JOSEPH WOLSTENHOLME, LESLIE STEPHEN AND 'TO THE LIGHTHOUSE'

Rod Gow

Readers of the *Bulletin* may perhaps recall an earlier article of this author, on the subject of collecting mathematical books, [5]. In that article, we mentioned having acquired copies of *Mathematical Problems* by Joseph Wolstenholme and we described how we had used the *Dictionary of National Biography* (DNB) to find out about Wolstenholme's life and work. Since writing the article, we have discovered how Wolstenholme has acquired a certain literary fame, through the novel *To the Lighthouse* by Virginia Woolf. We thought it may be of interest for mathematicians to read about how Wolstenholme came to be connected with this novel and so we present here what we have read concerning Wolstenholme and Virginia Woolf's father, Leslie Stephen. The information about Wolstenholme that we have used is all taken from published sources, but it may not be well known to the mathematical community.

We begin by quoting from the DNB article on Wolstenholme. Wolstenholme was born on 30 September 1829 in Eccles, Manchester. He entered St John's College, Cambridge in 1846 and graduated as Third Wrangler in 1850. He was elected a fellow of his college in 1852 but then took up a fellowship at Christ's College, Cambridge in the same year. He vacated his fellowship upon his marriage in 1869 to a Swiss woman, Thérèse Kraus. Previous to his marriage, he had served four times as an examiner for the mathematical tripos. In 1871, he was appointed professor of mathematics at the Royal Indian Engineering College at Cooper's Hill, near London, retiring in 1889. He died on 18 November 1891, leaving a widow and four sons.

The Royal Society Catalogue of Scientific Papers lists 23 papers by Wolstenholme, these being mainly on geometric subjects. His name is attached to an elementary result in number theory, known as Wolstenholme's Theorem, which is described in [6, pp.88-90], and may be stated thus. Let $p > 3$ be a prime. Then p^2 divides the numerator of the fraction

$$1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{p-1}.$$

However, in a note in [6, p.93], it is observed that a result of this kind already existed in Edward Waring's *Meditationes Algebraicae* of 1782.

The DNB article includes an appraisal of Wolstenholme's work by Andrew Forsyth, Sadlerian Professor of Pure Mathematics at Cambridge University. He writes as follows:

> ... his fame rests chiefly on the wonderful series of original mathematical problems which he constructed upon practically all the subjects that entered into the course of training students twenty-five or thirty years ago. They are a product characteristic of Cambridge, and particularly of Cambridge examinations; he was their most conspicuous producer at a time when their vogue was greatest. When gathered together from many examination papers so as to form a volume, which was considerably amplified in its later edition, they exercised a very real influence upon successive generations of undergraduates; and "Wolstenholme's Problems" have proved a help and a stimulus to many students. A collection of some three thousand problems naturally varies widely in value, but many of them contain important results, which in other places or at other times would not infrequently have been embodied in original papers. As they stand, they form a curious and almost unique monument of ability and industry, active within a restricted range of investigation.

It should be noted that Forsyth campaigned to reform the Cambridge mathematical syllabus, which he saw as outdated and out of touch with the developments in mathematics that had occurred on the continent in the course of the 19th century, and entirely subservient to the competitional aspects of the mathematical tripos examination. Wolstenholme's books may well have

typified for him the moribund Cambridge mathematical tradition with its emphasis on the solving of ingenious problems, instead of developing proper structures and theories.

The first edition, [8], of *Mathematical Problems* was published in 1867 and contained 1,628 problems, mainly geometrical. The second edition, [9], appeared in 1878, the book being in a larger format, and it contained 2,815 problems. A third edition of 1891 was largely a reprint with corrections of the second edition. As we stated in our previous article, the problems do not translate well into the modern syllabus and have too great a bias to geometry and sometimes a rather imprecise formulation.

We turn now to the second person mentioned in our title. Leslie Stephen may perhaps be best known nowadays as the father of Virginia Woolf and as the first editor of the DNB. In his own day, he was a major figure in literary circles in London, knowing many of the leading American and British writers and thinkers of the second half of the 19th century. We will briefly provide some details on his life. Leslie Stephen was born on 28 November 1832 and was the son of Sir James Stephen, a politician and Professor of Modern History at Cambridge University (1849-59). His mother was the daughter of the Reverend John Venn and the aunt of John Venn, the logician, whose name is associated with the set-theoretic diagrams. Thus Stephen and Venn were cousins. He entered Trinity Hall, Cambridge in 1850 and studied mathematics. To do well in the mathematical tripos, most students had to undertake intensive coaching to prepare for the rigours of the examination, which required them to repeat numerous sections of bookwork quickly and accurately, before engaging in tricky problems in the later stages of the papers. Stephen's coach was Isaac Todhunter, a famous figure in British mathematics of the 19th century. Todhunter wrote numerous textbooks for schools and universities, which must have sold well, as most went through several editions. His name is associated with four major histories of mathematical subjects, including a history of the theory of probability and a history of the theory of Newtonian gravitational attraction. An enormous amount of effort went into the production of these scholarly works, which tried to describe

virtually every relevant contribution to the subjects up to the time of Laplace. It is interesting to see what Stephen thought of Todhunter, who was clearly something of a character in Cambridge mathematical circles and about whom several anecdotes have survived (see, for example, [3] and [7, pp.87-88]). Stephen wrote as follows about Todhunter, [1, p.27]:

> He lived in a perfect atmosphere of mathematics; his books, all ranged in the neatest order, and covered with uniform brown paper, were mathematical; his talk, to us at any rate, was one round of mathematics; even his chairs and tables strictly limited to the requirements of pupils, and the pattern on his carpet, seemed to breathe mathematics. By what mysterious process it was that he accumulated stores of miscellaneous information and knew all about the events of the time (for such I afterwards discovered to be the fact) I have never been able to guess. Probably he imbibed it through the pores of his skin. Still less can I imagine how it came to pass that he published a whole series of excellent educational works. He probably wrote them in momentary interstices of time between one pupil's entering his sanctum and another leaving it.

Stephen performed reasonably well in the tripos examination of January 1854, achieving the position of Twentieth Wrangler and obtaining a first class degree. The tripos list was of a high quality that year, as the Senior Wrangler was E. J. Routh, later to be author of several mechanics textbooks and the most successful mathematical coach of all time in Cambridge, and the Second Wrangler was J. C. Maxwell. Stephen obtained a fellowship at Trinity Hall in 1854, on the strength of his tripos results, and he remained at Cambridge until 1864. He got to know Joseph Wolstenholme during this time. Annan writes of Stephen in [1, p.54]:

> So far we have seen him as a man with many younger cronies but few intimate friends; deeply attached only to Fawcett or to some odd Cambridge fish such as Joseph Wolstenholme, a mathematician and walker who had the gift of being able to spout thousands of lines of poetry by heart, as the evening fell and the pair of them pounded the last ten miles of the grind back to Cambridge.

In 1864, Stephen left Cambridge to embark on a literary

career in London. He wrote articles for reviews and literary magazines and eventually became the editor of the *Cornhill Magazine* in 1871. He published works of literary criticism and wrote on the history of philosophy. A list of his publications may be found in [4]. He was appointed editor of the projected *Dictionary of National Biography* in 1882 and retained the editorship until 1889. The first volume of the DNB appeared in 1885. He died on 22 February 1904.

When Stephen's second wife, Julia, died in 1895, he wrote a long autobiographical letter to his wife's children (three children by her first marriage and four by Stephen). This letter was known by the children as the *Mausoleum Book*. It was published in 1977, [2]. In the *Mausoleum Book*, [2, p.79], he writes:

I think especially of poor old Wolstenholme, called 'the woolly' by you irreverent children, a man whom I had first known as a brilliant mathematician at Cambridge, whose Bohemian tastes and heterodox opinions had made a Cambridge career unadvisable, who had tried to become a hermit at Wastdale. He had emerged, married an uncongenial and rather vulgar Swiss girl, and obtained a professorship at Cooper's Hill. His four sons were badly brought up; he was despondent and dissatisfied and consoled himself with mathematics and opium. I liked him or rather was very fond of him, partly from old association and partly because feeble and faulty as he was, he was thoroughly amiable and clung to my friendship pathetically. His friends were few and his home life wretched. Julia could not help smiling at him; but she took him under protection, encouraged him and petted him, and had him stay every summer with us in the country. There at least he could be without his wife.

Thus a rather different picture of Wolstenholme emerges from Stephen's own pen, compared with that given in the DNB, Stephen's former undertaking (the article on Wolstenholme was written after Stephen's resignation from the DNB and is unsigned). With regard to the statement above about having Wolstenholme to stay every summer in the country, Stephen had a house in St Ives in Cornwall where his family and guests, sometimes distinguished, would assemble for the holidays. Wolstenholme must have made some sort of impression on

Virginia Stephen (later Woolf), who was born in 1882 and thus quite young when Wolstenholme used to visit, as it seems to be agreed that the character of Mr Augustus Carmichael in *To the Lighthouse*, published in 1927, was based on Wolstenholme. See, for example, the introduction to [10], page x.

Annan wrote of Wolstenholme in [1, p.294]:

In old age he became something of a bore and Stephen irritated his family by asking the lonely old bachelor (*sic*) to stay in Cornwall with them for the holidays and then, finding his company tedious, leaving wife and daughters to entertain him. Wolstenholme was present on the summer holiday in Cornwall (see *To the Lighthouse* Part III), of which Stephen wrote to C. E. Norton, 21 Sept., 1899, 'I have lost the power of holiday making'.

Of course, the statement that Wolstenholme was a bachelor is incorrect, as we have seen.

The novel draws on Virginia Stephen's experiences of family holidays in St Ives and the tension generated by her father's difficult temperament and moods, and his wife's attempts to placate him. Carmichael (who is not portrayed in any respect as a mathematician) is interested in Persian poetry and has a not insignificant role in the novel. *To the Lighthouse* is one of Virginia Woolf's most highly regarded works and analyses of it certainly mention Carmichael's significance in the story. We feel that it is amusing to see how a mathematician, albeit not of the greatest importance, has achieved some fame as a footnote to an important novel.

References

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Research Announcement

A UNIFORMLY CONVERGENT METHOD FOR A SINGULARLY PERTURBED SEMILINEAR REACTION-DIFFUSION PROBLEM WITH NONUNIQUE SOLUTIONS

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We analyse a simple central difference scheme for a singularly perturbed semilinear reaction-diffusion problem that may have nonunique solutions. Asymptotic properties of solutions to this problem are examined. To compute accurate approximations to these solutions, we consider a piecewise equidistant mesh of Shishkin type, which contains $O(N)$ points. On such a mesh, we prove existence of a solution to the discretization and show that it is accurate of order $N^{-2}\ln^2 N$, in the discrete maximum norm, where the constant factor in this error estimate is independent of ε and N. Numerical results are presented which verify this rate of convergence. Full details appear in [1].

Reference

[1] G. Sun and M. Stynes, *A uniformly convergent method for a singularly perturbed semilinear reaction-diffusion problem with nonunique solutions* (1993). (Preprint 1993-11, Mathematics Department, University College Cork.)

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