

Introduction

In 1947, the Chemical Society published a book titled *British Chemists*.¹ This book contained the compiled biographies of prominent British chemists. None were women, and the accounts read as if women were essentially absent from the chemical enterprise in the latter decades of the 19th century and the first half of the 20th century.

Nothing could be further from the truth: there were significant numbers of women chemistry students and women chemists. For example, we have identified 896 who were members of the Royal Institute of Chemistry and/or the Chemical Society during our time frame of 1880–1949. In this book, we provide biographical accounts of 141 women chemists, together with brief notes on an additional 21.

Documentation

For the most part, these women chemists did not gain any recognition. In those times, most considered it unthinkable for a woman to occupy anything more than a supporting role. The majority of the women remained unmarried; thus, when they died, no record of them survived. Any relative would probably have been unaware of the scientific contributions of their deceased aunt and hence destroyed her papers and correspondence. For this reason, many of our accounts raise more questions than provide answers. Some of the women simply “disappear” from the record, perhaps through marriage, perhaps

death, or perhaps a change in career direction brought about by a lack of opportunity to practise their chosen profession.

Deaths in the early part of the 20th century were usually given some coverage, even a short article in the *Journal of the Institute of Chemistry*. Some of the Oxbridge women graduates, when deceased, rated a brief biography in the appropriate college newsletter. A few were fortunate to have another women chemist write an obituary of them. Paradoxically, the longevity of most of these women meant they did not die until the late decades of the 20th century, when a one-line name and date of death in *Chemistry in Britain* was all they received.

To a certain extent, it is the sparseness of records that has limited us in considering which women chemists to include and which to exclude. However, we decided some women played a role in the narrative even when very little information could be found about them. For this reason, we ask the reader to tolerate some of the short “bare essentials” biographical accounts.

The Pioneer Women Chemists

For the women chemists for whom we have biographical information, what comes through most strongly is their enthusiasm and dedication. It is for this reason we have titled the book *Chemistry Was Their Life*. The women chemists of the 1880s to 1920s saw themselves as the pioneers: they had to succeed for the sake of the young women who followed them. At the same time, they truly found chemistry enthralling — it was indeed the centre of their lives and, for those in academia, they were determined to convey this belief to their students.

Where we have documentation, the women chemists readily acknowledge their appreciation of their supervisors, such as biochemist F. Gowland Hopkins (see Chap. 8), for allowing them to follow their chosen path in an environment where other prominent male chemists refused to countenance a woman student.

In Marcia Bonta's study of the lives of pioneer American botanists, she found this same attitude:

Because most women naturalists believed that the work was all that mattered, they seemed to feel little or no rivalry toward the more powerful males in their fields and were pleased and grateful for whatever help these men gave them.²

The quantity of research accomplished by these women was enormous. In this book, we only have space to list the books authored by the women chemists we have chosen to include. In the accompanying website, the publications of each of the 896 pioneer women chemists are listed (see: www.worldscibooks.com/histsci/p538.html). So why has their work been forgotten? Much was published under their names alone, and was never retrieved when historians were looking under the names of the "great men"; and when the women's research was co-authored with one of the "great men," then they were overshadowed by their more famous supervisor. An example of the latter is Mollie Barr (see Chap. 13). Of the 36 publications of the biochemist Alexander Glennie F. R. S. between 1932 and 1955, 25 were co-authored by Mollie Barr,³ yet Barr's lifetime of contributions to the field has not been recognised and little can be found about her life history.

The underrecognition of women's contributions in science has been well documented by Margaret Rossiter.⁴ Rossiter was building on the contribution of the sociologist, Robert K. Merton. Merton identified the "Matthew effect," the minimisation of the role of secondary contributors in science, naming the effect after the Biblical quotation of Matthew 13:12, which stated that "whosoever hath not, from him shall be taken away even that he hath." Rossiter contended that the effect was far more endemic and serious for women scientists, for whom she coined the term the "Matilda effect" after the American suffragist, Matilda J. Gage, who both experienced it and articulated the phenomenon.

For consistency, all women chemists are discussed under their birth name (their married name is provided in parentheses).

The change in name upon marriage has always been problematic for academic women. Sharon Bertsch McGrayne remarked the change in name even caused confusion in the case of Dorothy Crowfoot (Mrs. Hodgkin): “Dorothy published her penicillin studies under her maiden name ‘Crowfoot’ and announced vitamin B₁₂ as ‘Hodgkin.’ Years later some scientists still did not know that the Crowfoot of penicillin fame was the Hodgkin of B₁₂ fame.”⁵

The reader will note that it was several males, especially William Tilden and William Ramsay, who vociferously promoted the right of women to be admitted to the Chemical Society (see Chap. 2). Sylvia Strauss has described the importance of sympathetic men to the suffrage campaign in Britain in her book, *Traitors to the Masculine Cause: The Men’s Campaigns for Women’s Rights*.⁶ In the more general context of women’s access to university, we highlight several male crusaders including William Shean (see Chap. 3), and Henry Sidgwick and Arthur Sidgwick (see Chap. 6). The admission of women to the Pharmaceutical Society would never have succeeded at the time without the efforts of Robert Hampton (see Chap. 10). Augustus Vernon Harcourt was another champion of women, both in the context of the Chemical Society and for the admission of women to chemistry lectures at Oxford (see Chap. 6).

Setting the Scene

As we show in Chap. 1, access of women to university could not have been possible until secondary schools existed that provided academic studies for girls. Certain schools played a particularly prominent role: North London Collegiate School for Girls (NLCS) and the related schools of the Girls’ Public Day School Company (GPDSC); Cheltenham Ladies’ College (CLC); King Edward VI High School for Girls, Birmingham (KEVI); and Manchester High School for Girls (MHSG). Not only did they provide an academic education, but they also saw the essentiality

of teaching girls about science, and specifically chemistry. In subsequent chapters, we have reported the school attended by each woman chemist, when known, and the reader will note the frequency with which these schools are mentioned.

We also introduce an issue which bedevilled the teaching of chemistry to women: whether it should be academic chemistry to enable matriculating girls to take their place alongside men in university laboratories, or domestic chemistry that would be relevant to women's lives. We revisit the issue in Chap. 3 in the context of King's College of Household and Social Science and of Battersea Polytechnic.

In Chap. 2, we summarise the access of women to professional societies. Each society handled the admission of women in a different way, with the long battle for admission to the Chemical Society taking up a substantial portion of the chapter. In addition to describing the long struggle, we highlight the women who signed the 1904 petition for admission. Most of those women, together with many of the signatories of a letter in 1909 to *Chemical News*, seem to have been the "movers and shakers" of their time.

Chapter 2 is the first chapter in which individual biographies of women chemists appear. We have endeavoured to place each biography in the most relevant narrative. In some cases, this is in the chapter of the institution from which the woman graduated; in others, where she undertook research or became employed; in others, in the context of her speciality or time frame. Where possible, we have cross-referenced the biographical accounts to linking locations in other chapters.

The Colleges and Universities

The next five chapters focus on the British universities and colleges. In each case, we have attempted to provide the reader a brief historical context of each institution without overwhelming the true focus of the book: the women chemists and their experiences. The biographical accounts in these chapters focus

mainly upon women chemists who joined the staff at those institutions, together with a selection of profiles of women chemistry students who later made notable contributions.

In some cases, we have found rich background material in student magazines of the 1880s to 1920s that give an insight into the lives of women students in those early days. We have employed quotes from these magazines to document the women's experiences both in general and specifically within the culture of the chemistry departments.

At the women's colleges (see Chaps. 4 and 6), the commentaries we have included highlight the regulations and formal dinners in the early years that were more like those at authoritarian boarding schools. At the same time, the women students had a sense of freedom and empowerment they lacked in the outside world. With the demise of the British women's colleges,⁷ it is crucial for the reader to appreciate the unique "insulating" environment of the time. Of the women's colleges, three institutions played an especially important role in educating women chemists: Bedford College, London; Royal Holloway College, London; and Newnham College, Cambridge. Throughout the book the reader will note the frequency with which these names appear.

Though the (co-educational) universities (see Chaps. 3, 5, and 7) all claimed to welcome women students, their daily experience was often otherwise. We have included a selection of comments from student magazines by male correspondents that indicate significant hostility to the presence of women. Carol Dyhouse has summarised the situation:

In many cases they [women students] were excluded from membership of existing societies and student unions, and found it necessary (or expedient) to form their own. The presence of a minority group of women frequently served to underline rather than undermine the norms of the dominant male culture, and male students often went in for exaggerated displays of masculinity, particularly in informal settings, where

the presence of women might supply both a target for aggression and an audience. Women students generally responded by keeping a very low profile.⁸

Favoured Fields for Women Chemists

One of our previous studies indicated that women scientists tended to “cluster” in certain areas.⁹ There were two areas in which women chemists flourished: biochemistry (see Chap. 8) and crystallography (see Chap. 9). In those chapters, we focus not only on the women and their work, but also the environment in which they worked and the mentors who contributed to their advancement. These were the only two fields in which pioneering women chemists received the accolade of election to Fellowship of the Royal Society (see Table 0.1).

In Chap. 10, we provide an account of the pioneering women pharmacists, some of whom had been active chemists. Even more than crystallography and biochemistry, pharmacy was a direction in which women chemists could find employment. In addition, the fight for the admission of women to

Table 0.1. Women in the chemical sciences elected Fellows of the Royal Society, 1945–1980.

Name	Subject	Date	Chapter
Kathleen Yardley (Mrs. Lonsdale)	Crystallography	1945	9
Marjory Stephenson	Biochemistry	1945	8
Dorothy Crowfoot (Mrs. Hodgkin)	Crystallography	1947	9
Dorothy Needham	Biochemistry	1948	8
Rosalind Henley (Mrs. Pitt-Rivers)	Biochemistry	1954	4
Helen Archbold (Mrs. Porter)	Biochemistry	1956	3
Patricia Clarke	Biochemistry	1976	13
Elsie Widdowson	Biochemistry	1976	13

the Pharmaceutical Society has interesting parallels to, and differences from, the admission of women to the Chemical Society.

Options for Women Chemists

Up to this point, we have used institutional and subject narratives in which to embed the biographical accounts. These encompass a relatively small number of women chemists of the period. In the last three chapters, we look at the roles of women chemists from other perspectives.

Chapter 11 focuses on the effects of marriage on women chemists. Though a significant proportion stayed single — particularly those who stayed in academia — many did marry, of whom most relinquished their career. A significant proportion of the women who did marry married a chemist. Of the working chemistry couples, some wives continued with their original field while the majority joined their husband's research group. The degree of recognition of the women's work depended very much on their marriage partner. Some wives were cited as co-authors, while it would seem others received no credit for their collaboration.

The First World War proved a turning point in the acceptance of women chemists, as it did for educated women in the wider society. Therefore, we devote the whole of Chap. 12 to the different roles women chemists played in this war, especially in the production of fine chemicals in academic laboratories and in the many H. M. Factories around the country. With the destruction of many records after the First World War, it is unlikely we will ever determine the full role of women chemists during this period.

It may come as a surprise to many readers, but the proportion, and even the total number, of women students at university reached a maximum in the late 1920s; the trend applied equally to women chemists.¹⁰ In Chap. 13, we examine this phenomenon and provide observations on the subsequent decline.

We give an overview of the different employment avenues for women chemists in the interwar period and choose exemplars for each. The chapter concludes with examples of women chemists who used the opportunities of the Second World War to develop career directions, though the effect of that war on women chemists seems to have been less momentous than that of the 1914–1918 conflict. The late 1940s seem to be an appropriate place to end the book, for as Evelyn Fox Keller has observed, the mid-20th century represented the “nadir of the history of women in science.”¹¹

Commentary

Each chapter ends with a commentary addressing some specific aspect of that particular chapter. In this commentary, we would like to consider that this book will finally bring awareness of the forgotten role of British women chemists in the late 19th and the first half of the 20th centuries. At last, in addition to the HIStory of British chemists, we now have HERstory.

Notes

1. Findlay, A. and Mills, W. H. (eds.) (1947). *British Chemists*. Chemical Society, London.
2. Bonta, M. M. (1991). *Women in the Field: America's Pioneering Women Naturalists*. Texas A&M Press, College Station, Texas, pp. xii–xiii.
3. Oakley, C. L. (1966). Alexander Thomas Glenny, 1882–1965. *Biographical Memoirs of Fellows of the Royal Society* **12**: 163–180.
4. Rossiter, M. W. (1993). The ~~Matthew~~ Matilda effect in science. *Social Studies of Science* **23**: 325–341.
5. McGrayne, S. B. (1993). *Nobel Prize Women in Science*. Birch Lane Press, New York, p. 248.
6. Strauss, S. (1982). *Traitors to the Masculine Cause: The Men's Campaigns for Women's Rights*. Greenwood Press, Westport, Connecticut.

7. Rosen, A. (2003). *The Transformation of British Life, 1950–2000: A Social History*. Manchester University Press, Manchester, p. 84; Howarth, J. (1994). Review article: Women's colleges — The latest lost cause? *Oxford Review of Education* **20**: 143–147.
8. Dyhouse, C. (1995). The British Federation of University Women and the status of women in universities, 1907–1939. *Women's History Review* **4**: 465–484.
9. Rayner-Canham, M. F. and Rayner-Canham, G. W. (1996). Women's fields of chemistry: 1900–1920. *Journal of Chemical Education* **73**: 136–138.
10. Rayner-Canham, M. F. and Rayner-Canham, G. W. (1996). Women in chemistry: Participation during the early twentieth century. *Journal of Chemical Education* **73**: 203–205.
11. Fox Keller, E. (1987). The gender/science system: Or, is sex to gender as nature is to science? *Hypatia* **2**: 40.