BO1.1. History of Mathematics
Sheet 1 — HT25
Reading Course: The Introduction of Differential Notation
into Britain. Reading and Essays

Under the headings below, I set out the reading required as preparation for the classes each week. There will be two long essays to complete during the term, to be handed in on the **Mondays of weeks 4 and 7**: please see the further details below. Besides those sources listed below, some other items that you might find useful for reference throughout the term are:

- Niccolò Guicciardini, *The development of Newtonian calculus in Britain, 1700–1800*, Cambridge University Press, 1989

- Helena M. Pycior, *Symbols, impossible numbers, and geometric entanglements: British algebra through the commentaries on Newton's* Universal Arithmetick, Cambridge University Press, 1997

Details of the assessed extended essay will be sent to you on the Monday of week 7. We will devote some time in the classes in weeks 7 and 8 to the discussion of this.

Week 1: Preliminaries (biographies and bad essays)

Please see the Christmas Vacation Reading sheet.

Week 2: Playfair's criticisms

Main reading

- John Playfair, 'Traité de Méchanique Céleste. Par P. S. La Place', *Edinburgh Review* 11(22) (1808), 249–284

While reading Playfair (and any of the later sources), remember to ask yourself the usual useful questions, including but not limited to:

- What was the author's motivation?

- Who was the intended readership?

- Which other authors (if any) are referred to, and what is the reader assumed to know?

- What technical terminology is used (if any)?

Other useful sources

- Amy Ackerberg-Hastings, 'John Playfair on British decline in mathematics', *BSHM Bulletin: Journal of the British Society for the History of Mathematics* 23(2) (2008), 81–95

- Guicciardini, *The development of Newtonian calculus in Britain*, pp. 95–107 (Chapter 7. 'Scotland')

- I. Grattan-Guinness, 'P. S. Laplace, *Exposition du système du monde*, first edition (1796); *Traité de mécanique céleste* (1799–1823/1827)', Chapter 18 in I. Grattan-Guinness (ed.), *Landmark writings in Western mathematics 1640–1940*, Amsterdam; Oxford: Elsevier, 2005, pp. 242–257

- Charles Babbage, *Reflections on the decline of science in England, and on some of its causes*, London, 1830

Week 3: Woodhouse, part 1

Main reading

- Robert Woodhouse, *The Principles of Analytical Calculation*, Cambridge, 1803, Preface (pp. i–xxxiv)

Other useful sources

- Christopher Phillips, 'Robert Woodhouse and the evolution of Cambridge mathematics', *History of Science* 44(1) (2006), 69–93

Essay

How fair were the criticisms of Playfair and others of the state of mathematics in Britain during the early nineteenth century? In answering this question, try to identify positive and negative aspects of British mathematics at this time. What were the motivations and goals of the criticisms?

(2,500 words, to be handed in by 12 noon on Monday of week 4)

Week 4: Woodhouse, part 2

Main reading

- Woodhouse, *The Principles of Analytical Calculation*

    – This is not the best sign-posted of books, but do try to browse it generally (and read the contents page) to get a feel for what it contains. The following suggested readings should help:

        * Note the nature of the introductory material on pp. 1–22, but there is no need to read it in detail
        * Read the discussion of the operator D in §12 (pp. 22–27)
        * Note the series for a^x (p. 35) and for logarithms (pp. 41–42)
        * Read the discussion of the extension of D to these cases (pp. 43–45)
        * Read the summary of these ideas in §22 (pp. 45–51)
        * Read §§31–35 on differentials and their calculation (pp. 72–79)
        * Read §§44–45 on integral calculus (pp. 91–93)
        * Read §§100–109, in which Woodhouse compares his method with those of fluxions and limits (pp. 211–219)

Week 5: Mathematical Repository

Main reading

- Thomas Leybourn (ed.), *The New Series of the Mathematical Repository*, vol. 4, London, 1819

    – For a general impression of the journal, have a look at the news items that it included: Part I, 'Notices', pp. 37–40, 74–80, 116–120

    – Next read some of the problems and solutions contained in the journal, and be prepared to discuss any **two** of the following in this week's class:

        * Article I, Question 350
        * Article II, Questions 358, 363, 367, 369, 370
        * Article III, Question 381, 382, 384
        * Article IV, Question 407

Other useful sources

- Brigitte Stenhouse, 'Mary Somerville's early contributions to the circulation of differential calculus', *Historia Mathematica* 51 (2020), 1–25

- Guicciardini, *The development of Newtonian calculus in Britain*, pp. 108–123 (Chapter 8. 'The Military Schools')

- M. Panteki, 'William Wallace and the introduction of continental calculus to Britain: A letter to George Peacock', *Historia Mathematica* 14 (1987), 119–132

- Sloan Evans Despeaux, 'Mathematical questions: A convergence of mathematical practices in British journals of the eighteenth and nineteenth centuries', *Revue d'histoire des mathématiques* 20 (2014), 5–71

Week 6: The Analytical Society

Main reading

- Preface to *Memoirs of the Analytical Society*, Cambridge University Press, 1813 (pp. i–xxii)

Other useful sources

- J. M. Dubbey, 'The introduction of the differential notation to Great Britain', *Annals of Science* 19(1) (1963), 37–48

- Philip C. Enros, 'The Analytical Society (1812–1813): Precursor of the renewal of Cambridge mathematics', *Historia Mathematica* 10 (1983), 24–47

Essay

Aside from the efforts of the Analytical Society, discuss the routes via which the Leibnizian form of the calculus was promoted in Britain during the early decades of the nineteenth century. You should comment on the motivations of the authors involved, their intended readerships, and how successful they were. You should also address the technical content of their works.

(2,500 words, to be handed in by 12 noon on Monday of week 7)

Week 7: Lacroix

Main reading

- Sylvestre-François Lacroix, *An Elementary Treatise on the Differential and Integral Calculus*, Cambridge, 1816

    – 'Advertisement', pp. iii–iv

    – Introductory material on differential calculus, pp. 1–40

Other useful sources

- João Caramalho Domingues, 'S. F. Lacroix, *Traité du calcul diff'erentiel et du calcul intégral*, first edition (1797–1800)', Chapter 20 in I. Grattan-Guinness (ed.), *Landmark writings in Western mathematics 1640–1940*, Amsterdam; Oxford: Elsevier, 2005, pp. 277–291

Week 8

Main reading

- Lacroix, *An Elementary Treatise on the Differential and Integral Calculus*, Note (B), pp. 596–620

A part of the class in week 8 will also be devoted to discussion of the extended essay.

Addendum

By the time we get to the end of this reading course, we will have had much discussion of the state of mathematics education in nineteenth-century Cambridge, so you might be wondering what was going on in Oxford at the same time. The answer, with a few caveats that I won't give here, is: not a lot. In contrast to Cambridge, where mathematics ruled, mathematical study in Oxford was firmly in the shadow of classics during this period. Although there have been several books and articles on mathematics in Victorian Oxford, the question of the introduction of differential notation is not one that has been treated in any detail. It was certainly used in a textbook published by the Savilian Professor of Geometry, Baden Powell (1796–1860), in 1829, but the impact of this was probably limited by the fact that (higher) mathematics was little-studied in Oxford at this time. A conservative examination regime could also cause trouble even for those who did study mathematics to a high level, as the experience of a Balliol undergraduate, Francis William Newman (1805–1897), attests:

He gained a Double First in 1826, being the first man who ever offered in the Schools the Higher Mathematics analytically treated. Cooke [Sedleian Professor of Natural Philosophy] pronounced that they could not, according to the Statute, pass beyond the Geometry of Newton; but Walker [later Reader in Experimental Philosophy], who probably of the three alone knew the subject, persuaded his colleagues to let him examine Newman in the work he offered; and the candidate's answers were so brilliant, that the examiners, not content with awarding his First, presented him with finely bound copies of La Place and La Grange.[1]

For more on mathematics in nineteenth-century Oxford, see:

- Raymond Flood, Adrian C. Rice and Robin J. Wilson (eds.), *Mathematics in Victorian Britain*, Oxford University Press, 2011

- John Fauvel, Raymond Flood and Robin J. Wilson (eds.), *Oxford figures: eight centuries of the mathematical sciences*, 2nd ed., Oxford University Press, 2013

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[1]William Tuckwell, *Reminiscences of Oxford*, Cassell, London, 1901, p. 204.

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