Notes to accompany four Alan Turing videos

1. General

The recent (mid-November 2014) release of *The Imitation Game* movie has caused the comprehensive Alan Hodges biography of Turing to be reprinted in a new edition [1]. This biography was the basis of the screenplay for the movie. A more recent biography, by Jack Copeland [2], containing some new items of information, appeared in 2012. A more technical work [3], also by Jack Copeland but with contributed chapters from other people, appeared in 2004.

2. The Princeton Years 1936–38.

Alan Turing spent the years from 1936–38 at Princeton University studying mathematical logic with Prof. Alonzo Church. During that time Church persuaded Turing to extend the Turing Machine ideas in the 1936 paper and to write the results up as a Princeton PhD. You can now obtaing a copy of that thesis very easily [4] and this published volume contains extra chapters by Andrew Appel and Solomon Feferman, setting Turing's work in context. (Andrew Appel is currently Chair of the Computer Science Dept. at Princeton)

3. Cryptography and Bletchley park

There are many texts available on cryptography in general and Bletchley Park in particular. A good introductory text for the entire subject is "The Code Book" by Simon Singh [5]

3.1. Turing's Enigma Problem

There are now a large number of books about the deciphering of Enigma codes, both in Hut 6 and Hut 8. A general overview is given by "Station X" by Michael Smith [6] while a more detailed treatment, with several useful appendices, can be found in the book by Hugh Sebag-Montefiore [7].

3.2. The Bletchley Bombes

The detailed story of Hut 6's decipherment of Army and Air Force Enigma is told in a book by the head of Hut 6, Gordon Welchman [8] and his colleague, John Herivel, sets out the details of the 'Herivel Tip' in a book of his own [9].

At the time of writing these notes it is possible to find some fascinating video material, about this era, both on DVD and online. In a 1993 documentary entitled "The Strange Life and Death of Dr Turing" [10] there is a brief interview (at 21m 20s) with Joan Clarke who features as part of the Hut 8 team in "The Imitation Game" and who, for a few months, was engaged to Alan Turing. There are also interviews with Andrew Hodges (Turing's biographer) and with Shaun Wylie and Jack Good (also members of the Hut 8 team).

Another valuable resource can be found in the 1977 BBC series "Secret War" presented by William Woollard [11]. The details of work at Bletchley are in Episode 6 of this series, entitled "Still Secret" (which was a very apt description of the state of affairs in 1977!). A fascinating introduction to "Banburismus" statistical techniques, used on Naval Enigma and Lorenz/Colossus, can be found 37 mins into this video [12]

4. Freddie Winterbotham and the Cipher Sergeants

The Anglo-America sharing of the 'Ultra' secrets during World War II laid the foundation for present-day security collaboration. However, there was a noticeable difference of opinion, all along, about how long this secret could be kept, once the war was over. By the early

1970s the UK secret service realised that the US was likely to put some of the less-sensitive material into the public domain. There was an anxiety to put down a marker that the Bletchley/Ultra effort was initiated by the UK while, at the same time, trying to keep secret as many of the details as possible.

The ideal opportunity arose in 1974 when the UK intelligence authorities authorised the publication of "The Ultra Secret" by Group Captain Freddie Winterbotham [13]. This book was an ideal 'limited disclosure' vehicle for the UK security community. Virtually nothing is said about how the decryption was performed. Instead, Winterbotham describes in detail the problems of creating intelligence digests from the decrypted materials and getting these digests out, very quickly, to Allied commanders in the field. To this end he concentrates on his own role in creating the idea of Special Liaison Units (SLUs) stationed with the armed forces to act as an interface between Allied commanders and Bletchley Park. The re-encrypted digests from Bletchley Park were printed out to a Type X machine located in each SLU. The operation of the Type X was under the control of an RAF Flight Sergeant (a 'cipher sergeant') who transcribed and decrypted the message onto a one-time pad for delivery to the Allied commander. The cipher message and the one-time pad were burned immediately after use.

The techniques used by Freddie Winterbotham in recruiting RAF personnel as Cipher Sergeants are described, by the man himself, in reference [12] at 30m 30s.

5. The 'Bletchley' crossword

If you would like to try a puzzle similar to the one used for Bletchley Park recruitment (with answers !) just visit:
http://www.telegraph.co.uk/history/world-war-two/11151478/Could-you-have-been-a-codebreaker-at-Bletchley-Park.html

References

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2. B. Jack Copeland, *Turing: Pioneer of the Information Age*, Oxford University Press, 2012.
3. B. Jack Copeland (Ed.), *The Essential Turing*, Oxford University Press, 2004.
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6. Michael Smith, *Station X*, Channel 4 Books (Macmillan Ltd.), 1998.
7. Hugh Sebag-Montefiore, *Enigma: The Battle for the Code*, Weidenfeld and Nicolson, 2000.
8. Gordon Welchman, *The Hut 6 story*, M & M Baldwin, 2005.
9. John Herivel, *Herivelismus*, M & M Baldwin, 2008.
10. Christopher Sykes, *The Strange Life and Death of Dr Turing (Part I)*, BBC Horizon, 1992. **https://www.youtube.com/watch?v=gyusnGbBSHE**
11. William Woollard (presenter), *The Secret War*, 1977. Complete series on two DVDs
12. William Woollard, *Secret War Episode 6 (Still Secret)*, 1977 . **https://www.youtube.com/watch?v=TPvqy9tldoo**
13. F. W. Winterbotham, *The Ultra Secret*, Weidenfeld and Nicolson, 1974.