

# Bletchley Park:

How new computing machinery helped to win WWII



## Bletchley Park: Location

North-East of London  
(50 minutes by train)

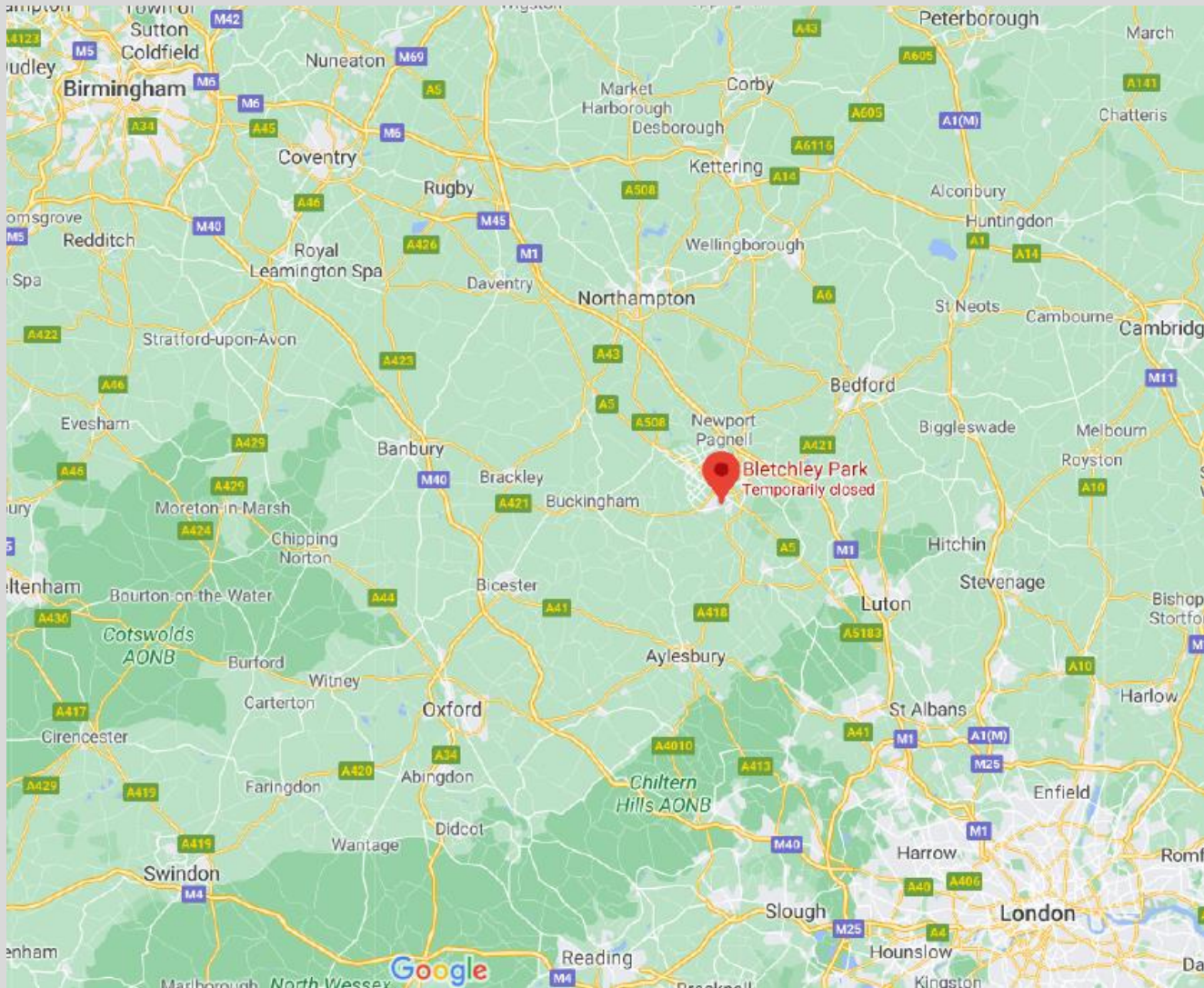
Close cities and towns:

London

Birmingham

Cambridge

Oxford



18 March 2021

Selected topics in history of science

2

# Bletchley Park: the estate



EDUCATION IMAGES/UNIVERSAL IMAGES GROUP/BETTY IMAGES

# Bletchley Park: government crockery losses

„The breakage and loss of tea cups, tumblers, knives and forks and other mess traps is taking place on fantastic scale.

The rate of loss is no less than five times that normally experienced in a man-of-war.

Tumblers, cups and plates have been found pushed away into the shrubberies and left about in offices, many of them broken.“

# Bletchley Park: measures

„This state of affairs cannot be allowed to go on and it has become necessary to prohibit the removal of any Government property whatsoever from the dining rooms except by members of the kitchen and dining room staff. The watchmen have orders to stop anyone carrying Government Crockery, etc. away from the dining room and to také their names. Those who wish to have milk in their offices must provide their own gear.“

# Bletchley Park: Afternoon Tea

- Tea served each day from 3:15 to 4:15 pm in the Recreation Hut
- Breaks taking too long – urns with 70 cups delivered to the Heads of Larger Section
- Milk distributed daily at 2pm, tea once a week (on a Monday)
- Allowance: 1 pound of tea per 200 people, 1 pint of milk per 10 people

# Film *The Enigma* (2001)



- Story of the film
- Weird things:
  - Why would one fight for a copy of their own paper?
  - Turing was gay
  - Based on a book – but for the sake of simplicity, two characters are merged into a single one

# Alan Mathison Turing (1912-1954):



Mathematician.  
Codebreaker.  
Marathon-runner.  
Machine-designer.  
Secret service.  
Programmer.  
Thinker.



# Alan Turing's family

- Born 1912
  - Father: in India (government service)
  - Mother – Sarah Turing
  - Elder brother John
- 
- photo: Alan, ca. 5 years old, his brother John



# Christopher Morcom



- Secondary school
- Common interests: astronomy, mathematics
- “won over Turing”
- Ch. M. died 1930
- A.T.’s friendship with Christopher’s family

# Turing's mathematical career

- Sherborne (1926-1931)
- Cambridge, King's College (mathematics, 1931-1934)
- 1935: King's College member
- Interest in quantum mechanics, probability, logic, and also the foundations of mathematics



# “On Computable Numbers”

(a mathematical intermezzo)

- Turing, A. M., 1936, On computable numbers, with an application to Entscheidungsproblem. *Proceedings of the London Mathematical Society* 2(43): 544-546.
- Priority issue: dealt with by his senior colleague, who wrote a recommendation and explanation
- Publishing then: peer review – plagiarism – etc.

# Turing machine

- The 1936 article does NOT state HOW the machine should be made
- Image: infinite tape, divided into square fields
- States and transition between them: on the basis of the sign read, the tape would
  - move right
  - move left
  - delete / overwrite a sign
  - stop the machine („halting problem“)

# Return to pre-WWII England



1936-38: Ph.D. in Logic,  
algebra, number theory,  
Princeton University

1938-39: return to  
Cambridge.

Learning about the  
German encryption  
machine Enigma

# Enigma

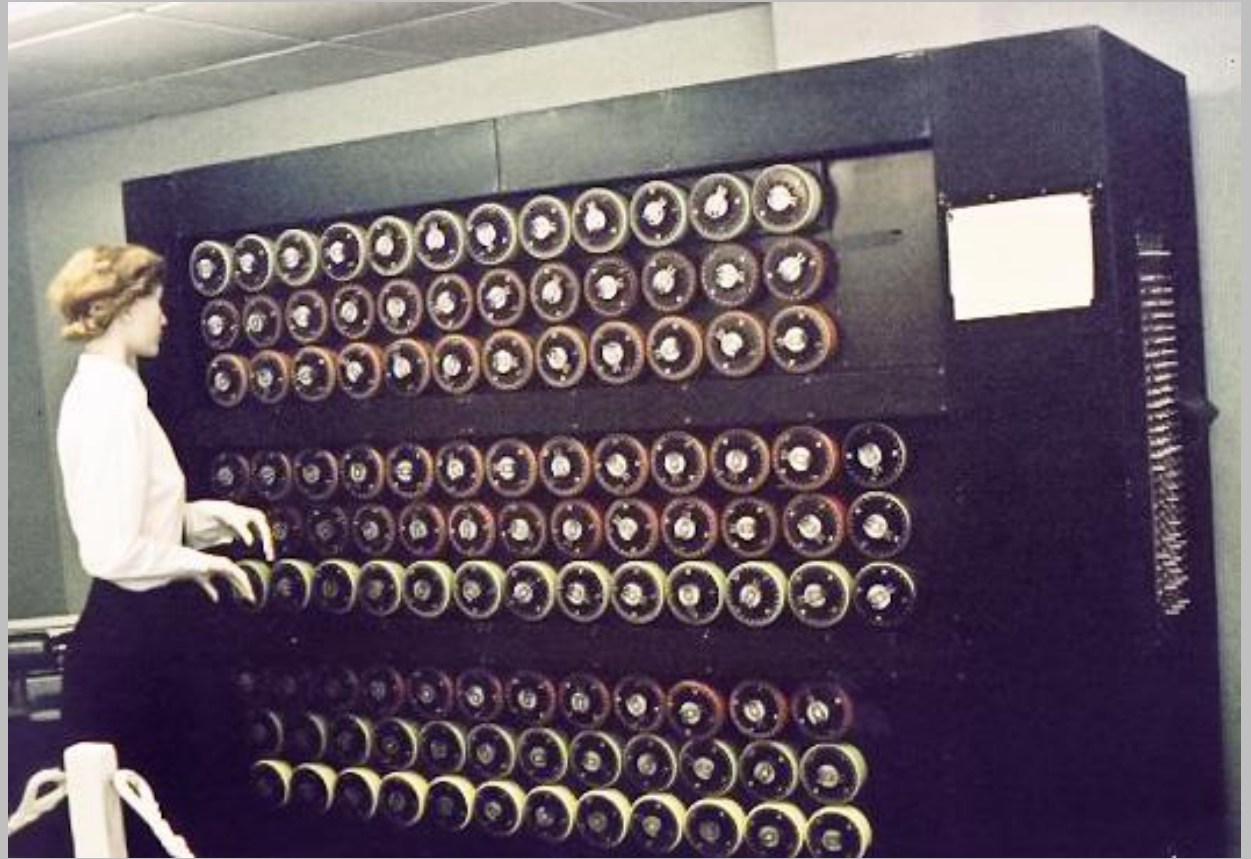
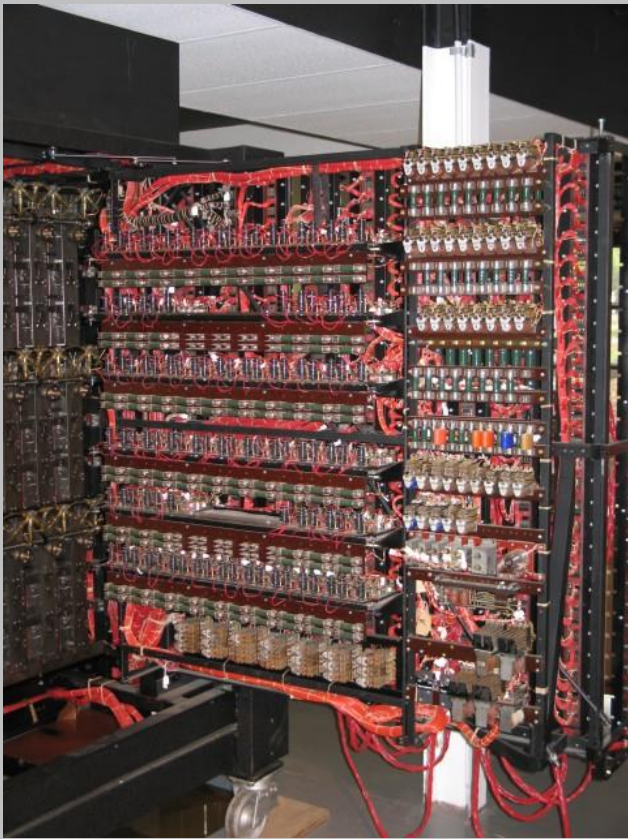
<https://www.cryptomuseum.com/crypto/enigma/hist.htm>

- Photo of Enigma: looks like a typewriter
- an encryption machine, complicated inside
- Role of Polish mathematicians
- Interception of messages
- The importance of time



# Bletchley Park

“Bombe”





# The Bombe and Alan Turing

- Paper-and-pencil solving: too slow
- A setting of the Enigma lasted for a day
- 1939-40: constructing the Bombe, a machine for cracking the code of Enigma in time
- 1942: Decrypting the message about U-boat attacks, key turn in the battle of the Atlantic
- 1943-45: Turing named key Anglo-American consultant in cryptology.

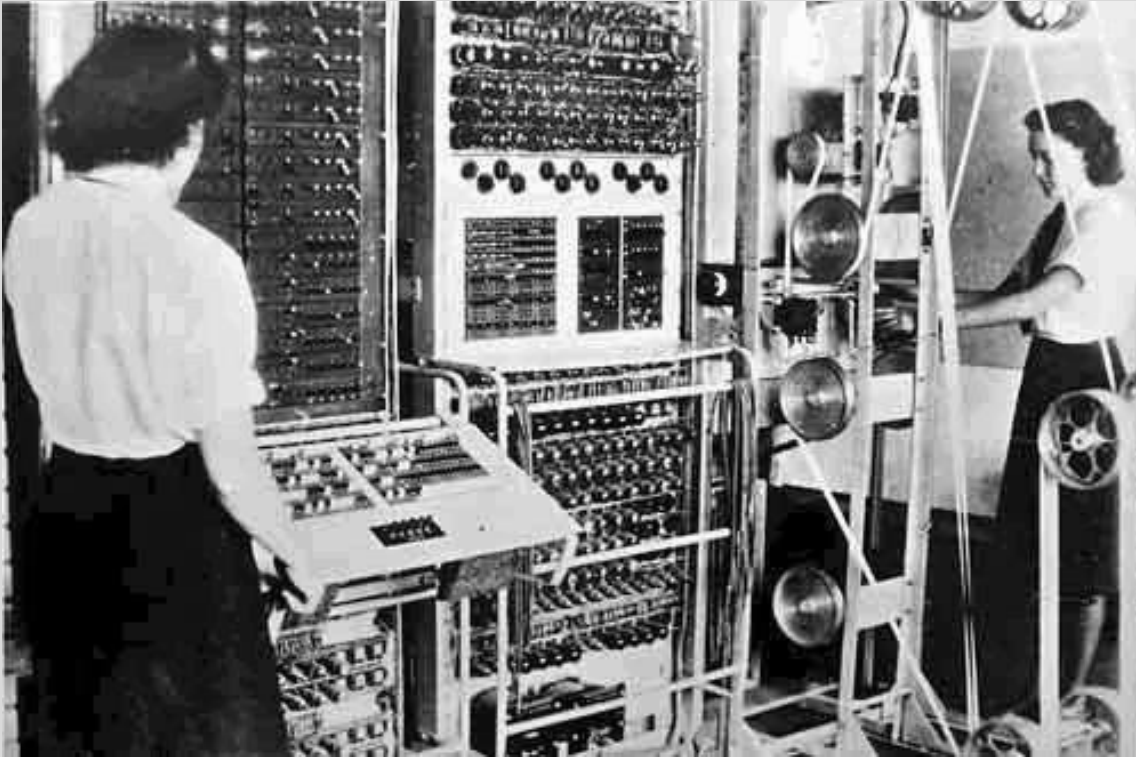
(For Turing, an opportunity to work with electronics.)

# World War II



- A letter to Churchill
- Sent to the US
- AT&T Bell Laboratories
- Anecdote:  
“I do not want to construct a brain of a genius, but only an average brain, like the brain of the AT&T CEO”

# The *Colossus* Computer



- Colossus Mark I
  - February 1944
- Colossus Mark II
  - June 1944
  - (D-Day - Normandy)

# Turing's activities after WWII

- 1945: National Laboratory of Physics, London
- 1948: University of Manchester
- 1949: First use of computers for mathematics
- 1952: sued for a homosexual relationship (crime)
- Punishment: hormonal treatment
- Loss of security clearance
- 1954, 7 June: died – cyanide poisoning, probably suicide, in Wilmslow, Cheshire.

# Hugh Whitemore: *Breaking the Code* (1986)



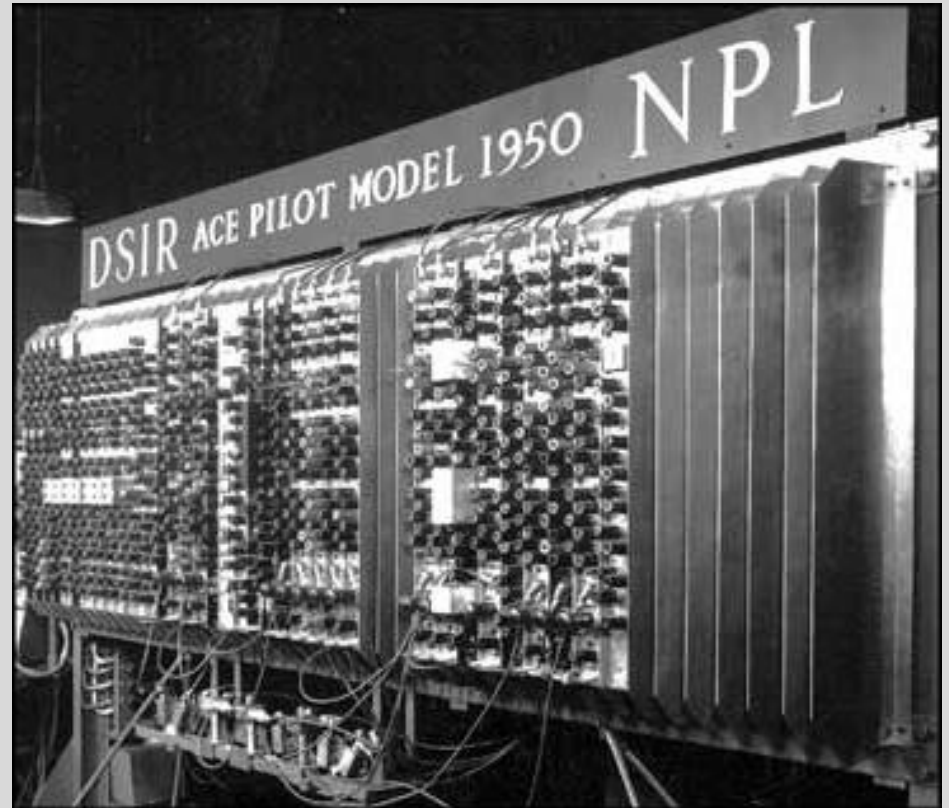
# National Physics Laboratory: ACE

- Turing's practical experience from the war



# Pilot ACE

- Turing in NPL since 1945
- 1946: design of computers and programmes
- 1947-48: programming neural networks, artificial intelligence



# Turing test

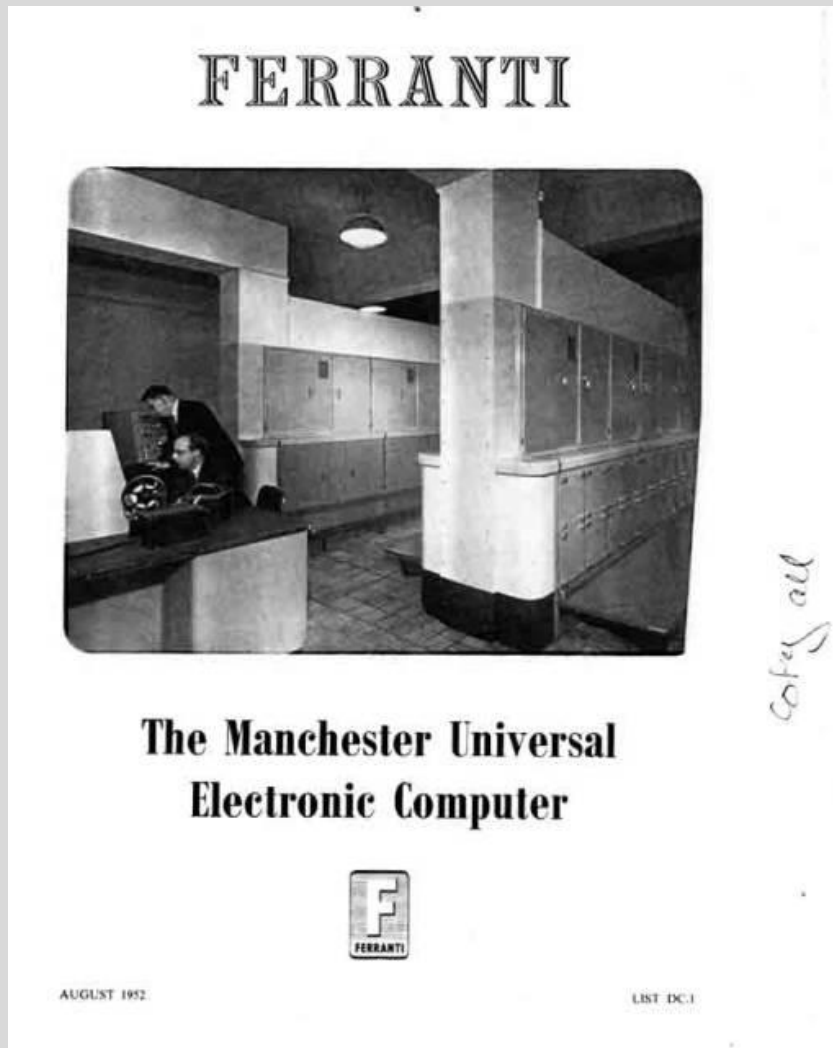
- Article in *Mind*, 1950
- Turing's thoughts on intelligence
- Again: computer and brain
- Turing tried to show what machines can do
- “machies do not think, and Turing said so”
- Defence of human intelligence



# Manchester



# Ferranti and Manchester University



- The Ferranti company and the University of Manchester co-operated in producing the computer
- Hence the name:  
Ferranti Mark I

# Programming: Manchester

(A programmer's sheet used by Turing in Manchester)

