Violet Cane: a breaker of codes and moulds August 2022 Version

DOI: 10.1111/1740-9713.01690

Rob Gandy (Visiting Professor, Liverpool Business School, Liverpool John Moores University)

Altea Lorenzo-Arribas (Socio-Economic Statistician, Biomathematics & Statistics Scotland)

Richard Startup (Honorary Research Fellow, Department of Geography, Swansea University)

Violet Cane was one of the great female statisticians, and to those who knew her, or knew of her, it is incomprehensible that it took 14 years from her passing for the Royal Statistical Society to publish an obituary[1]. Yet even this arguably did not do full justice to her remarkable character, her groundbreaking work and her involvement in critical initiatives such as code-breaking at Bletchley Park. As will be seen below, Violet was a socially concerned woman who bridged the gap between the ivory tower of academia and the political life of her local community (and was a lot of fun).

Early life

Violet was born on 31st January 1916 in Camberwell, London, and moved to Cambridge at an early age. She studied Mathematics at Newnham College, Cambridge University, being awarded a BA (Class: II) in 1938; one of only six women who graduated in the course that year. Subsequently she took Maurice Bartlett's course in Mathematical Statistics, which she recalls as being "difficult", before a short stint at the Board of Trade. In 1941 she was awarded the University of Aberdeen Robbie scholarship; £250 to cover for the period from 1st March to 30th September of that year. After a successful start, she was admitted as a Research Student to the Mathematics Department with a view to complete a PhD degree entitled *'An Investigation by Combinatorial Methods of the Structure of Topological Spaces'* supervised by Professor Wright, who had co-authored with Hardy *'An Introduction to the Theory of Numbers'*[2] three years earlier. However, Violet didn't pursue her PhD and at age 25 moved back to England to contribute to the war efforts.

Bletchley Park

The RSS obituary simply states that Violet "joined the Foreign Office (1942-45), working at Bletchley Park during that period"[1]; but it is worth keeping in mind that it was only in 1975 that the UK Government even acknowledged the existence of its Code and Cypher School in Buckinghamshire, with former employees being bound by the Official Secrets Act. Cambridge Statistical Laboratory colleague Patricia Altham recalls that just once, when alone together, did Violet refer to working at Bletchley Park; describing the very lengthy 'working week' of 12 days on and 2 days off. In retrospect it is clear that Violet developed good contacts and friendships with many eminent mathematicians whilst there, including her Head of Department Professor Ian Cassels and Edward H. Simpson (later renowned for the Simpson's paradox) who nicknamed her "*Bunty*". Therefore, whilst her writing to Alan Turing in Manchester in 1952 concerning "the possibility of constructing, at least theoretically, a machine whose operation resembles that of a human brain" (with Richard Gregory) might appear something of a "cold-call" approach, in all likelihood they knew each other.

The limited knowledge about her involvement in Bletchley Park is that she initially joined the Naval Section, working on Italian material, before switching to the decryption of Japanese messages. She continued her work in codebreaking until 1945 and a brick in her name is featured in the Codebreakers' Wall marked with the morse code symbol of 'V' for veteran.

Post WWII and Cambridge

In the immediate post-war years Statistics was becoming fully mature as a science, with its own theoretical paradigms and repertoire of concepts and techniques. Violet was a prime mover in this respect and, it must be stressed, she became a fully-rounded statistician, rather than being more properly characterised, like some of her colleagues, as a probabilist; that statistical identity ran throughout her teaching, research and consultancy work. Highly strategic for the discipline was the creation of the Cambridge postgraduate Diploma in Mathematical Statistics, where Violet was a member of the first cohort of students; being awarded the qualification in 1948. As a Statistics lecturer, she organised and vigorously furthered this demanding course in subsequent decades. Its underpinning rationale was that students acquired a mathematically-grounded understanding of the fundamentals of statistics while investigating its application in a significant field of their own choosing. The system worked well mainly because it was built upon Violet's ever-growing first-hand familiarity with applications and her extensive professional links.

Richard Startup's own experience of the course during 1963-64 is illustrative. Even at this point in time it was still the case that the study of statistics and probability in the university was regarded with some hostility and suspicion by some members of the mathematical establishment. As an Oxford mathematics graduate, Richard was intending a career in social statistics or sociology, so Violet arranged additional supervision at Cambridge's Institute of Criminology. His newly acquired familiarity with non-parametric techniques contributed to a final project on sources of variations in regional crime rates within England and Wales. Of particular note too is the fact that at that time, influenced by Moser and Scott's (1961) *'British Towns'*[3], widespread use was beginning to be made of principal component analysis[4] of census data in the comprehensive treatment of urbanism in Britain by social geographers and sociologists. Richard recalls that all her former students highlighted her knowledgeable and supportive nature, where she guided them to select the right statistical tool for the job in hand. He says "Violet knew all the statistical techniques and the associated experimental and research designs developed in the twentieth century by R.A. Fisher and others inside out, both in practice and theoretically. She was a conscientious and highly effective teacher."

Although the proportion of women among mathematics graduates was low at the time, there is every reason to believe that Professor David Kendall, Violet and their colleagues were particularly encouraging of female recruits to postgraduate mathematical statistics. It is indicative, for instance, that Patricia Altham gained the Diploma in 1964-65 which then led her on to a career involving both the Cambridge Diploma and MPhil courses.[5] She reports that, "I got my PhD and university post in 1970, at which point dear Violet became a colleague, and I shall always thank her for her friendship and support, especially in the casual conversations over coffee after lunch. She had a very relaxed and easy manner, never standing on ceremony, and always happy for a good gossip, but all the same showing a mind which was both sharp, shrewd and sensible." Patricia retired in 2005 as Director of Studies for the MPhil in Statistical Science.

Both Violet's body of work and her reputation grew over the 1950s and 1960s (see Box for a selection of her publications). These included the measurement of sensory thresholds, the effects of

ageing on perception, and the relationships between thresholds and learning; and the application of stochastic models to data collected by psychologists and animal behaviourists in relation to choice, learning and contagion. She facilitated Ewart Thomas's contact with Richard Dawkins at Oxford, which resulted in Ewart utilising some of Dawkins' research data for his own PhD thesis; work that was foundational for Thomas's career as an academic psychologist at Stanford University. Perhaps unsurprisingly she was a founder member of the Experimental Psychology Society. One of her great strengths was her willingness to work collaboratively, although Byron Morgan points out that many of her publications were sole authored, but this was not unusual for that time. Her research brought her into close contact with such luminaries as Richard Gregory, Walter Smith, Robert Hinde, Jessie MacWilliams, and Margaret Vince; interactions that facilitated the rapid application of theory to data.

Violet's friend and colleague at the Cambridge Statistical Laboratory[6] in the early 1960s, Sir John Kingman, perhaps best summed her up: she "believed that common sense was as important as mathematical theory in statistical practice, and she loved to solve statistical problems by back-of-envelope calculations wherever possible. She was suspicious of the increasing reliance on computers, which she felt often replaced careful thought."

Professorship in Manchester

In 1971 Violet was appointed as the first female Professor of Mathematical Statistics, and the first woman ever to be appointed as a professor in the Faculty of Science at Manchester University. She was 55 years of age; and Rob Gandy's recollection that "the 'word on the street' amongst the staff and students at Manchester was that if she had been a man, she would have been awarded a professorship at least 10 years earlier" bears repetition and emphasis. Despite her aforementioned attitude towards computers, as Rob's supervisor she happily oversaw his dissertation on a computer simulation of a hospital ward.

It should be noted that Violet was now one member of a remarkable statistical triumvirate: at that time Manchester's Statistical Laboratory was one part of the Manchester-Sheffield School of Probability and Statistics along with the Statistics Group within the University of Manchester Institute of Science and Technology's Mathematics Department, and Sheffield University's Department of Probability and Statistics. Her opposite numbers were Maurice Priestley at UMIST and Joe Gani at Sheffield; and she had a particularly good relationship with Maurice given their close geographical proximity and the fact that their respective Masters students attended the same courses.

Another of Violet's supervisees was (now Professor) Roseanne McNamee whose MSc dissertation involved mathematical models for infectious diseases. Whilst Roseanne admits that she hadn't really thought beyond her MSc, Violet found money to support her for a further two years to do a PhD in the subject area. Roseanne fondly remembers Violet's kindness, including encouraging her to (successfully) apply for a post at an MRC Unit in Cambridge; and her valuable lesson that approximate solutions to equations might be sufficient to answer an important practical question.

The Statistical Laboratory was based in the iconic Maths Tower on Oxford Road (now sadly demolished) which had a fairly unique internal triangular staircase. Her two main colleagues were Ron Doney and Eos Kyprianou; the latter being the father of Andreas Kyprianou, Professor of Probability Theory at Bath University. The Laboratory was small and friendly with everyone mixing and embarking on energetic debates about one statistical issue or another almost every coffee

break. Ron has fond memories of Violet, describing her as a kind and understanding Head of Department. He readily admits that at heart he is a pure mathematician, which served to limit their personal interaction. He describes Violet as being rather at the other end of the statistical spectrum, adopting an approach based on common sense and understanding of the problem in hand, but one fully informed by technical mathematics and statistics. He adds that she "was certainly effective".

Throughout her time in Manchester Violet and her beloved cat lived in a pleasant rented flat on Platt Lane, often commuting back to Cambridge with the cat loose on the backseat of her car. She retained her medieval house at 13 & 14 Little St Mary's Lane in Cambridge, where Stephen Hawking was a near neighbour at one point, and returned there upon her retirement in 1981. Characteristically, she had rescued these two ancient cottages from demolition by the Cambridge City Council.

Retirement?

Despite holding posts in Aberdeen, Buckinghamshire and Manchester, it seems it was very much a case of "You can take the lass out of Cambridge but you cannot take Cambridge out of the lass!". Once back in the city that she loved, Violet continued to lead a very active life. Her residence in Little St Mary's Lane was charming, and she was known as a generous hostess. As a Fellow of Newnham she would visit the College and the Laboratory occasionally (although this naturally decreased over time); and she also involved herself in local politics. A public- spirited academic, Violet served on the Cambridge City Council as an elected Labour Councillor representing Newnham Ward on the Cambridge City Council (1982-90). She was not shy of using her statistical skills; which included confronting the then traffic officer and proving him wrong in his traffic congestion proposals for the city. Once, at a public inquiry, when called to give evidence, the inspector asked her whether she was "Doctor" or "Mrs" Cane, she replied "actually it's Professor but you can call me Violet".

Violet was part of the "Newnham Ladies" group (which included Gwyneth Lipstein, Ruth Cohen, Wendy Nichols, Nora David and Clarissa Kaldor), and was very close with Cohen, distinguished agricultural economist and former Principal of Newnham College, who led the council's Finance committee.

Conclusions

A brilliant pioneer statistician in many aspects of teaching and research, Violet was the sort of female role model that continues to be needed. Lessons from her career which remain pertinent include: be generous with your time, knowledge and advice to help and inspire (younger) colleagues, and where necessary guide their career direction and possibly their advancement; and, be passionate about further developing your statistical interests, exploring where they can help in other fields, but recognise that many statistical problems/issues are best addressed collaboratively. Her overcoming prejudice illustrates how with perseverance and good humour individuals can still achieve their goals, even when the odds seem stacked against them. And for those of a certain age, keep active and involved in retirement; there can be many opportunities to contribute to your subject and community, even on an unpaid basis. Violet died in 2008 at the ripe old age of 92; sadly missed by everyone who came into contact with her inside and outside academia.

Acknowledgements

The authors would like to thank Patricia Altham, Roseanne McNamee, Byron Morgan, Ewart Thomas, and all of the ex-students, ex-colleagues and archivists who kindly shared their memories or provided information.

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Notes & References

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2. G. H. Hardy and E. M. Wright (1938). *An Introduction to the Theory of Numbers.* (First ed.), Oxford: Clarendon Press
3. C. A. Moser and W. Scott (1961). *British Towns: A Statistical Study of their Social and Economic Differences.* Edinburgh: Oliver and Boyd.
4. Principal component analysis is a technique of multi-variate analysis developed for the purpose of analysing the inter-correlations within a set of variables (such as characteristics of urban areas). The essence of it is to investigate how much of the total variability in the primary items can be associated with a small number of new independent variates.
5. P. M. E. Altham (2019) *Reminiscences about the Diploma in Mathematical Statistics.* Statistical Laboratory, University of Cambridge. http://www.statslab.cam.ac.uk/~pat/DipRem.pdf
6. More details of the Cambridge Statistical Laboratory can be found in: P. Whittle (1993) *The History of the Statistical Laboratory*. https://www.statslab.cam.ac.uk/history-statistical-laboratory

Selection of potential photos already supplied and not repeated here