‘WHERE ARE YOUR INTELLIGENT MOTHERS TO COME FROM’?
MARRIAGE AND FAMILY IN THE SCIENTIFIC CAREER OF DAME
KATHLEEN LONSDALE FRS (1903–71)

by

MELINDA BALDWIN*

Program in the History of Science, Dickinson Hall, Princeton University,
Princeton, NJ 08544, USA

Although she was one of the most successful female scientists in twentieth-century Britain, the X-ray crystallographer Kathleen Yardley Lonsdale (1903–71) has received relatively little attention from historians of science. This paper, based on material from the recently opened Dame Kathleen Lonsdale Papers, argues that Lonsdale’s scientific career was shaped in particular ways by her identity not just as a woman, but as a married woman and a mother. When interacting with her scientific colleagues, Lonsdale frequently had to confront the assumption that married women should not pursue scientific careers, an attitude shaped by British concerns about reasserting traditional gender roles after the World Wars I and II. Furthermore, although Lonsdale’s husband, Thomas, was an ardent supporter of her career, in the early 1930s Lonsdale left research temporarily to care for her small children. Her desire to work from home during this period led her to pursue one of her most significant scientific projects: the creation of crystallographic reference tables. Lonsdale’s own experiences, and those of her female students, led her to focus on issues of marriage and family when she began speaking and writing about women in science during the late 1960s.

Keywords: Lonsdale; women in science; marriage; crystallography; Royal Society

INTRODUCTION

In January 1962 Dame Kathleen Lonsdale, head of the Department of Crystallography at University College London (UCL), received a letter from a University of Manchester student named Jean Peskett. Peskett had just earned her master’s degree and wanted to know whether Lonsdale’s department might accept her as a PhD candidate. On the surface it was a fairly ordinary inquiry, but Peskett’s curt and unenthusiastic description of her time at Manchester hinted that there was more to her story. When Lonsdale contacted her friend Henry Lipson, a Manchester professor, she discovered that Peskett had already finished a PhD thesis, one the department had deemed acceptable. However, Peskett had performed poorly on the accompanying oral examination, and some of her supervisors had complained that her laboratory work was not up to standard. The Manchester degree committee decided not to award her a PhD, offering her an MSc instead.1

*mcbaldwi@princeton.edu
Lipson seemed unable to understand why Peskett wanted to continue with her scientific career after she had failed to obtain her PhD. ‘Although she married about a year ago, she still puts the Ph.D. first, and has become almost unbalanced about it’, he said in his initial reply to Lonsdale.\textsuperscript{2} In a subsequent letter, Lipson confided, ‘I am sure that she should not be allowed to continue with her research. She would make a good housewife, and she ought to look after her husband. She knows how to look after a house and she bakes excellently.’\textsuperscript{3}

Lipson’s comments are somewhat curious when we consider the person to whom they were addressed. Dame Kathleen Lonsdale was one of Britain’s most respected crystallographers, with a long list of publications and awards to her name. In 1945 she and the biologist Marjorie Stephenson had become the first women elected to the Fellowship of the Royal Society of London; subsequently, Lonsdale became a Dame of the British Empire in 1956, was awarded the Royal Society’s Davy Medal in 1957 (its first female recipient since the award of the medal to Marie and Pierre Curie in 1903), and was elected the first female president of the British Association for the Advancement of Science in 1967. At the time of Lipson’s letter, Lonsdale had also been married for 35 years and was the mother of three children.

Materials from the recently opened Dame Kathleen Lonsdale Papers at University College London strongly suggest that Kathleen Lonsdale’s scientific career was shaped by her identity not just as a woman, but as a married woman and a mother. Influential biographies of women in twentieth-century science have shown that female scientists such as Barbara McClintock and Rosalind Franklin often encountered scepticism and discrimination because of their gender.\textsuperscript{4} However, many of these studies focus on women who chose to remain single. As a married woman, Lonsdale had to contend with a somewhat different set of assumptions and attitudes from those applied to her single counterparts. Throughout her career, Lonsdale encountered numerous colleagues who thought that married women ought to devote their time to their husbands rather than the laboratory. Furthermore, many of Lonsdale’s early career choices were strongly influenced by her family circumstances. Most notably, she chose to take a sabbatical from laboratory research when her children were born. This early gap could have posed problems for Lonsdale’s later career, but she found a way to continue her scientific work from home and was able to build a network of contacts who helped her obtain scientific positions when she chose to return to the laboratory full time. The balancing act between family life and research would become a recurring theme in Lonsdale’s speeches and articles on women in science in the 1960s, suggesting that these issues had a significant impact on her own experiences as a scientist.

\textbf{Attitudes towards married women in the British scientific community}

Kathleen Yardley was born in 1903 in Newbridge, Ireland, to an impoverished postman’s family; she was the youngest of ten children, although four of her elder brothers died in infancy. In 1908 her mother, Jessie Yardley, left her husband and moved her children to a small town in Essex to escape Irish unrest. Yardley excelled academically from a young age, especially in mathematics and science; from the ages of 14 to 16 years she attended most of her courses at the County High School for Boys because the girls’ school did not offer physics, chemistry or higher mathematics.\textsuperscript{5} At the age of 16 years she was awarded a scholarship to London’s Bedford College for Women, where she intended to study physics. Although the headmistress of her Essex girls’ school had told Yardley that she would not be able compete in a ‘man’s field’ such as physics, \textsuperscript{6} in 1922 Yardley earned the highest score of
any University of London student on the Honours Physics BSc examination. One of the
examiners, the Nobel prize-winning crystallographer William H. Bragg, was impressed by
her performance and offered her the chance to learn X-ray crystallography at his laboratory at
UCL. In 1923 Bragg had the opportunity to move his research to London’s prestigious
Royal Institution (RI). He accepted, and brought Yardley (among others) with him to his
new laboratory.7

Yardley remained at the RI until 1927. In that year she married Thomas Lonsdale, a textile
chemist she had met during her time at UCL. There seems to have been no question between
the two that both would continue with their scientific careers. Thomas apparently assured
Kathleen that ‘he had not married to get a free housekeeper.’8 On the contrary, he fully
expected her to continue her scientific work. Thomas Lonsdale had an extremely high opinion
of his wife’s scientific talents; he was fond of telling interviewers that he had initially been
attracted to Kathleen because of her mathematical ability.9

However, Kathleen was probably aware that despite her husband’s enthusiasm for her
career, her colleagues might not approve of her decision to marry Thomas. One anecdote
from her early career illustrates the scepticism that might face a woman scientist who wished
to marry. During her time at the RI, Bragg had introduced her to Sir Alfred Yarrow, a marine
ingineer and Fellow of the Royal Society. Yarrow told Yardley that he believed that brilliant
men often inherited their gifts from intelligent mothers. But he went on to share the opinion
that women should not be scientists because they would inevitably leave the laboratory if they
married. Yardley reportedly responded, ‘Where are your intelligent mothers to come from,
if only those with no professions are allowed to marry?’ 10

Years later, Lonsdale was able to make light of Yarrow’s attitude, but the widespread
belief that married women should not be scientists had more serious consequences for her
career. Shortly after her marriage, she applied for two research grants: a fellowship from her
alma mater Bedford College, and an 1851 Exhibition Fellowship, a research grant awarded by
the British crown. Lonsdale was offered the Bedford award, but apparently delayed accepting
it because Bragg assured her that her application for the more prestigious 1851 Fellowship
ought to be successful. It was not. Lonsdale quickly wrote to Bedford asking whether their
award was still hers for the taking. She explained in her note that the Commissioners of the
1851 scholarship had told her ‘they would be breaking the spirit of the regulations in
awarding an exhibition to a married woman.’11

The response of the Commissioners to Lonsdale’s application seems to fall within a larger
cultural discussion about the employment of married women. In the years after World War I,
as women who had been employed in wartime began leaving the workforce and British
society adjusted to the new laws allowing women to vote, many prominent Britons began
arguing for the need to maintain traditional gender roles.12 A key part of this campaign to
rebuild traditional gender identities was a campaign against the employment of married
women. If a married woman held a job outside the home, the argument went, she would be
forced to neglect her true womanly duties: caring for her family. The assumption that married
women would devote themselves exclusively to their families was even adopted by some
former suffragettes. The ‘new feminists’, as both supporters and detractors called them,
argued that most women naturally sought to make marriage and family the centre of their
lives; therefore, the most important task for feminists was not to seek equal wages or legal
protection against employment discrimination but to secure the right of married women to
remain within the domestic sphere even if their husbands were abusive, incapacitated or
otherwise unable to support the family.13 Defending women’s rights meant defending women
from the workplace. Furthermore, some Britons argued, giving jobs and salaries to married women—whose husbands, it was assumed, were already employed—meant denying those positions to men whose families needed the income. Presumably this is why the Commissioners felt they would be ‘breaking the spirit’ of the scholarship in awarding it to Kathleen Lonsdale—the scholarship was intended to support researchers who had no other source of income, and because Lonsdale already had a husband to provide for her, awarding her a fellowship would mean taking it away from a man (or perhaps a single woman) who needed the money more. The Commissioners may also have felt, like Yarrow, that awarding a scholarship to a married woman would be something of a waste because she would probably end her career to care for her husband and household.

The belief that married women should not pursue professional careers would prove to be an enduring one in twentieth-century Britain. In January 1957, eight years after being elected to the Fellowship of the Royal Society, Lonsdale volunteered to help draft a Royal Society report about the state of science education in British schools. At the height of the Cold War, the quality of science education was of special concern to Western scientists and policymakers, and during the 1950s British science teachers launched a largely successful campaign to revise the traditional secondary school curriculum to educate students more extensively in science and technology subjects. The first draft of the report, however, was written in entirely gender-exclusive language, referring only to ‘boys’ and ‘masters’ and ignoring unique issues facing young women who wanted to obtain a scientific education.

Lonsdale almost immediately wrote to Sir Thomas Merton, the chairman of the committee, to argue that women’s issues should be addressed in the report. ‘The reasons why girls do not proceed to advanced work are, in general, quite different from those which apply to boys’, she wrote. The main problem, in her view, was ‘the whole attitude of parents and girls who feel that advanced education, especially on the science side, is wasted on a girl who may expect soon to be married’—an attitude that did not apply to young men.

The only other woman on the committee was Mary L. Cartwright, a mathematician at the University of Cambridge and a member of the Council of the Royal Society. Cartwright also felt that girls’ education should be discussed in the report and paid a personal visit to Merton to discuss her concerns. In a letter to Lonsdale, a frustrated Cartwright wrote that Merton had largely dismissed her objections to the report’s first draft. Merton did suggest adding a footnote indicating that there were special issues facing young women. He told Cartwright that in his opinion, moving the topic to the main text ‘made it too prominent.’ When the committee reconvened 10 days later, Cartwright had resigned. Lonsdale almost immediately wrote to Sir Thomas Merton, the chairman of the committee, to argue that women’s issues should be addressed in the report. ‘The reasons why girls do not proceed to advanced work are, in general, quite different from those which apply to boys’, she wrote. The main problem, in her view, was ‘the whole attitude of parents and girls who feel that advanced education, especially on the science side, is wasted on a girl who may expect soon to be married’—an attitude that did not apply to young men.

Lonsdale chose to remain, and she was able to convince the other committee members to rework the gendered language and include some discussion of the biases preventing girls from studying science. The final report acknowledged that there was a strong prejudice against women pursuing advanced science education because of the expectation that they would marry, which often resulted in poor science instruction in girls’ secondary schools. The report also mentioned the ‘tendency for parents still to feel that advanced education, particularly on the science side, is wasted on a girl who may expect soon to be married.’ These words were lifted almost exactly from Lonsdale’s earlier letter to Merton.

But the mere acknowledgement of this educational bias may have been enough to draw controversy. In July 1957, the President of the Royal Society, Sir Cyril Hinshelwood, wrote to Lonsdale to tell her that the Royal Society would not publish the report. Sir Cyril’s explanation for the Society’s decision was somewhat vague. ‘It appeared’, he wrote, ‘that very wide and deep divergence of opinion existed on a number of issues, which made a
majority of the Council unwilling to take responsibility for the report as a whole.\textsuperscript{20}
The minutes of the Council meeting on 20 June do not provide much more insight into the Council’s decision, saying only that the Council voted 10–6 not to print the report after a discussion

in which various statements in the report ‘Science in Schools’ were criticized and questions were asked about the propriety of publishing such a report, which, even if it were a report of a Committee, might inevitably be regarded as having the approval of the Council and the Society.\textsuperscript{21}

It is possible that some of the committee’s other suggestions, such as allowing younger students in secondary school to change specializations more easily so they might be less reluctant to undertake challenging scientific courses, were as controversial as the issue of gender and science education. Given the battle that Cartwright and Lonsdale fought to include girls in the report at all, though, it seems likely that the section on girls’ education contributed to the ‘divergence of opinion’ that prevented the report’s approval.

Both Merton’s reluctance to include women’s issues in the report and the Society’s reaction to the final draft seem to reflect the ‘cult of domesticity’ that was gaining strength in Britain after World War II. Wartime conditions had made female participation in the workforce a necessity, and for a time women had worked alongside men in almost all areas of British life to keep the country running.\textsuperscript{22} However, as in the years after World War I, many Britons felt that traditional gender roles ought to be re-established now that the threat from Germany was over and it was no longer necessary for women to work. The society that had encouraged women to work during World War II now encouraged women to abandon careers; British marriage and birth rates increased, and the number of women earning money outside the home decreased.\textsuperscript{23} The cultural message to young women was clear: marriage and family were their highest calling, their duty as British women. The Fellows may not have wanted to endorse a document that seemed to criticize such beliefs—even though Lonsdale herself stood as an example that scientific education might not be entirely wasted on a girl who eventually married. The correspondence with Henry Lipson about Jean Peskett in 1962 further suggests that this kind of scepticism towards married women in science persisted well into the later years of Lonsdale’s career.

\textbf{Balancing Family and Research: Lonsdale’s Home Life and Career Strategies}

Shortly after their marriage in 1927, the Lonsdales made the decision to relocate to Leeds. For Thomas, Leeds was an ideal place in which to pursue his work in textile chemistry; for Kathleen, the University of Leeds promised laboratory space and supportive colleagues such as the organic chemist Christopher Ingold.\textsuperscript{24} It was at Leeds that Kathleen Lonsdale earned her reputation as one of Britain’s most gifted crystallographers with her most famous project, a crystallographic study of the benzene ring in hexamethylbenzene (C\textsubscript{6}(CH\textsubscript{3})\textsubscript{6}). Lonsdale published her preliminary results in a 1928 issue of \textit{Nature},\textsuperscript{25} and her full report in 1929 in the \textit{Proceedings of the Royal Society of London}.	extsuperscript{26} Her study investigated and settled the long-standing question of the geometry of the six-carbon benzene ring, a problem that had vexed both crystallographers and organic chemists.

Lonsdale’s career path after the publication of this extremely successful paper was strongly influenced by her family situation. In 1929 Lonsdale gave birth to her first child, Jane, who was followed by Nancy in 1931 and Stephen in 1934. Between 1930 and 1932 she
stayed at home with her young children and did not hold a paying scientific post. Although she was not officially employed during this period, Lonsdale did not want to give up her scientific work entirely. Instead, she was able to find ways to continue her crystallographic work even without a laboratory. X-ray crystallography required an enormous number of mathematical calculations to obtain information on the structure of a compound from an X-ray photograph. Lonsdale spent the first months after Jane’s birth working on the calculations for the structure of another benzene compound, hexachlorobenzene (C₆Cl₆), based on laboratory work she had done before giving birth.

When those calculations were complete, Lonsdale reached back to her earliest years at the Bragg laboratory and resumed one of her first scientific projects. During her first years working under Bragg, Lonsdale had realized that the X-ray diffraction patterns of crystals might be used to determine their space group (a mathematical description of the symmetry elements in a crystal structure). She and her colleague William (W. T.) Astbury reasoned that if they knew the space group of a crystal, they could determine the structure of the crystallized molecule more easily. The two began to collaborate on a set of tables that would enable crystallographers to determine the space groups of crystals from their X-ray diffraction patterns. Their paper, ‘Tabulated data for the examination of the 230 space-groups by homogeneous X-rays’, was published in 1924, and the tables proved so popular within the crystallographic community that they had to be reprinted.

As a young mother working from home, Lonsdale began compiling more sets of reference tables meant to help scientists derive chemical structures from X-ray photos more easily. In many ways this was an ideal project for her situation—it required no laboratory space, only reference books, old X-ray photos and the patience and mathematical skill to undertake the demanding calculations by hand. Although she did not have access to a laboratory during this period, Lonsdale managed to create a niche for herself that enabled her to make a significant contribution to her field while at home. Her interest in the project continued even after her children were grown; between 1948 and 1963 she devoted a significant amount of time to the creation of the International Union of Crystallography’s official reference book of equations and tables.

Despite the apparent success of this endeavour, however, there is some indication that Lonsdale’s work on the reference tables lowered her status in the eyes of some scientific colleagues. In her Royal Society obituary of Lonsdale, fellow crystallographer Dorothy Hodgkin tried to address these critics by contending that Lonsdale’s work on the tables had been essential for other crystallographers and that Lonsdale’s own research output was still significant despite the time she spent on the reference books. ‘Her work [on the reference tables] has helped so many others to success’, wrote Hodgkin, adding that Lonsdale’s body of research was still ‘considerable, and permeated by her knowledge of [crystal] symmetry.’ Hodgkin’s words indicate that although Lonsdale was successful at combining scientific work with a desire to stay home, she did so by taking on a relatively low-status project. Similarly, when Lonsdale returned to the laboratory in 1932 (by which time her family had moved back to London), it was as a research assistant operating on year-to-year grants—a position for which she was probably overqualified given her earlier success, but which allowed her to continue spending significant time at home.

Although Lonsdale often spoke openly about her Quaker faith and her commitment to pacifism, when it came to her scientific career she was a private person who rarely made reference to her own feelings or to any struggles she might have had. Even the archival materials contain very little insight into what she was thinking or feeling at any given
time—the Lonsdale Papers contain mostly professional correspondence, not personal letters. But in the 1960s, as the British feminist movement was undergoing a revitalization, and figures such as the American sociologist Alice Rossi were inquiring into why there were so few successful female scientists, Lonsdale began delivering speeches and writing articles on the subject of women in science. The challenges facing a mother and scientist were a frequent theme in these pieces, and it seems likely that she chose to focus on these issues because they were the ones that had most affected her own experiences. In her articles, Lonsdale repeatedly asserted that domestic obligations often forced women to choose between family life and science. Her 1970 article ‘Women in science: reminiscences and reflections’, for example, noted that 13% of female research scholars gave up their research after marriage. Furthermore, more than half of women researchers chose to remain single. Lonsdale found this statistic especially striking because less than 10% of women in the population at large remained unmarried. Analysing these trends, Lonsdale wryly commented:

Sir Lawrence Bragg [William Bragg’s son] once described the life of a university professor as similar to that of a queen bee, nurtured, tended and cared for because she only has one function in life. Nothing could be farther from the life of the average professional woman.

In another article, Lonsdale described the ideal female scientist as a sort of superwoman:

She must be a good organizer and be pretty ruthless in keeping to her schedule, no matter if the heavens fall. She must be able to do with very little sleep, because her working week will be at least twice as long as the average trade-unionist. ... She must be willing to accept additional responsibility even if she feels that she already has more than enough. But, above all, she must learn to concentrate in any available moment, and not require ideal conditions in which to do so.

It was not surprising to Lonsdale that few women managed to ascend such a steep slope. In fact, her reaction to the number of female scientists who gave up their careers after marriage was that it was ‘much smaller than might be anticipated’ given the strenuous demands made on a woman who was a wife, a mother and a researcher.

Lonsdale’s experiences with her students at UCL further underlined the challenges that a married female scientist might face. Lonsdale was an effective and valued advisor for students of both sexes; in the correspondence about Jean Peskett, Henry Lipson referred to Lonsdale’s ‘long history of helping problem students’, suggesting that Lonsdale had a reputation as a successful advisor even for students whom other professors considered difficult. Her correspondence about her PhD students indicates that she recognized the special difficulties her female students faced and made an extra effort to aid them. Jean Peskett’s story is one example of this kind of situation. Despite Lipson’s conviction that Peskett ought to concentrate on baking, Lonsdale helped the young woman pursue a position as an X-ray crystallographer at the University of Bristol.

A less dramatic case is that of Marianne Ehrenberg, one of Lonsdale’s PhD students during the 1950s, who faced many problems common to married women of that era who attempted to pursue careers. Ehrenberg elected to study for her PhD part time to take care of her household obligations, a decision that greatly increased the amount of time she needed for completing her degree. After her daughter was born, Ehrenberg gave up her position as a lecturer at Birkbeck College. Lonsdale managed to find some grant money to bring Ehrenberg back to UCL to work as a part-time crystallographic technician. ‘We hardly hoped to find anyone so well qualified who was ready to come in a relatively junior capacity’, Lonsdale wrote, hinting...
(perhaps unintentionally) at the career sacrifice Ehrenberg had made.\textsuperscript{45} It was not until many years later, after her daughter turned 10 years of age, that Ehrenberg (with Lonsdale’s support) obtained a full-time teaching position.\textsuperscript{46}

In the face of these kinds of challenges, how did Lonsdale herself build such a successful scientific career? As previously noted, one important element of Lonsdale’s success was her ability to create a productive role for herself while at home. Another factor in her success was the network of supportive colleagues she built during the early years of her career. W. H. Bragg, who had offered Lonsdale her first scientific post, would prove to be one of her most valuable contacts in the years after her children were born. Shortly after the birth of her first child, Bragg helped Lonsdale secure a small grant that enabled her to hire a housekeeper, Mrs Snowball, for a few months. ‘With her to wash and clean, I managed to care for the baby, cook and continue the structural analysis of C\textsubscript{6}Cl\textsubscript{6},’ Lonsdale later recalled.\textsuperscript{47} When the Lonsdales moved back to London, Bragg also found Kathleen Lonsdale a position at the RI. In late 1931, Bragg wrote to her and announced that a benefactor had given him £200 ‘with which you are to get assistance at home to enable you to come and work here.’\textsuperscript{48} After Lonsdale calculated that it would cost their family £277 per year to replace her at home, Bragg increased her proposed salary to £300, indicating that he understood the challenges of caring for a young family while pursuing research and was eager to help his former protégée minimize these difficulties. These exchanges with Bragg also show us another of Lonsdale’s strategies for balancing family and work—hiring domestic help to reduce the amount of time spent on household tasks.\textsuperscript{49}

Bragg was not Lonsdale’s only ally. W. T. Astbury, the former RI colleague with whom she had collaborated on the first reference tables, put Lonsdale’s name forward as a potential Fellow of the Royal Society in 1945 and was a vocal supporter of her candidacy. He recommended her as ‘quite the best woman scientist that I know’,\textsuperscript{50} and sent her regular updates on the Selection Committee proceedings. ‘I did my damnedest for you at the meeting of the Roy. Soc. Selection Committees the other week’, he wrote to her on 1 March 1945 in a note marked ‘Confidential!’ ‘I managed to get you on the “short list” that is submitted to Council from which to make the final selection.’\textsuperscript{51} Another valuable contact was Christopher Ingold, the organic chemist she had met during her time in Leeds. Ingold had been deeply impressed by Lonsdale’s work with benzene, and when he became head of the Department of Chemistry at UCL in 1946 he recruited Lonsdale as a Reader in Crystallography for his department. In 1949 Lonsdale and Ingold were able to transform the Readership into a full Professorship. Lonsdale became Head of the Department of Crystallography, the first such department in Great Britain.\textsuperscript{52}

Lonsdale hinted at another element of her success in an article entitled ‘Women in science: why so few?’ where she wrote, ‘For a married woman with children to become a first-class scientist, she must first of all choose or have chosen the right husband.’ The right husband was a man who would share in the household chores, accept his wife’s hectic schedule, and otherwise do what he could to ease the domestic burdens on his spouse.\textsuperscript{53} Notably, whereas Kathleen had been the one to make career sacrifices early in her marriage, when her career took off it was Thomas who assumed a supporting role and took on a larger share of the household duties.\textsuperscript{54} In a letter to a family friend, written after her death, Thomas called his wife ‘one of the most powerful mathematical minds of the present day’ and described his role in Kathleen’s life as being similar to that of whoever had collected the apple that fell on Newton’s head and made a pie from it so the great man could eat.\textsuperscript{55} For her part, Kathleen clearly felt that she was one of the women who had chosen the right sort of husband.
One further feature of the Lonsdales’ relationship may have played a part in Kathleen Lonsdale’s success: although they were both scientists, the couple did not work together in the laboratory. Many scholars have noted that women scientists who collaborated with male colleagues frequently did not receive full credit for their contributions, a phenomenon that Margaret Rossiter has called ‘the Matilda effect’. The problem could prove especially acute when wives collaborated with their husbands; the couple’s scientific colleagues often assumed that the husband was the intellectual force behind the collaboration and that the wife played the role of his assistant. But the Lonsdales did not collaborate on scientific projects or co-author papers, and Thomas’s field of textile chemistry was distinct from his wife’s field of crystallography. Furthermore, Lonsdale published her most significant scientific paper as sole author—the success of her benzene research was hers and hers alone, and there were no male co-authors or collaborators who could be credited with the paper’s success. Lonsdale’s independence during the early years of her career probably helped establish her reputation as a first-rate crystallographer. This reputation kept many professional doors open even when she was not working as a full-time research scientist. In the later years of her career, when Lonsdale did collaborate with male colleagues, hers was frequently the more famous name on the paper.

**CONCLUSION**

It will hardly seem a revelation that a female scientist in the early twentieth century encountered difficulties during the course of her career. However, it is worth noting that when Kathleen Lonsdale encountered gender bias in the British scientific community, it was often directed not at women in general, but specifically at married women. As scholars such as Londa Schiebinger and Margaret Rossiter have shown, scientists have often viewed their discipline as a uniquely masculine undertaking in which ‘feminine’ qualities are discarded to achieve objectivity and rationality. It is therefore not surprising that some of Lonsdale’s colleagues considered the feminine role of ‘wife’ and the masculine role of ‘scientist’ especially incompatible.

This is not to say that married women somehow faced ‘worse’ discrimination than single scientists. We need only recall James Watson’s infamous remarks about Rosalind Franklin to realize that the sword cut both ways—an unmarried woman could be seen as a bitter ‘bluestocking’ or a troublemaking feminist. Instead, this examination of Lonsdale’s life suggests that our current historical picture of women in twentieth-century science could benefit from more attention to the ways in which marriage and family (or the absence thereof) affected a scientist’s career. Female scientists in the twentieth century had to navigate an extremely complex web of attitudes and assumptions, meaning that the experiences of someone like Franklin ultimately bore little resemblance to the experiences of someone like Lonsdale. There have been some very insightful sociological discussions of the challenges of having both a family and a scientific career (Londa Schiebinger, for example, deals at length with this issue in her book *Has feminism changed science?*), but aside from the excellent 1987 collection *Uneasy careers and intimate lives*, there are few works that examine these issues from a historical perspective. Further historical attention to the relationship between marriage, family and science could deepen our understanding of gender dynamics in the twentieth-century scientific community.
Finally, Lonsdale’s own place in the existing historiography on women in science deserves further scrutiny. At first glance, it would seem that Lonsdale’s impressive list of scientific and professional achievements should make her an important figure in the history of women in science. But despite her accomplishments, there are only a handful of scholarly pieces that discussed Lonsdale at any length, many of them written by her former graduate student Maureen Julian.63

Ironically, Lonsdale’s success may be precisely why there is so little on her in the current scholarship. Many of the most significant studies of women in science have focused on scientists whose contributions were ignored and whose careers were severely undermined by gender bias. Lonsdale’s life does not conform to this biographical model. There seem to be few wrongs to right on her behalf. But a complete picture of women in science must deal not just with cases in which women scientists’ careers were compromised because of their gender, but also with examples of women who were able to succeed despite these difficulties. As this paper has shown, Lonsdale did contend with substantial obstacles during her career and overcame them using a variety of strategies. Although her career was far from typical of her generation, Lonsdale is significant enough to warrant more attention from scholars—and, as this paper has attempted to demonstrate, even an anomalous example might yield wider insight into the history of women in science.

ACKNOWLEDGEMENTS

I am deeply grateful for the assistance and input of Angela Creager, Vivien Dietz, Michael Gordin, Simon Schaffer and John Wertheimer at various points in this project, and for the helpful and insightful comments provided by the referees who reviewed this paper. I also owe special thanks to the staff at the Special Collections department of the UCL Library and at the Royal Society Library for assisting my research and for granting permission to publish material from the Lonsdale Papers and the Minutes of the Council of the Royal Society, respectively.

NOTES

1 Henry Lipson to Dame Kathleen Lonsdale, 14 February 1962, Dame Kathleen Lonsdale Papers, Special Collections, UCL Library (hereafter DKLP), B.302.
2 Henry Lipson to Dame Kathleen Lonsdale, 8 February 1962, DKLP, B.302.
3 Henry Lipson to Dame Kathleen Lonsdale, 14 February 1962, DKLP, B.302.


9 Thomas Lonsdale to ‘Mollie’ (possibly Maureen Julian), 11 November 1974, DKLP, A.10.

10 Maureen Julian, untitled biography of Dame Kathleen Lonsdale, no date, DKLP, A.6.

11 Kathleen Lonsdale to M. Monkhouse, 26 May 1927, DKLP, H.156.


13 Banks, op. cit. (note 12) p. 29; Pugh, op. cit. (note 12), chs 7 and 8. ‘New feminists’ such as Eleanor Rathbone argued that the feminist movement ought to concentrate on obtaining legal protection and government support for women whose husbands could not provide for their families.


16 Dame Kathleen Lonsdale to Sir Thomas Merton, 4 April 1957, DKLP, G.370.

17 Mary L. Cartwright to Dame Kathleen Lonsdale, 17 May 1957, DKLP, G.370.
Minutes of the Committee, 27 May 1957

Science in Schools: a report prepared by a Committee appointed by the Council of the Royal Society, 1957

Sir Cyril Hinshelwood to Dame Kathleen Lonsdale, 12 July 1957

Minutes of the Council of the Royal Society, 20 June 1957

Most historians agree that in the years after World War II, British women made many legal and social gains related to their participation in wartime duties. However, historians differ on whether gains made by British women during the war were permanent or temporary. See Harold L. Smith, ‘The womenpower problem in Britain during the Second World War’, Historical J. 27 (4), 925–945 (1984).


For more on Ingold, see Mary Jo Nye, From chemical philosophy to theoretical chemistry: dynamics of matter and dynamics of disciplines, 1800–1950 (University of California Press, Berkeley, 1993), ch. 8.


Kathleen Lonsdale, ‘The structure of the benzene ring in C₆(CH₃)₆’, Proc. R. Soc. A 123, 494–515 (1929). There had been a lengthy theoretical debate within the scientific community about the structure of the benzene ring. At the time Lonsdale published her article, many scientists had aligned themselves with the University of Chicago’s Jared K. Morse, who believed the benzene molecule had a ‘zig-zag’ structure. Morse had reconciled the apparent bond length problems with the zig-zag model by suggesting that the carbon–carbon bonds in benzene were significantly shorter than those in diamonds. See Jared Kirtland Morse, ‘The structure and dimensions of the benzene ring’, Proc. Natl Acad. Sci. USA 13, 789–793 (1927). Other chemists, such as CalTech’s Linus Pauling, used theoretical calculations to argue that the benzene ring was planar. See Linus Pauling, ‘The dynamic model of the chemical bond and its application to the structure of benzene’, J. Am. Chem. Soc. 48, 1132–1143 (1926). For a useful account of the historical development of the benzene structure debate, see Kathleen Lonsdale, ‘X-ray evidence on the structure of the benzene nucleus’, Trans. Faraday Soc. 25, 352–366 (1929). Lonsdale’s research provided empirical data for what had been, until that point, a largely theoretical debate; she concluded that the X-ray scattering patterns could only be consistent with a planar benzene molecule. Her crystallographic study was regarded by most scientists as the definitive answer to the question of benzene’s structure.

On a curriculum vitae that she compiled in the 1940s, Lonsdale explicitly attributed the gap in her employment history between 1930 and 1932 to the births of her children. Kathleen Lonsdale, ‘Curriculum vita: Kathleen Lonsdale’, no date, DKLP, A.15.


Common symmetry elements include mirror planes (which divide a crystal into two mirror-image halves) and axes of rotation (around which a structure can be rotated without seeming to change the position of the atoms). Other scientists internationally had also made this observation, including P. Niggli and R. W. G. Wycoff. See Hodgkin, op. cit. (note 5), p. 455.


Kathleen Lonsdale, ‘Reminiscences’, no date, DKLP, E.115.

34 See, for example, Kathleen Lonsdale, Is peace possible? (Penguin, London, 1957); Kathleen Lonsdale, I believe …: the eighteenth Arthur Stanley Eddington Memorial Lecture (Cambridge University Press, 1964). Kathleen and Thomas Lonsdale became Quakers in 1935. Both Lonsdales were strongly committed to the Quaker principle of pacifism. In 1943 Kathleen refused to register for mandatory wartime duties—in her case, firewatching during the London Blitz. Lonsdale was already serving as a volunteer firewatcher and the ages of her young children would have exempted her from mandatory duty, but Lonsdale did not wish to obey the registration law because it had no clause exempting conscientious objectors from wartime duties. When she refused to pay the resulting £2 fine, she was sentenced to serve one month in Holloway Gaol, a prison in North London. Lonsdale maintained a lifelong interest in both pacifism and prison reform.
35 Thomas Lonsdale indicated in a letter written after his wife’s death that he had destroyed some of her personal papers because he felt the other parties involved would not want them made public. Thomas Lonsdale to ‘Mollie’ (possibly Maureen Julian), 11 November 1974, DKLP, A.10.
38 Lonsdale, op. cit. (note 5), p. 56.
41 For example, Robert Bones, who left Lonsdale’s lab in the early 1950s, corresponded regularly with Lonsdale about his career and family well into the 1960s. R. A. Bones, various letters to Kathleen Lonsdale, DKLP, B.108–113. D. V. Badami, an Indian student who worked with Lonsdale from 1954 to 1956, frequently sought and received Lonsdale’s advice on papers he submitted for publication during the late 1960s. D. V. Badami, various letters to Kathleen Lonsdale, DKLP, B.103.
42 Henry Lipson to Dame Kathleen Lonsdale, 14 February 1962, DKLP, B.302.
43 Dame Kathleen Lonsdale to Jean Peskett, 20 February 1962, DKLP, B.302. Unfortunately nothing further is known about Peskett’s later career.
44 Marianne Ehrenberg to Dame Kathleen Lonsdale, 17 August 1963, DKLP, B.157.
45 Dame Kathleen Lonsdale to F. B. Tours, 21 May 1958, DKLP, B.406. Tours was responsible for approving Ehrenberg’s appointment and her salary; Lonsdale was probably also emphasizing the good value that UCL was getting in bringing Ehrenberg on board.
46 Marianne Ehrenberg to Dame Kathleen Lonsdale, 28 September 1967, DKLP, B.157.
49 Lonsdale was not the only—or even the first—woman scientist to employ this strategy. In 1885, the married astronomer Hertha Ayrton received a generous financial gift from her friend, the feminist Barbara Bodichon, and used the money to hire a housekeeper so she could continue her research without worrying about the household chores. See Carol Dyehouse, Feminism and the family in England 1880–1939 (Blackwell, Oxford, 1989), at pp. 110–111. More recently, the


51 W.T. Astbury to Kathleen Lonsdale, 1 March 1945, DKLP, A.30.

52 Lonsdale’s contract promised a permanent position until she reached the age of 60 years, at which time she would be eligible for reappointment. ‘University of London; Professor of Chemistry at University College London; Tenure’, no date, DKLP, A.36.


55 Thomas Lonsdale to ‘Mollie’ (possibly Maureen Julian), 11 November 1974, DKLP, A.10.


60 In a passage early in *The double helix*, Watson wrote of Rosalind Franklin, ‘By choice, she did not emphasize her feminine qualities … her dresses showed all the imagination of English blue- stocking adolescents. … The thought could not be avoided that the best home for a feminist was in another person’s lab.’ James Watson, *The double helix: a personal account of the discovery of the structure of DNA* (New American Library, New York, 1969), at pp. 20–21.

