s biggest crisis in the 1920s was when Turkey ‘annihilated Greek forces in Anatolia’.³²³ The problem was concentrated in Chanak; a town on the shores of the Dardanelles³²⁴ which gave its

³¹⁵ West, *GCHQ*.

³¹⁶ Ferris, *Behind the Enigma*, p. 69.

³¹⁷ Boyd, *British Naval Intelligence* p. 258.

³¹⁸ Boyd, *British Naval Intelligence*. p. 258.

³¹⁹ Ferris, *Behind the Enigma*, p. 149.

³²⁰ Ferris, *Behind the Enigma*, p. 151.

³²¹ Ferris, *Behind the Enigma*, p. 157.

³²² Denniston, *Thirty Secret Years*, p. 101.

³²³ Ferris, *Behind the Enigma*, p. 134.

³²⁴ Ferris, *Behind the Enigma*, p. 134.

name to the crisis. The area had been vitally important during the First World War in what was known as the battle for Gallipoli. The use of Comint during the crisis allowed Britain to have the upper hand on each country's intentions and use them to decide between war and peace.³²⁵

2.4.3 Roles and gender

The number of women in paid employment increased from 33.7 percent in 1921, to 34.2 percent in 1931; this represents 6,265,000 women.³²⁶ Over a third of women in employment worked in paid domestic service in 1931, despite there being complaints by middle- and upper-class women that there were not enough servants.³²⁷ Previously most of these servants were female, single and under the age of 35, meaning when the call to the munitions factories took place, many flocked to 'do their bit' for the war, leading them to reject the return to domestic placements once the war had ended as they wished to stay in manufacturing³²⁸, which was better-paid.

Little changed for the women of GC&CS following the move from wartime to peaceful organisation after the end of the Great War. Some of the women stayed with the organisation but many left, either because they were forced to by the marriage bar, or of their own volition. Some of the women who had been codebreaking HushWAACs stayed with the newly amalgamated organisation and continued working in a cryptanalytic role. Women from the GPO moved over to work in the junior roles available to them.³²⁹

Whilst the roles did not change greatly following the amalgamation of Room 40 and MI1(b) into a more recognisable civil service organisation, the countries on which effort was concentrated were

³²⁵ Ferris, *Behind the Enigma*, p. 136-7.

³²⁶ Penny Summerfield, *Women Workers in the Second World War; Production and Patriarchy in Conflict* (Kent: Croom Helm Ltd 1984, repr. London: Routledge, 1989).

³²⁷ Summerfield, *Women Workers*, p. 8.

³²⁸ Summerfield, *Women Workers*, p. 8.

³²⁹ TNA, FO366/800 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

different. Italian codebreaking became important as Mussolini adopted the *mare nostrum* policy (Latin meaning 'our sea').³³⁰ Mussolini intended, amongst other policies, to acquire more territory in the Mediterranean and Africa.³³¹ Later, Spanish codes also became of greater interest due to the Spanish Civil War.³³² The Nationalist Spanish received assistance from Nazi Germany and Fascist Italy, whilst the Republicans obtained aid from the Soviet Union and International Brigades.³³³ As the Nationalists were working with Nazi Germany, it was of interest for the British government to keep abreast of the situation.

This period also saw women working in other areas of the British Civil Service including the Treasury, who considered each gender to have well-defined roles.³³⁴ Clerical employment, which had previously been a male dominated domain, was regendered to female.³³⁵ Within these posts it was proposed that women would be given low-grade 'mechanical jobs' based on new technology such as the typewriter, as these had no male precedent.³³⁶ The marriage bar was firmly in place for women, meaning the Treasury were only prepared to hire lower-paid single women.³³⁷

Arguably the (ab)use of psychology in the form of a study into 'women's inferiority complex',³³⁸ used to categorise women in the 1920's and 1930's, found that women only had themselves to blame for their situation. Previous studies had considered how equal to men women really were.³³⁹ During the 1920s and 1930s women were 'frequently discussed in terms of psychological

³³⁰ <https://www.britannica.com/place/Italy/Foreign-policy> [accessed 21 June 2021].

³³¹ <https://www.britannica.com/place/Italy/Foreign-policy> [accessed 21 June 2021].

³³² <https://www.britannica.com/event/Spanish-Civil-War> [accessed 21 June 2021].

³³³ <https://www.britannica.com/event/Spanish-Civil-War> [accessed 21 June 2021].

³³⁴ Zimmeck, *Strategies and Stratagems* p. 903.

³³⁵ Zimmeck, *Strategies and Stratagems* p. 903.

³³⁶ Zimmeck, *Strategies and Stratagems*, p. 903.

³³⁷ Zimmeck, *Strategies and Stratagems*, p. 904.

³³⁸ Barbara Caine, *English Feminism; 1780-1980* (Oxford: Oxford University Press, 1997), p. 214.

³³⁹ Caine, *English Feminism*, p. 214.

complexes' which described them in relation to their 'potential' and their 'limited range of possibilities'.³⁴⁰ Modern feminists argue that:

The chief obstacle to winning political, social and economic equality was the 'humbleness, the timidity, the fear in the hearts and minds of women themselves, planted there by centuries of teaching that woman is the inferior sex... But in our man-made world we still permit the highest praise of a women to be, 'She has a masculine mind'.³⁴¹

2.4.4 Concluding thoughts

In considering the demand for cryptanalysts during the interwar period, two factors are critically important. First, the need for large numbers of cryptanalysts, whether male or female, fell dramatically; peacetime both reduced the number of messages to be decrypted and the urgency for such decryption, which had been so pressing in time of war. Second, during the 1920s, German language skills were deemed far less important – Germany, a defeated and weakened foe riven with internal conflicts, was not then seen as a potential adversary.

As Ferris observes, cryptanalysis in support of diplomacy is rarely newsworthy, and so does not stimulate memoirs to the degree which the First World War achieved. Published literature about this period usually takes the form of a chapter within studies of cryptanalysis across the twentieth century, covering on the one hand the contribution made to containing Bolshevism in the UK or later to diplomacy in the Spanish Civil War, and on the other the organisational formation of GC&CS.

In terms of the supply of potential women cryptanalysts, more and more women were gradually acquiring higher and university-level education and – looking forward to the Second World War – more were qualifying in mathematical and scientific subjects. In the interwar period itself, most

³⁴⁰ Caine, *English Feminism*, p. 214.

³⁴¹ Caine, *English Feminism*, p. 214.

codes remained book codes, and the time of the mathematical skillset was yet to come; the machine codes such as Enigma were features of the end of the period, and the early attacks on them were a male preserve, albeit led by Dillwyn Knox, a man who would do much to advance female cryptanalysis in the Second World War. Nonetheless, during this period, women began to develop careers in professional roles and to be accepted, slowly but increasingly, as professional equals; there remained, however, a majority comprising women who worked in domestic service or less-skilled manufacturing and assembling roles, and among the upper classes the debutantes ('debs') with a primary aim of seeking a 'suitable' marriage. Both categories would work in BP during the coming conflict.

2.5 The Second World War

2.5.1 BP: Publishing from memory

The publication of the first book in English on BP was by Frederick Winterbotham and published in 1974.³⁴² This was only 29 years after the end of the Second World War and could be the reason for the consternation caused (it was before the accepted 30 years covered by the OSA), nowhere more so than among the former BP incumbents who had also signed the OSA and who felt angered by what they saw as Winterbotham's 'betrayal'.³⁴³ Winterbotham's book was based solely on memory as he did not have access to archival sources. As Winterbotham had no access to archival material, the result was a book that is generally accepted as full of inaccuracies.³⁴⁴ According to the then Director of GCHQ of this period (Arthur 'Bill' Bonsall), the Government's awareness of the books published in Europe – by Wladyslaw Kozaczuk in Polish (1967),³⁴⁵ and

³⁴² Winterbotham, *The Ultra Secret*.

³⁴³ Author's interview with Mavis Batey, 22 August 2012.

³⁴⁴ Author's interview with Bill Bonsall, 17 October 2013. Clabby, *Brigadier John Tiltman*, p. 61.

³⁴⁵ Wladyslaw Kozaczuk, *Enigma: How the German Machine Cipher was Broken, and how it was Read by the Allies in World War Two*, ed. and trans. by Christopher Kasparek (London: Arm and Armour Press, 1984).

Gustave Bertrand in French (1973)³⁴⁶ - led to an understanding that ‘*it would only be a matter of time*’ before the story ‘broke’, and so they decided not to stop Winterbotham, but nor did they support him; however, GCHQ took out the parts that would compromise their organisation.³⁴⁷

Later books by former male incumbents were also predominantly based on memory, but, due to the date of publication, potentially with some access to archival sources. Peter Calvocoressi’s *Top Secret Ultra*,³⁴⁸ published in 1980 and Gordon Welchman’s 1986 book *The Hut Six Story*³⁴⁹ are both more technically accurate and concerned the Government Communications Headquarters (GCHQ).³⁵⁰ Ultra, or ULTRA, was the name given to the intelligence obtained by GC&CS during the Second World War. It stood for ‘Ultra Top Secret’; Top Secret Ultra was often stamped on the top of communications and files.³⁵¹ Calvocoressi’s book describes the work carried out by BP; the intelligence work, the Enigma machine’s workings, and the establishment itself. Calvocoressi also used the description of ‘Chiefs’ and ‘Indians’ as the two different types of individuals that worked at BP.³⁵² The concept that those at the top could be considered Chiefs were made up of two different types; mathematicians who solved the problems, and chess players who thought about the ‘next move.’³⁵³ The ‘Indians’ therefore could be said to include everyone else. Within this generalised classification it is stated that the Chiefs “*were distinguished from the Indians because they were fewer and preponderantly male and had the better jobs – better because they were more responsible and closer to the brush of real events.*”³⁵⁴ This is a very generalised identification of the people at BP and there

³⁴⁶ Bertrand, *Enigma*.

³⁴⁷ Author’s interview with Bill Bonsall, 17 October 2013.

³⁴⁸ Calvocoressi, *Top Secret Ultra*.

³⁴⁹ Welchman, *The Hut Six Story*.

³⁵⁰ Author’s interview with Bill Bonsall, 17 October 2013.

³⁵¹ Ronald Lewin, *Ultra Goes to War: The Secret Story* (London: Penguin, 1978), pp. 63-64.

³⁵² Calvocoressi, *Top Secret Ultra*, pp. 18-20.

³⁵³ Calvocoressi, *Top Secret Ultra*, p. 19.

³⁵⁴ Calvocoressi, *Top Secret Ultra*, p. 18.

is virtually nothing included about the women; simply one mention of the Women's Royal Naval Service (WRNS) 'tending' to the bombs.³⁵⁵

Gordon Welchman was the Head of Hut Six before continuing his cryptanalytic career in the USA and published *The Hut Six Story* in 1978. Despite it being published after the end of the 30 years covered by the OSA, Welchman may have ultimately regretted his lack of 'discretion' as it would end his career in the USA intelligence agencies due to the withdraw of his top level clearance which led to ultimately him being shunned by both American and British governments.³⁵⁶ However, to this day, Welchman's books remains one of the best recognised technical digests of the work of Hut Six at BP. It too describes the work he carried out at BP but fails to mention any of his female colleagues.

Also published in 1978 was R.V. Jones's *Most Secret War*.³⁵⁷ In 1939 Jones, who had been 'exiled' to the Admiralty Research Laboratory from July 1938³⁵⁸, was appointed as the Air Ministry's Assistant Director of Scientific Intelligence, and worked for a month in late 1939 in Hut Three's Air Section³⁵⁹. Jones has become better known for having identified the German use of radio navigation, radar, and the use of the *Knickerbein* 'bombing beams'. Whilst Jones's book is written from memory, he had illicitly retained copies of all his wartime reports and of much correspondence, so that although he worked without access to the full official records, his book is a generally accurate portrayal of the use of radar during the Second World War. It has recently been critiqued by James Goodchild on the basis of Jones' withholding due credit from others, such as BP staff or the Imint analysts at Medmenham³⁶⁰.

³⁵⁵ Calvocoressi, *Top Secret Ultra*, p. 68.

³⁵⁶ Greenberg, *Gordon Welchman*.

³⁵⁷ Jones, *Most Secret War*.

³⁵⁸ Jones, *Most Secret War*, p. 25.

³⁵⁹ <https://bletchleypark.org.uk/roll-of-honour/5019> [accessed 6 August 2019].

³⁶⁰ James Goodchild, *A Most Enigmatic War* (Solihull: Helion & Co., 2017).

Another book written from memory was Hugh Melinsky's *A Code-breaker's Tale* published in 1998.³⁶¹ The book is mostly a social narrative on Melinsky's experiences, in an account he describes as having initially been a personal account for his grandchildren.³⁶² It includes details on the Language School in Bedford where Melinsky learnt Japanese, and some technical detail on the codes that were used in the Pacific theatre whilst he was stationed in Darwin, Australia³⁶³.

In addition to these books there are also chapters in books that have been written predominantly from memory. '*Code Breakers: The Inside Story of Bletchley Park*' edited by Hinsley and Stripp contains an extensive amalgamation of collective memories.³⁶⁴ Both Hinsley and Stripp are contributors in the book along with several other individuals, both men and women, all of whom were at BP during the war. Each tells the story of the individual's memories, and some include scientific detail on their aspect of codebreaking, or the machines they used.

The late mathematician and noted cryptanalyst Joan Clarke was one of four female contributors to the book and gives an interesting account of how she was recruited and some of the work she carried out while there. Clarke's account is the only one from a female cryptanalyst. She describes the low pay in comparison to both other cryptanalysts and her male counterparts. She also adds how her flair for breaking codes became apparent quite quickly.³⁶⁵

The remaining three female contributors of the Hinsley and Stripp book offer a brief insight into Naval Section VI, one of the Naval 'code names' for BP. The contributions of the three comprise a total of two pages written by Vivienne Alford³⁶⁶, another by WRN Diana Payne who describes her work with the bombs³⁶⁷, and finally, another brief autobiographical section has been written

³⁶¹ Hugh Melinsky, *A Code-breaker's Tale*. (Dereham: Larks Press, 1998).

³⁶² Melinsky, *A Code-breaker's Tale*, introduction (unnumbered).

³⁶³ Melinsky, *A Code-breaker's Tale*, Language School p. 4, codes pp. 39-40.

³⁶⁴ Hinsley and Stripp, *Code Breakers*.

³⁶⁵ Clarke 'Hut 8 and naval Enigma, Part I' pp. 113-118.

³⁶⁶ Vivienne Alford, 'Naval Section VI' in Hinsley and Stripp, *Code Breakers*, pp. 68-70.

³⁶⁷ Diana Payne, 'The bombs' in Hinsley and Stripp, *Code Breakers*, pp. 132-137.

by Carmen Blacker about her experiences learning Japanese and assisting with the war in the Pacific.³⁶⁸ The number of pages in the book that have been written by women total less than 20 (six per cent) and is vastly less than any representative number of the total number of women in BP compared to men (two-thirds, per the BP RoH). It is possible to speculate that this could be due to several different reasons - it could be that these women were the only ones who were prepared to write a piece and talk about their experiences, or another possibility is these were the only women who Hinsley and Stripp knew at the time who were considered noteworthy enough to be asked to contribute.

The last to publish his memoirs was James Thirsk in 2008 at the age of 94 when the book was published.³⁶⁹ It is possible that, because he did not publish his memoirs until 2008, Thirsk was able to take advantage of the release of archival records and his friendships of former BP 'inmates'. Thirsk was able to publish a book that is more inclusive than other memoirs³⁷⁰, his book is solely about his time at BP and includes details of some of the women (he married BP colleague Joan Watkins³⁷¹). Also included in the book are a series of short biographies that Thirsk has written about 44 of his colleagues;³⁷² of those, only one woman is included - Joan Clarke³⁷³, the remainder are men. Although he does make clear "*Some may complain that nearly all the biographies are of men. The truth was, however, that during the war there were very few women in charge of the sections or in senior positions.*"³⁷⁴ Thirsk also states that he only met four of the men he included³⁷⁵ so it is unlikely he picked these

³⁶⁸ Carmen Blacker, 'Recollections of temps perdu at Bletchley Park', in Hinsley and Stripp, *Code Breakers*, pp. 300-305.

³⁶⁹ Thirsk, *Bletchley Park*, p. 13.

³⁷⁰ James Thirsk, *Bletchley Park; An Inmate's Story*, (Cleobury Mortimer: B&B, 2008, repr. 2012).

³⁷¹ <https://www.theguardian.com/world/2018/jun/11/jimmy-thirsk-obituary> (accessed 25 July 2021).

³⁷² Thirsk, *Bletchley Park*, pp. 117-187.

³⁷³ Thirsk, *Bletchley Park*, pp. 125-127.

³⁷⁴ Thirsk, *Bletchley Park*, p. 114.

³⁷⁵ Thirsk, *Bletchley Park*, p. 114.

43 men because he knew them, but more because he knew of them and perhaps thought highly of them

2.5.1.1 Female social narrative

With the publication of the first autobiography by Irene Young in 1990, the way was paved for women to share their social narrative.³⁷⁶ Approximately two thirds of the workers on the BP Roll of Honour (RoH) are women.³⁷⁷ The majority of these women principally worked at BP, its outstations³⁷⁸ or Y-Stations.³⁷⁹ As the largest group of individuals working there, it makes sense that most female authored social narrative books published about BP are written by these women. These are typically written accounts of their experiences which include the WRNS social life, billets, and everyday life, with some inclusion of how machines such as the bombe worked. They have in some cases, included their lives in the lead-up to, and after the war, particularly if they went on to work in related departments. Arguably women have written from memory to share their experiences with other women (and to a lesser degree men), by writing books that women would want to read, as dealing more in relationships and human interactions rather than with the details of machines.³⁸⁰ Women are arguably more interested in books about other women's lives than the intricate workings of such machines as the bombe, or Colossus.³⁸¹

A total of 20 books or chapters have been published by women about their experiences at BP since Young's book. In addition to these books, some women such as Gwendoline Page, for

³⁷⁶ Young, *Enigma Variations*.

³⁷⁷ <https://bletchleypark.org.uk/learn/resources/women-at-bletchley-park> [accessed 18 June 2021].

³⁷⁸ Outstations were located in places like Eastcote due to the lack of space at BP, and it must be born in mind that that Y-Stations have a completely different structure and cannot be considered comparable with BP.

³⁷⁹ Y-stations were the listening stations which recorded the messages sent over the airwaves before sending them on to BP.

³⁸⁰ <https://www.theguardian.com/books/2019/dec/07/why-women-love-literature-read-fiction-helen-taylor> [accessed 27 June 2021].

³⁸¹ From a conversation with Laura Perehinec at The History Press (publishers), 24 November 2017.

example, have amalgamated several women's stories and edited the stories into short chapters, in Page's case in two books. The first '*We Kept the Secret; Enigma Memories*' contains a number of memories provided by WRNS.³⁸² These memories include everything from the food and undesirable billets through to weekends off, transport and lifelong friends. The only mention of the work carried out at BP is usually in relation to its tedium. The second book predominantly concerns the war in the Japanese theatre and is an amalgamation of stories in a similar vein to the first book.³⁸³

Each of the twenty books and chapters by women authors have similar stories with a slightly personalised interpretation. As an example, Betty Webb has written about her experiences at BP. Initially Betty joined the Auxiliary Territorial Service (ATS). As she was fluent in German, she also took advantage of a reciprocal school German exchange programme which improved her German language skills before she joined the ATS.³⁸⁴ Once the war in the European theatre was over Betty was interviewed for her suitability for a posting to Delhi to continue working on Japanese codes. She ultimately ended up in the newly created Pentagon in Washington declaring "*especially as I was the only member of ATS to be posted there – a humble staff sergeant!*"³⁸⁵ The role that Betty carried out was identical to her role at BP; it involved paraphrasing although she could not remember exactly what was being paraphrased.³⁸⁶

Other women who have written about their work at BP include Gwen Watkins who wrote the autobiographical book '*Cracking the Luftwaffe Codes*' which encapsulates her Women's Auxiliary Air Force (WAAF) experience, particularly as a paraphraser at BP.³⁸⁷ Although it is not clear precisely

³⁸² Page, *We Kept the Secret*.

³⁸³ Page, *They Listened in Secret*.

³⁸⁴ Webb, *Secret Posting* pp. 20-23.

³⁸⁵ Webb, *Secret Posting* p. 42.

³⁸⁶ Webb, *Secret Posting*, p. 42.

³⁸⁷ Watkins, *Cracking the Luftwaffe Codes*.

what paraphrasing is in an intelligence context, it is likely to have required pulling together reports and distilling them into useful data.

Mair Russell-Jones, with the assistance of her son, has written of her experiences in Hut Six.³⁸⁸ As with many others, she describes how she was told by a man she did not know, to apply for an unnamed post at an un-named place for the Foreign Office.³⁸⁹

The late Baroness Trumpington wrote her autobiography in 2014, and she too briefly mentions her time at BP.³⁹⁰ It contains some inaccuracies, including incorrect details regarding First World War codebreaking where she describes a book published called 'Room 47'³⁹¹, it being likely that she meant Room 40. Baroness Trumpington was a well-known colourful character, often seen in the House of Lords, and known for an incident in which she put two fingers up to Lord King who '*suggested World War Two veterans were getting pretty old*'.³⁹²

More recently, books have been published by individuals viewing First and Second World War cryptanalysis from an 'independent' point of view, the authors having not worked at any of the establishments during either of the wars. These books are considered separately as they are based predominantly on archival documents with the omission of personal memory.

2.5.2 BP: Historical publications

E.W. Humphreys argues that the historical writings of Ultra appear to be 'conceived' in three different major stages.

³⁸⁸ Mair Russell-Jones & Gethin Russell-Jones, *My Secret Life in Hut Six: One woman's experiences at Bletchley Park* (Oxford: Lion Books, 2014).

³⁸⁹ Russell-Jones and Russell-Jones, *My Secret Life in Hut Six*, p. 79.

³⁹⁰ Trumpington, *Coming Up Trumps*.

³⁹¹ Trumpington, *Coming Up Trumps*, p. 63.

³⁹² <http://www.bbc.co.uk/news/uk-politics-16283295> [accessed 12 May 2015].

The writings of the first and second waves of writers are generally written from a nationalist and patriotic point of view... The earliest writers on the subject of ULTRA were men, who had been employed during 1939-45 war at Bletchley Park (BP). They had some involvement with Signals intercept, decoding, interpretation or the building of the Bombes. Many writers were not professional historians but men who wanted us to know ‘what they did in the war, Daddy’.³⁹³

As Humphreys further points out there were occasional references to females of the same class, but generally they were referred to as WRNS, WAAFS and civilians. The third group that Humphreys describes are the authors who published in the 1980s and 90s who were not involved in ULTRA during the war, were writing with the benefit of “20/20 hindsight” and so “*were able to re-search, re-interpret and re-write the use of ULTRA*”³⁹⁴ It is worth noting that Humphrey’s classification can to a certain extent be broadened to the First World War as the books published regarding Room 40 and MI1(b) were also written by the male decoders and interpreters who had worked for their respective organisations (as has been discussed in section 2.2.3 Memory).

The first book to be published in English which includes mention of BP was *Room 39* in 1968 by Donald MacLachlan.³⁹⁵ It alludes to BP by its other name of ‘Station X’ several times but does not go into detail because of OSA restrictions in 1968.³⁹⁶ Revelations of the role BP played during the Second World War soon became an area of worldwide interest due in no small part to the Winterbotham book published in 1974.

³⁹³ E.W. Humphreys, ‘Enigma’, in *The Enigma Symposium 2000*, ed. by Hugh Skillen (Pinner: publisher unavailable, 2010), p. 121. (Unfortunately, nothing else is known about the author as this might allow more gender context for these statements.).

³⁹⁴ Humphreys, ‘Enigma’ p. 122.

³⁹⁵ MacLachlan, *Room 39*.

³⁹⁶ MacLachlan, *Room 39*, pp. 76-101.

Ronald Lewin published *The Ultra Secret* in 1978, only four years after Winterbotham. This leads to certain parallels. Similarly, to Winterbotham, Lewin also describes the efforts of BP within a tactical history of the Second World War. However, as Lewin had access to more sources of information than Winterbotham, as well as some more recently released archival material, the result is arguably a more accurate account complete with the effect that Ultra had on the war; something which was missing from earlier histories.³⁹⁷ In addition to access to limited primary resources, Lewin had contact with more former staff, who had by then been released from the OSA. There is little detail of the female cryptanalysts, although he does mention Mavis Lever and describes her as a cryptanalyst, this is but one sentence. Both Margaret Rock and Joan Clarke, as the other two women who are so far generally acknowledged as the only Second World War female cryptanalysts, remain conspicuous by their absence. Lewin also had the added advantage of several photographs which add a visual element to the story, noticeably lacking from Winterbotham's book.

As more archival material has become available, authors have updated Second World War history books with the role of BP encompassed within the sequence of events of individual battles. Previously this intelligence had been assumed to come from a variety of other sources including prisoners of war. Hugh Sebag-Montefiore has written a thought-provoking book which includes early details of Hans Thilo Schmidt's contribution of secret German documents on Enigma which were provided to the British.³⁹⁸ The remainder of the book predominantly considers the Battle of the Atlantic and Ultra's effect on the decisions made by both commanders and several high-ranking staff in the navy. In the years post-World War Two several official historians were asked to produce histories of different aspects of the war, yet it still took until 1993 before official historian Harry Hinsley's first book in his series on intelligence was published, including its role in the Second World War. Hinsley's original five volumes were not without controversy; once these were published, there were complaints of inaccuracies, which led to Volume 3 being reprinted into

³⁹⁷ Lewin, *Ultra Goes to War*.

³⁹⁸ Sebag-Montefiore, *Enigma*, pp. 9-10.

two volumes: a newer Volume 3, Part 2 whilst the earlier volume 3 was renamed Volume 3 Part 1.³⁹⁹ Errors aside, the volumes do provide a detailed account of World War Two including the impact of intelligence. However, there is no mention of individuals except for the key players, a term which did not include the women.

Early World War Two histories were obviously bereft of cryptanalytic details, as those intimate details needed to be protected from contemporary adversaries. Churchill wrote a series of books charting the history of the Second World War, from the end of the Great War, for which he won a Nobel Prize for Literature. There is obviously no mention of codebreaking in these books as Churchill was not able to write about BP and its role in intelligence. It would be interesting to speculate on what could be added to these books if this had not been the case; such speculation is, however, beyond the remit of this thesis.

Over 40 years after these early pathfinders, books are still regularly being published about BP, as more stories are published by the people who served there. Today it is very easy to self-publish and some former BP incumbents have only recently decided to publish their memories; often because they know that the information will be lost if they do not share it before they pass away. Indeed, an unknown number have died and have taken their secrets to the grave, either because they passed before they were allowed to speak, or because they continued to believe that they were not permitted to talk. More information may become available, as more files are released to TNA and others come forward to share their own, or familial, stories. It is important to add that the number of personal accounts are reducing, as the number of former incumbents diminishes.

More recently authors have concentrated their in-depth works into two broad thematic categories: first, the technical aspects of decipherment and second, the impact of reading Axis messages. An approach to the first category is biographic - Andrew Hodges for example produced a detailed

³⁹⁹ Hinsley et al. *British Intelligence in the Second World War*, 5 vols.

account of Alan Turing.⁴⁰⁰ His book was also used as the basis of the Hollywood film *The Imitation Game* which will be considered later in this chapter. Turing is the tragic but brilliant archetype of a Second World War cryptanalyst and arguably has become the best known due to his short but eventful life, and premature death⁴⁰¹, illustrating how publications about World War Two cryptanalysis has become skewed in favour of unusual individuals such as Turing, and as a result, other cryptanalysts have faded into relative obscurity. The present research does not seek to detract from the excellent work carried out by Turing, but to indicate that Turing was one of many brilliant minds, both male and female, at BP.

A contrast to this male-dominated field is Mavis Batey who has written a detailed account of Alfred Dillwyn ‘Dilly’ Knox. Although there is some technical detail, it tells a more complete story of the department set up by Knox (and Mavis’ future husband Keith Batey) in which they were involved.⁴⁰² In comparison to the published material on the male cryptanalysts, very little has been written about female cryptanalysts, except those who worked under Knox – the women known collectively as ‘Dilly’s Girls’.⁴⁰³ This team of ‘girls’ is also included in Dilly’s niece’s Penelope Fitzgerald’s biography of the Knox brothers.⁴⁰⁴ It is worth noting that several women who worked with these cryptanalysts were ultimately married to them; for example, Olive Roddam was Knox’s secretary in Room 40 and they married in 1920⁴⁰⁵, while Alistair Denniston had married his secretary Dorothy Gilliat in 1917⁴⁰⁶.

⁴⁰⁰ Hodges, *Alan Turing*.

⁴⁰¹ Hugh Whitmore has embodied World War Two codebreaking into Turing with the play entitled ‘*Breaking the Code*’. Copeland has also edited a book about Turing which includes some articles written by Turing himself. The book offers an in-depth look at the ‘ideas behind the computer age’ B. Jack Copeland, *The Essential Turing: The ideas that gave birth to the computer age* (Oxford: Clarendon Press, 2004).

⁴⁰² Batey, *Dilly*.

⁴⁰³ Batey, *Dilly*, p. 107.

⁴⁰⁴ Penelope Fitzgerald, *The Knox Brothers* (London: Macmillan, 1977), pp. 236-237.

⁴⁰⁵ Batey, *Dilly*, p. 44.

⁴⁰⁶ Joel Greenberg, *Alistair Denniston; Code-Breaking from Room 40 to Berkeley Street and the Birth of GCHQ* (Barnsley: Frontline Books, 2017), p. 66.

The female cryptanalysts are only peripherally mentioned in specific sections of other, more general books, about BP. ‘*Action This Day*’⁴⁰⁷ was reprinted and published as *The Bletchley Park Codebreakers*⁴⁰⁸ edited by Erskine and Smith, and contains one chapter written by Mavis Batey, and another by her husband Keith Batey. As one of ‘Dilly’s Girls’, Mavis has insight and a unique position; in addition to Mavis’s book and her numerous published interviews, this author also had the opportunity to interview Mavis twice for the purposes of this research. Brian Oakley has published a booklet, *The Bletchley Park War: Some of the Outstanding Individuals*, which contains a small section on ‘Dilly’s Girls’ as a whole.⁴⁰⁹ Sinclair McKay’s *The Secret Life of Bletchley Park*⁴¹⁰ and Michael Smith’s *Station X*⁴¹¹ also mention some of the female cryptanalysts but are heavily reliant on Mavis’s recollections. Mavis brings in her own experiences and address the subject as a whole in her book about Dilly Knox⁴¹².

In 2020, two authors published historiographical work that encompassed BP. The first was Boyd who specifically wrote about naval intelligence. In his description of the full in-depth story, he does mention the names of Margaret Rock, Mavis Lever and Joan Clarke, albeit in passing.⁴¹³

The final book in this section is by Ferris and includes a more general history of GCHQ.⁴¹⁴ Ferris describes how unprepared GC&CS was at the outbreak of the Second World War claiming it had been stronger in military Sigint in World War One.⁴¹⁵ He covers in detail the move to BP and

⁴⁰⁷ *Action this Day*, ed.by Michael Smith and Ralph Erskine. (London: Bantam Press, 2001).

⁴⁰⁸ Erskine and Smith, *The Bletchley Park Codebreakers*, Mavis Lever – pp. 79-80, pp. 258-9, p. 271, pp. 274-8. There is no mention of Margaret Rock or Joan Clarke.

⁴⁰⁹ Brian Oakley, *The Bletchley Park War: Some of The Outstanding Individuals* (Online: Wynne Press, 2006), pp. 32-33.

⁴¹⁰ McKay, *The Secret Life of Bletchley*.

⁴¹¹ Smith, *Station X*.

⁴¹² Batey *Dilly*.

⁴¹³ Boyd, *British Naval Intelligence*, p. 330, p. 444, p. 515.

⁴¹⁴ Ferris, *Behind the Enigma*.

⁴¹⁵ Ferris, *Behind the Enigma*, p.164.

some of the individuals who worked there. Unusually he also discusses several female cryptanalysts too, not just the better-known ones such as Mavis Lever, Margaret Rock and Jean Clarke, but also some of the women who have been identified in this research from archival sources. Ferris includes cryptanalysts such as Wendy White,⁴¹⁶ Emily Anderson⁴¹⁷ and Marie Rose Egan⁴¹⁸ albeit briefly. This is important because for the first time these women have been officially recognised for the contribution they made.

In addition to these books are others which have used BP as a 'hook' for a biography. In *'The Girl from Station X: My Mother's Unknown Life'* Elisa Segrave has written a detailed book based on her mother's (Anne Hamilton-Grace's) diaries. The book has a small section (some ten percent) which is very informative on the day-to-day life at BP, but this is lost under the detritus of diary entries and memories.⁴¹⁹ It could be speculated that Segrave chose to title her book under the BP heading because she anticipated that it would sell more under this title compared to a book based on diaries which happened to include a brief period at BP.

More recently Tessa Dunlop has written *The Bletchley Girls* detailing 15 women's lives before, during and after their jobs at BP and its Y-stations.⁴²⁰ The result is a rather confusing mélange of stories which run concurrently rather than individually (where it would be possible to have a deeper understanding of each woman's journey), presumably due to the relative quantities of available information as some of the women are described more than others; inevitably the 'interesting' women are those described in far more depth.⁴²¹ Dunlop also inexplicably refers to Hut Six as

⁴¹⁶ Ferris, *Behind the Enigma*, p. 90-91.

⁴¹⁷ Ferris, *Behind the Enigma*, p. 89.

⁴¹⁸ Ferris, *Behind the Enigma*, p. 87-88. p. 440.

⁴¹⁹ Elisa Segrave, *The Girl From Station X: My Mother's Unknown Life* (London: Aurum Press Ltd, 2013).

⁴²⁰ Tessa Dunlop, *The Bletchley Girls: War, Secrecy, Love and Loss: The Women of Bletchley Park Tell their Story* (London: Hodder & Stoughton, 2015).

⁴²¹ Dunlop, *The Bletchley Girls*, p. 5.

‘Bethlehem’, a term which is not explained. These accounts go part way to showing the roles and responsibilities of the women carrying out lower grade tasks at BP.

In contrast to Joan Clarke’s personalised account in Hinsley and Stripp, Sinclair McKay’s *The Secret Life of Bletchley Park*’ can be compared. McKay’s social narrative seems to be able only to recognise Joan for her relationship to Alan Turing. Throughout the book, McKay predominantly refers to Joan in the somewhat demeaning term of “Turing’s former fiancée”⁴²²; indicating that Joan is not worthy of mention in her own right, for her own abilities. The reality was vastly different; Joan was a gifted mathematician who for most of her life⁴²³ worked for GC&CS and later GCHQ. Anthony Randall describes how she was highly thought of by her colleagues, although he has his own inaccuracies: he seems to indicate that Turing was head of the team which included Knox, Welchman and Birch, which was simply not the case⁴²⁴; initially Turing was attached to Knox⁴²⁵ and worked under him⁴²⁶ before becoming head of Hut Eight, Knox was head of ISK until his death in 1943, Welchman head of Hut Six, and Birch took over as head of Naval Section.

Many authors, however, have undertaken the presumably less daunting task of writing about the numerous WRNS, due to the sheer numbers who were there and who are now able to talk about the roles they played.⁴²⁷ Eric Taylor and Felicity Hill consider how the WRNS felt at the time, as they could not talk about their work. Their personal war effort was often considered unimportant and something of a failure, the reality being obviously quite different.⁴²⁸ It is important to note that this was not exclusively experienced by WRNS. Taylor and Hill also observe how age was no

⁴²² McKay, *The Secret Life of Bletchley Park*, p. 96, p. 133, p. 198.

⁴²³ Randall, *Joan Clarke*, p. 160.

⁴²⁴ Randall, *Joan Clarke*, p. 50.

⁴²⁵ Hodges, *Alan Turing*, p. 151; Copeland *The Essential Turing*, p. 220.

⁴²⁶ Hodges, *Alan Turing*, p. 161.

⁴²⁷ Marion Hill, *Bletchley Park People: Churchill’s Geese that Never Cackled* (Stroud: The History Press, 2004), Sinclair McKay and Hinsley & Stripp all mention the WRNS working on the bombs.

⁴²⁸ Eric Taylor and Felicity Hill, *Women Who Went to War 1938-1946* (London: Robert Hale Limited, 1988), p. 98.

obstacle and former women counter clerks from the GPO, many in their 70s and 80s, came forward and helped in response to an appeal.⁴²⁹ What is striking is that Taylor and Hill have written a book about the women who went to war, but do not include the female codebreakers.

Having served in the British Army and written numerous books on various political topics, Michael Smith has written several books on BP and the intricacies of codebreaking.⁴³⁰ As an investigative journalist Smith's style is much more to the point and factual by contrast with McKay's. While McKay concentrates more on individual stories which are at times disjointed; Smith has taken a chronological approach encompassing the war in Europe. Some humour is injected into the story with accounts regarding Jean Campbell-Harris (see Baroness Trumpington) being loaded into a laundry basket which was sent flying down the corridor straight into the men's toilets.⁴³¹

Both Smith and McKay have written predominantly about the war in the European theatre. They also write briefly about the war in the Pacific, but this is not the main function of their books. Smith also takes into consideration the negatives of codebreaking including details discussed by Mavis Lever and the impact of breaking into the message which led to vast numbers of Italian deaths in the Battle of Cape Matapan.⁴³² This can be considered in direct contrast to the successful aspect of breaking codes, which allowed the Allies to evade death themselves.

⁴²⁹ Taylor and Hill, *Women Who Went to War*.

⁴³⁰ Smith, *The Secret of Station X*.

⁴³¹ Smith, *The Secret of Station X*, p. 185.

⁴³² Smith, *The Secret of Station X* pp. 120-121, and author's interview with Mavis Batey, 11 July 2011.

One book written about Mavis is a recent biography by Jean Stone.⁴³³ The book is a social narrative on Mavis's life including the work she carried out at BP, and the subsequent work in historic gardens for which she was awarded an MBE in 1988.⁴³⁴

Margaret Drabble has written a detailed biography of Angus Wilson and includes some detail of Wilson's life at BP, although not the codebreaking aspect; instead, Drabble concentrates on Wilson's eccentric behaviour and love life.⁴³⁵

2.5.3 Roles and gender

The number of people in the British workforce reached its height in 1943; at that time it stood at 22,285,000 (compared to 19,750,000 in 1939).⁴³⁶ Of this total of women in the British workforce approximately 8,600 worked at BP.⁴³⁷ As the Second World War, and therefore BP, is more recent in people's memory, and as BP was considerably bigger than its First World War counterparts, it is much better known than the three earlier Sigint intelligence organisations (Room 40, MI1(b), HushWAACS). Furthermore, thousands of BP documents have been deposited in TNA in recent years, and BP has thus arguably become more accessible. It also can be seen in greater detail as women working in intelligence have spoken about their roles as clerical and administrative assistants, in communications and on machines – bombes, Colossi and Holleriths amongst others. Furthermore, “*Alongside the more than one and a half million women employed in essential industries by 1943, and who have been the focus of considerable research, 470,000 women served in the Women's Auxiliary Services: the Auxiliary Territorial Service (ATS), the Women's Royal Naval Service (WRNS) and the Women's*

⁴³³ Jean Stone, *Mavis Batey: Bletchley Codebreaker, Writer, Garden Historian, Conservationist*. (Kidworth Beauchamp: Matador, 2020).

⁴³⁴ Stone, *Mavis Batey*, p. 217.

⁴³⁵ Margaret Drabble. *Angus Wilson: A Biography*. (London: Minerva, 1995), pp. 96-111.

⁴³⁶ Summerfield, *Women Workers*, p. 29.

⁴³⁷ <https://bletchleypark.org.uk/learn/resources/women-at-bletchley-park> [accessed 18 June 2021].

Auxiliary Air Force (WAAF).”⁴³⁸ Occupational segregation by sex is arguably one of the persistent patterns that characterise the world.⁴³⁹ Men and women are generally drawn to different roles, they are physically different so they are treated differently; separate toilets, different clothes, different departments, and separate occupations.⁴⁴⁰ Although today the ‘gaps’ are narrowing, prior to 1945 gendering was normal and specific roles and tasks were considered suitable for either men or women respectively.

Catherine Hakim has taken the segregation concept further and split ‘gender segregation’ into two further sub-sections; the first is that of horizontal segregation which indicates women and men hold different types of occupations and that ‘crowding’ can occur; the job market becomes flush with too many of one gender doing the same role.⁴⁴¹ One example of horizontal segregation would be women working as dressmakers and men as tailors.⁴⁴² The second is the concept of vertical segregation where men and women attain different levels in the employment hierarchy.⁴⁴³ A frequent example of vertical segregation would have been in junior schools, where men typically were headmasters and women, school teachers.⁴⁴⁴ Horizontal segregation is slightly more subtle than vertical segregation as it might be perceived that male and female roles were similar, rather than the more obvious difference in status that could be seen in vertical segregation.

The concept of gendered roles is not new. A man’s job was linked to his social standing, and masculinity as family ‘bread-winner’.⁴⁴⁵ At the same time, the women’s responsibilities were linked

⁴³⁸ Stone, *Creating a (gendered?) military identity*, pp. 605-624.

⁴³⁹ Cynthia Cockburn, ‘The gendering of jobs: workplace relations and the reproduction of sex segregation’, in *Gender Segregation at Work* ed. by Sylvia Walby (Maidenhead: Open University Press, 1988), p. 29.

⁴⁴⁰ Cockburn, *The gendering of jobs*, p. 29.

⁴⁴¹ Catherine Hakim, *Occupational Segregation* (London: Department of Employment Research Paper No9, HMSO, 1979).

⁴⁴² Hakim, *Key Issues*, p. 148.

⁴⁴³ Hakim, *Occupational Segregation*.

⁴⁴⁴ Hakim, *Key Issues*, p. 148.

⁴⁴⁵ Harriet Bradley, *Men’s Work, Women’s Work* (Minneapolis, University of Minnesota Press, 1989), p. 8.

to the home as a feminine caregiver, if a woman did have to work it was because the husband was on a low-income and it was necessary to earn money to support the family.⁴⁴⁶ Harriet Bradley also argues that work based segregation came about to off-set the threat men felt as they lost their role as ‘tough’, masculine, ‘pioneering’ breadwinners.⁴⁴⁷ There was an argument that women preferred feminine jobs, and men masculine ones with men refusing to be subordinate to women in the workplace⁴⁴⁸, and a yet further argument that women’s occupations required fewer skills than men.⁴⁴⁹

Margaret Higonnet et al discuss the first wave of scholarship as the mythology of war’s gender – the masculine effects of war.⁴⁵⁰ It was not until the second wave, now known as feminism, that the assertion arose that the two world wars were entirely male enterprises.⁴⁵¹ It could be argued that world war narratives can be masculinised, omitting the role played by women, the concept being that the front line is a male-controlled domain with no available roles for women. There is a pointed difference between the ‘activities, responses [to situations] and status’ of men and women during this period; however it is important to keep in mind that women continued to be subordinate to men.⁴⁵² However, it could be said that this was a period when women were temporarily behaving like men, and Higonnet introduces the concept of the double helix⁴⁵³, that

⁴⁴⁶ Bradley, *Men’s Work*, p. 8.

⁴⁴⁷ Bradley, *Men’s Work*, p. 224.

⁴⁴⁸ Hakim, *Key Issues*, pp. 10-11.

⁴⁴⁹ Sylvia Walby, ‘Segregation in employment in social and economic theory’, in *Gender Segregation at Work*, ed. by Sylvia Walby (Maidenhead: Open University Press, 1988), p. 15.

⁴⁵⁰ *Behind the Lines: Gender and the Two World Wars*, ed. by Margaret Randolph Higonnet, Jane Jenson, Sonya Michel, Margaret Collins Weitz (London: Yale University Press, 1987), p. 2-3.

⁴⁵¹ Higonnet et al *Behind the Lines*, p. 3.

⁴⁵² Higonnet et al, *Behind the Lines*, pp. 2-3.

⁴⁵³ Higonnet and Higonnet, *The Double Helix*, Women behaving like men p. 7, double helix pp. 31-47.

is, although the roles of men and women change over time, they do not change in relation to each other.

Hakim uses Goldberg's argument that male hormones push men to be more assertive, aggressive, dominant, and competitive and this is the reason they search top positions in any hierarchy.⁴⁵⁴ In comparison a women's position in society as a whole is determined by both her employment status and domestic role.⁴⁵⁵ This inequality shows that a man can be considered societally successful the higher up the employment ladder he goes, having attained the rung he has reached due to his own admirable 'aggressive' male tendencies. Whereas a woman can only be considered successful if she has worked and/or had a family, with often no recognition being given to a woman who has given up her career to have a family, leading her to work full time in managing a household in addition to any future employment. There is no indication of the level of importance of her job as importance is allocated only according to the sexual division of labour.

Penny Summerfield discusses the concept of dilution. By 1943 women flooded the workplace and became the predominant work-population, making up, for example, about 60 percent of the workers in electrical engineering (they had never made up more than 14 percent previously).⁴⁵⁶ However, Hakim argues that in reality the female full-time rate has remained constant for over a century.⁴⁵⁷ As the work was now being carried out by women it was considered less skilled and less valuable than when it had been done by men.⁴⁵⁸ Whilst some people like to stress the extreme jobs that women did during the Second World War such as crane driving and heavy lifting work normally associated with men, Summerfield argues that this still did not put women on an equal

⁴⁵⁴ Hakim, *Key Issues in Women's Work*, p. 5.

⁴⁵⁵ Hakim, *Key Issues*, p. 5.

⁴⁵⁶ Penny Summerfield, *Women Workers in the Second World War*, p. 151.

⁴⁵⁷ Hakim, *Key Issues*, p. 65.

⁴⁵⁸ Summerfield, *Women Workers*, p. 151.

footing to the men⁴⁵⁹ arguably doing 'lesser' jobs.⁴⁶⁰ It has been argued that the achievement levels of the women were semi-skilled, with a very small proportion in the highly-skilled grade.⁴⁶¹

According to Summerfield there are two schools of thoughts in the dilution process during this period.⁴⁶² The first argues that little changed for women, that the dilution only served to perpetuate gender divisions; and the second, that dilution remained because the system permitted women to carry out men's work.⁴⁶³ Men were somewhat threatened by women doing their roles, the main concerns being that women would take over more jobs, thereby removing any jobs for men⁴⁶⁴, an argument also involving the fact that women were cheaper to employ and therefore arguably more 'desirable' to the employer. Numerous men threatened to strike in objection despite it being illegal to do so under 'Order 1305' of 18 July 1940.⁴⁶⁵ One of the actions that the men could take was through passive resistance, for example by refusing to teach the women how to do their jobs so that the jobs would still be there on their return.⁴⁶⁶ Furthermore, men had the backing of trade unions which themselves had government backing for an agreement to terminate women's jobs at the end of the war.⁴⁶⁷

The women were in an unwinnable situation – they could be blamed for inefficiency which brought down the take-home pay, or conversely over-efficiency by bringing down piece-rates.⁴⁶⁸ If a woman enjoyed her 'new' role, then this fact caused more difficulty as she was unlikely to want to

⁴⁵⁹ Summerfield, *Women Workers*, p. 152.

⁴⁶⁰ <https://www.nationalww2museum.org/war/articles/gender-home-front> [accessed 1 July 2021].

⁴⁶¹ Summerfield, *Women Workers*, p. 152.

⁴⁶² Summerfield, *Women Workers*, p. 152.

⁴⁶³ Summerfield, *Women Workers*, p. 153.

⁴⁶⁴ <https://www.bbc.co.uk/bitesize/guides/ztx66sg/revision/5#:~:text=Impact%20of%20the%20war%20on%20the%20position%20of%20women&text=The%20problem%20was%20called%20'dilution,had%20to%20work%20under%20supervision> [accessed 1 July 2021].

⁴⁶⁵ Summerfield, *Women Workers*, p. 155.

⁴⁶⁶ Summerfield, *Women Workers*, p. 155.

⁴⁶⁷ Walby, *Segregation in employment*, p. 26.

⁴⁶⁸ Summerfield, *Women Workers*, p. 156.

return to her pre-war job. Despite men blaming women for the loss of ‘men’s’ jobs, the women arguably also lost jobs formerly available to them - domestic servants, dressmakers and sewing – all of which continue to be considered female gendered roles which would no longer exist in such numbers with the changes in society.⁴⁶⁹ Furthermore, it is worth noting that little has changed in the attitudes between men and women workers today. In her recent book Sieghart has assessed the way men and women are perceived at work through interviews with transgender men and women, the fascinating findings show that a transgender female experiences a complete role reversal in being ignored and spoken over as if she has nothing of importance to say, whilst a transgender male is buoyed by his male colleagues to perpetuate the cycle of ignoring women; even in situations when colleagues knew their birth-sex before they transitioned.⁴⁷⁰

The language of gendering also needs to be considered in this study as there are marked differences between men and women. Many roles are still ‘manned’, particularly in ‘war-making’ and ‘national security’.⁴⁷¹ Carol Cohn further points out

As a woman, I can choose the ‘masculine’ (tough, rational, logical) position. If I do, I am seen as legitimate, but I limit what I can say. Or I can say things that place me in the ‘feminine’ position – in which case no one will listen to me.⁴⁷²

This is worth considering in more depth. The concept is that women can speak but will not be listened to, but changing what is said, and the way it is said, to become more ‘man-like’ results in being heard. In addition to language, appearance can also be considered an essential part in the gendering differences between servicemen and women. Service men were in a set uniform,

⁴⁶⁹ Hakim, *Key Issues*, p. 77.

⁴⁷⁰ Mary Ann Sieghart, *The Authority Gap: Why women are still taken less seriously than men, and what we can do about it* (London: Penguin Books, 2021), pp. 37-48.

⁴⁷¹ Carol Cohn, ‘War, Wimps, and Women: Talking Gender and Thinking War’, in *Gendering War Talk*, ed. by Miriam Cooke and Angela Woollacott (Princeton, Princeton University Press, 1993) p. 238.

⁴⁷² Cohn, ‘War, Wimps, and Women’, p. 238.

whereas a uniform had to be carefully chosen to identify women as part of that service but remain feminine at the same time. The WAAF was unusual in the female services as they were the only ones not put into all-female regiments but worked alongside men in what could be argued comparable roles; in other words, if “*a particular station needed a radar operator, the RAF Records Department would send an airman or airwoman, depending purely on who was due a posting.*”⁴⁷³ This was in direct contrast to the ATS and WRNS who were given gender-specific roles. WAAF uniform was the same, except for a skirt (although in some situations trousers were permitted) instead of men’s trousers and they were entitled to wear “*cap badges, buttons, badges of rank and the crest of the RAF, an honour denied to women of the ATS or WRNS*”.⁴⁷⁴

2.5.4 BP

The normative assumption is that gender segregation took place at BP, that the roles of men and women were very different and there was no overlap.⁴⁷⁵ The men were top level cryptanalysts, or high-level engineers for the cryptological machines such as the bombe and Colossus, and the women were working separately as secretaries, Hollerith operators, and card indexers amongst other low-level unskilled work. It can be proven that whilst the men did indeed hold these positions, women were also working in a full range of low-, mid- and high-grade work but the highest grades were unavailable to them. Whilst there were women who were senior assistants, none held the highest graded posts; the highest role a woman held was deputy head of a top department, for example, Joan Clarke in Hut Eight, and Catherine Wallace Pope in ISOS (see Chapter Six for more detail). There were also a small number of women heading sub-departments of mainly female secretariat staff; like Phoebe Senyard (see CS4).

⁴⁷³ Stone, *Creating a (gendered?) military identity*, pp. 606-607.

⁴⁷⁴ Stone, *Creating a (gendered?) military identity*, pp. 606-607.

⁴⁷⁵ Jane Pilcher & Imelda Whelehan, *50 Key Concepts in Gender Studies* (London: Sage, 2004, repr. 2008), p. 64.

It is worth noting here that, whilst there was a combination of women from low-, middle-, and high-class backgrounds, there were some cryptanalysts at BP who were not prepared to work with certain women. Dilly Knox refused to work with any 'debs' who were there because they 'knew someone' who could arrange for them to work at BP, and Knox also refused to work with any of the 'uniforms' because he wanted to know how qualified they were for their role, rather than merely their rank.⁴⁷⁶

In terms of BP technology, the British created their own cypher machine for use during the war, based on the same principles as the Enigma machine, and called Typex. It was co-designed by Sergeant EW Smith who also worked on its later derivative 'Mercury'.⁴⁷⁷

The Enigma machine itself was based on a rotor wheel system. The appeal is easy to comprehend; the three rotor Enigma had an inconceivable 3×10^{14} possible combinations of letter substitutions⁴⁷⁸ which would seemingly be an impossible task to break such a code. However, the difficulties did not stop here; later adaptations were made to the original three rotor machine to increase its complexity. Initially the Enigma had three rotors, and knowledge of the details of the setting up of the machine to send messages was required, as well as some method of simulating the workings of the Enigma machine itself, to decrypt messages. Without these, it was nearly impossible to decrypt a message. Later the German navy chose to upgrade the three-rotor to a four-rotor machine. Other adaptations incorporated the inclusion of a plug board, and the addition of a choice of three out of eight rotors.⁴⁷⁹ The complexities of Enigma and how it worked has been well documented and is considered beyond the remit of this research.

⁴⁷⁶ Batey, *Dilly*, p. 107.

⁴⁷⁷ Ferris, *Behind the Enigma*, p. 98.

⁴⁷⁸ Ratcliff, *Delusions of Intelligence*, p. 18.

⁴⁷⁹ Singh, *The Code Book*, p. 181.

Fortunately for British cryptanalysts human error and predictability meant the process was considerably less random and patterns emerged which could be considered gifts or ‘cillies’ to a cryptanalyst. Examples of cillies include the use of ‘*Heil Hitler*’ at the beginning of a message, and ‘*Nothing to report*’ sent at the same time, from the same location.⁴⁸⁰

The use of the Enigma machine variants, upgrades and adaptations added enough complexity for the German High Command and military to believe that it was unbreakable.⁴⁸¹ A number of officers in the higher echelons of German command did question its security, but Hitler was assured of its confidentiality and refused to listen.⁴⁸²

The Germans were not the only ones to use rotor machines for cryptanalysis. The Italians too were using a version of Enigma.⁴⁸³ The Japanese Navy for example purchased an Enigma machine in 1934.⁴⁸⁴ The machine that they later created by adapting it was codenamed ‘Purple’ by the Americans.⁴⁸⁵ The Americans themselves were using a rotor machine called ‘Sigaba’.⁴⁸⁶

The Enigma machine could arguably be gendered male as it was used by male soldiers in the field. The Typex machines which were based on Enigma could be considered gendered female as they were used predominantly by women for decrypting messages, following the initial breaking of the key.

2.5.4.1 *The bombe*

⁴⁸⁰ <https://plus.maths.org/content/exploring-enigma> [accessed 1 April 2017].

⁴⁸¹ Ratcliff, *Delusions of Intelligence*, pp. 4-5.

⁴⁸² Ratcliff, *Delusions of Intelligence*, p. 128; and 138; 155.

⁴⁸³ Ratcliff, *Delusions of Intelligence*, p. 128.

⁴⁸⁴ Kahn, *The Code-Breakers*, p. 6.

⁴⁸⁵ Ratcliff, *Delusions of Intelligence*, p. 11.

⁴⁸⁶ Ratcliff, *Delusions of Intelligence*, p. 11.

As war broke out and communications increased in volume, the keys to the codes changed much more often and the number of rotors changed from a set of three, to three from a choice of five.⁴⁸⁷

It is important to note that the keys changed daily (and later more frequently) so the codes had to be attacked continually. Once the cryptanalysts had broken into a key, they were only able to read the messages encrypted in it until the key changed once again.

Turing worked on creating an electro-mechanical machine which he also called the bombe. He was later joined by Welchman who had been working on traffic analysis.⁴⁸⁸ “*The bombe was capable of simulating the activity of several Enigmas wired together and could run through the 17,576 possible rotor settings of the Enigma in roughly two hours.*”⁴⁸⁹

Harold ‘Doc’ Keen at the British Tabulating Machinery factory in Letchworth oversaw the practical creation of the bombes based on Turing and Welchman’s designs.⁴⁹⁰ A small group of WRNSs were then brought in to test their abilities operating the bombe machine; until that point, it had been assumed that they would not be able to manage. Former WRN Merial Dunn confirmed that she was in this test group.⁴⁹¹ The test was successful, and WRNS were brought in from across the UK to run the machines. The prototype bombe came into operation in May 1940.⁴⁹² By June 1941 there were five bombes in operation, and 15 by November 1941.⁴⁹³ The numbers continued to rise, and outstations were set up to house the machines. Adstock, Eastcote, Gayhurst, Stanmore and Wavendon were the locations of the five outstations which housed these bombes and were predominantly staffed by WRNS. It is important to acknowledge this because 1280 of women

⁴⁸⁷ Ratcliff, *Delusions of Intelligence*, pp. 22-23.

⁴⁸⁸ Hodges *Alan Turing*, p. 179.

⁴⁸⁹ Leavitt. *The Man who knew too much*, p. 175.

⁴⁹⁰ Andrew Hodges *Alan Turing*, p. 181. John Keen, *Harold ‘Doc’ KEEN and the Bletchley Park BOMBE, Code name CANTAB* (Cleobury Mortimer: M & M Baldwin, 2012).

⁴⁹¹ Details from the author’s private collection of documents from Merial Dunn, former WRN.

⁴⁹² Copeland. *The Essential Turing* p. 256.

⁴⁹³ Copeland. *The Essential Turing* p. 256.

were involved in the work carried out by the bombe.⁴⁹⁴ Thus, whilst arguably the bombes could initially be gendered male because it was not clear if they could be operated by women, they certainly became regendered female by the British, if not the Germans, within a short space of time.

2.5.4.2 Colossus

Later in the war the Lorenz was introduced; a machine designed to communicate secure messages between Berlin and the German Army. The Lorenz was a more complex machine as it had 12 rotors (compared to Enigma's three or four). To BP the Lorenz was known as 'Tunny' and the messages derived from it as 'Fish'.⁴⁹⁵ The Lorenz encrypted messages were sent in Baudot code over teleprinter links rather than, as Enigma was, in Morse code over radio waves. The upper echelons of the German Government used Lorenz; it was considered even more secure than the 'unbreakable' Enigma. The messages were not necessarily more important than those sent on the Enigma, but a different method of reading the traffic was needed to get meaningful intelligence from it.

Professor Max Newman headed up the department working on a machine to attack Tunny in a department known as the Newmanry. Such machines included the 'Heath Robinson' named after the cartoonist who drew ridiculous contraptions, clearly having such a masculine name automatically genders the Robinson male, despite its female operators. These early versions of machines were not successful. Eventually, mathematical genius William 'Bill' Tutte was able to solve every permutation of the 12 rotor-wheeled machines on a series of large pieces of card.⁴⁹⁶ Tommy Flowers from the GPO Research Station in Dollis Hill was then tasked with creating a

⁴⁹⁴ See section 6.4.14.3.

⁴⁹⁵ Erskine and Smith, *The Bletchley Park Codebreakers*, p. 314.

⁴⁹⁶ Erskine and Smith, *The Bletchley Park Codebreakers*, pp. 314-315.

machine based on these cards; the machine was called Colossus.⁴⁹⁷ The machine used electronic valves allowing for greater speed in reading the ticker tape input and processing the information, therefore Colossus was the first semi-programmable computer.⁴⁹⁸ The Colossi that were built facilitated a successful break into Tunny.

The Colossi are an interesting conundrum as they are arguably more difficult to gender. Computers tend towards a male gendering and Colossus is no different to this; it was created by Thomas 'Tommy' Flowers using the settings worked out by William 'Bill' Tutte, and like Enigma it was looked after by mostly male engineers – 52 men worked on Colossus, of which 18 were engineers or technicians, but no female equivalents.⁴⁹⁹ As it is now recognised as one of the first computers, might this be the reason for its difficulty in gendering? A total of 130 women are listed as having worked on Colossus,⁵⁰⁰ but importantly the machine operator roles that the WRNSs carried out were gendered female. (Relatively few women carried out this role in comparison to working on the bombe because Colossus only came into being in 1944⁵⁰¹.) Perhaps a different category is needed for women carrying out a gendered female role on a male gendered machine; one of nurse, or nursemaid. Intriguingly, however, there are other roles within the Newmanry which were gendered female – one woman; Leading Wren Rosemary Hole, is listed as operating 'Mrs Miles' which was a paper tape machine.⁵⁰²

One other machine that is worth including is 'The Baby', a machine that was used exclusively in Hut Eight. Joan Clarke mentions the first time she had to 'mind the baby' (could be considered a

⁴⁹⁷ Jack Copeland, *Colossus and the Dawning of the Computer Age*, in *The Bletchley Park Codebreakers* ed. by Erskine and Smith, *The Bletchley Park Codebreakers* (London: Biteback Publishing Ltd. 2011, pp. 305-327), p. 306.

⁴⁹⁸ Tony Sale, *Colossus 1943-1996* (Cleobury Mortimer: M & M Baldwin. 1998, repr.2014), p. 9.

⁴⁹⁹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 21 June 2021].

⁵⁰⁰ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&location=colossus&page=1> [accessed 21 June 2021].

⁵⁰¹ Copeland, *Colossus*, p. 75.

⁵⁰² <https://bletchleypark.org.uk/roll-of-honour/4416> [accessed 21 June 2021].

nursemaid), a role that made her feel ‘important’.⁵⁰³ The use of this gendered language is interesting; the term ‘baby’ indicates a helpless being that is not capable of being left on its own and needs to be cared for.

2.5.4.3 Administrative and clerical work

In a role similar to the First World War, there were women working on book-building. These included women such as Dorothy Joyce Muston who compiled dictionaries of German technical terms and abbreviations⁵⁰⁴, Evelyn Margaret Senior who produced technical intelligence and a dictionary of technical terms.⁵⁰⁵ Another woman Monica Daniels, was a Foreign Office (FO) Civilian linguist who worked in technical intelligence, who dealt in particular with difficulties in German translations and who compiled a dictionary of German naval terms⁵⁰⁶. The final woman in this type of work is Dorothy Rogerson, who decoded and translated *Abwehr* signals and who produced a dictionary of German abbreviations; she had previously been in Ottawa between December 1941 and January 1943⁵⁰⁷, and is listed in the senior grade of ‘TSAO’.⁵⁰⁸ It was not simply German book-building that took place at this time; Eileen Clark⁵⁰⁹ and Audrey Ellement⁵¹⁰, both WAAFs worked on building Japanese codebooks.

Further to these book-building roles was the Index Room and the Registration Room. There was different indexing for Japanese vessels and navy signals, Air Intelligence, and various German signals – a total of 92 women worked in this section, and six men.⁵¹¹ The men worked on setting

⁵⁰³ Clarke, ‘Hut 8 and naval Enigma, Part I’, p. 114.

⁵⁰⁴ <https://bletchleypark.org.uk/roll-of-honour/6569> [accessed 21 June 2021].

⁵⁰⁵ <https://bletchleypark.org.uk/roll-of-honour/8178> [accessed 21 June 2021].

⁵⁰⁶ <https://bletchleypark.org.uk/roll-of-honour/2289> [accessed 21 June 2021].

⁵⁰⁷ <https://bletchleypark.org.uk/roll-of-honour/7852> [accessed 21 June 2021].

⁵⁰⁸ <https://bletchleypark.org.uk/roll-of-honour/7852> [accessed 21 June 2021].

⁵⁰⁹ <https://bletchleypark.org.uk/roll-of-honour/1736> [accessed 21 June 2021].

⁵¹⁰ <https://bletchleypark.org.uk/roll-of-honour/14538> [accessed 21 June 2021].

⁵¹¹ <https://bletchleypark.org.uk/roll-of-honour/search?keyword=index&page=1> [accessed 21 June 2021].

up the sections and supervision.⁵¹² Within the Registration Room there were 42 women⁵¹³ and six men⁵¹⁴.

2.5.5 BP in fiction and film: the myth capturing the public imagination

Many myths have sprung up around the BP story, partly due to its portrayal in popular culture. Since the publication of Winterbotham's book in 1974, BP has captured the world's attention. It has all the intrigues of a modern thriller; a clandestine organisation with a vast number of employees in a secret Home County location where, to the casual observer, nothing of importance appeared to happen. It had more than its share of geniuses and a subsequent tragic suicide, as well as love affairs spanning continents and British spies working for the Russians (John Cairncross, later to be identified as one of the 'Cambridge Five' spies for Soviet Russia, worked at BP⁵¹⁵). As what could be considered a fiction-writer's paradise, BP and its World War Two intelligence work have been shamelessly exploited by Hollywood. One such example is author Ian Fleming, a regular visitor to BP on behalf of naval intelligence as the personal assistant to Admiral John Godfrey; these visits are likely to have provided him with material which he later used in his James Bond books.

Robert Harris' novel *Enigma*, published in 1995, hinges on a love triangle set in wartime BP.⁵¹⁶ The main protagonist is a male codebreaker working on the U-boat code known as Shark and the two women are both clerks, a role in which most of the women working there at the time were employed. Shark did exist it – it was a Triton code produced on a four rotor Enigma machine. In

⁵¹² <https://bletchleypark.org.uk/roll-of-honour/search?gender=Male&keyword=index&page=1> [accessed 21 June 2021].

⁵¹³ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&keyword=registration%20room&page=1> [accessed 21 June 2021].

⁵¹⁴ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Male&keyword=registration&page=1>

⁵¹⁵ <https://bletchleypark.org.uk/roll-of-honour/1453> [accessed 8 June 2021].

⁵¹⁶ Robert Harris, *Enigma* (London: Arrow Books, 1995).

1942 there was a period of ten months in which BP were blocked from breaking into the codes due to a change in the parallel weather book codes; their inability to read it led to the situation being called the ‘Shark blackout’. Harris’s book is based loosely on these facts but the ‘Hollywoodisation’ of the plot sees the main protagonists taking messages out of BP to work on at home. Whilst such an episode is unlikely to have happened, there were nefarious reasons why some messages were taken home: John Cairncross was known to have taken messages out of BP to pass to the Russians.⁵¹⁷

The Hollywood film ‘*U571*’ is a fictitious story released in 2000 about the capture of an Enigma machine and codebooks by the Americans during the Second World War, with its premise based loosely on a real wartime episode involving the Royal Navy.⁵¹⁸ It being an ‘action’ picture of the war at sea, no women are involved. More recently the mini-series ‘*The Bletchley Circle*’, aired on British television in 2012 followed by a sequel in 2014, showed four women using the skills acquired during their time at BP to solve heinous crimes in the 1950s. What would seem to be a good detective story is obliterated in the web of clues worked out according to ‘code like’ numbers and extremely improbable conversations with wartime officials.

The most recent portrayal of BP in film, ‘*The Imitation Game*’, was released in 2014, and has continued to bolster the myth that Alan Turing singlehandedly fought and won the codebreaking ‘battle’ at BP. Very loosely based on Hodges’s detailed biography of Turing, the film has many inaccuracies.⁵¹⁹ Joan Clarke’s recruitment was depicted in the film as completing a crossword puzzle before anyone else in the room⁵²⁰ but she was actually recruited by her former university

⁵¹⁷ Cairncross was later revealed to be one of several British who spied for Russia, notably during the Cold War.

⁵¹⁸ The film itself was discussed in Parliament as it was the British who had captured the codebooks; it was not until close to the end of the war that the Americans themselves captured any codebooks.

⁵¹⁹ Hodges, *Alan Turing*.

⁵²⁰ In the film Joan is shown to be recruited through completing an ‘impossible’ crossword puzzle. While Joan was not recruited in this fashion - some people were through crosswords published by The Telegraph.

professor, Welchman.⁵²¹ The other erroneous depiction was her devastation at Turing breaking off their engagement; they in fact continued to be friends for the rest of Turing's life.⁵²²

These 'Hollywoodised' representations are fabricated stories, but are thought by many to represent the actualities of BP. While it is commendable that some of them portray strong female protagonists, these stories are far from the reality. Unfortunately, the use of such stories by Hollywood can probably be considered as having created a public assumption that they are factually accurate. There is a great deal of myth about what actually happened at BP, and, although the film and fiction are of value in bringing this period of history to the public consciousness and generating debate about what actually happened, it is also the depiction which the public have on which to base their opinions of BP, and Hollywood offers a somewhat skewed view of BP's involvement with World War Two, presenting the story of the top individuals based there heavily in favour of men to the detriment of women. It is important to consider here how historiography and popular decision making have, many years later, shaped the current understanding of the period, not necessarily in entirely accurate ways.

2..5.5.1 Global recognition

Because of film and fiction, and also because of published literature and the opening of BP as a showplace museum and interpretation centre, BP has in recent years become a global phenomenon, synonymous with codebreaking. Since 1974 the English-speaking world have become gradually more engaged with the 'romantic' world of Second World War cryptography. For the first time, BP people could claim the story as their own. Not everyone agreed with the publication of the story of BP; Mavis Batey explained how she felt 'betrayed' by Winterbotham for his breaking the Official Secrets Act.⁵²³ According to Sir Arthur Bonsall, former head of

⁵²¹ Clarke, 'Hut 8 and naval Enigma, Part I'.

⁵²² Randall, *Joan Clarke*.

⁵²³ Author's interview with Mavis Batey, 11 July 2011.

GCHQ in 1974, the publication of the book did not worry the organisation, due primarily to the inordinate number of inaccuracies it contained. GCHQ had also had the opportunity to censor the content pre-publication.⁵²⁴ Bonsall confirmed that whilst GCHQ (and by default the government) was not concerned over this publication, they were by contrast concerned about the publication in 1982 of Welchman's *The Hut Six Story* as it contained much more accurate information, and, more importantly, detailed specifics of how the codes were broken.⁵²⁵ Welchman had continued working in cryptography after the end of the Second World War and so had the opportunity to recall and share memories with others before publication. Bonsall further clarified in the author's interview with him that an announcement was made in Parliament to confirm that BP veterans could now speak about BP in 1986.⁵²⁶ This announcement was not understood by many veterans who continued to abide by the terms of the Official Secrets Act, and many took their secrets to their deathbeds.

Former incumbents continue to arrive at BP to see the places where they used to work, or to show it to their families. While a number continued to live in the UK, a small proportion have moved abroad. For example, Barbara Abernethy, former PA to Head of BP Alistair Denniston, married an American and moved there to live. It is not only former incumbents' families who come to visit BP but also people from across the globe including German and Japanese tourists. It could be said that this global recognition is important because BP needs to be saved for future generations, arguably as a reminder not to make the same mistakes again in the future. This is particularly poignant as unexpected situations exemplified by the recent Covid-19 crisis threaten the future of BP, as it has led to restructure and redundancies.⁵²⁷

⁵²⁴ Author's interview with Bill Bonsall, 17 October 2013.

⁵²⁵ Author's interview with Bill Bonsall, 17 October 2013.

⁵²⁶ Author's interview with Bill Bonsall, 17 October 2013.

⁵²⁷ <https://bletchleypark.org.uk/news/bletchley-park-trust-to-undergo-organisational-restructure>
[/https://www.bbc.co.uk/news/uk-england-beds-bucks-herts-53867934](https://www.bbc.co.uk/news/uk-england-beds-bucks-herts-53867934) [accessed 21 August 2020].

2.5.6 Concluding thoughts

The published literature about BP follows the pattern established by that of the First World War, in that the first books are written exclusively by men who are writing from memory, and the books in this case have a strong focus on the machines involved – the workings of the Enigma and of the bombe, followed later by those of the *Geheimschreiber* and of Colossus. Though the machines are detailed, the machine operators (almost exclusively women) are ignored for two decades with female cryptographers receiving likewise almost no mention. When finally, Hinsley and Stripp's 'Code Breakers' appears, with personal recollections, those of women – two-thirds of the workforce – make up just 6% of the total⁵²⁸. As late as 2008, the memoir of the then 94-year-old James Thirsk dismisses women's contribution with the words "*The truth was ... there were very few women in charge of the sections or in senior positions*"⁵²⁹.

A feature of the women's stories, which gradually began to be published after 1990's autobiography by Irene Young, is that they constitute shared social narrative rather than machine-focussed memoirs. An interesting insight for this thesis is provided by a publisher, whose observation was that women's memoirs are often written with a mainly female readership in mind and concentrate upon relationships as these, not details of machines, are usually of greater interest to women⁵³⁰.

With the gradual release of official papers and documents into TNA, published literature has begun to detail, and in areas to re-assess, these earlier accounts. Again, an early focus was the work of brilliant individuals – Hodges' sensitive biography of Turing being the archetype – although it was left to Mavis Batey to set out the contribution of Dilly Knox, the longest-serving and widest-ranging of all the codebreakers. The male/ female balance has slowly begun to be restored with the most recent publication, by John Ferris giving much fuller recognition to the work of Mavis

⁵²⁸ Hinsley and Stripp, *Code Breakers*, pp. 8-70, 113-118 and 300-305

⁵²⁹ Thirsk, Bletchley Park, p. 114

⁵³⁰ From a conversation with Laura Perehinec at The History Press (publishers), 24 November 2017.

Lever, Margaret Rock and Joan Clarke as well as of Wendy White, Emily Anderson and Marie Rose Egan.

In parallel, the literature of gender studies has begun to clarify the processes of gendering and how this significantly affected jobs and roles during the Second World War – that women’s work in ‘men’s jobs’ was seen as essential but threatening to the masculinity of men and was restricted to ‘diluted’ versions of the work and ‘only for the duration of the present emergency’. The assumption therefore is that, while women are present in numbers at BP, both horizontal and vertical segregation was the order of the day – men were cryptanalysts and section heads, women were low-skilled machine operators, clerks or secretaries, leading to Smith’s observation that “*Men filled positions of seniority and management in all GC&CS’s sections, and women could rarely expect to rise beyond positions of junior management, and never to senior management*”⁵³¹ – a statement which would no doubt have been surprising to the 73 women who held senior staff grades⁵³². Smith’s book contains no additional material in comparison to other literature and at times uses archival sources that are arguably of lower value.⁵³³ This thesis adds to the work that Smith has very loosely considered to provide a much wider ranging study.

What has so far been lacking in the published literature has been a detailed analysis of the work carried out by women, and in particular by women holding senior grades. The purpose of BP was to break codes daily, for the codes changed anew on a daily basis at first, then every 12 hours and finally every 6 hours; that was BP’s entire *raison d’être*. Therefore, did women never break codes, or, in greater detail, was women’s part in breaking codes limited to simpler codes or to dealing with the mass of messages once a man had broken the key to a code? Examining these contentions forms the research of Chapters Four to Six of this thesis.

⁵³¹ Smith, *The Hidden History of Bletchley Park*, p. 169.

⁵³² <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 20 June 2019].

⁵³³ Smith, *The Hidden History of Bletchley Park*.

2.6 Conclusions

This review of the published literature has identified that, after each World War, the first books and papers to be published in the UK were written by men, usually writing many years later in their old age and from memory, as official records had not then been released. The part played by women is rarely mentioned in these early works, leaving the impression that women were either not involved, or, if they were, women carried out roles in low-level administration, typing or clerical support. These books focus on details of codes or of the results of codebreaking in the case of the World War One; and in the case of the Second World War, on the details of cryptographic machines, the results of codebreaking, and the achievements of a few, exclusively male, cryptographic geniuses, the archetypal example being Alan Turing.

At the start of the First World War, communications technology hinged upon telegraphic cables and early wireless. With the British cutting all German international cables in the first hour of the war, Germany perforce resorted to wireless (which any listener could intercept) or the good offices of neutrals to use British cables, all messages on which were copied to British cryptanalysts. Britain was fortunate enough to acquire copies of all three German naval codes in the first hundred days of the war. As a result the Admiralty's Room 40 cryptographic unit was established and dealt with a growing volume of book code traffic. On the Western Front battlefields, wireless at first had limited use – the Germans had captured the Belgian and Northern French telephone and telegraph system and so their higher-level Army messages were uninterceptible, but their battlefield messages used simpler codes.

By 1916 the volume of messages to be intercepted needed more people than could be supplied from the pool of men, as active service absorbed all those available. The need was for fluency in languages, and particularly German; women of the upper- and middle-classes had had opportunities to acquire that fluency whether by travel, holidays, roles such as governesses, or familial intermarriage. Equally, there was a supply, though as yet limited, of women with university degrees, or other relevant skills such as telegraphists, and motivationally all women were aware of,

if not participants in, the fight for universal suffrage. Women began to be accepted into cryptanalysis, although tragically the records of the area into which they were most assimilated, the War Office's MI1(b), were destroyed at the end of the First War, rendering this unit and the 'HushWAACs', female analysts who worked as equals on the front line with men, as a blank in the literature for over half a century. Such that the spotlight necessarily fell upon the Admiralty's Room 40 where women were less widely accepted into cryptanalytical, as opposed to administrative, work.

The books published about First World War cryptanalysis were, as described above, written by men who had worked in these organisations and are heavily gendered; the only contemporary female accounts comprise two unpublished diaries written by HushWAACs. Chapter Four of this thesis will identify that there were at least a dozen women directly involved in codebreaking at a high level and examine why published literature is silent about their activities.

The period between the two World Wars was one of considerable development of machine encryption, but the widespread adoption of this technology – which would add logic and mathematics to the skills demanded of a cryptanalyst – took place primarily in the mid to late 1930s. Until that point, linguistic skills were, and continued to be, of prime importance. What initially changed after the defeat of Germany was the volume and urgency of intercepts, and the need for fluency in German. What was now needed were fewer people but with a broader spread of languages. The resulting integration of the various First World War cryptographic units, including related Post Office functions, into GC&CS, with a winnowing of staff into a tighter structure.

The interwar work of GC&CS ranged across the world's codes as the codebreakers sought to provide information to aid British diplomats in international negotiations, whether on arms control or on maintaining British interests in the Middle East. Cryptanalysis came to public attention with parliamentary statements on 'Bolshevism' in the UK following the breaking of Soviet codes by the ex-Tsarist cryptographer Fetterlein and his female assistants. As 'hot war' returned to Europe with

the Spanish Civil War of the later 1930s, codebreaking by the (mainly female) cryptanalysts working in this area became important but hidden from the public gaze.

Published literature on the interwar period takes the form of chapters in more general works and concentrate on the few areas where codebreaking yielded significant results, or on the advance of machines into the encryption function. Women during this period were developing careers in non-traditional areas, aided by a greater attainability of high-level education, a growing acceptance of women as independent professionals, and indirectly by women's gaining the vote, but held back by prejudice, gendering of roles and such major obstacles as the marriage bar. It is no surprise that the prominent female cryptanalyst of this period was Elizebeth Friedman in the USA, due to her success in breaking Prohibition-era codes and the publicity accorded her in court hearings; but without trespassing too far into the research of Chapter Five, there can be identified at least ten women in GC&CS who held roles as cryptanalysts and whose so-far undocumented existence will aid the removal of the current veil of silence.

The attempts by the British, with significant Polish and French help, to break the German Enigma code were an exclusively male preserve prior to the Second World War. As in the case of the First World War, the first books to be written about BP were published many years after the event by men writing from memory in their later years, as no official records had been released; those men had grown up in a heavily gendered society as the UK then still was, despite the advances of women in the interwar period.

Following the development during 1940, led by Welchman and Turing, of the bombe as the prime electro-mechanical device to decrypt Enigma codes, and Welchman's re-organisation of BP into a structure around the growing number of these machines, the history of BP during the Second World War is one of continuing organisational turmoil, as more and more people were recruited to cope with the massively growing number of intercepted messages.

Initially, the various male memoirs tended to focus upon how the results of the codebreakers efforts affected the Allied conduct of specific campaigns, for example, the war at sea, or the North

African campaign, or alternatively upon the contributions made by the writer of the memoir, as exemplified by Welchman or by Calvocoressi. There was at first considerable scope for this - there were many different varieties of Enigma with individual groups within BP established or adapting to cover them, such that – for example – simpler variants were used by the Italian forces, and by the *Abwehr*, the German Secret Service. Such variants were still capable of being decrypted by non-mechanical means known as ‘rodding’, and Dillwyn Knox’s all-female group used these means to break the Italian naval code *Supermarina* leading to the British victory at Cape Matapan. Specific groups of staff concentrated either upon Army, Air, Naval or co-operation codes, and other groups upon establishing and maintaining a Central Registry recording details of all the individuals and all the codenames which appeared in all the messages intercepted.

The Armed Services then provided people to carry out several support functions, almost all of whom were women – for example, Naval WRNS to cover bombe, and from 1944 Colossus, operation, and Air Force WAAFs to operate the teleprinter network to communicate results to High Command and to Commanders in the field. Those women who had shown their capabilities pre-war were taken into the new structures, some certainly performing administrative tasks, but others flourishing as cryptanalysts.

Gradually, however, as more and more ground was covered in memoirs and as BP veterans became fewer, together with more information gradually being released to the National Archives, published literature has begun to focus on the full detail of the BP structure, from the organisational study by Grey to Geoffrey Pidgeon’s⁵³⁴ work on its intercept facilities (predominantly a female role) and Smith’s examination of the various support functions such as transport and catering.

There are therefore primarily two areas into which most of the books about its cryptography can be divided. The first are in-depth (male) perspectives, written by men, many of which go into the

⁵³⁴ Geoffrey Pidgeon, *The Secret Wireless War* (Nottingham: Arundel Books, 2008).

mechanical complexities of breaking codes. Some of this detail is included in biographies; for example, Hodges on Turing⁵³⁵ and others as histories of departments like Welchman⁵³⁶. These books appear primarily aimed at people who want to deepen their knowledge of machine-based codes and codebreaking.

The second area may be considered less specialist and much more mainstream. Often written by women, these books could be considered a much more general ‘social narrative’ which describes the experiences of their lives during the war period. They serve as an interesting backdrop to the complex, and at times dull, work-lives that these women experienced. In addition, some biographies have been written by family members loosely based on BP experiences. These books cover a much wider range of the former incumbent’s lives and typically contain less about their work at BP.

This review of the literature on women in cryptanalysis between 1914 and 1946 shows that there is a disparity in available research between both men and women, and the roles they played. Women have not experienced the same level of satisfaction as that enjoyed by their male counterparts. The present research will seek to address that disparity and prove that the background and stories of these women are and should be of equal interest to the public, and that they fully merit equal recognition.

This chapter has considered the general literature regarding cryptanalysis in World War One and World War Two within a historical context. It has identified the elements that are currently missing from the literature and the findings chapters (Chapters Four to Seven) will seek to readdress these missing elements so far as is possible.

⁵³⁵ Hodges, *Alan Turing*.

⁵³⁶ Welchman, *The Hut Six Story*.

Chapter Three: Methodology

“Cryptography is a trade which requires that those who practice it shall do so in comfort and peace...”

William ‘Nobby’ Clarke¹

3.1 Introduction

This chapter considers the appropriate research methodology and approach to consider the hypothesis of this thesis, first in validating the contention that British cryptological history has focussed upon male actors to the neglect of women, and then in critically evaluating the evidence that women played a significant role in cryptanalysis during the period between 1914 and 1946. The work will be considered through a gendered lens. It will reflect on the best methods to approach this thesis and why they are important. Furthermore, it will study the methods that have been used in this thesis to prove that these under-represented women do exist and explain why this is important. It will explain the relevance of this thesis and why it is still pertinent today.

3.2 Research strategy

3.2.1 The hypothesis

“The history of cryptanalysis in Britain in the first half of the twentieth century has substantially focussed upon a limited number of men, and neglected the significant role played by women in codebreaking establishments from the First World War onwards.”

The literature review of Chapter Two above has identified a *prima facie* case that, given the numbers of women working at Bletchley Park, the primary British World War Two codebreaking establishment, formed two-thirds of its 8,000 staff contrasted to women’s extremely limited – far

¹ TNA, HW3/1 Clarke’s history of Naval Section. Section 36. *Most Secret*. (unnumbered).

less than five percent by pages written, appearance in published literature, the work of women in codebreaking appears to have been neglected. Chapter Two identified that, from 1914 onwards, men have become the better-known cryptanalysts with particular note being made of those male cryptanalysts from the Second World War. They have unintentionally led this focus and have become the face of World War Two codebreaking², with prominent men such as Alan Turing, whose life was cut short following his tragic suicide³ to the detriment of their female counterparts.

To establish its hypothesis, the present research must, in showing that women are not only under-represented but are unfairly so, recognise that representation is not merely a question of number, but of the reality of what women actually did, of the reasons why their work has not been the subject of study, and, since any results may not apply over time, of examination of their applicability in both World Wars.

To illustrate these points, it may be straightforward, given the staff numbers already quoted, to show that the Bletchley codebreaking establishment could not have survived without the work of women, however apparently unskilled and unrecognised in their roles, but the contention would not apply to the First World War, as women appear to have been in a minority in both Admiralty and War Office cryptanalysis, and not to have been resent at all before 1916. At a deeper level, women may have been present in large numbers in BP, but was all their work ‘unskilled’, or in support roles such as low-level machine operation – or were some women at least operating at the level of BP’s very existence, the breaking of complex codes? Were some women truly codebreakers? To demonstrate this a two-stage analysis was developed:

- To identify women who may have been cryptanalysts by such signifiers as grade, job title, the professional assessment of colleagues and so on,

² <https://www.historyextra.com/period/second-world-war/alan-turing-life-death-legacy-facts-enigma-sexuality-timeline/> [accessed 10 July 2021].

³ Hodges. *Alan Turing*, p. 487.

- Then to refine this analysis by showing where such identifiers may mislead, for example the job title ‘decoder’ used in the First World War for a person simply translating multiple messages using a code which had already been broken by others.

It is necessary also to understand external factors which may have impacted both events which happened at the time and how those events is now viewed as history. Such factors include gender, patriarchy, the role of women, the marriage bar, and the impact of the Official Secrets Act (OSA) on concealing facts, and how much knowledge has been lost over time.

3.2.2 *Aims*

This thesis is a historical study which considers published literature in a gendered context and how that has created a public assumption that, because very little is published about both the role of women in cryptanalysis and about high-level female cryptanalysts, the latter simply did not exist. The most significant reason this perception has taken root originates in the organisation of BP. As stated above, approximately 8,000 people were working at BP⁴ according to the BP Roll of Honour (RoH), and two-thirds of those 8,000 were women.⁵ Significant numbers of this two-thirds (just over 5,000 women) were working in predominantly lower-level roles. The present research challenges the perception that women in Second World War cryptanalysis held only these low-grade, horizontally segregated roles⁶, including administrative posts, ‘lower-level’ managerial roles (typically managing only other women), or semi-skilled machine posts supervising the many bombes and other machines at both BP and its outstations.

The Second World War is within human memory for octogenarians, their ‘children’, often today’s sexagenarians, will have memories arising from this period - rationing of sweets for example, is

⁴ <https://bletchleypark.org.uk/roll-of-honour/search?page=1> [accessed 12 March 2020].

⁵ Howard and Gallehawk, *Figuring it Out*, p. 3; pp. 7-10.

⁶ Hakim, *Occupational Segregation*.

memorable, for it did not end until 1953⁷. The influence of these memories has led to the telling of a certain type of ‘partial narrative’, reinforced by 1940s/50s ‘war films’ showing the Allies as the valiant, heroic, and almost always male protagonists; *The Dam Busters*, *Escape to Victory*, and *The Great Escape* as examples among many others. The story of these films was ‘black and white’ - good British combatants against evil German combatants - and they only showed a specific narrative, a martial story of men away from their normal everyday lives. For those, mostly ‘ordinary’, women left at home, their reality was different, and could be perceived as less ‘heroic’. This was doubly so for the women of BP, sworn to lifetime secrecy under the OSA not even to tell their partners and family what they had done. Some of their stories were shared as oral history with their children (only many years later in the case of the women of BP), and where such women continued their cryptanalytical work into the Cold War, some choosing their careers over family. Some women had no children or close family to tell; their parents had already passed away by the time the OSA had released them, and so women such as Emily Anderson took their secrets to the graves. Others, in discussions, said they did not consider themselves (or the roles they played) remarkable, and therefore chose to leave no record, except for what was left in the archives; their professed view was that rather than being remarkable women, they were ordinary women in remarkable situations, and that people would be unlikely to be interested in their stories.

Most of the accounts of this era of British military and intelligence history, particularly pre-1938, have been written about men, usually by men. Therefore, this research will be shown through a gendered lens as ‘her-story’; this term originates from militant feminists in the USA in the 1970s, as a counter to male-dominated ‘history’, although the term ‘history’ actually comes from the Greek and Latin *historia* meaning ‘narrative’⁸ and not from the amalgamation of ‘his’ and ‘story’.

⁷ http://news.bbc.co.uk/onthisday/hi/dates/stories/february/5/newsid_2737000/2737731.stm [accessed 5 July 2021].

⁸ <https://www.oxfordreference.com/view/10.1093/oi/authority.20110803095933417> [accessed 6 July 2021].

The present research shows women were working on both high- and low-grade cryptographic work during the period of 1914 to 1946 to a much greater extent than has been publicly acknowledged, and it is important here to clearly state that ‘high-grade’ cryptographic work denotes the complexity of encryption to be broken, not the importance of the message hidden within the encryption. This thesis argues that women have thus far been a largely invisible part of this important aspect of history, and it is equitable that women should have identical recognition as men where they performed the identical role, despite their never being recognised for it in the literature. Such a hypothesis does not disparage the work done by women, or by men, with lesser levels of skill or aptitude, but to permits women with high levels of skill or aptitude to be recognised as equals to their male counterparts when at the time men and women were in reality unequal, due both to the silent ‘cancer’ of gendering and to such explicit discrimination as the marriage bar.⁹

3.2.3 Terminology

As regards the complicating problem of terminology, referred to both above and in Chapter Two, the present research will provide a more detailed analysis of cryptographic terminology throughout the period between 1914 and 1946 (see Chapter Seven). Over time and in popular usage, the terms ‘codebreaker’ and ‘decoder’ have become interchangeable with ‘cryptanalyst’, whereas each term needs to be deconstructed in light of the work of individuals and the roles they held in their respective periods. The First World War, for example, was for diplomatic messages a war of book-based codes, whereas during the Second World War, both book-based codes and machine codes were used; different skills are required by each form of encryption, as book-codes require primarily language-based skills¹⁰, while machine-codes tended to yield to mathematicians¹¹. All of the people

⁹ <https://www.parliament.uk/about/living-heritage/transformingsociety/private-lives/relationships/overview/propertychildren/> [accessed 13 June 2021].

¹⁰ See Chapter One, Figure 1.1.

¹¹ Murray ‘Hut 8 and naval Enigma, Part I’, p. 113.

working at BP are in general parlance called ‘codebreakers’¹² but these ‘codebreakers’ include not only top-level cryptanalyst such as Welchman, Tiltman, Knox, and Turing, but also, for example, the semi-skilled women who were taught how to set up the bombe to decrypt a day’s Enigma messages. The term does not distinguish between these roles, or the wide variety of high and low-level roles that lie in between.

Other terms, such as ‘Linguist’, were used by GC&CS to denote an expert with language skills, but this term does not denote that its holder possessed any codebreaking skills, though they may have used their skills and they already-broken key to a code to read many encrypted messages. A ‘book-builder’ was someone who compiled the ‘dictionaries’ that held the decrypted codewords for a specific book code, a task which is essential to reading coded messages, but of itself does not necessarily imply a codebreaking role.

These specimen terms illustrate some of the complexities of the terminology, skill requirements, processes, and roles that applied over the 30-year period between 1914 and 1946. Understanding this period in cryptographic history requires a full understanding of what was meant by these terms at the time, and of how we use them now. Within this thesis, specific case studies, such as that of Phoebe Senyard, who in the early 1920s was transferred from the GPO as a ‘decoder’ to GC&CS before becoming Head of the Secretariat of Naval Section 9 (NSIX)¹³, shed a uniquely detailed light on our understanding of this field within its historical context.

3.2.4 Issues with the literature

As identified in Chapter Two, personal accounts that have been written by former incumbents from MI1(b), Room 40, GC&CS and BP fall into two main categories. The first category consists

¹² <https://bletchleypark.org.uk/our-story/bletchley-park-people/who-were-the-codebreakers> [accessed 5 July 2021].

¹³ <https://bletchleypark.org.uk/roll-of-honour/8179> [accessed 10 July 2021].

of male dominated technical publications drawing on memory. Books such as Fisher¹⁴, Kenworthy and Young¹⁵, Hoy¹⁶, Ewing¹⁷, Toye¹⁸ and James¹⁹ from Room 40, Hay²⁰ from MI1(b), and Winterbotham²¹, Welchman²² and Calvocoressi²³ from GC&CS, all published their memoirs before 1990. These books contain little to nothing about the women who were working alongside them in high-level posts. First World War women in cryptanalysis had to wait for later works such as Gannon²⁴ in 2010 (albeit with some errors), and Ferris²⁵ in 2020, the latter covering the whole period from 1914 to 1946 and publishing details of several women who worked in Room 40, MI1(B), HushWAACs, and GC&CS.

It was only in 1990 that women started to publish their own accounts.²⁶ These, numerically few, female accounts can be considered more as personal narratives, as the details of their roles at BP are intertwined with their contemporary life stories of life and loss. The women who have published their social narratives tend to be from the lesser-regarded roles in which the majority of the 5,000 women²⁷ were employed, rather than from the small minority who worked as top-level cryptanalysts. More recent books have been biographical in nature, although these have been

¹⁴ Fisher, *Memories*.

¹⁵ Kenworthy and Young, *Freedom of the Seas*.

¹⁶ Hoy, *40, OB*.

¹⁷ Ewing, *The Man of Room 40*.

¹⁸ Toye, *For What We Have Received*.

¹⁹ James, *The Sky was Always Blue* (in 1951) followed by James, *The Eyes of the Navy* (in 1955).

²⁰ Hay, *Valiant for Truth*.

²¹ Winterbotham, *The Ultra Secret*.

²² Welchman, *The Hut Six Story*.

²³ Calvocoressi, *Top Secret Ultra*.

²⁴ Gannon, *Before Bletchley Park*.

²⁵ Ferris, *Behind the Enigma*.

²⁶ Young, *Enigma Variations*.

²⁷ Howard and Gallehawk, *Figuring it Out*, p. 3, and 7-10.

considered by some to be “*a rather poor relation to ‘serious’ history... [although] it has also enjoyed something of a rapprochement with history in recent decades.*”²⁸

This lack of literature has, as stated, led to a public assumption that, because only stories about male cryptanalysts have been published, the simple conclusion is that the female equivalents did not exist. It is important that this balance be readdressed because such women did have an important role which should be recognised as an important part of British cryptographic history rather than be ignored. This research will therefore, use primary sources to illustrate the cases of women who worked continuously in codebreaking organisations as cryptanalysts from as early as 1917 (Florence Hayllar joined in 1917).²⁹ The significance of these findings is that it overturns the normative assumption in much of the existing literature that women who worked during World War One in Room 40 and MI1(b) were solely secretaries, and the women who worked during World War Two at BP were only working as bombe operators, or in other low-level roles.

3.3 Research Approach

As the study is historic in nature, there are a limited number of approaches to the research. From literature research, there appears to be no single feminist methodology perspective³⁰, and so the following methodology was developed as a ‘best-fit’ feminist approach to the hypothesis. The concept of a feminist methodology considers the researcher as ‘feminist’, or ‘non-feminist’ and the divisions ‘between’ and ‘within’ feminisms.³¹ It is however difficult to identify a single feminist methodology.³² Previous studies have been criticised by feminists for ignoring and excluding

²⁸ Krista Cowman, ‘Collective Biography’ in *Research Methods for History 2nd edition*, ed. by Simon Gunn and Lucy Faire (Edinburgh: Edinburgh University Press, 2012, repr. 2016), p. 85.

²⁹ TNA, HW3/35 *List of selected present staff* attached to a letter probably signed by Hay (signature difficult to read) to the Director of Naval Intelligence. (unnumbered).

³⁰ <https://www.qualitative-research.net/index.php/fqs/article/view/974/2124> [accessed 8 July 2021].

³¹ <https://www.qualitative-research.net/index.php/fqs/article/view/974/2124> [accessed 8 July 2021].

³² Sandra Harding ‘Introduction Is there a Feminist Method?’ in *Feminism & Methodology: Social Sciences Issues*, ed. by Sandra Harding (Maidenhead: Open University Press, 1987), p. 2.

women from their quantitative positivistic methods³³, this being important in relation to the present thesis which concerns women and how their role has been ignored in the literature throughout the history cryptanalysis in the first half of the twentieth century, even though primary archival resources do show that female cryptanalysts did exist.

It is not possible to exclusively use quantitative methods, given that there are only a small number of women still alive who worked at BP, and none who worked in cryptanalysis pre-1939. The challenge to find families and any potential family archives proved difficult, but not impossible, the consequence being that a study of the period 1914-1939 was perforce founded upon archival records, autobiographies, and biographies.

It has been possible to use the Bletchley Park Role of Honour (RoH) which permits some quantitative data analysis to shed at least a little light on the roles that women carried out during World War Two. The RoH itself is a combination of the original TNA file HW14/156 (now renumbered HW14/127 and released) coupled with former incumbents' personal memories, or details provided by the descendants of former incumbents. However, despite the considerably greater number of women involved in cryptography in World War Two than the Great War, the fact remains that 1945 was 76 years ago and the biological consequence is that the number of women who worked in BP diminishes each year.

The most appropriate method for this study is, therefore, a mixed method approach which combines interviews with surviving veterans, published first-hand accounts, secondary accounts, and archival records from the period, to construct the reality of women's experiences in cryptanalysis in two World Wars and counter the present situation where women do not feature the literature. The ethical issues of this research will also be considered later in this chapter.

³³ <https://www.qualitative-research.net/index.php/fqs/article/view/974/2124> [accessed 8 July 2021].

The best way to illustrate the individuality of each cryptographic role, and of the women who held them, suitable case studies – some of cryptanalysts, some of other women of senior grade - were identified by the author. Six women were chosen specifically due to the varied roles they held in cryptography over this period.

In addition to primary and secondary, published and unpublished materials, several online resources were employed. These included recent newspaper articles, www.ancestry.co.uk, and Burke's Peerage. Regarding primary sources, archives visited included the Churchill Archives, Churchill College, Cambridge which holds the papers of Denniston and Clarke; the BBC Archives which holds the personnel record of Mary Elizabeth Jenkin; the Bletchley Park archive which holds narratives from a variety of BP employees; the Imperial War Museum Archives, London in which several narratives can be found; and finally the National Archives, Kew which holds all official documentation released by GCHQ which includes official departmental histories, messages and papers from Room 40, GC&CS and to a lesser extent MI1(b). Information from these resources supports the hypothesis that women were employed in top level cryptanalysis between 1914 and 1946.

It would today be exceedingly difficult to replicate all the results from this study, as many of the women and both men who were interviewed for this research are no longer alive, although much could be reproduced through the triangulation of archival records based at Kew, and from primary and secondary source-based published and unpublished documents, articles, and books.

3.3.1 A mixed methods research approach

As stated, the present research lends itself to a predominantly qualitative study with limited quantitative analysis; although the numbers cannot be considered 'big data'³⁴, it has proven possible in Chapter Six to illustrate the roles that women held at BP and how these compared to their male

³⁴ Gunn and Faire 'Introduction', p. 2.

counterparts. The list of women working in cryptanalysis between the wars is also available through archival records and can therefore be analysed in a quantitative way. Quantitative methods have been used to compare the roles of women from different periods, although again the figures remain small until about 1940.

While the figures available from the Bletchley Park Role of Honour (BP RoH) can be considered in a quantitative manner, several veterans were interviewed in an in-depth and semi-structured approach, the majority in person, and others through electronic or telephonic means. Questions were structured to be as unambiguous and clear as possible (see Appendix Five).³⁵ Qualitative interviews gave the interviewees the opportunity to give their own unique view on their early life experiences both in the lead up to and working at BP. The questions were designed to be as neutral as possible to avoid unnecessary emotional distress and conceivably any potentially sensitive areas. This qualitative approach has ultimately ended in a quantity of narrative that has been analysed and interpreted.³⁶

Other approaches to this historical research could have been taken³⁷; for example, this research could have been based solely on archival evidence, but this would have removed both the human element of oral histories which are arguably an integral part of humanising this research, and the opportunity to correct faults in, or improve understanding of, the archival material. The combination of literature analysis with archival sources and interviews provides the fullest illustration of the period, and the use of case studies as an important element of this research has only been possible with the ability to interview Mavis Batey, and the families and friends of Marie Rose Egan and of Wendy White respectively.

³⁵ *A Companion to Qualitative Research* ed. by Uwe Flick, Ernst von Kardoff, and Ines Steinke (London: Sage Publications Ltd. 2000).

³⁶ Tim May, *Social Research. Issues, Methods and Process. Third Edition.* (Maidenhead: Open University Press. 2001), p. 137-142.

³⁷ Gunn and Faire, *Research Methods for History*, p. 4.

Due to dwindling numbers, it was necessary to identify and carry out the interviews with BP veterans early in this research; several of the women who were interviewed have subsequently passed away.

3.3.2 Archival data availability

First World War cryptanalysis was fragmented due to its being carried out discretely in two separate locations in London. There is very limited archival information regarding women in cryptanalysis in this period for example, there is currently no single, publicly available definitive list of female cryptanalysts or their roles during this time, which further emphasises the importance of the present research. Limited World War One personnel lists do exist at TNA, originating from such unlikely sources as a catering list³⁸ and various address books.³⁹ The present research will for the first time amalgamate the information from such scattered primary sources, and provide a clear overview, both of the women involved and, as far as possible, the roles they filled.

Post-1918, the earliest and most complete list is provided by a document dated 1922, when GC&CS moved from under the Admiralty to the Foreign Office.⁴⁰ This lists the women in weekly paid employment with their current and previous ranks, dates when specific roles were held, and current and previous pay. Further documents provide sporadic but valuable information, which will be amalgamated in Chapter Five to build up a clearer picture of the women during this interwar period, a process also illustrating the scope and nature of women's roles as compared to their male counterparts.

³⁸ TNA, HW3/185, MI1B. *The following is the Catering List for MI1B for November. The Tea account runs from 25th October to 22nd instant, and the Lunch account from 24th October to 22nd instant, both dates inclusive.* (unnumbered).

³⁹ TNA, ADM223/769. *Life Histories of ID25* – address book A-Z of staff working in Room 40 (unnumbered).

⁴⁰ TNA, FO366/800. *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

Also, at the end of the First World War, the Head of Naval Section in Room 40, William F. ‘Nobby’ Clarke, wrote a history of World War One codebreaking. This is the clearest, and, as the only contemporary source, probably the most accurate record of First World War codebreaking, albeit potentially with personal prejudice.⁴¹ Within the document, Clarke states that he was helped by Mary ‘May’ Elizabeth Jenkin, although it is not clear whether this was as a contributor or merely as a typist (see Chapter Four).

In August 1939, under the threat of war, GC&CS officially moved to BP. In considering World War Two comparators, the most complete list of GC&CS personnel is TNA file HW14/127 which has, at least in part, been made available to the BP Trust,⁴² for it forms the basis of their RoH.⁴³ Whilst the information has recently become publicly available, some is quite heavily redacted, presumably to protect those veterans who are still alive. The information is brief and provides nothing more than the name (sometimes only initials and a surname), rank, and role.⁴⁴

Official histories were undertaken by a select number of BP departments in 1945/46; some of the departmental staff were retained specifically to write these historiographical accounts of their respective sections. This is significant because at least one of the departmental histories was co-written by two female cryptanalysts - Mavis Lever and Margaret Rock both contributed to the history of the Research Department, also known as Illicit Services Knox (ISK).⁴⁵ This researcher has thus far, been unable to locate this elusive document,⁴⁶ its last known holder being deceased. Whilst it is unlikely that this document will provide a social narrative of the department, it is likely

⁴¹ TNA, HW3/6 and CCAC. GRB/0014/CLKE/3/3 Official History.

⁴² The BP Trust was created in 1992 to protect the site from developers and save the World War Two buildings for the nation. It continues to run BP today.

⁴³ <http://rollofhonour.bletchleypark.org.uk/> [accessed 17 April 2014].

⁴⁴ There is no available data on when the member of staff took over a post.

⁴⁵ Also known as Intelligence Services Knox. The document is known as Batey, Batey, Twinn and Rock (BBTR) after its four authors. (Mavis Batey neé Lever, Keith Batey, Peter Twinn and Margaret Rock).

⁴⁶ The document was released by GCHQ in September 2012 directly to Mavis Batey neé Lever, now deceased.

to add to the current knowledge of the technicalities of Second World War codebreaking in the ISK Department. Such World War Two BP departmental histories are as varied as the individuals who wrote them, and usually contain a chronological, often mainly technical, narrative, with minimal information regarding staff. It is exceedingly difficult to identify the authors, for they are not recorded in the documents themselves (although educated guesses can be made in some cases).

There is however, one exception located by this researcher – TNA file HW3/135 is a history written by Phoebe Senyard, and forms an account of the Italian department, later Naval Section VIII, from her reluctant arrival in August 1939 until the end of the war. This file is particularly illuminating as it seems to be the only account of the social history of GC&CS set out in parallel with the events of the war. In it, Phoebe describes the everyday trials of working in GC&CS right down to the details of having to justify requisitioning a box of pencils.⁴⁷

3.3.4 Issues specific to historic cryptanalytic data gathering: 1914 – 1946

First World War cryptography was carried out by two separate organisations, and issues of balance arise as the volume of archival material for Room 40 is vastly greater than that for MI1(b); this is due to the destruction of papers at the end of the Great War by MI1(b)'s head, Sir Malcolm Hay. The empirical data of the First World War cryptography therefore, predominately relates to naval concerns, whether as archive material or in primary source memoirs written after the war by the men involved in setting-up these organisations. A reasonable assessment, therefore, is that any data relating to the First World War cryptanalysis is skewed more favourably towards naval capabilities and achievements, whereas the reality was that MI1(b) was the larger organisation and dealt with considerably more traffic.

The lapse of time also severely constrains the potential quantity and quality of information that can be gathered for First World War cryptanalysis. As over a century has passed since the end of

⁴⁷ TNA, HW3/135, *Historical Memoranda No31*, p. 9.

the First World War, the archival evidence relating to women working in Room 40 and for MI1(b) during this period is essential to this research, as it is no longer possible to interview individuals. The source materials for collating World War One evidence are therefore restricted to archival materials and former incumbents' memoirs, these have provided an overview both of some of the women involved, and of the roles they carried out.

However, it has been possible additionally to speak with a limited number of descendants and close friends of some of the women. A descendant of one of Room 40's linguists, and its Head of Secretariat, Lady Sybil Hambro, has been identified and approached, although the family's knowledge was very limited.⁴⁸ Similarly, detailed information has also been discovered in the present research regarding others of the World War One female cryptanalysts, and is set out in Chapter Four.

The primary data which has been published also needs to be considered in context. The full story is incomplete as has been identified in Chapter Two, due in large part to the lack of archival material specific to MI1(b). Any material published subsequently may also potentially be considered biased according to its author's opinions and views on the Admiralty's published material, one such example being Sir Malcolm Hay who oversaw MI1(b). Hay kept notes on his work, but it was his wife who ultimately wrote and published a book based on those notes. It was her decision what to make public and what to withhold, a fact which is pertinent because it is unknown what other information regarding the roles of the female cryptanalysts in MI1(b) exists.

3.3.5 Selectivity of responses

⁴⁸ The Hambro family have a better-known war hero from World War Two in Charles Jocelyn Hambro; one-time head of SOE, in their lineage and were at the time of contact unaware of the role held by Lady Sybil in World War One.

As the Second World War is still within human memory, it has been possible to hold interviews with former BP personnel. An advertisement was placed in the BP Veterans magazine, explaining this research and inviting people to respond. The interviews and following information were therefore restricted to the former employees who responded, that is, the respondents selected themselves, which restricted the sampling options. Subsequently other women were identified from TNA records, and it proved possible to contact their family or friends through details provided on death certificates; this allowed a more targeted approach which yielded a higher return of female cryptanalysts.

In addition to this advertisement, the BBC contacted the researcher for information regarding women cryptanalysts and were able through their own researchers to ask people to contact them with more information.

The interviews raise methodological issues concerned with historiographical work based on alleged narratives, but to counterbalance this, combining interviews with archival material and other published details provided a degree of triangulation and evaluation of the remembered narratives.

3.3.6 Interviews

The BP Trust was approached, and with their assistance, former BP veterans were sent the researcher's details asking for female cryptanalysts to contact this researcher via electronic mail or by post. While the number of veterans originally contacted by BP is unknown, the number of responses totalled 34. The drawbacks of this method were that the researcher had no control over which veterans were contacted, and more importantly, over which ones responded. The collated primary data is based on the respondents that chose to share their experiences and the information they provided. It was also considered important for the researcher not to impose personal cultural issues and assumptions on the interviewee.⁴⁹ In addition to the people who contacted the author,

⁴⁹ Nicolas Walliman, *Social Research Methods*, 2nd ed. (London: Sage Publications Ltd. 2016), p. 90.

BP also provided details of some individuals from the posthumous RoH. This included service details of the individual and any recorded memories that they or their families submitted before they died. This information was added to the data collection and should be considered subject to the same caveats as other primary data as previously outlined.

All BP related interviews were held with women, with two exceptions, both male widowers, married to women who had also worked at BP and whom they identified as cryptanalysts. Both men were in the position of being able confidently to identify their late wives as cryptanalysts; however, as this research has not been able to find any corroborating information from archival sources for Rebecca Gibson, she has been identified in Appendix Three only as potential cryptanalysts, with more research required to corroborate her status definitively.⁵⁰

In addition to the information gleaned from the interviews, details were also provided by BP from interviews which BP had carried out, and from other respondents who had sent in information, most of whom are now deceased. Most women interviewed were former WRNS, as might be expected due simply to the numbers of WRNS at BP (in excess of 1,000). As these women were in a role deemed outside the topic of this thesis, most of their testament has not been included in the present research and will be published separately.

The predominant narrative for many of the women who have spoken about their time at BP hinges upon their personal experiences. As has been seen in Chapter Two, these cannot always be relied upon, but mainly concern events these women found ‘memorable’ such as food, billets, and friendships than the day-to-day job. Qualitative research is concerned with “*words, sounds, feeling, emotions, colours and other elements that are non-quantifiable*.”⁵¹ One straightforward reason for the women having no clear memories of their day-to-day job is they were endlessly ‘drilled’ never to

⁵⁰ One of the men later became the Director of GCHQ (Arthur Bonsall) during the mid-1970s, the other well-known in the field of economics (Edward Simpson).

⁵¹ <https://research-methodology.net/research-methods/data-collection/> [accessed 8 July 2021].

Speak about their work, as confirmed by Mavis Batey. They would, therefore, be likely to remember only the simple drudgery, or things they were able to speak about such as food or personal relationships. As an example, Joan Jackson states: *“My memories of the work are pretty blurred, because we were brainwashed into not remembering anything, as it was all so secret; apart from flurries of excitement when we all had to look out for a special message going through (presumably our “plant”), it was deadly boring.”*⁵²

The women who were interviewed would have been young during the Second World War as the older women have already passed away. Due to their young age at the time of recruitment, the service women interviewed would not have had much life experience compared to those who had come from university, BP is likely to have been their first, or one of their first, jobs. Their previous courses studied included social sciences, languages, secretarial skills, and mathematics. Of the total information from the additional collated details, returned interviews, correspondence and other data, some general statements can be made. A small number of individuals could remember little of their time at BP and so could not provide any useful addition to this research, others could remember parts of their life during this time, but little about what their actual day to day role entailed. Thirteen of the women were WRNS holding jobs working on ‘bombes’ or ‘Colossus’. As the primary intention of this thesis was to identify women working as high-grade cryptanalysts rather than those operating equipment, the work of these women was considered outside the remit of this study and will be published separately.

3.4 Case study methodology

The present research illustrates the detailed roles of women in British cryptography in the historical period in question through the use of six case studies, the subjects being chosen because of their unique roles in cryptanalysis in World Wars One and Two respectively; no such study has previously been published.

⁵² From information provided by BP, 22 March 2012.

These case studies can be considered ‘disciplined-configurative’ in nature.⁵³ The use of case studies is considered by this researcher to be critical, as it shows in detail the roles that were held by women chosen to be representative of the high-level females, many cryptanalysts but some not, from the 1914 to 1946 period. Details from their case studies could then be used in a ‘building block’ method to “*identify common patterns or serve a particular kind of heuristic purpose*”⁵⁴, essentially to form a matrix by use of which other women could be compared and potentially identified as working at a similar level, which would further validate the hypothesis of this thesis.

There are several advantages of using case study methodology in this research. Of the ‘four strong advantages’ identified by Alexander George and Andrew Bennett, two can be directly correlated to the aims of this study.⁵⁵ The first is ‘conceptual validity’ which offers a method of representing theoretical concepts, which in the case of the present research would mean that particular women could be identified as cryptanalysts through specific indicators.⁵⁶ The second is ‘deriving new hypotheses’.⁵⁷ As has been seen with the perception of conceptual validity, by deriving new hypotheses it could be said that this offers the heuristic identification of new variables. In other words, the combination of archival research and interviews with former BP incumbents gives the reader certainty that female cryptanalysts at the highest level did exist at BP and indeed earlier and should be given the same credit awarded their male counterparts. The qualitative case study “*is an approach that facilitates exploration of a phenomenon within its context*”.⁵⁸ In short, the case study is “*about seeing something in its completeness...*”⁵⁹ The use of case studies would be to illustrate if women were

⁵³ Alexander George & Andrew Bennett, *Case Studies and Theory Development in the Social Sciences* (Cambridge: BCSIA, MA 2005), p. 75.

⁵⁴ George and Bennett, *Case Studies and Theory*, p. 76.

⁵⁵ George and Bennett, *Case Studies and Theory*, p. 19.

⁵⁶ George and Bennett, *Case Studies and Theory*, p. 19.

⁵⁷ George and Bennett, *Case Studies and Theory*, p. 20.

⁵⁸ Pamela Baxter and Susan Jack, ‘Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers’ in *The Qualitative Report* 13/4, (2008), pp. 544-559 (p. 544).

⁵⁹ Gary Thomas, *How to do your Case Study* 2nd ed (London: Sage, 2016), p. 23.

(or were not) working in a role that could be considered cryptanalytic, or something more on a lower level like a ‘decoder’ or the general catch-all ‘codebreaker’.

One major disadvantage is the possibility of selection bias in the identification of case studies. The researcher has attempted to avoid this by researching as far as possible all the different components available for each individual and selecting the best possible individual to illustrate the research hypothesis, although it is also important to add that there is inevitably an element of having to use individuals with the greatest amount of available information to write a full case study.

The design of the case studies is based on details provided by Wisker.⁶⁰ Wisker suggests establishing aims, outcomes and context of the case study followed by setting the scene. With this basic layout the case studies in Chapters Four, Five and Six of this thesis will be set out under the following subheadings:

- Aim
- Context
- Literature Review / Methodology / Identification Issues
- Findings
- Conclusions

The six subjects were chosen based on the role they played in cryptanalysis and their past histories. The analytical frame would be based on the roles that the women held, any words used to identify those roles, and potentially how their roles have come to mean something slightly different today.⁶¹

⁶⁰ Gina Wisker, *The Postgraduate Research Handbook* (Basingstoke: Palgrave Study Guides. 2001), p. 193.

⁶¹ Thomas, *How to do your Case Study*, p. 17.

In summary, the first case study subject is Miss Joan Harvey, who worked for the Admiralty's Room 40 in the First World War.⁶² As she was a linguist, it is possible that she was carrying out cryptanalytic work at that time; she was later to return to GC&CS and, as her eventual grade was that of a Senior Officer, the grade of senior career cryptanalysts, it is likely that she was involved in cryptanalytic work at BP.⁶³

The second case study subject is Emily Anderson who started at GCHQ in 2017⁶⁴ and has been confirmed as the first Junior Assistant (JA), that is, the first British 'career-grade' cryptanalyst. Emily had been trained as a HushWAAC in 1918 before moving to the War Office and being promoted very quickly to JA.⁶⁵ She was described as one of the leading bookbuilders of her time.⁶⁶

The third case study subject is Miss Wendy White, who worked for The War Office from 1916⁶⁷, and moved to either Room 40 or GC&CS at a later date as yet unknown. It can be shown, from a combination of archival material and personal accounts from a friend of Wendy, that she was at one point a personal secretary to Mr William 'Nobby' Clarke, but later worked as a cryptanalyst on French, Italian and American traffic.⁶⁸

The fourth case study subject is Miss Phoebe Senyard, who was transferred from the GPO to GC&CS as a 'decoder'.⁶⁹ Despite this term today being used interchangeably with 'codebreaker' and 'cryptanalyst', Miss Senyard did not achieve a higher position than Head of Secretariat for BP's

⁶² HW3/6 Address book contains list of names of Room 40 employees with additional pages, (unnumbered); CCAC. GRB/0014/CLKE/3/3 Official History.

⁶³ <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 8 July 2021].

⁶⁴ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 27 June 2021].

⁶⁵ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 27 June 2021].

⁶⁶ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 27 June 2021].

⁶⁷ From the author's personal collection of notes, based on memories from friend Norman Hockley (document appears to be an article possibly from a GCHQ publication just before she died), (20 December 2016).

⁶⁸ TNA, HW3/6, 400B (following pages unnumbered).

⁶⁹ TNA, FO366/800, *Telegraphists etc. (GPO)*, p. 362.

Naval Section although she did receive an award in the New Year's Honours list in 1946⁷⁰, and is unlikely to have worked on high-level cryptanalysis. This case study illustrates that codebreaking terminology is likely to have changed meanings over time.

The fifth case study is Miss Marie Rose Egan, identified by this researcher as working as a high-level cryptanalyst.⁷¹ Marie Rose was deployed to help set up the Combined Bureau Middle East (CBME) in Egypt before returning to BP where she continued her pre-war work for Josh Cooper in Air Section.⁷² The case of Marie Rose shows that some women attained the position of cryptanalyst before the Second World War and were a key component in vital cryptanalysis projects.

The last case study is Miss Mavis Lever, internationally recognised as a cryptanalyst who worked on Italian Naval codes whose work was crucial in the outcome of the Battle of Cape Matapan.⁷³ Mavis was interviewed twice by this researcher and added materially to the case study.⁷⁴ Mavis is generally accepted by colleagues and by external authorities as an important World War Two female cryptanalyst⁷⁵ and therefore will be one of the gauges by which other female cryptanalysts could be identified.

Although other female cryptanalysts were considered, they were not deemed to provide the best illustrative case studies for several reasons, including primarily a lack of archival and contemporary material relating to them. Their roles are considered no less important, but their situations are

⁷⁰ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷¹ TNA, HW3/83, *Air Section GC and CS and the Approach to War 1935-39. Part II Formation of Air Section GC and CS*, paragraph 4, p. 2.

⁷² TNA, HW3/83, *Air Section GC and CS and the Approach to War 1935-39. Part XV Air Sigint in the Middle East*, paragraph 52, p. 2.

⁷³ Smith, *The Secrets of Station X*, and author's interview with Mavis Batey, 11 July 2011.

⁷⁴ The interviews took place on 11 July 2011, and 22 August 2012.

⁷⁵ Smith, *The Secrets of Station X* and Erskine and Smith, *The Bletchley Park Code Breakers*.

sometimes markedly different and will be used instead to illustrate specific points throughout this research.

3.5 Ethical issues

There are ethical issues involved in researching World War One, but these are slightly less definable than those relating to World War Two and tend to be related to the personal bias of the respective authors. As stated earlier, Hay, the former head of MI1(b), chose to burn all the wartime papers related to his section, probably due to his being passed over for promotion; the information posthumously published by his wife includes only what was left in his own papers, and cannot be verified as fact as no corroborating evidence has so far been found, the few documents that do survive are mostly due to being archived by the Admiralty's Room 40. A second example is Clarke, who worked in Naval Section between 1916 and 1945, and who wrote a file on one of his female employees whom he believed had been treated unfairly by the organisation. Again, although it is not completely clear why both Hay and Clarke behaved in these ways, the information they provide must be taken at face value in the absence of other information, albeit with the stipulation that there could be underlying motives for their actions.

The issues relating to World War Two and BP also include bias regarding personal situations and today's values being used to assess World War One situations. There are, in addition, several other particularly important ethical issues which are more pertinent to today because there are a small number of BP veterans still alive, these include memory as has been seen in Chapter Two, the cultural differences between considering a period in history using today's values and the sexual discrimination element which has been discussed at length in Chapter Two.

3.6 Methodological limitations

Further to the ethical issues that need to be carefully considered in research, there are also several limitations that should also be identified. These limitations can greatly impact a historical study as

everything from the media to familial stories that have been passed down a generation. These limitations can be considered in turn.

3.6.1 Narrative ownership

An aspect of outside influence which also needs to be acknowledged is the ownership of the story. At its height nearly 10,000 people worked at BP, and they can be said to have a collective identity. Common narrative themes run through each story and, as has been explained, there is both overlap, and occasional flat contradictions as to whether specific events happened or not, such as former incumbent Rozanne Colchester who describes the job roles that she and her friend Rhoda Welsford did which do not tally with the BP RoH (see Chapter Seven). If the writer of the element of the common narrative under discussion is a well-respected historian, they are likely to be believed over someone who is not⁷⁶, and their version will become the accepted narrative.

In 2009 Gordon Brown's government issued all BP veterans with a 'service medal', thus further collectively identifying all BP individuals as part of a single elite group. While the award was generally accepted in a positive light, there were some veterans who disagreed because the medals were given indiscriminately to all veterans including auxiliary staff, cleaners, and catering staff as well as low-, mid- and high-grade codebreakers.⁷⁷ However, it is important to add that BP only worked as efficiently as it did due to the work put in by every member of its staff; the question of whether all BP incumbents are equal is not an easy one to answer as they all had their part to play.⁷⁸

Due to the surrounding secrecy, the time that has passed, and the available data, it is impossible to corroborate or verify every single account of BP. To this end it is necessary to accept for the

⁷⁶ Whether this makes the 'story' the more accepted, or less, is therefore questionable and could also be an area for future research.

⁷⁷ Mavis Batey did not agree with these 'service medals' being handed out to everyone who was there. Author's interview with Mavis Batey, 11 July 2011.

⁷⁸ The answer to this is not explored in this research but would be an interesting topic for future studies.

purposes of this research that the collective narrative is correct unless it can be proven otherwise by contemporary sources. However, this cannot be extended to Edward Simpson's opinion that his wife Rebecca was a cryptanalyst as additional proof would be needed to clarify this.

3.6.2 *Media influence*

Today it could be said that the media has a greater influence on the general population due to widely available news channels and papers, the higher levels of literacy and advances in inexpensive, pervasive, communications technology. During World War One and Two people placed a greater trust in the government 'doing the right thing', although such trust might at times be considered misplaced.⁷⁹

The media also influences individuals and their belief system, one example of this being the story of Alan Turing. Much has been published about Turing's tragically short life, and indeed what might be considered a lack of support by the British Government, for, at a time when homosexuality was illegal and punishable by either prison or chemical castration, Turing was successfully prosecuted.⁸⁰ Knowing that a prison sentence would prevent him from working for the government, Turing chose chemical castration, which was to have a very detrimental effect on him by causing changes in his personality and mental abilities. In a present-day society that is more accepting of difference, people today use current society norms to vilify the British Government of a half-century ago for failing to protect individuals such as Turing. In 2014, the film '*The Imitation Game*'⁸¹ illustrated a generally fictitious account of Turing's life, the role of BP and the people Turing worked with. Based very loosely on the biography of Turing by Andrew Hodges,

⁷⁹ Today the media frequently publishes whatever it believes the public 'has a right to know', as more sensationalist news stories are likely to increase sales.

⁸⁰ Dermot Turing, *Prof Alan Turing Decoded: A Biography by Dermot Turing*, (Stroud: The History Press, 2015, repr. 2016), pp. 217-222.

⁸¹ 'The Imitation Game' (2015) produced and distributed by Black Bear Pictures and Bristol Automotive Ltd. <http://www.imdb.com/title/tt2084970/> (accessed 25 September 2016).

the 'Hollywood' interpretation evokes strong emotions in people today, as the public use modern ideals and principles to understand an historic event in '*their own time*'.⁸² Examples such as this create a type of false image of history, where modern values are used to judge the past. With the introduction of legislation such as the Equality Act 2010 the modern world is more tolerant, but it is equally likely to be 'emotionally manipulated' by films such as '*The Imitation Game*'.⁸³

Films and programmes such as this are not the only interpretation of BP's World War Two events which can influence the general public, and so it is important to bear in mind that stories can be sensationalised in order to make them more appealing to the general populace, in short, the story of BP 'sells' and this must be contemplated when evaluating any article or film about BP.

3.6.3 Biography and autobiography: contemporary views

No memory is as clear as they were during, or immediately after the event being described. Due to the OSA signed by all the former BP incumbents, it was illegal to write down any memories. As stated above, one woman who was able officially to write down her memories of her entire six years at BP was Phoebe Senyard (CS4). The record was written for the official archive and so has remained inaccessible until recent years.

If Phoebe's official history is one that is permitted, one that is not is by Anne Segrave, whose daughter Elisa Segrave published her mother (Anne's) private diary entries from her time at BP.⁸⁴ If this had been discovered at the time, then Anne would likely have faced serious disciplinary

⁸² Alistair Thomson, 'Life Stories and Historical Analysis' in *Research Methods for History*, ed. by Gunn and Faire, p. 104.

⁸³ The Imitation Game is not alone; there are other examples including the fictional spy film '*Enigma*'⁸³ set at BP during World War Two, and '*The Bletchley Circle*' a television series where a group of women solve mysteries. The film '*Enigma*' was one of the first generally available illustrations of BP and thus one to which some people refer for 'accuracy'. '*Enigma*' (2001) was produced and distributed by Buena Vista Inc. and based on the novel by Robert Harris. http://www.imdb.com/title/tt0157583/?ref=nm_sr_1 [accessed 25 September 2016].

⁸⁴ Segrave, *The Girl from Station X*.

action. However, these two accounts remain unusual, and they offer a contemporary view of the role of two women in different roles at BP. This does, however, lead to the ethical question of whether descendants of BP veterans are the most suitable medium to interpret, write and publish family memoirs based on questionable reminiscences and sell it under the guise of BP, an ethical question discussed by Alistair Thomson in relation to the Second World War⁸⁵. As can be seen in the partial publication by Hay's second wife, Alice, of his First World War account familial accounts can be biased in favour of the individual.⁸⁶ Another diary that has been recently published is Basil Cottle.⁸⁷ It is stated by the editors that Cottle destroyed much of the BP related diary entries, but there are still inclusions to such things as 'fractures' (keys).⁸⁸ However, as more accounts are published about BP, a wider picture appears; the sense of ownership of the BP story by those who were there at BP during the war is palpable.⁸⁹

3.7 Conclusions

It has not been possible to place this research into a solely feminist structure, because one does not exist. Therefore, the most appropriate methods of approach have been identified empirically. The primary resources for the First World War are limited to archival material, with some additional diaries written by HushWAAC Gwendoline Watkins, and publicly available biographies. Several books were published after the authors had been released from the OSA but are lacking on specific details pertaining to the women who worked for Room 40 and MI1(b) respectively.

⁸⁵ Alistair Thomson, 'Life Stories and Historical Analysis', in *Research Methods for History*, ed. by Gunn and Faire, (Edinburgh: Edinburgh University Press, 2012, repr. 2016), pp. 104-105.

⁸⁶ Hay, *Valiant for Truth*.

⁸⁷ *A Grand Gossip: The Bletchley Park Diary of Basil Cottle*, ed. by James and Judith Hodsdon (Warminster: The Hobnob Press, 1997).

⁸⁸ *A Grand Gossip*, p. 84.

⁸⁹ In all the interviews carried out by the author, the sense of pride about serving at BP was obvious in the way they were speaking about their experiences. It must be borne in mind that some former incumbents have chosen not to speak about it, even when open discussion was possible.

For the Second World War there are a far greater number of archival records located in TNA, IWM and the Churchill Archives. There are also significantly more books written and published about BP's role in the Second World War. In the mid to late 1970s, when the story began to be published, the books were written by men, about men, and mostly written from memory. As the Second World War is more recent, there are a small number of women who were still alive when the present researcher began this project. Therefore, the optimal forms of data gathering were considered to include qualitative interviews both with former incumbents from BP, and, following the identification of two top level cryptanalysts, Wendy White and Marie Rose Egan, interviews also with their surviving family and friends. With the recent public availability of the BP RoH, it has also been possible to analyse some of the data that is available. The data collection aspect of this research has, as a result, shown that at least some women were working as top-level cryptanalysts in contradiction to published accounts.

There are several ethical issues which need to be considered in context, for example social narrative is a significant element of this research, which relies heavily on memory. As has been seen it is possible for memories, with time, to become clouded and misremembered. While this possibility needs to be borne in mind, recollections must be accepted 'at face value' unless conflicting archival evidence is found. Memories are '*not a passive depository of facts but an active process of creating of meanings*'.⁹⁰ It is also necessary to consider the information in context with potential ethical issues, including contemporary author bias, and interpretation of history by today's standards.

The following three chapters will present the findings of research on a chronological basis, identifying developments firstly in World War One (Chapter Four), the Interwar years (Chapter Five) and finally World War Two (Chapter Six).

⁹⁰ Thomson, *Life Stories and Historical Analysis*, p. 106.

Chapter Four: World War One Cryptanalysis

*"The services of these ladies are invaluable. They are experienced in the working out of all kinds of codes."*¹

4.1 Introduction

This chapter is divided into five main sections. The first considers enemy (German) codes, how they were broken during the period from 1914 to 1918, and the type of person originally recruited for that task. Because the code-breaking organisations of the Admiralty, 'Room 40', and the War Office's MI1(b), diverged in their development and their recruitment and employment practices, the second and third sections will compare and contrast the two, in particular as regards how and to what roles women were recruited, and how these developed over time, compared to their male counterparts. Three case studies will be used to illustrate the roles of women in Room 40 and in MI1(b) during the First World War. The fourth section will identify the First World War origins of key components of the Second World War code-breaking organisation – the wireless intercept ('Y') stations and the use of machines to break codes, with women employed in both areas as operators. The final section will demonstrate from the research findings that the reality was in opposition to depictions in current literature, by showing that from 1916 onwards women were working in similar roles to their male cryptanalytic counterparts.

4.2 World War One cryptanalysis

4.2.1 Wireless

¹ TNA, HW3/35, *List of selected present staff attached to a letter probably signed by Hay (signature difficult to read) to the Director of Naval Intelligence* (unnumbered).

Although wireless had been used both in the Boer War (1899 – 1902)² and in the Russo-Japanese war (1904 -1905)³, the use of wireless in warfare was yet in its infancy. Europe was not fully prepared for a ‘radio age’ war of long duration, a short war had been anticipated, in which it was expected that, on land, the telegraph would continue to provide adequate and effective communications.⁴ At sea, such alternatives were not of course available, wireless use was more extensive, and wireless interception was anticipated. In the case of diplomatic messages, Britain’s war plans included a GPO cable ship’s physically severing Germany’s overseas cable links, so that communications to her colonies and overseas forces, naval and army, would unavoidably have to be by wireless, and therefore be open to British listeners, this severing was in fact Britain’s first act of war.⁵

On the Western Front, cryptanalysis was at first less important than German language, for in 1914 German wireless messages were unexpectedly in plain speech: intercepts allowed the Allies to regroup at the Marne and to avoid being surrounded in the ‘Race to the Sea’.⁶ When 1915 brought in the era of trench warfare, and heavy reliance on field telephone and telegraph (morse buzzer) usage. In the front lines, telephone and morse communications lines were soon buried to avoid shell damage; but in a short time, German interception units found these lines easy to listen into by use of sensitive amplifiers and headphones picking up induced currents through earth spikes⁷, and so listened to Allied conversations tens of kilometres away.⁸ Until 1916, British Army front-line messages were often telegraphed, or even telephoned, en clair (plain language) or simple local

² Elizabeth Bruton and Graeme Gooday *DEHS Autumn Symposium on ‘Savage Little Wars’, STEAM, Swindon, 13 October 2017*, unpublished notes provided by Professor Gooday.

³ Brian Austin, *Wireless in the Boer War*, <http://samilitaryhistory.org/diaries/wirelessabw.html> (accessed 12 July 2021).

⁴ *The British Army and Signals Intelligence during the First World War*, p. 4.

⁵ Beesley, *Room 40*, p. 2.

⁶ David Stevenson, *1914-1918 The History of The First World War* (London: Penguin Books, 2004), p. 55.

⁷ John Pether, *Funkers and Sparkers: Origins and Formation of the Y Service* (Report 17. Bletchley Park Trust. 2000), p. 4.

⁸ <https://www.electronicweekly.com/blogs/engineer-in-wonderland/stealth-comms-100-years-ago-in-the-trenches-of-world-war-one-2016-07/> [accessed 12 July 2021].

codes, due to the time required for encryption and decryption in the approved Army codes, and so could easily be read.⁹ To minimise interception, the British developed the uninterceptible Fullerphone, of which 23,400 were distributed from early 1917,¹⁰ and in parallel devised purpose-built wireless sets allowing the British to eavesdrop on German telegraph and telephone lines up to two miles away without the need for a direct connection¹¹, a development which led to the establishment of specialised stations to listen for German messages,¹² and, as will be described, the consequent need for ever-increasing resource – including women - to be demanded for decryption of such messages in the field.

Within the UK, early interceptions of German naval signals by both the Marconi Company and the Royal Navy led to the construction of intercept and direction-finding stations to intercept and locate warship and airship (Zeppelin) signals.¹³ Fortuitously, the British had acquired copies of the key three German naval codebooks within 100 days of the outbreak of war, and so cryptanalytical resource, with a strong demand for German language fluency, was required from the earliest months. Intercept stations were created across the UK and were operated by both paid staff and volunteers,¹⁴ including women. Because the Zeppelins which mounted bombing raids against Britain were primarily operated by the German Navy, the Naval Intelligence Division (NID), in addition to its role of monitoring movements of German warships and cargo vessels, was a source of wireless intelligence on Zeppelin raids.¹⁵ British cryptanalysts, through the study of the

⁹ Pether, *Funkers and Sparkers*, p. 4.

¹⁰ Ferris, *The British Army and Signals Intelligence*, p. 14.

¹¹ Boghardt, *The Zimmermann Telegram*, p. 81.

¹² Pether, *Funkers and Sparkers*, p. 5.

¹³ Pether, *Funkers and Sparkers*, p. 5.

¹⁴ Pether, *Funkers and Sparkers*, p. 6.

¹⁵ John Ferris, 'Airbandit': C³I and Strategic Air Defence during the First Battle of Britain, 1915-1918 in *Strategy and Intelligence: British Policy During the First World War*, ed. by Michael Dockrill and David French (London: Hambledon Press, 1996), pp. 23-66 (p. 25).

decrypted intercepts, introduced the concept of traffic analysis which was to become crucial to both World Wars.¹⁶

As regards diplomatic traffic, according to James, the British Government had before 1914 never entertained reading any diplomatic messages.¹⁷ As the British had intermittently been reading diplomatic messages since Elizabethan times, James presumably means diplomatic traffic obtained through wireless interception.¹⁸ Few states - primarily France, Austria-Hungary, and Russia¹⁹ - had organised cryptanalytic bureau for that purpose in the period leading up to World War One. As the German diplomatic service used book codes in a similar fashion to the German Navy, the Admiralty's Room 40 worked on these codes also. The best-known example of a World War One diplomatic decrypt was Room 40's decryption of the so-called Zimmermann telegram (detailed in Appendix Eight). This telegram, sent and decrypted in 1917, was despatched from Arthur Zimmermann, the German Foreign Secretary in Berlin, to the German embassy in Mexico, promising Mexico three states of the USA if they agreed to enter the First World War on the side of the Central Powers. The message, encoded in a two-part, four-digit code known to the British as 7500, and 0075 to the Germans, was created from two separate German telegrams, the shorter of which allowed a 'skeleton' to be worked out, providing enough information for the Admiralty's Room 40 cryptanalysts Reverend William Montgomery and Nigel de Grey to ascertain what Zimmermann was planning on Germany's behalf. The Americans were reluctant to believe the authenticity of the telegram, and so Admiral Hall, knowing a copy of the telegram existed in a code

¹⁶ Pether, *Funkers and Sparkers*, pp. 5-6.

¹⁷ James, *The Eyes of the Navy*, p. 70.

¹⁸ By the last year in service Sir Frances Walsingham reportedly had items from 50 correspondents. Alan Haynes, *The Elizabethan Secret Services* (Stroud, Sutton Publishing, 1992, repr. 2000), p. 15

¹⁹ Thomas Fergusson, *British Military Intelligence, 1870-1914: The Development of a Modern Intelligence Organization*. (Maryland: University Publications of America Inc., 1994), p. 219.

known to the USA, suggested the Americans read this, and thus removed all suspicions of a potential hoax. The Americans agreed to join the Allies and fight in the European theatre.

4.2.2 Codebooks

As has been seen, sending correspondence over the airwaves was not adequately secure. First World War codes were book-based, a system which can be considered secure unless the enemy has a copy of that specific book, or the codes are elementary and can be easily worked out, such as a substitution code, for example transposing A for F, B for G and so forth. Book codes effectively worked in a similar way to a modern language dictionary, where a word could be looked up and transposed into code by the sender, before the process is reversed by the receiver's using an identical codebook to recover the original message. In short, any person in receipt of a complete codebook could 'read that code'. The codes could be numbers, words or phrases as shown in figure 1.1, and might include a superencipherment (that is, the code numbers are amended by an additive number known only to sender and receiver).

The German navy used three main codebooks throughout The Great War, and by November 1914 the British were in receipt of all three books.²⁰ The first book was captured from the German merchant ship 'Hobart' in Melbourne Harbour by Captain Richardson of the Royal Australian Navy.²¹ This was the German mercantile marine's *Handelsverkehrsbusch* (HVB) or 'Trading book'.²² A second book was captured at the beginning of September 1914, when the German cruiser 'Magdeburg' was wrecked in the Baltic,²³ the Russians pulled a drowned officer from the ocean with this codebook clasped in his hands.²⁴ This was the *Signalbuch der Kaiserlichen Marine* (SKM) or

²⁰ Beesley, *Room 40*, p.3.

²¹ Beesley, *Room 40*, p.3.

²² Boyd, *British Naval Intelligence*, p. 106.

²³ Beesley, *Room 40*, pp. 4-6; and ADM137/4156 *A copy of the Magdeburg codebook*.

²⁴ Kahn, *The Code-Breakers*, p. 269.

‘Signal Book of the Imperial Navy’, which was considered more important than the HVB²⁵ as it was used by warships rather than trading vessels. Finally, in October 1914, a British trawler dredged up a heavy chest, jettisoned by a sinking German destroyer; this chest contained the third codebook,²⁶ the *Verkehrsbuch* (VB) or ‘Traffic Book’.²⁷ The British continued to search for other codebooks and updates of these basic three books throughout the war, in particular by diving on sunken vessels, for example, shipwright and diver E.C. Miller was regularly sent down to search ‘scuttled’ and torpedoed German U-Boats to check for codebooks and other items of intelligence, a role at which he became very proficient.²⁸

The codes were difficult to read until any added superencipherment was identified and stripped away from the basic book code. In addition, many words might not appear in the basic code book, but be derivatives or compounds of such words, when their meaning might have to be derived from the context, and be then used to amplify the original code book, a process called ‘book building’. This led to the development of the skill set required by cryptanalysts, at first, language fluency alone had been required, but later, as the code could be sent as a number with an additive, some mathematical skill in addition to language fluency was helpful; however, language was always necessary rather than the mathematical genius that was to become essential in the Second World War.

German Army codes differed in three ways from those of the German Navy and the German diplomatic service. First, the codes were those used on the active battlefield – there was no need to use wireless transmission at the level of the Corps HQ and higher, because the Germans had control of the Belgian and German telephone and telegraph systems and made full use of them.²⁹

²⁵ Boyd, *British Naval Intelligence*, p. 106; and Beesley, *Room 40*, p. 3.

²⁶ Beesley, *Room 40*, p. 7.

²⁷ Boyd, *British Naval Intelligence* p. 107.

²⁸ Kahn, *The Code-Breakers*, pp. 273-4.

²⁹ <https://eandt.theiet.org/content/articles/2014/06/ww1-first-world-war-communications-and-the-tele-net-of-things/> [accessed 12 July 2021].

Codes used on the battlefield had, because of the pressures upon and risks of troops in action, to be simple to assimilate and use under conditions of extreme stress, noise and physical damage (from mud rendering writing illegible to shrapnel damaging or destroying messages pads); keeping any complex codebook intact, let alone clean and legible, in such conditions was a major task. The German military in 1918 had an encryption choice of two cypher and two codes,³⁰ but the code book for one system ran to some 29 editions in a short period of months,³¹ and the problems of field ciphering are illustrated by a comparable British cipher in tests taking between four and 13 minutes to encipher, transmit and decipher a message of just 14 words³². It is little wonder that, under the pressure of battle, there proliferated, among both groups of combatants, local codes and ciphers, simple to use and equally simple to break – which in turn demanded increased numbers of code-breakers able to crack relatively straightforward codes, the necessary skills for which would be fluency in German and an analytical thought process of the type used to solve crosswords or puzzles in logic.

It is important to add here that a feature of the process was that it was necessary for the resulting decryption to be interpreted with the addition of supporting information from previous decrypts, rather than merely passing on the ‘*raw decrypts*’ which could have little to no value; a single decrypt rarely contains enough information for action without additional cryptanalytic evidence³³. As Ferris explains “*Mistakes and failures are inevitable in intelligence, the only questions being: how often and significant?*”³⁴ and extra information and context reduces the risks of such errors.

³⁰ John Ferris, *The British Army and Signals Intelligence*, p.8.

³¹ John Ferris, *The British Army and Signals Intelligence*, p.8.

³² John Ferris, *The British Army and Signals Intelligence*, p.6.

³³ Boyd, *British Naval Intelligence*, p. 111.

³⁴ Ferris, *Behind the Enigma*, p. 21.

4.2.3 *The initial cryptanalyst 'types'*

The start of World War One therefore initiated both a change in thought and the inevitable construction of two organisations to deal with Sigint. The Navy and Army both created sub-sections to attempt to read wireless traffic, despite neither having had much experience in reading codes.³⁵ In the beginning, both were small sub-sections until it became apparent that reading codes was both a possible and a valuable exercise.³⁶ For the first time, significant military intelligence both from allies and enemies was available on a continuing basis through intercepted wireless messages, for any government with the appropriate equipment to read. As will be seen, it is not always necessary for the message to be entirely intact or detailed for accurate decryption, as several intercepted messages can be used to achieve the same effect.

For the Admiralty's Room 40, the types of people who were initially taken on to break these codes for Room 40 were primarily friends and former colleagues of Admiral Hall, former head of Plymouth Naval College, most of whom came from a classicist or languages background.³⁷ For the War Office's MI1(b), the source was Hay's colleagues from Aberdeen University.³⁸ Classicists had skills in piecing together fragmentary inscriptions or manuscripts in dead languages, whilst linguists could identify meaningful sentences from texts with random or indistinguishable words. Once it was possible regularly to read coded messages, both Room 40 and MI1(b) could use the resulting intelligence for their own service's purpose, and to pass onto other appropriate interested parties.

For the Army cryptanalysts, three 'pen-pictures' can be provided, all male-gendered, the first of which are in agreement on the desirable skills (with the author's emphasis):

³⁵ Ferris. *Behind the Enigma*. p. 21.

³⁶ Ferris. *Behind the Enigma*. p. 21.

³⁷ Ferris. *Behind the Enigma*. p. 34.

³⁸ Ferris. *Behind the Enigma*. p. 34.

(men with the) right kind of brain to do this work. For research of this kind requires an active, well-trained and scholarly mind; not **mathematical, but classical**. ... It is of course undeniable that there may be a few men who, without having had university training, or without having acquired a great reputation for palaeographical work, nevertheless are well suited for this work. But there is no method of discovering such people. Therefore, the only test applicable is that of scholarship.³⁹

And

The would-be solver must possess **a thorough knowledge of the language employed, not only from the point of view of vocabulary but also from that of a knowledge of all the peculiarities of its grammar, syntax and idiom**, and of the peculiar phraseology, diplomatic, commercial or military, in which the messages are likely to be couched.

He should possess a lively intelligence, the faculty of imagination tempered by a highly developed critical faculty, the power of analysis, a high degree of a certain natural flair or instinct for the work, untiring patience and perseverance, in a word, the qualities of genius, defined as an infinite capacity for taking pains.

He will need a dogged obstinacy, which however must not render him incapable of discarding a supposed clue, once it has been discovered not to lead anywhere; a highly trained visual memory which will help him to remember the look of a code group, to recognise it on its reappearance, and to remember where he has seen it before, what its sequences were, and what theory, if any, he had formed about it each time it occurred.

³⁹ Ferris, *The British Army and Signals Intelligence*, p. 9.

He must possess the faculty of keeping anything from a dozen to twenty theories in his mind in order to build up a chain of coincidences and reasoning until each link fits into its place and forms a coherent whole⁴⁰

It will be noted that the description is gendered; and equally noted that none of the qualities described are gender-specific, so that as after 1916 the supply of men deemed to have these characteristics grew short, the recruitment of women was an obvious next step. Mathematics is not deemed to be an essential, but contrast the following description of one such group:

... a rummer set of fellows I never came across in all my born days. It was not in the smallest degree possible to teach these wonderful fellows a scrap of discipline. You had to treat them as geniuses ... they lived together in a dirty little rabbit hutch, smoking their pipes all day and all night, the hutch being frightfully untidy like themselves, and I don't think they looked upon washing or shaving as part of their days' serious work. But they were the most amazingly brilliant fellows, **both as linguists and as mathematicians**. As soon as a new code came along, they pounced upon it like vultures on their prey ... there was never a new German code, baffling as they always appeared to us, which those four men did not solve within thirty-six hours⁴¹

Mathematics here appears as an essential skill, and this may be a consequence of a higher level of code being the target.

⁴⁰ Ferris, *The British Army and Signals Intelligence*, p. 243.

⁴¹ Ferris, *The British Army and Signals Intelligence*, pp. 10-11.

4.3 Naval Intelligence: Room 40

4.3.1 Structure and processes

In the Royal Navy, Rear Admiral Henry Oliver, Director of Naval Intelligence (DNI), instructed Sir Alfred Ewing, then Director of Naval Education, to create a department to deal with ‘enemy cryptograms’.⁴² The organisation itself originated in 1914 with solely male employees; it had no women workers until at least 1916.

In a 1925 letter from Clarke to Ewing, Clarke describes two distinct ‘fellowships’ emanating from Room 40. The first was “40 OB – i.e., *those who had been there since the beginning*”, and “ID25 – *those who were in any way connected to it*”.⁴³ This indicates that there was a very distinct identity recognised by staff who had been there from the beginning, compared to those who came later. This is pertinent because women began employment from 1916, and in one archival source women are listed as working in ID25, indicating that this could mark the change described by Clarke: the ‘male stalwarts’ who had been recruited in 1914, compared to the new, 1916, organisation with men working alongside women for the first time.⁴⁴

Ewing began the process of creating the department by researching cyphers in “*the stacks of the British Museum library*” and obtaining commercial codebooks (which did not prove useful); he next called on four teachers from the Portsmouth Naval Academy.⁴⁵ One of these men was Alistair Denniston who was to become head of the organisation after the end of the First World War.⁴⁶ Several other men were also involved almost from the beginning, including Dillwyn Knox, and

⁴² Kahn, *The Code-Breakers*, p. 266.

⁴³ The Churchill Archives, Cambridge. The Papers of William F. Clarke. GRB/0014/CLKE/3.

⁴⁴ TNA, FO366/800 *Alphabetical List of the Staff at Queen's Gate*.

⁴⁵ Kahn, *The Code-Breakers*, p. 267.

⁴⁶ Ferris, *Behind the Enigma*, p. 30.

continued to work for the organisation throughout the First World War, with some continuing thereafter into World War Two.⁴⁷

The initial code-breaking process could be considered very much ‘trial and error’.⁴⁸ Room 40 grew organically as priorities were identified, quantities of messages increased, and it became apparent that more resources were required.⁴⁹ It had been very difficult to gauge at the beginning how many cryptanalysts were needed, because an organisational process of breaking codes to such an extent had never previously been created in Britain. Once the German codebooks had been acquired, and processes for the solution of superencipherment established, it was possible for the men of Room 40 to read correspondence regularly. In turn, once intercepts started to yield detailed intelligence, Room 40 was in position to pass the results on to the high commanders of the Admiralty. Winston Churchill, First Lord of the Admiralty at the outbreak of the First World War, was fully aware of the benefits of reading enemy messages, and such awareness would later make World War Two code-breaking an imperative priority.

As there were initially four men sharing Ewing’s office, it rapidly became necessary for them to move to a new home, and this was in Room 40 situated in the Admiralty’s ‘Old Building’, hence 40OB (the other name that Room 40 is known by). By November 1914, the quantity of traffic increased and so it was necessary to increase staffing and improve processes. Admiral Hall took over from Ewing in autumn 1916 and planned to organise the division into three sections; “*cryptography, direction finding and intelligence*”.⁵⁰ As the war continued it became further necessary to increase staffing levels, due both to the greater quantity of messages, and to the frequency of German changes of codes; at the beginning of World War One, the Germans had changed codes

⁴⁷ Kahn, *The Code-Breakers*, p. 267.

⁴⁸ Ferris, *Behind the Enigma*, p. 24.

⁴⁹ Ferris, *Behind the Enigma*, pp. 334-35.

⁵⁰ James, *The Sky was Always Blue*, p. 104.

every three months; by 1916 they were changed every 24 hours at midnight⁵¹, representing a massive increase in the requirement for cryptanalysts.

4.3.2 Recruitment of women

Before 1916, in Room 40, there were no women working in cryptanalysis, however in 1916, Hall made the decision to recruit women to assist Room 40 with the increased workload. Initially Hall had extremely specific ideas about what was expected from these women at a minimum: *“Candidates had to be closely connected with the Navy – daughters or sisters of officers – they had to know at least two foreign languages and be able to type, and if they could also take down shorthand, so much the better.”*⁵²

Several women have been identified by the present research as falling into the category of family of an officer; Miss Henderson, Miss Ella Lee and Miss Hope were all related to Senior Officers in the Navy.⁵³ It is unknown if they also spoke more than one language, although it is quite probable that they did due to their experience and education; this being so, they would fit with Hall’s criteria. Over time, new employees also came through alternative channels, additional to recruitment through familial relationships. While there could be several reasons for the employment of women outside of the criteria listed by Hall, it is most likely that the lack of suitably ‘qualified’ females related to Naval Officers meant that women had to be recruited externally.

The available evidence is not sufficient to support statistically-accurate identification of specific methods of recruitment, but it has been possible to conclude how at least some of the women came to join Room 40, to which both Ewing and Hall recruited staff.⁵⁴ The greater number of women recruited to Room 40 appear to be unrelated to naval personnel, but the women tend to

⁵¹ James, *The Sky was Always Blue*, p. 104. / Fitzgerald, *The Knox Brothers*, p. 136.

⁵² James, *The Eyes of the Navy*, p. 32.

⁵³TNA, HW3/6, Address book contains list of names of Room 40 employees with additional pages, (unnumbered); CCAC. GRB/0014/CLKE/3/3 Official History.

⁵⁴ Boyd, *British Naval Intelligence*, p. 114.

be listed under their title and surname, such as ‘Miss McGavin’, and this increases the difficulty in finding further validating information, because many of the surnames are common within the UK.⁵⁵ It is possible that more relationships between Navy Officers and the women working in



Room 40 can be identified over time; Miss May Jenkin (photograph on left)⁵⁶ for example, pictured left, was the granddaughter of Fleeming Jenkin, former Professor of Engineering at the University of Edinburgh.⁵⁷ Ewing, the head of Room 40 in 1914, was an engineering student under Fleeming Jenkin at Edinburgh and the two became firm, lifelong friends, and this connection leads to the likely conclusion that, as Ewing knew May Jenkin, this led to her recruitment in Room 40.⁵⁸

Lady Sybil Hambro is also unlikely to have been related to a member of the Navy; however, she was married to London banker, Sir Eric Hambro, who was known to Hall, and it is through this connection that Sybil Hambro was most likely recruited. Sybil Hambro would have been known to ‘the right people’ and as a result have been considered discreet enough to work in Room 40.⁵⁹ Sybil Hambro held the position of ‘Head of the Secretariat’ and was known for her “...*strong character and striking personality...*”⁶⁰ As Proctor adds “*Women’s reputations, it seemed, depended on their social and political placement rather than on their own accomplishments.*”⁶¹ This observation well crystallises the point

⁵⁵ TNA ADM223/769 *Address book*, under ‘M’. (Unnumbered).

⁵⁶ Photograph: BBC Written Archives, Caversham, Reading, L1/223. May Jenkin went on to become Head of Children’s Hour for the BBC and her personnel file can be viewed there.)

⁵⁷ Robert Louis Stevenson, *Memoir of Fleeming Jenkin* (New York: Charles Scribner’s Sons, 1901), p. 40. Kindle ebook.

⁵⁸ Ewing, *The Man of Room 40*, pp. 22-3.

⁵⁹ James, *The Eyes of the Navy*, p. 159.

⁶⁰ Bo Bramsen and Kathleen Wain, *The Hambros 1779 – 1979*. (London: Michael Joseph, 1979.), p. 328. (Great-granddaughter The Honourable Clare Hambro was unable to provide any further detail.)

⁶¹ Proctor, ‘Family Ties’, (p. 456)

that it is very difficult to summarise the attributes necessary for the women who worked in Room 40.

It is interesting to consider here the likely depiction of Sybil Hambro in *Alice in I.D.25*, a parody on the work of the department in the style of *Alice in Wonderland* written by Room 40 codebreaker Frank Birch. Walter Bruford, in a letter to author Penelope Fitzgerald, says that he thought the character *The Ruler of Room 55* was probably Sybil,⁶² which ‘chimes’ with other descriptions in which Sybil is described as a forthright, dominant, figure in Room 40.⁶³ It is known that more than one variant of *Alice in I.D.25* exists and, in the same letter, Bruford refers to Sybil as *Big Ben* which may be a reference in an alternative version unseen by this author.⁶⁴ Whilst Sybil could be described as direct, or forthright, the name *Big Ben* is arguably derogatory in nature. Big Ben is the great bell located in the clock tower in London’s Houses of Parliament (recently renamed Elizabeth Tower to mark the Diamond Jubilee of Queen Elizabeth II),⁶⁵ and Ben is a male name, gendering the bell as masculine. By nicknaming Sybil Hambro after a loud bell, it may be that Bruford and Birch, by drawing similarities between the brashness of the masculine bell with Lady Sybil Hambro⁶⁶, are belittling her.

⁶² Birch, *Alice in I.D.25*, p. 33

⁶³ Bramsen and Wain. *The Hambros* p. 328 and Ramsay *Blinker Hall*, p. 168 (NB: Sybil is incorrectly listed as Ebba in Ramsey).

⁶⁴ CCAC, Misc20 Letter from WH Bruford to Penelope Fitzgerald, 2 January 1975.

⁶⁵ <https://www.bbc.co.uk/news/uk-politics-18592966> [accessed 23 April 2021].

⁶⁶ CCAC, Misc20 Letter from WH Bruford to Penelope Fitzgerald, 2 January 1975.

4.3.3 *The Role of women in Room 40*

There were in total nearly 100 people working in Room 40 by the end of the First World War⁶⁷; of those, it can be summarised from TNA records that at least 59 were women⁶⁸, and it is possible there were more women who have not been listed. One such example is an unnamed woman who worked only one or two days as Admiral Hope's secretary before leaving, and so is unlikely to be listed; Miss Tribe was later to take this role.⁶⁹ There is sparse information regarding these women in the National Archives, and it has only been possible to learn more about them if they appear on the more complete list made by Clarke.⁷⁰ Clarke was charged with writing the official history of the department after the end of World War One, and was assisted by May Jenkin. As part of this history, he provides a short list of some of the women involved and a brief description of them.⁷¹ It is interesting to consider the style and content of this depiction, for some are demeaning in nature. The women are defined in the main by their husband's status (although it should be added that some women were probably only recruited due to their husband's social status), by their appearance, and a small minority of cases, by their actual academic achievements:

*"Miss [Freda] Curtis, in my opinion the most capable of them all."*⁷²

*"Mrs Bailey, wife of a City doctor, who caused slight but unimportant trouble by her very attractive appearance."*⁷³

*"Miss Winthrop Smith who married a well-known [sic] diplomat. I met her many years later at Helsinki where her husband was a Minister."*⁷⁴

⁶⁷ James, *The Eyes of the Navy*, p. 102.

⁶⁸ TNA, ADM223/769, *Life Histories of ID25* – address book A-Z of staff working in Room 40 (unnumbered).

⁶⁹ CCAC, GRB/0014/CLKE/3/3, Official History.

⁷⁰ CCAC, GRB/0014/CLKE/3/3, Official History.

⁷¹ TNA, HW3/6, *400B List of members made in 1918* and CCAC. GRB/0014/CLKE/3/3 Official History.

⁷² CCAC, GRB/0014/CLKE/3/3, Official History. Freda continued working for GC&CS at BP.

⁷³ CCAC, GRB/0014/CLKE/3/3, Official History.

⁷⁴ CCAC, GRB/0014/CLKE/3/3, Official History.

Clarke also adds the names of several university women who came to join Room 40: Miss Nugent, Miss O'Conner, Miss Rhoda Welsford and Miss May Jenkin.⁷⁵ It is interesting to note that Clarke adds "*There were many others, but I think I have given the names of the most important*".⁷⁶ It is not clear how he has defined the 'most important' and if they are generally held by the department as the most important, or indeed, whether this was merely his personal opinion.

According to the archives, the earliest recorded arrival date for a woman in Room 40 is Miss EM Tribe, on 1 May 1916; it is possible that women might have started working in Room 40 before that date, but this cannot be verified. Little additional information exists in the archives about these women; what exists can be summarised as several having their addresses listed, and others their start and finish dates. There is no information regarding their date of birth, and so it is not possible to identify the ages of these women, except in cases where these have been identified through alternative resources for instance BBC personnel file in the case of May Jenkin, and National Archive files and birth/death certificates in the cases of Phoebe Senyard and Wendy White.

Some of the women are listed with their full names and titles, but other women are recorded solely by their surname and prefix. This would seem to indicate a level of respect; there appears to be no malice in the identification. There are some women's surnames which are recognisable due to their marriages; for example, Dorothy Denniston⁷⁷, married to Alistair Denniston, head of the later organisation GC&CS, and Olive Roddam⁷⁸, who was later to marry Dilly Knox. Others are recognisable because of their more famous relations; Sybil Hambro, wife of Sir Eric Hambro, a London banker, Miss Violet Hudson, daughter of Robert Spear Hudson, the soap magnate and

⁷⁵ CCAC, GRB/0014/CLKE/3/3, Official History. Rhoda Welsford is further discussed in Chapter Six.

⁷⁶ CCAC, GRB/0014/CLKE/3/3, Official History.

⁷⁷ TNA, ADM223/769, *Life Histories of ID25* under 'D'.

⁷⁸ TNA, ADM223/769, *Life Histories of ID25* under 'R'.

sister of a member of the conservative government, Miss Phillipa Hope, daughter of Admiral Hope, and Miss Catherine Henderson, daughter of Admiral Sir Wilfred Henderson.⁷⁹

As the codes were book-based, one of the key requirements for employment at Room 40 for the women was that they were at least bilingual. For example, Miss Webster gives her address as “*Theoule, Alpes Maritimes, France*” which indicates that she was likely to be fluent in French.⁸⁰ Some of the women are also known to have travelled widely; for example, Joan Musgrave Harvey to New Zealand and Sybil Hambro to Jamaica.⁸¹ Some of the women are listed in the archives as having received a “*language allowance*” at the end of World War One.⁸² Regardless of their other skills, learning a language would have been an accepted part of a middle or upper-class woman’s education at that time.

The precise roles women in Room 40 held were not recorded, but it is likely to have been for most of them of a secretarial nature as then defined – comparable to a personal assistant role in today’s terms. As some of the women had an additional language, it is possible that they worked on such tasks as book-building and translations which can be considered cryptanalytic in nature, and likely to account for the additional payment received by linguists; this would, however, would have been considered part of their ‘secretarial’ duties. It is also possible that the additional payment was in direct recognition of cryptanalytic abilities, although this cannot be established with certainty.⁸³ Furthermore, it is possible that the same duties could be carried out by their male counterparts who were also working as cryptanalysts, or indeed in linguistics themselves.

⁷⁹ TNA, ADM223/769, *Life Histories of ID25* under ‘H’.

⁸⁰ TNA, ADM223/769, *Life Histories of ID25* under ‘W’.

⁸¹ www.ancestry.co.uk [accessed 10 January 2016].

⁸² TNA, ADM223/769, *Life Histories of ID25* – address book A-Z of staff working in Room 40 (unnumbered).

⁸³ This also occurred in World War Two at BP. Joan Clarke was paid a linguist salary in recognition for her work despite having no additional languages.

As has been shown, First World War cryptanalysis was performed predominantly through interpretation of the relevant codebooks, which the British possessed, and through identification and removal of any superencipherment.⁸⁴ Linguistic fluency can be considered an essential requirement of the cryptanalytic procedure, and the linguistic abilities held by the men and women would have been a vital part of the cryptanalysis process. In summary, whilst it is not possible to confirm beyond doubt that these women were working as cryptanalysts, it is highly likely that at least some had cryptanalytic duties between 1916 and 1918.

Room 40 also contained a Political Section.⁸⁵ Again, little is known about this section, but several women were employed on punching cards, operating sorting machines, and processing the outcome.⁸⁶ These women were managed by Miss Margaret Ethel Robertson who was the headmistress of Christ's Hospital for Girls at Hertford between 1893 and 1921.⁸⁷ Margaret is described as having “*managed the first brute force codebreaking attacks in history, as her ladies sequentially pursued multiple hypotheses by ‘grinding groups out of the hat machine.’*”⁸⁸ This section is further discussed in Section 4.5.2 below, and Robertson's appointment shows that some women such as Margaret herself and Lady Sybil Hambro were promoted and put in charge of managing other women.

Whilst only scant information has been located about the women mentioned in this chapter, it has nonetheless been possible to produce case studies of two women involved in World War One cryptanalysis. These case studies will be used to illustrate the different functions that the women carried out, and to offer definitions for the roles available to them.

⁸⁴ Kahn, *The Code-Breakers*, p. 268.

⁸⁵ Ferris, *Behind the Enigma*, p.37.

⁸⁶ Ferris, *Behind the Enigma*, p.37.

⁸⁷ Ferris, *Behind the Enigma*, p.37.

⁸⁸ Ferris, *Behind the Enigma*, pp.37-38.

The first case study is that of Miss Joan Musgrave Harvey, who during World War One worked in Room 40 as a ‘linguist’ and is likely to have worked on cryptanalytic work. Miss Harvey was later to return to the re-structured establishment at BP at the beginning of World War Two.

CS1 Case Study One: Linguist: Miss Joan Musgrave Harvey⁸⁹

CS1.1 Aim

To show that Joan Musgrave Harvey, a linguist and secretary during World War One, who left, and then returned to GC&CS for the start of the Second World War, was then appointed as a Temporary Senior Acting Officer ((TSAO(D))), a senior position in terms of status and pay which would indicate that she was involved in cryptanalytic work during both wars.



CS1.2 Context

Miss Joan Musgrave Harvey was a linguist who started work in Room 40 on 28 March 1917.⁹⁰ Joan attained the grade of TSAO(D) on her 1939 return to GC&CS, which indicates that she is likely to have carried out cryptanalytic work during her time at BP. The meaning of ‘(D)’ is currently obscure. This case study will also be used as one of the measures against which other women can be identified as carrying out cryptanalytic work.

⁸⁹ Picture provided by kind permission of Brigadier Antony Karlake.

⁹⁰ TNA, ADM223/769, *Alphabetic address book*, under ‘H’.

There is extraordinarily little written about Joan in the literature, but she is mentioned in Paul Gannon's book *Inside Room 40*, and in the BP Roll of Honour (RoH). Clarke describes Joan as "*Lady Secretary*" in his description of the women in Room 40.⁹¹ As has been seen this is likely a reference to a specialist grade. Joan does not appear on the 1922 list of members of staff, and so is likely to have left Room 40 at the end of World War One; she then reappears on the BP RoH in 1939. As the daughter of a peer of the realm it is probable that she did not work between the wars; from a financial point of view, it is unlikely that she would have needed to.

As Joan's family is in Burke's peerage, and includes the unusual name 'Musgrave' it has been possible to track down members of her family to build up a wider picture of her life⁹², although, unfortunately, as Joan passed away in 1949, there are no surviving records in her own words about her work in either Room 40 or GC&CS⁹³ however, it would then have been too early for her to speak about her work.⁹⁴ As a result of a combination of these factors, it is very difficult to be specific about the roles that Joan may have had. However, as her father was a peer, this could indicate why Clarke refers to her by the title of '*Lady Secretary*'⁹⁵.

In ascertaining Joan's family through Burke's peerage, it was possible to identify her nephew as Antony Karslake, and an internet search made it possible to contact him. Brigadier Karslake, whilst not having many memories of his aunt, and none of her work for Room 40 or GC&CS, was able to confirm other family history. Brigadier Karslake is the son of Joan's youngest sister and is the

⁹¹ CCAC, The Papers of William F. Clarke, GRB/0014/CLKE/3.

⁹² <http://www.thepeerage.com/p822.htm> [accessed 21 January 2016]

⁹³ From the author's private collection. Joan's Death Certificate.

⁹⁴ The Official Secrets Act ban was lifted in 1974.

⁹⁵ CCAC, The Papers of William F. Clarke, GRB/0014/CLKE/3.

only surviving member of the family who have any memories of Joan, who died when Brigadier Karslake was 17 (over 70 years ago).⁹⁶

CS1.4 Findings: Background

Joan was born on 5 June 1897 in West Kensington, London; according to the 1901 census the family were living in Fulham at that time.⁹⁷ She was the eldest daughter of Sir Ernest Musgrave Harvey who was later granted the title 'Baronet of Threadneedle Street' in 1933.⁹⁸ According to Brigadier Karslake Sir Harvey was the Deputy Chief Cashier of the Bank of England from 1903 to 1914, later becoming the Chief Cashier from 1918 to 1925. Joan and her siblings grew up in a family apartment in the Bank of England; this is recorded in the 1911 census with Joan then aged 13, they moved out in 1914, presumably when Sir Harvey left his role of Deputy Chief Cashier.⁹⁹ It is not known what Joan did between the wars; but a record exists showing Joan travelling back to Southampton from New Zealand in 1932¹⁰⁰; this was confirmed by Joan's nephew as her father lived in New Zealand for some time.¹⁰¹ Joan died in a nursing home in 1949 aged 52, as a result of a tuberculosis related illness.¹⁰²

CS1.5 Recruitment and Cryptanalytic Work in Room 40

When the Harvey family moved to 29 Cranley Gardens in 1914, one of their neighbours was Admiral Reginald 'Blinker' Hall, who by the autumn of 1914 was overseeing Room 40. As it was likely that Hall in 1916 was looking to recruit more staff, specifically women, to Room 40, it is

⁹⁶ From the author's personal collection of correspondence from Brigadier Antony Karslake. (3 February 2016) and Burke's Peerage: <http://www.thepeerage.com/p822.htm#i8220> [accessed 23 April 2021] and Joan's death certificate from the author's collection.

⁹⁷ www.ancestry.co.uk [accessed 9 September 2015].

⁹⁸ <https://www.thegazette.co.uk/London/issue/33905/page/522> [accessed 19 June 2019].

⁹⁹ From the author's collection of correspondence from Brigadier Antony Karslake. (3 February 2016).

¹⁰⁰ www.ancestry.co.uk [accessed 9 October 2015].

¹⁰¹ From the author's collection of correspondence from Brigadier Antony Karslake. (3 February 2016)

¹⁰² From the author's collection. Joan's Death Certificate.

highly possible that, knowing her family background, he invited Joan to work with him.¹⁰³ Joan started work in Room 40 in March 1917.¹⁰⁴ Prior to this recruitment Joan's nephew confirmed that Joan was working as a nurse.¹⁰⁵ Despite her lack of previous relevant experience, Joan was highly likely to be multilingual and was known to the right people, and so started work in Room 40. Although 'nurse to cryptanalyst' would appear an unusual career move, Joan's recruitment is most logical through the familial contact of Hall.

As it is known that Joan worked as a linguist during World War Two, it is probable that she was already multilingual before Hall offered her a job; indeed, Joan's nephew was confident that she had a German governess as a child, which would be a contributory factor in acquiring linguistic abilities.¹⁰⁶ As Joan is likely to have spoken German, if not other languages, this leads to the hypothesis that translating or book-building could have been part of her 'secretarial duties'.¹⁰⁷

Joan also features in *Alice in I.D.25* wherein a character proposes to Alice that "*A little bit of Harvey's Fattening Food will put you to rights*"; this, Bruford suggests, indicates that Joan probably ran the 'tea club', in British upper circles of the period an informal 'tea and cakes' afternoon social break during work; the Government would not have paid for cakes, biscuits and other sweet treats (individuals would have 'paid' themselves).¹⁰⁸ Joan is described by Bruford as "*a great favourite in room 40*" and this may be the reason that she is the only woman mentioned by her real name in the story.¹⁰⁹

¹⁰³ Men would presumably have been preferred but were unavailable because they would have been called up for war service.

¹⁰⁴ TNA, ADM223/769 Address book, under 'H'. (unnumbered).

¹⁰⁵ From the author's collection of correspondence from Brigadier Antony Karslake. (3 February 2016).

¹⁰⁶ From the author's collection of correspondence from Brigadier Antony Karslake. (3 February 2016).

¹⁰⁷ Book-building was the process of building the code books. It was necessary for them to be 'built' so that they could then be used to decrypt messages.

¹⁰⁸ Birch, *Alice in I.D.25*, and CCAC, Misc20 Letter from WH Bruford to Penelope Fitzgerald, 2 January 1975.

¹⁰⁹ CCAC, Misc20 Letter from WH Bruford to Penelope Fitzgerald, 2 January 1975.

CS1.6 Cryptanalytic Work in World War Two

Joan is listed on a document under emergency clerical staff, who would be able to return to work for GC&CS on the event of World War Two breaking out.¹¹⁰ She duly returned to work at GC&CS in August 1939 and is listed in the BP RoH on a grade of TSAO, probably as a linguist although this is not detailed on her record. The grade TSAO was only shared by a total of 73 women according to the RoH¹¹¹; the number of men identified at this same grade is 253, some three times as many.¹¹² In the RoH, 257 women who are identified as linguists,¹¹³ and whilst it is possible that other women could have been carrying out similar work to Joan, only two other women in the list of female TSAOs are identified as linguists.¹¹⁴ This is a strong indication that Joan was working at a high level of cryptographic work using her linguistic skills. It is also a potential indicator that, as a veteran of Room 40, she possessed a unique set of skills learnt in World War One which placed her ahead of newer recruits at BP. On the RoH she is listed as having carried out work on German Army and Air Force Enigma.¹¹⁵

According to the BP RoH, Joan worked in Hut Six, one of the principal huts for World War Two code-breaking, but she is not mentioned in Gordon Welchman's book *'The Hut Six Story'*, despite his heading up the department from 1940; however, few people are mentioned by name in *'The Hut Six Story'*, and only six of these are women. These women include: Katherine Welchman (Welchman's wife), June Canney (Welchman's secretary), Patricia Newman and Peggy Taylor (assistants from the early days), Diana Lucy (later Stuart) WAAF, and Jean Alington (later Howard) both of whom it is not clear why they are mentioned by name but must have meant something to

¹¹⁰ TNA, HW3/82, *Available emergency staff*, subsection *emergency clerical staff numbered 20.3.9* [date?], (unnumbered).

¹¹¹ More details regarding the grades can be seen in Chapter Six.

¹¹² <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 20 June 2019].

¹¹³ <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 20 June 2019].

¹¹⁴ <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 20 June 2019].

¹¹⁵ <https://bletchleypark.org.uk/roll-of-honour/4084> [accessed 20 June 2019].

Welchman in order for him to do so.¹¹⁶ The most likely explanation for the lack of mention may be that the archival record upon which the RoH is based is incomplete, and so simply does not record all of Joan's activities. TNA records state that Joan started in August 1939, and not only does Welchman make no mention of her presence, but he also states "*I do not believe that anyone in Hut 6 had more than a smattering of German*", which is contrary to the information on Joan's family upbringing and linguistic skills.¹¹⁷

It is possible that Joan was working in a different part of the Hut and had little to do with Welchman, or even was seconded to a different section that is not mentioned in the records - Joan was likely to have known some of the staff working in the Naval Section who continued with the organisation from its original guise as Room 40 – and it is also entirely possible that she started elsewhere before moving to Hut Six at a later point. Equally it is also possible that Denniston, then in charge of GC&CS and as a Room 40 veteran himself, knew Joan and her capabilities and used her knowledge of other languages rather than German. Finally, it could also be postulated that Welchman simply did not know Joan, or that his comment about lack of German was referring predominantly to men, as he mentions only the six women whom he knew well or with whom he had a direct involvement.

CS1.7 Conclusions

It is highly likely Joan was one of a small number of women who made the transition from World War One to World War Two codebreaking. In 1916, as a linguist and being known to the 'right people', Joan was an ideal candidate to be recruited to Room 40; she came from a 'good family' at a time when such a background was highly prized for top secret government work. Joan's precise role in Room 40 is not known but, although regarded as 'secretarial' in nature (at a date when the

¹¹⁶ Welchman, *The Hut Six Story*, p. 7, and 57, 86, 134, 158, 186-7, 189.

¹¹⁷ Welchman, *The Hut Six Story*, p. 93.

term covered a broader range of duties than it does today), it may well have included book building. The skills that she learnt in Room 40, as well as her language abilities, placed Joan on the list to be re-recruited to GC&CS in 1939 to work on German Army and Air Force Enigma. It can be said that her previous experience is likely to have fitted her for cryptanalytical work in her time at GC&CS. As Joan died in 1949, her premature death may have precluded her from being awarded the MBE which several other women received.¹¹⁸

4.4 War Office Intelligence: MI1(b)

4.4.1 Structure and Processes

During the First World War, army code breaking initially took place under M.O.6 and M.O.6(b).¹¹⁹ M.O.6(b) was renamed MI1(b) in December 1915¹²⁰. MI1(b) was the



War Office equivalent to Room 40, and at the outset, in the summer of 1915, comprised four men.¹²¹ Initially General Anderson was in charge of the department, but Malcolm Hay was to take over as head in early 1917.¹²² It is known that three university educated women worked in MI1(b) at that date: Miss [JF] Carleton, Miss Chichester and Miss [Florence] Hayllar.¹²³ It is possible that these and some of the other women who are included in this thesis can be seen in the photograph above.¹²⁴

¹¹⁸ From the author's collection. Joan's Death Certificate.

¹¹⁹ James Bruce, *A shadowy entity*, p. 318.

¹²⁰ Bruce, *A shadowy entity*, p. 318.

¹²¹ Hay, *Valiant for Truth*, p. 58.

¹²² Bruce, *A shadowy entity*, p. 319.

¹²³ Bruce, *A shadowy entity*, p. 319.

¹²⁴ <https://www.dailymail.co.uk/news/article-3179749/The-Bletchley-Park-New-exhibition-reveals-secrets-Room-40-codebreakers-hidden-heroes-won-World-War-One.html> incorrectly identified as Room 40 in the article. [accessed 17 July 2021].

Hay was a good choice for the department, as he was fluent in French, had good Italian and a reading knowledge of Latin, Spanish, German, and Greek.¹²⁵ He was also a popular choice with the small number of other cryptographers in the department. Hay recruited a “*large and brilliant staff*”; including many professors from some of the great British universities.¹²⁶

The role of MI1(b) in 1917 was to construct codes for Army use in France, the Near East, and representatives to Mesopotamia (located mostly in Iraq and Kuwait, and the remainder partially in various other countries including Syria and Turkey) in order to co-ordinate security.¹²⁷ Also at this time Hay visited France twice, to discuss breaking codes with the head of Deuxième Bureau; French equivalent of MI1(b).¹²⁸

In the spring of 1917, MI1(b) moved from the War Office to 5 Cork Street, London.¹²⁹ By Armistice Day, the department had a staff of 85¹³⁰, comprising 34 officers, 11 civilians and 40 ladies¹³¹. Hay describes them as consisting of about 20 “*solvers*” and “*sixty assistants; typists etc*”; it can be hypothesised from this that Hay called cryptanalysts ‘solvers’.¹³² Hay also describes Cork Street as ‘*never defeated*’, which would indicate the department was extremely successful, certainly in his opinion even if this cannot be verified by recorded facts.¹³³

4.4.2 The Female Cryptanalysts of MI1(b) and HushWAACs

As there are very few archival records from this period relating to MI1(b), it is currently impossible to identify all 40 women; it has, however, been possible to identify at least some of them. A

¹²⁵ Hay, *Valiant for Truth*, p. 58.

¹²⁶ Hay, *Valiant for Truth*, p. 58.

¹²⁷ Hay, *Valiant for Truth*, p. 59-60.

¹²⁸ Hay, *Valiant for Truth*, p. 59-60.

¹²⁹ Hay, *Valiant for Truth*, p. 78.

¹³⁰ Bruce, *A shadowy entity*, p. 323.

¹³¹ Ferris, *Behind the Enigma*, p. 60.

¹³² Hay, *Valiant for Truth*, p. 78.

¹³³ Hay, *Valiant for Truth*, p.78.

catering list can be seen in TNA containing a total of 19 women who possibly worked in MI1(b) although this cannot be warranted as accurate.¹³⁴ While the majority are only known by surname, there are some informative details that can be used to identify the roles they held, and each appears to have been assigned to work on certain codes. Codebooks had to be supplemented, or even constructed, before the messages could be decrypted, and it is likely that this is the role that at least some of the women held.¹³⁵ One archival record identifies six women as ‘*breaking codes*’;¹³⁶ these six women - Miss Watkins, Miss Hannam, Miss Marreco, Miss Spurling, Miss Hayllar, and Miss Anderson – each can be studied in greater detail.

Miss Watkins and Miss Hannam are described as working on both French and German codes, but also as having “*served in France GHQ, German Field codes*”.¹³⁷ British General Headquarters were initially located in St Omer from October 1914, but were later to move to Montreuil in March 1916, both geographically close to the British Expeditionary Forces (BEF) on the front line.¹³⁸ Recent research has confirmed these women were working in St Omer in a cryptanalytic role, breaking German field codes; after the British Headquarters relocated to Montreuil, these women continued to live and work in St Omer before they moved back to London to work at MI1(b).¹³⁹ It is possible that these could be amongst the women mentioned in War Office records as the 12 women (Queen Mary’s Army Auxiliary Corp QMAAC) who were moved from the War Office to

¹³⁴ TNA, HW3/185, MI1B. *The following is the Catering List for MI1B for November. The Tea account runs from 25th October to 22nd instant, and the Lunch account from 24th October to 22nd instant, both dates inclusive.* (unnumbered).

¹³⁵ Hay, *Valiant for Truth*, p. 78.

¹³⁶ TNA, HW3/35, *List of selected present staff* attached to a letter probably signed by Hay (signature difficult to read) to the Director of Naval Intelligence. (unnumbered).

¹³⁷ TNA, HW3/35, *List of selected present staff* attached to a letter probably signed by Hay (signature difficult to read) to the Director of Naval Intelligence. (unnumbered).

¹³⁸ <http://www.remembrancetrails-northernfrance.com/history/the-rearguard/montreuil-sur-mer-british-ghq-on-the-western-front.html> [accessed 23 October 2016].

¹³⁹ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

assist on the front line.¹⁴⁰ The same record states that “*If the proposal is sanctioned, application will be made to the War Office for this personnel, as special qualifications are required for work of this sort*”¹⁴¹. Unfortunately, it seems that the experience does not appear to be as successful as had been intended due to the low rates of pay (£120pa) awarded to a QMAAC Assistant Administrator which is what these women were intended to be.¹⁴² The letter suggests that of the current women employed only two “*can be said to approach the necessary standard*”¹⁴³ It is suggested that the rate of pay increases to £250pa in order to attract women “*of considerably higher attainments*”.¹⁴⁴ This therefore indicates that it was hoped that the women had the requisite qualifications¹⁴⁵ which was strong language skills¹⁴⁶ and “*a high initial educational standard*”¹⁴⁷; although this is not quantified.

Something is known of the relative numbers of men and women involved in the decryption of German field codes in France. An Appendix to a memorandum of 4 November 1918 reprinted by Ferris gives the establishment of the German codes and ciphers section of Intelligence 1E concerned as 20 males (ten officers and ten cipher clerks) and 19 women (12 ‘Assistant Administrators’ and seven clerks, both QMAAC).¹⁴⁸ As described below, the women were working in teams with the men on breaking codes, and there appears no distinction in the work allocated to each gender.

¹⁴⁰ TNA, WO158/961, *Letter from J. Charteris, Brig. Genl. General Staff, dated 9 August 1917 to GSO(b) to GSO(b), unnumbered, and Appendix I. Intelligence “E”. GSC, 2nd Grade. (Unnumbered).*

¹⁴¹ TNA, WO158/961, *Letter from J. Charteris, Brig. Genl. General Staff, dated 9 August 1917 to GSO(b) to GSO(b), (unnumbered).*

¹⁴² TNA, WO158/961, *Letter from Field Marshal Haig to the Secretary of the War Office, dated 20 July 1918.*

¹⁴³ TNA, WO158/961, *Letter from Field Marshal Haig to the Secretary of the War Office, dated 20 July 1918.*

¹⁴⁴ TNA, WO158/961, *Letter from Field Marshal Haig to the Secretary of the War Office, dated 20 July 1918.*

¹⁴⁵ TNA, WO158/961, *Letter from Field Marshal Haig to the Secretary of the War Office, dated 20 July 1918.*

¹⁴⁶ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 14 July 2021].

¹⁴⁷ TNA, WO158/961, *Letter from Field Marshal Haig to the Secretary of the War Office, dated 20 July 1918.*

¹⁴⁸ Brigadier-General E. Clive, *General Staff, G.S.1., 4 November 1918* in John Ferris, ed, *The British Army and Signals Intelligence During the First World War* (Stroud: Army Records Society and Alan Sutton Publishing Ltd) pp. 202-208.

These women and a small number of others were known as ‘HushWAACs’[sic], and were predominantly recruited for their German language skills.¹⁴⁹ The initial group totalled six; Mary Lilian Caborne, Catherine Hayes Osborne, Mabel Dymond Peel, Aline Flora Robertson, Elsie Margaret Thring and Gwendoline Edith Gwyllam Watkins.¹⁵⁰ The so-called ‘*Secret Six*’ women were later joined by others (Appendix Two details the full list).¹⁵¹ Gwendoline Watkins kept a diary with some detail of the work carried out¹⁵²; this confirms that she was interviewed by the War Office, which would indicate the connection with MI1(b).¹⁵³ Florence Hannam went out to St Omer in October 1917.¹⁵⁴ They were not told what they would be doing, but soon found out that it would involve breaking codes. They were “*divided up to work with teams of men who were already attacking multiple German codes*”.¹⁵⁵ They were considered to be part of I(e)C, part of the army’s Intelligence Corps.¹⁵⁶ Indeed Mabel Peel describes in her memoir “*I know that at the end of three months, a colleague and myself decoded our daily messages quite by ourselves, handing up our suggestions each evening to be signed by the head of the room.*”¹⁵⁷ Many of the HushWAACs including Florence Hannam and Gwendoline Watkins were awarded the Victory Medal and British War Medal in 1919 for their work (see Appendix Two).¹⁵⁸

¹⁴⁹ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 15 November 2020].

¹⁵⁰ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 15 November 2020].

¹⁵¹ <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁵² Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁵³ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁵⁴ <https://www.gchq.gov.uk/information/hush-waac-roll-honou> [accessed 15 November 2020].

¹⁵⁵ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 18 November 2020].

¹⁵⁶ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 18 November 2020]. It is likely this stands for Intelligence (e) Corps.

¹⁵⁷ Samantha Philo-Gill, *The Women’s Army Auxiliary Corps in France 1917-1921*, (Barnsley, Pen & Sword, 2017), p. 78.

¹⁵⁸ www.ancestry.co.uk [accessed 18.11.20].

As described above, German battle-field codes would have been substantially different to the codes used by the upper echelons of the Central Powers but no less important for the troops on the ground. Later, when they returned to the UK, Gwendoline and Florence joined MI1(b). They are described as having worked on French and German codes,¹⁵⁹ and Rumanian [sic] non-alphabetical codes.¹⁶⁰

Whilst little in detail is known about them, all these women and the others listed in Appendix Two (except Miss Bale) can be considered cryptanalysts. Gwendoline Watkins describes the decrypted messages as sometimes trivial, but occasionally as holding great importance such as troop locations, which meant they needed to be solved as quickly as possible.¹⁶¹ Gwendoline's handwriting is difficult to read, but it would seem that she describes how there were three or four different codes in use at the same time on different sections of the line.¹⁶² For decryption, each code was then assigned to a different room (each usually with an officer in charge¹⁶³), and the women were allocated between these rooms. It is known that they worked on several German codes which were given '*absurd*' names such as '*Adolph*', '*Gretchen*' and '*Brünhilde*'.¹⁶⁴

Gwendoline also discusses the long hours they worked, and how they would be expected to temporarily run the rooms during certain periods, before going back to the monotony of normal

¹⁵⁹ TNA, HW3/35, *List of selected present staff* attached to a letter possibly signed by Hay (signature difficult to read) to the Director of Naval Intelligence. (Unnumbered).

¹⁶⁰ TNA, HW3/35 *List of selected present staff* attached to a letter probably signed by Hay (signature difficult to read) to the Director of Naval Intelligence. (unnumbered).

¹⁶¹ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶² Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶³ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶⁴ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020]. Interestingly Gwendoline also indicates that there were no French women carrying out the same role as the HushWAACs.

work.¹⁶⁵ She also observes that the conditions were not for everyone as three women who were unhappy were returned home within a week.¹⁶⁶ According to Gwendoline, the HushWAACs were referred to in the ‘Daily Mail’, much to their horror as they had been told their work was obviously extremely secret.¹⁶⁷ All of the original six women are believed to have been ranked as “*Assistant Administrators, only one of us... attaining the dignity of a second pip, an experiment which was never repeated*”.¹⁶⁸

The third woman included in the list is Miss Marreco.¹⁶⁹ As Marreco is an extremely uncommon name, and in the absence of a first name, it is highly probable that she was Barbara Freire-Marreco. University educated classicist Barbara became a renowned anthropologist before being employed in World War One in the War Trade Intelligence Department (WTID), which was a department known to have utilised cryptanalysts.¹⁷⁰ Argued by Ferris as “*the most academic of British intelligence agencies during the war, or ever before, matched only since by Bletchley Park’s Hut 3*”, the WTID, similarly to GC&CS during the Second World War, dealt with processing large amounts of information, but in a censorship capacity.¹⁷¹ Barbara continued with her anthropological work after the war, and later became connected with the Pitt-Rivers Museum in Oxford.¹⁷² As a classicist Barbara would fit the profile of a First World War language based cryptanalyst. Furthermore, as discussed by her biographer Mary Ellen Blair, there exists no information about the job Barbara Freire-Marreco did

¹⁶⁵ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶⁶ The women were nicknamed ‘The Three Mutineers’ although not named they are referred to as Miss A, Miss B (possibly Miss Bale) and Gwendoline Watkins. Diary, National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶⁷ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶⁸ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁶⁹ HW3/35, *List of selected present staff* attached to a letter possibly signed by Hay (signature difficult to read) to the Director of Naval Intelligence, (unnumbered).

¹⁷⁰ HW3/35, *Titled Most Secret*: Captain G.L. Bickersteth untitled, (unnumbered).

¹⁷¹ Ferris, *Behind the Enigma*, p. 58.

¹⁷² <https://england.prm.ox.ac.uk/englishness-Barbara-Freire-Marreco.html> [accessed 1 April 2017].

in the WTID¹⁷³, there is however a clue in a letter that Barbara wrote which is quoted in her biography where she alludes to her work in the ‘Military Trade Department’.¹⁷⁴ It is a subtle difference in wording, but she does not describe the War Trade Intelligence Department, but Military. As the WTID is known to have transferred cryptographic staff to the Admiralty, (for example Captain G.L. Bickersteth, R.M. (M.A. Oxon) on 8 July 1918¹⁷⁵, it could be said that whilst Barbara’s identity as this Miss Marreco cannot absolutely be corroborated, but on the balance of probability it is likely that it is.

The fourth woman is Miss Spurling, seen in the picture to the right.¹⁷⁶

Using her unusual surname, it has been possible to identify more about her; Claribel Spurling, born in 1875, was the daughter of Reverend Frederick William Spurling.¹⁷⁷ Claribel moved with the family each time Reverend Spurling was offered a new post. As an adult Claribel was



initially taken on as a History teacher at a school in Chester,¹⁷⁸ before going on to become the Headmistress at a school in Birkenhead.¹⁷⁹ Claribel’s grandfathers are both described as gentlemen on her parent’s wedding certificate, and on a later document her paternal grandfather was a clerk at The New River Company.¹⁸⁰ Also on that wedding certificate, her father is described as a schoolmaster, possibly before he joined the clergy.¹⁸¹ Such relations may indicate that the family considered education very significant, which could lead to the conjecture that Claribel was well

¹⁷³ Blair, *A Life Well Led*, p. 238.

¹⁷⁴ Blair, *A Life Well Led*, p. 239.

¹⁷⁵ TNA, HW3/35, Titled Most Secret: Captain G.L. Bickersteth untitled, (unnumbered).

¹⁷⁶ Manchester Archives: International Federation of University Women. Paris 1921. Negative Sheet Number 2/N50/3. Reference: 2436/80.

¹⁷⁷ <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁷⁸ <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁷⁹ Josephine Kamm, *Indicative Past: A Hundred Years of The Girls’ Public Day School Trust* (Abingdon: Routledge, 2007), p. 193.

¹⁸⁰ www.ancestry.co.uk [accessed 31 March 2017].

¹⁸¹ www.ancestry.co.uk [accessed 31 March 2017].

educated for her time, leading to a career first as a schoolteacher and headmistress, and later to her code-breaking endeavours.

As, according to one source, Claribel wanted to help with the war effort, she joined the WRNS.¹⁸² While this cannot be corroborated, it is known that she applied at some point, probably in 1917, to work for MI1(b). Hay had devised a test to protect both himself and his department from the large number of applications they received; this test was described as ‘practically impossible’ and was based on a newspaper article taken from a “*French newspaper about the visit of President Wilson to France*”.¹⁸³ Of all the attempts by people to pass the test, only one individual managed to do so - Miss Claribel Spurling, who was immediately taken on in MI1(b).¹⁸⁴ In Hay’s own words “*Miss Spurling’s imagination and tenacity were remarkable*”¹⁸⁵. Quite how many people applied for a position in this way is unknown - it is possible that it ran into hundreds of people - but Claribel was the only one to be taken on in this fashion.

Claribel was fluent in German and French, and according to archival records, worked on French, German, and Italian codes during her time in MI1(b)¹⁸⁶; the record also states that she was ‘*probably working on current Swedish non-alphabetical*’ code.¹⁸⁷ Indeed she was proposed to be given a ‘Junior’ post on Scandinavian codes in 1919.¹⁸⁸ On 10 January 1920, she was appointed a ‘Lady Translator’, and within a few months a JA.¹⁸⁹

¹⁸² <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁸³ Hay, *Valiant for Truth*, pp. 61-62.

¹⁸⁴ Hay, *Valiant for Truth*, pp. 61-62.

¹⁸⁵ Hay, *Valiant for Truth*, pp. 61-62.

¹⁸⁶ TNA, HW3/35, *List of selected present staff attached to a letter possibly signed by Hay (signature difficult to read) to the Direction of Naval Intelligence*. (Unnumbered).

¹⁸⁷ TNA, HW3/35, *List of selected present staff attached to a letter possibly signed by Hay (signature difficult to read) to the Direction of Naval Intelligence*. (Unnumbered).

¹⁸⁸ TNA, HW3/35, *Personnel. Following the Chart of proposed organisation*.

¹⁸⁹ TNA, HW3/35, *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School*.

As could be expected with such exceptional abilities, Claribel continued to be a pioneer after she left MI1(b) for the field of education. She was first involved with Manchester University, specifically with the Ellis Lloyd Jones Hall, a hostel¹⁹⁰, and was later to become the warden at Crosby Hall, which was linked to the University of London, before having to retire due to her failing health.¹⁹¹ This ill health is likely to be the reason Claribel did not return to GC&CS in the lead up to World War Two; she passed away in 1941.

The fifth woman is Miss Hayllar. This is Florence, who unusually has the same middle name and surname: Hayllar Hayllar.¹⁹² Florence was born in Brighton on 26 October 1868.¹⁹³ Florence was the eldest of six children.¹⁹⁴ She is listed as a governess aged 22 in the 1891 census, in Harewood, Yorkshire for the three children of a retired surgeon and physician.¹⁹⁵ It is known that Florence was also a poet because she wrote a poem for Malcolm Hay when he retired from MI1(b) following the creation of GC&CS.¹⁹⁶ It is possible that she wrote *the Legend of Saint-Frideswide & other poems* in 1904.¹⁹⁷ Florence was known to have attended university although it is not clear which one.¹⁹⁸ She is incorrectly listed as having assisted Fetterlein with Emily in the solving of Russian cyphers.¹⁹⁹ It is possible that Florence worked with Emily as has been seen they were both promoted to JA at the same time in 1920, although Florence only stayed a month.²⁰⁰

The sixth and final woman is Miss Emily Anderson, who forms the second case study.

¹⁹⁰ <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁹¹ <https://www.thequeensschool.co.uk/sites/default/files/mynde/1941.pdf> [accessed 15 October 2016].

¹⁹² Hay, *Valiant for Truth*, p. 89.

¹⁹³ www.ancestry.co.uk [accessed 17 July 2021].

¹⁹⁴ www.ancestry.co.uk [accessed 17 July 2021].

¹⁹⁵ www.ancestry.co.uk [accessed 17 July 2021].

¹⁹⁶ Hay, *Valiant for Truth*, p. 289.

¹⁹⁷ Florence Hayllar, *The Legend of Sain Frideswide & other poems*, (Westminster: Archibald Constable, 1904).

¹⁹⁸ Bruce, *A shadowy entity*, p. 319.

¹⁹⁹ West, *GCHQ*, p. 91.

²⁰⁰ TNA. HW3/35. *Summary of Documents relating to Staff of GC&CS. Chief Clerk*, FO No X 6700/Gm July 7, 1922, p. 1.

CS2 Case Study Two: First Female Junior Assistant: Emily Anderson²⁰¹

CS2.1 Aim

To show that Emily Anderson was the earliest confirmed female cryptanalyst who became the first female Junior Assistant of GC&CS in 1919.²⁰²



CS2.2 Context

Miss Emily Anderson has been chosen as one of the test cases because it has been confirmed by GCHQ that she was working as a cryptanalyst from 1918 and was the first female Junior Assistant in 1919.²⁰³ Emily was awarded an OBE in 1943 for her work in cryptographic work in Cairo between 1940 and 1943, although the precise detail of her work cannot be corroborated at this time.²⁰⁴ This case study is one of the measures by which other female cryptanalysts can be identified.

CS2.3 Literature review, methodology, and identification

Miss Emily Anderson is unusual in the context of this thesis as she has had details of her life available in the public domain confirming her role at MI1(b), her work before and after the First World War through to the Second World War and beyond. Several articles have been specifically written about her work for GC&CS²⁰⁵, her academic career²⁰⁶ and a book is due to be published in

²⁰¹ Photograph: <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 27 June 2021].

²⁰² <https://www.gchq.gov.uk/person/emily-anderson> [accessed 27 June 2021].

²⁰³ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 1 July 2021].

²⁰⁴ <https://bletchleypark.org.uk/roll-of-honour/164> [accessed 27 June 2021].

²⁰⁵ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 1 July 2021].

²⁰⁶ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

the next year²⁰⁷. The combination of these publicly available articles, archival records, and personal information from ancestry.com allow for a balanced view of Emily's life, both her upbringing, and through her working life. It is intended that this case study will be a balanced view of all of the different articles and resources available regarding Emily,

There is mention of Emily in two separately published books. Firstly, she is mentioned in West's *GCHQ* (published in 1986) as working as one of former Tsarist codebreaker Ernst Fetterlein's two assistants on Soviet cyphers at the end of 1925 (the second assistant is Florence Hayllar – see Chapter Four: MI1(b)).²⁰⁸ Most recently Ferris has written about Emily in *Behind the Enigma*.²⁰⁹ He describes her as one of the women who make up the 25% of GC&CS's female managers, but the only one who was a 'codebreaker'.²¹⁰ She is listed as a member of MI1(b) having been trained as a HushWAAC²¹¹, this might simply have been the training that took place in London that all WAACs were expected to take part in (drill, roll call, physical training and route marches)²¹². As the predominant qualification for entry into the HushWAACs was language skills it is obvious why Emily was recruited. There are further descriptions of her abilities and attitude towards work²¹³ and details of another codebreaker she recruited named Patricia Bartley, who she met while staying with the family.²¹⁴ Furthermore, Emily is described as a classic bookbreaker in Bodsworth's account of Naval Section between 1927 and 1939. There is no mention of Emily in Gannon's *Before Bletchley Park*.

²⁰⁷ By author Jackie Uí Chionna of the National University of Ireland, Galway. The book is unfinished at the present time.

²⁰⁸ West, *GCHQ*, p. 91

²⁰⁹ Ferris, *Behind the Enigma*, p. 89-90, and 114-15, 339, 439-40, 442.

²¹⁰ Ferris, *Behind the Enigma*, p. 89.

²¹¹ Ferris, *Behind the Enigma*, p. 89.

²¹² Philo-Gill, *The Women's Army Auxiliary Corps in France*, p. 26.

²¹³ Ferris, *Behind the Enigma*, pp. 89-90.

²¹⁴ Ferris, *Behind the Enigma*, p. 339, p. 442.

CS2.4 Findings: background

Emily was born in Galway, Ireland on 17 March 1891.²¹⁵ One of four children she was the daughter of a prosperous, middle-class family.²¹⁶ The Anderson family were middle class, and able to afford servants which is illustrated on the 1901 (four servants) and 1911 census (two servants) respectively. One of the four servants listed in 1901 is Swiss national, and likely French and German speaker, Elisa Curtet, who is recorded as a ‘governor’ (governess) for their three children; Elsie (aged 11), Emily (aged ten) and Alexander (aged five), (the fourth child Helen was born in 1902).²¹⁷

In 1901 Emily’s father Alexander was recorded on the census as having been born in County Derry²¹⁸ and was ‘President of Queen’s Colleges, Galway’²¹⁹ (now known as National University of Ireland (NUI) Galway)²²⁰. Alexander was a noted astronomer and physicist who had graduated from Galway in 1881 with an MA. He is ‘widely credited as the first person to suggest the existence of black holes’.²²¹ Emily’s mother (also called Emily) was a women’s rights advocate and played a prominent role in the local women’s suffrage movement.²²² This is noteworthy because at the time women’s suffrage in Galway in the 19th century was mostly within the confines of ‘university

²¹⁵ www.ancestry.com [accessed 1 July 2021].

²¹⁶ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²¹⁷ www.ancestry.com [accessed 1 July 2021].

²¹⁸ www.ancestry.com [accessed 1 July 2021].

²¹⁹ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²²⁰ <http://www.nuigalway.ie/about-us/> [accessed 3 July 2021].

²²¹ <http://www.nuigalway.ie/royalvisit/interestingfacts/> [accessed 3 July 2021].

²²² <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

circles’.²²³ This is significant because the Anderson family were living in the university grounds as well as heavily involved in the university itself.²²⁴

Languages clearly played a big part in Emily’s upbringing, with Swiss Governess Elisa likely to have taught the children her native French and German amongst other lessons.²²⁵ Alexander Anderson who had been born in Coleraine learnt Irish following his appointment as President of Queen’s Colleges, Galway.²²⁶

Emily herself, studied at Queen’s Colleges, Galway and received first-class honours in all four subjects she was taught – French, German, English, and Latin – matriculating in 1908 and graduating in 1911.²²⁷ Between 1909 and 1910 she held the Browne Scholarship.²²⁸ The Dr and Mrs W.A. Browne Scholarship was to the value of £32²²⁹ and open to students with a ‘colloquial knowledge of French and German and must obtain at least 66 per cent in one of the languages and at least 40 per cent in the other language’.²³⁰ The indication is that it is only available to one student and highly likely that it would be the most academically gifted student in the class. After she graduated at Galway, she went onto the Universities of Berlin and Marburg for postgraduate

²²³ Anne Clancy, ‘Women of the West: campaigning for the vote in early twentieth century Galway c1911-1915’ in *Irish Women and the Vote*, ed. by Louie Ryan and Margaret Ward (Newbridge: Irish Academic Press, 2007, repr. 2018), Kindle eBook.

²²⁴ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²²⁵ www.ancestry.com [accessed 1 July 2021].

²²⁶ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²²⁷ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²²⁸ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²²⁹ This would be approximately £2,500 in today’s money. <https://www.nationalarchives.gov.uk/currency-converter/#currency-result> [accessed 3 July 2021].

²³⁰ <http://hdl.handle.net/10379/2856> [accessed 1 July 2021].

study before travelling to Barbados in 1915 to teach languages at a girl's secondary school.²³¹ Emily was awarded the professorship of German at Queen's Colleges, Galway in 1917, although she was not the first female professor at the university (three-year prior Mary Donovan held the professorship of History).²³² According to the NUI, Galway, Emily resigned three years later²³³, although this does not correspond to GC&CS archival records which state that she started working for them, having trained as a HushWAAC before moving to the War Office's MI1(b) in 1918 and became the only female Junior Assistant in 1919.²³⁴ It is possible that she was perhaps working for them both at the same time, or took leave from Queen's Colleges, Galway and finally decided in 1920 that she preferred cryptographic work to teaching languages; her first class at Queen's Colleges, Galway had what was probably a disappointing eight students²³⁵. As the situation cannot be corroborated any further than this, each must be taken on face value as being correct as there is proof that she both tendered her resignation to Queen's Colleges, Galway in 1920²³⁶, and started working at the War Office, MI1(b) and GC&CS by 1918²³⁷.

CS2.5 Cryptanalytic work

²³¹ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 3 July 2021].

²³² <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 3 July 2021].

²³³ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²³⁴ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 1 July 2021].

²³⁵ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²³⁶ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 1 July 2021].

²³⁷ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 3 July 2021].

Emily Anderson joined the War Office in 1918.²³⁸ Initially she was trained as a HushWAAC but then transferred to MI1(b).²³⁹ In 1919 Emily and Gwendoline Watkins were proposed to become Junior Assistants working on French and Italian codes.²⁴⁰ Although, according to GCHQ Emily “*was the only woman Junior Assistant at the formation of GC&CS in 1919.*”²⁴¹ However, according to an archival source she was appointed a Junior Assistant (JA) on 10 January 1920, with Miss Florence H. Hayllar²⁴², but that Emily could not be admitted in ‘view of certain technicalities’ which meant it could only be regarded on a temporary basis.²⁴³ Florence was to resign as JA on 11 February 1920²⁴⁴ and so it is not clear why Emily is listed as the only JA. A JA post at this time is arguably the highest grade attained (and attainable) for a woman; Emily was approximately 31 years old when she was taken on as such²⁴⁵. Despite the issues with being regarded a temporary member of staff there is a list of ‘Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School’ which includes both Emily and Florence.²⁴⁶ She was also entitled to a pension, as were all members of staff with the exception of the ‘Lady Translators’.²⁴⁷

In 1925, Joshua Cooper (who went on to become head of Air Section in 1936²⁴⁸) describes the structure of the office at GC&CS as “*pretty hopeless*”²⁴⁹, it consisted of one Senior Assistant with a responsibility allowance (this was Alistair Denniston), 12 Senior Assistants and 12 Junior Assistants. Regarding the structure itself, Cooper continues:

²³⁸ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 3 July 2021].

²³⁹ Ferris, *Behind the Enigma*, p. 89.

²⁴⁰ TNA, HW3/35, *Code and Cypher personnel*, paragraph 2.

²⁴¹ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 1 July 2021].

²⁴² TNA, HW3/35, *Summary of Documents relating to Staff of GC&CS. Chief Clerk*, FO No X 6700/Gm July 7, 1922, p. 1.

²⁴³ TNA, HW3/35, *Summary of Documents relating to Staff of GC&CS. Chief Clerk*, FO No X 6700/Gm July 7, 1922, p. 2.

²⁴⁴ TNA, HW3/35, *Summary of Documents relating to Staff of GC&CS. Chief Clerk*, FO No X 6700/Gm July 7, 1922, p. 2.

²⁴⁵ www.ancestry.com (accessed 1 July 2021).

²⁴⁶ TNA, HW3/35 *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School*, p. 1.

²⁴⁷ TNA, HW3/35 *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School*, p. 2.

²⁴⁸ TNA, HW3/83, Document title: *Reminiscences of JES Cooper, Head of Air Section at GCCS 1936-1946*.

²⁴⁹ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 6, (unnumbered).

A Senior Assistant received the same pay as a Principal, a Junior Assistant received the pay of an Assistant Principal (with £5 less annual increments – imposed by the Treasury to make the fact that we were not quite the same class as the administrative grade!) Supporting staff consisted of a few misemployed typists, some women on S.I.S. books and I believe a few women employed as ‘J.A.A.’ (Junior Assistant’s Assistant). For it was the Treasury’s understanding that Senior Assistants broke new cyphers, and Junior Assistants deciphered and translated the texts.²⁵⁰

Despite Cooper’s indication that the highest woman employed was as a JAA, by this time Emily was already a JA. It is worth further noting that Cooper describes the Treasury’s understanding of the difference between the roles held by Senior and Junior assistants as breaking new codes (SA) and deciphering and translating the texts (JA). It is not clear if this is the actual difference, but it is possible that it is a close comparison as Emily was described as ‘the leading book-builder’.²⁵¹ If Emily can be considered a leading bookbuilder then it could be said to be a role carried out by language-based specialists or linguists as they were known at GC&CS. Therefore, this is an indication that other linguists could have been carrying out the role in Room 40.

By 1925 GC&CS was located at Queensgate [Queen’s Gate, South Kensington], London.²⁵² Cooper worked for GC&CS from 1925 as a Junior Assistant having been introduced by a friend of Sybil Pugh.²⁵³ It was said that Cooper “*had unusually high linguistic ability*”.²⁵⁴ Initially Cooper gained valuable training working under Emily Anderson.²⁵⁵ It is notable that of the 12 Junior Assistants it was Emily who was chosen (or perhaps offered?) to teach Cooper.

²⁵⁰ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 6, (unnumbered).

²⁵¹ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 1 July 2021].

²⁵² TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 1, (unnumbered).

²⁵³ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 1, (unnumbered).

²⁵⁴ https://bletchleypark.org.uk/cms/record_attachments/2123.pdf [accessed 19 April 2020].

²⁵⁵ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 7, (unnumbered).

Emily was “*Head of the Italian Diplomatic Section by 1927*” and she is described as “*by far the most capable of the JAs*”.²⁵⁶ This is high praise indeed for possibly the only female JA at the time and shows that despite being a woman in a male dominated department, she was considered equal to the male JAs, so perhaps could be deemed an honorary man. The section translated telegrams coming to and from Mussolini’s government, by the mid-1930’s the messages forewarned of increasing risk of conflict.²⁵⁷

Wilfred Bodsworth describes the ‘strings’ that Emily pulled to get him into working in the Italian Diplomatic section.²⁵⁸ This is noteworthy because it is unusual for a woman to manage a man. Bodsworth goes on to explain that he initially worked on ‘key breaking and decoding, learning diplomatic Italian from decodes, documents, magazines and newspapers’ before being taught how to build books and translate; a job that he worked alongside Emily.²⁵⁹

Although sources agree that she was in Cairo, reports differ slightly as to what she was doing there. According to the GCHQ website “*She accepted a posting to GHQ Middle East in July 1940...*”²⁶⁰, the BP RoH simply states that she was in Cairo from 1940 to 1943²⁶¹, but the Moore Institute explains that she was seconded to the War Office and went to Cairo to work in the Special Operations Executive (SOE) office²⁶². Although the Moore Institute also points out that it was unlikely that she was acting as a ‘honeytrap’ for senior officials given that she was in her early 50s by this point.²⁶³ It is unlikely that this could be true, it is more likely that Emily was working for GHQ Middle East,

²⁵⁶ <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

²⁵⁷ <https://twitter.com/gchq/status/1236561847979048965?lang=en> [accessed 3 July 2021].

²⁵⁸ TNA, HW3/1 Mr W. Bodsworth’s account, *Naval Section 1927-1939, Italian Diplomatic*, Paragraph 1, p. 1 / 91.

²⁵⁹ TNA, HW3/1 Mr W. Bodsworth’s account, *Naval Section 1927-1939, Italian Diplomatic*, Paragraph 1, p. 1 / 91.

²⁶⁰ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 1 July 2021].

²⁶¹ <https://bletchleypark.org.uk/roll-of-honour/164> [accessed 4 July 2021].

²⁶² <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 4 July 2021].

²⁶³ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 4 July 2021].

as suggested by GCHQ²⁶⁴ or possibly Central Bureau, Middle East (CBME) which was also operating out of Heliopolis, Cairo during this period (more details can be seen in CS4 as Marie Rose Egan was also stationed there).

By 1938 Emily is described as expecting ‘of her subordinates the same high standard she has herself’ which gives insight into her demeanour.²⁶⁵ Later in the Second World War John Tiltman wrote about Emily that “*she seemed to bully any of my attached officers who worked under her.*”²⁶⁶ Emily was clearly someone who “*expected her own high standards in her colleagues and subordinates*”²⁶⁷ It was later said that

Most of us shared rooms (as head of the largest section of 30, I shared a room with four others), but one lady (recently returned from Egypt), demanded her own room, and refused to come to work until she was given it. How Denniston mollified her I will never know, but after a week’s absence she meekly asked if she could have a table and chair. She was an excellent translator, but with her status as the senior lady of the Foreign Office she insisted on translating only messages less than a week old! When there was nothing to her liking she brought from her drawer her manuscript of a definitive biography of Beethoven which later became a classic.²⁶⁸

This exert is undoubtedly describing Emily later in her career on her return GC&CS in 1943. Clearly Emily felt any traffic that was more than a week old as a waste of her time, but also the indication is that she felt entitled to a high standard, as described by GCHQ “*She was considered the leading book-builder in GC&CS and expected her own high standards in her colleagues and subordinates.*”²⁶⁹ At

²⁶⁴ <https://www.gchq.gov.uk/person/emily-anderson> [accessed 4 July 2021].

²⁶⁵ TNA, HW3/1 Mr W. Bodsworth’s account, Naval Section 1927-1939, Italian Diplomatic, Paragraph 1, p. 1 / 91

²⁶⁶ <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

²⁶⁷ <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

²⁶⁸ P. William Filby, ‘Bletchley Park and Berkley Street’ in Hugh Skillen, *The Enigma Symposium*, 1999 (Bath: Print in Black, 1999), p. 41

²⁶⁹ <https://www.gchq.gov.uk/features/key-figures-uk-sigint> [accessed 1 July 2021].

some point Emily was promoted to Senior Assistant as this is what is indicated on the BP RoH although it is not clear when this happened²⁷⁰, although it had happened by September 1939²⁷¹. As Emily was clearly highly thought of it is possible that this might have happened before the Second World War started, or indeed on the outbreak.

Also included in the information on the GCHQ website Emily continued to work for GC&CS after the end of the Second World War, and received an OBE in 1943, however this cannot be corroborated by the London Gazette listing.

CS2.6 After World War Two

Emily continued to work for GC&CS after the war, and stayed with them when the organisation became GCHQ, their move to Eastcote, then Cheltenham until her retirement in 1951 aged approximately 60.²⁷² It is not clear what Emily did after the war ended but as she worked in the Diplomatic Section following her return from Cairo it is most likely that she continued working on Diplomatic traffic, although potentially as she had worked on Russian traffic in 1925²⁷³ it is possible that she could have worked on Russian codes.

Outside her roles as a cryptanalyst Emily's work on *"editing and publishing the letters of Mozart and Beethoven led the German government to award the Officer's Cross of the German Order of Merit."*²⁷⁴ Emily located and translated hundreds of letters from Mozart and Beethoven into English and published

²⁷⁰ <https://bletchleypark.org.uk/roll-of-honour/164> [accessed 4 July 2021].

²⁷¹ TNA, HW3/82, document lists staff in GC&CS, (unnumbered), section dated 29.9.39.

²⁷² <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 4 July 2021].

²⁷³ West, *GCHQ*, p. 91.

²⁷⁴ <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

three-volume editions on each, the first in 1938 and the second in 1961.²⁷⁵ Emily died the following year on 26 October 1962 in London.²⁷⁶

CS2.7 Conclusions

Emily Anderson is a cryptanalyst confirmed by GCHQ from her training as a HushWAACs in 1918, to her pioneering promotion as a JA in 1919. Clearly Emily had proven how capable she was very early in her career to have been promoted to JA within about a year of her starting with GC&CS. She also trained other significant future top cryptanalysts such as Josh Cooper who headed Air Section during the Second World War.

The evidence shows that Emily was an exceptional gifted linguist who chosen to leave a teaching professorship and embrace a different future as a cryptanalyst working for the British government. Not only did she use her skills for cryptanalysis but also for the translation of letters from Mozart and Beethoven for which she was awarded the *Officer's Cross of the German Order of Merit*²⁷⁷ which may have somewhat conflicted with the OBE that she was awarded by the British government for services against the Axis powers.

This case study proves that Emily is one of two of the earliest confirmed cryptanalysts who were promoted to JA in recognition of her skills in 1919. Although it has only been possible to identify and name the women above as cryptanalysts, it is highly probable that these were not the only women working in the role. It would also appear from the examples quoted that Hay had no qualms in recruiting people to the roles he felt best suited to them, regardless of their sex. This was a very progressive view for the time and one which may have continued to influence British

²⁷⁵ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 4 July 2021].

²⁷⁶ www.ancestry.ac.uk [accessed 4 July 2021].

²⁷⁷ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> [accessed 4 July 2021].

cryptographic organisations into the years between the wars and indeed into World War Two and beyond.

Whilst these six women seem to be leaders in the cryptanalytic field, other women have been identified with origins in MI1(b). The third case study is that of Miss Wendy White, who initially worked for the War Office from at least 1916. Unlike the six women already described, it seems that Wendy was likely to have come in at a lower secretarial grade, due possibly to her age, or possibly her lack of experience. There is little information about her regarding her early career, but it is known that she worked for the War Office during the First World War so is likely to have moved from MI1(b) before the end of World War One. It is however certain that she was working for the combined organisation of GC&CS by 1919.

CS3 Case Study Three: Early Female Cryptanalyst: Miss

Winifred ‘Wendy’ White²⁷⁸



CS3.1 Aim

To show that Wendy White worked predominantly as a cryptanalyst on several different codes over a 30-year period during her time working for GC&CS and later GCHQ.

CS3.2 Context

Miss Wendy White has been chosen as one of the test cases because this researcher can prove that she worked as a cryptanalyst through much of her career. Wendy was awarded an MBE in the Queen’s birthday honours in June 1952²⁷⁹ and was later to retire in 1958.²⁸⁰ Initially Wendy was recruited in 1916 to the top floor of the War Office, known unofficially as ‘Zeppelin Terrace’, but

²⁷⁸ Photograph provided by kind permission of Norman and Mary Hockley.

²⁷⁹ <https://www.thegazette.co.uk/honours-lists> [accessed 25 January 2016].

²⁸⁰ From the author’s personal collection of memories from friend Norman Hockley.

was later to move to the newly created GC&CS in about 1920;²⁸¹ it is not known what activities took place on the ‘Zeppelin Terrace’ which was thus named due to the “*layer of air raid protection nets to ward off bombs*”.²⁸² It is not clear on present evidence how Wendy was recruited or when and how she changed departments. It is known, however, that throughout her 42-year career working for the British Government, at least 30 of those years was as a cryptanalyst.²⁸³

CS3.3 Literature review, methodology, and identification issues

Wendy White appears to be an individual who has had extraordinarily little published about her, and nothing about her own personal situation. In National Archives files she is listed as ‘Miss W. White’.²⁸⁴ Wendy appears on two publicly available listings; the first is the BP RoH as ‘W. White’, and the second ‘The Bletchley Park War Personnel’ list produced by Paul Gannon.²⁸⁵ She is also briefly mentioned, and a photograph published, in John Ferris’ official history of GCHQ.²⁸⁶ Finally, a National Archives file note, ‘The White Conspiracy’²⁸⁷, written by her manager William F. ‘Nobby’ Clarke; documents an incident in which Wendy was overlooked for a promotion; the exact reasons are not recorded, but are likely to be either because of her demeanour or possibly because of her gender, or a mixture of the two.

Through a combination of research and deduction, a death certificate for a ‘Winifred White’ who died in Cheltenham on 8 September 1993²⁸⁸ was obtained, this being the prime candidate for the

²⁸¹ From the author’s personal collection namely a document which appears to be an article possibly from a GCHQ publication just before she died, provided by friend Norman Hockley, (20 December 2016).

²⁸² ‘The War Office “Old” and New’ in *Stand To! The Journal of the Western Front Association*. Issue 15 (1985) p. 13.

²⁸³ From the author’s personal collection of memories from friend Norman Hockley. (20 December 2016).

²⁸⁴ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed for by] *Accountant-General of the Navy 30/03/1922*, p. 364 (following pages unnumbered).

²⁸⁵ <http://www.paulgannonbooks.co.uk/styled-3/files/personnel-list-room-40.pdf> [accessed 31 March 2017].

²⁸⁶ Ferris, *Behind the Enigma*, p. 90-91. Contemporary photo also included.

²⁸⁷ TNA, HW3/27, A series of handwritten notes by Clarke (progressively harder to read).

²⁸⁸ From the author’s personal collection: Winifred White’s death certificate.

cryptanalyst W. White on the grounds of her living, at the time of her death, in Cheltenham, whence she would have moved with GC&CS from Bletchley via Eastcote as newly renamed GCHQ in 1946. The death certificate identified Winifred White was a ‘retired Civil Servant’, which is what would be the expected declared profession of a cryptanalyst²⁸⁹, and a brief internet search confirmed that the person who registered her death was still living at the same address. This was Mr Norman Hockley who had worked with Wendy in GCHQ and became a close family friend; on questioning by this researcher, Mr Hockley was able to confirm personal information about Wendy that was not available in the archives.

Several issues were identified during the process; these included confusion over Wendy’s name, as she was named Winifred on her birth certificate but was known as Wendy. No information exists in either archival records or published sources regarding Wendy’s life before her recruitment to GC&CS and her War Office work. It has not been possible to identify close family, as the name White is common, and for the same reason it has not been possible to identify any areas in the UK where her family might currently be located.

CS3.4 Findings: background

Wendy White was born Winifred White in Ealing, London, on 3 November 1897, one of four siblings.²⁹⁰ Later in life Wendy was known to visit her sister who lived in Spain. It is not known if Wendy was fluent in Spanish, but it is possible as it is known that she was multi-lingual in performing her role.

It is unknown at this time if ‘Wendy’ is the name by which she was known from birth, but certainly by the time she was working at GC&CS she was known as Wendy. As she preferred to be called Wendy, this is the name which will be used throughout this research. Which schools Wendy

²⁸⁹ From the author’s personal collection: Winifred White’s death certificate.

²⁹⁰ From www.ancestry.co.uk [accessed 30 December 2016].

attended, or any experience that she had in the lead up to her recruitment to the War Office, are also not known. Under the provisions of the 1868 Taunton Report, Wendy would have been in school until she was at least 14 or 15, and on finishing school, a common progression would have been to a Pitman Secretarial College, if so, it is MI1(b) that might have been her first job, or she may have had another job in the War Office prior to transfer to MI1(b). By 1920 Wendy was a ‘Shorthand Typist Grade 1 – Supervisor’, which would indicate that she must have had experience in both typing and supervising.²⁹¹ This will be examined in more detail in CS3.5, Recruitment.

Wendy was not the only nickname by which she was known. During the early days in GC&CS Wendy was also known as ‘Mrs Bruin’.²⁹² The reason is not known, but a number of people in the department had nicknames - Clarke, for example, was known as Dr Lion. According to Austerfield this was probably due to his “*gingery mane*”²⁹³ The term ‘bruin’ may reflect Wendy’s temperament, or indicate that, like a mother bear over her cubs, she was fiercely protective of the men in the department.

There are two anomalies in Miss White’s data which have been identified at this time; the first is an apparent middle name, from the appearance of an initial C in her name as ‘Miss W.C. White’ in the GC&CS archives (and consequently in the BP RoH), and the second is her date of birth recorded in the National Archives as 4 November 1897.²⁹⁴ In the first instance, Wendy’s birth certificate confirms that Wendy was not recorded with any middle name and therefore it is likely that the ‘C’ is an error in the records. In the second, family friend Mr Hockley, who registered

²⁹¹ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed for] *Accountant-General of the Navy 30/03/1922*, p364 (following pages unnumbered).

²⁹² TNA, HW3/26 Postcard.

²⁹³ E. Austerfield. *Station X 1940/1* in H. Skillen, *The Enigma Symposium 2000* (Bath: Print in Black, 2000).

²⁹⁴ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed for] *Accountant-General of the Navy 30/03/1922*, p364 (following pages unnumbered).

Miss White's death, believed her date of birth to be 3 November 1897, which agrees with Wendy's birth certificate and is therefore more likely to be correct.²⁹⁵

CS3.5 Recruitment

As stated above, Wendy was initially recruited to the War Office in 1916 when she worked on the top floor known as the 'Zeppelin Terrace'.²⁹⁶ It is unclear exactly when Wendy left the War Office and moved to a different department as two dates are mentioned in the archives as 'start' dates; the first is 1917 and the second, when it is likely that she moved to GC&CS²⁹⁷, is 1 February 1920; Wendy was initially employed as a "*Shorthand typist, Grade 1 – Supervisor*"²⁹⁸ but was later to be Clarke's personal secretary and continued to work with him until his retirement as Head of Naval Section in 1945.²⁹⁹

Previous to Wendy's arrival, the position had been held by Miss Violet Hudson who was 'the daughter of a soap magnate' (likely to be Hudson Soap) and described by Clarke as a "*very nice child*"³⁰⁰ - this belittling description is a revealing insight into how the women were viewed by the men at that time, as there is no indication of her abilities; it may also indicate that Violet was younger than Wendy. Clarke and Wendy however, obviously enjoyed a close working relationship as the archival documents attest.³⁰¹ Clarke had been recruited in 1916, worked initially on

²⁹⁵ From the author's personal collection: Winifred White's birth certificate.

²⁹⁶ From the author's personal collection of memories from friend Norman Hockley (document appears to be an article possibly from a GCHQ publication just before she died. (20 December 2016).

²⁹⁷ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed on behalf of] *Accountant-General of the Navy 30/03/1922*, p. 364 (following pages unnumbered).

²⁹⁸ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed on behalf of] *Accountant-General of the Navy 30/03/1922*, p. 364 (following pages unnumbered).

²⁹⁹ TNA, HW3/6, 400B (following pages unnumbered).

³⁰⁰ TNA, HW3/6, *Clarke's note on individuals, unnumbered*, (undated).

³⁰¹ TNA, HW3/27, *The White Conspiracy* Clarke's handwritten notes, untitled (unnumbered).

American Diplomatic traffic, and was later promoted to Head of the Italian Naval Section.³⁰² He transferred from Room 40 at the Admiralty to GC&CS and later moved with that organisation to Bletchley, Wendy transferring with him. In Clarke's own words "*During the years 1919-1923... naval cryptography was not practiced [sic] at all.*"³⁰³ This could be an indication that neither Wendy nor anyone else was working on naval codes, but it might also mean she was working on a different, non-naval, code.

CS3.6 Cryptanalytic work

In 1941 Clarke states that Wendy had been working for 14 years on 'Italian, French and American codes' which would indicate that from 1927 at the latest she had been working as a cryptanalyst.³⁰⁴

Wendy's responsibilities under Clarke were described as:

1. She will deal with all section correspondence, prepare necessary letters in connection Procedure Y and arrange for their typing and despatch. She will keep a register of all letters received from the Fleet, showing when they were received and acknowledged.
2. She will be responsible for all papers coming to or leaving the section except actual intercepts.
3. She will generally supervise all the clerical staff, acting in this under the discretion of the Head of Section.
4. She will do cryptographic work as may be determined by Head of Section.³⁰⁵

³⁰² TNA, HW3/27, *The White Conspiracy* Clarke's handwritten notes, untitled (unnumbered).

³⁰³ William F. Clarke, *Government Code and Cypher School Its Foundation and Development with Special Reference to its Naval Side*". Cryptologia 11/4, 219-226 (1987) p. 221.

³⁰⁴ TNA, HW3/27, *The White Conspiracy* Clarke's handwritten notes, untitled (unnumbered).

³⁰⁵ TNA, HW3/1, *Naval Section. Standing Orders*. Subsection *Secretary and Assistant Cryptographer* p. 3.

It is therefore highly likely that Wendy learnt cryptographic skills in the early days of her employment in GC&CS, possibly alongside Clarke when he was working on American Diplomatic traffic.³⁰⁶ In 1935 Wendy, one of only four members of Naval Section listed³⁰⁷, worked specifically on Italian keys and carried out all of the secretarial work. Wendy is also described on another list as “*Secretary and Assistant Cryptographer*” under Bodsworth on 21 October 1936.³⁰⁸ Importantly, Wendy is the only woman included as a cryptographer in a staffing list dated 1938.³⁰⁹ Wendy would have needed to be fluent in French and Italian to work on these naval codes, and it is possible that she could speak other languages also.³¹⁰

As Clarke’s secretary Wendy was also required to scrutinise all the newly obtained messages for which Clarke had no time. In 1938 Wendy was working on ‘B’, a codebook used by the Spanish, solely for ships in Spanish waters³¹¹, and by 1941, on Italian naval code ‘Rosie’ which appears to have been a book-based code; she was described by Clarke as having “*done valuable work*” on it.³¹² ‘Rosie’ was a chiefly administrative code that came into force in June 1940.³¹³

CS3.7 Work ethic: ‘The White Conspiracy’

During the Second World War Wendy experienced extreme prejudice in an incident Clarke called “The White Conspiracy”³¹⁴, the name which Clarke gave to an occurrence when he was absent on a period of long-term sickness.³¹⁵ Wendy felt that she should have been given a specific assignment

³⁰⁶ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³⁰⁷ TNA, HW3/1, *Chapter VI War 1939-1941* (unnumbered).

³⁰⁸ TNA, HW3/1, *The First Wave in working sections* (unnumbered).

³⁰⁹ TNA, HW3/1, *Naval Section. Standing Orders. September 1937. Constitution of Section 7* (unnumbered).

³¹⁰ Wendy is likely to have been fluent in Spanish as it is known that she used to regularly visit her sister there.

³¹¹ TNA, HW3/1, *Secret. Head of GC ad CS* [review of present state of various sub-divisions of Naval Section] *part 70*, p. 2.

³¹² TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³¹³ TNA, HW8/23, *SECRET, 6.1.41, Italian Naval Section. 2. Work done during the year. A. Cyphers read, (5) Rosie.*

³¹⁴ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³¹⁵ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

but was passed over for a man whom she considered unsuitable for the role.³¹⁶ Clarke tried to rectify the situation, as he also felt that she was the best person for the job, but by this time communications had irretrievably broken down between Wendy and the department, and it became necessary for her to be moved.³¹⁷ Clarke had wanted Wendy to continue working with him on his return, but this was refused by her new superior Frank Birch.³¹⁸ It would seem from the archival records that some people considered Wendy a difficult person to work with, although it would appear Clarke was not one of them; it is possible that whilst himself being strongly opinionated, Clarke inspired loyalty in Wendy.³¹⁹

Family friend Mr Hockley was able to confirm that Wendy was intolerant and liked to get her own way.³²⁰ It is in consequence debatable whether she was overlooked for this assignment because of her gender or indeed because of her ‘attitude’ towards her peers. It is the opinion of this researcher that the latter is more likely, because, though recorded as ‘doing valuable work’, it appears that she was not promoted during her 30-year career; she appears to have remained at the same, or a very similar, grade to the one into which she was recruited when she started at GC&CS. Mr Hockley described Wendy as “... *a very friendly person* ...” but “... *she had an air of aristocracy and expected to be treated with respect* ...”³²¹ If the adage ‘respect is earned, not given’, is applied, then it could be that, in effectively ‘speaking down’ to people, Wendy alienated them; arguably this could be the reason for her lack of promotion, since such a lack of interpersonal skills would have made it very difficult for both colleagues and superiors.

³¹⁶ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³¹⁷ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³¹⁸ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³¹⁹ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²⁰ From the author’s personal collection of memories from friend Norman Hockley. (20 January 2016).

³²¹ From the author’s personal collection of memories from friend Norman Hockley. (20 January 2016).

Clarke, however, believed that Wendy should have held a position of more authority in Naval Section due to her experience, which he believes was wasted.³²² Clarke goes further to state that “... *importance of several persons in the section has been ‘faked’ to a remarkable extent.*”³²³ This is a fascinating insight into the group dynamics, as in Clarke’s own words he himself had “... *been got rid of for incompetence...*”³²⁴

Accusations continued from Wendy who listed numerous errors that she herself had identified to have been made by the department, and more specifically by Mr Bodsworth; the man who had been put in charge of her.³²⁵ This continual “*nit-picking*” led to Wendy’s transfer out of the department into another.³²⁶

CS3.8 After the War

Wendy continued to work for GC&CS, and at the end of the Second World War moved back to London to work on diplomatic traffic, probably in Berkeley Square, before moving permanently to Cheltenham; the new home of what by then had become GCHQ.³²⁷ Wendy continued to work as a cryptanalyst and was awarded an MBE in the Queen’s Honours list in June 1952; it is possible that this is when she retired, as she would have been 55 in that year.³²⁸ Mr Hockley confirmed that Wendy was not promoted during her time at GCHQ, permanently remaining at cryptanalyst level. By 1919, when GC&CS came into existence, it is unlikely that either horizontal or vertical gendering was the cause, for at this same time other women moved to more prestigious roles, and it is possible that lack of promotion was a conscious choice made by Wendy rather than the result

³²² TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²³ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²⁴ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²⁵ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²⁶ TNA, HW3/27, *The White Conspiracy* Clarke’s handwritten notes, untitled (unnumbered).

³²⁷ Ferris, *Behind the Enigma*, p. 390.

³²⁸ From the author’s personal collection of memories from friend Norman Hockley. (20 January 2016).

of prejudices beyond her control. Wendy died in a nursing home on 8 September 1993 when she was 94 years old; she did not speak about her work during her life, nor did she leave any details following her death.

CS3.9 Conclusions

Wendy was a cryptanalyst through most of her career at GC&CS and its successor GCHQ. When Wendy was initially taken on, she had secretarial responsibilities before working with Clarke who worked with her to develop cryptanalytic skills. Wendy experienced career difficulties, which might perhaps be assigned partly to her gender and partly to her attitude. As it is not possible at present to identify her background, it is difficult to identify what ‘precursors’ may have caused her general demeanour. Wendy’s intolerance towards certain people is likely to have held her back from advancing further within the organisation, but it may also be that she felt she was exactly where she wanted to be.

Wendy was a linguist who spoke French, Italian, and possibly other languages and used these combined with cryptanalytical skills to work on specific codes, such as Italian naval code Rosie. Towards the end of her career, Wendy was awarded an MBE in 1953, at that date an honour neither guaranteed nor bestowed on everyone. There are several gaps in the present research that could only be filled by a knowledgeable family member, and it is hoped that in the future it may be possible to identify Wendy’s educational profile and the job(s) she had before starting at GC&CS which may have helped her to become a cryptanalyst.

4.5 First steps towards an integrated code-breaking organisation

In the Second World War, Bletchley Park and its outstations would lie at the centre of an integrated organisation covering all aspects of code-breaking from acquisition of the encrypted messages (in World War Two, usually from Wireless Intercept or Y listening stations; the central code-breaking organisation which itself relied heavily upon machine assistance in the breaking of codes (in World

War Two, Colossus, the ‘bombes’, and at a more basic level, Hollerith sorting machines); and distribution of the decrypted material to the politicians and military commanders who would make use of it. These organisations had their counterparts in the First World war, and women played a significant role in each case.

4.5.1 Intercept.

Prior to the First World War, the Admiralty operated shore-based wireless stations to communicate with its ships, the GPO to fulfil its Post, Telephone and Telegraph charter, and Marconi Ltd for its commercial purposes. The Admiralty had begun to acquire land in anticipation of wartime needs, as in the case of Stockton on Tees³²⁹, and during the war many stations were built or adapted from existing properties to serve as wireless stations; the 2015 survey by Jane Phimester of Oxford Archaeology for English Heritage³³⁰ has identified the locations of 215 sites (87 coastal and intercept sites) in England alone, and there would have been many more in Wales, Scotland, and Ireland.

The facilities required for intercept operations required no major engineering – typically four aerial masts and two huts, one to house the equipment and operators’ positions, one as domestic accommodation for the operators where no alternatives such as existing vacant buildings or local billets were available. The Stockton station was recently listed as an historic building and was the subject of a detailed report by Alan Bettany for Tees Archaeology in 2017³³¹; this shows the level of staffing necessary for the 24-hour listening watch as varying between 21 and 24 over the period. The names listed are male, but the first historian of the site, Ernest Sockett³³² confirmed that his aunt worked there either as operator or telegraphist, and the site has a unique feature in the form

³²⁹ <https://historicengland.org.uk/listing/the-list/list-entry/1444381> [accessed 17 July 2021].

³³⁰ <https://research.historicengland.org.uk/PrintReport.aspx?i=15803> [accessed 17 July 2021].

³³¹ <https://teesarchsoc.files.wordpress.com/2018/01/wireless-station-report.pdf> [accessed 17 July 2021].

³³² <https://teesarchsoc.files.wordpress.com/2018/01/wireless-station-report.pdf> p. 36 [accessed 17 July 2021].

of a grave memorial to Emily Jenkinson³³³, wife of one of the operators, who appears also to have worked at the station in some capacity.

Support for the equipment was provided by central depots where there is evidence for WRNS directly involved in the high technology of the time, testing wireless valves (Figure 4.1 below).



Figure 4.1: *Valve Testing: The Signal School, RN Barracks, Portsmouth*© IWM (Art. IWM ART 2620)³³⁴

Records of service of WRNS³³⁵ show a small but increasing number of women being recruited, often from domestic service, into roles such as telegraphist, signaller, telephonist and even electrician; these were the precursors of the many hundreds who would staff the Y stations of World War Two.

4.5.2 Machine Operations

Gannon first identified that code-breaking machinery was employed from May 1916 to work on the 'hatted' (randomised book code) 6400 code, and that 'leave was granted to set up a special staff

³³³ <https://teesarchsoc.files.wordpress.com/2018/01/wireless-station-report.pdf> p. 25 [accessed 17 July 2021].

³³⁴ <https://ww1wrenratings.wordpress.com/> [accessed 17 July 2021].

³³⁵ <https://ww1wrenratings.wordpress.com/> [accessed 17 July 2021].

of educated women to work (the) machinery’.³³⁶ The work ‘proved to be merely a matter of tedious drudgery for one or two experts and the staff of ladies trained by Miss Robertson’³³⁷, ‘grinding groups out of the hat machine’. A ‘hat’ code is one that is “*more or less hat-shaped figure into which the text of a message in simple transposition is written by the cryptographer when the key-length is known (or guessed) and the case is not a complete rectangle... the code groups are not in numerical (or alphabetical) order; a two-part code.*”³³⁸ It is highly likely that the machine involved was a punched card sorter, used to find all the occurrences of a particular code group in all the messages which the Admiralty had received in that code, and making the ‘staff of ladies’ better able to guess at that group’s meaning and so help build the book. Not published by Gannon was the fact that the British Tabulating Machine Co (BTM), later to become the maker of the bombes for BP, had been established in Britain in 1902 as ‘The Tabulator Ltd’ with a licence to sell Hollerith machines³³⁹ – also later extensively used at BP – in Britain, becoming BTM in 1909. Powers Tabulating Machine had also established a British subsidiary, Accounting and Tabulating Machine Company of Great Britain Ltd, in 1915³⁴⁰, although the Admiralty might perhaps have been more likely to choose a supplier of longer standing. Whichever may have been chosen, the women and their machine, housed in Room 229, proved remarkably quickly to be a godsend to Room 40, such that by 1918 it had broken some 13,000 code groups and was working on German, Austrian, Turkish, Bulgarian, Spanish and other codes (including American)³⁴¹; it may reasonably be supposed that language fluency was one requirement of the ‘educated women’.

‘Miss Robertson’ is of course Margaret Ethel Robertson who is discussed in Section 4.3.3 above.

³³⁶ Gannon, *Before Bletchley Park*, p. 228

³³⁷ Gannon, *Before Bletchley Park*, p. 228

³³⁸ <https://www.codesandciphers.org.uk/documents/cryptdict/page43.htm> [accessed 17 July 2021].

³³⁹ https://www.gracesguide.co.uk/British_Tabulating_Machine_Co [accessed 17 July 2021].

³⁴⁰ https://www.gracesguide.co.uk/Powers-Samas_Accounting_Machines [accessed 17 July 2021].

³⁴¹ Gannon, *Inside Room 40*, p. 169.

4.6 Conclusions

Chapter Two identified that the limited published literature on cryptography in World War One gave little space to women's involvement. The first specific study, that of Patrick Beesly in 1982³⁴², devoted in all just one single page-length of content from its 315 pages to mentions of women's contribution, including the demeaning reference to the Admiralty's women of Room 40 as "Blinker's Beauty Chorus"³⁴³. The most recent book-length focus on the specific topic, that of Paul Gannon in 2010³⁴⁴, doubled the length of its mentions to two page-lengths from a work of 256 pages. The most recent book devoted to the general topic of military intelligence as a whole, that of Nicholas van der Bijl in 2015³⁴⁵, has no specific references, even though some 14 pages are devoted to mentions and details of the war contribution of the Army's carrier pigeons (plus one, by a flaw of indexing, to pigeonholes), and even though reference is made to female agents such as the doughty Madame Rischard. The pigeons did indeed do good and valiant service, as did Madame Rischard, but it is perhaps more positive that Dr Jim Beach of Northampton University³⁴⁶ is currently seeking to balance the record with his accounts of the HushWAACs and their achievements.

To set against this written record, the present research has clearly identified above a core totalling some 13 women who were working, not simply on typing, filing or other clerical duties, but on cryptanalysis at a high level so far as the First World War defined that term. The HushWAACs carried out that role in mixed groups with men and were accepted as equals; they also carried out that work in a war zone and earned their campaign medals, with two also earning the tribute of

³⁴² Beesley, *Room 40*.

³⁴³ Greenburg, *Alistair Denniston* p. 20.

³⁴⁴ Gannon, *Before Bletchley Park*.

³⁴⁵ Nicholas van der Bijl, *To Complete the Jigsaw: British Military Intelligence in the First World War* (Stroud: The History Press, 2015).

³⁴⁶ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 17 July 2021].

being 'Mentioned in Despatches'³⁴⁷ and entitled to wear their oak leaves, the badge marking this distinction.

The work in which women engaged also foreshadowed their roles in the end-to-end decryption organisation which Bletchley Park and its outstations would become in the Second World War. Women worked in the wireless intercept stations, and in the units where post and telegrams were sifted for coded messages of interest; women operated the machines which were used to help the break into 'hatted' codes, the earliest sign of technology in cryptanalysis, as well as using captured code-books and their language skills to read coded German messages; and in the distribution of those messages to the decision-takers and military commanders who could best use them, women were also integral to the process, from the telephonists of the GPO to the Girl Guide messengers³⁴⁸ in Whitehall.

This was so because for both the War Office and the Admiralty, the need for timely and accurate intelligence dominated World War One. Significant advancements in technology meant that messages could be sent by wireless, a medium previously little used in warfare. Wireless technology also enabled messages to be recovered from radio waves, and those with the right abilities, skills and knowledge could decrypt those messages to create valuable intelligence.

From amateurish beginnings, two distinct organisations, Army and Navy, developed with similar objectives, to gain advance knowledge of enemy actions. Initially, from 1914, it was men who were recruited to handle cryptanalysis, several of whom went on to have distinguished careers in cryptography. First in the field were the Admiralty's Room 40 cryptanalysts, who aided the War Office in setting up their own MI1(b), and so at the beginning their aims and processes were very similar. Codebreaking in the First World War was language based, and, once the volume of

³⁴⁷ <https://www.gchq.gov.uk/information/hush-waac-roll-honou> [accessed 17 July 2021].

³⁴⁸ Proctor, *Female Intelligence*, p. 58.

decryption to be carried out overwhelmed the available male resource, women began to be recruited, particularly those with language skills, as exemplified by the HushWAACs who in 1916 were recruited directly due to their language abilities.

Clearly, the need for high levels of security set strict guidelines on who could be recruited; in the case of the women who were taken on by the Admiralty's Room 40 from 1916, a family relationship with an existing senior officer, foreign language fluency, and proficient secretarial skills set an expected minimum level. Recruitment for Room 40 was initially by the adage 'it's not what you know, but who you know'; men were sought through their work colleagues, but there being at first no females in employment in this field, it was not possible for women to be similarly identified at this time. Admiral Hall laid down strict guidelines for the recruitment of women, but it is not known how long these expectations lasted³⁴⁹ - at least one of the women, Miss Musgrave Harvey, lived next door to Hall, and is likely to have been recruited by this method.

The War Office's MI1(b) appears to have operated less circumspectly. Malcolm Hay, acting for MI1(b), was happy to employ at least five women directly into the role of cryptanalyst. Of these six women, Miss Spurling appears to have applied directly; Florence Hannam and Gwendoline Watkins came through HushWAACs and would have already had code-breaking experience; Emily Anderson was trained through the same route and assuming 'Miss Marreco' to be Barbara Freire-Marreco, then her work in WTID would have provided her with the skills needed in MI1(b). It is not clear how Florence Hayllar was recruited. These six female MI1(b) cryptanalysts, and the majority of the other HushWAACs, demonstrated their skills as cryptanalysts in very practical operational arenas. The War Office could therefore be said to have made little 'vertical gendering' distinction between male and female cryptanalysts, an attitude sustained by Hay, although of course it may be that horizontal gendering took place.

³⁴⁹ James, *The Eyes of the Navy*, pp. 32-33.

In the Admiralty's Room 40, women were generally classified as carrying out 'secretarial duties' under Sybil Hambro, but a select group certainly went on to become cryptanalysts during the interwar period and into the start of the Second World War. Book-building was an especially important part of First World War cryptanalysis, and the women in Room 40 were certainly performing this role. While, therefore, they may not have been classed as cryptanalysts during World War One, it is probable that even more women than those the author has clearly identified as cryptanalysts were carrying cryptanalytic work through their book-building skills, administrative and linguistic abilities.

While the women came from a variety of backgrounds, the majority seem to have been born into families who valued education; May Jenkin's grandfather was an eminent professor and Claribel Spurling was the daughter of a clergyman and former schoolmaster. It may therefore reasonably be inferred that their families supported the women's chosen career paths including their recruitment, albeit briefly, as cryptanalysts. In considering the role of such women and their recruitment as cryptanalysts, MI1(b) may be regarded as far more advanced by comparison to Room 40, in recruiting these women directly as cryptanalysts, but as this research has shown, the women of Room 40, however, might equally be considered cryptanalysts despite their secretarial titles.

Much of the archival material analysed during this research has never been previously published, and it identifies several cases of women working in previously unrecognised roles. The archival evidence of these women working in Room 40 and for MI1(b) during World War One is central to the research, as it is no longer possible to interview such women, and the available data indicates that the women identified almost exclusively presented with linguistic skills, which matched the needs of World War One codebreaking.

It should also be noted that it was not only the women working in these organisations who struggled to be recognised; according to Clarke, "*cryptographers were regarded for a long time as mere*

crossword puzzle solvers, and not as the experienced intelligence officers which years of training and experience had made them".³⁵⁰ Likewise, as the case study of the forthright Wendy White illustrates, it cannot be said that every aspect of the treatment of these women during this period was solely a result of gendering, but it is difficult not to conclude that gender allowed such features as traits of personality to retard the career progression of a woman more than might be the case for a man.

In summary, this chapter has demonstrated that, over the course of the conflict, women became an integral part of World War One cryptanalytic processes, whether directly, as in the case of the War Office MI1(b), or, as in the case of the Admiralty's Room 40, in a variety of roles which blended administrative, linguistic-translation and cryptanalytical skills in highly personal roles which suited the strengths and personality traits of individual women. Published literature has almost entirely ignored this group of women - in the case of the HushWAACs, equal in number to the men with whom they served in the same cryptanalytical role. This may be because the published literature for many years constituted the memoirs, written by men in their retirement and many years after the events; it might also be because the records of the War Office's MI1(b) where women were more accepted were largely destroyed, leaving published literature to focus upon the more female-resistant Admiralty Room 40, which enjoyed the advantages of early enemy codebook capture and of the fame of the Zimmerman telegram decrypt. Nonetheless, the success of the women HushWAACs and the acceptance of women into cryptanalysis, however grudgingly, paved the way for women to continue working in these roles as the organisation grew over the years, despite the vertical and horizontal gendering that is apparent. The following chapter will consider how the employment of women in cryptanalysis developed in the period between the wars.

³⁵⁰ Clarke, 'Government Code and Cypher School' pp. 219-226.

Chapter Five: Interwar Years: GC&CS

“Success depends on not thinking alike”

GCHQ (2014)¹

5.1 Introduction

This chapter will first consider the developments made in mechanising cryptographic technology over the Interwar years, and the implications these carried for the skills needed by cryptanalysts. These implications would become reality only towards the end of the interwar period but would be of profound significance from the early months of the Second World War onwards, both operationally and for staff recruitment, and should be borne in mind when considering the interwar careers of cryptographers and those who supported them.

The second, and much more immediate, factor affecting cryptanalytical staff careers in the interwar period is the integration of cryptanalytical effort from both the Admiralty and the War Office within the newly created Sigint organisation of the Government Code and Cipher School (GC&CS) in 1919, and its evolution over the following 20 years between the wars. The creation of GC&CS enabled those women selected for, or recruited to, it, both to retain the roles some had held during the First World War, and to be considered for promotion in the same way as their male counterparts, albeit to a lesser degree.

The present research illustrates the different types of roles held by women, and how these very gradually began to change from the First World War's book-based and relatively simpler codes carried out by the two organisations Room 40 and MI1(b), into a single administration that dealt with a mix of simple, book-based, and, later, complex machine-based codes. Examples will be offered to show the changes in roles when the GC&CS organisation further changed as it moved

¹ <https://www.gchq.gov.uk/news-article/success-depends-great-minds-not-thinking-alike> [accessed 29 March 2017].

from the operational control of the Admiralty to that of the Foreign Office in 1922, identifying that some women developed into cryptanalysts while others remained at a secretarial level.² The case study of Miss Phoebe Senyard will exemplify how not all women who started working for GC&CS in the immediate aftermath of the First World War, and who continued with the organisation, automatically achieved the rank of cryptanalyst.

5.2 Interwar mechanisation of cryptographic systems: rotor-based cypher systems

The concept of a rotor system as the basis for a ‘complex and secure’ cypher had been considered even before the First World War; in the USA in 1912 American inventor Edward Hebern submitted his first patent on a cryptographic machine to ‘*embody the rotor principle*’.³ Several other rotor machines were developed during the early post-war period by inventors including Boris Hagelin, Hugo Alexander Koch, Arvid Damm, and Arthur Scherbius,⁴ with the best-known machine from this period being Scherbius’ ‘Enigma’ whose production began in 1923.⁵ Enigma was originally offered for sale as a machine to encrypt securely sensitive information for transmission between financial institutions and businesses.⁶

The Enigma machine, as originally intended for a commercial market,⁷ resembles a German manual typewriter with its keys set out in a QWERTZU configuration, and horizontally above the keys a series of letters in the same pattern individually illuminated from below by small electrical bulbs. Inside its casing are a dry battery and a spindle with three rotor wheels, each wheel having twenty-six electrical contacts on each of its two faces; within each wheel, each contact is wired to

² TNA, FO366/800 ‘*Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*’.

³ Kahn, *The Code-Breakers*, complex and secure p. 394, Hebern’s rotor patent p. 415.

⁴ Kahn, *The Code-Breakers*, pp. 415-427.

⁵ Kahn, *The Code-Breakers*, pp. 420-421.

⁶ Kahn, *The Code-Breakers*, p. 421.

⁷ Ronal Koorm, *Backing Bletchley: The Codebreaking Outstations from Eastcote to GCHQ* (Stroud, Amberley Publishing, 2020), p. 17

another on the other face non-sequentially, so that A on one face might be wired to T on the other, B to L, C to X and so on. The wiring is different within each of the three wheels. When a key is pressed, current flows from the battery into, say, A in the first rotor, and using the wiring example above, emerges at T; it then enters the second rotor at T, and emerges as S; enters the third rotor at S and emerges at Z. The current then enters an electrical 'reflector', a static wheel cross-wired on its face to send the current back through the three coding wheels and light up the lamp illuminating, say, W, so that A is coded as W. But the next time the key is pressed, a mechanical pawl turns the first rotor $1/26^{\text{th}}$ of a revolution, so that if the same letter A is pressed, the current flows through a different set of wires within the first code-wheel, so that this time A is coded as, say, D. The third time A is pressed, another $1/26^{\text{th}}$ of a revolution means that new wiring codes A on this occasion as K, and so on. When the first code-wheel completes a revolution, the second code-wheel moves $1/26^{\text{th}}$ of a revolution, so that the sequence of letters cannot repeat earlier than $[26 \times 26 \times 26]$ depressions of the same key. Given that each rotor has factorial 26 possibilities of wiring, and the reflector rotor factorial 13, and that further devices such as an electrical plugboard were also incorporated to make the system the more complex, the appeal to cryptographers and higher Commanders alike is easy to comprehend; but, since to attempt to decipher a message, in addition to the machine and the rotor wiring, an enemy would need to capture the machine settings for each day – the order of the rotors on the spindle, the day-key, the plugboard set-up, message-key and so on – and without these, the three rotor Enigma had a barely-conceivable 3×10^{14} possible combinations of letter substitutions⁸, so that it would seemingly be an impossible task to break such a code at all, and quite certainly not in any timely fashion. There were also many different design varieties of the basic Enigma machine, for example for the German navy⁹ and within the navy for its submarines (U-boats); for the German Secret Service (the Abwehr¹⁰), and

⁸ Ratcliff, *Delusions of Intelligence*, p. 18.

⁹ Singh, *The Code Book*, pp. 181-182.

¹⁰ Koorm, *Backing Bletchley*, p. 22.

so on, and during the Second World War, further adaptations would be made to ensure that even capture of a machine would not compromise the security of those still in operation. These variations would all create additional difficulties for British cryptanalysts, and the machine diversities would only become more sophisticated over time.

Without anticipating Chapter Six, it is sufficient to say here that British cryptanalysts were greatly assisted in their task not only by advanced mathematics, but by those age-old friends of the cryptographer, human error and predictability, which meant the Enigma encryption was considerably less random than it should have been, such that patterns emerged which could be considered ‘gifts’ to a cryptanalyst. These ‘gifts’ were known as ‘cillies’ to the incumbents of BP. Examples of cillies include the use of repeated phrases such as ‘*Heil Hitler*’ at the beginning or end of a message, or in a famous case ‘*Nothing to report*’ (*Nichts zu melden*) sent by a Western Desert observation post for days on end at the same time, from the same location.¹¹ The use of the Enigma machine variants added enough complexity for the German High Command and military to believe that it was unbreakable¹²; a number of senior officers did question its security, but Hitler was assured of its confidentiality and refused to listen.¹³

Many nations in the interwar years developed rotor-wheel based cipher machines. The Japanese navy, for example, also purchased an Enigma machine in 1934¹⁴, and the machine that they later adopted was codenamed ‘Purple’ by the Americans.¹⁵ The Italians too were using a variant of Enigma.¹⁶ The British, who had purchased two German Enigma machines at a commercial

¹¹ <https://plus.maths.org/content/exploring-enigma> [accessed 1 April 2017].

¹² Ratcliff, *Delusions of Intelligence*, pp. 4-5.

¹³ Ratcliff, *Delusions of Intelligence*, p. 155.

¹⁴ Kahn, *The Code-Breakers*, p. 6.

¹⁵ Ratcliff, *Delusions of Intelligence*, p. 11.

¹⁶ Ratcliff, *Delusions of Intelligence*, p. 128.

exhibition, developed from them their own high-grade encryption machine called Type-X, or Typex.¹⁷ The Americans produced a complex rotor machine called 'Sigaba'.¹⁸

Whilst it is important to acknowledge the complexities of Enigma and how it works to ensure understanding of the difficulties that cryptanalysts faced with machine-based codes, the mechanics of Enigma and its variants have previously been well documented and further detail is considered beyond the remit of this research.¹⁹ However, the processes involved in ensuring that the encrypted messages were received, recorded, processed, and decrypted does constitute an increasingly important part in the roles held by both men and women later in the Interwar period and the Second World War and it is that which is important to consider in relation to this thesis.

5.3 International Co-operation and Comparisons

5.3.1 Polish contributions

The first attempt to break the basic Enigma machine was mounted in 1932, by Marian Rejewski, then part of the Polish Cypher Bureau.²⁰ At that early date, and in conditions of peace, the key was changed only every few months, so that it was possible for the Poles to break Enigma by hand and keep abreast of decrypts.²¹ The 'Deuxième Bureau (French Cypher Bureau) purchased Enigma instruction books from Hans-Thilo Schmidt, a German traitor, and shared these with the Poles, which allowed Rejewski to develop an automated machine to test decryption hypotheses; this he called a '*Bomba*' which was an early precursor to the Bletchley Park Turing/Welchman 'bombe' for the same purpose. In 1939, with their nation under imminent threat of invasion, the Polish

¹⁷ Ferris, *Behind the Enigma*, p. 339.

¹⁸ Ratcliff, *Delusions of Intelligence*, p. 11.

¹⁹ Kahn, *The Code Breakers*; Welchman, *The Hut Six Story*; Singh, *The Code Book*; Ratcliffe, *Delusions of Intelligence*. and Pidgeon, *The Secret Wireless War*.

²⁰ John Gallehawk, *Some Polish Contributions in the Second World War* (Bletchley Park Trust Report No.13, May 2010), p. 4.

²¹ Gallehawk, *Some Polish Contributions*, p. 4.

Cypher Bureau met their French and British equivalents and passed over all information they had obtained thus far, both France and Britain benefitted from it.²² In the lead up to the events of 1939, the assistance that the Poles provided considerably advanced Allied cryptanalysis.²³ Specifically, the Poles provided order of the wiring from the keyboard to the first rotor wheel which had baffled senior British cryptanalyst Dillwyn Knox.²⁴

The relationships between the Poles, French, and British cryptographic organisations in the early stages of the Second World War have been well documented, including the initial distrust experienced at the onset of the meeting.²⁵ The details of these relationships are thoroughly recorded in the literature and considered to be outside the remit of this research. Here, it is important to note that the entire Enigma story up to this point, in terms of development, production, use in the field, and cryptological attack by three nations, Poland, France and Britain, has not involved a single woman. Therefore, the Enigma machine itself could arguably be described as gendered male.

5.3.2 Early American female cryptanalysts

In a 1921 magazine, Hebern advertised the first “unbreakable” machine cypher, but female cryptanalyst Miss Agnes Meyer (later Driscoll), who was working for the American Navy’s Code and Signal Section, decyphered the message.²⁶ By 1923 Agnes was working for Hebern “for

²² Gallehawk, *Some Polish Contributions*, pp. 7-8.

²³ Singh, *The Code Book*, pp. 143-160.

²⁴ Sebag-Montefiore, *Enigma*, p. 49.

²⁵ Sebag-Montefiore, *Enigma*, p. 49.

²⁶ Kahn, *The Code-Breakers*, p. 415.

*cryptologic help and liaison with the Navy.*²⁷ Former maths teacher Agnes Meyer was, however, not the first American female cryptanalyst.²⁸

Other pioneering women worked in American cryptanalysis during the First World War, including Elizebeth Smith, who went on to work with and marry renowned cryptanalyst William Friedman.²⁹ After the First World War both Elizebeth and Friedman worked for the American Army; despite carrying out seemingly similar roles on a six-month contract Elizebeth was paid half the wage compared to her husband, although arguably their performing similar roles did reinforce her status as an honorary man.³⁰ Later, in 1927, Elizebeth was approached by the American Coast Guard to assist with the breaking of prohibition rum-running messages, or as she “*wryly put it ‘If we can’t have William Friedman we will make use of his brains through his wife.’*”³¹ She achieved outstanding success and considerable national fame, albeit for being a woman as much as for being a brilliant cryptographer.

A third US female cryptanalyst is Genevieve Young Hitt, who “*Like Elizebeth Friedman... found military brainwork to be refreshingly different from the idle and decorative life she had been brought up in.*”³² Both Genevieve and Agnes, as with Elizebeth, worked with their husbands, and all three women can be afforded the title of honorary men.³³

This summary illustrates that these American women and the British women of Room 40, MI1(b) and HushWAACs were working as ‘honorary men’ during the First World War, and that their careers continued to develop in the interwar period. However, whilst the women in America have

²⁷ Kahn, *The Code-Breakers*, p. 417.

²⁸ Liza Mundy, *Code Girls. The Untold Story of the American Women Code Breaker of World War II* (New York, Hachette Books, 2017), pp. 56-83.

²⁹ Mundy, *Code Girls*, p. 65.

³⁰ Mundy, *Code Girls*, p. 69.

³¹ Mundy, *Code Girls*, p. 72.

³² Mundy, *Code Girls*, p. 68.

³³ Mundy, *Code Girls*, p. 67 and 78.

in recent years been recognised, at least to some extent, the more numerous women in Britain are generally an invisible part of cryptanalytical history; prosecution of criminals in the Prohibition Era was newsworthy, and publicity was encouraged by the US authorities, but obviously there was no comparable pressure for publicity for cryptanalysis in the UK – quite the reverse.

5.4 Creating the complete cryptanalytical system: W/T Interception, the Y-Committee and the Defence Teleprinter Network

As stated in 5.2 above, the integrated process of gaining, decrypting, and speedily and securely communicating the results of an intercepted message can be as important as the cryptanalysis itself, and women were involved at every stage.

First, to gain the raw material of cryptanalysis, intercepted wireless messages, wireless intercept stations were required. One of the main issues facing GC&CS was how physically to hear what the Germans were transmitting through the *natural atmospheric hazards*³⁴ such as atmospheric static, burst of interference whether natural (such as thunderstorms) or man-made (such as sparks from overhead tram- and trolley-bus power lines). A second problem was that highly-directional aerials, and the problem of daily variances in height of the radio-reflective layers of the geosphere, meant that signals might be well-received in Germany, but not in the UK.³⁵ A series of W/T stations were built up both across Britain and in British territories around the world to record these messages sent through wireless telegraphy sent in Morse code³⁶; the messages themselves were sent either *en clair* (plain text) or encrypted.³⁷ The Y-Service stations (the term Y derives from Wireless Interception or ‘W.I’, pronounced, and then spelled, as ‘Y’³⁸) were staffed by men and

³⁴ Calvocoressi, *Tope Secret Ultra*, p. 55.

³⁵ Calvocoressi, *Tope Secret Ultra*, p. 55.

³⁶ Calvocoressi, *Tope Secret Ultra*, p. 55.

³⁷ Calvocoressi, *Tope Secret Ultra*, p. 56.

³⁸ Pidgeon, *The Secret Wireless War*, p. xxx.

women who were employed to listen and record any messages sent over the airwaves,³⁹ collected both messages and direction-finding details⁴⁰ and were skilled at ‘tracking habits and styles’ in the frequencies and keying styles the sender was using.⁴¹ The same message was often recorded more than once, but this assisted cryptanalysts as the received messages were often corrupted due to imperfect broadcast reception, and comparison of two texts could provide a perfect message.

Initially the peacetime regime was begun with two Admiralty stations; Pembroke and Scarborough, who after the 1918 Armistice gradually decreased their naval work due to an obvious lack of ‘targets’ and increased “*their watch of the big foreign commercial stations, thereby producing foreign government cipher traffic*”.⁴² In 1921, the War Office established a station at Chatham.⁴³ The Admiralty had the loan of ten police constables and control of the police W/T network based at Denmark Hill.⁴⁴ From 1929, following concerns emerging from the Far East, the Y-Committee, as it became known, began to work closely with GC&CS in a sub-committee of the various heads of departments.⁴⁵ In 1939, the Foreign Office reached a decision to open its own Y-Station at Sandridge.⁴⁶ The system for traffic collection can be seen to be growing, but diverse, from its inception.

Once the messages were recorded the information was sent onto GC&CS by despatch riders where attempts were made to decrypt them, although some stations had cryptanalysts attached to them, especially abroad in the Second World War.⁴⁷ The Y-Service is more associated with the collection

³⁹ Calvocoressi, *Top Secret Ultra*, p. 55.

⁴⁰ Johnson, *The Evolution of British Sigint*, pp. 45-57.

⁴¹ Briggs, *Secret Days*, p. 78.

⁴² Denniston, *The Government Code and Cypher School Between the Wars*, p. 66.

⁴³ Denniston, *The Government Code and Cypher School Between the Wars*, p. 66.

⁴⁴ Denniston, *The Government Code and Cypher School Between the Wars*, pp. 66-7.

⁴⁵ Denniston, *The Government Code and Cypher School Between the Wars*, p. 67.

⁴⁶ Denniston, *The Government Code and Cypher School Between the Wars*, pp. 67-8.

⁴⁷ Calvocoressi, *Top Secret Ultra*, p. 56.

of messages during the Second World War, and so will be considered in more detail in relation to the women who worked with them (see Chapter Six).

Encrypted traffic of course also passed through the British-owned cable networks, at that date the most extensive in the world. Despite the problems that GC&CS initially faced regarding the censorship of foreign diplomatic traffic, the passing of Clause 4 of the Official Secrets Act (1920) ensured that cable companies were required to send “*receipt, originals or copies of all telegrams sent to or received from overseas*” to the Admiralty within ten days of despatch.⁴⁸ “*Sorting and copying was done by a small body of GPO lower grade staff taken over by GC&CS, the traffic being returned within 24 hours.*”⁴⁹ These female GPO staff include Phoebe Senyard (CS4 below) and will be considered in more detail in Section 5.6.3.1. In addition to the traffic sent through the GPO, it was also obtained from British territories abroad including Hong Kong, Bermuda, Malta (“*through which Japanese traffic to France and Germany passed, as well as Italian telegrams*”) and various private lines which were hired by foreign embassies during conferences.⁵⁰

By 1935, GC&CS arranged for the cable traffic to be obtained even more quickly - virtually instantly from the GPO’s Central Telegraph Office and from British-owned Cable and Wireless, and with only 24 and 48 hours delay for foreign companies.⁵¹ It is important to consider the quantity of traffic and messages because it shows, first, that GC&CS were aware of the importance of cable traffic and knew that the amounts would only increase over time, and also because it had such an impact on the women who would be employed in breaking those codes.

The Defence Teleprinter Network, which was approved in September 1938, was stimulated by the need to transfer massive amounts of data extremely quickly around the country as a consequence

⁴⁸ Johnson, *The Evolution of British Sigint*, p. 45.

⁴⁹ Johnson, *The Evolution of British Sigint*, p. 45.

⁵⁰ Johnson, *The Evolution of British Sigint*, p. 45.

⁵¹ Johnson, *The Evolution of British Sigint*, p. 45.

of the establishment of the Chain Home British radar air defence system. The need paralleled the need for data to be sent quickly and accurately between RAF commanders and airfields, and between commanders and their dockyards and troop barracks in the Army and Navy; and had obvious relevance to the need to communicate decryptions rapidly to the War Cabinet and senior commanders, and, later, from Y stations to BP. The need for teleprinter operators would rise rapidly during World War Two as more and more data was transferred.⁵²

5.5 The Creation of GC&CS

At the end of the First World War both MI1(b) and Room 40 were redundant as wartime Sigint organisations. The quantity of traffic was greatly reduced in peacetime compared to the First World War and so it was unnecessary for either organisation to maintain the same number of staff as they had between 1914 and 1918.⁵³ As both MI1(b) and Room 40 had similar responsibilities, discussions took place on the best methods to combine them into a single entity. Principal among the discussions were the decisions on who would lead the new organisation and where it would be located; the War Office was anxious for Hay to secure the position, while the Admiralty wanted Denniston. Denniston was ultimately chosen, possibly due to answering in the interview that he would be happy to work under Hay; a sentiment that Hay was unwilling to reciprocate.⁵⁴ Initially GC&CS was a civil administration established under the Admiralty, perhaps also an influencing factor in the choice of Denniston as head.⁵⁵ This decision is relevant because, bearing in mind the differences in attitude to women as cryptanalysts described in Chapter Four, it is possible that it impacted on the opportunities that were available to women as the organisation developed.

⁵² *Official History, RAF Signals Vol 2 Telecommunications* (London: Air Ministry, 1958), pp. 29-31.

⁵³ Johnson, *The Evolution of British Sigint*, p. 43.

⁵⁴ Wyllie and McKinley, *Code Breakers*, p. 290.

⁵⁵ Ferris, *Behind the Enigma*, p. 67.

In 1919 GC&CS was created⁵⁶, its original function being “*to advise as to the security of codes and cyphers used by all Government departments and to assist in their provision*”⁵⁷. It began life with 25 ‘established’ (pensionable) officers (one head, six senior assistants, and 18 junior assistants) and an ‘unestablished’ (non-pensionable) clerical staff of 28 (six typists, 12 clerks for code construction, and ten traffic sorters and slipreaders).⁵⁸ Traffic sorters were the individuals who organised the messages into appropriate divisions; slipreaders read the traffic coming through the mechanical systems. The non-pensionable post holders were more likely to be women, the rationale being that women were expected to live at home, therefore worked for ‘pin-money’, and did not have any dependants.⁵⁹ In 1925 Denniston also details how the pay of the senior staff was based on the Administrative class, the elite of the British civil service; senior assistants were comparable to principals, and junior assistants were the equivalent to assistant principals.⁶⁰

GC&CS moved from the Old Admiralty Building to Watergate House, Adelphi, and then on to Queen’s Gate in 1921.⁶¹ In 1925 it moved again, to the third and fourth floor of the Broadway Buildings opposite St James Park underground station.⁶²

Many of the women that had been working in both organisations left at the end of the First World War, some by their own volition. Some were to return to family life and others who married were expected to leave their employment as a result of the marriage bar. The marriage bar which prohibited married women from joining the civil service and required women civil servants to resign when they became married (unless granted a waiver), was used to stop married women working in the organisation at this time, until they were needed again in the lead up to the Second

⁵⁶ Ferris, *Behind the Enigma*, p. 66 and Aldrich, *GCHQ*, p. xvii.

⁵⁷ Johnson, *The Evolution of British Sigint*, p. 44.

⁵⁸ Denniston, *The Government Code and Cypher School Between the Wars*, p. 50.

⁵⁹ Zimmeck, *Strategies and Stratagems*, p. 904.

⁶⁰ Denniston, *Thirty Secret Years*, p. 95.

⁶¹ Johnson, *The Evolution of British Sigint*, p. 44.

⁶² Johnson, *The Evolution of British Sigint*, p. 44.

World War. The bar was abolished in the Home Civil Service in October 1946, although the Foreign Office did not fully remove the bar until the 1970s⁶³, and the GPO restored it in 1919 following the Great War.⁶⁴ The bar is important because it is the clearest possible indication of the barriers for denying women work, although it is important to add that it was connected to Britain's socio-economic factors and was sometimes relaxed accordingly (for instance, during the recession in the 1920s, and the Second World War).

5.6 The Role of Women in GC&CS following the move to the Foreign Office

In 1922 GC&CS moved to the control of the Foreign Office, because they were the predominant user of diplomatic traffic, the bulk of GC&CS work, and was therefore a more appropriate 'parent company' than the Admiralty.⁶⁵ A list was drawn up which included the '*Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*'⁶⁶ This list includes 52 women holding a variety of roles including decoder, clerks, censor's assistants, temporary assistants, and shorthand typists⁶⁷, allowing the characteristics of the group to be examined according to several different factors including age, marital status, length of service, changes in role, length of service, and pay-grades. However, in addition to these women several others have been identified through other means and they have been added will be considered in turn. These women can be classified under the grade 'Junior Assistant' and have a permanent and more senior role many of the temporary women which make up TNA, FO366/800 list. The list from TNA, FO366/800 lists a total of 52 women. An additional five women have been identified

⁶³ Helen McCarthy, *Women of the World; The Rose of the Female Diplomat* (London: Bloomsbury, 2014), p. 284.

⁶⁴ Campbell-Smith *Masters of the Post*.

⁶⁵ TNA, HW3/1, *GC&CS Its foundation and development with special reference to its Naval side. Chapter I*. Dated 7.1.45 (unnumbered).

⁶⁶ TNA, FO366/800 '*Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*'

⁶⁷ TNA, FO366/800 '*Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*'

as Junior Assistants which sit outside of the FO366/800 list of women transfers. It could perhaps be supposed that the women were already part of the organisation, and it was not necessary to officially 'transfer'. These women have already been discussed: Emily Anderson (CS2), Claribel Spurling (Chapter Four), Helen and Margaret Young (Chapter Four and Seven) and Miss JF Carleton (Chapter Four). Whilst they have been added to the list, much of their information is unavailable. It is also a strong possibility that these women were not the only Junior Assistants, indeed some female JA's from an earlier point have been identified but had already left by 1922. What is known is that all of the JAs were single and have been therefore, added to Figure 5.3.

5.6.1 Defining factors

5.6.1.1 Age

Many of the women have their dates of birth recorded, from which it can be shown that the average age of the women who worked in GC&CS at this time was 37. There are several possible reasons for the average age being higher than perhaps expected. These could include GC&CS wanting to employ only women with experience that could have begun in 1916, or even that these were the only women available to do the work required. It is also interesting to note that one of the married women was a Mrs Buncher, aged 61 in 1922⁶⁸, and so beyond retirement age. This is highly unusual for the time, and the reason is not clear, although it could simply be that she was a widow, needed the income, and was given special permission. Moreover, the fact that age does not appear to be an indication of seniority will be considered later in this chapter. The following graph (figure 5.1) shows all the women working at CG&CS in 1922 by age; the average age is represented by the horizontal line through the graph. The average result is slightly higher due to a minority of women who are considerably older than their colleagues; although many single

⁶⁸ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

women were quite young, a small number of older, mainly married, women increased the overall average.

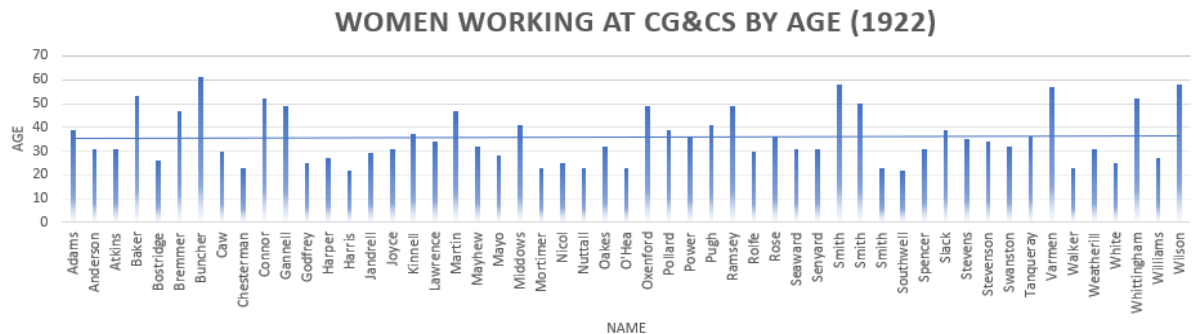


Figure 5.1 Women working at GC&CS in 1922 by age⁶⁹

5.6.1.2 Married Women in GC&CS (1922)

Of the women, 46 were single and 11 married. At a time when it was unusual for married women to be working due to the marriage bar, there are several possible explanations. It could be that the husbands are unable to work, although, if men had been injured in World War One, they might have been issued a pension that could help to support the family. Alternatively, these women could be war widows, who again might have been in receipt of a pension. It is also possible that at least a few of the husbands were both out of work and not in receipt of a pension, but again this is unlikely for all 11 husbands. It may well be, however, that either GC&CS wanted to keep the women workers, or the women themselves wanted to continue working.

As part of this research, these 11 married women working at GC&CS in 1922 have been tabulated below (Figure 5.2) cross referencing age, start date, job title and grade. The table shows the changes in terminology from the women's Room 40, MI1(b), GC&CS and GPO job titles to the

⁶⁹ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

new Foreign Office grades. However, some of the new grades have not been given so it can be presumed that the job title did not change, although the role responsibilities may have done.

Married name	Start date	Job title pre-transfer	Grade on transferring to Foreign Office, 1922	Age
A. Baker	03.01.1920	Decoder	Temporary Woman Clerk II	53
K.I. Bremmer	07.02.1920	Temporary Assistant (Telegraphist)	Temporary Woman Clerk II	47
E.E. Buncher	06.04.1920	Temporary Woman Clerk II	(no detail given)	61
D. Caw	14.10.1918	Temporary Woman Clerk III	(no detail given)	30
A.O. Middows	03.01.1920	Temporary Assistant (Telegraphist)	(no detail given)	41
E.M. Oakes	15.01.1915	Temporary Woman Clerk	(no detail given)	32
E.J. Power	25.07.1917	Temporary Woman Clerk	(no detail given)	36
M.P. Rolfe	08.12.1916	Temporary Woman Clerk	(no detail given)	30
L.P. Swanston	23.11.1916	Temporary Woman Clerk	Temporary Woman Clerk I	32
M.M. Walker	07.08.1916	Temporary Woman Clerk	(no detail given)	23
J. Whittingham	03.01.1920	Decoder	(no detail given)	52

Figure 5.2 Job title and rank by married woman⁷⁰

Nearly half of the married women listed in figure 5.2 are described as carrying out the role of Temporary Woman clerk following the 1922 change. As has been seen, on its creation GC&CS had 28 non-pensionable roles for six typists, 12 clerks for code construction, and ten traffic sorters and slipreaders, all of whom are likely to have been women.⁷¹ Although women had increased in

⁷⁰ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

⁷¹ Denniston, *The Government Code and Cypher School Between the Wars*, p. 50.

number to five by 1922 (not including JAs), it is likely that their roles would retain some similarities to earlier manifestations. By employing women in temporary roles, it was possible for GC&CS to gain the benefits of a skilled workforce (albeit female) with the ability to fire them without question or repercussions, and without having to take the cost and responsibility of paying pensions. As Zimmeck points out, it also meant that women were unable to progress to a higher position because they had neither 'earned' nor 'deserved' it.⁷² Opportunities for women to progress did exist, up to a point, but this usually was to manage other women (see Section 4.3.3, Lady Sybil Hambro, and CS3; Wendy White).

In Figure 5.2 the job title on start identifies two decoders, Baker and Whittingham, but following the transfer to the Foreign Office only Baker has a grade change, to Temporary Woman Clerk II. The significance of the blanks where no detail is given is not clear - it is possible that the roles were continued under their earlier guise, or that these women left shortly afterwards, or that they carried on in some unrecorded role.

The remaining women were graded Temporary Woman Clerks or Temporary Assistant (Telegraphists) on their initial entry, but while this shows that the women continued to work for GC&CS, it does not provide any further detail on what their future role became; as with Mrs Whittingham, it could be postulated that this is an indication that their role did not change. There does not seem to be any correlation between marriage, age, experience, and job role, and there is also no indication that the roles are either full time or part time. The longest serving member of female married staff was Mrs E.M. Oakes, who had worked for GC&CS and presumably one of its earlier incarnations or a different governmental department, for seven years.⁷³ As her maiden name is unknown, it is not possible to identify on the earlier lists whether she was working for

⁷² Zimmeck, *Strategies and Stratagems*, p. 908.

⁷³ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

either Room 40 or MI1(b), although there are two possible candidates, Miss E.M. Reed and Miss E.M. Smith⁷⁴. However, since both women have a start date of 1918 and an end date of 1919 this is possible but cannot be confirmed, as it may be that Mrs Oakes, when single, worked in a different department and moved over at some point.

5.6.1.3 Single Women in GC&CS (1922)

The details of the single women can be analysed in a similar way to their married counterparts.

The details of the 41 women are tabulated below:

Name	Start date	Job title pre-transfer	Rank change in transferring to Foreign Office 1922	Age
A Adams	21.05.1919	Temporary Woman Clerk III	Temporary Woman Clerk II	39
Emily Anderson ⁷⁵	1919	Junior Assistant		31
MA Atkins	13.01.1916	Temporary Woman Clerk III	(no detail given)	31
W.M. Bostridge	17.04.1916	Temporary Woman Clerk	Temporary Woman Clerk II	26
JF Carleton ⁷⁶		Junior Assistant		
B Chesterman	30.07.1917	Temporary Woman Clerk III	(no detail given)	23

⁷⁴ <http://www.paulgannonbooks.co.uk/styled-3/files/personnel-list-room-40.pdf> [accessed 31 March 2017].

⁷⁵ Emily Anderson has been added by the author from details provided by GCHQ: <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019] which states that she started in 1919 as a Junior Assistant at the formation of GC&CS.

⁷⁶ TNA, HW3/35, *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School*.

M.A Connor	06.04.1920	Temporary Woman Clerk II	(no detail given)	52
G.C Gannell	03.01.1920	Temporary Assistant (Telegraphist)	Temporary Woman Clerk II	49
G.C. Godfrey	15.10.1917	Temporary Woman Clerk	Temporary Woman Clerk II	25
C. Harper	06.04.1920	Temporary Woman Clerk II	(no detail given)	27
M.M. Harris	30.07.1917	Temporary Woman Clerk	Temporary Woman Clerk III	22
G.C Jandrell	01.02.1920	Shorthand Typist Grade 1	(no detail given)	29
J.M Joyce	06.08.1918	Temporary Woman Clerk III	(no detail given)	31
E.M. Kinnell	15.07.1918	Temporary Woman Clerk III	Temporary Woman Clerk II	37
A Lawrence	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	34
Helen Lunn ⁷⁷	1919	Junior Assistant	Junior Assistant	
Margaret Lunn ⁷⁸	1921	Junior Assistant ⁷⁹	Junior Assistant	
K.A Martin	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	47

⁷⁷ Ferris, *Behind the Enigma*, pp. 88-89.

⁷⁸ Ferris, *Behind the Enigma*, p. 89.

⁷⁹ As Margaret is likely to be one of the 'girls' listed by Ferris with her sister working on Russian codes with Fetterlein in 1925, it is likely that she was a JA, but it is not known exactly when she was promoted following her start date of 1921. Ferris, *Behind the Enigma*, p. 89.

E.J Mayhew	03.12.1917	Temporary Shorthand Typist	Temporary Woman Clerk II	32
O Mayo	01.02.1920	Shorthand Typist Grade 1	(no detail given)	28
E.M.N Mortimer	26.07.1917	Temporary Woman Clerk	Temporary Woman Clerk III	23
O.M.D Nicol	02.09.1918	Temporary Woman Clerk III	(no detail given)	25
Hebe Maud Nuttall	26.07.1917	Temporary Woman Clerk	Temporary Woman Clerk III	23
K O'Hea	06.08.1918	Temporary Woman Clerk III	(no detail given)	23
M Oxenford	29.05.1917	Temporary Woman Clerk	Temporary Woman Clerk II	49
Caroline Pollard	06.04.1920	Temporary Woman Clerk II	(no detail given)	39
Sybil .M Pugh	19.11.1917	Temporary Woman Clerk	Temporary Woman Clerk I	41
J.S Ramsey	25.10.1917	Temporary Woman Clerk	Temporary Woman Clerk II	49
E.V Rose	18.03.1918	Temporary Woman Clerk	Temporary Woman Clerk III	36
E.N Seaward	29.05.1917	Temporary Woman Clerk	Temporary Woman Clerk II	31
Phoebe Senyard	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	31
J.M Smith	03.07.1917	Temporary Woman Clerk	Temporary Woman Clerk III	58

K Smith	03.07.1917	Temporary Woman Clerk III	Temporary Woman Clerk III	50
W.A Smith	20.05.1919	Temporary Woman Clerk III	Temporary Woman Clerk II	23
M.A. Southwell	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	22
M.G Spencer	25.07.1917	Temporary Woman Clerk	Temporary Woman Clerk III	31
Claribel Spurling ⁸⁰		Junior Assistant		
S.V Slack	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	39
A Stevens	03.01.1920	Temporary Assistant (Telegraphist)	Temporary Woman Clerk II	35
C.A. Stevenson	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	34
GEC Tanqueray	27.05.1918	Temporary Woman Clerk	Temporary Woman Clerk III	36
BE Varmen	03.01.1920	Temporary Assistant (Telegraphist)	Temporary Woman Clerk II	57
F Weatherill	03.01.1920	Temporary Assistant (Telegraphist)	Temporary Woman Clerk II	31
Winifred White	01.02.1920	Shorthand Typist Grade 1 - Supervisor	(no detail given)	25
JM Williams	19.05.1919	Temporary Woman Clerk III	(no detail given)	27

⁸⁰ TNA, HW3/35, *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School.*

KM Wilson	03.01.1920	Censor's Assistant	Temporary Woman Clerk II	58
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Figure 5.3 Job title and rank by single woman⁸¹

The details of the single women constitute an interesting set of data. Only 18 of the women started after the end of the First World War, the remaining 24 having started between 1916 and 1918, a result which closely mirrors the married women. Again, whilst the average age closely reflects the married women list, there are obviously considerably more women in the 20s to 30s age brackets; 33 of the 42 women are aged in their 20s and 30s. This would reflect the marriageable age for younger women who wished to have a family; those women who are older could arguably be considered, in modern-day terms, ‘career women’, whether through choice or circumstance is a different matter

It is difficult to provide exact detail from job titles or grades on what the jobs entailed. Some, such as ‘Censor’s Assistant’, are easier to classify as they are likely to involve the identification of sensitive information. The term ‘clerks’ is likely to cover a variety of administrative tasks, which are likely to be divided by importance depending on grade.

Censorship was an important aspect for the government from a security point of view at this time. The women censors in the GPO often caught spies through the censorship of correspondence.⁸² It would have been necessary for these women to have language skills, although it could be supposed that some languages were more common than others (European correspondence for example). The training that these women would have been given would be ideal to move from the GPO to GC&CS as the skills would have been comparable and transferable – more details on the transfer of women from the GPO to GC&CS can be seen in Section 5.6.3.1.

⁸¹ TNA FO366/800, handwritten notes, untitled, 19 Dec 1922, p. 157, and other pages unnumbered. (Additional names have been added where known.)

⁸² Proctor, *Female Intelligence*, p. 45.

The average age of the single women is 35, which appears not far distant from the average age of 37 on both the 1922 list and the earlier amalgamated list.⁸³ The youngest woman was Miss M.M. Harris aged 21, originally employed at the age of 17 in what is likely to have been her first job after leaving school or college.⁸⁴ She is listed as a Temporary Woman Clerk when she started on 30 July 1917, but is described as a Temporary Woman Clerk Grade III on the 1922 list.⁸⁵ The change could indicate that previous grades were brought in line with other civil service posts when GC&CS moved to the Foreign Office, or it may signify a promotion.

5.6.3 *Length of Service*

Perhaps the most significant finding is that all these women have worked for GC&CS for at least two years. This would indicate that all the women had relevant experience and so were recruited or retained to allow the smooth running of the department over this period of change. It is interesting to observe that, of these women, six are over 40, five are between 30 and 40, and perhaps the most surprising is Mrs Walker who was 23. According to her start date, Mrs Walker began working for what was likely to have been either Room 40 or MI1(b) aged 17, which means she is likely to be on an earlier list. Again, however, it is impossible to verify which organisation because her maiden name is currently unknown; there are various possibilities, as several of the women either have their initials missing, or include an initial M. It would seem, if so, that Mrs Walker married during her service and returned, which is highly unusual for the period due to the

⁸³ The list was amalgamated by the author from the following sources: TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*, ADM223/769 Address Book. (unnumbered), and HW3/6 40OB, *List of Members made in 1918*. (unnumbered).

⁸⁴ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*.

⁸⁵ TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*.

marriage bar. This is perhaps an indication of GC&CS's unusual position and practices and could be said to be ahead of its time.

The BP RoH shows that a small number of the women on the 1922 list appear to have continued working for GC&CS when it moved to Bletchley. The two married women concerned were Mrs M.P. Rolfe and Mrs L.P. Swanston, who are both described as a Foreign Office Civilians.⁸⁶ This indicates that Mrs Rolfe, by grade TJAO(E), joined as a “Civil Service graduate or equivalent grade”⁸⁷; she worked in Mansfield College, Oxford in the Code and Cypher Production Unit.⁸⁸ Mrs Swanston, who is ranked as a Temporary Assistant (TA), likewise worked at Mansfield College.⁸⁹

Many of the names listed are common British surnames, and so it is difficult to identify any further details of each woman. Some continued with GC&CS and moved with the organisation to BP, and in those cases, it is possible to identify more; for example, Wendy White (CS3) and Phoebe Senyard (CS4).

5.6.3.1 GPO transfer of women

It is important to acknowledge the GPO's role in providing staff. Several GPO women were trained as decoders, telegraphists, and copyists and, although their exact start dates are unknown, some were transferred to GC&CS to work on “*sorted cable traffic*”.⁹⁰ This has led to some confusing terminology issues. Decoding and censorship was carried out by women in the GPO, but the exact meanings have been lost over time. However, ‘censor's assistant’ for example would seem to be comparable in status to a decoder, or a telegraphist role (as can be seen in Figures 5.2 and

⁸⁶ <https://bletchleypark.org.uk/roll-of-honour/7856> and <https://bletchleypark.org.uk/roll-of-honour/8844> [accessed 20 July 2019].

⁸⁷ <https://bletchleypark.org.uk/roll-of-honour/7856> [accessed 20 July 2019].

⁸⁸ <https://bletchleypark.org.uk/roll-of-honour/7856> [accessed 20 July 2019].

⁸⁹ <https://bletchleypark.org.uk/roll-of-honour/8844> [accessed 20 July 2019].

⁹⁰ Ferris, *Behind the Enigma*, p. 172.

5.3); the women in these roles were moved to Temporary Woman Clerk II. Equally there are temporary women clerks whose rank was changed to a mixture of Temporary Woman Clerk I and II. It may be that their moves created an opportunity for the women to be ranked according to ability.

5.6.4 Changes in role in the 1922 transfer to the Foreign Office

As it would be most logical to assume that any staff who transferred would either stay in similar roles or move into ones which increased in importance over time, it appears that those in the role of 'decoder' are at the lower end of the scale. The 52 women included in figures 5.2 and 5.3 can be identified by pre-transfer job title and this is tabulated in figure 5.4 below.

Job Title	Number listed by GC&CS pre-move to the Foreign Office	Number listed after the move to the Foreign Office in 1922⁹¹
Temporary Women Clerk III	10	15
Temporary Women Clerk II	4	26
Temporary Women Clerk I	0	2
Temporary Assistant (Telegraphist)	6	1
Censor's Assistant	7	0
Decoder	2	1
Temporary Woman Clerk	19	4
Shorthand Typist Grade I	2	1
Shorthand Typist Grade I Supervisor	1	1
Temporary Shorthand Typist	1	1

Figure 5.4 Numbers of women by job role⁹²

⁹¹ Author has assumed that the women with a blank in the change section have retained their former employment level.

⁹² TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

The roles would indicate that the grading system goes up in importance; the lowest grade that a woman was likely to be assigned was a Temporary Women Grade, or Temporary Woman Clerk Grade III, and this was likely to be based on experience. The figure below is a depiction of how the posts were regraded following the move of GC&CS to under the Foreign Office.

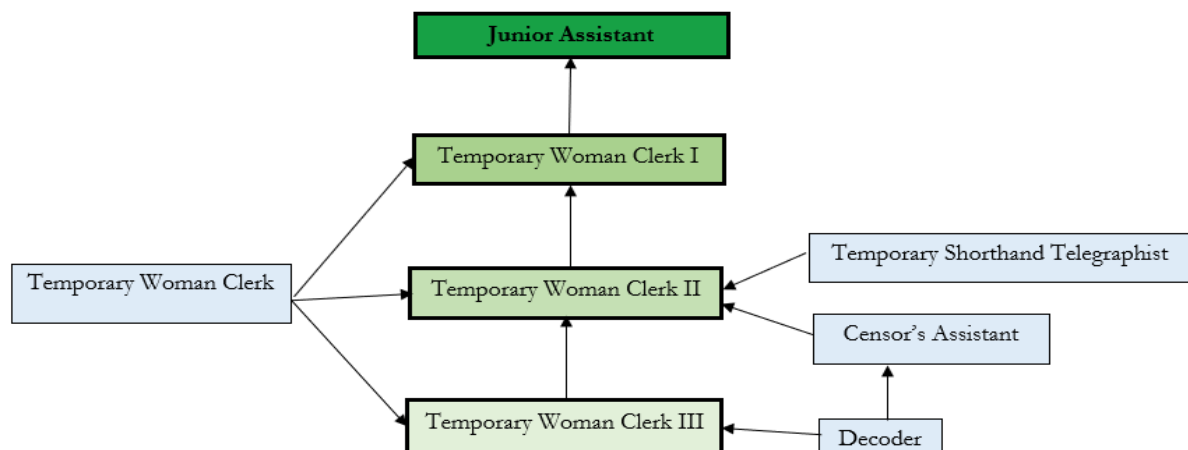


Figure 5.5 Illustration depicting the roles awarded to women from their first job in GC&CS's predecessors (in blue) to the change in role in the move to the Foreign Office in 1922 (in green).⁹³

Age cannot be accepted as an indicator of seniority and grade. Wendy White was the Shorthand Typist Grade I Supervisor at age 25, arguably a higher role than Mrs Bremmer who was a Temporary Women Clerk II aged 61; Wendy (see CS3), ultimately achieved the role of cryptanalyst. Emily Anderson was the singularly identified JA, arguably the highest grade on this list and age 31 at the time (see CS2) It would seem that Emily, like Wendy White, could be considered quite formidable. These two women; Emily and Wendy, could both be said to have substantial experience with the organisation, and this is why they have a slightly higher grade than the others.

⁹³ Taken from details from TNA, FO366/800 *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922* and <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

Two other women who should be considered here are Mrs Oakes and Miss Sybil M Pugh; both are mentioned on the FO366/800 list as Temporary Women Clerks. On the 1922 list of re-gradings following the move to the Foreign Office, both are moved to be Temporary Women Clerks Grade I, which would seem to be an extreme move from one of the lowest grades to one of the highest. Sybil Pugh had previously worked for Room 40, which may well indicate that Sybil had a particular set of skills and technical ability demonstrating her worth to her employers, and which contributed to her being promoted above her contemporaries.

The position of decoder also presents an interesting conundrum. The two decoders are namely Mrs A. Baker aged 53, and Mrs J. Whittingham aged 52, and as neither appears on the catering list from Room 40 or MI1(b), they are likely to have come to the post from other backgrounds, or perhaps a different department; or it may be that they could have married in the intervening years. Furthermore, neither appear on the BP RoH, though this would most probably be due to their age since they would have been in their 70s by the outbreak of the Second World War. It is possible that 'decoder' is a specialised role, a historic post or even a title from an outdated grading system. Both women held the post for only three months, for both started on 3 January 1920, and both finished on 31 March 1920, leading to the interesting question of why they were only there for such a short time. No answer has been found in the present research; it might simply be that they had a served probationary period which they did not pass, they did not like the work, or were made redundant. The role of decoder will be further considered later in this chapter and in more detail in Chapter Seven.

5.6.5 Women's pay grades⁹⁴

Wendy White appears to hold the highest grade in the section before the move to the Foreign Office as she is described as a “*Shorthand Typist Grade 1 – Supervisor*”, which would match her role as secretary to Clarke.⁹⁵ It is not generally possible to compare women's roles with their male counterparts in terms of pay rates, as the weekly pay women received appears to have been based on several factors including (but not necessarily restricted to) age, seniority, and length of service, with an additional bonus for language ability, and a bonus for those in a supervisor's role. Wendy White, for example, received 64s 6d plus 5s a week supervisor allowance.⁹⁶

Six men also appear on the same weekly paid list; five are classed as telegraphists, and all five men received 60s per week. However, five women described as Temporary Assistants (Telegraphists) were paid 64s 6d. At this time, it was thought unnecessary for a woman to have a pension as it was expected that her husband would provide for her. As the women were paid more it might be that they had a language allowance, or as the women were temporary they were not allowed access to a pension which the men were.

The sixth man from the list, Mr Gambrill, is listed as a Temporary Clerk, Grade 1 on a pay of 90s per week, which is approximately £131 per week in today's money.⁹⁷ The female equivalent would appear to be Temporary Woman Clerk Grade 1 and there are four women in this category;

- *Miss M. Oxenford who was paid 66s per week*
- *Mrs L.P. Swanston who was paid 66s.6d per week*

⁹⁴ As nothing is known about Emily Anderson's pay grades, it is impossible to add her details into this comparison and it has therefore not been included, but it is highly likely that she was paid less than her male colleagues.

⁹⁵ TNA, FO366/800, 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

⁹⁶ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

⁹⁷ <https://www.nationalarchives.gov.uk/currency-converter/> [accessed 5 August 2020].

- Mrs E.M. Oakes who was paid 68s.6d per week
- Miss S.M. Pugh who was paid 68s.6d per week (Sybil Pugh also received 7s a week language allowance).⁹⁸

Another equivalent female grade might be Shorthand-typist Grade 1; a post held by Miss Mayo, Miss Jandrell and Miss White, all of whom were paid at least 64s per week. The discrepancies in pay could be due to several reasons as previously discussed; however, it is also possible that it is simply down to the male / female pay gap.

By 1938 Miss Bishop and Miss White are the only women described as permanent civil servants.⁹⁹ This is interesting because it was cheaper to keep women, particularly single women, at the bottom of the career ladder in temporary posts, so that pensions did not have to be paid.¹⁰⁰ These facts point to some of the women obtaining promotion within the department over time, as might be expected. It is important to emphasise that long service did not automatically mean that a junior assistant could become a senior assistant.¹⁰¹ It is possible to hypothesise that the senior roles were simply not available at this time. This example can be illustrated by the Air Ministry Air Estimates, published each year, which provided guidelines for the monetary allowance made for each post within a department.¹⁰²

5.7 Women as cryptographers

Some of the women are described as working in specific roles which could be an indication of the duties that they carried out. Indeed, by 1938 Miss Dale (see Section 6.4.3) and Miss Sinclair are

⁹⁸ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. Sybil Pugh's basic pay would be approximately the equivalent of just under £100pw today, plus, an additional £10 per week language allowance: <https://www.nationalarchives.gov.uk/currency-converter/> [accessed 5 August 2020].

⁹⁹ TNA, HW3/1, Chapter VI, War 1939-1941, p. 1.

¹⁰⁰ Zimmeck *Strategies and Stratagems*, p. 904

¹⁰¹ TNA, HW3/41, Letter from the Admiralty, dated 29th March, 1921, to Grieve, *Code and Cypher School*. (unnumbered).

¹⁰² Air Ministry Estimates for the year 1932 (London: HMSO, 1932)

described as working in the cryptographic section of Naval.¹⁰³ This is likely to be an indication that they could be classed at a cryptanalytic level.

A Spanish sub-section was created following the outbreak of the Spanish Civil War; July 1936 to March 1939, specifically because Spanish naval messages ‘became of interest’. Initially there were four members of staff; Mr Kendrick, Miss Sinclair, Miss Milne, and Miss Harris.¹⁰⁴ After the end of the Civil War in August 1939, when the Spanish decrypts were of less importance, the sub-section consisted of Commander Westall R.N. (Royal Navy) for intelligence purposes, and Miss Milne as ‘sole cryptographer’.¹⁰⁵

Of the three women noted above, Miss Milne is likely to be Janet Marjorie Milne who continued to work for GC&CS for the Second World War. In the early part of 1940, the Spanish commenced using an Enigma machine for messages between Madrid and the naval attaches at Berlin and Rome.¹⁰⁶ This necessitated the services of Mr Bodsworth being directed to its solution, which was duly achieved, and this in turn resulted in an increase in the numbers staff within the Spanish sections in June 1941.¹⁰⁷ As she is listed as sole cryptographer Miss Milne was clearly in a cryptographic role, it also indicates that when there was a substantial increase in traffic this necessitated the introduction of a new head; Commander Westall.¹⁰⁸ It is not clear why Miss Milne was **not** offered the new head-ship role at this time (Mr. Wellington took over in 1942),¹⁰⁹ it would appear from the RoH that she did become *Head of Spanish Section* at a specific point in the future

¹⁰³ TNA, HW3/1, Chapter VI, War 1939-1941, p. 6.

¹⁰⁴ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰⁵ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰⁶ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰⁷ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰⁸ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰⁹ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

because she is listed as such but it is not clear when this change happened.¹¹⁰ The department however remained small, varying between four and six staff throughout the war.¹¹¹

The role that Miss Sinclair played is not clear, but it seems likely that this is Miss Evelyn Beatrice Sinclair who is listed on the BP RoH, where she is described as a Foreign Office civilian whose grade was TJA0. According the RoH she was at “*Bletchley Park from 1939*”, located in the “*Mansion*”, and worked on “*Naval Section, Italian and Spanish*”. She is also there listed as working in “*Wavendon House, probably Commercial Section*” and “*Ryder Street*” (London) which was the location of the diplomatic section.¹¹² Both the diplomatic and commercial sections were located in Elmer’s School (an appropriated former boy’s school located next to BP) until 1942 when they moved back to London’s Ryder Street.¹¹³ Miss Sinclair was the sister of Admiral Sir Hugh Sinclair, former head of SIS from 1923 to November 1939.¹¹⁴

At this time little more is known about Miss Harris but it is likely that she is Mabel Mary, who is listed as working for GC&CS as a temporary woman clerk, having started in 1917 (see figure 6.2).¹¹⁵ All three women were identified as working at BP from 1939, but in different jobs, and while other sources provide a few clues, there is no information about what these women were doing.

Russia’s revolutionary government had no naval codes in 1919 and did not risk the Czarist ones they had inherited but they were using a ‘simple transposition of plain Russian’ which was successfully read by “*Fetterlein.... and two very competent girls, refugees from Russia, with a perfect knowledge of the language, who subsequently became permanent members of the staff*”.¹¹⁶ These two ‘competent’ girls are

¹¹⁰ <https://bletchleypark.org.uk/roll-of-honour/6322> [accessed 18 May 2021].

¹¹¹ TNA, HW3/22, *Spanish Sub-Section*, p. 2.

¹¹² <https://bletchleypark.org.uk/roll-of-honour/8331> [accessed 2 November 2017].

¹¹³ Smith, *Station X*, p. 4.

¹¹⁴ <https://bletchleypark.org.uk/roll-of-honour/8331> [accessed 25 April 2021].

¹¹⁵ TNA, FO366/800 - ‘*Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*’

¹¹⁶ GBR/0014/DENN 1/4.

likely to be expatriate sisters Helen and Margaret Lunn, who were born in Russia.¹¹⁷ Helen started working for Room 40 shortly before it disbanded, and Margaret worked for MI6's Helsinki station before being dismissed 'under suspicion of espionage'.¹¹⁸ Margaret was then recruited by GC&CS.¹¹⁹ Although the exact timeline cannot be corroborated it is known that the three 'Lady Translators'¹²⁰ which consist of Miss HC [Helen] Lunn, Miss JF Carleton, and Miss C [Claribel] Spurling¹²¹, were "*eventually absorbed into the rank of Junior Assistants, after considerable turnover, probably because of low pay.*"¹²² This shows that at least one of the sisters (Helen) working for Fetterlein in 1925 was probably by then a JA.

5.8 Decoders

Included in the 1922 list, there is mention of several women who moved from the General Post Office (GPO) to the Foreign Office; Phoebe Senyard is listed as one of these women.¹²³ Phoebe and a small number of other women including Mrs Baker and Mrs Whittingham were classed initially as 'decoders'.¹²⁴ It is not clear at this time what is meant by 'decoder' in this context, but Phoebe is later described as a 'censor's assistant'.¹²⁵ Both would have required language skills which Phoebe can only be presumed to have. As stated above in Section 5.6.1, the work of decoders and censor's assistants would seem to be comparable – the women would ultimately

¹¹⁷ Ferris, *Behind the Enigma*, pp. 88-89.

¹¹⁸ Ferris, *Behind the Enigma*, pp. 88-89.

¹¹⁹ Ferris, *Behind the Enigma*, pp. 88-89.

¹²⁰ TNA, HW3/35, *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School.*

¹²¹ TNA, HW3/35, *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School.*

¹²² Ferris, *Behind the Enigma*, p. 88.

¹²³ TNA, FO366/800, *'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'*

¹²⁴ TNA, FO366/800, *'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'*

¹²⁵ TNA, FO366/800, *'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'*

become temporary clerks in the restructure of 1922.¹²⁶ However, it is important to note here that whilst a decoder could arguably be carrying out low grade decrypting or translation work, it was **not** guaranteed that a decoder would automatically be promoted to cryptanalyst after years of carrying out the decoder role. One example is Phoebe Senyard who does not achieve a higher grade than Head of Secretariat for Naval Section VII by the end of World War Two; it is highly unlikely that she was working as a cryptanalyst in the period between the wars, only to be demoted at the outbreak of the Second World War, for that would be an unnecessary waste of a scarce skill set; it is therefore likely that the role of decoder was at the lower end of GC&CS grading.

Another example of this is Helen Smith, who was recruited towards the end of the First World War, she is also described as a decoder, and hers appears to be the only personnel file from this period in TNA. Helen was taken on as a Wren, and after a period at the Portsmouth Training College, she was assigned to 'special duties'. There is proof in her file that Helen spoke other languages and she had an aptitude for mathematics, though the recruitment board was unimpressed, remarking:

"The Board did not care for her, but they had nothing against her. She only looked 'colourless'. The Doctor would probably turn her down because of her teeth.

*Decision. PASSED. Might do for Decoding."*¹²⁷

This is suggested as further proof that a decoder during this period was not at the high end of cryptanalysis but at the extreme opposite; it is likely that a decoder dealt with more administrative tasks, censorship, or perhaps ones related to telegraphy rather than to cryptanalysis. This also

¹²⁶ TNA, FO366/800, 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

¹²⁷ TNA, ADM318/306, SMITH – Helen. Decoder, Personnel File. (unnumbered)

argues against any assumption that early service automatically meant one could achieve a cryptanalyst position.

Using information available in the archives it has been possible for the author to illustrate the roles from this period and how they were graded. The role of decoder has been put at the lowest part of the chart which sets out the apparent grading changes (see figure 5.5 above).

There are other examples of women initially defined as carrying out decoding and key breaking staff and this indicates a change in perception of roles by 1927. Miss Linehan and Miss Abernethy are classed under this heading as described in Bodsworth's history of 1927 to 1939.¹²⁸ Miss Barbara Abernethy was 16 when she started working for GC&CS in 1937.¹²⁹ Barbara had been sent to a Belgian Convent School where she learnt German, French and Flemish, which put her in a good position to work at BP.¹³⁰ Barbara herself described her first role as decoding, but, once the head of the organisation learnt that she had commercial skills she was moved to 'administration'.¹³¹ The BP RoH describes Barbara's service as: "*Mansion, Naval Section. PA to Head of GCCS, Cdr Denniston from c 1941.*"¹³² Barbara died in 2012 in Florida, having continued her administrative career to become personal assistant to a British Consul general.¹³³ These factors potentially indicate that Barbara could have become a cryptanalyst but was not given the opportunity because she had other skills that were deemed of greater value.

Miss Caroline Linehan appears in the BP RoH as "*Hut 4 and Block A(N), Naval Section*" and held the grade of TSAO.¹³⁴ Miss Linehan is described as solving the current keys on an Italian Attaché

¹²⁸ TNA, HW3/1, *Naval Section 1927-1939, Italian Diplomatic, Mr W Bodsworth's account*, p. 5.

¹²⁹ <https://www.theguardian.com/theguardian/1999/jan/18/features11.g2> [accessed 13 November 2016].

¹³⁰ <https://www.theguardian.com/theguardian/1999/jan/18/features11.g2> [accessed 13 November 2016].

¹³¹ <https://www.theguardian.com/theguardian/1999/jan/18/features11.g2> [accessed 13 November 2016].

¹³² <https://bletchleypark.org.uk/roll-of-honour/3> [accessed 13 November 2016].

¹³³ http://www.bostonherald.com/news_opinion/obituaries/2012/02/barbara_eachus_91_former_british_gov%E2%80%99t_official [accessed 13 November 2016].

¹³⁴ <https://bletchleypark.org.uk/roll-of-honour/5539> [accessed 13 November 2016].

code in 1938¹³⁵ and is listed on a group of decoding and key breaking staff.¹³⁶ This is a strong indication that she was working as a cryptanalyst.

There is evidence that in 1938 the Head of GC&CS; Denniston was searching for ‘clerical labour’ which required ‘very good’ linguistic qualifications, with university training or equivalent in the main language of German.¹³⁷ This shows that Naval Section was already looking for women clerks in 1938. Furthermore, there are lists of staff who are classed as the ‘first wave’ of staff to move to BP when the time came (see Chapter Six); the lists include names of women, but it is not clear if they are cryptanalysts or clerks. In the cryptographic section Miss White, Miss Linehan, Miss Bishop, Miss Abernethy, and Miss Russell Clarke are included.¹³⁸ As has been shown above, Barbara Abernethy is unlikely to have been a cryptanalyst at this time, which infers that some of these women were working in a cryptanalytic role, but others are more likely to have been administrative support. In the Spanish section two people only are included, and both are women: Miss Milne and Miss Harris.¹³⁹ On the same list are intelligence section staff, some of whom could be considered cryptanalysts; an example, on the basis of information from her husband¹⁴⁰, is Miss Wingfield; it is not therefore possible to be certain whether all the women on these lists were working as cryptanalysts or as secretaries.

The fourth case study, which follows, will consider Miss Phoebe Senyard’s position in GC&CS and the extent that it changed over the two decades or more that she worked there. Phoebe’s case

¹³⁵ TNA, HW3/1, *Test of War Site Communications, 15th August, 1939. List of Personnel in Sections, Naval* (unnumbered).

¹³⁶ TNA, HW3/1, *Naval Section 1927-1939, Italian Diplomatic, Mr W Bodsworth’s account*, p. 5.

¹³⁷ TNA, HW3/82, List of letters from AGD on Naval Section 1938 Staff requirements, p. 2.

¹³⁸ TNA, HW3/1, *Test of War Site Communications 15th August 1939. List of Personnel in Sections*. Dated 27.07.39, (unnumbered).

¹³⁹ TNA, HW3/1 *The First Wave in working sections* undated, unnumbered.

¹⁴⁰ Author’s interview with Sir Arthur Bonsall, 17 October 2013.

study will show that promotion to cryptanalyst was not automatic and may be considered almost as an antithesis to the other case studies.

CS4 Case Study 4: Decoder and Secretary: Miss Phoebe Senyard¹⁴¹

CS4.1 Aim

To show that Miss Phoebe Senyard was initially taken on as a decoder but as she did not achieve a higher role than 'Head of the Secretariat' for Naval



Section the implication of which is that length of service is not a guarantee for individuals to be granted cryptanalyst status. The corollary is that decoder was not considered a synonym for cryptanalyst before the mid-1920s, perhaps even before this.

CS4.2 Context

Miss Phoebe Senyard was working as a decoder for the GPO, probably from 3 January 1920, but was transferred to GC&CS on its move under the Foreign Office on 1 April 1922.¹⁴² Phoebe continued to work for GC&CS on a secretarial grade until at least the end of the Second World War, ultimately finishing at the end of the Second World War as Head of the Secretariat for Naval Section IX. She was awarded an MBE in the New Year's Honours list in January 1946¹⁴³, but it is not known at this time if Phoebe continued to work for GC&CS after the war, although it is likely that she did until her retirement.

CS4.3 Literature review and methodology

Phoebe Senyard is unique in the archival records of World War Two cryptography because she wrote a history of her time at BP; the only person of a secretarial grade so to do. This contains

¹⁴¹ Picture provided by kind permission of William Francis Senyard.

¹⁴² TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.*

¹⁴³ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

factual details of her reluctance to move from London, but with the hope that it would only be a brief and temporary move through to the end of the Second World War. As Phoebe's role is well documented, it has been possible to identify specific functions that were relevant to a secretarial grade.

Phoebe and her family have been identified due to both her uncommon first and family name, and so some of her background story can be filled in. Even so, it has not been possible to discover the date that Phoebe retired from GC&CS / GCHQ, what she did when she finished at BP, or any further detail about her outside of her BP work.

Phoebe is mentioned in Smith's 'Station X', but not in any other widely published work, perhaps because Phoebe's role as a secretary was not very 'glamorous' in comparison to other women who worked at BP, although her position was a very necessary part of the BP process.

CS4.4 Findings: background

Phoebe Gladys Senyard was born in Highgate, London on 22 August 1891 to Frederick and Louise Senyard, the middle child of seven.¹⁴⁴ The family appears to have lived in London for most of their lives as all records from her birth certificate to census forms state a London address.¹⁴⁵ As Phoebe moved with GC&CS to BP there would have been a period when she was more likely to have been billeted closer in or near Bletchley. Phoebe is listed in the 1911 census as a 'clerk', and it is possible that at this date she may have been working for the GPO, which would ultimately lead her to working for GC&CS.¹⁴⁶

¹⁴⁴ www.ancestry.co.uk [accessed 14 June 2015].

¹⁴⁵ www.ancestry.co.uk [accessed 14 June 2015].

¹⁴⁶ www.ancestry.co.uk [accessed 14 June 2015].

Phoebe was still living with her family in 1937, and it is probably this that led to her reluctance to move to Bletchley.¹⁴⁷ As Phoebe would have probably been keen to return to her family in London, it is possible that she either retired in 1945 when she would have been 54, or that she returned to continue working for GC&CS in London, where work on diplomatic traffic in London was continuing under Denniston, or Eastcote, whence GC&CS moved in 1946 before relocating to their permanent new home in Cheltenham. Phoebe died in Croydon, Surrey on 8 February 1983, aged 91.¹⁴⁸

CS4.5 Recruitment to GC&CS

Phoebe was classed initially by the GPO as a “decoder”¹⁴⁹, and is also described as a “*Censor’s Assistant*” and a “*Temporary Woman grade II*”.¹⁵⁰ As Phoebe was taken on as a ‘decoder’ but never achieved a higher role than secretary, it is highly likely that the term signifies low level decrypting or clerical work, as it would be unlikely that her skills would have been ‘wasted’ in a clerical role if she had strong cryptographic capabilities. The term decoder will be fully considered in Chapter Seven.

Phoebe came into the organisation at Temporary Women Grade II; she is described as a Censor’s Assistant at the beginning of her role at GC&CS. Little is known about her role between 1920 and 1939; however, by the time the Second World War became a very real threat, Phoebe was given direct orders to “*proceed to Bletchley*” and duly arrived the following day on 15 August 1939.¹⁵¹

CS4.6 World War Two: war work

¹⁴⁷ TNA, HW3/135, *Historical Memoranda No31*.

¹⁴⁸ www.ancestry.co.uk [accessed 14 June 2015].

¹⁴⁹ TNA, FO366/800, *Telegraphists etc. (GPO)*, p. 362.

¹⁵⁰ (TNA) FO366/800. *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*.

¹⁵¹ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 1.

On her arrival at BP Phoebe was expected to work on “*registering German signals*” and “*the identifying of call signs*”.¹⁵² This would indicate that she must have had some training in these tasks, although it is not clear if she spoke German. From the history that Phoebe wrote, it seems that it took some time for the organisation to become ‘war ready’.¹⁵³ Those at the top of GC&CS would have been fully aware of what was needed in order for the organisation to successfully function, but it is unlikely that someone of Phoebe’s grade had the necessary knowledge “*...I was given little information as to what our function really was...*”.¹⁵⁴ This was not unusual; in fact it is more likely that Phoebe understood the purpose of the organisation more so than other new recruits who arrived at BP, since she had by then some 19 years of experience.

Phoebe’s history is unique within archival records because she details a more social history of the department, unlike official accounts. She specifically details the men and women she worked directly with, and the roles that they held. Initially based in the library in the mansion, her department were moved into Hut Four by November 1939¹⁵⁵, and by mid-1942 moved again into the more appropriate Blocks A and B.¹⁵⁶ Phoebe describes working with the intercepts from Y stations, initially delivered by despatch rider and later sent by teleprinter, and how she inducted new staff into how to identify specific details such as “*...sort[ing] ‘Y’ traffic in frequencies, codes and time groups...*”.¹⁵⁷

Phoebe describes in some detail her role in devising and operating filing systems such as the “*Bible files*” which she created in March 1940 “*...into which was put a copy of every German Naval and Naval Air signal, the files being placed on a shelf at the back of my chair in the secretariat.*”¹⁵⁸ In another aspect of

¹⁵² TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 1.

¹⁵³ TNA, HW3/135, *Historical Memoranda No31*.

¹⁵⁴ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 1.

¹⁵⁵ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 9.

¹⁵⁶ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 30.

¹⁵⁷ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 14

¹⁵⁸ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 13.

her job Phoebe discusses how the early processes which had been created for specific functions evolved, including the dangers of such processes such as confusing passing messages in inter-connecting (pneumatic) tubes, and the machinery that would later replace the early processes.¹⁵⁹

Phoebe also understood the need to motivate the women that she managed, and regularly requested her seniors to motivate ‘my girls’¹⁶⁰ by stressing the importance of the work they were doing and airing any grievances.¹⁶¹ Much of the work carried out at BP could be dull and tedious – indeed, this is one of the recurring themes in the memoirs of many veterans. Unfortunately for Phoebe, her requests for motivational speeches did not come to fruition, but it is clear that she genuinely enjoyed working with her team and regularly thought of ways to improve their everyday lives.

CS4.7 Conclusions

There can be no doubt that, despite Phoebe’s length of service and ‘decoder’ beginnings, the work that she carried out was secretarial based. Phoebe’s job at the beginning of her career at GC&CS involved censorship and this later led to her work as a secretary. Because her wartime work at BP ended in 1945 with her as the Head of the Secretariat for Naval Section IX, it is clear that there was not an automatic guarantee that any woman employed in GC&CS would achieve the role of cryptanalyst. A number of factors, such as linguistic skills, past experience and to a certain extent opportunity, are likely to play a part into why some women were able to take up a role that allowed them to achieve cryptanalyst status, while other women could not. This is not to diminish the work carried out by secretaries and clerks but is illustrative of the differences between the roles

¹⁵⁹ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 30. (The pneumatic tubes were nick named ‘spit and suck’).

¹⁶⁰ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 26.

¹⁶¹ TNA, HW3/135, *Historical Memoranda No31*, (undated), p. 11.

carried out by women that would seem similar by title in the early 1920s but had developed to be considerably different by the late 1930s.

5.9 GC&CS: 1925 onwards

Cooper had been required to take an entrance exam which had been devised by Oliver Strachey, which “*included a number of puzzles, such as filling in missing words in a mutilated newspaper article and simple mathematical problems calling for nothing more than arithmetic and a little ingenuity. I wasted a lot of time on these, thinking there must be some catch and rechecking my work...*”¹⁶² While it is not clear whether the paper could be considered easy in general, or was just easy to Cooper, he adds “*I do not think this exam was ever repeated but selection continued on a fairly haphazard basis right up to the war.*”¹⁶³

By 1925, GC&CS was located at Queens Gate, London.¹⁶⁴ These are not the only women to be described as working on key breaking; another is Miss Sercombe¹⁶⁵ who is Daphne Mary later listed as a TSAO at BP, is described as working in the “*Mansion, Hut 5 and Block F. Military Section. Probably also Research Section.*”¹⁶⁶ This is pertinent to Joan Musgrave Harvey as she is described by Clarke as ‘Lady Secretary’ during the First World War.¹⁶⁷ While, interestingly, the women’s names are not listed, the term ‘lady clerk’ as has been seen is likely to be classed as a special grade.

It would also seem there were changes in the types of messages that were considered worthy of decryption. In the 1920’s ‘wireless raw material’ was “*disliked and distrusted*” due to its “*messy pencil script*”¹⁶⁸ (on the log sheets of the operators in the Y stations); by contrast, in the 1930’s there was

¹⁶² TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 1, (unnumbered).

¹⁶³ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 1, (unnumbered).

¹⁶⁴ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 1, (unnumbered).

¹⁶⁵ TNA, HW3/82, *Civilian and Military Personnel Employed by GCCS During the 1939-45 War. Civilian Grade T/AO Military Rank Captain (and equivalents). EF Master Copy. Military Section. Section dated 12. 7.39.* (unnumbered).

¹⁶⁶ <https://bletchleypark.org.uk/roll-of-honour/8180> [accessed 20 May 2020].

¹⁶⁷ CCAC, The Papers of William F. Clarke. GRB/0014/CLKE/3.

¹⁶⁸ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 17, (unnumbered).

an increase in the quantity of this traffic and confidence grew following a “*notable improvement in quality*”.¹⁶⁹

A certain degree of incredulity also pervaded those staff of GC&CS who had come from the two First World War organisations; they believed the Germans would never again allow their codes to be read, and so GC&CS did not devote much effort in breaking German codes over much of the Interwar period.¹⁷⁰ In fact, so far as is known, for many years only one man was employed in the attempt to break these.¹⁷¹

The annual rates of pay for senior assistants by the 1930s were between £700 3 0d and £1000, while junior assistants were paid between £250 2 5d and £500, although Denniston also points out there was no difference between the work of good juniors and seniors.¹⁷² He continues “*through the Chief Clerk’s Department we obtained Treasury sanction for 56 seniors, men and women with the right background and training (salary £600 a year) and 30 girls with a graduate’s background knowledge of at least two of the languages required (£3 a week).*”¹⁷³ The phrase ‘men and women’ indicates that Denniston was not adverse to employing women in the role of senior assistant, even from this early date.

In 1937 the department began to investigate German traffic for the first time since 1928.¹⁷⁴ In 1935 Cooper requested an additional six assistants to support his work on Italian Diplomatic and Italian Colonial traffic, and one person recruited at this time being Admiral Sinclair’s sister Miss

¹⁶⁹ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 18, (unnumbered).

¹⁷⁰ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 26, (unnumbered).

¹⁷¹ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, by JES Cooper, paragraph 26, (unnumbered).

¹⁷² CCAC Denniston papers. GBR/0014/DENN/1/3.

¹⁷³ CCAC Denniston papers. GBR/0014/DENN/1/3.

¹⁷⁴ TNA, HW3/1, *Naval Section, Government Code and Cipher School, Investigation of Fleet Codes, German*, 1937 p. 6.

Evelyn Sinclair.¹⁷⁵ It was 1938 when the Luftwaffe started using Enigma but a year earlier when air/ground co-operation units¹⁷⁶ began using cyphers.

5.10 Conclusions

The period between the World Wars was one of significant change for cryptanalysis. The newly created GC&CS, which brought together the Admiralty and War Office cryptanalysts, continued to develop their skills, now focused mainly on diplomatic decrypts. Despite initial personnel issues, GC&CS went on to become one of the leading cryptanalysis operations in Europe in the years leading up to and during the Second World War, with successes ranging over most of the world's diplomatic codes.

World War One cryptanalysis had begun with book-based codes and developed onto both book and field codes of many varieties. It was possible for the organisation to build on the knowledge it had built up from the First World War and with the reduction in traffic following the end of the war; GC&CS emerged as a unified and well-organised professional operation.

The introduction of machine-based codes towards the end of the interwar period meant that the decryption challenge became compounded with the vastly increased possible combinations of letter substitutions. A different skill set, now including mathematics, would now be needed to break and read them in a timely manner.

In the early 1920s, for the first time, archival records contain some detail of the employees of the newly created GC&CS - surnames, some dates of birth, pay and grade, making it possible to compare, contrast and analyse the roles that the women held. These women were recruited from

¹⁷⁵ TNA, HW3/83, *Air Section GC and CS and the Approach to War 1935-39. Part I, The Sanctions Crisis, First Emergency Expansion of GC and CS, paragraph 1*, p. 1.

¹⁷⁶ TNA, HW3/83, *Air Section GC and CS and the Approach to War 1935-39. Part XII, German Air Force Three Letter Codes, paragraph 41*, p. 51.

several organisations including Room 40, MI1(b), HushWAACs and the GPO, and we know that some at least, including Emily Anderson, went on to perform high-level cryptanalysis.

In this relatively quiet period for codebreaking, this research has identified at least fifteen women who were involved with codebreaking at more than an elementary level – Emily Anderson, Wendy White, Evelyn Sinclair, Janet Milne, Daphne Sercombe, Caroline Linehan, Helen Lunn, Margaret Lunn, Claribel Spurling, Florence Hayllar, and the Misses Russell Clarke, Bishop, Harris, Dale, and Carleton.

While many of the women appear to have been promoted, or assimilated onto a government grading system, from their former employment, it was absolutely not guaranteed that a woman formerly working on codes would automatically achieve the status of cryptanalyst; ability and opportunity seem to have played a factor in achieving that status. This research has also identified those who, while working in a code-breaking establishment, held a more administrative role of a type similar to those in other large high-security government establishments, such as Farnborough; Barbara Abernethy and Phoebe Senyard are the examples here. Phoebe Senyard's case study shows that she was initially brought in as a decoder before being either promoted or moving to become a Censor's Assistant, and that by the end of the Second World War she had achieved the role of Head of the Secretariat for NSIX; but she was not regarded as a cryptanalyst. Phoebe can be contrasted with Wendy White, who had both the opportunity and the ability to become a cryptanalyst, and achieved that status even though she began on similar grade to Phoebe in 1922; she continued as a cryptanalyst for the rest of her career.

While codebreaking at this time was relatively less hurried compared to the intense pressures of the World Wars, it was a time of adaptation for all, and a period of great development and expansion for women. Although they did not receive the same recognition as their male counterparts, women like Wendy White were generally becoming to be recognised for their cryptanalytical abilities.

The next chapter will examine codebreaking during the Second World War and the women involved in it.

Chapter Six: Second World War Cryptanalysis: GC&CS at Bletchley Park

"...the geese that laid the golden eggs but never cackled".¹

Winston Churchill

6.1 Introduction

This chapter considers cryptanalysis at Bletchley Park during World War Two in three main sections. The first reviews the increased staffing and alterations in structure that took effect as GC&CS moved to BP in 1939, in preparation for war. The second details the roles that were available to women working at GC&CS and their grades, using details from the BP Roll of Honour (RoH) and showing how the grades Senior Temporary Assistant Officer (TSAO) and Temporary Junior Assistant Officer (TJAO) can be considered one indicator by which to identify female cryptanalysts accurately. TSAO was the grade given to senior people – more often male cryptanalysts, although some were likely to be managers rather than cryptanalysts. The TJAO was the next senior level following TSAO.

The chapter will then consider in turn each main cryptanalytic section at BP, exploring the roles held by women. Two case studies will provide a yardstick against which other female cryptanalytic roles can be compared, the first being high-level cryptanalyst Marie Rose Egan who worked in the Central Bureau Middle East (CBME), and the second, Mavis Lever, the female cryptanalyst publicly recognised for breaking the Italian Naval Code, leading to the Battle of Matapan. The final section uses the research findings to show that a significant number of women were working in similar cryptanalytical roles to their male counterparts during the Second World War.

¹ <http://news.bbc.co.uk/1/hi/5319126.stm> [accessed 1 April 2017].

6.1.1 Important Note: The BP Role of Honour²

One of the most informative sources of information regarding BP's wartime staff, and one heavily used in this Chapter, is the BP RoH. It is, however, necessary to re-emphasise its shortcomings. It is not a full and complete list as no official fully inclusive source exists for the period. The information on which the RoH is based has been obtained through a variety of sources, including archives, the memories of former staff, and the recollections of their families.

Family recollections are heavily reliant on memory, the drawbacks of which are discussed fully in Chapter Three; details on individuals are thus sometimes quite sparse or missing entirely.

Secondly, it is not always apparent exactly when individuals were working in specific departments, nor when they achieved their specified grades, so that, while the records do include the individual's grade, it is not clear when this grade was achieved, or whether it was their starting grade or if they were promoted into it during their service.

Third, as staff transferred between departments, a given grading may apply to their role in only one of those departments, typically the most recent; for example, Rhoda Welsford, who worked for the Air Ministry, was graded TSAO and is listed as working in 'the Mansion, Hut 10, Block A and Block F and being Head of the Call-Sign Research subsection'³, but as Rhoda was at BP from September 1939 to November 1944, it may have been several years before she attained TSAO grading, and, if that grading were granted when she took over as Head of Call-Sign Research subsection⁴, the grading may have recognised a managerial rather than a cryptanalytical role.

² For more detail of the RoH, see Appendix Three. As of July 2021 the RoH is no longer available due to work on the website. It is likely to be online once again from August, however the links may change.

³ <https://bletchleypark.org.uk/roll-of-honour/9607> [accessed 3 May 2021].

⁴ <https://bletchleypark.org.uk/roll-of-honour/9607> [accessed 3 May 2021].

Whilst, therefore, the RoH is a valuable source of information, its limitations must also be kept in mind; hypotheses drawn from it are not necessarily conclusive without corroborating evidence.

6.2 BP Staffing

A major influence on GC&CS was the attitude towards gender and social class the Second World War.⁵ It affected how people were recruited and how the work was allotted.⁶ Well educated upper- and middle-class men tended to be given higher posts⁷, although this is not true for all of the higher posts as has been seen with Emily Anderson. It is important to reflect on these points when considering BP; essentially that it should be considered in context: it was not just about role availability for women but also other cultural expectations.

6.2.1 Preparations for War 1938-39

GC&CS moved from London to BP on 15 August 1939⁸, and at the outbreak of war, GC&CS consisted of 186 staff.⁹ Of these 49 belonged to the code construction section, devising codes for British use, and 137 constituted the code-breaking ‘GCCS proper’.¹⁰ Of the remaining 137, 131 were civilians, and six belonged to the services.¹¹ Nine months later this total had increased to 530, of whom 120 were working exclusively on code construction, and of the 305 “GC&CS proper”, 50 were exclusively engaged on diplomatic tasks, and 131 on Commercial.¹² The increase shows how GC&CS were preparing for war and the increase of code traffic, both British and enemy, which would need to be processed.

⁵ Smith, *The Hidden History*, p. 168.

⁶ Smith, *The Hidden History*, p. 168.

⁷ Smith, *The Hidden History*, p. 168.

⁸ TNA, HW3/1 *Chapter VI War 1939-1941*, p. 2.

⁹ TNA, HW3/82, *Personnel at B.P. Sept. 1939* (unnumbered).

¹⁰ TNA, HW3/82, *Personnel at B.P. Sept. 1939* (unnumbered).

¹¹ TNA, HW3/82, *Personnel at B.P. Sept. 1939* (unnumbered).

¹² TNA HW3/82, *Staff Statistics*, handwritten notes, detailed: 2006 23.5.40/39 (unnumbered).

Figure 6.1 illustrates the number of people in each specific role at GC&CS, their grade (where relevant) and the salary pertaining to that grade.

Numbers.				Code and Cypher School.	
1938.	1939.				
1	1	Head	..	.. (1,150l.-50l.-1,450l.)	1,450
1	1	Deputy Head	..	.. (1,150l.-50l.-1,450l.)	1,328
3	3	Chief Assistants	..	(847l.-30l.-1,150l. personal)	3,385
13	14	Senior	..	(847l.-30l.-1,058l.)	13,846
17	16†	Junior	..	{ Men (275l.-25l.-635l.) Women (275l.-25l.-515l.) (5 with 100l. allowances)	8,082
1	1	Wireless Expert	..	(634l.-25l.-750l. personal)	750
11	12	Clerks	..	{ Women (85l. to 280l.) (3 with 60l. allowances)	2,341
1	1	Superintendent of Typists	..	(215l.-10l.-280l.)	267
2	2	Shorthand Typists	..	(40s. to 72s. a week)	315
15	15	Typists	..	(31s. to 60s. "	1,860
13	13	Clerical Assistants, Grade I	..	(28s. to 72s. "	1,994
1	1	Temporary Technical Assistant	..		300
35	38 §	Temporary Clerks	..		5,462
7	8	Temporary Typists	..		959
—	1	Executive Engineer	..	(650l.-25l.-750l.)	650
—	2	Inspectors	..	(250l.-10l.-350l.)	500
1	1	Assistant Superintendent of Telegraphists	..	(personal)	500
				Allowances	26
12	12	Telegraphists	..	(25s. to 105s. a week)	3,682
—	—	Overtime and Sunday Duty	..	(with allowances varying from 5s. to 20s. "	850
12	12	Telegraphists	7 (53s. 9d.-2s. 6d.-67s. "		1,918
			5 (55s. 6d.-2s. 6d.-63s. "		
1	1	Doorkeeper and Head Officekeeper	..	(145l.-7l. 10s.-190l.)	158
3	4	Unestablished Officekeepers or Messengers	..	(47s. 6d.-1s. 6d.-55s. 6d. a week)	548
8	10	Women Cleaners	(1 at 32s. and 9 at 29s. 6d. "		777
—	—	National Insurance Schemes—Employer's contributions	..		244
—	—	Provision for additional staff	..		3,000
					325,903
		Adjustment of salaries consequent upon interchange of First, Second and Third Secretaries between the Foreign Office and posts abroad—add 975l.			975
		Deduct for vacancies 2,000l.			deduct 1,025
904	937	TOTAL FOR SALARIES, &c.			324,878

The authorized GC&CS budget for the financial year 1939

Figure 6.1 List of authorized GC&CS budget: financial years 1938 and 1939¹³

This evidence shows a small difference between the salary of the Chief Assistants (direct reports to the Head of GC&CS) and the Senior Assistants (SA). It will be recalled that Emily Anderson was a SA at the time¹⁴ but it is not clear whether she was paid the same as her male counterparts;

¹³ West, *GCHQ*, p. 109.

¹⁴ TNA, HW3/82 (unnumbered) document dated 29.9.39.

there is the possibility that she would have been paid at the lower end of the scale due to her gender.

The gender-based pay discrepancy is, however, apparent for the Junior Assistants (JA), the only grade where a difference between the male and female salaries is explicit; whilst the lower end of the scale was the same for both men and women, men at the top of the scale could be paid £120 more than their female counterparts. However, it is important to note that this document indicates that there were five women who held an additional £100 allowance, so that if these five women were at the top of the female scale and held this allowance, then the discrepancy between the men and women at this grade, whilst certainly still present, was a more modest £20. Furthermore, whilst there is indication at the bottom of figure 6.1 regarding the employer's National Insurance contributions, there is no detail about pension entitlements – all Civil Service pensions at this date were non-contributory, but the benefits differed as between men and women.

So far as numbers are concerned, there is an increase over 1938 of one to a total of 14 SAs in 1939, matched by a decrease in one JA. It is possible that this was a single individual holding a 'legacy' entitlement, as a result of which (for example) an individual in post for a specified number of years was automatically promoted (see CS4 - Marie Rose Egan is such an example).

The JAs are the only group identified by gender, presumably because at least five of the 16 were women and this substantial female representation had to be explicit. None of the other posts are specified by gender, which may well be because certain roles were 'gender specific', as was well-known at the time; for example, the GC&CS Head was male, the Shorthand Typists were female, the Temporary Clerks were female and so on.

6.2.2 The Emergency List

GC&CS had also compiled an emergency list of people to contact in the event of war breaking out, and there are 72 names on that list.¹⁵ Amongst the men's names are renowned cryptanalysts such as Frank Birch, Dennis Babbage, Nigel de Grey, Professors Adcock, Jopson and Bruford, and Gordon Welchman.¹⁶ There are just two women on the list: Miss A.M. Dale and Miss F. Ede.¹⁷ This indicates that these two women must have been of considerable significance given that they are listed in the main record, rather than under the heading 'emergency clerical staff' where another 18 women are named¹⁸, a fact which constitutes a good indicator of the important role these two women played. Marjorie Dale's role is discussed in more detail below, in part 6.4.3, Naval Section, and the second woman, Fiona Ede, in part 6.4.11, Diplomatic Section. It is noteworthy that the men listed are indicated as earning £600 per annum (or their existing service pay) – this would work out to be approximately £26,600p.a.¹⁹ today, while Fiona is listed as earning £450 per annum²⁰ - which would be approximately £17,700p.a. today.

Under Intelligence and Movements Section on the Emergency List are listed Miss Wingfield and Miss Meyler.²¹ Joan Wingfield (seen in photo on the right²²) is listed as a TJAO and her husband's opinion is that she was working in a cryptanalytic role. Her summary of service is (BP) "*August 1939 - 1942. Mansion (Library). Italian Naval Section. With GCCS from 1936; member of Captain*



¹⁵ 'Prof J.R. Tolkien' is included on this list. TNA, HW3/82, un-numbered document dated 29.9.39.

¹⁶ TNA, HW3/82, (unnumbered) document dated 29.9.39.

¹⁷ TNA, HW3/82, (unnumbered) document dated 29.9.39.

¹⁸ <https://bletchleypark.org.uk/roll-of-honour/2757> [accessed 5 May 2020].

¹⁹ <https://www.nationalarchives.gov.uk/currency-converter> [accessed 20 July 2020].

²⁰ <https://www.nationalarchives.gov.uk/currency-converter> [accessed 20 July 2020].

²¹ Photograph <https://bletchleypark.org.uk/news/top-secret-christmas-card-rediscovered-at-bletchley-park> [accessed 20 July 2020]. Miss Wingfield is Joan Wingfield who later married Bill Bonsall.

²² Author's interview with Sir Arthur Bonsall. 17 October 2013.

*Ridley's Shooting Party in 1938.*²³ Joan is listed as working on Italian Naval code “XY” with Mr Henderson.²⁴ According to one official archival source, she is described as working in the Intelligence Section “...which had been revived in January 1941 with the return of Cdr. O’Callaghan from the Admiralty, dealt with W.T.I, call signs, TINA and Fleet Codes (the last three being done by Miss Wingfield).”²⁵ This last phrase indicates that Joan was working in a cryptanalyst role similar to that of her male counterparts, an example that some women were working at the same level as men. The second woman, Miss Meyler, is likely to be Miss D.E. Meyler who was a Temporary Assistant (TA). The summary of her service is “from 1940. Mansion (room 51), Block B(N). Naval Section, Italian. Later in Berkeley Street”²⁶, which appears to indicate that she was working initially on naval, and later on diplomatic, cryptanalysis.

In addition to the women listed above, the Emergency list also includes several other women and other posts of interest. A total of 18 emergency clerical staff could be called upon, with some names recognisable from their work in World War One’s Room 40, and in the earlier GC&CS organisation; the names that can be recognised are set out below, in figure 6.2. In addition, three women are listed as ‘training as decoder-translators’.

Role	Name	Notes
Senior Assistant	Miss Emily Anderson ²⁷	See Case Study 2
Junior Assistants	Miss Marie Rose Egan ²⁸	see Case Study 5
	Miss M. Anderson	

²³ <https://bletchleypark.org.uk/roll-of-honour/9942> [accessed 12 May 2020].

²⁴ TNA, HW8/23, *SECRET. Head of GC and CS (staff review)*. 24.10.38 (Section 70).

²⁵ TNA, HW3/1, *Chapter VI War 1939-1941*, p. 7.

²⁶ <https://bletchleypark.org.uk/roll-of-honour/6258> [accessed 12 May 2020].

²⁷ TNA, HW3/82 (unnumbered) document dated 29.9.39. See CS2 for more detail on Emily Anderson and GCHQ website <https://www.gchq.gov.uk/information/key-figures-uk-sigint> [accessed 20 July 2019].

²⁸ Marie Rose Egan (CS5) is not included on this official list but is included on a list from TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18.

	Miss Harris	Probably Mabel Mary Harris working for GC&CS in 1922 ²⁹
	Miss Nunn	
Emergency Staff	Miss Amy Marjorie Dale	See 6.4.3 Naval Section
	Miss Fiona Ede	See 6.4.11 Diplomatic Section
Training as 'decoder-translators' ³⁰	Miss Fry Miss Ryder Miss Blake	
Emergency Clerical Staff ³¹	Mrs Olive Knox	Formerly Room 40; née Roddam, married Dilly Knox ³²
	Miss Mary Vernon Nugent	Formerly from Room 40
	Miss Sybil Pugh	Formerly from Room 40
	Miss B. Speirs	Possibly Bettine from Room 40
	Miss Joan Musgrave Harvey	Formerly from Room 40
	Miss Rhoda Welsford ³³	Formerly from Room 40

Figure 6.2 Female staff identified by role on 29th September 1939.³⁴

There are three women listed as 'decoder-translators' in figure 6.2, but that term does not appear on the budget forecast from 1939 (figure 6.1); it is therefore probably a job title rather than a pay grade. The women are therefore likely to be considered under a different pay grade in the 1939

²⁹ TNA, FO366/800 - 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

³⁰ TNA, HW3/82, (unnumbered) document dated 29.9.39.

³¹ TNA, HW3/82, (unnumbered) document dated 29.9.39.

³² HW3/6 Address book contains list of names of Room 40 employees with additional pages, (unnumbered); CCAC. GRB/0014/CLKE/3/3 Official History.

³³ Rhoda Welsford is listed as living in Lincoln's Inn and joining in September 1939 (TNA, FO366/1075 *Personnel Earmarked for Foreign Office. Names still outstanding* (7 12.1939. p75). According to Clarke she insisted on coming back uninvited - CCAC. GRB/0014/CLKE/3/3 Official History.

³⁴ TNA, HW3/82, (unnumbered) document dated 29.9.39 and (unnumbered) section dated 20.3.9 (presumably 1939)

budget, and if they are, then the most likely pay grades would either be the Clerks or Clerical Assistants if they were permanent members of staff, or one of the Temporary Clerks or Typists if they were not. It may however be that these posts are simply additional to the original budget, as GC&CS found it necessary to increase staff almost immediately following the outbreak of war; this is an area where future research could help to clarify the situation.

It is important to note that this 'emergency list' (figure 6.1) includes three current staff JA's; Miss M. Anderson, Miss Harris, and Miss Nunn, indicating that these three women were already working as JAs for GC&CS before the move to BP. Unfortunately, it is not clear if they continued with the organisation as they are difficult to identify on the RoH at this time. However, one notable fact is that SA Emily Anderson is on the emergency under the subtitle of 'senior staff'. This is an important distinction because it indicates the people who GC&CS considered 'senior' and in 1939 this included at least one woman.

This section has shown that there were several women working as an integral part of mid- and high-level functions at BP by 1939, and that at least some women in permanent posts were considered 'senior staff', even if this changed later in the Second World War when the numbers of staff grew exponentially, and the term senior staff may have altered its meaning. It can be seen that, as the Second World War progressed, more women were promoted, albeit in a temporary capacity, as cryptanalysts.

Not included in the list are decoders which also appear to be a role open to women during this period; Miss Barker, Miss Curtis and Miss Tritton (Miss Curtis is likely to be Freda who worked

in Room 40 during the First World War³⁵) are all described as working on Focke Wulf Traffic (whenever it came in, it was to be sent immediately to one of these three ladies).³⁶

6.2.3 Staffing Numbers: September 1939 Onwards

GC&CS in the later years of the Second World War bore little resemblance to that of 1939, as it became much more varied - even chaotic. Its constantly varying structure was the result of a number of variables, including technological changes, variations in importance of particular message areas (Naval, Air, Army) due to operational priorities, and to variations in how people were recruited, their roles, grades, and general experience, all of which have a bearing on who can be considered a cryptanalyst.

As can be seen in figure 6.3 the numbers at BP grew rapidly and peaked in 1944. By 6 May 1944, the numbers listed at BP and its outstations totalled 10,471³⁷; including in the UK 3,201 civilians, and 5,701 from the services, the remainder being based in outstations abroad.³⁸ Once victory had been secured in the European theatre, numbers decreased rapidly; just over three months later comparative numbers had reduced to 2,114 civilians and 3,757 service personnel.³⁹ Outstation staff numbers continued to rise, with 7,096 personnel due to the continuing war in the Pacific.⁴⁰

³⁵ <https://bletchleypark.org.uk/roll-of-honour/2240> [accessed 18 July 2021].

³⁶ TNA, HW8/23, *SECRET. Office Note (3.2.41) G.N.S. Procedure with regard to Focke Wulf Traffic and long E bar.* (unnumbered).

³⁷ TNA, HW3/82, *Personnel at BP.* Un-numbered. Dated May 6th 1945.

³⁸ TNA, HW3/82, *Personnel at BP.* Un-numbered. Dated May 6th 1945.

³⁹ Howard and Gallehawk, *Figuring it Out*, p. 3, pp. 7-10.

⁴⁰ Howard and Gallehawk, *Figuring it Out*, p. 3, pp. 7-10.

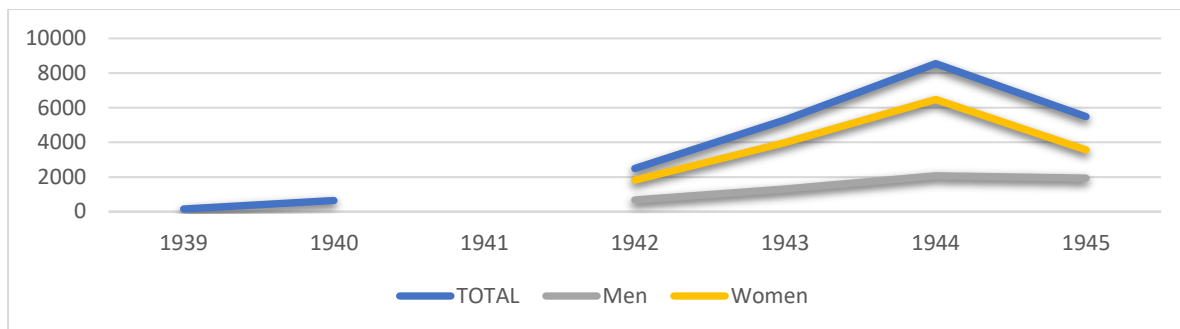


Figure 6.3 The overall number of staff at BP from 1939 to 1945.⁴¹

As can be seen in figure 6.3, numbers sharply increased after 1942; in fact, most likely after October 1941, which coincides with a letter written by ‘the wicked uncles’ (as they were termed) - Gordon Welchman, Alan Turing, Stuart Milner-Barry and Hugh Alexander - to Churchill requesting additional resources.⁴² That letter was delivered to Churchill by hand, and, tagged by him as ‘Action this day’; it was to lead to a huge boost in much needed staff and other resources. The same letter led also to the reorganisation of BP, with Alistair Denniston retaining the Deputy Directorship but moved sideways to the Diplomatic Section in London, and Edward ‘Jumbo’ Travis taking over the running of BP.⁴³

The breakdown ratio of women to men before 1942 is not known; from post-1942 figures, it is likely that more people in higher posts were predominantly men.

As at April 2020, a total number of 13,651 staff were listed in the BP Roll of Honour.⁴⁴ Of these 8,035 can be identified as working at BP at some point⁴⁵, a number which can be broken down

⁴¹ Howard and Gallehawk *Figuring it Out*, p. 3, pp. 7-10.

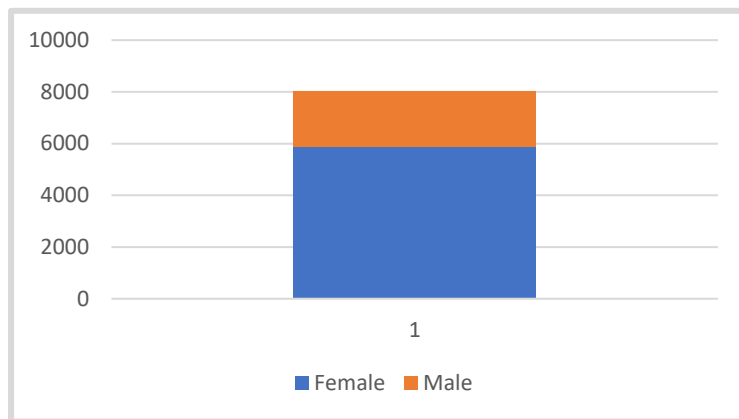
⁴² Erskine & Smith, *The Bletchley Park Codebreakers*, pp. x-xiii.

⁴³ <https://bletchleypark.org.uk/roll-of-honour/9170> [accessed 2 May 2021].

⁴⁴ <https://bletchleypark.org.uk/roll-of-honour/search?page=1> [accessed 14 April 2020]. The numbers included in this total are from BP, its outstations, and listening stations from Melbourne, Australia amongst other locations.

⁴⁵ There is no distinction on the RoH between someone who worked at BP for six months or six years.

again by gender to yield the number of men (2,151) compared to the number of women (5,875); see figure 6.4.⁴⁶



*Figure 6.4 The total number of staff at BP divided by male and female.*⁴⁷

As the most informative analysis of roles relates to the work done in specific departments, numbers can be compared by section. The overview provided by Figure 6.5 shows that by far the largest number of women worked on the bombe, illustrating that the largest service provider was the Admiralty who supplied the WRNS who operated both the bombes and the Colossus. Each section will be discussed in detail later in the Chapter.

It is very important to note that the figures shown only indicate the total number of women who worked in their respective posts over the 1939 to 1945 period, and not the number who were working there at any one time.

⁴⁶ <https://bletchleypark.org.uk/roll-of-honour/search?page=1> [accessed 12 March 2020]. There is a disparity between the figures as sometimes the database is incomplete. On this occasion there are nine who do not have an allocated gender.

⁴⁷ <https://bletchleypark.org.uk/roll-of-honour/search?page=1> [accessed 12 March 2020].

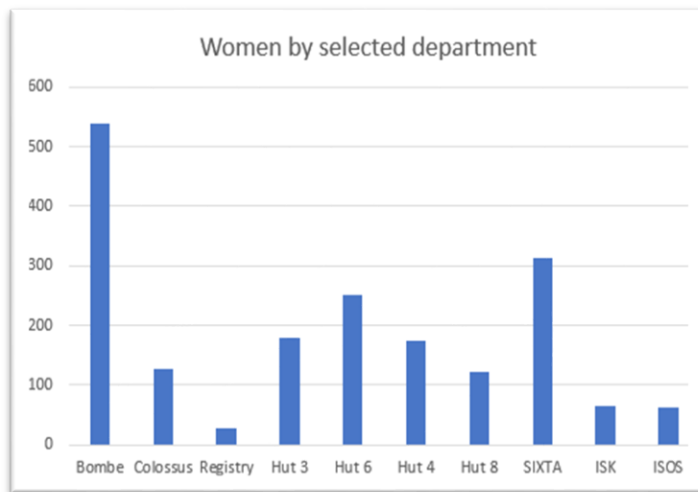


Figure 6.5 Women identified by selected department.⁴⁸

6.2.4 Recruitment of Women

6.2.4.1 Civilians

In a manner comparable to the First World War, women were initially recruited through friends and family of existing staff.

A small number of these women were debutantes; recruited usually through familial contacts; such recruits had proven their value during the First World War, and shown that they could be trusted with national secrets. The Honourable Sarah Baring serves as an example – a debutante who had been presented to the King and Queen in 1938, she was called to the Foreign Office for testing as a linguist before arriving at BP in Spring 1941, with her friend Osla Benning.⁴⁹

Denniston also returned to several British universities, to handpick staff who previously worked for the organisation or to identify new prospective candidates.⁵⁰ Individuals such as Welchman would recruit former students like Joan Clarke, who had been one of his students at university.⁵¹

⁴⁸ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 12 March 2020]. All the departments are considered in greater detail later in the chapter. Registry was the ‘sorting’ office for BP.

⁴⁹ Baring, *The Road to Station X*, as a debutante p. 8-12, letter p. 62, interview p. 63, arrival at BP p. 66.

⁵⁰ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XIV Territorial Training Course*, p. 17

⁵¹ Randall, *Joan Clarke*, p. 41.

Milner-Barry recruited a number of women clerks through his sister, vice-principal of Newnham College, Cambridge⁵²; these recruits were graduates who worked on trying to establish ‘*the specific Enigma cypher in use from the preambles, carefully examining them to see if there was any intelligence that could be garnered before the code-breakers got to work*’.⁵³

Other recruitment methods included word of mouth as existing staff were often asked if they knew anyone who would be suitable.⁵⁴ Perhaps the most famous method employed by BP was to run a crossword competition in *The Telegraph*.⁵⁵

6.4.2.2 Military Services

Following the 1941 letter to Churchill requesting more resources with great urgency, the necessary recruitment took place through a variety of media, but probably the largest number of women were employed through the military services. This avenue had the added advantage that large numbers of women could be recruited without divulging what they were being recruited for; a further advantage was that, if they were deemed unsuitable, they could be withdrawn at any time.

In 1939 the women’s auxiliary services had started to recruit, but this was prior to the main nationwide recruitment drive and these first women were volunteers.⁵⁶ The motivating reasons for joining a service varied wildly. Some women, like Osla Benning and Sarah Norton,⁵⁷ preferred a particular uniform, some wanted to meet eligible men, while some, like WRNS Betty Mayall⁵⁸, expected to go to sea and others, such as WAAF Doreen Spencer⁵⁹, felt an appeal to a specific

⁵² Smith, *Station X*, p. 53.

⁵³ Smith, *Station X*, p. 53.

⁵⁴ Smith, *The Hidden History*, pp. 45-48.

⁵⁵ <https://www.telegraph.co.uk/news/2019/11/19/telegraph-puzzlers-cracked-gchq-100th-anniversary-code/> [accessed 2 May 2021].

⁵⁶ Virginia Nicolson, *Millions Like Us Women’s Lives during the Second World War* (London: Viking, 2011 repr. London: Penguin Books, 2012), p. 12.

⁵⁷ Anne De Courcy, *Debs at War 1939-1945 How Wartime Changed Their Lives* (London: Phoenix, 2005), p. 76.

⁵⁸ Mayall in Page, *We Kept the Secret*, p. 13.

⁵⁹ Doreen Luke, *My Road to Bletchley Park: The memoirs of WAAF LACW2068978 Doreen Gertrude Spencer 1941 to 1946* (Cleobury Mortimer: M&M Baldwin, 1998, repr. 1999) p. 3.

organisation. The disappointment of women joining the WRNS specifically to ‘go to sea’, only to be assigned to HMS Pembroke V, or PV/P5 as it became known in December 1942 (BP’s designation)⁶⁰, can only be imagined.

Although WRNS were by far the largest service, there also were at BP women from both the WAAF and the ATS; however, most messages that were processed by BP were *Kriegsmarine* (Naval) and therefore the predominant military service was WRNS. A gentleman’s agreement was made that “...each Service provided a large block of labour - (1) the W.R.N.S. manned the Bombes (2) Army (A.T.S.) provided the T/A (Sixta)⁶¹ (3) R.A.F., communications (W.A.A.F.).”⁶²

The use of service personnel occasionally encountered difficulties such as foreign nationals (for example, Belgians) being recruited into the ATS and sent directly to SIXTA without any consultation with SIS⁶³, which could potentially have led to allegations of spying for Axis forces.

6.3 Grading System

One method that can be used to identify potential cryptanalysts is the grading system in use at BP. Whilst it is not infallible, it is possible to use this as a gauge of position and a broad indication of capability. It is important to add that the use of the RoH to identify roles can only be used for temporary staff graded either TSAO or TJAO; it is also not possible to identify all the original 150 staff that arrived at BP in the lead up to the Second World War either by name or by grade, because this information on the RoH is sparse or missing altogether, and there are indeed some grades such as ‘CV’ whose meaning has been totally lost over time.

Regarding the women staff there is an archival document which is worth reproducing below:

⁶⁰ Page, *We Kept the Secret*, p. x.

⁶¹ Hut Six Traffic Analysis was known as SIXTA.

⁶² TNA, HW3/87, *General, Section 2, External Recruitment, Channels of Recruitment, IV Services*, p. 5.

⁶³ TNA, HW3/87, *General, Section 2, External Recruitment, Channels of Recruitment, IV Services*, p. 6.

It is under consideration to as the Treasury for approval to grade some categories of our present temporary women staff.

2. The present position is that we have a few posts as Temporary Junior Assistants (scale £260 to £350 p.a.) and a large number of posts as Linguists (scale £3 to £3.15 a week - £156 to £195 p.a.). The authorised number of posts in each grade is filled.

3. In the Linguist grade we have a number of women who either are [word illegible] linguists or who are linguists employed on equivalent work which entails no knowledge of foreign languages.

4. It is now proposed to transfer all such non-linguists to another grade called Temporary Assistants (scale £150 to £240 p.a.) they will be put on a salary equivalent to that which they are now receiving as Linguists.

5. In future our Linguists will only consist of those women with first class knowledge of the language (e.g. Honours degree or an equivalent knowledge of the language) which they are using in their work.

6. Temporary Assistants will be those women with Honours degrees (not necessarily in languages) or of corresponding qualifications who are carrying out duties other than linguistic, such as cryptographic, research, mathematical, etc

7. It should be clearly understood that women will be regraded according to the work they do and not only on account of academic qualifications.

8. In exceptional cases it may be possible to promote outstanding linguists or Temporary Assistants to temporary Junior Assistants. The broad qualifications will be a good Honours degree combined with general administrative ability. Similarly women without an Honours degree but who have proved themselves of equal value will receive equal consideration.

9. Consideration may also be given to regarding some of our present Grade II and III clerks as Temporary Assistants but this will be done only in exceptional cases.

10. Will Heads of Sections to whom this is addressed let me have as soon as possible but not later than noon on Thursday 3rd July nominal lists as follows:-

(a) Linguists employed as such;

(b) Linguists to be regarded as Temporary Assistants;

(c) and in exceptional cases Grade II and III clerks recommended for transfer to grade of Temporary Assistant.

(d) Any of (a) or (b) above recommended for promotion to Temporary Junior Assistant.⁶⁴

This shows a fascinating insight into how the roles were reassessed in 1941, to ‘untangle’ the roles and responsibilities of those women who were Linguists, and those women who were at a Linguist grade but are unlikely to have been using any language-based skills. It shows the basis for the Temporary Assistant posts.

It should also be noted that the grading system cannot be used in every single case as an accurate yardstick to compare women against men or each other. Examples can be given of the anomalies; Miss Valerie Travis does not have an allocated grade on her summary of service, but she is listed as ‘1940-1945. Hut 4 and Block A, Naval Section. Head of the Library Management team in Naval Technical Intelligence’.⁶⁵ She is also listed as assisting Geoffrey Tandy in deferred intelligence.⁶⁶ If Valerie is compared to Dr James Macrae Aitken whose summary of service in the RoH is “*Cryptanalyst, exploited a weakness in German Enigma security – ‘Aitkenismus’*”⁶⁷, Miss Travis is listed as FO Civilian while Dr Aitken is assigned TJAO, and therefore likely to have been recruited directly to BP; he is described as both a cryptanalyst and a TJAO, and had the honour of naming his method of

⁶⁴ TNA, HW8/23 *Personal. Regrading of staff (women) 1/7/41*, p. 1. (Distribution: Cooper, Smith, Knox, Bradshaw, Birch, Saunders, Travis, Milne-Barry, Tilman, Strachey. Signed by AG Denniston.)

⁶⁵ <https://bletchleypark.org.uk/roll-of-honour/9171> [accessed 5 March 2018].

⁶⁶ HW8/23, (2) *Memorandum, Organisation for Joint German-Italian Naval Section, Deferred Intelligence, (b), 30/5/41*, Commander Travis, p. 7.

⁶⁷ <https://bletchleypark.org.uk/our-story/bletchley-park-people/about-the-roll-of-honour> [accessed 5 March 2018].

codebreaking identification after himself, in a similar fashion to others such as ‘Yoxallismus’ after Leslie Yoxall, or ‘Herivelismus’ after John Herivel.⁶⁸

Whilst it is difficult to make any comparisons between ungraded roles, it is possible to compare similar temporary ones such as the TJAO and TSAO posts. The following two graphs compare the number of men and women who held the roles of TJAO and TSAO at BP over the period from 1939 to 1945.

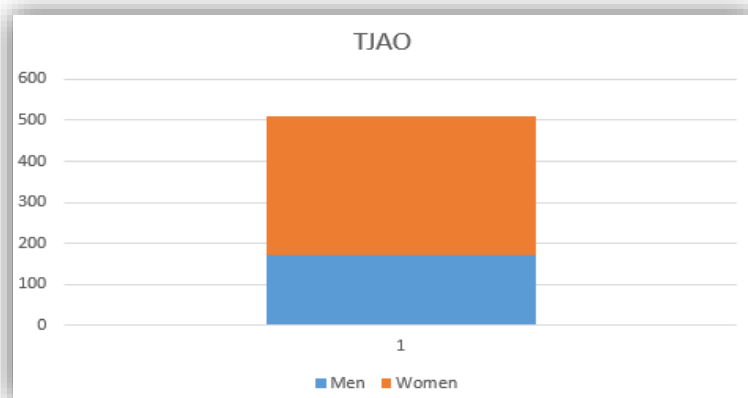


Figure 6.6: The breakdown of men and women at the level of TJAO according to the BP RoH.⁶⁹

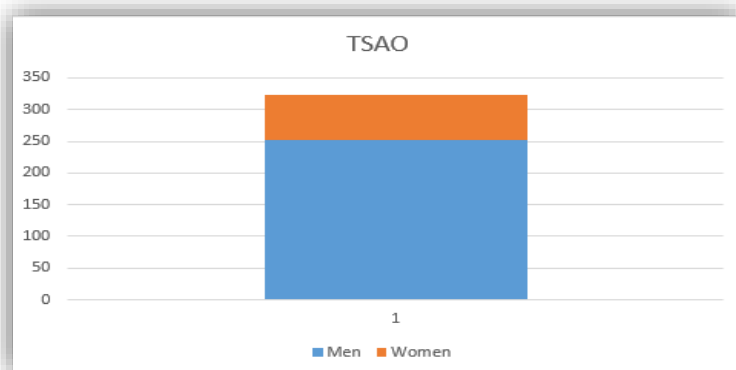


Figure 6.7: The breakdown of men and women at the level of TSAO according to the BP RoH.⁷⁰

⁶⁸ <https://bletchleypark.org.uk/roll-of-honour/4258> , <https://bletchleypark.org.uk/roll-of-honour/6951> , <https://bletchleypark.org.uk/roll-of-honour/10161> [accessed 13 May 2021].

⁶⁹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 5 May 2020].

⁷⁰ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 5 May 2020].

Figures 6.6 and 6.7 show the number of men and women as a total in their respective temporary grades. Firstly, according to the RoH the total number of men working at BP was 2,107; this means male TJAOs constitute seven percent of the total number of staff⁷¹, whereas the more senior male TSAOs constitute eleven percent of the overall total. Comparing this to the ratios for women, who total 5,733⁷², some five percent of women are graded TJO and just one percent as the more senior TSO grade. Although the percentage of men and women in a TJO graded role is not too dissimilar at seven percent male to five percent female, the disparity in the TSO graded roles is vast - at 11% male to one percent female, a full ten percent difference in the ratio between men and women. It would appear that not only was TSO a harder grade for women to achieve, but also that considerably fewer women had this option open to them.

An additional fact here is that one 1928 source indicates that a TJO could be performing the same role as a TSO⁷³, and, whilst this is some ten years before the outbreak of the Second World War, it does indicate a blurring of the grade boundary that may have continued through to the Second World War.

6.4 Female Cryptanalysts by Section

BP was a complex organisation made up of several units that were established in a series of 'huts', and later 'blocks' when they had outgrown their respective huts. Often more than one section shared a building (Hut 4 for example, contained both part of Naval Section and also Air Section⁷⁴). Taking an individual's summary of service from the RoH and using each of the locations identified therein for a statistical summary, may mean that an individual is counted twice. Bearing this in mind, each of the main sections are now identified and considered in turn

⁷¹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 5 May 2020].

⁷² <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 5 May 2020].

⁷³ TNA, HW3/51. *Memorandum*. (undated but approximately January 1928), (unnumbered).

⁷⁴ GCHQ, *History of Bletchley Park Huts & Blocks* (Bletchley Park Trust, Report No. 18 September 2009), pp. 9-10.

According to GC&CS there were four main service sections:

- *“Air Section*
- *Military Section*
- *Naval Section*
- *JAFO (Japanese Army and Air Force Section)”⁷⁵*

In addition to these areas there were also sections that processed and reported German machine cyphers. These were:

- *“Hut 3 German Army and Air Force Enigma Reporting Section*
- *Hut 6 German Army & Air Force Enigma Processing and Decryption Section*
- *Hut 8 German Navy Enigma Processing and Decryption Section”⁷⁶*
- *“the German Secret Service (Abwehr) Sections of*
 - *ISK (Illicit Services Knox)*
 - *ISOS (Illicit Services Oliver Strachey).”⁷⁷*

In addition to the areas listed above and identified by GCHQ - arguably the most important sections with the greatest number of cryptanalysts - other significant sections are considered below, to help put BP in perspective.

- Hut 4
- Diplomatic Section
- Commercial Section
- Research Section

⁷⁵ GCHQ *History of Bletchley Park Huts & Blocks* p. 3.

⁷⁶ GCHQ, *History of Bletchley Park Huts & Blocks*, pp. 3-4.

⁷⁷ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5.

- Mansfield College: Code and Cypher Production Unit
- Machine Sections
- Communications
- Y-Service
- Support Sections

Each area is considered in turn.

6.4.1 Air Section

As has been seen in Chapter Five, the Air Section was created in 1936 by Josh Cooper, who remained its head throughout World War Two⁷⁸; its role was to decrypt both Italian and German Air Force codes.⁷⁹ At the start of the Second World War, the department consisted of nine men and nine women, but by July 1944 it had grown to approximately 500, of which some two fifths were women.⁸⁰ TSAO and TJAOs in the Air Section can be seen in figure 6.8, which compares the numbers of men and women in these roles; the total number in both grades of males and females is similar, but the disparities within each grade are apparent – women predominate in the lower grade, men in the more senior.

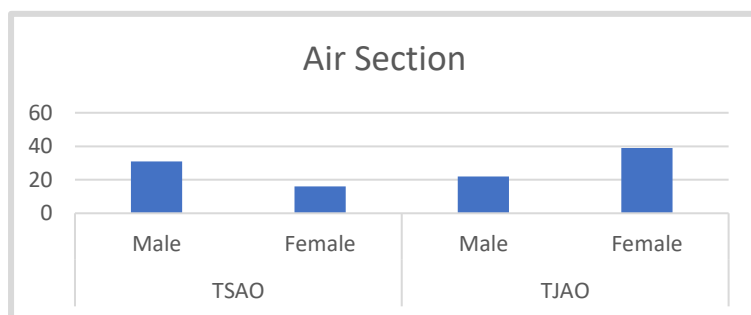


Figure 6.8 Numbers of TSAO and TJAO by gender in Air Section⁸¹

⁷⁸ https://bletchleypark.org.uk/cms/record_attachments/2123.pdf [accessed 19 April 2020] p. 1.

⁷⁹ https://bletchleypark.org.uk/cms/record_attachments/2123.pdf [accessed 19 April 2020] pp. 1-2.

⁸⁰ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 7 July 2020].

⁸¹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 7 July 2020].

One woman of note is Rhoda Welsford, who in the First World War worked in Room 40, was listed in 1939 as living at Lincoln's Inn, and was then to return to GC&CS (see above, figure 6.2). She was offered a starting salary of £3.10 per week⁸², which would seem to indicate that she was initially brought in as clerical staff - but Rhoda went on to achieve the senior TSAO grade despite her World War One experience being as a clerk⁸³. The senior cryptanalyst Bill Bonsall indicated that Rhoda was someone who, in his opinion, was working as a cryptanalyst⁸⁴, and as Bonsall headed GCHQ (successor to GC&CS) from 1973 to 1978, he is arguably well placed to know what constituted a cryptanalyst.⁸⁵ Therefore, while it cannot be confirmed beyond all possible doubt, this research has considered her to be a cryptanalyst. For comparison, Fiona Ede, also on this list, was paid three times Rhoda's initial salary, at £450 per annum (though the corresponding men were paid £600 per annum⁸⁶) and continued with the organisation until November 1944, working in several areas including Air Section, and '*Head of Call-Sign Research sub-section*'⁸⁷ - but this may well be a managerial rather than a cryptanalytical post.

Interestingly Rhoda's mother was Lady Welsford who lived in Newton Longville Manor near Bletchley. As a member of the aristocracy, Rhoda would probably have been a debutante and been fluent in other languages (probably German). Further confirmation of her status as a cryptanalyst is provided by Rozanne Medhurst, who worked in the same hut and described Rhoda as a "*brilliant code breaker and colleague of Tom Boase's at the Courtauld Institute of Art. She was aged 48. She had a powerful influence for the good on all the members of our Hut. She was a 'morale raiser' in moments of gloom.*"⁸⁸ After the war, Rhoda held the position of Librarian at the Courtauld Institute of Art and

⁸² TNA, FO366 /1075, *Personnel Earmarked for Foreign Office. Names still outstanding (7.12.1989)* p. 76.

⁸³ <https://bletchleypark.org.uk/roll-of-honour/9607> [accessed 7 July 2020].

⁸⁴ Author's interview with Bill Bonsall, 17 October 2012.

⁸⁵ <https://www.bbc.co.uk/news/uk-england-gloucestershire-30278242> [accessed 13 May 2021].

⁸⁶ TNA FO366 /1075 *Personnel Earmarked for Foreign Office. Names still outstanding (7.12.1989)* p. 75.

⁸⁷ <https://bletchleypark.org.uk/roll-of-honour/9607> [accessed 25 July 2020].

⁸⁸ Author's interview with Rozanne Colchester, 17 October 2012.

catalogued the entire collection, during which time she worked closely with Anthony Blunt, later unmasked as a Soviet agent.⁸⁹

A second woman, Marie Rose Egan, constitutes Case Study Five which follows.

CS4. Case Study Four: CBME Cryptanalyst: Miss Marie Rose Egan⁹⁰

CS4.1 Aim

To show that Miss Marie Rose Egan was a cryptanalyst who worked for GC&CS before being deployed to Egypt, where she helped establish the CBME before returning to BP.



CS4.2 Context

Miss Marie Rose Egan has been chosen as one of the case studies because the present research can prove that she worked as a high-level cryptanalyst both at BP and in Egypt. Of the five case studies, Marie Rose's family has been able to provide a detailed picture of the education that was available to Marie Rose, and therefore provide a template of the types of education leading to women's recruitment into GC&CS and work as a cryptanalyst.

CS4.3 Literature Review and Methodology

There is no mention of Marie Rose Egan in published literature. She is however included in Josh Cooper's archival record 'History of Air Section' in the National Archives⁹¹, which has provided much of the information available on her career.

⁸⁹ <http://courtauld.ac.uk/wp-content/uploads/2015/06/pa-bio-higgon1.pdf> [accessed 5 May 2017]. The academic Anthony Blunt has become better known as a Cold War Russian spy; one of the 'Cambridge Five'.

⁹⁰ Photograph provided by Clare Morgan, Marie Rose's niece.

⁹¹ TNA, HW3/83, *Personal notes on GC&CS 1925-39*, paragraph 32.

Following the identification of Marie Rose Egan as high-level cryptanalyst in the archives, it was possible to trace her further, both due to her uncommon name and also because Cooper provided her married name; this meant that it was possible to obtain her death certificate and as a result, contact her family.⁹² The family were able to provide photographs and familial detail, beyond that available in the archives, of Marie Rose's life.

CS4.4 Findings; Background

Marie Rose was born at Chateau Le Bourdieu in Saint-Médard-en-Jalles, France on 7 April 1914. Marie Rose grew up multi-lingual due directly to her Irish father and French mother, combined with time spent in England.⁹³ Marie Rose attended school at the Ecole Libre de Saint Médard before moving onto Notre Dame (de Namur) Convent in Clapham and, in about 1930 or 1931, continuing on to a convent finishing school near Munich where she learnt German.⁹⁴ Thereafter, Marie Rose matriculated at University College, London in 1932 where she obtained her BA Modern Languages including French, German and Italian; graduating in 1935.⁹⁵ This may well indicate that Marie Rose was recruited to GC&CS directly from university.

CS4.5 Cryptanalytic Work: London

It is not known what Marie Rose worked on in her first few months of employment at GC&CS, but it is known that, during the Spanish Civil War in July 1936, Marie Rose helped the Military Section with their Spanish 'material' until a Spanish speaking officer was obtained.⁹⁶ At that point

⁹² www.ancestry.co.uk [accessed 10 March 2019].

⁹³ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

⁹⁴ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

⁹⁵ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

⁹⁶ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39*, p. 5.

Marie Rose and Josh Cooper were able to move back to the Air Section⁹⁷, which would indicate that Marie Rose was already working in a cryptanalytic role in Air Section.

In 1938 the Civil Service Commission “held a competition for Junior Assistant posts on a new pay scale which provided automatic promotion to Senior Assistant after ten years’ service. Air Section recruited four J.A.s to fill the four posts newly added to its establishment. These were Miss Egan, cross promoted from within the section; LJ Cooper, PA Vlasto and JO Fischer-Sobell.”⁹⁸ This shows that Marie Rose continued working in Air Section and was ranked JA before departing for Egypt. To indicate the level at which Marie Rose was working, the three males named comprised Leonard Cooper, who was to go on to become Head of GCHQ from 1965 to 1973⁹⁹, James Fischer-Sobell, who appeared to change his name to James Saint Clair-Sobell after his marriage and possibly moved to Canada to teach¹⁰⁰, and Alexis Peter Vlasto, who was a RAF Squadron Leader (which may also indicate that the Squadron Leader rank was comparable to JA¹⁰¹), remained in the Air Section, and also went to Cairo in July 1940 until February 1943.¹⁰² Post-war, Vlasto by 1954 had become a university lecturer in Slavonic Studies at Cambridge.¹⁰³ This evidence shows that, certainly before the Second World War, JAs were likely to be considered suitable material for future important positions.

⁹⁷ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39*, p. 5.

⁹⁸ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part VIII Expansion of Air Section GC an CS* p. 11.

⁹⁹ West, *GCHQ*, p. xv.

¹⁰⁰ <http://www.thepeerage.com/p57733.htm> / https://www.researchgate.net/scientific-contributions/2073812824_James_St_Clair-Sobell [accessed 21 April 2020].

¹⁰¹ <https://bletchleypark.org.uk/roll-of-honour/9343> [accessed 21 April 2020].

¹⁰² TNA, HW3/83 *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18.

¹⁰³ <https://bletchleypark.org.uk/roll-of-honour/9343> [accessed 19 April 2020].

CS4.6 Cryptanalytic Work: Egypt

After 1929, the Admiralty had started to take the situation in the Far East more seriously¹⁰⁴, and strategically Egypt was a good location for the Allies to establish a base, due to its proximity to the Suez Canal, and the resulting shortened journey time to the Far East.¹⁰⁵

Marie Rose sailed from Southampton on the *SS Dilwara* on 9 March 1939 for Egypt.¹⁰⁶ The party consisted of four people: Marie Rose, Fischer-Sobell and two Italian linguists Miss Mason and Miss Berry who had both been working on plain language (uncoded) messages at Air Ministry AIIC.¹⁰⁷

Marie Rose was in Alexandria in 1940 and then in Cairo; she is believed not to have returned to England until late 1942.¹⁰⁸ Although the exact date of Marie Rose's move to Cairo was unknown, it is quite likely that it could have been November 1940 when the CBME was formed in Heliopolis, Cairo.¹⁰⁹ Following the outbreak of war with Italy, Air Section combined with the Air Ministry Interception Station (in Heliopolis) to create the CBME.¹¹⁰

In 1941 CBME was supplementing the work carried out by BP; decrypting “*locally intercepted signals in the hand cyphers used by the Abwehr in Turkey, and later by the Abwehr and Sicherheitsdienst in the Balkans, the Aegean and north [sic] Africa.*”¹¹¹ In July 1941 CBME also broke a medium-grade field cypher

¹⁰⁴ Denniston, *thirty secret years*, p. 114

¹⁰⁵ J. Lee Ready, *World War Two Nation by Nation*. (London: Arms and Armour Press. 1995), pp. 74-75.

¹⁰⁶ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18, and Author's interview with Clare Morgan, 9 May 2019.

¹⁰⁷ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18.

¹⁰⁸ Author's interview with Clare Morgan, 9 May 2019 (and details provided by nephew Michael Egan).

¹⁰⁹ *The Oxford Companion*, p. 253.

¹¹⁰ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18.

¹¹¹ Hinsley, *British Intelligence* p. 20.

used by the Germany Army in North Africa, based on work already carried out in Crete.¹¹² It is known that in Cairo Marie Rose was decrypting Italian high-grade Air Force cypher traffic.¹¹³

‘This decentralisation of decryption was quite successful. Miss Egan’s party, with later reinforcements, held full responsibility for decryption and reporting of Italian Air Force traffic in East Africa until the end of hostilities in that theatre, except for one brief period when the Italians made a major change that called for some assistance from Bletchley. I have not seen any mention of Sigint in any historical record, but I believe that the military and air end-product from Combined Bureau Middle East was of considerable value to Wavell’.¹¹⁴

It is important to note that Cooper describes the party as ‘Miss Egan’s party’, indicating that Marie Rose carried responsibility for the group rather than Fisher-Sobell who was both male and the other JA.

Furthermore, Marie Rose was not the only known female cryptanalyst who worked in Cairo. As has been seen in Chapter Four, Emily Anderson was based there from 1940 to 1943 as a cryptanalyst.¹¹⁵ Miss Dorothy Brooks is also listed as working in Cairo from June 1940 to 1943.¹¹⁶ Although it is not clear which role she carried out; Dorothy is listed as a TJAO and went on to work in the Commercial Section.¹¹⁷ This could mean she was a cryptanalyst, although more research would be needed to confirm this, and is of interest because it gives an indication of the level of other people working at CBME. It seems probable from this information that Marie Rose was one of the most senior people at CBME, despite her JA grade.

¹¹² Hinsley, *British Intelligence*, p. 293.

¹¹³ TNA, HW3/83, *Personal Notes on GC&CS 1925-39*, Paragraph 32.

¹¹⁴ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18

¹¹⁵ <https://bletchleypark.org.uk/roll-of-honour/164> [accessed 19 April 2020] (See Chapter Five).

¹¹⁶ <https://bletchleypark.org.uk/roll-of-honour/1179> [accessed 19 April 2020].

¹¹⁷ <https://bletchleypark.org.uk/roll-of-honour/1179> [accessed 19 April 2020].

Following the work carried out for CBME, Marie Rose returned to BP. She also took a Japanese course, which would indicate that she did some work on Japanese codes on her return. It is most likely that this course took place in Bedford where there was a language school, which most BP incumbents attended; this was confirmed by Mary Body, Marie Rose's friend who worked with her at BP / GCHQ and who was able to give Marie Rose's nephew this information.¹¹⁸

CS4.7 After the War

Marie Rose was awarded an MBE in January 1946, most probably for her work with CBME.¹¹⁹ Following the war, Marie Rose married BP colleague Peter Palmer in 1950 and became a 'housewife'. The family believes that Peter became First Secretary at the British Embassy in Washington.¹²⁰ This has been confirmed by the Foreign Office List.¹²¹ Several women have worked as diplomats, particularly over recent decades¹²², and it is possible that Marie Rose could have also held a position at the Embassy, but since the family are unaware if she did and she is not listed in the Foreign Office List, it is more likely that she would have been seen in the role of diplomat's wife, rather than holding an independent role, particularly as there is no record that she continued with the organisation after the end of the Second World War. Later, Peter had been tipped to lead GCHQ (as GC&CS had become) but he passed away in 1963. Following Peter's death, Marie Rose became chatelaine of her brother's house and the main carer for his children. She made a very conscious choice not to return to GCHQ despite her friend Mary Body's encouragement. She grieved very deeply for Peter and, having made a commitment to raise her brother's three children, she let go of one life and embraced another.¹²³ Having lived life at a very

¹¹⁸ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

¹¹⁹ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

¹²⁰ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

¹²¹ The Foreign Office List and Diplomatic and Consular Year Book (London: Official Records, 1957), p. 81A, (repr. 1958), p. 82.

¹²² McCarthy, *Women of the World*, pp. 153-310

¹²³ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

senior level when she was married to Peter, and being well acquainted with other senior personnel at GCHQ and in Washington including Louis Tordella, it is the family's understanding that she was also reluctant to return at a junior level, as would have been necessary after a long gap in service.¹²⁴ This is a fate familiar to several other women from BP; despite it being then a 'society norm', it is poignant that so many women either were forced through redundancy, or 'chose', to give up their careers in a way that is far removed from today's cultural norms.

CS4.8 Conclusions

It can be said without doubt that Marie Rose was working as a high-level cryptanalyst from early in her career at GC&CS. Her skills were quickly recognised, and her linguistic abilities combined with her skill as a cryptanalyst allowed her to work on Spanish traffic within a year of starting at GC&CS. It is known from the archives that Marie Rose was a JA with automatic promotion to SA after ten years.¹²⁵ Despite her never speaking about her role in GC&CS, it has been possible to piece together some of the jobs she worked on. Working closely with Josh Cooper, she was able to help support the Spanish section before a permanent appointment was made, and she was considered important enough to be sent to help set up CBME. Her brother used to say to his children that she was 'running the show out there' in Egypt at that time, and the archival record seems to support this.¹²⁶ It is very surprising in this gendered society that a woman was able to do this when there were men of a similar grade and situation who were essentially overlooked. A colleague who knew Marie Rosie in a professional capacity in Egypt recalled to her sister-in-law that she was respected by all as a very formidable boss.¹²⁷ It is interesting to speculate whether, if

¹²⁴ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

¹²⁵ TNA, HW3/83, *Air Section GC and CS and the Approach to War 1935-39. Part VIII, Expansion of Air Section GC and CS, paragraph 30*, p. 11.

¹²⁶ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

¹²⁷ Author's interview with Clare Morgan, 9 May 2019 (and details provided by Michael Egan).

Marie Rose had been a man, she would have been considered for the position of head of GCHQ, but this is of course a question that unfortunately can never be answered.

This case study is rare, in that it is as a rule difficult to piece together information for female high-level cryptanalysts because so little information exists. It is only with a familial identification that intricate detail can be provided, which, with study, it is possible to match to archival records and provide a more complete picture.

6.4.2 Military Section

The Military Section was started by Colonel John Tiltman in 1930, who remained head until 1944 when it was taken over by Colonel FA Jacob.¹²⁸ The section was initially located in the Mansion but moved to Hut 5 in 1940, before finally moving to Block F in August 1943.¹²⁹

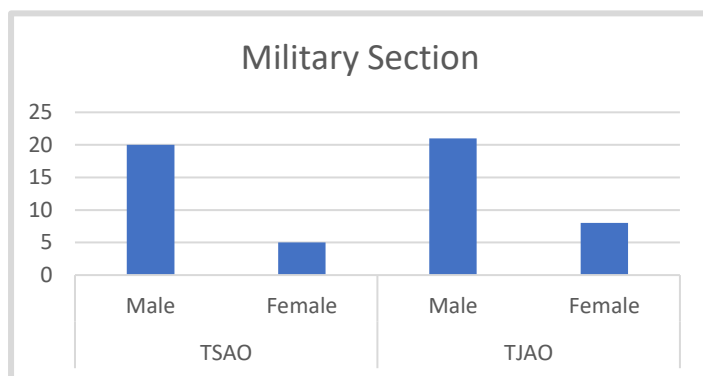


Figure 6.9 Numbers of TSAO and TJAO by gender in Military Section¹³⁰

Figure 6.9 shows that the numbers of men in both TSAO and TJAO grades were approximately equal, and that there were slightly more women in the junior role compared to the senior. However, comparing the numbers of women to men in each grade, there is a significant discrepancy - there were four male TSAO to every single female. This shows clearly that the men in Military Section

¹²⁸ GCHQ, *History of Bletchley Park: Huts & Blocks*, p. 3.

¹²⁹ GCHQ, *History of Bletchley Park: Huts & Blocks*, p. 3.

¹³⁰ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 4 July 2020].

held most higher graded posts despite the section having relatively similar numbers of women (355) and men (427).

It is possible to identify some of these women as likely (though not absolutely conclusively) cryptanalysts. Included in one of the archival records is a “*List of persons who went down to Bletchley in Aug. 39*”¹³¹ Within this list, under the Military Section, are four women listed as ‘working on Italian codes’¹³² - Miss Sercombe, Miss Taylor, Miss Elizabeth Anderson, and Miss Thompson.¹³³

Miss Daphne Sercombe is listed on the RoH and so more information can be ascertained. She was born on 15 June 1912, so would have been 27 when she started working at BP.¹³⁴ She is also listed as living at 43 Palace Mansions, Fulham and working as a clerk at the Foreign Office, according to the 1939 England and Wales Register.¹³⁵ Daphne went on to marry fellow cryptographer Alan Bradshaw in Leighton Buzzard in 1941.¹³⁶ Daphne is described on the RoH as TSAO and at BP “*from 1939. Mansion, Hut 5 ad Block F. Military Section. Probably also Research Section.*”¹³⁷ It is known that she “*Has been working in the Military Section for several years. Has been employed on key breaking and has successfully broken keys of one Italian book. Normally employed on book building, indexing and registration.*”¹³⁸

Miss Elizabeth “Andy” Anderson, who is also listed as a TSAO is described thus: “*1939-June 1943 Hut 5, Military Section, Italian. Hut 10 and Block F(4). Meteorological. ISIS Bedford. Mauritius. Berkeley Street and Aldford House June 1943-1945 Diplomatic and Commercial Section.*”¹³⁹

¹³¹ TNA, HW3/82, Military Section, (unnumbered).

¹³² TNA, HW3/82, Military Section, (unnumbered).

¹³³ TNA, HW3/82, Military Section, (unnumbered).

¹³⁴ www.ancestry.co.uk [accessed 23 April 2020].

¹³⁵ www.ancestry.co.uk [accessed 23 April 2020].

¹³⁶ www.ancestry.co.uk [accessed 23 April 2020].

¹³⁷ <https://bletchleypark.org.uk/roll-of-honour/8180> [accessed 23 April 2020].

¹³⁸ TNA, HW3/1, *Chapter VI War 1939-1941*, p. 7.

¹³⁹ <https://bletchleypark.org.uk/roll-of-honour/163> [accessed 23 April 2020].

Regarding the other two women, there are several Taylors and Thompsons on the list, and identity must be hypothesised rather than conclusively proven. A Miss Jean Thompson is likely to be the one listed in the document, as she is described on the RoH as BP “*from September 1939. Hut 5, Military Section, Italian. Hut 10, Block A and Block F(A), Air Section, including Meteorological. Breaking Rumanian cypher for Crib into German air meteorology.*”¹⁴⁰

Miss Taylor is most likely to be Miss Pamela Elise Taylor, since she was also a FO Civilian and is listed on the RoH as “*1939 – c.1945. Hut 5 1939-1945. Block F 1943 – c.1945. Military, later Air Section. Italian linguist.*”¹⁴¹ However, Miss Pamela Taylor is listed as a TJAO, indicating perhaps that her level or abilities were lower than the others in 1939 (or that there were no TSAO grades available), although she is the only one who is also described as a linguist on her entry; it may simply be that there were no more available TSAO posts within the Treasury-approved establishment levels.

All four women were listed as “*persons who went down to Bletchley in Aug. 39*”, working on Italian¹⁴² and are described as ‘female clerks’ in 1939, which indicates that they were promoted to a temporary senior grade during their work at BP¹⁴³ - this is significant, because it could indicate all four working in cryptanalytic roles after their work for the organisation in the lead up to the Second World War.

Whilst it is interesting to be able to identify more about these women than is listed on the RoH, it is difficult to be able to identify beyond all possible doubt whether all four could be considered cryptanalysts, this being important because it would further prove that more women were working in a more significant role than has been previously believed; three certainly appear to have been

¹⁴⁰ <https://bletchleypark.org.uk/roll-of-honour/9035> [accessed 18 July 2021].

¹⁴¹ <https://bletchleypark.org.uk/roll-of-honour/8938> [accessed 18 July 2021].

¹⁴² TNA, HW3/82, *Military Section, Docs related to N/S 12.7.39.*

¹⁴³ TNA, HW3/82, *Org & Evol: of Military Sigint. Breakdown of Sections by duties. 27th July 1939.*

so, and the query against the fourth is her junior grading. However, the Case Study shows that it was possible to confirm absolutely that Marie Rose Egan was working as a cryptanalyst despite her JA grade, and it seems likely that Pamela Taylor also was.

As can be seen from figure 6.9, the numbers of women occupying these roles were extremely low throughout the war years, particularly bearing in mind the total of 838 members of female staff working here over the six-year period.

6.4.3 Naval Section

Naval Section was created by William F ‘Nobby’ Clarke in 1924.¹⁴⁴ He remained in post until 1941 when he was replaced by Frank Birch.¹⁴⁵ The section was originally located in the Mansion library. The German subsection moved to Hut Four by the end of 1939 and remained there until August or September 1942 when it moved to Blocks A and B.¹⁴⁶ A total of 1,807 members of staff worked in Naval Section over the six-year period.¹⁴⁷ As can be seen in figure 6.10, the absolute numbers of male TSAO and of both male and female TJAOs are comparably high, which is surprising because it is unusual to have such a high number of TSAO and TJAOs in one department. The most striking difference is, obviously, the small number of female TSAOs.

¹⁴⁴ GCHQ, *History of Bletchley Park: Huts & Blocks*, p. 3.

¹⁴⁵ GCHQ, *History of Bletchley Park: Huts & Blocks*, p. 3.

¹⁴⁶ GCHQ, *History of Bletchley Park: Huts & Blocks*, p. 3.

¹⁴⁷ <https://bletchleypark.org.uk/roll-of-honour> [accessed 5 May 2020].

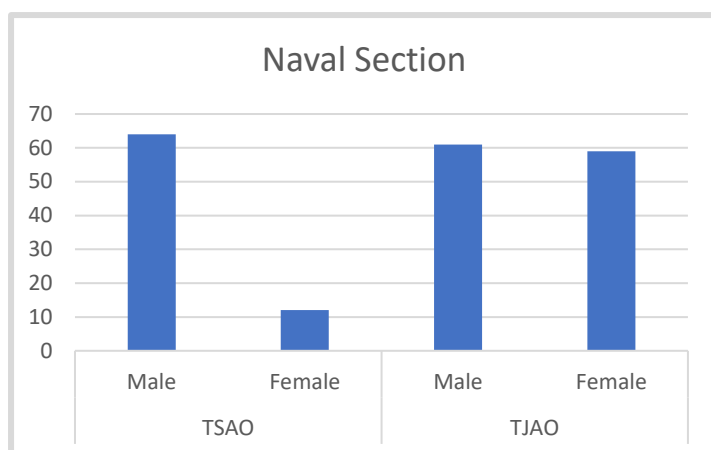


Figure 6.10 Numbers of TSAO and TJAO by gender in Naval Section¹⁴⁸

This thesis has identified two female cryptanalysts as part of Naval Section, both of which are discussed as Case Studies - Wendy White (CS3) and Mavis Lever (CS6).

A further woman of note is Marjorie Dale, who worked for Naval Cryptographic section in 1920.¹⁴⁹ Marjorie, “*who had had experience in the Swedish Diplomatic Section and was to prove a very competent cryptographer later on*”¹⁵⁰, is also listed as working on Naval Attaché, and Italian Diplomatic codes in July 1941¹⁵¹. She is listed as TSAO on the RoH¹⁵², according to which her service was “*Mansion, Hut 5, Hut 9 and Block B. Naval Section, Italian, on naval attaché cipher to September 1943. Japanese course, in NS XII September 1943. Naval Section, Japanese 1944 - 1945, Head of a team in NS II J.*”¹⁵³ Further, she is described as “*Pre-war Fellow of Lady Margaret Hall Oxford, Reader in Classics at Birkbeck College London 1952 – 1963.*”¹⁵⁴ Marjorie attended Somerville College and would seem to have made an

¹⁴⁸ <https://bletchleypark.org.uk/roll-of-honour/search?location=Naval&page=1> [accessed 3 May 2021].

¹⁴⁹ CCAC, GRB/0014/CLKE/3/3 Official History.

¹⁵⁰ TNA, HW3/1, *Chapter VI War 1939-1941*, p. 7.

¹⁵¹ TNA, HW8/23, *State of work on Italian Naval Codes and Cyphers in use in July 1941*, p. 6.

¹⁵² <https://bletchleypark.org.uk/roll-of-honour/2257> (accessed 5 May 2020). Marjorie is listed as living in Linslade, Bedfordshire on the 1939 England and Wales Register, she went on to marry Thomas Webster in 1944: www.ancestry.co.uk [accessed 5 May 2020].

¹⁵³ <https://bletchleypark.org.uk/roll-of-honour/2257> [accessed 5 May 2020].

¹⁵⁴ <https://bletchleypark.org.uk/roll-of-honour/2257> [accessed 5 May 2020) Marjorie became a world-renown and published classicist who was Professor Emeritus in Greek at the University of London, a post she had held for four

impression even then, as she was elected first president of a “*society for women Greats* [sic] *students, ‘The Megalomaniacs.’*”¹⁵⁵ Marjorie is the only woman listed on the “*Appointments from outside the Civil Service*”¹⁵⁶ and was the only woman to do the first six-month Japanese course in Bedford.¹⁵⁷ It is clear from the details listed in the archives that Marjorie was a cryptanalyst. Marjorie went on to marry fellow Naval Section member Thomas Webster in 1944. Dermot Turing lists her as ‘Madge’ Dale, and hints at an obituary “in the ‘Brown Book’ at Lady Margaret Hall College”; unfortunately, despite a request for a copy of the ‘Brown Book’ entry, the College were unable to help this researcher.¹⁵⁸

Other potential cryptanalysts are Ruth Briggs who worked in NS I – German cryptography,¹⁵⁹ and actress Pamela Gibson¹⁶⁰ who worked on Japanese naval codes and cyphers before becoming Head of Naval Section records.¹⁶¹ Because no independent confirmatory material has been found in the archival records, they cannot absolutely be confirmed as cryptanalysts, but remain on the ‘likely’ list (see Appendix Three).

Another note-worthy woman is Jane Hughes who worked in Naval Section, specifically in the Hut Six Decoding Room.¹⁶² Jane had set up her Typex machine to decode the message when she saw a ‘stream of German’ coming out, as she had been typing automatically, she hadn’t paid attention

years before her death in 1967. https://books.google.co.uk/books?id=gjlza-sYRREC&pg=PR9&redir_esc=y#v=onepage&q&f=false [accessed 5 May 2020].

¹⁵⁵ Pauline Adam, *Somerville for Women: An Oxford College 1879-1993*. (Oxford: Oxford University Press. 1996), p. 208

¹⁵⁶ TNA, FO366/1075, *Assignments from outside the Civil service*, p. 26.

¹⁵⁷ https://bletchleypark.org.uk/cms/record_attachments/1890.pdf [accessed 5 May 2020]. Later courses were a month so that individuals could have the basics of the Japanese language.

¹⁵⁸ Dermot Turing, *The Codebreakers of Bletchley Park: The Secret Intelligence Station that Helped Defeat the Nazis* (London: Arcturus Holdings Limited. 2020), pp. 146-147

¹⁵⁹ <https://bletchleypark.org.uk/roll-of-honour/1122> [accessed 4 July 2020].

¹⁶⁰ Smith, *The Secrets of Station x*, p. 165.

¹⁶¹ <https://bletchleypark.org.uk/roll-of-honour/3462> [accessed 4 July 2020].

¹⁶² Smith, *The Debs of Bletchley Park*, p. 71.

to the actual message until she saw the word ‘Brest’.¹⁶³ Once she had read the message and realised that it was the location of the *Bismarck*; the message was rushed to the Admiralty and the *Bismarck* was sunk. This incident illustrates the importance of work carried out by women who cannot be considered high-level cryptanalysts but still need to be acknowledged for the important role that they played.

6.4.4 JAFO

Jafo “possibly expands to ‘Japanese Forces’”.¹⁶⁴ This section was a combination of Japanese Army and Air Force. It was headed by L.J. ‘Joe’ Hooper and formed under the auspices of Air Section in late 1944¹⁶⁵; Hooper would later go on to become head of GCHQ in the 1960s. According to the RoH, there were a total of 187 people working in Jafo, and 998 people who worked on Japanese codes. It is important to note that as World War Two progressed and the Allies gained victory in the European theatre, staff were redeployed to deal with Japanese codes.

As can be seen in figure 6.11, in both TSAOs and TJAO grades there are a far larger number of males than females.

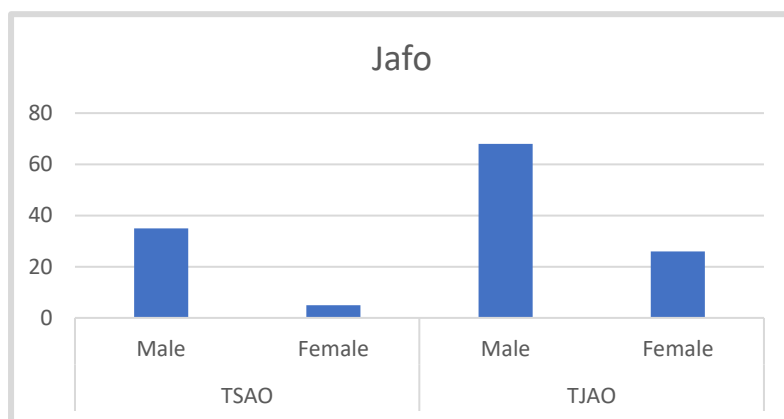


Figure 6.11 Numbers of TSAO and TJAO by gender in Jafo

¹⁶³ Smith, *The Debs of Bletchley Park*, p. 71.

¹⁶⁴ GCHQ, *History of Bletchley Park Huts & Blocks 1939-1945*, p. 3

¹⁶⁵ GCHQ, *History of Bletchley Park Huts & Blocks 1939-1945*, p. 3

One woman of note in the Japanese section was Rebecca Gibson (photo on right¹⁶⁶). Rebecca was from Northern Ireland and studied English at Queen's University Belfast¹⁶⁷, going on to teach English at a grammar school there before being recruited to BP.¹⁶⁸ On the RoH, Rebecca is listed as starting in 1943 and working in Naval Section, Italian Sub-section, and Japanese Naval Sub Sections NS IIJ. In addition to studying on the one-month Japanese course, she also did the one-month mathematics course.¹⁶⁹ Rebecca worked on JN25 which was a subtractor Japanese naval code.¹⁷⁰ Rebecca is listed as a TJAO, but her husband, who worked with her, indicated that in his opinion she was working as a cryptanalyst.¹⁷¹ Rebecca continued working for GCHQ after the Second World War ended. There is, therefore, circumstantial evidence to indicate that Rebecca was cryptanalyst, but the opinion of another cryptanalyst who was her husband, might be skewed following the passing of time, and their marriage. When asked what constituted a cryptanalyst, her husband suggested that the grade of TSAO was a good indicator, but that several TJAOs should also be considered cryptanalysts.¹⁷² Therefore, as there is no independent corroboration, and because there may be unconscious bias on the behalf of her husband, Rebecca has for the present research been categorised only as a 'likely' cryptanalyst; more research would be needed absolutely to confirm her status.



¹⁶⁶ Photograph provided by Edward Simpson.

¹⁶⁷ <https://bletchleypark.org.uk/roll-of-honour/3453> [accessed 10 July 2020].

¹⁶⁸ https://bletchleypark.org.uk/cms/record_attachments/1890.pdf [accessed 10 July 2020].

¹⁶⁹ https://bletchleypark.org.uk/cms/record_attachments/1890.pdf [accessed 10 July 2020].

¹⁷⁰ JN25 was a sub-tractor code. This was a transposition code that was number based. In order to double check the code, the vast numbers were based on a number divisible by three.

¹⁷¹ Author's interview with Edward Simpson, 5 November 2012.

¹⁷² Author's interview with Edward Simpson, 5 November 2012.

One area of Japanese cryptanalysis which differed from other codes was that of the processes that Japanese codebreaking had to follow, and the work of two more women can be considered in relation to this aspect.

Joy Aylard was a Leading WRN listed on the RoH.¹⁷³ After the European war finished, she switched to the Pacific theatre, and then moved from Eastcote to BP.

... I was immediately put in a section run by someone called Hugh Foss. For about the first month I was working on my own, going through a codebreakers' course in English, not Japanese... Then for a very short time I was working on a Japanese code, just pencil and paper, in the corner of a room, on blocks of numbers. I can't remember much about it, because in August the war was over.¹⁷⁴

Temporary Assistant (TA) Win Wenman also worked in Hut Seven and clearly remembered working on JN25 and JN11, but her strongest memories were that the work involved blocks of numbers which had to be added to another number before being divisible by three, which is how the start of the message could be found. She stressed that the work was not difficult but had to be correct.¹⁷⁵

This would indicate that both Joyce and Win worked not as cryptanalysts, but as 'strippers',¹⁷⁶ an important and necessary part of the cryptanalytic process; stripping was essential because of the way the codes were set up. The Japanese had codebooks, and the way that the codes could be checked by the Japanese was to see if they were divisible by three. If they were, then they were likely to be correct and could be transmitted. The individuals involved in stripping numbers could not be classed as cryptanalysts (they did not themselves break codes) although their work was an

¹⁷³ Joyce Ethel Baker (née Aylard) <https://bletchleypark.org.uk/roll-of-honour/364> [accessed 10 July 2020].

¹⁷⁴ https://bletchleypark.org.uk/cms/record_attachments/1578.pdf [accessed 29 March 2020] p. 2.

¹⁷⁵ Author's phone interview with Win Merison (née Wenman), 16 October 2012.

¹⁷⁶ Author's interview with Edward Simpson, 5 November 2012.

important part of the cryptanalytic process preceding the actual cryptanalysis to find the key for the day's code.

6.4.5 Hut Three

Hut Three dealt with German Army and Air Force Enigma reporting and was initially started in 1939 by Wing Commander Frederick Winterbotham.¹⁷⁷ There were a total of 353 people working in Hut 3, of whom 185 were women.¹⁷⁸ The same major disparity between the ratios of women to men in the TSAO and TJAO grades is quite clear – more men than women in the senior role, more women than men in the junior.

This research has not identified any definite female cryptanalysts in Hut Three, although there were nine female TSAOs in the department; it cannot be said that these TSAO women were not cryptanalysts, and their work and role is an area for further research.

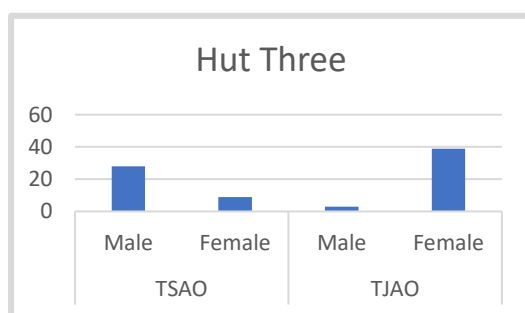


Figure 6.12 Numbers of TSAO and TJAO by gender in Hut Three¹⁷⁹

Of the 39 female TJAOs who worked in Hut Three, four are also listed as having worked in SIXTA (see figure 6.12); there were close links between Hut Three and Hut Six, and it would seem logical that some individuals worked in both areas. It is worth adding here that for reasons unknown, in the GCHQ report which includes the main BP Huts and Blocks, Hut Four is not included.¹⁸⁰

¹⁷⁷ GCHQ, *History of Bletchley Park Huts & Blocks* p. 3.

¹⁷⁸ <https://bletchleypark.org.uk/roll-of-honour/search?location=hut%203&page=1> [accessed 4 May 2021].

¹⁷⁹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 20 July 2020].

¹⁸⁰ GCHQ, *History of Bletchley Park Huts & Blocks*, pp. 3-4.

6.4.6 Hut Six

Hut Six dealt with German Army & Air Force Enigma Processing and Decryption. The RoH indicates a total of 341 people worked in the department over the six years it was active.¹⁸¹ As can be seen in figure 6.13, the familiar pattern repeats - a large ratio of female to male TJAOs, and a similarly large proportion of male to female TSAOs (see figure 6.13).

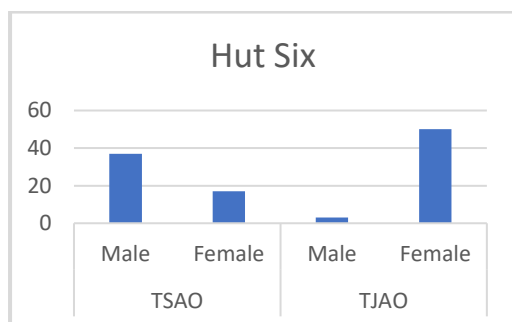


Figure 6.13 Numbers of TSAO and TJO by gender in Hut Six¹⁸²

Little is known about the TSAO women in Hut Six, but one woman of note is Mary Moncrieff Wilson who was a former student from Newnham College and arrived at BP in “late 1940 [until] 1945. *Hut 6 and Block D(6). Cryptanalyst, head of Machine Room in 1943.*”¹⁸³ The source of the information that she was a cryptanalyst is unclear; it may be based on information she or her family provided, but it may be that she was taken as working in a cryptanalytic role simply due to her position as head of Machine Room; however, it is not clear what the job of ‘head of Machine Room’ would entail beyond a managerial role, and Mary, for the present research, is regarded as a ‘possible’ cryptanalyst, but needing considerable additional research to verify this description.

¹⁸¹ <https://bletchleypark.org.uk/roll-of-honour> [accessed 20 July 2020].

¹⁸² <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 20 July 2020].

¹⁸³ <https://bletchleypark.org.uk/roll-of-honour/9919> [accessed 6 May 2020].

6.4.7 Hut Eight

Hut Eight dealt with German Navy Enigma Processing and Decryption. As stated above, most intercepts that came into BP were naval, so it is likely that this Hut, as part of Naval Section, would have been considered highly important, which may account for the large number of male TSAO compared to the other grades shown in figure 6.14.

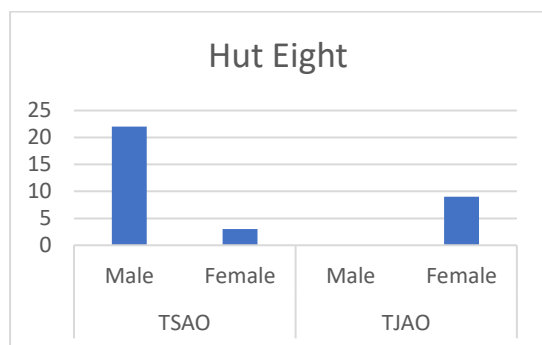


Figure 6.14 Numbers of TSAO and TJAO by gender in Hut Eight¹⁸⁴

One Hut 8 female TSAO was Joan Clarke, who, as described in Chapter Two, is one of the three foremost recognised female cryptanalysts at BP. Joan was born in 1917 into an educated family, predominantly of vicars, and was extremely gifted in maths which allowed her to “...advance as far as she was able, rather than permitted.”¹⁸⁵ Her listing in the RoH is “June 1940 - 1945. Hut 8 and Block D(8). Cryptanalyst. Deputy Head of Hut 8 1944.”¹⁸⁶ Joan arrived at BP on 17 June 1940 and worked alongside Turing in Hut Eight, despite her expecting to be working with Welchman (her former tutor) in Hut Six¹⁸⁷; Joan had studied Mathematics at Cambridge, described how her skills were quite quickly recognised, and was promoted within a short space of time to work alongside the male cryptanalysts.¹⁸⁸ Joan also includes the information that she was first promoted to linguist grade in order to be paid a more appropriate salary for the work she was doing, a fact which is

¹⁸⁴ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 20 July 2020].

¹⁸⁵ Randall, *Joan Clarke*, p. 28.

¹⁸⁶ <https://bletchleypark.org.uk/roll-of-honour/1768> [accessed 23 April 2020].

¹⁸⁷ Murray, ‘Hut 8 and Nava Enigma, Part I’, pp. 113-118.

¹⁸⁸ Murray, ‘Hut 8 and Nava Enigma, Part I’, p. 114.

important because it shows that grades were not self-evidently logical - indeed, Joan says she delighted in answering a questionnaire: “*grade linguist, languages none*”.¹⁸⁹ Joan describes early additional work on German Railway Enigma, and Italian naval codes.¹⁹⁰ Once the work stopped on the labour-intensive ‘Banburismus’ (an early method of codebreaking using specially created hole-punched sheets made in Banbury), many of the departmental staff changed their roles; it became unnecessary to retain as many staff, as the bombe carried out the work previously undertaken by people, but Joan remained in the department.¹⁹¹ It is known that Joan later worked on the four wheel Naval Enigma - the Dolphin and Shark codes.¹⁹² Ultimately, Joan ended her career at BP as Deputy Head of Hut Eight. However, Joan went on to work for GCHQ in H Division and despite her marriage to Jack Murray, continued to work intermittently for GCHQ until her retirement; she returned to assist Harry Hinsley in writing the official history.¹⁹³ Joan was appointed an MBE in January 1946¹⁹⁴ and died in 1996.¹⁹⁵

6.4.8 ISK

ISK stood for Illicit Services Knox and was created by Dilly Knox in late 1939 or early 1940 to deal with Abwehr Enigma and other Abwehr machine systems¹⁹⁶; ISK was a sub-section of Naval Section. Knox was known to prefer working with women, but it is noteworthy that although there were more women than men working in the department, the male/ female grading ratio at TSAO level stayed remarkably similar to the overall average (although that at TJAO level was slightly more balanced). This can be seen in figure 6.15 below.

¹⁸⁹ Murray, ‘Hut 8 and Nava Enigma, Part I’, p. 114.

¹⁹⁰ Murray, ‘Hut 8 and Nava Enigma, Part I’, pp. 113-118.

¹⁹¹ Murray, ‘Hut 8 and Nava Enigma, Part I’, pp. 113-118.

¹⁹² Randall, *Joan Clarke*, p. 83.

¹⁹³ Randall, *Joan Clarke*, pp. 144-46.

¹⁹⁴ <https://bletchleypark.org.uk/roll-of-honour/1768> [accessed 23 April 2020].

¹⁹⁵ Randall, *Joan Clarke*, p. 148.

¹⁹⁶ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5.

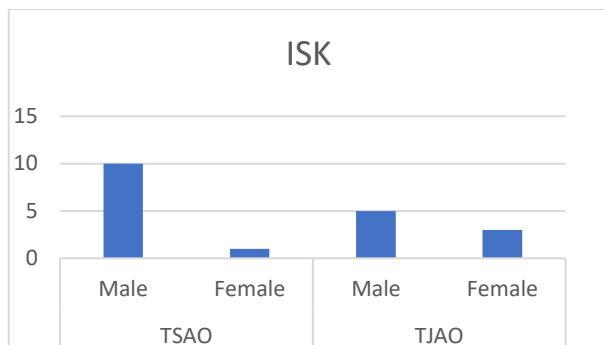


Figure 6.15 Numbers of TSAO and TJAQ by gender in ISK¹⁹⁷

Two well-known female cryptanalysts in ISK can be examined in turn.¹⁹⁸ The second foremost recognised female cryptanalyst is Margaret Rock.¹⁹⁹ Her record on the RoH is negligible, summarised as “*from April 1940. Cottage, Research Section. Later with ISK*”²⁰⁰, and it has been possible to find further information. Margaret was born on 7 July 1903 in Hammersmith to Frank and Alice Rock.²⁰¹ Margaret was also a mathematician and was awarded a Mathematics Class II degree in 1925 at Bedford College for Women at the University of London.²⁰² It is thought that she was recruited through a contact at Whitehall²⁰³, and it is known that Margaret worked in ISK under Knox - she is mentioned in Knox’s poem about Matapan (Appendix Six). Most of the information in the public domain regarding Margaret has been provided by Mavis Lever. Mavis indicated that Margaret was senior to her, and, as this is generally accepted beyond doubt, Margaret can firmly be regarded as a cryptanalyst.²⁰⁴ It is also known that Margaret continued on with GCHQ and it



¹⁹⁷ <https://bletchleypark.org.uk/roll-of-honour> [accessed 7 May 2020].

¹⁹⁸ As has been seen the three best known women from this period are Joan Clarke, Margaret Rock and Mavis Lever.

¹⁹⁹ Photograph: <https://www.girlmuseum.org/the-women-codebreakers-of-bletchley-park/> [accessed 25 July 2020].

²⁰⁰ <https://bletchleypark.org.uk/roll-of-honour/7820> [accessed 5 May 2020].

²⁰¹ Author’s interview with Charles Foster, 21 September 2013.

²⁰² Author’s interview with Charles Foster, 21 September 2013.

²⁰³ Author’s interview with Charles Foster, 21 September 2013.

²⁰⁴ Author’s interview with Mavis Batey, 11 July 2011.

is likely that she held a ‘commanding’ position at GCHQ as a department head where she controlled 600 workers, although this cannot be absolutely verified at this time.²⁰⁵ Margaret was awarded an MBE in the Birthday Honours List in 1945.²⁰⁶

The third and final woman who can be identified as a cryptanalyst is Mavis Lever and a more in-depth study on her is now described.

***CS5. Case Study Six: World War Two Cryptanalyst:
Miss Mavis Lever²⁰⁷***



CS6.1 Aim

Mavis Lever is generally accepted as one of the best-known cryptanalysts from BP. This case study will illustrate how this recognition has been achieved, and provide specific details on the role she held at BP.

CS6.2 Context

Mavis worked at BP from 1940 to 1945 under Knox.²⁰⁸ Mavis learnt her cryptanalytic skills under the tutelage of Knox, who, as stated, was well known for preferring to work with women.²⁰⁹ Knox very much believed in people working things out for themselves, and ran his department in that way. Mavis Batey’s first memory of Knox, for example, was his asking if she had paper and a pencil because they were breaking codes.²¹⁰ Knox’s department, ISK, was located in the Cottage at BP. Mavis went on to marry one of her codebreaking colleagues from Hut Six, Keith Batey, in 1942, and they both spoke publicly about their work once strict secrecy had been lifted. Mavis

²⁰⁵ Author’s interview with Charles Foster, 21 September 2013.

²⁰⁶ Author’s interview with Charles Foster, 21 September 2013.

²⁰⁷ Photograph: www.cryptomuseum.com [accessed 7 August 2016].

²⁰⁸ <https://bletchleypark.org.uk/roll-of-honour/5472> [accessed 3 May 2021].

²⁰⁹ Batey, *Dilly*, p. 106.

²¹⁰ Author’s interview with Mavis Batey, 11 July 2011.

published a book about Knox, and this researcher was able to interview her twice before her death, aged 92, on 12 November 2013.²¹¹

CS5.3 Literature Review, Methodology and Issues

Mavis has been the subject of extensive writings due to her and Keith's decision to talk openly about the work they carried out during the Second World War.²¹² It has allowed an insight that has previously been unavailable, as the number of people who worked as cryptanalysts is slowly diminishing over the years. Many of the books written about World War Two codebreaking at BP contain some detail about Mavis, including that of Michael Smith, a former member of the Bletchley Park Trustees, who interviewed her several times and with whom she later became close friends.²¹³ Mavis' own book on Knox also discusses the work that she and the other members of the team carried out.

Mavis married fellow cryptanalyst Keith Batey from Hut Six, with whom she worked on occasion, and it is to this which she attributed her excellent memories about their time at BP. Amongst many of the memories that Mavis retained were those related to her work in ISK and the necessity at times for her to work with other BP departments. At the end of Second World War, Mavis went on to Eastcote with the organisation, but remembers very little of her time there, only that she worked on Russian codes, and it was related to a "*machine with wiggly lines*".²¹⁴ Mavis attributes her better memories of the work in ISK to her conversations with her husband over the years. Furthermore, the fact that they did not talk about her work in Eastcote, which at that time was

²¹¹ Interviews: 11 July 2011, and 20 August 2012.

Death: <https://www.theguardian.com/world/2013/nov/20/mavis-batey> (accessed 3 May 2021)

²¹² Smith, *The Secrets of Station X*, pp. 42-43, pp. 55-6, p. 75, pp. 117-20, p. 121, p. 125, pp. 156-7, p. 160, p. 215, and Batey, *Dilly*.

²¹³ Smith, *The Secrets of Station X*, pp. 42-3, & 55-6, 75, 117-21, 156-7, 160, 215. Smith, *Station X*, p. 39, 45-6 & 54, 59-60, 93, 67, 77-8, 46, 126. Author's interview with Mavis Batey, 11 July 2011.

²¹⁴ Author's interview with Mavis Batey, 11 July 2011.

still protected by the Official Secrets Act, is probably the reason she was unable to recall much about it.

During the first interview with this researcher, Mavis spoke in an organised manner. She told the ‘story’ of BP and other incidents that were happening on the periphery – things that were indirectly related to the work at BP such as the SOE and SIS. In addition to its other duties, SIS also ran the turning of Abwehr agents (the ‘Double Cross’ system); ISK was able to assist with this system as ISK could decrypt Abwehr messages and therefore ascertain the system’s success. ISK was also able to keep abreast of the situation with SOE agents, again due to intercepted radio traffic, and was on occasion able to provide details of their work with local resistance fighters. It is possible that, through her work at BP, Mavis would have been aware of such events, particularly in the lead up to D-Day and the success of the Double Cross system, but it is more likely Mavis only learnt the full story about these events after the war and was therefore able to piece together the complete ‘story’.

During the second interview this researcher asked Mavis several different questions outside her ‘familiar story’ area, about the people she worked with and the roles they might have held; Mavis was unable to answer many of these questions. This confirms the issues related to memory which are discussed in Chapter Three.

CS5.4 Findings: recruitment

Mavis Lillian Lever was born on 5 May 1921 in Dulwich and was educated at a convent school in Croydon.²¹⁵ Mavis was studying German Romanticism at University College, London in 1939 when World War Two broke out.²¹⁶ She quickly realised the connection between her university work and German nationalism, which led her to halt her studies and apply to the Foreign Office

²¹⁵ Author’s interview with Mavis Batey, 11 July 2011.

²¹⁶ Author’s interview with Mavis Batey, 11 July 2011.

‘to do her bit for the war’.²¹⁷ Initially expecting to be a World War One Mata Hari figure, she must have experienced some disappointment on arrival at GC&CS in London before later transferring to ISK at BP in ‘deepest Buckinghamshire’.²¹⁸

CS5.5 Cryptanalytic Work: World War Two

In 1940, Mavis started working at BP where she worked in ISK from 1940 to 1945 on Italian naval codes. At the time, Mavis was one of ten in the department located in the Cottage under Knox and Twinn²¹⁹, and worked as a cryptanalyst. Initially taken on as a TJAO, Mavis was to be ultimately promoted to TSAO²²⁰, as indicated on the RoH; this contrasts with other identified women such as Margaret Rock whose grade is not included, even though Margaret worked post-war for GCHQ for several years.²²¹

Mavis has probably become best known for her work on breaking a coded message which initiated the Battle of Cape Matapan in 1940, which she described herself as “*heady stuff at the age of nineteen*”.²²² With knowledge of an impending attack by the Italian navy on the British fleet, Admiral Cunningham deceived the Italian navy into believing he was staying in port overnight, but was able to slip back onto his battleship and lead the British fleet into a successful attack off Cape Matapan which decimated the Italian fleet; the battle effectively put the Italian navy out of the remainder of the Second World War. There is an interesting contrast here between the cryptanalyst Mavis breaking codes leading to situations of life and death, and the teenage Mavis who helped play a prank on Admiral Cunningham; Cunningham had come out to BP to congratulate the ISK

²¹⁷ Author’s interview with Mavis Batey, 11 July 2011.

²¹⁸ Author’s interview with Mavis Batey, 11 July 2011.

²¹⁹ Fitzgerald, *The Knox Brothers*, p. 236

²²⁰ <https://bletchleypark.org.uk/roll-of-honour/5472> [accessed 3 May 2021].

²²¹ Author’s interview with Charles Foster, 21 September 2013.

²²² Author’s interview with Mavis Batey, 11 July 2011.

department on their codebreaking abilities and was tricked into walking backwards into a newly painted wall which covered the back of his navy uniform with paint.²²³

Mavis was introduced to techniques such as ‘rodding’ to break codes. Rodding was the name given to a method used to identify potential codes; the ‘rods’ were similar to a modern ruler, but with letters rather than numbers, which could be moved across a line of encrypted text, there being several versions of the rods as it was necessary for the letters to be moved about. As related above, a significant flaw of Enigma was that a letter could not be encrypted as itself, so that A could not appear encrypted as A, nor B as B and so on. The rods could be used to exploit this flaw; if any of the letters on the rod matched a letter in the corresponding part of the encrypted message, then an alternative had to be sought. Once there was identified the correct rod, in which no letter matched an encrypted counterpart, the associated key could be applied, and the message read. Mavis described her job as looking for the key to break the codes; once the message started to ‘come through’ it meant that she could pass it onto other members of staff who would use the key she had found and fully decrypt the message. Mavis had little knowledge of the actual information of messages that she worked on because she did not read the whole message - it was more usual for her to start the code-breaking, and then, once decrypted text could be identified, pass it on²²⁴; this allowed her to use her skills on the next message that needed to be broken.

CS5.6 Post BP Work

When World War Two ended Mavis made the decision to continue working for GC&CS in its new location in Eastcote, North London. Mavis did not enjoy this work and perhaps it is one of the reasons why she was unable to recall much about it; she found the work dull and boring, for

²²³ Author’s interview with Mavis Batey, 11 July 2011.

²²⁴ Author’s interview with Mavis Batey, 20 August 2012.

the prospective life and death element had ceased and it was no longer necessary for the staff at GC&CS to work as urgently to break codes to save Allied lives.²²⁵

After leaving GCHQ, Mavis became a renowned garden historian. She published much on this subject, but it was not until much later in her life that she chose to talk and publish more about her work at BP and other interests.²²⁶ Mavis was awarded an MBE in 1987 for her work in the preservation and conservation of gardens.²²⁷

CS5.7 Conclusions

There can be no doubt that Mavis was working as a high-grade cryptanalyst during her time at BP; the work she did as part of ISK allowed that department to contribute significantly to BP's involvement in the Second World War. If Mavis had not spoken about her time in ISK, the details of her work would most probably have been lost, as is the case for many other people, and it is unlikely that the Allied victory at Cape Matapan would have been attributed to Mavis and ISK, had she not been able to speak about it. However, the victory was a victory of the team in the department, and department head Knox wrote a poem following its success which can be seen in Appendix Six.

There are several potential conundrums about the details which Mavis was able to recall; these relate to how much of her memories were elicited or 'created' from a combination of part memory, part subsequent research. This is a question which can never be fully answered, but which needs to be considered in the context of memories. As has been discussed in Chapter Three, there are a number of issues with the use of memory in history, including outside influences that can be

²²⁵ Author's interview with Mavis Batey, 11 July 2011.

²²⁶ Mavis published a booklet, *From Bletchley With Love*, about author Ian Fleming who was a regular visitor to BP and likely to have used these experiences to write the James Bond series: Mavis Batey, *From Bletchley with Love* (Bletchley Park Trust, 2008)

²²⁷ Author's interview with Mavis Batey, 11 July 2011.

used to fill in memory blanks, and selective or unintentional memory loss which could also impact on how the past is remembered. This is not to imply that this happened to Mavis, but rather that it should be considered in parallel with the details she provided.

A point of interest is that Mavis was not awarded an MBE for her cryptanalytical work at BP despite her status, although other women such as Wendy White, Marie Rose Egan, and Margaret Rock all received that award. It could be hypothesised that MBEs were awarded only to cryptanalysts who remained with GCHQ until closer to, or upon their retirement, or it may be that these women had a specific achievement of national importance over a longer period, or even deemed of greater significance, than Mavis.

6.4.9 ISOS

ISOS stood for Illicit Services Oliver Strachey. Strachey had initially been recruited in World War One to work in MI1(b) and continued with the organisation through the Interwar years and World War Two. ISOS was created by him in 1940 for dealing with the German Secret Service (*Abwehr*).²²⁸ The profile of graded staff in ISOS differs only slightly from the norm of the rest of BP. Initially ISOS started in 1940 with five officers and a secretary, all of whom were civilians.²²⁹ According to the RoH, a total of 43 men and 62 women worked in this department.²³⁰ As can be seen in figure 6.16, there was a high proportion of male TSAOs and TJAOs. The high number of female TJAOs is comparable to other departments like the Diplomatic and Commercial Sections, and again there are very few female TSAOs in this department, in line with the pattern in most other departments.

²²⁸ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 4

²²⁹ TNA, HW19/316, *Notes on the History of ISOS*, paragraph 1 and 3, undated and unnumbered.

²³⁰ <https://bletchleypark.org.uk/roll-of-honour/search?keyword=ISOS&page=1> [accessed 1 July 2020].

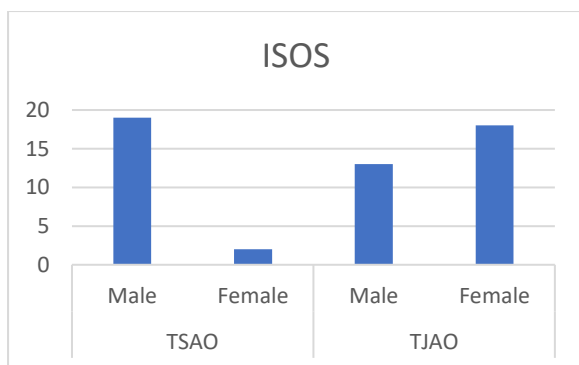


Figure 6.16 Numbers of TSAO and TJA0 by gender in ISOS²³¹

There was one noteworthy woman in this department: Catherine Wallace Pope. Catherine worked at BP from 1940, although it is not clear when she left.²³² Catherine is listed on the RoH as working in Hut Eight, in the Research Section, and then later in Hut Nine A, Elmers School.²³³ Hut Nine A housed ISOS in October 1941 and so it is likely that Catherine was already working in this department by that date.

Catherine is significant as a woman because by 1942 she was the Deputy Head of ISOS.²³⁴ Although the post is by no means a guarantee that Catherine was a cryptanalyst, it would seem very likely that she would be one to hold such a position. However, when asked if departmental Deputy Heads were usually cryptanalysts, Mavis Lever replied “*not necessarily*”²³⁵; this could indicate that Catherine might have been a good administrator rather than a good cryptanalyst. Strachey himself describes the department’s cryptanalysts in masculine terms.²³⁶ Other Deputy Heads of significant sections elsewhere in BP are Stuart Miler-Barry, Peter Twinn and Joan Clarke, all cryptanalysts, so while it is likely that Catherine was a cryptanalyst, further research is required to

²³¹ <https://bletchleypark.org.uk/roll-of-honour/search> [accessed 1 July 2020].

²³² <https://bletchleypark.org.uk/roll-of-honour/7344> [accessed 1 July 2020].

²³³ <https://bletchleypark.org.uk/roll-of-honour/7344> [accessed 1 July 2020].

²³⁴ <https://bletchleypark.org.uk/roll-of-honour/7344> [accessed 25 July 2020].

²³⁵ Author’s interview with Mavis Batey, 20 August 2012.

²³⁶ TNA, HW19/316, *Notes on the History of ISOS*. There is no mention of the women who worked in the department, and none specifically of Catherine Wallace Pope.

confirm this beyond any doubt. Although little further information has been found about Catherine, it is known that she was born on 21 April 1912, and so she would have been aged about 28 when she worked at BP.²³⁷ It is also known that she did not marry, and that after the war she went on to become a teacher before dying in Stockport on 29 June 2001 aged 89.²³⁸ It is worth noting here that Joan Clarke and Catherine Wallace Pope were both female and second in command of important sections at BP.

6.4.10 Hut Four

Hut Four housed both Naval (see 6.4.3) and Air (see 6.4.1) sections²³⁹, and contained a wooden trunking covering a pneumatic system conveying teleprinter messages received from the Y intercept operators at RAF Cheadle²⁴⁰ from a teleprinter at the back of the Mansion. GCHQ also state there were five new machines delivered which were probably ‘Tunny’s’ (see section 6.4.15).²⁴¹

In total there were 273 people based in Hut Four.²⁴² Of this total, 99 were men, and 174 women²⁴³, though it needs to be borne in mind that these totals may contain people who have already been counted in other sections

²³⁷ www.ancestry.co.uk [accessed 29 June 2019].

²³⁸ Details from Catherine’s death certificate. Copy held by the author.

²³⁹ GCHQ, *History of Bletchley Park Huts & Blocks*, pp. 9-10.

²⁴⁰ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 10.

²⁴¹ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 10.

²⁴² <https://bletchleypark.org.uk/roll-of-honour/search?location=hut%204&page=1> [accessed 2 May 2021].

²⁴³ <https://bletchleypark.org.uk/roll-of-honour/search?location=hut%204&page=1> [accessed 2 May 2021].

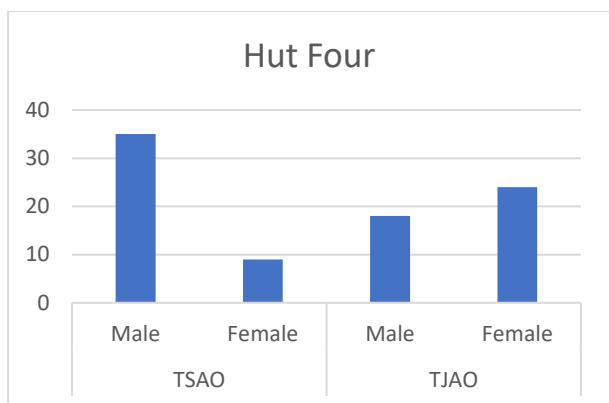


Figure 6.17 Numbers of TSAO and TJAO by gender in Hut Four²⁴⁴

According to GCHQ, in addition to Naval and Air sections, Hut Four also contained the Intelligence Exchange and in January/February 1943, although it is not clear what intelligence this department exchanged with whom.²⁴⁵ The ‘Cover Traffic and Records (CTR) Section’ which concerned Commercial and Diplomatic traffic was also based in Hut Four, before it was absorbed by the ‘W/T Co-ordination (WTC) Section’, and being renamed ‘Cover Management Y’ (CMY) in August 1944.²⁴⁶

It is interesting to compare the numbers of TSAO and TJAOs from Hut Three (see figure 6.12) with Hut Four (figure 6.17). There were more people working in Hut Three (353) compared to Hut Four (273), but the numbers of male TSAO are considerably higher in Hut Four and the number of female TJAO are also high. The number of female TSAO and male TJAO are relatively low. This indicates there are significantly more ‘higher-graded’ people in Hut Four despite it having less people than Hut Three.

6.4.11 Commercial and Diplomatic Section

As Diplomatic and Commercial sections are often linked, they are being considered together as one section; staff were often shared between both sections. Diplomatic Section was located at BP

²⁴⁴ <https://bletchleypark.org.uk/roll-of-honour/search?location=hut%204&page=1> [accessed 2 May 2021].

²⁴⁵ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 10.

²⁴⁶ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 10.

and Elmers School until 1942 when it returned to Berkeley Street in London; Commercial Section was in Wavendon to the south-east of modern-day Milton Keynes before moving to Aldford House, Park Lane, London in early 1942.²⁴⁷ Denniston was put in charge of the Commercial and Diplomatic sections between 1942 and 1945, following the ‘wicked uncle’ letter to Churchill.²⁴⁸

There were a total of 285 people working in the Diplomatic Section; 192 women and 93 men.²⁴⁹

There are three female TSAOs who are listed under both Diplomatic and Commercial. Miss Elizabeth Anderson is listed as working “*Hut 5, Military Section, Italian. Hut 10 ad Block F(A). Air Section, Meteorological. ISIS Bedford. Mauritius. Berkeley Street and Aldford House June 1943-1945*”.²⁵⁰

The other two female TSAOs are Miss Sylvia Hanson and Miss Bertha Stiles²⁵¹; although there is very little information about these two women, they must have held roles of importance as they are listed as TSAO; indeed, their male counterparts include renowned cryptographer Frank Birch, formerly of Room 40. The Diplomatic Section were reading traffic from across the world including Europe and the Far East, but it is impossible to confirm exactly on what these women were working.

As can be seen in figure 6.18, there was a high number of male TSAOs, although the number of TJAOs is more balanced as between the sexes.

²⁴⁷ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5.

²⁴⁸ <https://bletchleypark.org.uk/roll-of-honour/2486> [accessed 2 May 2021].

²⁴⁹ <https://bletchleypark.org.uk/roll-of-honour/search?location=diplomatic&page=1> [accessed 4 May 2021].

²⁵⁰ <https://bletchleypark.org.uk/roll-of-honour/163> [accessed 5 May 2021].

²⁵¹ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&keyword=TSAO&location=diplomatic&page=1> [accessed 5 May 2021].

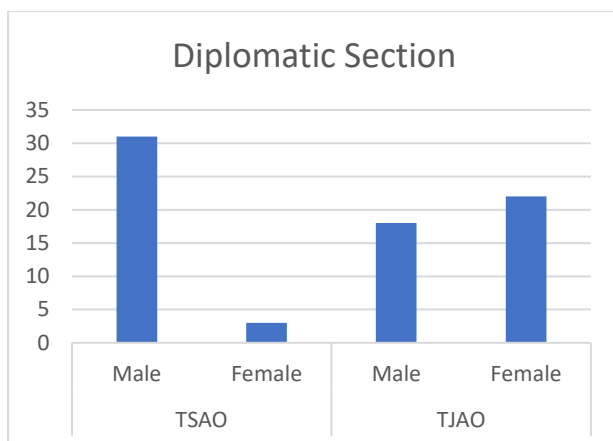


Figure 6.18 Numbers of TSAO and TJAO by gender in the Diplomatic Section²⁵²

Fiona Margaret Ede was included on the GC&CS Emergency List of people to call upon if the Second World War were to break out. She is significant because she is only one of two women in a list of 72 people; clerical staff are listed elsewhere. Fiona, who graduated from Newnham College, Cambridge²⁵³, is listed as living at 80, Aberdair Gardens, NW6²⁵⁴ and worked for the Foreign Office from 1939 to 1945 in the Spanish Diplomatic Section, probably in Berkeley Street.²⁵⁵ As Fiona is not listed with a grade, it is possible that she worked for the organisation before, or continued after, the Second World War. Nothing more is known about Fiona at this time; if she is compared to Marjorie Dale (Section 6.4.3) from the same Emergency List, then it is likely that she was a cryptanalyst, but this cannot be corroborated and is thus in Appendix Three.

²⁵² <https://bletchleypark.org.uk/roll-of-honour/search?location=Diplomatic&page=1> [accessed 2 May 2021].

²⁵³ <https://bletchleypark.org.uk/roll-of-honour/2757> [accessed 4 May 2021].

²⁵⁴ TNA, FO366/1075, *Personnel Earmarked for Foreign Office. Names still outstanding* (7.12.1939) p. 75

²⁵⁵ <https://bletchleypark.org.uk/roll-of-honour/2757> [accessed 4 May 2021].

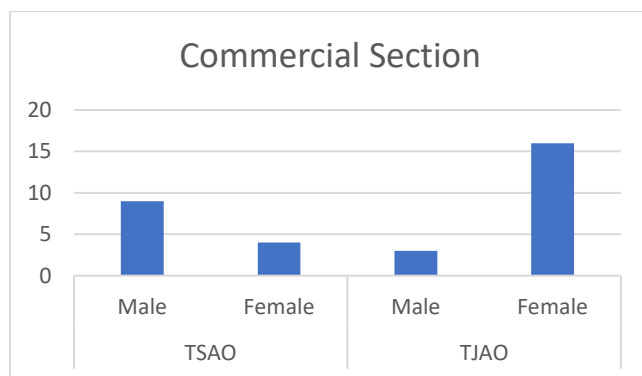


Figure 6.19 Numbers of TSAO and TJAO by gender in the Commercial Section²⁵⁶

In addition to the three TSAOs listed under Diplomatic and Commerical there is one additional woman of note from the Commerical Section, Miss Chloe Holland. Chloe is listed as a sub-section head in the Commerical Section.²⁵⁷ Her record states that she was based at Wavendon House from September 1939 until March 1942 whence she moved to London's Berkeley Street and Adford House.²⁵⁸ The only other information listed is that she went to 'a university in London'²⁵⁹, but it is not clear which university, or indeed what she studied.

Further to the women who have been identified above, one more noteworthy woman should be included. This is Miss Patricia 'Pat' Bartley who was Head of the German Diplomatic Section.²⁶⁰ In addition to her '*skilful leadership and management of cooperation with her US counterparts*',²⁶¹ she broke the leading German diplomatic code 'Floradora'.²⁶² Pat, following her studies at Lady Margaret Hall in Oxford²⁶³, was recruited by Emily Anderson, who was said to be "*immediately impressed by her*

²⁵⁶ <https://bletchleypark.org.uk/roll-of-honour/search?location=commercial&page=1> [accessed 4 May 2021].

²⁵⁷ <https://bletchleypark.org.uk/roll-of-honour/4417> [accessed 3 May 2021].

²⁵⁸ <https://bletchleypark.org.uk/roll-of-honour/4417> [accessed 4 May 2021].

²⁵⁹ <https://bletchleypark.org.uk/roll-of-honour/4417> [accessed 4 May 2021].

²⁶⁰ <https://bletchleypark.org.uk/roll-of-honour/508> [accessed 4 May 2021].

²⁶¹ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶² Ferris, *Behind the Enigma*, p. 439.

²⁶³ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

*intellect and fluency in German.*²⁶⁴ When Pat first arrived at BP, she was given paper, a pencil, and the German diplomatic code that had been ignored during the Interwar period because it was considered unbreakable.²⁶⁵ Floradora was a double additive code system, which means it had been encyphered twice in the mistaken belief that it could not then be broken.²⁶⁶ Floradora was

...initially encoded to produce a stream of five-figure groups, each of which represented a German word or phrase. Then two machine-generated streams of five-figure groups were lined up beneath the encoded message and added to it using non-carrying arithmetic – for instance, $7 + 5$ producing 2 rather than 12.²⁶⁷

Furthermore, the work that Pat did enabled her to assist American colleagues who were grateful for her “*perspicacity in spotting German mistakes and other ways into the code, not least one technical error in the system that immediately halved the workload.*”²⁶⁸ It is noteworthy that one of her male colleagues attempted to claim credit for her work, but Pat was quickly supported by her supervisors.²⁶⁹ Whilst it would seem that she had the full support of her supervisors in that case, it is disappointing that she also had to deal with discrimination; her work required the support of the Hollerith sorting machines whose supervisor, Frederic Freeborn, allegedly frequently bypassed her work, or delayed her requests for machine time.²⁷⁰ These episodes show the contrast between the women being on some occasions fully supported in their jobs despite their sex, and in other cases men holding them back and making it difficult for them to carry out their job at all.

²⁶⁴ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶⁵ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶⁶ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶⁷ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶⁸ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

²⁶⁹ Ferris, *Behind the Enigma*, p. 439.

²⁷⁰ <https://www.theguardian.com/world/2021/may/02/patricia-brown-obituary> [accessed 4 May 2021].

6.4.12 Research Section

The Research Section was “*staffed by top GCCS cryptographers working on new and unbroken codes and cyphers.*”²⁷¹ There were a total of 152 people listed as working in the Research Section at some point in their BP careers²⁷² As can be seen in figure 6.20, there was a significantly high number of male TSAOs, who include some already mentioned in this research: Head of Naval Section Clarke, Max Newman (see section 6.4.15), Alan Turing, Bill Tutte (see section 6.4.15), and Peter Twinn (former Head of ISK).²⁷³ There were a total of five female TSAOs, four of whom have already been discussed: Mavis Lever (CS5), Rhoda Welsford (section 6.4.1), Catherine Wallace Pope (section 6.4.9) and Daphne Sercombe (section 6.4.2).²⁷⁴ The fifth woman was Penelope Cavendish Storey, who worked at BP from 1940, in “*Hut 6 and Block D(6), Research Section.*”²⁷⁵ If the information on the RoH is taken at face value, then this would be a strong indication that all these women were working as cryptanalysts; however, with the exception of Mavis, it is not possible to confirm beyond all doubt that these women were working as cryptanalysts, although the evidence is very strong.

As can be seen in figure 6.20 the numbers of male TSAO and female TJAO, and TSAO female and TJAO men respectively are relatively similar. This follows the same pattern as other departments at BP, in that there are significantly more senior male staff.

²⁷¹ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5.

²⁷² <https://bletchleypark.org.uk/roll-of-honour/search?location=research&page=1> [accessed 4 May 2021].

²⁷³ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Male&keyword=tsao&location=research&page=1> [accessed 4 May 2021].

²⁷⁴ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&keyword=tsao&location=research&page=1> [accessed 4 May 2021].

²⁷⁵ <https://bletchleypark.org.uk/roll-of-honour/8749> [accessed 4 May 2021].

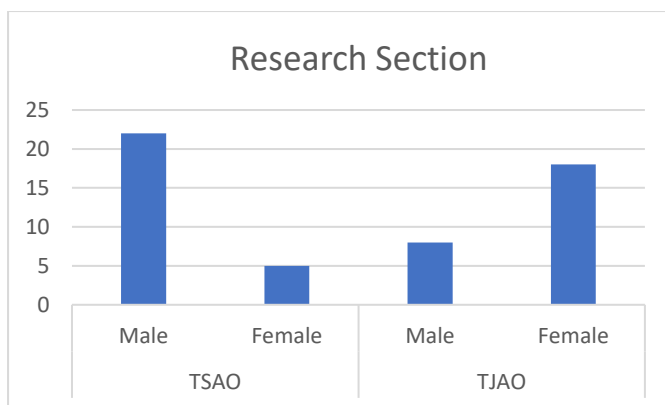


Figure 6.20 Numbers of TSAO and TJAO by gender in the Research Section²⁷⁶

6.4.13 Code and Cypher Production Unit, Mansfield College

The Code and Cypher Production Unit was based at Mansfield College in Oxford.²⁷⁷ It was headed by Commander Edward Hok until from September 1939 to 1944.²⁷⁸ There is very little detail regarding the department on the RoH. 48 people are listed, made up of 33 women and 15 men.²⁷⁹ Of these, there is just one TSAO; Mrs Helen Lowndes²⁸⁰, and one TJAO; Mrs M.P. Rolfe.²⁸¹ It is possible that Mrs Rolfe was the long standing member of staff listed on the FO366/800 archival document²⁸²; if this is the same Mrs M.P. Rolfe, then she would have been aged 53 at the beginning of the Second World War, and had originally been recruited as a temporary woman clerk in 1916,

²⁷⁶ <https://bletchleypark.org.uk/roll-of-honour/search?location=research&page=1> [accessed 4 May 2021].

²⁷⁷ <https://bletchleypark.org.uk/roll-of-honour/10350> [accessed 4 May 2021].

²⁷⁸ <https://bletchleypark.org.uk/roll-of-honour/10350> [accessed 4 May 2021].

²⁷⁹ <https://bletchleypark.org.uk/roll-of-honour/search?location=mansfield%20college&page=1> [accessed 3 May 2021].

²⁸⁰ <https://bletchleypark.org.uk/roll-of-honour/search?location=mansfield%20college&page=1> [accessed 3 May 2021].

²⁸¹ <https://bletchleypark.org.uk/roll-of-honour/7856> [accessed 3 May 2021].

²⁸² TNA, FO366/800, 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

before being re-designated temporary woman clerk III in the 1922 reshuffle.²⁸³ There is very little information about either woman or their roles at Mansfield College.

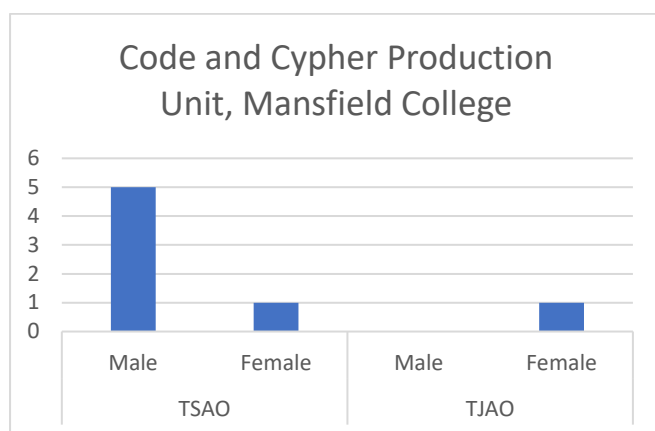


Figure 6.21 Numbers of TSAO and TJA0 by gender in the Code and Cypher Production Unit, Mansfield College.²⁸⁴

There was, however, some information about the activities at Mansfield College revealed as part of the oral history project which is a component of the RoH, in which one woman, Miss June Edyvean, took part (pictured right).²⁸⁵ In the details she provides she explains:



All the colleges of Oxford University had been taken over by government ministries. It was thought that Hitler wanted to make Oxford his capital so therefore the city would not be bombed. So Mansfield had the Foreign Office; also in Mansfield Road was Manchester College which was occupied, I think, by Cartography. Magdalen College had the Ministry of Home Security, the boss of which lived next door to me in Headington, and all the other colleges were taken over by ministries with the exception of the Examinations Schools, which were used as emergency hospitals, especially after Dunkirk.

²⁸³ TNA, FO366/800 - 'Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922.'

²⁸⁴ <https://bletchleypark.org.uk/roll-of-honour/search?location=mansfield&page=1> [accessed 3 May 2021].

²⁸⁵ Photograph: <https://bletchleypark.org.uk/roll-of-honour/11528> [accessed 4 May 2021].

This is interesting because no details exist regarding Mansfield College in books written about BP: Ferris 2020, Smith 1998, Kahn 1969, Erskine and Smith 2011 all fail to include the Code and Cypher Production Unit, notwithstanding its arguably important status as part of BP.²⁸⁶ Furthermore, despite the limited numbers of individuals listed on the RoH, according to June there were up to 80 women working on her floor at any one time.²⁸⁷ She explained: “*All the messages we saw were in code. I can’t remember how we could tell what code had been used; it must have been on the message, which looked rather like a telegram*”²⁸⁸ and continued

Once we broke one of the codes, but whether this was one that would normally be dealt with by Bletchley Park I don’t know, or maybe it was one of ours they wanted to try out to see if it would work. The eight of us in our room were each given a message in code, I think it was numbers, and I can’t remember if we had to subtract something from these or if we had a code book – but it was 70 years ago! I actually broke the code! Just luck, it happened to be the one I had which must have fitted the codebook. The message was taken away from me and given to another girl.²⁸⁹

It is also important to note that when she was interviewed by Hok, she explained “... *that as I was only 16, I could not be a temporary clerk grade II, like most of my colleagues, but would have to be taken on as a typist, though I never did any typing while I was there.*”²⁹⁰ Furthermore, “*At the age of 18, when I would have been called up, I tried to join the WAAF, as my closest friend had previously joined the WAAF, but Cdr Hok would not release me. He did release Connie Basson and Betty Salter who both became Wrens. Connie went on to*

²⁸⁶ Ferris *Behind the Enigma*, Smith *Station X*, Kahn *The Code Breakers*, Erskine and Smith, *The Bletchley Park Codebreakers*.

²⁸⁷ https://bletchleypark.org.uk/cms/record_attachments/1933.pdf [accessed 3 May 2021] p. 1.

²⁸⁸ https://bletchleypark.org.uk/cms/record_attachments/1933.pdf [accessed 2 May 2021] p. 3.

²⁸⁹ https://bletchleypark.org.uk/cms/record_attachments/1933.pdf [accessed 2 May 2021] p. 3.

²⁹⁰ https://bletchleypark.org.uk/cms/record_attachments/1933.pdf [accessed 2 May 2021] p. 3.

*serve out in Colombo.*²⁹¹ This indicates that June was proficient, such that Hok was not prepared to lose her.

6.4.14 Machine Sections

There were several machine sections at BP. These sections are an important part of the role that women played at BP but, whilst they were present in significant numbers, the sections were predominantly staffed by women in the military services and so the researcher does not have the benefit of civilian grading such as TSAO and TJAO; service grades were awarded on service rules. Only a brief overview of what the servicewomen did in these sections can be provided. These sections were headed by men who lent their names to each section. According to Hicks *“Interestingly, men who supervised machine work were there less to facilitate the work or give guidance to the operators, and more for their own benefit. Park leaders felt male cryptographers came up with better theoretical insights when they alternated their cryptographic research with practical, applied work.”*²⁹² Each of the main sections can be considered in turn.

6.4.14.1 Freebornery

The Freebornery was named after Frederic Freeborn from the British Tabulating Machine Company (BTM).²⁹³ The Hollerith machines were based in this section.²⁹⁴ American Herman Hollerith created a tabulating and sorting machine for punched cards which he named the ‘Hollerith’.²⁹⁵ Hollerith machines aided BP’s work by beginning the automation of the code-breaking process. Initially the Hollerith machines were staffed by local women until the workload increased later in the war, at which point WRNS were used.²⁹⁶ According to the RoH there were

²⁹¹ https://bletchleypark.org.uk/cms/record_attachments/1933.pdf [accessed 2 May 2021] p. 5.

²⁹² Mar Hicks, *Programmed Inequality* (London: The MIT Press, 2018), pp. 39-40.

²⁹³ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 6.

²⁹⁴ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 6.

²⁹⁵ <http://www.columbia.edu/cu/computinghistory/hollerith.html> [accessed 4 May 2021].

²⁹⁶ Hicks, *Programmed Inequality*, p. 25.

301 people working with the Holleriths, 45 of whom were male and 256 female.²⁹⁷ It is important to acknowledge the importance of the many women working on the Holleriths, but the work they were carrying out was considered ‘important but boring’ by the women themselves.

6.4.14.2 Testery and Newmanry

Major Ralph Tester formed the Testery in autumn 1941.²⁹⁸ According to the RoH there were a total of 156 people in total working in the Testery, but in a reversal of the pattern seen in other BP departments, only 45 were women whilst 111 were men²⁹⁹ Initially the staff of the Testery worked on breaking a Double Playfair code by hand until 1 July 1942, when they switched to the Lorenz *Geheimschreiber*.³⁰⁰ The *Geheimschreiber* was a twelve-rotor system in use by the Germans from 1940 onwards; it was known as ‘Fish’ or ‘Tunny’ to the British.³⁰¹ Mathematician Bill Tutte broke the complex system in Spring 1942, which involved working out every permutation of the twelve-rotor machine.³⁰²

The Lorenz was used by Hitler and the senior echelons of the German High Command.³⁰³ The encrypted messages were not necessarily more important than Enigma messages; it was simply the more secure encryption process chosen by Hitler to ensure his messages were not read. Initially the Lorenz messages were broken by hand³⁰⁴; later, the GPO Research Section at Dollis Hill were approached to mechanise Tutte’s breakthrough, and engineer Tommy Flowers created the

²⁹⁷ <https://bletchleypark.org.uk/roll-of-honour/search?location=hollerith&page=1> [accessed 3 May 2021].

²⁹⁸ Jerry Roberts, *Lorenz: Breaking Hitler’s Top Secret Code at Bletchley Park* (Stroud: The History Press, 2017), p. 53.

²⁹⁹ <https://bletchleypark.org.uk/roll-of-honour/search?location=testery&page=1> [accessed 3 May 2021].

³⁰⁰ Roberts, *Lorenz*, p. 86.

³⁰¹ Roberts, *Lorenz*, p. 72.

³⁰² Roberts, *Lorenz*, p. 59.

³⁰³ Singh, *The Code Book*, p. 243.

³⁰⁴ Roberts, *Lorenz*, p. 130.

Colossus proto computer within ten months.³⁰⁵ Thousands of messages were intercepted and read by the cryptanalysts of the Testery during the war.³⁰⁶

The Newmanry was founded by Dr Max Newman in 1942 who initially experimented with the 'Robinson' machines to break the Lorenz *Geheimschreiber*. The Robinson machines were so named after the elaborate contraptions created by cartoonist Heath Robinson. In February 1944, the first Colossus machines were built and established in the Newmanry.³⁰⁷ The machine used radio valves rather than electro-mechanical relays, which made for greater speed both in reading the input ticker tape that had always broken on the Heath Robinsons, and in computation. Colossus is now generally regarded as the first semi-programmable computer.³⁰⁸ The Testery and Newmanry processed German encyphered teleprinter transmissions using Colossus, which in turn read the ticker tape of intercepted German teleprinter signals, which were based on the International Teleprinter Code.³⁰⁹

The similarities between the Testery and Newmanry mean that the heads of both departments can be compared. Tester was an Army Major, and Newman was a TSAO.³¹⁰ It could therefore be said that a Major is parallel to a TSAO. Former colleague Jerry Roberts clearly points out that Tester was not a cryptanalyst,³¹¹ and Newman is described as having “*extraordinary administrative flair*.”³¹² This is important as illustrating that these senior posts, whether held by males or females, are not

³⁰⁵ Roberts, *Lorenz*, p. 84 and p. 132.

³⁰⁶ Roberts, *Lorenz*, p. 67.

³⁰⁷ Roberts, *Lorenz*, p. 132.

³⁰⁸ Tony Sale, *Colossus 1943-1996* (Cleobury Mortimer: M & M Baldwin. 1998, repr. 2014), p. 9.

³⁰⁹ <https://www.cryptomuseum.com/ref/ita2/index.htm> [accessed 5 May 2021].

³¹⁰ Newman - <https://bletchleypark.org.uk/roll-of-honour/6638> and Tester - <https://bletchleypark.org.uk/roll-of-honour/8969> [accessed 5 May 2021].

³¹¹ Roberts, *Lorenz*, p. 53.

³¹² <https://history.computer.org/pioneers/newman-mha.html> [accessed 5 May 2021].

necessarily cryptanalytic; some TSAO (or equivalent) posts are almost certainly senior administrative posts.

In 1943 the Newmanry “*contained only two cryptanalysts and sixteen members of the WRNS*”, but the RoH records that 201 women and 73 men served in the Newmanry³¹³; by April 1945 there were 273 WRNS³¹⁴ and, according to Hicks, a total of 325 working in the Newmanry by the end of the Second World War.³¹⁵

6.4.14.3 The Bombe

Turing worked on creating an electro-mechanical machine which he also called the bombe. He was later joined by Welchman who had been working on traffic analysis.³¹⁶ “*The bombe was capable of simulating the activity of several Enigmas wired together and could run through the 17,576 possible rotor settings of the Enigma in roughly two hours.*”³¹⁷

Harold ‘Doc’ Keen at the British Tabulating Machinery factory in Letchworth oversaw the practical creation of the bombes based on Turing and Welchman’s designs.³¹⁸ A small group of WRNSs were then brought in to test their abilities to operate the bombe; until that point, it had been assumed that they would not be able to manage. Former WRN Merial Dunn confirmed that she was in this test group.³¹⁹ The test was successful, and WRNS were brought in from across the UK to run the machines. The prototype bombe came into operation in May 1940.³²⁰ By June 1941 there were five bombes in operation, and 15 by November 1941.³²¹ The numbers continued

³¹³ <https://bletchleypark.org.uk/roll-of-honour/search?location=newmanry&page=1> [accessed 3 May 2021].

³¹⁴ Hicks, *Programmed Inequality*, p. 30.

³¹⁵ Hicks, *Programmed Inequality*, p. 30.

³¹⁶ Hodges *Alan Turing*, p. 179.

³¹⁷ Leavitt. *The Man who knew too much*, p. 175.

³¹⁸ Hodges, *Alan Turing*; p. 181.

³¹⁹ Details from the author’s private collection of documents from Merial Dunn, former WRN.

³²⁰ Copeland, *The Essential Turing*, p. 256.

³²¹ Copeland, *The Essential Turing*, p. 256.

to rise, and outstations were set up to house the machines at Adstock, Eastcote, Gayhurst, Stanmore and Wavendon, predominantly staffed by WRNS. It is important to acknowledge the thousands of women who were involved in the work carried out by the bombe; according to the RoH there were 1,526 people working on the bombes, of whom 1,280 were female.³²² Again, this work was organisationally critical, but was regarded by the women who carried it out as important, but tedious, and, because of the machine oil needed for the bombes to operate, dirty. The bombe started as gendered male, only to be regendered female later, and as noted above, was in retrospect gendered female (“the bronze goddess”) by Winterbotham.

6.4.15 Comcen

One specific section was designated Communications Section, usually abbreviated to ‘Comcen’³²³, and the Teleprinter Room was a sub-section of Comcen.³²⁴ According to the RoH there were 393 people working on the teleprinters, of which 351 were female.³²⁵ The biggest number of operators for the teleprinters were from the WAAF, so whilst there were no female FO civilians (TSAO/TJAO) in this department there would have been equivalents from the Air Force. There are for example 21 Corporals³²⁶ and 13 Sergeants³²⁷ who are likely to have taken on supervisory or managerial roles. Teleprinters were also used by the ATS to convey information collated by

³²² <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&location=bombe&page=1> [accessed 5 May 2021].

³²³ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5

³²⁴ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5

³²⁵ <https://bletchleypark.org.uk/roll-of-honour/search?keyword=teleprinter&page=1> [accessed 5 May 2021].

³²⁶ <https://bletchleypark.org.uk/roll-of-honour/search?keyword=Cpl&location=teleprinter&page=1&rank=WAAF> [accessed 5 May 2021].

³²⁷ <https://bletchleypark.org.uk/roll-of-honour/search?keyword=sgt&location=teleprinter&page=1&rank=WAAF> [accessed 5 May 2021].

intercept operators, mainly women, who listened to and transcribed meaningless 5-letter groups of Morse code for hours on end.³²⁸

In addition to the Teleprinter Room, but still under Comcen, was the Central Signals Registry (CSR).³²⁹ According to the RoH there were a total of 26 people, of which 23 were women.³³⁰ The department was overseen by Army Captain Ernest Jones³³¹, and later by Mrs Vera Handcock, although the date of handover is not clear.³³² Vera is listed as a TJAO (one of six in the section) so arguably comparable to an Army captain.³³³ CSR was responsible for *the handling of all incoming and outgoing signals*.³³⁴ This appointment shows how increasingly women were being introduced to managing women in departments that had previously been headed by men.

6.4.16 Y-Section

Described as the oldest problem in Wireless Interception, Cooper raises the issues of “*no one station or group can ever cover all frequencies due to the radio ‘skip distances’, ‘scatter effect’ and ‘fading’*”.³³⁵ The German Air Force were using “*some 25 frequencies*”.³³⁶

There were listening stations (Y-stations) across the UK and abroad which provided the raw decrypts that were sent to BP for decoding.³³⁷ Y station radio operators required extensive training and would require a good understanding of Morse code.³³⁸ One of the better-known Y-stations is

³²⁸ Hicks, *Programmed Inequality*, p. 29.

³²⁹ GCHQ, *History of Bletchley Park Huts & Blocks*, pp. 5-6.

³³⁰ <https://bletchleypark.org.uk/roll-of-honour/search?location=central%20signals&page=1> [accessed 3 May 2021].

³³¹ <https://bletchleypark.org.uk/roll-of-honour/4973> [accessed 5 May 2021].

³³² <https://bletchleypark.org.uk/roll-of-honour/3951> [accessed 5 May 2021].

³³³ <https://bletchleypark.org.uk/roll-of-honour/3951> [accessed 5 May 2021].

³³⁴ GCHQ, *History of Bletchley Park Huts & Blocks*, p. 5.

³³⁵ TNA, HW3/83, D.D.I. 27.7.38. p. 1.

³³⁶ TNA, HW3/83, D.D.I. 27.7.38. p. 4.

³³⁷ Koorn, *Backing Bletchley*, p. 182.

³³⁸ Koorn, *Backing Bletchley*, p. 182.

Beaumanor, Leicestershire³³⁹ where the majority of listeners were ATS.³⁴⁰ According to BP there were 174 women working at UK Y-stations, of whom 145 were ATS, and a further 22 were WRNS.³⁴¹

At Beaumanor, decrypts were collected for Tunny intercepts which were sent straight to BP.³⁴² Some of the other Y-stations had their own cryptanalysts who may have been female, but this cannot be corroborated at this time.

6.5 International co-operation and comparisons

6.5.1 American contributions

America entered the Second World War following the bombing of Pearl Harbour in December 1941.³⁴³ Despite the threat of war for over a year, the Americans were generally unprepared for war, however the US Navy realised quite quickly that they would need to mobilise, and letters were sent out from November 1941³⁴⁴ to prospective women to take civilian jobs with the US Navy³⁴⁵. In addition to the cryptanalytic jobs available at the Navy there was also the Signal Intelligence Service (SIS), which employed William Friedman, to work on Purple – the name given to the Japanese diplomatic cypher used by the Foreign Office in Tokyo.³⁴⁶ The results of the machine breaks were called ‘Magic’.³⁴⁷

³³⁹ Koorn, *Backing Bletchley*, p. 184.

³⁴⁰ Koorn, *Backing Bletchley*, p. 182.

³⁴¹ <https://bletchleypark.org.uk/roll-of-honour/search?gender=Female&location=Y%20station&page=1> [accessed 5 May 2021].

³⁴² Koorn, *Backing Bletchley*, p. 185.

³⁴³ Munday, *Code Girls*, pp. 1-2.

³⁴⁴ Munday, *Code Girls*, p. 3.

³⁴⁵ Munday, *Code Girls*, p. 5.

³⁴⁶ Ronald W. Clark, *The Man who Broke Purple: The Life of the World's Greatest Cryptologist, Colonel William F. Friedman* (London: Weidenfeld and Nicolson, 1977), p. 103.

³⁴⁷ Lewin, *Ultra goes to war*, p. 21.

American women worked in various roles during the Second World War including for the ‘Women’s Army Auxillary [sic] Corps’ (WAAC) as in the case of ‘Lady GI’ Irene Brion, and ‘Women Accepted for Volunteer Emergency Service’ (WAVES).³⁴⁸ The women who were recruited to work with US naval codebreakers tended to be ex-schoolteachers “*for a number of reasons beyond their level of education.*”³⁴⁹ In a direct contrast to the roles of women at BP, American women ‘found themselves running top units by April 1943.’³⁵⁰ These women included Wilma Berryman, Delia Taylor, and Genevieve Grotjan.³⁵¹

In addition to the women working in cryptanalysis at home there were several men who came to BP to learn more about the British and their capabilities. They would be shocked by the setup of GC&CS at BP.³⁵²

6.5.2 Russia

The Glavnoye Razvedyvatelnoe Upravleniye (GRU) was created in 1918 following the fall of the Tsarist government the previous year.³⁵³ GRU was the Main Intelligence Directorate of the General Staff of the Red Army.³⁵⁴

Russia was unusual in what roles women were permitted to do during the Second World War. Hundreds of thousands of women served in supporting roles like other countries: nursing, driving, and factory working, but also on the front line as pilots and snipers.³⁵⁵ The women pilots often

³⁴⁸ Irene Brion, *A Woman’s War in the South Pacific: Lady GI: The Memoir of Irene Brion* (Novato: Presidio, 1997), p. 1.

³⁴⁹ Mundy, *Code Girls*, p.51.

³⁵⁰ Mundy, *Code Girls*, pp. 206-211.

³⁵¹ Mundy, *Code Girls* Mundy, *Code Girls*, p. 211.

³⁵² Thomas Parrish, *The American Codebreakers: The U.S. Role in Ultra* (Chelsea: Scarborough House, 1986, repr. 1991), pp. 17-18

³⁵³ *The Oxford Companion*, p. 511.

³⁵⁴ *The Oxford Companion*, p. 511.

³⁵⁵ <https://www.warhistoryonline.com/war-articles/roles-soviet-women-filled-ww2.html> [accessed 31 July 2021].

flew the Polikarpov Po-2 biplanes which were built with plywood and fabric, many often dying in combat, as did the snipers who targeted the Germany frontline officers and Non-combat Officers (NCO) to disrupt troops.³⁵⁶ Although names are unavailable, women also worked as cryptographers in Russia.³⁵⁷

6.6.2 Axis powers

6.6.2.1 Germany

German Sigint was very fragmented during the Second World War. It was carried out by several different organisations like the *Abwehr* and *Wehrmacht* for example. Previous to the outbreak of war, German women had worked in factories, but May 1941 there were 440,000 fewer women working because they had married and left work to remain in their homes.³⁵⁸ The German government encouraged the '*kinder, Kirche, Küche*' (children, church, kitchen) – the famous domestic 'triad'³⁵⁹ irrespective of if they wanted to become (or remain) legislators, lawyers or leaders³⁶⁰, because they were encouraged to have children instead to increase Germany's low birth-rate pre-war.³⁶¹ There were a handful of women who worked outside this encouraged cultural model. The only two active female test pilots to survive the Nazi regime were Hanna Reitsch and Melitta von Stauffenberg.³⁶² These women were the exception: extraordinary women living in extraordinary times. Furthermore there is reference to a woman (unnamed) working in cryptanalytic

³⁵⁶ <https://www.warhistoryonline.com/war-articles/roles-soviet-women-filled-ww2.html> [accessed 31 July 2021].

³⁵⁷ <https://www.warhistoryonline.com/war-articles/roles-soviet-women-filled-ww2.html> [accessed 31 July 2021].

³⁵⁸ *The Oxford Companion*, p. 457.

³⁵⁹ Alison Owings, *Frauen: German Women Recall the Third Reich* (London: Penguin Books, 1993), p. xv.

³⁶⁰ Owings, *Frauen*, pp. xxxiii-xxxiv.

³⁶¹ Owings, *Frauen*, p. xxxiii.

³⁶² Clare Mulley, *The Women who flew for Hitler: The True Stories of Hitler's Valkyries* (London: Macmillan, 2017), p. xix.

organisation in Germany in 1920 (one of a group of ten).³⁶³ It is unknown if this indicates that there were women working in cryptanalysis during the Second World War.

6.6.2.2 Italy

Italy joined the Second World War following the fall of France in 1940.³⁶⁴ It had both Army and Navy codebreaking organisations; the Army was Servizio Informazioni Militari (SIM) which worked on Diplomatic, Military and Research, and Commercial, and the Servizio informazioni Speciali della Royal Marina (SIS).³⁶⁵ Italy was very successful in reading enemy codes because they had a special undercover team who infiltrated foreign embassies and copied the codes; whilst they did use IBM punch card machines for cryptanalysis it is not known if they employed women on these tasks.³⁶⁶

Women were however, heavily involved in the Italian resistance: ensuring the resistance fighters had food, clothing, and medical supplies, whilst collecting information and carrying communications.³⁶⁷

6.2.3 Japan

The Japanese began intercepting foreign signals in the 1920's.³⁶⁸ But it was not until the 1930s that they began exchanging cryptographic information with Germany and Italy.³⁶⁹ During the Second World War they had some success with reading Allied codes used by Louis Mountbatten when

³⁶³ Jennings, *The Third Reich is Listening*, p. 60.

³⁶⁴ <http://chris-intel-corner.blogspot.com/2012/08/italian-codebreakers-of-wwii.html> [accessed 31 July 2021].

³⁶⁵ <http://chris-intel-corner.blogspot.com/2012/08/italian-codebreakers-of-wwii.html> [accessed 31 July 2021].

³⁶⁶ <http://chris-intel-corner.blogspot.com/2012/08/italian-codebreakers-of-wwii.html> [accessed 31 July 2021].

³⁶⁷ <https://www.dday.org/2015/03/19/the-untold-story-women-in-the-italian-resistance-wwii/#:~:text=They%20took%20care%20of%20the,for%20clandestine%20communications%20and%20operation> s. [accessed 31 July 2021].

³⁶⁸ Alan Stripp, *Code Breaker in the Far East* (Oxford, Oxford University Press, 1989), p. 128.

³⁶⁹ Stripp, *Code Breaker*, p. 128.

communicating with Chungking and Indian meteorological codes.³⁷⁰ There were three separate organisations that provided Sigint; “*the Chūo Tokushu Jōhō Bu (Central Special Intelligence Department), of the Army, the Tokumu Han (Special Service Section of the Navy, and the Angō Kenkyū Han (Cryptographic Research Section) of the Foreign Office.*”³⁷¹ There is no indication that women worked for any of these organisations. Instead, before the war broke out the expectation was that unmarried women would work in silk, textile and weaving factories, and but married women were expected to work hard for no wages at all.³⁷² Often the women ‘toiled’ in agricultural work on family farms in unpaid work.³⁷³ By the Second World War the women naturally migrated to industrialised factory work; following the creation of the labour corps four million women over the age of 15 were expected to work in industrial sectors such as aircraft manufacturing, munitions, electrical factories, pharmaceuticals and textiles amongst others.³⁷⁴

6.6 Conclusions

Despite a concerted effort, the incumbents of BP were at the outbreak of war simply not equipped to deal with the daily changes in Enigma keys fast enough to make a continued difference to the war effort. The change in processes to machine codes from book codes, and the vastly increased wartime quantity of messages, meant major change was needed in the way the codes were broken. Mathematicians were brought in to deal with the problem; it was thought ‘you did not need to be a mathematician to solve codes, but mathematicians tended to be good at it’. As a result, it is mathematicians such as Turing and Welchman who have become better known as cryptanalysts since 1939.

³⁷⁰ Stripp, *Code Breaker*, p. 128.

³⁷¹ Stripp, *Code Breaker*, p. 128.

³⁷² https://ethw.org/Japanese_Women_and_the_Japanese_War_Effort [accessed 31 July 2021].

³⁷³ https://ethw.org/Japanese_Women_and_the_Japanese_War_Effort [accessed 31 July 2021].

³⁷⁴ https://ethw.org/Japanese_Women_and_the_Japanese_War_Effort [accessed 31 July 2021].

The number of staff rose rapidly as BP prepared itself for its role as a war station. Following the 'Action This Day' letter to Churchill in 1941, staff numbers increased sharply until the peak in June 1944, at which point several staff moved from the European theatre to the Pacific.

Women were a significant component of the change in staffing. Several women were already working for BP on the outbreak of war, and many others picked up their role again from their World War One work. Some of these women had their worth recognised in a noticeably short space of time, leading them to be treated more equally (although their treatment cannot be said to be 'complete equality' as this is simply untrue). The roles that were available to women at BP were wide and varied, with some of the women able to work in the new and growing area of computing.

Most women working at BP were employed in clerical or machine operator roles, such as bombe or Colossus operators. Given their significant numbers, and the volume of social narratives about these women, their overshadowing numbers, combined with the myth that 'all people who worked at BP are codebreakers' may form one of the reasons why comparatively little is known about the very much smaller number of high-level female cryptanalysts working at BP.

As might be expected, in this time of national emergency, organisations which were in urgent need of staff, as was BP, tended to be slightly more flexible and more open to the employment and promotion of women. In the case of BP, there were already women who had worked on cryptanalysis during the first World war, and were prepared to take up their decrypting pencils once again; and there was also that group of women who had stayed in, or been recruited into, cryptanalysis during the interwar period, when, as Chapter Five identifies, several had flourished in the role.

The complex and fast-changing nature of BP in wartime, the inconsistent use of terminology, and the fallibility of human memory, all compounded by the extreme secrecy of the work and the lack of publicly-available records, makes identification of women who had triumphed over all

opposition to be recognised as high-level cryptanalysts a challenging task. However, by use of the set of tools discussed in Chapter Seven and provided by salary gradings, the BP Roll of Honour, fragmentary information provided by official records and by families, and the opinions of authoritative cryptanalysts such as Bill Bonsall, a postwar Head of GCHQ, it has been possible for the present research to have conservatively identified a group of at least 20, including Joan Clarke, Mavis Lever, Wendy White, Marjorie Dale, Margaret Rock, Catherine Pope, Pat Bartley, Daphne Sercombe, Elizabeth ‘Andy’ Anderson, Jean Thompson, Pamela Taylor, Ruth Welsford, Emily Anderson, Joan Wingfield, Marie Rose Egan, Ann Mitchel, Janet Milne, Mabel Mary Harris, M. Anderson and Miss Nunn, with a further group of 30 identified in Appendix Three where the attribution of high-level cryptanalyst status is likely but cannot as yet be proven beyond all doubt. Pat Bartley typifies the opposition probably faced by them all – determined attempts both to steal the credit for her work, and to obstruct as far as possible her carrying out that work by refusal of the facilities (machine time) needed to do it; similarly, the belittling use of language, such as ‘Dilly’s Fillies’ to describe the women of ISK whose work led to the victory of Cape Matapan. It is noteworthy that many of these women were to become famous both nationally and internationally in their own chosen disciplines following the war - but not for their work at BP; while security doubtless inhibited this until the 1980s, its relaxation has not resulted in a proper recognition of credit for these women.

It should be noted as a preamble to the discussion of Chapter Seven that a degree was not of itself an infallible indication of grading and ability, and nor indeed was the grade that a woman might hold. Several women had degrees; examples of the variety of degrees include Ann Mitchel who was awarded a degree in mathematics in 1943³⁷⁵; Margaret Rock also had a degree in

³⁷⁵ A. Mitchell ‘Hut 6 and the MR’ in *The Enigma Symposium 1994*, ed. by Hugh Skillen (Bath: Create Publishing, 1994) (un-numbered).

mathematics.³⁷⁶ Mavis Lever's degree was in German romanticism³⁷⁷ and Margaret Queenings's degree in zoology.³⁷⁸ The degree is perhaps a better indicator simply of a sufficient intelligence, and the need was to be in the right place at the right time.

At the end of World War Two, GC&CS undertook a move from Bletchley to Eastcote, and then on to its current location in Cheltenham. Several of the women moved with the organisation including Joan Clarke, Mavis Lever and Margaret Rock amongst others, and enjoyed continuing careers in cryptography.

The next chapter will address the problems of terminology which have been identified in this study and will bring together and discuss the tools used in this research to identify those working at a high level of cryptanalysis, with the aim of informing future research into those involved in cryptanalysis.

³⁷⁶ Author's interview with Charles Foster, 21 September 2013.

³⁷⁷ Author's interview with Mavis Batey, 11 July 2011

³⁷⁸ M. Queenings *A Civilian at Bletchley* in *The Enigma Symposium 1994* (Bath, Create Publishing, 1994) (pages unnumbered).

Chapter Seven: Analysis

"Will cryptography be of use in the next War?"

William Clarke¹

7.1 Introduction

Previous chapters have shown that published literature has, until very recently, been almost silent on the role played by women in breaking the enemy codes of the First and Second World Wars, and of the Interwar period. This is so, even though Chapter Six has shown that numerically the majority of those working at BP were women; is it the case, therefore, that women are under-acknowledged because the nature of their work was in every case more pedestrian than that of the men – in a word, that women were always ‘handmaidens’? Or was it the case that some women at least performed at the highest level of cryptanalytical skill, and that their condemnation to silence is a result of other factors such as gender discrimination?

The answer to these questions is complicated by two factors. First, as has been emphasised in this thesis, technology changed significantly over the period, and the process of breaking a code perforce changed also. Second, the terminology used to define jobs and roles changed also, but not necessarily in line with the changes in technology. To identify tools against which a job or role can be considered at a very high level of skill or otherwise is therefore the function of this Chapter. It will consider how terminology has changed over the period of 1914 to 1946, what this means and how it can be considered today. It will consider definitions which could be used in the future to identify and classify as far as possible the jobs and roles that women in cryptanalysis held during the first half of the twentieth century and consider the positions that were held by women in cryptanalysis and how that has changed over this period. It is of course impossible to provide a

¹ TNA, HW3/1, *Will Cryptography be of use in the next War?* Section 47 (unnumbered).

definitive set of key identifiers to be used in the classification of future cryptanalysts, but this chapter will provide several factors that might be used to determine if a woman could potentially be a cryptanalyst.

It is important to state that the only way that a woman in either World War could be definitively identified as a cryptanalyst is through archival research and cross-referencing with published material from experts such as Ferris who have accessed GCHQ archives which are unavailable to the general public.

7.2 Cryptanalytic Processes 1914-1946

As has been shown above, the First World War was a book-code-based war, and the Second World War was a war of a combination of machine codes and book-codes.

Following the early capture of three main naval books in 1914², book-based cryptanalysis was a reasonably straight-forward process for the Admiralty compared to the machine-based codes of World War Two, while after 1916 the War Office faced a challenging task decrypting a mass of battlefield codes. In both cases, messages were recorded from the relatively new wireless and telegraphic cable interception systems and passed for decrypting to Admiralty Room 40 (naval traffic) and War Office MI1(b) (army traffic), before the results were passed to the relevant government department. In 1917, in France, following the increase in wireless traffic, the HushWAACs were introduced to breaking battle-field-codes in St Omer, which would have directly impacted the troops in the trenches. Women played a varied role in each codebreaking organisation; the largest group were in administrative posts, although these roles are likely to have been involved in book-building, but a small number, particularly the HushWAACs on the front line and MI1(b), were working directly in important cryptanalytic roles. This thesis argues that the War Office's MI1(b) and HushWAACs saw at least 16 women working as cryptanalysts, with

² Beesley, *Room 40*, p. 3, and Boyd, *British Naval Intelligence*, p. 3 and 106.

particular note given to six of their number: Emily Anderson, Claribel Spurling, Florence Hannam, Gwendoline Watkins, Florence Hayllar, and 'Miss Marreco' (almost certainly Barbara Friere-Marreco).

During the period between the wars, Admiralty and War Office organisations were integrated, and in the new GC&CS women were for the first time promoted to Junior Assistant, the trailblazers being Emily Anderson and Florence Hayllar³ followed within a fairly short period by Claribel Spurling, Helen Lunn, and Miss J.F. Carleton. These appointments indicates a changing attitude towards women; Denniston, who led the newly formed GC&CS, intended to have three female JAs, and 15 males.⁴ Following restructuring and staff changes, the named women might have changed roles, but one was always constant - Emily Anderson, who stayed with GC&CS until retirement in 1951.⁵ In 1925 Helen and Margaret Lunn, expatriate sisters born in Russia, worked with great success on Soviet codes with Fetterlein.⁶ This period firmly established female cryptanalysts such as Emily Anderson and Wendy White as a natural part of the establishment and arguably paved the way for women to become an accepted part of British cryptanalysis. Before the Second World War had broken out additional women including Marie Rose Egan, Caroline Linehan and Marjorie Dale were recognised cryptanalysts, working at a high cryptanalytic level - Caroline Linehan on Italian Attaché codes⁷; Marie Rose Egan in Air Section and helping in the Spanish section⁸; Janet Milne and Miss Harris on Spanish codes⁹; and Marjorie Dale and Evelyn Sinclair in the naval cryptographic section¹⁰. In addition, several other women worked in the

³ TNA, HW3/35, *Summary of Documents relating to Staff of GC&CS. Chief Clerk, FO No X 6700/Gm July 7, 1922*, p. 1.

⁴ Ferris, *Behind the Enigma*, p. 88.

⁵ <https://mooreinstitute.ie/2017/03/20/lives-emily-anderson-galway-professor-music-historian-british-intelligence-officer/> (accessed 4 July 2021).

⁶ Ferris, *Behind the Enigma*, pp. 88-89.

⁷ TNA, HW3/1, *Test of War Site Communications, 15th August, 1939. List of Personnel in Sections, Naval* (unnumbered).

⁸ TNA, HW3/83, *Air Section GC&CS and the Approach to War 1935-39. Part XV*, p. 18.

⁹ TNA, HW3/22, *Spanish Sub-Section*, p. 1.

¹⁰ TNA, HW3/1, *Chapter VI. War 1939-1941*, p. 6.

cryptographic section, although on precisely which codes cannot be confirmed - Daphne Sercombe¹¹, Evelyn Sinclair¹², and Misses Russell Clarke¹³, and Bishop¹⁴. Although there is a Miss Sinclair included in archival records which is likely to be Evelyn who worked on Italian and American codes (see Appendix Three). All these examples illustrate that at least some women were working at the same level as men before the outbreak of the Second World War, even if they had not yet achieved a Senior Assistant grading.

During the Second World War, the vast array of British Y Stations scattered across the UK and internationally intercepted and logged thousands of messages sent by the Axis powers. In turn, GC&CS was compelled to create a much bigger and ever-evolving organisation, with more staff arranged into a complex system of registry rooms, machine rooms for the bombes, and Colossus, and cryptographic decoding sections through to traffic analysis, with the aim of ultimately producing meaningful intelligence for dissemination to relevant Commanders. Many of the women already mentioned relocated with the organisation to BP, where they were joined by Margaret Rock, Joan Clarke and Mavis Lever – all to become well-known and world-renowned in the field of cryptanalysis.

7.3 Terminology

Unfortunately, the terminology has altered over time and the words ‘decoder’, ‘codebreaker’, and ‘cryptanalyst’ have all come to mean the same thing; simply, a person who breaks codes. However, whilst the terms may be interchangeable today, the argument remains that this was simply not always the case. As discussed by Oakley, it seems ‘*pedantic*’ when the word cryptograph and its

¹¹ TNA, HW3/1, *Test of War Site Communications, 15th August, 1939. List of Personnel in Sections, Military* (unnumbered).

¹² TNA, HW3/1, Chapter VI, War 1939-1941, p. 6.

¹³ TNA, HW3/1, *Test of War Site Communications, 15th August, 1939. List of Personnel in Sections, Naval* (unnumbered).

¹⁴ TNA, HW3/1, *Test of War Site Communications, 15th August, 1939. List of Personnel in Sections, Naval* (unnumbered).

related words are in ‘*common usage*’.¹⁵ All people who worked at BP have become known as ‘codebreakers’ regardless of the work they did. As has been seen, this is an over-simplification of the roles that individuals, particularly the women, held, for these range from low- to high-level. To consider what the roles were and how they were defined it is necessary to analyse the terms used in detail.

Over a 30-year period, of course, the use of terminology provides an interesting conundrum. Regardless of the discipline involved, language inevitably changes over time, and cryptography is no different. Tantalising glimpses of roles that were available to women can be seen but the job roles must be interpreted. Most of the terms accepted today have come about in more recent years, from 1939 onwards. Each of the main terms is now considered in turn.

7.3.1 *Cryptanalysis and cryptanalyst*

Hinsley states that the term ‘cryptanalysis’ was not widely used until the 1950s, although he does not state what was used previously.¹⁶ In direct contrast Kahn says the term came into use before the 1920s.¹⁷ The only contemporary source from World War One was Gwendoline Watkins who used the term ‘cryptography’ in her diary.¹⁸ In 1938, however, Clarke indicates that ‘decoders’ and ‘cryptographers’ are not the same thing.¹⁹ So, whilst cryptanalysis may or may not have been a term in use, ‘cryptography’ was certainly used by the late 1930s, and it could therefore be proposed that the term in use for people involved could have been ‘cryptographer’. Another source described ‘cryptographers’ in masculine terms.²⁰ Dermot Turing discusses the fact that the Civil

¹⁵ Oakley, *The Bletchley Park War Diaries*, p. iii.

¹⁶ Hinsley and Stripp, *Code Breakers*, p. xv.

¹⁷ Kahn, *The Code-Breakers*.

¹⁸ Gwendoline Watkins Diary. National Army Museum: 1998-01-110-1 (accessed via the online collection): <https://collection.nam.ac.uk/detail.php?acc=1998-01-110-1> [accessed 1 December 2020].

¹⁹ TNA, HW3/1 *Notes on D.N.I.’s Letter. 20th October 1938*, (unnumbered)

²⁰ TNA, HW8/23, *Naval Section. Decode Watch. 21.8.41*.

Service establishment set limits to the number of jobs graded appropriately for codebreaking, and that these were too few, the result being that some codebreakers not covered by the approved establishment had to be given inappropriate gradings such as ‘linguist’ or ‘translator’ to gain a higher rate of pay²¹; one codebreaker, graded ‘linguist’, was thus able to complete her staff record as ‘Grade: Linguist. Languages: None’²² Turing also makes the point that female university graduates were generally given better roles²³, which is noteworthy because it cannot be proven that at this time every female cryptanalyst was a university graduate. It is important to add that, simply because a woman is listed as working in the cryptanalytic section, there is no guarantee that she was a cryptanalyst, as it is possible that she could have been a clerk, or a secretary whose job it was to support the section or sub-section.

A contemporary source describes cryptanalysis as “*The making and use of codes and cyphers*” and includes “*cryptanalytic*” as “*of, or belonging to, or employed in cryptanalysis.*”²⁴ Stripp describes the term ‘code-breaker’ as English, and ‘cryptanalyst’ as American²⁵; although he does not set this in context by specifying an exact date, the implication of the statement being in a book about BP is that it is Second World War terminology.

Today cryptography is described by Ratcliff as “*The development of codes and cyphers’ and cryptanalysis as ‘...the cracking of the same...’*”²⁶ As Kahn points out cryptanalysis “*...provides much more... trustworthy information than spies...’*”²⁷ due to the enemy themselves being the direct source. Kahn also goes further to define the differences between ‘decipherment’ and ‘cryptanalysis’ – ‘decipherment’ being

²¹ Turing, *The Codebreakers of Bletchley Park* p. 142.

²² Murray, ‘Hut 8 and Nava Enigma, Part I’, p. 114

²³ Turing *The Codebreakers of Bletchley Park* p. 142.

²⁴ TNA, HW43/6 *British Secret Service Sigint, Glossary*, p. 223.

²⁵ Alan Stripp (Foreword) in Welchman, *The Hut Six Story*, p. xii.

²⁶ Ratcliff, *Delusions of Intelligence*, p. xi.

²⁷ Kahn, *The Code-Breakers*, p. xi.

to read a message legitimately by the intended recipient, and ‘cryptanalysis’ the enemy’s reading of a message obtained by more nefarious means.²⁸ According to one archival source, ‘cryptanalysis’ is “*The art or science of ascertaining the essential nature of codes and cyphers and reconstructing the systems and operations used by the encoders, and encypherers, or enough of these, to enable the message to be read.*”²⁹ It further adds a ‘cryptanalyst’ as “*A person engaged on cryptanalysis*”³⁰. According to Singh, ‘cryptanalysis’ is “*The science of deducing the plaintext from a ciphertext, without the knowledge of the key.*”³¹ World War Two Official intelligence historian Hinsley describes cryptanalysis as simply “*the ancient craft of reading codes and cyphers.*”³²

In the official history of GCHQ, Aldrich states that he followed the common usage of the term ‘code-breaker’ to avoid confusion;³³ a method that also seems to have been followed by Jeffery.³⁴ It is interesting that the official historians of both SIS and GCHQ appear to make a conscious decision not to deal with the terminology, although this could be because they are trying to please a wider audience by simplifying the lexicology.

7.3.2 Decrypting

According to Boghardt

A code is a system for replacing words, phrases, letters, or numbers by other words or groups of letters or numbers for concealment or brevity. A cipher, on the other hand, replaces each individual letter or figure with another letter or figure....³⁵

²⁸ Kahn, *The Code-Breakers*, p. xvii.

²⁹ TNA, HW43/6 *British Secret Service Sigint, Glossary*, p. 223.

³⁰ TNA, HW43/6 *British Secret Service Sigint, Glossary*, p. 223.

³¹ Singh, *The Code Book*, p. 382.

³² Hinsley et al. *British Intelligence Vol I*, p. 20.

³³ Aldrich, *GCHQ*, (pages unnumbered but listed in Notes on Terminology).

³⁴ Jeffery. *MI6*.

³⁵ Boghardt, *The Zimmermann Telegram*, p. 253.

He goes into further detail: -

Encryption or encrypting refers to the encoding as well as to the enciphering of a message. Decryption or decrypting typically refers to the process of cryptanalysis, that is, the conversion of an encoded or enciphered message into plain (readable) text without having initial knowledge of the original code or cipher. German diplomats used codebooks to encode and decode their telegrams, but the British needed to reconstruct the relevant German code before they could read an intercepted and encyphered message. Therefore, as long as the British were not in possession of a full, reconstructed codebook, they decrypted, rather than decoded, the intercepted messages. Once they had reconstructed the relevant codebook, the cryptanalysts could use their reconstructed codebook to decode the message in the same manner as the 'legitimate' German recipient."³⁶

From this detailed description it is clear that there is a distinct difference between decoding and decrypting during World War One.

Again, Hinsley states the term decrypt as not widely used before the 1950s.³⁷ Another contemporary source discusses 'crypting' and 'decrypting', although interestingly the word 'decoder' was originally used but crossed out.³⁸ 'Crypting' is not a commonly used word in either the literature or archival sources, and it is possible this should read 'encrypting', a term more widely used.

This raises interesting questions about the terms originally used and when they changed. The individuals describing the terms would have used language contemporary to that period. In other words, someone writing in 1938 is more likely to have used the recognised 1938 term for

³⁶ Boghardt, *The Zimmermann Telegram*, p. 254.

³⁷ Hinsley and Stripp. *Code Breakers*, p. xv.

³⁸ TNA, HW3/32, *Meteorological Codes*, p. 3.

cryptanalyst when describing the work done during World War One, not necessarily the actual term that was prevalent in that period, a point further complicated by the terms being used interchangeably today.

7.3.3 Decoding

Decoders have also become synonymous with cryptography and cryptanalysis although this has not always been the case. In 1938 a GC&CS archival source indicates that decoders use complete [code] books in their process of decoding.³⁹ This poses an immediate question – how much has the term changed between 1914 and 1938? If it is taken that the term has not changed, in other words that a decoder in the First World War did the same job as one in 1938, then women were probably working on book-building, and then on decoding (although both were not necessarily performed by the same individual). Decoding in this situation would require a certain level of linguistic skills, to draw full meaning from coded words in a codebook, in other words, “reading between the lines”, and likely would include further skill in the precise knowledge of military or naval terms. This could be considered a lower role than that of top-level cryptanalysts, although one that is still important. If this is the case, then there would be two separate potential roles for female linguists – those of decoder, and of linguist (indicating the translation of messages from either book-based code, or machine code.) If decoders’ skills are more general, then it is plausible that a former decoder (as in the cases of Phoebe Senyard and Barbara Abernethy) would be moved to administrative roles if their secretarial skills were stronger. Barbara Abernethy states “*I was in decoding but then they learned I had commercial training – I could type – so they whipped me into administration. I kept the personnel records all through the war.*”⁴⁰ As Barbara was with the organisation before the start of World War Two, her grade is not listed. In addition to Barbara, Caroline Linehan was also

³⁹ HW3/1, *Notes on DNI's Letter*, p. 1, 20th October, 1938.

⁴⁰ <https://www.theguardian.com/theguardian/1999/jan/18/features11.g2> [29 March 2020].

listed as decoding and key breaking staff in 1927.⁴¹ As has been seen this is clearly an earlier role for both of these individuals and thus would indicate that decoders are at the lower end of the cryptanalytic scale.

7.3.4 *Linguist*

The job, and also pay-grade, of linguist is likewise a difficult term to define precisely. According to Rozanne Medhurst who was taken on as linguist⁴²

“I was instructed then in ‘de-coding’ by Leonard Hooper. Then I was positioned at a table, and the coded messages came from the teleprinter room on sheets of paper delivered by messengers every half-hour. I had to go through every one trying various groups which represented Italian words. At the start of the message there were usually varying numbers of phoney groups (‘pre-ambles’) before the actual message began. The job of de-coding required a lot of slog, application, and a certain amount of imagination. Daily, Josh Cooper sent down to us a list of various numbers in groups which then had to be subtracted from the existing groups which had been received via radio and which would reveal the substance of the message.”⁴³

Furthermore, Rozanne described herself;

“I was a de-codist [sic] at the Park, and one night on duty I was decoding a message freshly arrived on the teleprinter. After many trials and errors, alone in my room, with Jo[e] Hooper on duty at a far desk, the ‘groups’ of numbers began to make sense, and I found myself faced with a message that made sense. It concerned S82s and S79s (Italian

⁴¹ TNA, HW3/1, *Naval Section 1927-1939, Italian Diplomatic, Mr W Bodsworth’s account*, p. 5.

⁴² <https://bletchleypark.org.uk/roll-of-honour/6221> [accessed 6 August 2019].

⁴³ Author’s interview with Rozanne Colchester née Medhurst and testimony from the author’s private collection, 17 October 2012 (Rozanne was the daughter of Air Vice Marshall Medhurst, Head of RAF intelligence).

bombers) which were leaving Tripoli to fly to Sicily at 0400 hours. Imagine the thrill – it was then 0130. I rushed to Jo [sic] Hooper with the message and he leapt into life and tore along the passage to Josh Cooper’s room. Then radio messages were sent to the RAF in N Africa and, consequently, ALL the Italian aircraft were shot down.”⁴⁴

This leads to the interesting debate of language and if Rozanne was using contemporary terms for her job role. Rozanne also describes Rhoda Welsford as a ‘de-codist’ but again this goes against how she was described by Bonsall. It would seem to be in a different category as Rhoda was a TSAO. It is possible that there was some overlap between roles which might account for this.

7.4 Definitions

As has been seen, over time the language used to describe individuals in cryptanalysis has changed. The following is a list of the main terms in use during the period of 1914 to 1946, and a short description of what they mean based on the research carried out for this thesis.

Cryptanalysis is the process of reading secret codes and cyphers.

A **computer** was an individual who made calculations using either paper and pen or a device. This was a role which needed more mathematical skills. The so called ‘strippers’ of World War Two Japanese codes could be considered computers.

An early **linguist** was an individual who often worked on book building. The role was for skilled workers with some cryptanalytic experience. Often it was a role filled by women, and frequently carried out by secretaries as part of a dual role.

⁴⁴ Interview with Rozanne Colchester and testimony from the author’s private collection, 17 October 2012.

An early **decrypter** was an individual who worked on completing broken, partial messages with the intention of completing the message. This role would require a high degree of cryptanalytic skills.

An early **cryptographer, cryptanalyst** or **solver** was an individual, generally a classicist, who usually worked with pencil and paper. They might have a complex problem that has not been seen before by the department. This role would require a high degree of cryptanalytic skills. An example is Knox who built a Hungarian dictionary/codebook despite having no knowledge of the language.

A **decoder** was an individual who used a codebook to read or translate a message. It was necessary for the decoder to have, or acquire, some specialist knowledge of the subject – for instance of naval terms if it was a naval codebook, military knowledge for a military codebook, in addition to language specialism. This role was sometimes carried out in tandem with book-building. The individual needed linguistic skills for this role, but no cryptanalytic skills were essential although a degree of interpretation might be needed; GPO staff completing partial telegrams is one such example. This term is not confined to cryptanalysis.

A **World War Two semi-skilled machine operator** was an individual, usually a woman, who inputted partially pre-identified code configurations into a device (the ‘machine’) to obtain results which enabled a key to be broken, for example, WRNS using the bombes to find the day’s Enigma keys. This term is obviously not confined to cryptanalysis.

A **World War Two cryptanalyst** was an individual, often a mathematician or classicist, who usually worked with pencil and paper. A cryptanalyst would be able to use ‘cribs’ (a guessed key or plain-text message), and their output, typically a best guess or guesses at the Enigma key for the day, could in turn be used to create menus for the bombes. The term ‘cryptanalyst’ should not be confused with the term ‘decoder’.

A **World War Two linguist** was an individual whose expertise was the precise interpretation of the language used in a message. This role might also require a moderately high degree of cryptanalytic skills, and again should not be confused with the role of a ‘decoder’.

An **intelligence officer or analyst** would work on traffic analysis, specifically to examine the facts provided by the messages in terms of details of where the signals have come from, who they are going to, and the volume of messages passed between locations (which might, for example, indicate which station was an HQ). Having built up a picture of this data, they would distil appropriate detail to pass onto superiors. This was a role carried out at BP by Huts Three and Four, and SIXTA (Hut SIX Traffic Analysis, hence SIXTA).

A **code breaker** is a general catch-all term for anyone working in code breaking. Depending on the role as described above would be an indication of the level of skills needed.

7.5 Classifications

Several key characteristics can be identified from the details of the identified female cryptanalysts, and these can potentially be used to allow future identification of others as cryptanalysts. However, it is important to acknowledge there is no absolutely definitive rubric that can be used to guarantee beyond all possible doubt whether a woman is a cryptanalyst or not; the only conclusive proof can be found in contemporary evidence in the National Archives. There are, however, characteristics which can be used in combination to give a very strong indication. These key themes can be considered in turn.

7.5.1 Education

Education may be considered an important indicator of ability. Several women in Room 40 were described as university graduates, and, as has been seen, most had language abilities, meaning they were likely to have been involved in book-building at the least. Women such as Rhoda Welsford and Joan Musgrave Harvey are described by Clarke as university graduates, and some of the

HushWAACs were likely to be university graduates; they were all selected as excellent linguists. Several of the women at BP are also identifiable as university graduates - Joan Clarke (mathematics), Margaret Rock (mathematics), and Marjorie Dale (a classicist).

Education could be said to feature highly in the families of these women. Both Claribel Spurling's grandfathers were described as gentlemen, while her father was a schoolmaster and clergyman. This would indicate education is an important part of Claribel's upbringing, and indeed, Claribel herself went on to work in education, this being one of the few careers available to women at the time, particularly as she, like many others, needed to support herself in the absence of a husband. Joan Clarke's father was also a clergyman. To become ordained, it is necessary for a man to be educated, and it would be natural that such an individual would prize education. Emily Anderson's father was a university professor, and she herself was to become one. This is significant because, despite it being unusual for the time, there were some men who prized education to the extent that they insisted their daughters were given an equitable chance to gain its enhanced opportunities, giving those women much more choice (within certain parameters) to select the life they wished to follow.

It is important however to include that there are exceptions to the rule. Wendy White started at MI1(b) in the First World War which indicates that it was probably her first job, this means that Wendy was not educated to the same level as many of these other women, and so it is possible that a small number of women may have been able to achieve the same level, but they had on-the-job training over a much longer period of time.

7.5.2 Opportunity and familial contacts

It could be said that an element of chance played a strong part in the opportunities available to the women. Certain men who were in senior positions seemed to recognise that women had the abilities needed to make successful cryptanalysts; these forward-thinking men included Hay, Knox,

Cooper, Simpson, and Clarke, and in all likelihood, there were probably others. As managers, they appear to have accepted women as equal to men, even if they were unable to promote them to the equivalent level. Through the opportunities thus created most of the women discussed in this thesis were given unique opportunities to excel in cryptanalysis. Arguably, women including Claribel Spurling, Emily Anderson, Mavis Lever, Margaret Rock, Marie Rose Egan, and Wendy White were all ‘in the right place at the right time’ with the necessary skills and outlook to take advantage of these opportunities.

As has been seen, several women took advantage of familial contacts; in fact, in the early days of Room 40, these were a prerequisite. During the First World War, Joan Musgrave Harvey lived next door to the head of Room 40. The likelihood of May Jenkin being offered work in Room 40 through her grandfather’s friend Ewing is extremely high. Equally the connections between the Hambro banking family and the upper echelons of Room 40 is also highly likely.

At BP there were several pairs of sisters who worked in different sections. Some women, like Rhoda Welsford, who had previously served as codebreakers, were invited to return. In the early days of GC&CS’s move to BP, people were asked if they knew anyone who would be suitable; Milner-Barry approached his sister at Newnham College to look for ‘suitable women’, and Welchman suggested his student Joan Clarke as a potential candidate.

These examples illustrate the fact that familial contacts were extremely important in the earlier periods of both World War One and World War Two; during those periods, there was no standardised method of carrying out security checks. Trust remained an essential part of working for a cryptanalysis organisation at a time when security checks may not have been as thorough as they are today, despite security being paramount.

7.5.3 Honours' Lists

The Honours Lists of Civil Service Awards and recognition are a curious conundrum, for it would seem that this cannot be used as a clear identifier of grade, of achievement, or of importance.

Predominantly it was the male cryptanalysts who were awarded post-war honours. Several female cryptanalysts were also recipients of honours, for example Marie Rose Egan, Wendy White, and Margaret Rock, but equally many were not - cryptanalyst Mavis Lever did not receive an honour for her work at BP, which included her contribution to the naval victory of Matapan, whereas secretary Phoebe Senyard did. It is interesting to contemplate why this is so; it is possible that Mavis did not serve long enough which appears highly unlikely; she may have refused the honour (but she accepted it years later for her garden work); or it could simply be she was not nominated by the 'right' people. Thousands of people, particularly men who were involved in overtly heroic situations, were awarded post-war honours. It may be that the combination of the secrecy of BP with the need for recognition meant that many women were overlooked for an award, though this does not account for a secretary receiving one.

In a cross-reference between the Honours lists and the BP RoH, there is a total of 22 women who received an award resulting from their work at BP (see Appendix Seven). If the assumption is made that women who were formally recognised for their World War Two work received an award in 1945 or 1946, then the total number is 14, and it appears likely that these women were recognised for some special achievement, while the remaining eight, awarded between 1946 and 1967, are awards to women likely to have continued with the organisation and to have left or retired later (GCHQ became independent from the FO in 1954⁴⁵). Four of the women who were given an award shortly after the Second World War have already been identified in earlier chapters:

⁴⁵ There are also an additional three women awarded honours in 1958, 1960 and 1964, as they do not appear on the BP RoH they have been considered beyond the remit of this research.

Margaret Rock, Marie Rose Egan, Joan Clarke, and Phoebe Senyard. Of the remaining 15 women awarded on the Honours Lists there is no single common denominator; Mary Charnock Smith worked for six years at GC&CS before receiving an award, so length of service was clearly not a defining factor in her case, another woman worked for the Diplomatic Section, and a third in Broadway (the pre-war location of GC&CS). These examples show there was no universal indicator that proves the role that the woman held. Although these awards could potentially be at least partially related to the adage ‘it is not what you know, but who you know’, this is potentially an area for future research.

7.3.4 Grading and military ranks

The women working for the intelligence agencies between 1914 and 1946 were assigned an appropriate grade if they were civilians, or a rank if they were from the services. During the First World War several of the HushWAACs were promoted to ‘Assistant Administrators’, a rank equivalent to that of male junior officers.⁴⁶ On returning to the UK, those who chose to remain with the War Office were transferred to MI1(b), shortly before it amalgamated with Room 40 to form GC&CS; some then became ‘Lady Translators’⁴⁷, and a small minority became Junior Assistants (JA)⁴⁸. As has been seen earlier in this chapter, some Lady Translators later became JA’s (although not all of them did) a fact which is pertinent because it shows that, as the early structuring of GC&CS developed, women continued to form an integral part of it.

⁴⁶ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 21 July 2021].

⁴⁷ HW3/35 *Names of Staff which it is desired to appoint to permanent posts in the Code and Cipher School. Particulars of each candidate attached*, (unnumbered)

⁴⁸ Ferris, *Behind the Enigma*, pp. 88-89

The civilian women working in Room 40 were mostly temporary staff⁴⁹, the expectation (as has been seen) being that they would leave once the duration of the First World War was over⁵⁰. Even following the movement of some staff from the GPO to GC&CS in 1922, most women kept their temporary roles, the most likely explanation being that, with the existence of the marriage bar, there was an expectation that fathers or husbands would support their daughters in the longer term.⁵¹ The women of World War One's Room 40 were generally secretaries, under the management of Lady Sybil Hambro, Head of the Secretariat.⁵² Some of the women such as Joan Harvey held a Linguist grade, a grade that persisted through to the Second World War when, as can be seen, Joan Clarke was awarded this grade in order to increase her pay.⁵³

During the period of restructuring in the early 1920s, as has been seen earlier in this chapter, Denniston wanted three female and 15 male JAs.⁵⁴ Emily Anderson and Florence Hayllar⁵⁵ are the two listed JAs, and, whilst Emily would later achieve a Senior Assistant grading, it is not clear on exactly when this regrading occurred.⁵⁶

During the Second World War, as the organisation rapidly increased, the need was for a much greater number of Temporary JAs and Temporary SAs, the grades being titled TJAO (Temporary Junior Acting Officer), and TSAO (Temporary Senior Acting Officer). As has been seen in

⁴⁹ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed for] *Accountant-General of the Navy 30/03/1922*, p. 364 (following pages unnumbered).

⁵⁰ Riley, 'Some Peculiarities of Social Policy concerning Women in Wartime and Postwar Britain', p. 261

⁵¹ TNA, FO366/800, *Particulars of service and pay of staff on weekly pay in the Code and Cypher School, transferred to Foreign Office for pay from 1st April 1922*. [signed for] *Accountant-General of the Navy 30/03/1922*, p. 364 (following pages unnumbered).

⁵² Bramsen and Wain. *The Hambros*, p. 328.

⁵³ Murray, 'Hut 8 and Naval Enigma, Part I', p.114.

⁵⁴ Ferris, *Behind the Enigma*, p. 88.

⁵⁵ TNA, HW3/35, *Summary of Documents relating to Staff of GC&CS. Chief Clerk, FO No X 6700/Gm July 7, 1922*, p. 1.

⁵⁶ <https://bletchleypark.org.uk/roll-of-honour/164> [accessed 4 July 2021].

Chapter Six, most departments had several women TJAOs, with many fewer as TSAOs; by far the greater number of TSAOs posts were taken by men.

In considering the civilian grade or military rank of individual women, it is important to point out that while, according to Simpson, the grade of TSAO was one good indicator of a cryptanalyst, several TJAOs should also be considered cryptanalysts.⁵⁷ This is noteworthy because, yet again, it illustrates that grade or rank alone can be considered indicators but cannot on their own be regarded as definitive.

7.6 Conclusions

As has been seen, the roles involved in cryptanalysis between 1914 and 1946 changed substantially over the period. During the First World War codebreaking was predominantly book-based and this allowed the women of Room 40 to be involved in book building, arguably work that could be considered cryptanalytic in nature. At least six female HushWAACs can be considered cryptanalysts and worked (and were accepted) as equals with their male colleagues, working on battlefield codes such as ‘*Adolph*’, ‘*Gretchen*’ and ‘*Brünhilde*’.⁵⁸ Some of these HushWAACs went on to become the first JAs for the newly created GC&CS. From at least 1919, when Emily Anderson and Florence Hayllar were promoted to JAs, it could be argued that this use of women helped to put GC&CS into a strong position as one of the best cryptanalytic organisations in the world.

With the massively increased number of people working at BP, the number of women cryptanalysts also increased, although further research is needed to confirm some names to further add to the list of recognised cryptanalysts. From the present research, in addition to Margaret Rock, Mavis Lever and Joan Clarke, at the very least a further 17 women can be added to the list of known female World War Two cryptanalysts and based on this research with further study it is

⁵⁷ Author’s interview with Edward Simpson, 5 November 2012.

⁵⁸ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 21 July 2021]

likely that at least another 12 women can be added to this exclusive list (see Appendix One and Three).

Some of the roles are recognisable from their earlier incarnations but others have changed considerably. From a historiographical aspect it is difficult to identify the meaning of particular roles, as the official histories have used contemporary terms to describe them, and this can lead to potential confusion over what could be considered comparable roles over the entire half century covered in this research. The terms that have been listed show as far as possible how the changes have impacted on the roles available to women, and in turn illustrated how the early experiences of these women allowed newer, younger, trail blazers to continue to widen the horizons first glimpsed in the First World War.

By tracing the changes in language and examination of the roles held by women, particularly in the case studies, a set of indicators have been identified which can also be used to guide future researchers. Whilst there are some strong indicators that specific women can be definitively described as cryptanalysts, other women cannot be assumed to be in the same category; they could be cryptanalysts, but further research is required to confirm that status beyond doubt. Therefore, the classifications should be considered as a loose guideline rather than conclusive proof, it is also important to point out that no one single identifier from this list can be used in isolation to categorically confirm that a woman was a cryptanalyst beyond all doubt. A combination of these factors can be used and cross-referenced against available information to indicate that a woman could potentially be considered a cryptanalyst, but it is by no means guaranteed. Through careful archival work this study has brought together a template for the roles during the period 1914 to 1946 and how they were used. It has shown how the terminology has changed and how this can be used to potentially identify specific roles.

The final chapter of this thesis will consist of the conclusions that can be drawn from this research and will consider what this means for the history of intelligence. It will also include areas for future research.

Chapter Eight: Conclusion

“It was astonishing what young women could be trained to do... in an incredibly short space of time with wonderful accuracy quite untrained to use their hands or apply their minds to such work.”¹

8.1 Introduction

This final chapter brings together all the key areas of research which have been considered in this thesis against the hypothesis that:

‘The history of cryptanalysis in Britain in the first half of the twentieth century has substantially focussed upon a limited number of men, and neglected the significant role played by women in codebreaking establishments from the First World War onwards.’

This chapter will illustrate that, until very recently, most accounts, including Smith and Erskine in 2001, Turing in 2020, Randall in 2019, and Stone in 2020, written by or about high-level cryptanalysis have neglected the role of women, and that it has only been as a result of more recent changes in attitudes to women that women have brought their narratives to the fore - unfortunately, too late for many women who have passed away. Many considered themselves ‘ordinary women in extraordinary circumstances’ who are likely to have believed that their accounts were not worth telling simply because they were women.

Prior to this study, a generally held norm was that, at least until 1939, there were no female cryptanalysts and that even during the Second World War they totalled just two - Mavis Batey and Joan Clarke, both belittled – the former as one of ‘Dilly’s fillies’, the latter as, very briefly, Alan Turing’s short-lived fiancée.

¹ TNA, HW14/145, *Memorandum by N. de Grey, section c) Medium and low grade labour numbers and types, 17th August 1949.* p. 7.

This chapter illustrates that this norm is at best an oversimplified and very partial truth; that in fact there were women working, equally in achievement to men, at intellectually-demanding high levels of cryptanalysis from 1916 onwards. The present thesis, through the use of detailed case studies based on research and interviews never previously undertaken, has advanced the understanding of specific, specialised cryptanalytical roles held by women, showing for example that women did not automatically become high-level cryptanalysts through long service, family connections or the provisions of legacy posts, but that those with the requisite qualities such as Emily Anderson had the ability to work at the same level as their male counterparts – and indeed to organise and to train their male counterparts, as both Emily (Anderson) and Marie Rose Egan were sent out to create the Combined Bureau Middle East cryptological bureau at a key point in the lead up to the Second World War. Such examples show that women, fewer in number perhaps, were nonetheless working at the same level as men and that their accounts of their service are as important and fascinating as those of their male colleagues, especially when taken in context with the contemporary antipathetic attitudes of men to women which they often encountered.

This chapter will illustrate the contribution to original knowledge which this thesis has provided, bring together the recommendations that can be made from the research, discuss the limitations of the findings, and in conclusion propose areas for future research.

8.2 Summary of Key Findings by Chapter

Chapter One introduced this thesis by showing that, following the first British author (Winterbotham) to publish on BP, the other accounts of BP that followed were published exclusively by male former incumbents who detailed their cryptanalytic experiences. Alan Turing has become the best-known BP cryptanalyst, in part due to his untimely death, in part to his high level of media exposure, leading some to assume that he personally broke every code at BP. It can be acknowledged that most cryptanalysts from this period are male, but it is erroneous to assume that all cryptanalysts were male. The earliest accounts by female cryptanalysts were not published

until a generation later - chapters by Mavis Batey and Joan Clarke in Smith and Erskine's book of 2001, and were not repeated until almost another generation has passed, with Batey's account in 2017 of the life of Dilly Knox with a chapter on 'Dilly's girls'. Mavis and Joan are the only former BP female incumbents who have published in their own right, or have been published, in a way which recognises their contribution as cryptanalysts, and this is perhaps one reason why they have become the best-known female cryptanalysts.

Chapter Two sets out that during peacetime before the outbreak of the Great War, there was little military need for the interception and decryption of wireless or cable messages, both relatively modern technologies, although there had been for many centuries diplomatic work in the interception of messages. Languages were an important part of a girl's education, especially among the middle and upper classes who might have foreign governesses or travelled to Europe for finishing school or staying with foreign families. The increased extension of technology in the form of telegraphs and telephones also led to an increase in roles available to women, which in its turn led to a potential supply of women with skills useful in cryptanalytic roles.

By 1914 and the outbreak of the First World War, the need for languages in cryptanalysis was crucial, although additional skills were also needed. Across the wartime economy, roles now available to women varied hugely, although they quickly became more defined with 'men in the trenches and women as nurses or in war factories.' Early in the War, the Admiralty had captured the main German maritime codes, while the German Army behind the Western Front made use of captured telephone and telegraph networks; in both cases, male cryptanalysts could cope. After 1916, Army battlefield intercepts grew massively in number, and the pool of male manpower for cryptanalysis was drained by the needs of the front, and so the need for women in cryptanalytical roles developed. In particular, the War Office's MI1(b) and 'HushWAACs' started to employ women as cryptanalysts, utilising their language skills on active deployment close to the front line in France.

The period between the wars at first saw a reduction in the volume and urgency of work and the Admiralty and War Office units were combined into GC&CS. Within the new structure, some women of talent such as Emily Anderson and Florence Hayllar gained an increased ability for women to cement their status as language-based cryptanalysts for the newly created GC&CS but published literature on this period is much less extensive than that of the two World Wars and so their stories have remained obscured.

The literature of British cryptanalysis in the Second World War, which is essentially that of BP, was not begun until a generation after the war had ended and was even then written from memory as no official files had been released. For a further generation, the literature was written only by male authors, and concentrated heavily upon male cryptanalysts and their feats, and upon the details of machines used to create and to break the German Enigma and Geheimschreiber codes. Discussions with a publisher of many wartime memoirs identified that women authors typically write for a female audience, who tended to be more interested in human relations and details of how life was lived, and very recently this view has been reinforced by Mary Ann Sieghart's thoughtful book on aspects of the authority gap between the genders.² Accounts by women at BP, which did not begin until a further generation had passed and also based on memory, have indeed tended to be narratives that often use BP as a hook or a backdrop for the rest of their life story. For almost 50 years BP literature was exclusively written by men and mainly about men, and since almost all the details of the technologies involved and of the successes of cryptanalysis (ascribed to males) had been made public, the widespread public assumption was that their female counterparts simply did not exist – an assumption reinforced by popular novels and films very loosely based around published literature. More recently, the greater availability of official records, women's memoirs, and the willingness of some at least of the rapidly-disappearing women of BP to be interviewed, in parallel with the development of gender studies, the impact of women on

² Sieghart, *The Authority Gap*, pp. 140-159.

male dominated roles, and the identification of horizontal and vertical segregation as inhibitors of women's achievements and careers, has created a greater interest in rebalancing the picture presented by the published literature, and provided the drive for the present thesis.

Chapter Three sets out the methodological deliberations that have been considered for this thesis, considering the limitations of memory and of official records, and the complexities introduced by changes in terminology over time. The Chapter sets out the intention to use a variety of tools by which to assess the roles of female cryptanalysts, and the choice of case studies to identify the lessons to be observed in the application of those tools.

Chapter Four briefly traces the background to cryptanalysis as practised in the First World War, noting the newly created organisations of Room 40 and MI1(b) which provided cryptanalytical intelligence to the Admiralty and War Office respectively during that conflict. It notes the emphasis on book codes, in particular for the Admiralty who had gained copies of those codebooks very early in the war; also noted is that fact that on the Western Front wireless messages were not significant until 1916, as captured French and Belgian telephone and telegraph networks sufficed for high-level German Army messages. Analysis of the work of women in these organisations identifies a group of over a dozen women who certainly carried out cryptanalytical work, in some cases such as the HushWAACs working in active service in the Western Front war zone alongside men, gaining both service medals and Mentions in Despatches. Three case studies, those of Joan Musgrave Harvey (CS1), Emily Anderson (CS2) and Wendy White (CS3) are presented, each illustrating a different aspect of cryptanalysis, Joan a linguist and secretary in World War One who left interwar, then re-joined and became a cryptanalyst in World War Two; Emily, who trained as a HushWAAC, moved interwar to being a Junior Analyst, trained male cryptanalysts and went to Cairo in World War Two to set up BP's Middle Eastern operation; and Wendy who progressed from a nominal grade of Shorthand Typist - Supervisor to being a cryptanalyst with a career of over 30 years. The importance of language fluency is shown to be a key factor at this date, and the

first embryonic steps towards creating a codebreaking ‘factory’ (as BP would become after 1940) are apparent with the first use of machines to break codes, and the establishment of a system of wireless intercept ‘Y’ stations.

Chapter Five charts the change from the two World War One organisations into the unitary GC&CS. Detailed analysis and case studies show that age and marriage were no barrier to working at GC&CS, and that women who were initially brought in with the job title of ‘decoder’ did not automatically become cryptanalysts later in their careers (Phoebe Senyard, CS4), although there were exceptions to the rule with women such as Wendy White (CS3) who had started in the War Office but was given the opportunity to work later as a cryptographer. Although the two decades of peace which reduced the volume of, and demand for urgent decryption of, intercepted messages might be expected to constrain women’s opportunities, it has been possible to identify at least fifteen women who can be identified as cryptanalysts during this period, a figure which includes those who joined GC&CS post-World War One. The chapter illustrates how women were already an established and integral part of GC&CS structure by the late 1930s, with significant female contributions made towards breaking Soviet codes in the 1920s and the codes used in the Spanish Civil War in the 1930s. However, as a veil of silence covered GC&CS activities, their work did not gain the same fame as was awarded to, for example, Elizebeth Friedman in the USA, whose cryptanalytical skills gained widespread public notice during the Prohibition Era due to her public testimonies in prosecutions. Also, towards the end of this period, encryption by machine, the exemplar being the German Enigma, became increasingly common, the attack upon it being led in the UK by Dilly Knox, but for the bulk of the period and for many nation states, codes continued to be book-based and fluency in languages, rather than mathematics, was still a major requirement of a cryptanalyst.

Chapter Six examines the rapid and fundamental changes that took place as GC&CS prepared for World War Two, and how its organisation continued to evolve at speed in both size and

complexity as ever more mechanical encryption of increasing technological sophistication was employed by all combatant nations. Mathematics as much as language fluency became increasingly important as a basic cryptanalytical skill, which in turn led to the promotion of women with university based mathematical backgrounds such as Joan Clarke and Margaret Rock, and machine-based decryption occupied many female workers. Each section of the BP organisation is examined in terms of its role, its staff numbers and its salary gradings as between men and women, and women who may, by use of such tools as the BP Roll of Honour, family histories, and opinions of both peers and of senior staff in GC&CS and its successor GCHQ, be identified as cryptanalysts working at the highest intellectual level of that profession. This analysis, and the case studies of Marie Rose Egan (CS5) and of Mavis Lever (CS6), who is generally accepted as a cryptanalyst and who was the only one this researcher was able to interview (most have passed away), illustrate the capabilities required of a cryptanalyst, but show also the importance of opportunity and of the 'helping hand' which could be given by (male) superiors, Dillwyn Knox being one classic example – but opposition, attempts to steal credit, and obstruction of women in their work are also identified, as are the continuing career obstacles such as the 'marriage bar' and the constraints of Treasury restrictions on numbers of grades which could be awarded in each section. Given the emergency, many women soldiered on at lower grades than their cryptanalytical work would merit, such that salary grading alone cannot be taken as a yardstick indicating a woman's cryptographic prowess. The chapter identifies some 20 women who were certainly working at the highest cryptanalytical levels, with a further ten identified in Appendix Three who are likely to have been so but where definitive proof from official records is lacking.

Finally, **Chapter Seven** considered the changing use of contemporary language describing cryptanalytical activities, terms for example such as 'cryptanalyst' and 'decoder', and what they are likely to have meant in their succeeding contemporary periods. It also showed that the terms are now used interchangeably and illustrated how this has confused the historiography. A second

purpose was to bring together and debate several potential key indicators that could be used to identify a cryptanalyst in the future, resulting in the yardsticks used in this thesis which, while they do not form a guaranteed methodology, should nevertheless be considered a realistic guideline.

8.3 Contribution to Knowledge

This research has established that published literature does neglect the role of women, both because of the sheer scale of their contribution in the Second World War was unachievable by any other realistic means, but importantly also because the women were not only working as ‘hewers of wood and drawers of water’³ secretaries, clerks and machine operators (although they performed those necessary tasks too) but they were in fact working at the same high-level cryptanalytical tasks level as men and should be recognised as such. This research has shown that there were tens of women who worked as equals – except in pay - of their male counterparts but who range from being vague or obscure references, to being completely unknown. Published literature has tens of historical accounts of male cryptanalysts, implying that only men could be considered as such, and the ‘Hollywoodisation’ of BP has reinforced the myth; as the release of Hollywood films such as *The Imitation Game* introduces BP to a wider audience, its male-centred portrayal has a detrimental effect on how the contribution of women at BP, and by extension in cryptanalysis, is perceived.

This research has drawn together the evidence for a richer understanding of both the women, and the potential type of woman, who could be classed as a cryptanalyst. Where records permit, this thesis has also illustrated the codes on which these women worked. It has shown that the women should be considered no less important than their male counterparts despite, so far, a lack of published literature supporting this.

The importance of this research lies in its amalgamation of multiple sources including interviews, familial memory and archival records. It is founded on the knowledge provided by key staff

³Joshua, 9.12

members who worked for Room 40, MI1(b), HushWAACs and GC&CS between 1914 and 1946, this period, which covers two World Wars, being especially important for British intelligence. As shown by the recent Science Museum exhibition, now touring the UK, the present-day GCHQ values its roots in MI1(b), HushWAACs, and Room 40, and the interwar combined organisation of GC&CS. Many of the concepts that are currently used have their origins in this period, as indeed does GCHQ's current recruitment of women; the women described in this thesis were trailblazers for this sector.

8.4 Limitations of the Findings

One of the major limitations on this thesis were restraints caused by the passing of time, the problems of memory and the death of many of those involved, but equally it would have been exceedingly difficult to write this thesis 40 years ago; there was then little interest in World War One cryptanalysis, and the archival papers for World War Two had not been released for public use. However, at least some HushWAACs and former incumbents of Room 40, MI1(b) and GC&CS would still have been alive, and it may have been possible to avoid the misunderstandings and confusion over the meaning of language terms.

There are several challenges specific to historiographical intelligence research. The first, discussed above, is the passage of time from the events of both wars to the present day. The second is participants' inability to speak about their work, which might first be forbidden by the Official Secrets Act and later, after the lifting of the Act's provisions, by a personal decision not to speak. The cryptographic lexis has also changed dramatically over the period; some words have fallen into disuse and others introduced, a process natural in any society, but particularly challenging in intelligence due to its secretive nature. Official histories which were written decades after the event are likely to contain contemporary words which aid current understanding but may not describe the precise nature of what happened in the past, or its significance. A further historiographical challenge is related to archival material. TNA contains a vast archival source, and it would occupy

many more years than a PhD thesis to read and reflect upon on every Room 40, MI1(b), GC&CS and BP archived file, but it is hoped that any future study could build on the research provided in this thesis.

8.5 Areas for Future Research

Although it cannot be exhaustive, this section aims to offer tentative suggestions for research in areas which could be of future interest.

8.6.1 Historiography and Female Cryptanalyst Identification

As considerable time has passed since the end of World War One, one area of potential interest is considering the women, both those recognised here and those yet to be identified. Further information on the backgrounds of, for example, Wendy White, Claribel Spurling, and Miss Marreco would prove illuminating to provide more context. Likewise, more information on the roles played by the HushWAACs building on Dr Jim Beach's current research, would assist in furthering understanding of the responsibilities of these women on the front line. The work that the women of Room 40 did in book building, the use of a machine to break 'hatted codes', and similar cryptanalytic work warrants further study.

Next, the women who have been listed in Appendix Three are likely to be cryptanalysts, but further research is required to confirm or refute this. It is highly likely that there are women not as yet identified who might also be confirmed as cryptanalysts – for example, it might be possible to use the concepts discussed here to identify women in such other organisations as the Y-Service, WTID and GPO amongst other organisations.

There are several Second World War departments which warrant further research, in particular the commercial and diplomatic sections based outside BP. A more detailed analysis of specific sections inside BP such as Hut Three, Hut Four, and SIXTA, if it became possible by release of further information, might reveal female cryptanalysts working within them. Another area would be the

Code and Cypher Production unit at Mansfield College, Oxford - the mirror image of the work carried out at BP, in code construction – for if more could be discovered about any potential female cryptanalysts working in this section, it would add substantially to the knowledge of this obscure field. Finally, this thesis does not consider the periods from 1947 onwards, which might also in time become areas for the future researcher; because this period would encapsulate the Cold War, there would be added complexities and a different dimension to any future study.

It will be obvious that the limitations on this research are likely to impact on these areas of future research too, particularly in relation to the OSA and available archives. With considerable research it might be possible to discover more – but it equally may be constrained by available data.

8.6.2 Education

As has been seen several of the women included in this study had a university education. It would be of interest to compare the men and women's education for the period and use this information to further analyse the impact it had, both on the available roles and individually on their studies. It would also be interesting to further explore the mathematical teachings of the time from universities and compare this with the work carried out on machine-based codes.

8.6.3 Memory and Narrative Ownership

The relationship between memory and ownership of the BP story is an area that could be of future interest. There is considerable rhetoric published on social narrative and in-depth perspectives, all of which could be used to find common threads of ownership. Memory is a considerable obstacle to obtaining accurate historiographical accounts. It might be possible to compare accounts from history and use them to illustrate how former members of specifically BP use them to recall their own accomplishments. This 'compare and contrast' concept could be used to illustrate how details published in the media affect the stories given by former incumbents.

8.6.4 New Year and Birthday Honours List

Finally, another area which can be considered for future research would be the New Years' and Birthdays' Honours Lists. There is potential for a study of comparing the women who received honours with those who did not, to discover why some women received honours and the specific reasons behind the choice, compared to those who did not. It is also an opportunity to confirm whether some of the women who were awarded an honour primarily because they knew the 'right people'. However, it is important in this case to be aware that such research may not be viable due to availability of conclusive information.

8.7 Concluding Discussion

Since the publication of Winterbotham's book in 1974, there has been a marked increase in public interest regarding Bletchley Park and by association, albeit to a lesser extent, First World War codebreaking. Bletchley Park is now a major tourist attraction which attracts over a quarter of a million visitors per year⁴, a fact also borne out by the volume of literature that is still regularly published: 46 years after it first entered the public's lexicon.

There has been a large amount of literature published about cryptanalysis between 1914 and 1946, but it is predominantly by men, often about men. This thesis has addressed that literature and found women to be a neglected part of high-level cryptanalysis in the first half of the twentieth century. It has shown that whilst some accounts have been published by and about women, they do so with partial detail of their individual roles, but with little mention of their specific work. There are a total of two accounts written by female cryptanalysts, both from BP: Joan Clarke and Mavis Lever. These factors have led to the assumptions that there were only a very small number during the Second World War, and that none existed before this. This thesis, however, has illustrated that at least some women were working at the same level as men between 1916 and

⁴ <https://www.kocarchitects.com/bletchley-park-phase-2> [accessed 24 July 2021]

1946. This secretive world can open discussion on the role of women in cryptanalysis, which could impact on the role of current female cryptanalysts. This study has shown that there was at least a dozen by the end of the First World War, in excess of 15 between the wars, and more than likely over 20 during the Second World War, with the high likelihood that many more can be identified.

As has been seen, memory plays a huge part of this knowledge and can on occasion impact how these organisations are viewed. This is further exacerbated by popular culture. In an ideal world all the cryptanalysts (male and female alike) would be recognised for the work they carried out, but, by the very nature of that work and the need for secrecy, many have fallen into obscurity. The women in particular who did not carry on in employment in GC&CS, but left to become wives, mothers and caregivers arguably should be recognised for the sacrifice they made in order to readdress the imbalance created by a patriarchal society.

This thesis has proven that women were working as cryptanalysts from the First World War onwards, showing clearly that, far from being an insignificant part of British cryptanalysis, some women at least were at the leading edge of that exacting and important profession throughout the early twentieth century. Room 40 recruited women from 1916 onwards, front line HushWAACs and MI1(b) from 1917, a matter of only two and three years respectively after their male counterparts. These pioneering women took the opportunity to work as cryptanalysts and excelled, growing numbers of capable women followed in the interwar period, and the Second World War provided the opportunity for their talents to flourish to the full; today's women stand as an essential, integral and fully recognised element of cryptanalysis built of the foundations established by the trailblazers described in this thesis.

Appendix One:
Summary of Female Cryptanalysts 1914-1946

Maiden Name	Married Name (if known)	First Name	Department /Section worked for	Codes worked on	In thesis locale (Inc. CS No)
Anderson		Elizabeth 'Andy'	Military Section Hut 5	Italian Meteorological Diplomatic Commercial	Chapter Six
Anderson		Emily	WWI - MI1(b) Interwar Years CBME BP Diplomatic	Italian ¹ Russian	Chapter Four (CS1)
Anderson		M		(JA at the outbreak of the Second World War.) ²	Chapter Six
Bartley	Brown	Pat		Floradora ³	Chapter Six
Clarke	Murray	Joan	BP Hut 8 (Deputy Head of Hut 8)	Naval Railway Enigma Italian Naval 'Dolphin' 'Shark'	Chapter Six
			Post 1945	H Section	
Dale	Webster	Marjorie	Interwar Years	Swedish Diplomatic	Chapter Six

¹ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

² TNA, HW3/82, document lists staff in GC&CS, (unnumbered), section dated 29.9.39.

³ Ferris, *Behind the Enigma*, p. 439.

			WWII - Naval Section	Spanish Naval Italian Cifario A.D (Autorita Diplomatiche) Naval attaché Japanese Cifrario Traf (Merchant Navy) ⁴	
Egan	Palmer	Marie Rose	Interwar Years WWII – Air Section CBME Jafo		Chapter Six (CS5)
Hannan		Florence Mabel	WWI - HushWAAC MI1(b)	French ⁵ and German German Field codes Rumanian non- alphabetical	Chapter Four
Harris		Mabel Mary	GC&CS	(JA at the outbreak of the Second World War.) ⁶	Chapter Five
Hayllar		Florence	MI1(b)		Chapter Four
Lever	Batey	Mavis	ISK	Italian naval codes.	Chapter Six (CS6)
			Post 1945	Russian.	
Linehan	Oliver	Caroline	Naval Section	Italian Attaché	Chapter Five

⁴ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 6; p. 8.

⁵ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

⁶ TNA, HW3/82, document lists staff in GC&CS, (unnumbered), section dated 29.9.39.

Lunn		Helen	GC&CS	Russian	Chapter Five
Lunn		Margaret	GC&CS	Russian	Chapter Five
Marreco			WWI - MI1(b)	Spanish French German South American (1919)	Chapter Four
Mitchell		Ann	GC&CS		Chapter Six
Nunn			GC&CS	(JA at the outbreak of the Second World War.) ⁷	Chapter Six
Pope		Catherine Wallace	ISOS (Deputy Head of ISOS)	Abwehr	Chapter Six
Milne		Janet Marjorie		Spanish: 'P' (Principal Naval authorities) 'M' (Admiralty and C's in C. communicating with SNOs Enigma ⁸	Chapter Five / Six
Rock		Margaret	ISK Research	Abwehr Russian	Chapter Six
Sercombe	Bradshaw	Daphne Mary	Military Section Research Section	Key breaking Italian key breaking	Chapter Five
Spurling		Claribel	WWI - MI1(b)	French German Italian	Chapter Four

⁷ TNA, HW3/82, document lists staff in GC&CS, (unnumbered), section dated 29.9.39.

⁸ TNA, HW8/23, *State of work on Spanish Naval Codes and Cypher in use July 1941*, p. 10.

				Scandinavian ⁹ Probably current Swedish non- alphabetical (1919)	
Taylor		Pamela Elise	Military Air	Italian	Chapter Six
Watkins		Gwendoline Edith Gwyllyam	WWI - HushWAAC MI1(b)	French ¹⁰ and German German Field codes Rumanian non- alphabetical	Chapter Four
Welsford		Rhoda	Mansfield College	Air Section Research	Chapter Six
White		Winifred (Wendy)	MI1(b) Naval	American, Italian: 'Rosie' Cifrario Generale 'B' 'M' Pekin (administrative traffic SNO Far East, new system used since May '41) ¹¹ German ¹²	Chapter Four (CS3)
Wingfield	Bonsall	Joan	Italian Naval	Fleet code Cifrario Scoperta CSAN b) 1 letter, 4- fig Gonio Code	Chapter Six

⁹ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

¹⁰ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

¹¹ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 8; p. 12; p. 9.

¹² TNA, HW8/23 *Naval Section and ID8G, Order of Battle. 15.6.41*, p. 2.

				Codice RT Nominative RT ¹³	
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¹³ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 6; p. 7, p. 8.

Appendix Two:

HushWAACs¹⁴

Maiden Name	First Name	Age in 1918 (if known)	Arrived in St Omer	Departed St Omer	Further details
Bale	K.		Oct 1917	Oct 1917	Likely to be one of the “Three Mutineers”
Caborne	Mary Lilian	53	Sep 1917	Dec 1917	Neé Boord. Promoted Deputy then Unit Administrator. Awarded the Victory Medal and British War Medal in 1919. ¹⁵
Chevalier	Olivia Margaret	22	Dec 1917	Nov 1918	Cheltenham Ladies College. War Office 1915-1917. Awarded the Victory Medal and British War Medal in 1919. ¹⁶
Deighton	Dorothy Lilian	29	Mar 1918	Aug 1918	Promoted Deputy Administrator. Awarded the Victory Medal and British War Medal in 1919. ¹⁷
Hannam	Florence Mabel		Oct 1917	Nov 1918	See Appendix One & Chapter Four (MI1(b)). Awarded the Victory Medal and British War Medal in 1919. ¹⁸

¹⁴ Based on information from <https://www.gchq.gov.uk/information/hush-waac-roll-honou> [accessed 18 November 2020]

¹⁵ www.ancestry.co.uk [accessed 18 November 2020].

¹⁶ www.ancestry.co.uk [accessed 18 November 2020].

¹⁷ www.ancestry.co.uk [accessed 18 November 2020].

¹⁸ www.ancestry.co.uk [accessed 18 November 2020].

Jackson	Dorothy Grace		Oct 1917	Nov 1918	Awarded the Victory Medal and British War Medal in 1919. ¹⁹
Masters	Katherine Elizabeth	53	Oct 1917	Jan 1918	Neé Ord. Awarded the Victory Medal and British War Medal in 1919. ²⁰
Munby	Gladys Mary	30	Oct 1917	Nov 1918	Pianist educated in German. YMCA work pre-1917. Awarded the Victory Medal and British War Medal in 1919. ²¹
Munby	Violet	33	Mar 1918	Nov 1918	Awarded the Victory Medal and British War Medal in 1919. ²²
Osborne	Catherine Hayes	54	Sep 1917	Nov 1918	Awarded the Victory Medal and British War Medal in 1919. ²³
Peel	Mabel Dymond ²⁴	38	Sep 1917	Nov 1918	University of Manchester. Languages teacher.  Awarded the Victory Medal and British War Medal in 1919. ²⁵
Robertson	Aline Flora	37	Sep 1917	Nov 1918	Cheltenham Ladies College.

¹⁹ www.ancestry.co.uk [accessed 18 November 2020].

²⁰ www.ancestry.co.uk [accessed 18 November 2020].

²¹ www.ancestry.co.uk [accessed 18 November 2020].

²² www.ancestry.co.uk [accessed 18 November 2020].

²³ www.ancestry.co.uk [accessed 18 November 2020].

²⁴ Photograph: <https://livesofthefirstworldwar.iwm.org.uk/lifestory/5152406> [accessed 18 November 2020].

²⁵ www.ancestry.co.uk (accessed 18 November 2020).

					Awarded the Victory Medal and British War Medal in 1919. ²⁶
Ross	Dora		Oct 1917	Oct 1918	Awarded the Victory Medal and British War Medal in 1919. ²⁷
Skelton	Nora Margaret	49	Oct 1917	Jun 1918	Neé Sutton. Awarded the Victory Medal and British War Medal in 1919. ²⁸
Thring	Elsie Margaret	25	Sep 1917	Jul 1918	Awarded the Victory Medal and British War Medal in 1919. ²⁹
Tiltman	Mary Charlotte	28	Mar 1918	Oct 1918	John Tiltman's sister ³⁰ Awarded the Victory Medal and British War Medal in 1919. ³¹
Watkins	Gwendoline Edith Gwyllam	23	Sep 1917	Nov 1918	See Appendix One & Chapter Four (MI1(b)) Awarded the Victory Medal and British War Medal in 1919. ³²

²⁶ www.ancestry.co.uk [accessed 18 November 2020].

²⁷ www.ancestry.co.uk [accessed 18 November 2020].

²⁸ www.ancestry.co.uk [accessed 18 November 2020].

²⁹ www.ancestry.co.uk [accessed 18 November 2020].

³⁰ <https://www.gchq.gov.uk/information/hush-waacs> [accessed 18 November 2020].

³¹ www.ancestry.co.uk [accessed 18 November 2020].

³² www.ancestry.co.uk [accessed 18 November 2020].

Appendix Three:

Summary of Likely Female Cryptanalysts 1914-1946³³

Maiden Name	Married Name	First Name	Department /Section worked for	Codes worked on (if known)	In thesis locale
Barker			GC&CS	German ³⁴	
Bishop			GC&CS	Cifrario R.M (Regia Marina) ³⁵ German ³⁶	
Briggs		Ruth	Hut 4 Hut 5 Naval Section	Naval German	Chapter Six
Bourchier	(Mrs)		MI1(b)	Uruguayan, Spanish and Argentine ³⁷	
Carleton		J.F	GC&CS	American ³⁸	
Chichester			MI1(b)	Uruguayan, Spanish and Argentine ³⁹	
Eason			GC&CS	Submarine Code 1 ⁴⁰ German ⁴¹	
Ede		Fiona Margaret	WWII	Spanish	Chapter Six
Edmonds	(Mrs)		MI1(b)	Scandinavian ⁴²	

³³ These are women who are highly likely to have been cryptanalysts, but more research is needed to verify this.

³⁴ TNA, HW8/23 *Naval Section and ID8G, Order of Battle. 15.6.41*, p. 2.

³⁵ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

³⁶ TNA, HW8/23 *Naval Section and ID8G, Order of Battle. 15.6.41*, p. 2.

³⁷ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

³⁸ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

³⁹ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

⁴⁰ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 6.

⁴¹ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁴² TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

Gardiner			GC&CS	Cifrario R.M (Regia Marina) ⁴³ German ⁴⁴	
Gibson	Simpson	Rebecca	Naval Section Jafo	Italian Japanese (JN25)	Chapter Six
Henvey			MI1(b)	Greek	
Hobbs			GC&CS	Cifrario R.M (Regia Marina) ⁴⁵ German ⁴⁶	
Keyser			MI1(b)	Greek ⁴⁷	
Larsen			GC&CS	German ⁴⁸	
Manners			GC&CS	Cifrario R.M (Regia Marina) ⁴⁹ German ⁵⁰	
Merritt			MI1(b)	Uruguayan, Spanish and Argentine ⁵¹	
Meyler			GC&CS	Codice RT ⁵²	
Musgrave Harvey		Joan	Hut 6	Naval	Chapter Four CS1
Niven			MI1(b)	American ⁵³	

⁴³ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

⁴⁴ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁴⁵ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

⁴⁶ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁴⁷ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

⁴⁸ TNA, HW8/23 *Naval Section and ID8G, Order of Battle. 15.6.41*, p. 2.

⁴⁹ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

⁵⁰ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁵¹ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

⁵² TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 8.

⁵³ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

Sandbach			GC&CS	German ⁵⁴	
Scott	(Mrs)		MI1(b)	Japanese ⁵⁵	
Sinclair			GC&CS	Cifrario Generale ⁵⁶ Compamare ⁵⁷ (Port cypher) Rosie (keys) ⁵⁸ Pekin (administrative traffic SNO Far East, new system used since May '41) (Keys) ⁵⁹ Washington (Press reports from NA Washington) ⁶⁰	
Stevens			GC&CS	Cifario A.D (Autorita Diplomatiche) ⁶¹ German ⁶²	
Thompson		Jean	Military Section	Italian Rumanian Meteorological	Chapter Six
Tritton			GC&CS	German ⁶³	
Wilson		Mary Moncrieff	Hut 6 Block D(6)		Chapter Six

⁵⁴ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁵⁵ TNA, HW3/35, *Nominal Roll of MI1B, 2.8.19*.

⁵⁶ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

⁵⁷ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 8.

⁵⁸ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 8.

⁵⁹ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 9.

⁶⁰ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 9.

⁶¹ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 5.

⁶² TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

⁶³ TNA, HW8/23, *Personal. Regarding of Staff (women) 1/7/41*, p. 1.

Wilson			MI1(b)	American ⁶⁴	
Wise			GC&CS	Submarine Code 1 ⁶⁵	
Wollaston			MI1(b)	American ⁶⁶	

⁶⁴ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

⁶⁵ TNA, HW8/23, *State of work on Italian Naval Codes and Cypher in use July 1941*, p. 6.

⁶⁶ TNA, HW3/35, *Nominal Roll of MI1B*, 2.8.19.

Appendix Four:

The Bletchley Park Roll of Honour

The Roll of Honour is a database which is available to the public for looking up service details of former members of BP staff. The inclusion of specific details of the Roll of Honour is because the list can be interrogated to provide a qualitative element to the data provided in this thesis.

The list is based on several different archival sources some of which are not available to the public. It is possible for the public to add details of their family members to the list, although documents are requested. It includes people who:

- *were employed for GC&CS at BP and its outstations*
- *served in the Armed Forces at BP and its outstations*
- *served in the Y Service intercepting enemy radio communications*
- *served in Special Liaison Units or Special Communications Units*
- *served in the Radio Security Service*
- *worked for the GPO at BP or Dollis Hill (Colossus team), or at Y stations*
- *served in signals intelligence in the Armed Forces of Commonwealth countries*
- *It also includes US signals intelligence personnel who were stationed in the UK⁶⁷*

⁶⁷ <https://bletchleypark.org.uk/our-story/bletchley-park-people/about-the-roll-of-honour> [accessed 30 January 2018].

Appendix Five:
Questionnaire Sent to Former BP Incumbents

1. Title, Full name and name you were known by (if different) during your time at BP
2. Any name changes since
3. Which years did you work at BP?
4. What were you doing and where were you living before you were recruited to work at BP
e.g. school, university or in employment?
5. How old were you when you initially started training or working at BP?
6. How were you recruited?
7. What was your role when you first started at BP? Did you change department or role
during your time at BP? Please give details of subsequent position or responsibility.
Head of dept / Hut etc
8. During your work at BP where were you billeted? Do you remember any details and
what did you do in your free time?
9. What did you go on to do after you finished at BP? E.g. Did you go back to studying,
continue working for GCHQ or work somewhere else?

Appendix Six:

Swollen Heads'

Dilly Knox⁶⁸

*When Cunningham won at Matapan
By the grace of God and Claire,
For she pilots well the aeroplane
That spotted their fleet from the air.*

*When Cunningham won at Matapan
By the grace of God and Jane,
For she was the girl who spotted the Wops
From the Cottage aeroplane.*

*When Cunningham won at Matapan
By the grace of God and Nancy,
For she is a girl, the Admiral said,
That might take anyone's fancy.*

*When Cunningham won at Matapan
By the grace of God and Mavis,
Nigro simillima cygno est, praise Heaven,
A very rara avis.*

*When Cunningham won at Matapan
By the grace of God and Margaret,
It was thanks for that girl, the Admiral said,
That our planes straddled their target.*

When Cunningham won at Matapan

⁶⁸ Batey, *Dilly*, pp. 125-7.

*By the grace of God and Phyllida,
And made that impossibly self-willed girl
If possible self-willeder.*

*When Cunningham won at Matapan
By the grace of God and Hilda,
And sank the Vittorio Veneto
Or at least they can't rebuild her.*

*When Cunningham won at Matapan
By the grace of God and Jean,
And if Jean Harvie had been there too,
Hoots man, what might na ha been?*

*When Cunningham won at Matapan
By the grace of God and Mrs Balance⁶⁹,
Indeed, he said, the Cottage team
Is a team of all the talents.*

*When Cunningham won at Matapan
By the grace of God and Elisabeth,
The credit was almost entirely ours
But possibly God did his bit.*

⁶⁹ Mrs Balance was the tea lady who served in the Research Section, she also signed the Official Secrets Act, who Knox clearly thought also deserved a mention.

Appendix Seven:

Former BP incumbents on the Royal Honours List

Name	Insert from the BP RoH details	Grade if known	Year of award
Miss Joan Elizabeth Lowther Clarke ⁷⁰ (married name Murray)	<i>Bletchley Park June 1940 - 1945. Hut 8 and Block D(8). Cryptanalyst. Deputy Head of Hut 8 1944.</i> ⁷¹		1946**
Miss Winifred Maud Culling ⁷²	<i>Bletchley Park 1939 - 1940. Elmers School. Diplomatic Section.</i> ⁷³		1946**
Miss Mary Sheila Cathcart Dunlop (married name Lady Killanin) ⁷⁴	<i>Bletchley Park 1940 - 1945. Hut 6 and Block D(6), Registration Room. Appointed MBE in 1946 for her services at Bletchley Park.</i>	TSAO ⁷⁵	1946**
Miss Evelyn Vera Earl ⁷⁶	<i>Broadway. Awarded MBE in 1946 for her work in the Foreign Office.</i>	TJAO ⁷⁷	1946**
Miss Marie Rose Egan ⁷⁸ (married name Palmer)	<i>Bletchley Park.</i> ⁷⁹	JA	1946**
Miss Dorothy Gunn ⁸⁰	<i>Bletchley Park 1941 - 1945. Mansion, Hut 10 and Block A, (room 117), Block F(A), (room 21), Air Section. Air intelligence, including German night fighter activity.</i>	TSAO(D) ⁸¹	1946**
Miss Olive Winter Montgomery ⁸²	<i>Bletchley Park late 1942 - c. mid 1944. Hut 10, Deputy to General Hill, Head of SIS</i>		1946**

⁷⁰ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷¹ <https://bletchleypark.org.uk/roll-of-honour/1768> [accessed 23 August 2020].

⁷² <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷³ <https://bletchleypark.org.uk/roll-of-honour/2214> [accessed 23 August 2020].

⁷⁴ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷⁵ <https://bletchleypark.org.uk/roll-of-honour/2700> [accessed 23 August 2020].

⁷⁶ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷⁷ <https://bletchleypark.org.uk/roll-of-honour/2736> [accessed 23 August 2020].

⁷⁸ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁷⁹ <https://bletchleypark.org.uk/roll-of-honour/2803> [accessed 23 August 2020].

⁸⁰ <https://www.thegazette.co.uk/London/issue/37412/data.pdf> [accessed 23 August 2020].

⁸¹ <https://bletchleypark.org.uk/roll-of-honour/3823> [accessed 23 August 2020].

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	<i>Codes Section and representative on Bletchley Park Women's Committee in mid 1943.</i> ⁸³		
Miss Phoebe Senyard ⁸⁴	<i>Bletchley Park 1939 - 1945. Hut 5, Hut 4 and Block A, Naval Section. German sub-section; PA to Frank Birch; later head of Secretariat (NS IX).</i> ⁸⁵		1946**
Mrs Judith Vivien Whitfield ⁸⁶	<i>Bletchley Park. Block D(6), on Hut 6 Index. Hut 15 and Block G. SIXTA.</i> ⁸⁷		1946**
Miss Isobel Doreen Henderson (married name Fletcher) ⁸⁸ Known as Susie	<i>Bletchley Park 1939 - 1945. Mansion. Hut 4 December 1940. Later Blocks A and B. Naval Section NS V. Headed naval Traffic Analysis section. Awarded MBE for her work at Bletchley Park.</i>	Linguist ⁸⁹	1946*
Miss Doris Layland ⁹⁰	<i>Bletchley Park from early 1941. Block F, Naval Section, Head of NS X, Luftwaffe maritime activity.</i> ⁹¹		1946*
Miss Sylvia Jane Luxmoore (married name Westall) ⁹² 	<i>Bletchley Park. Block D(3), Head of German Book Room. Block F(A), Air Section. Block F, Latin Section.</i>	TSAO(D) ⁹³	1946*

⁸³ <https://bletchleypark.org.uk/roll-of-honour/6387> [accessed 23 August 2020].

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Miss Mary Diana Charnock Smith ⁹⁴	<i>Bletchley Park from 1940. Hut 8. PA to Cdr Travis, Director, from mid-1943 onwards.</i> ⁹⁵		1946*
Miss Margaret Alice Rock ⁹⁶	<i>Bletchley Park from April 1940. Cottage, Research Section. Later with ISK</i> ⁹⁷		1945*
Mrs Eva May Parsons Known as Eve ⁹⁸	<i>Bletchley Park 1940 - 1945. Elmers School, Diplomatic Section; later in Naval Section, NS II, Blocks A and B, Hut 7. Head of Japanese Naval Processing Party from 1943.</i> ⁹⁹		1947**
Mrs Katharine Louise, Harman (Katherine Lousia on the RoH) ¹⁰⁰	<i>Wavendon House from October 1939. Probably Commercial Section.</i> ¹⁰¹		1950*
Miss Winifred White ¹⁰²	<i>Bletchley Park from 1939. Mansion, Naval Section, Italian. Personal secretary to William Clarke. With GCCS pre-war; member of Captain Ridley's Shooting Party in 1938.</i> ¹⁰³		1952*

⁹⁴ <https://www.thegazette.co.uk/London/issue/37617/data.pdf> [accessed 23 August 2020].

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¹⁰² <https://www.thegazette.co.uk/London/issue/39555/data.pdf> [accessed 23 August 2020].

¹⁰³ <https://bletchleypark.org.uk/roll-of-honour/9710> [accessed 23 August 2020].

Miss Annie Stevens ¹⁰⁴	<i>Bletchley Park from 1939. Mansion (room 39). Support Section.</i> ¹⁰⁵		1953**
Miss Natalie Muriel Harris ¹⁰⁶	<i>Bletchley Park 1939 - 1945. Elmers School. Diplomatic Section. Later Naval Section.</i> ¹⁰⁷		1953*
Miss Mabel Mary Harris ¹⁰⁸	<i>Bletchley Park 1939 - 1945. Elmers School. Diplomatic Section. Later Naval Section.</i> ¹⁰⁹		1954*
Miss Elizabeth Margaret Roscoe (Departmental Specialist) ¹¹⁰	<i>Bletchley Park from 1943. Military Section, SIXTA.</i> ¹¹¹		1965**
Miss Mary Winter ¹¹²	<i>Bletchley Park February 1944 - Spring 1946. Block D(8). Probably Modified Typex operator, Decoding signals using settings found on Bombe. From May 1945, Naval Section, secretary to Frank Birch and Edgar Jackson.</i> ¹¹³		1967**

Key

*The King's Birthday Honours

** New Year's Honours

¹⁰⁴ <https://www.thegazette.co.uk/London/issue/39732/data.pdf> [accessed 23 August 2020].

¹⁰⁵ <https://bletchleypark.org.uk/roll-of-honour/8661> [accessed 23 August 2020].

¹⁰⁶ <https://www.thegazette.co.uk/London/issue/39863/data.pdf> [accessed 23 August 2020].

¹⁰⁷ <https://bletchleypark.org.uk/roll-of-honour/4040> [accessed 23 August 2020].

¹⁰⁸ <https://www.thegazette.co.uk/London/issue/40188/data.pdf> [accessed 23 August 2020].

¹⁰⁹ <https://bletchleypark.org.uk/roll-of-honour/4038> [accessed 23 August 2020].

¹¹⁰ <https://www.thegazette.co.uk/London/issue/43529/data.pdf> [accessed 23 August 2020].

¹¹¹ <https://bletchleypark.org.uk/roll-of-honour/7883> [accessed 23 August 2020].

¹¹² <https://www.thegazette.co.uk/London/issue/44210/data.pdf> [accessed 23 August 2020].

¹¹³ <https://bletchleypark.org.uk/roll-of-honour/9956> [accessed 23 August 2020].

Appendix Eight:
The Zimmermann Telegram¹¹⁴

WESTERN UNION TELEGRAM
NEWBORN CARLTON, PRESIDENT

Send the following telegram, subject to the terms on back hereof, which are hereby agreed to:

GERMAN LEGATION
MEXICO CITY

via Galveston

JAN 19 1917

130 13042 13401 8501 115 3528 416 17214 6491 11310
18147 18222 21560 10247 11518 23677 13605 3494 14936
98092 5905 11311 10392 10371 0302 21290 5161 39695
23571 17504 11269 18276 18101 0317 0228 17694 4473
22284 22200 19452 21589 67893 5569 13918 8958 12137
1333 4725 4458 5905 17166 13851 4458 17149 14471 6706
13850 12224 6929 14991 7382 15857 67893 14218 36477
5870 17553 67893 5870 5454 16102 15217 22801 17138
21001 17388 7146 23638 18222 6719 14331 15021 23845
3166 23552 22096 21604 4797 9497 22464 20855 4377
23610 18140 22260 5905 13347 20420 39689 13732 20667
6929 5275 18507 52262 1340 22049 13339 11265 22295
10439 14814 4178 6992 8784 7632 7357 6926 52262 11267
21100 21272 9346 9559 22464 15874 18502 18500 15857
2188 5376 7381 98092 16127 13486 9350 9220 76036 14219
5144 2831 17920 11347 17142 11264 7667 7762 15099 9110
10462 97556 3569 3670

BEKNSTOPFF.

Charge German Embassy.

861.30112/734

¹¹⁴ <https://www.docsteach.org/documents/document/zimmermann-telegram-as-received> [accessed 20 August 2020].

Appendix Nine:
Gwendoline Watkins Medal Card¹¹⁵

Name.		Corps.	Rank	Regt. No.
WATKINS. <i>Gwendoline</i> G. E. G. (Mrs)		Q.M. A. A. G.	Asst. Adm.	
Medal.	Roll.	Page.	Remarks.	
VICTORY	2maac/101	1015		
BRITISH	do	do		
STAR				
Theatre of War first served in				
Date of entry therein				
Em/1478. LV. 1491/E. 16.4.20.				

K. 1380.
NW/4/1190

¹¹⁵ From the personal notes of Dr Jim Beach.

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HW3/40

HW3/41

HW3/51

HW3/82

HW3/83

HW3 /86

HW3/87

HW3/135

HW3/85

HW8/23

HW14/6

HW14/186

HW19/316

HW43/6

Records created or inherited by the Foreign Office

FO366/800

FO366/1075

Records of the Admiralty

ADM137/4156

ADM223/769

ADM318/306

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WO158/961

WO223/769

The Churchill Archives, Churchill College, Cambridge

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[Margaret Rock].

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[Marie Rose Egan]

2013. Interview with Bill Bonsall, 17 October 2013, Cheltenham, (recorded by author),
[Joan Wingfield]

2012. Interview with Rozanne Colchester, 17 October 2012, Hook Norton, (recorded by
author).

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