

Memories of Bill Tutte: Endnotes

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First contacts

1. The original paper is:

- Brooks, R.L., Smith, C.A.B., Stone, A.H. and Tutte, W.T. 1940. 'The dissection of rectangles into squares'. *Duke Math. J.* 7 312-340.

Tutte's account of the background to this project was published in the *Scientific American* in November 1958, and a more mathematical version appears as Chapter 1 in:

- Tutte, W.T. 1998. *Graph Theory As I Have Known It*, Oxford: University Press.

This book will be referred to as GTAIHKI in the following notes.

2. This was Tutte's first book. In the preface he says that he has written 'as though the book were to be the first section of a three-volume work'.

- Tutte, W.T. 1966. *Connectivity in Graphs*, Toronto: University Press.

3. This is one of four ground-breaking papers by Tutte published in 1946 and 1947.

- Tutte, W.T. 1947. 'A family of cubical graphs'. *Proc. Camb. Phil. Soc.* 43 459-474.

4. Letter from WTT to NLB, 22 April 1969.

5. The Oxford Conference took place 7-10 July 1969. It is now known as 'The First British Combinatorial Conference'. The Proceedings were published:

- Welsh, D.J.A. (ed.). 1971. *Combinatorial Mathematics and its Applications*. London: Academic Press.

The talks referred to in the text are: C.St. J. A. Nash-Williams on 'Possible Directions in Graph Theory' pp. 191-200; C.A.B. Smith on 'Map Colourings and Linear Mappings', pp. 259-283.

6. The first paper on the golden root was:

- Berman, G, and Tutte, W.T. 1969. 'The golden root of a chromatic polynomial' *J. Combinatorial Theory* 6 301-302.

The bound for $P_G(\tau^2)$ was published in:

- Tutte, W.T. 1970. 'On chromatic polynomials and the golden *ratio*' *J. Combinatorial Theory* 9 289-296.

Details of the background to this work are given on pages 133-139 of GTAIHKI.

7. Letters from WTT to NLB, 23 July, 6 August, 9 November, 2 December 1970.

8. The 1971 Royal Holloway meeting is now referred to as 'The Second British Combinatorial Conference'. Some documents relating to it have been deposited in the archive maintained by the British Combinatorial Committee, and details of the series of conferences can be found on their website.

9. Tutte had another reason for wanting to visit Royal Holloway, because it is located at Englefield Green in Surrey, and he believed that he had lived there briefly with his family in the early 1920s. The place where they lived has not been identified.

10. Bill described the motivation for his work on chromatic sums in GTAIHKI, pages 125-128. The Royal Holloway talk on bicubic graphs was probably related to the material on pages 44-45 of that book.

Waterloo 1973

11. Letters from WTT to NLB, 7 February, 18 February 1972.

12. Letter from WTT to NLB, 3 April 1972.

The blinkers start to slip, 1973-1977

13. The proceedings of the Aberystwyth conference are:

- McDonough, T.P. and Mavron, V.C. (eds.). 1974. *Combinatorics*. Cambridge : University Press.

Tutte's paper on 'Some polynomials associated with graphs' is on pages 161-167. The subject is related to his (presumed) 1971 talk on bicubic graphs (see note 10).

14. Letter from WTT to NLB, 1 August 1975. Tutte's paper is:

- Tutte, W.T. 'The dichromatic polynomial'. In: Nash-Williams, C. St.J. A, and Sheehan J. (eds.) 1975. *Proceedings of the Fifth British Combinatorial Conference, Congressus Numerantium XV* pp.605-635.

15. The proceedings of the 1977 Waterloo conference are:

- Bondy, J.A. and Murty, U.S.R.(eds.) 1979. *Graph Theory and Related Topics*. New York: Academic Press.

The papers referred to in the text are Smith's 'Early Reminiscences', pages xix-xxi, and Tutte's 'All the King's Horses (A Guide to Reconstruction)', pages 15-33.

Writing and travelling, 1978-85

16. The proceedings of the 1978 Szeged conference are:

- Lovász, L. and Sós, V.T. (eds.) 1981. *Algebraic Methods in Graph Theory (two volumes)*. Amsterdam / New York: North-Holland Publishing Co.

17. The UCL talk was about a special kind of 'V-function' that applies only to cubic graphs. Tutte explained the background in GTAIHKI, page 60.

18. Tutte's talk on 'Map Colourings and Differential Equations' was published in the conference proceedings, pages 477-486:

- Bondy, J.A. and Murty, U.S.R. (eds.). 1984. *Progress in Graph Theory*. Toronto: Academic Press.

19. The book is Volume 21 of the *Encyclopedia of Mathematics and Its Applications*.

- Tutte, W.T. 1984. *Graph Theory*. Reading Massachusetts: Addison-Wesley.

20. The book GTAIHKI is cited in note 1.

21, Hodges' book has been reprinted many times. The original publication was:

- Hodges, Andrew. 1983. *Alan Turing: The Enigma*. London: Burnett Books.

22. In his post-war work Turing suggested several non-numerical problems that might be solved by a computer. One of them was a 'jigsaw puzzle', apparently based on the problem of Brooks, Smith, Stone, and Tutte (note 1). The footnote on p.332 says only that 'W.T. Tutte had worked on this pure-mathematical problem'.

In retirement, 1986-97

23. A photograph of Jeanne Youlden, with Bill and Dorothea Tutte at the Royal Society, appears in:

- Younger, D.H. 'William Thomas Tutte (1917-2002)'. *Biog. Mem. Fell. R. Soc.* 58 283-297.

24. A series of accounts or wartime intelligence had been published from 1977 onwards. They were written by the historian Sir Harry Hinsley, himself a veteran of Bletchley Park, and focussed on the influence of the Bletchley Park material on the course of the war. Many details of the codebreaking operation were still subject to the Official Secrets Act,

and consequently the account of them was unsatisfactory. In 1993 Hinsley edited a collection of personal recollections of some of the codebreakers.

- Hinsley, F.H. and Thripp, A. (eds.) 1993. *Codebreakers: The Inside Story of Bletchley Park*. Oxford: University Press.

The sole mention of Tutte is on page 161.

25. Letters from WTT to NLB, 26 January 1997, 2 February 1997.

26. There is now (2019) a working Colossus in the National Museum of Computing at Bletchley Park. The article referred to in the text is:

- Fox, Barry, and Webb, Julian, 1997. 'Colossal Adventures'. *New Scientist* 10 May 1997, pp.36-43.

27. Bill's lack of empathy with mechanical devices of all kinds was probably one of the reasons why he decided to abandon his research in experimental chemistry. His first sighting of Colossus (recorded in his article cited in note 32) illustrates his unfamiliarity with electrical devices. He seems to have concluded that the pools of water under the machine were due to the valves being cooled by water -- a method that would have had interesting consequences.

His own words, 1998-2000

28. A transcript of Tutte's talk was originally published in Waterloo as a departmental research report (CORR #98-39). It was later reprinted in:

- Joyner, D. (ed.) 2000. *Coding Theory and Cryptography*, pp. 9-17. Berlin: Springer.

29. Tutte's talk at Canterbury is published as:

- Tutte, W.T. 1999. 'The coming of the matroids'. In Lamb, J.D. and Preece, D.A. (eds.) *Surveys in Combinatorics*, pp.3-14. Cambridge: University Press.

30. Letter from J.V. Field to the President of the LMS, 11 August 2000.

31. A facsimile of the General Report on Tunny is now (2019) available at www.AlanTuring.net/tunny_report.

32. From internal evidence it is clear that the article was written in the year 2000. It was published posthumously:

- Tutte, William T. 2006. 'Appendix 4: My Work at Bletchley Park'. In: Copeland, B. Jack (ed.) *Colossus: The Secrets of Bletchley Park's Codebreaking Computers*. Oxford: University Press.

Conclusion

33. The *Times* obituary was the subject of comments from Charles Evans and Donald Michie, published on 17 May and 20 May 2002 respectively.

34. *Breaking the Code*, a play based on Andrew Hodges' book (note 21) was first performed at the Theatre Royal in London's Haymarket on 21 October 1986. I saw it soon afterwards. The dramatization of the Bletchley story was continued in 2014, in a film, *The Imitation Game*, also based loosely on Hodges' book, but mainly a work of fiction.

35. Jack Copeland's book (note 32) was one of the first attempts to pierce the gloom.

36. 'Codebreakers: Bletchley Park's Lost Heroes'. BBC Television, October 2011, Producer/Director Julian Carey.

37. The Prime Minister's letter is reproduced in the Royal Society biographical memoir (note 23).

38. The Bill Tutte Memorial Fund website can be found [here](#).

39. The quotation is from Keats' poem 'On First Looking into Chapman's Homer', where it describes how Cortés first caught sight of the Pacific Ocean. Tutte used it in his 'At Bletchley Park' (note 32) to describe Max Newman's remark that the Colossus could do more than just break codes.